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For those of us who have been studying the evolution of banking over the years, and specifically witnessed the creation of today’s global banking giants, it has been a puzzle as to why these institutions end up having the business models that they do, and whether the benefits of such diverse enterprises flow solely to the management, as some have suggested, or whether shareholders also benefit from such complexities. In this paper, we try to answer these questions by trying to determine whether the complexity of a bank’s business model is related to its returns. Our approach allows for the possibility that bank returns may be retained in part by mobile and powerful bankers and that the amount of rent extraction may vary across different lines of business. Using data on U.S. bank holding companies over the years 2003-12, we find strong evidence that the scope of a bank’s business is an important determinant of bank returns and that, all else equal, diversification favors bank shareholders relative to bankers. Our statistical results support the hypothesis that banks that achieve effective diversification across lines of business also achieve higher returns. In search of this diversification a bank may enter a more sophisticated line of business, and the bankers needed to do this successfully may command premium compensation. But the organizational complexity needed to achieve a competitive advantage in several wholesale banking businesses simultaneously favors shareholders because it serves to moderate bankers’ rent extraction. These forces help us understand the evolution of the business models of some of the largest banks in the last 10 years.
A brave new world? Making sense of practitioner and regulator perspectives on risk culture
by Simon Ashby, Associate Professor of Financial Services, Plymouth University,
Michael Power, Professor of Accounting, London School of Economics and
Tommaso Palermo, Lecturer in Accounting, London School of Economics

The risk culture of financial organizations is a popular area of focus at the current time, with regulators, advisory organizations, professional/trade institutes and financial organizations themselves all providing their view on the subject. However, despite the wealth of commentary there remain many unanswered questions, and to the extent that there is any consensus, there is a danger of overemphasizing certain elements. We provide a critical, but constructive, review of the practitioner literature on risk culture, the aim being to shed further light on some key questions. Specifically: what does risk culture do, can risk culture be modeled, is there a risk culture ideal (in terms of the elements of an appropriate risk culture) and can risk culture be regulated? We argue that there are no easy answers to these questions, and we also challenge some of the existing answers that have been provided. We suggest that to better answer these questions there is a need to look beneath the tip of the risk culture iceberg, focusing less on the more tangible and visible aspects of risk culture (incentives, risk management processes and procedures, etc.) and more on the human-social elements of organizations (such as communication networks and social relationships).
Globalization is driving business for today's insurance executive. Opportunities for global expansion into new markets represent a powerful force accelerating the growth in insurance premiums today – especially as economic performance languishes in much of the developed world. As a result, insurance executives are forced to continuously evaluate and refresh their strategies to identify which international markets are most likely to offer the best prospects for focus and investment. As regional markets around the world become more interconnected and complex, however, understanding how best to optimize the balance between opportunities and risks in individual countries remains a significant challenge. This article aims to help executives better understand the rebalancing now taking place across the insurance landscape in rapid-growth markets and highlight future growth opportunities in specific countries around the globe. Specifically, we identify six rapid-growth markets that qualify as top-tier opportunities, markets that would appear to be particularly attractive for insurance investment over the next decades. These are Turkey, Indonesia, China, Malaysia, Hong Kong and the UAE.
Evaluating the government as a source of systemic risk
by Deborah Lucas, Sloan Distinguished Professor of Finance and Director of the MIT Center for Finance and Policy, Sloan School of Management, MIT

In the wake of the financial crisis, the Dodd-Frank Act established the Financial Stability Oversight Council (FSOC) and the Office of Financial Research (OFR) to address the concern that policymakers lacked sufficient data to anticipate emerging threats to financial stability. Although most discussions about systemic risk have focused on the private sector, the U.S. federal government is the world’s largest and most interconnected financial institution, and through its activities – as a banker, rule-maker and regulator – represents a major source of systemic risk. This paper makes the case that the government is a significant source of systemic risk and offers suggestions for how the OFR could help to illuminate and mitigate such risks.
The recent global financial crisis highlighted the risks arising from an international monetary system that mainly relies on the U.S. dollar as the international currency. Shortages of dollar funding in numerous advanced and emerging economies spilled over into the real economy, contributing to significant economic slowdown. A sound international monetary system in the 21st century requires a number of major currencies to act as world reserve currencies. The Chinese currency could emerge as one of the major world reserve currencies over time. The purpose of this article is to analyze the factors that could contribute to the emergence of the Chinese currency as an international currency.
Should investors avoid or seek out currency risk? 
How to resolve a long-standing puzzle

by Momtchil Pojarliev, Senior FX Portfolio Manager, Fischer Francis Trees & Watts Inc.,
and Richard M. Levich, Professor of Finance and International Business and Deputy Chair 
of the Department of Finance, Stern School of Business, New York University

The question of how to manage currency risk in institutional portfolios has been 
controversial since the modern surge in global investing started to take root in the 1970s. 
Fund managers tend to hedge some or all of their embedded currency exposure, but few pursue currency returns separately with a specially designed currency investment plan. In this paper, we argue that institutional investors ought to hedge a larger portion, and logically all, of the currency exposure in their underlying assets and then make use of the resulting portfolio risk reduction to engage in purposeful currency investing designed to produce alpha- and beta-style returns that are largely uncorrelated with traditional risky assets.
The impact of the recent financial crisis on organizations has been to drive a set of immediate responses that might not be the best long-term solution. The laudable desire to stop things going wrong could be leading some to focus on the “quick fix” while missing the underlying causes. People do not generally deliberately do things wrong, so maybe it is because they do not realize what they are doing is wrong that is the cause. This often places organizational failures within the responsibilities of leadership, not “bad” employees. Having employees who care about the organization and know what its objectives and values are will not only enable more effective risk management but also potentially add to profitability. Revisiting what we are seeking to achieve via leadership and how we do it may provide the long-term solution to many of our organizational challenges, not just those related to risk.
Are structured products a sustainable financial innovation?  
A lesson from the European markets

by Alberto Burchi, Assistant Professor, Department of Economics, University of Perugia and Paola Musile Tanzi, Full Professor of Banking and Finance, Department of Economics, University of Perugia and SDA Bocconi Banking and Insurance Professor, SDA Bocconi School of Management

In recent years, many have started to question the social welfare implications of structured products, which are one of the most complex outcomes of the financial innovation process, and debated about whether they need to be regulated. Given that, similar to options and futures, structured products result in zero-sum outcomes, where one side's losses are the other side's gains, we aim to understand who profits from structured products and investigate the behavior of issuers in proposing new products and examine whether, and to what extent, the financial innovation process is influenced by market trends. Looking at 14,701 products issued in Europe that expired between January 2008 and December 2012, we find that the market for structured products is highly concentrated within Europe, with 9 countries controlling almost 90% of the market, and that the payoffs of these instruments vary quite substantially across markets. We also find a negative relationship between the volumes issued and the number of listed products, which could be construed as a signal for pushing behavior on the part of issuers. Considering that, the product intervention approach by the regulators could be useful in discouraging the pushing behaviors.
The (re)insurance industry is currently at a turning point: new standards have emerged for both insurance contract accounting with IFRS 4 phase 2 being under preparation and solvency evaluation with Solvency II increasingly becoming a standard worldwide. The IFRS 4 phase 2 standard will certainly be welcomed by investors as it should improve the comparability of (re)insurance companies’ performance with each other as well as with other sectors. However, as the awareness of the costs associated with the implementation of the new standard increases, many are beginning to ask whether the benefits may be outweighed by the costs involved. In addition, the proposed standard may also not fulfill the initial purpose of increased comparability within and across industries. On the benefit side, the new standard should reduce the negative valuation premium that the (re)insurance sector is experiencing due to the supposed lack of transparent information, which the current insurance contract accounting (IFRS 4 phase 1) does not manage to lessen. On the cost side, the implementation of the new standard puts a significant stress on the (re)insurance organizations’ resources and, in particular, on its quantitative experts. In this time of uncertainty, the way in which the final insurance accounting standard IFRS 4 phase 2 will be written should have an impact on the cost/benefit analysis that decision makers will undertake. As a consequence, there are already signs that many are beginning to ask whether it makes sense for (re)insurance companies to opt for accounting standards other than IFRS.
Executive summaries

The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it
by Bruce I. Jacobs, Principal, Jacobs Levy Equity Management and Kenneth N. Levy, Principal, Jacobs Levy Equity Management

Leverage entails a unique set of risks, such as margin calls, which can force investors to liquidate securities at adverse prices. Modern Portfolio Theory (MPT) fails to account for these unique risks. Investors often use portfolio optimization with a leverage constraint to mitigate the risks of leverage, but MPT provides no guidance as to where to set the leverage constraint. We propose an amended approach to MPT that allows leverage to be incorporated more effectively. This is achieved by explicitly incorporating a term for investor leverage aversion, as well as volatility aversion, allowing each investor to determine the right amount of leverage given that investor’s preferred trade-offs between expected return, volatility risk and leverage risk. Incorporating leverage aversion into the portfolio optimization process produces portfolios that better reflect investor preferences. Furthermore, to the extent that portfolio leverage levels are reduced, systemic risk in the financial system may also be reduced.
The “3 lines of defense” (3LOD) model, which should provide a simple and effective methodology for improving risk management by clarifying roles and responsibilities among different members of an organization, has been used by many firms over the years. However, this approach has limitations, as three distinct “lines” do not always enable sufficient clarity, mindsets formed through deployment in one business can be difficult to break when considering another, and simplistic and inaccurate generalizations can be made about those in each line of defense. We propose that the limitations of the 3LOD model could be overcome by the use of risk management formations that can make responsibilities clearer and accountability more precise. The risk management formations approach makes it easier to identify and deal with “red flag” formations that could constrain the effectiveness of risk management systems in organizations. It also enables optimized alignment of risk management activities in organizations - helping firms take risks in a suitably controlled manner that meets the expectations of shareholders, customers and regulators.
Executive summaries

Reinsurance and stability: catering to the needs of countries at different stages of development

by Sebastian von Dahlen, Economic Counsellor, International Association of Insurance Supervisors (IAIS) and Goetz von Peter, Senior Economist, Monetary and Economic Department, Financial Markets, Bank for International Settlements (BIS)

The role and functioning of the global reinsurance market has received increasing attention in recent years. While rising losses from natural catastrophes have heightened awareness of the role of peak risk transfer by reinsurance companies, the fallout from the global financial crisis has intensified scrutiny of all parts of the financial sector, including reinsurance. This paper argues that reinsurance-related stability analysis should consider both financial stability and economic stability. In practice, the different emphasis on the two dimensions of stability could lead to a conflict of objectives. For instance, ringfencing a national insurance market for financial stability reasons prevents the country from transferring peak risk abroad – this reduces countries' catastrophe preparedness and risks exacerbating the economic consequences of natural disasters. Our distinction between financial and economic stability helps to identify high- and low-income countries' differing needs for (re)insurance regulation and related data. In this context, our paper discusses distinct features of peak risk transfer and introduces a parsimonious scheme to analyze the cascade of losses that ripple through the (global) insurance market after a natural catastrophe. While countries at different stages of development have distinct needs for the two dimensions of stability, we argue that national and international public sector bodies could usefully combine the objectives of financial and economic stability. This notion relates to the finding that catastrophe preparedness typically also comes with measurable positive effects on the real economy.
Scale, scope and complexity: assessing banking business models

Ronald W. Anderson, Professor of Finance, London School of Economics
Karin Jõeveer, London School of Economics

Abstract
In this paper we study how the complexity of a bank’s business model is related to its returns. Our approach allows for the possibility that bank returns may be retained in part by mobile and powerful bankers and that the amount of rent extraction may vary across different lines of business. Using data on U.S. bank holding companies over the years 2003–12, we find strong evidence that the scope of a bank’s business is an important determinant of bank returns and that, all else equal, wide scope favors bank shareholders relative to bankers. Establishing a presence across a wide range of wholesale banking activities requires a complex organization that would be difficult to replicate elsewhere and in this way serves to moderate bankers’ compensation demands. We use our statistical results to shed light on the evolution of the business models of some of the largest U.S. banks over the last 10 years.

1 We gratefully acknowledge support of The Clearing House Foundation, the Frederik Paulsen Foundation, and the Economic and Social Research Council (ESRC) in funding the Systemic Risk Centre [grant number ES/K002309/1]. All views expressed and responsibility for all results reported here are the responsibilities of the authors.
1. Introduction
The banking crisis emanating from the U.S. in 2007-08 and continuing in the sovereign debt crisis in Europe has given rise to an enormous public reaction against past actions of banks and bankers. Following large taxpayer support for the banking sector, banks have come under enormous pressure to break with the past. The drivers of change are coming from many directions. Heightened capital requirements have encouraged deleveraging and asset disposals. Basel III and other detailed changes in prudential regulation have created strong incentives to rebalance the bank’s mix of businesses with the retreat from securitization being one of the most visible examples. Compensation practices have been subjected to challenges from directors, shareholders and policymakers. Banks have been actively shifting away from cash bonuses to increased reliance on both long-deferred compensation and straight salary. In apparent reaction, there have been numerous, high-profile departures of senior bankers into hedge funds or other ventures. Efforts to force changes in banking structure are being backed by major legislation following the Volker Rule in the U.S., the U.K.’s Vickers Commission, and the E.U.’s Liikanen report. Aggressive criminal and civil litigation has challenged many business practices. And more recently, especially in the U.S., proposals for breaking up banks through anti-competitive statutes are gaining momentum. As it struggles to keep up, senior bank management is being forced to deeply reconsider its desired banking model.

All these actions are reflections of an enormous public debate, now underway, about the appropriate role of banking in society. In effect, many are asking: why do we need big banks? So far, there have been very few clear and convincing reasons put forward. This void has revealed what has for some time been a concern of regulators, which we can describe as the “big bank puzzle.” During the last 25 years, there has been a clear trend toward banking consolidation that has created much larger and more complex banks. Nevertheless, most of the previous research done on banking efficiency has failed to

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2 This puzzle was summarized by Alan Greenspan (2010) as “For years the Federal Reserve was concerned about the ever-growing size of our largest financial institutions. Federal Reserve research had been unable to find economies of scale in banking beyond a modest size.”
uncover any evidence of economies of scale or scope in banking that might account for this increased concentration in banking.³ In the absence of convincing evidence of the greater efficiency of the largest banks, many have found an alternative explanation of the banks’ quest for large size that seems to ring true – too big to fail (TBTF).

For some, this explanation seems to fall short of really accounting for the transformation of banking in the last 25 years. Without diminishing the importance of finding appropriate regulatory treatment of large complex banking organizations, it seems hard to accept that the massive consolidation of local banks into dominant regionals and then later into super-regionals was driven solely by a possible funding advantage of being TBTF.⁴ According to FDIC statistics, between 2001 and 2012 there were 14 banking failures of banks with total assets of above U.S.$5 billion, which placed them in the top 10% of all banks by size. So, there is still an open question of what were the advantages being sought that created these large banks that never came close to being so large or so complex that the prospect of their failure following an idiosyncratic loss would have posed a systemic risk that justified a public rescue operation.

This question has prompted a small number of researchers to try to have a fresh look at the data to see whether recent data tell a different story than in the past or whether older methodologies were to blame for failing to reveal efficiency benefits of size that were always present. In his review of past literature, De Young (2010) concludes that the traditional static efficiency approach is incapable of capturing the advantages of large organizations that seems to be implied by the observed equilibrium distribution of

³ The top 10 bank holding companies in the U.S. held 35% of total banking assets in 1990. In 2009 this concentration ratio had risen to 75%. Much of the M&A activity that has taken place in this period has been justified by top management as a search for competitiveness through productivity gains. This seems to be contradicted by early bank efficiency studies, which [as summarized by Berger et al. (1993)] found banks reach minimum efficient scale (i.e., the low point on their cost curves) at U.S.$300 million (i.e., at the 6th percentile of the distribution of U.S. banks in 1993).

⁴ The funding advantage of TBTF is controversial. Acharya et al. (2013) find that banks they characterize as TBTF benefit from a funding advantage about 28 bps per year. However, Araten and Taylor (2012) find that the very largest banks tend to have higher funding costs because of the relatively higher reliance on relatively more expensive forms of external finance. Krozner (2013) discusses these and other findings and emphasizes that the problem of differentiating a TBTF advantage from liquidity, risk or other explanations poses important problems of identification that are still unsolved.
bank sizes. In particular, small and large banks tend to offer very different ranges of services with the latter dominating wholesale banking services. Wheelock and Wilson (2012) use the static cost function framework employed by earlier banking efficiency studies. However, working with more recent data and introducing an important change in the functional form for the empirical specification, they find evidence of stronger economies of scale than in previous studies. Hughes and Mester (2013) allow for managerial risk preferences and use more recent data. Under the assumption that leverage is adjusted optimally in the face of banks’ cost of capital, they find significant scale economies.

In our own earlier work on U.S. bank holding companies covering 1990 to 2009, we make a fundamental departure from the static efficiency framework by allowing for the possibility that efficiency gains associated with large scale might be captured in part by mobile bankers. In this rent extraction framework, we find very strong and robust evidence of economies of scale reflected in banking returns [Anderson and Jõeveer (2013)]. We further found that the advantages of size largely operate through three drivers of efficiency – funding efficiency, presence in wholesale banking and leverage. That is, size itself does not produce efficiency gains. Rather, the modes of managing their businesses and kinds of businesses that they can pursue seem to be the advantages available to large banks.

Many wholesale banking activities (custody, market-making in global markets, investment banking) are dominated by a small number of players. The fact that the same banks are often dominant across a wide range of very different activities suggest they may reap synergy gains. That is, there may be significant economies of scope in banking. However, the search for synergies in combining different business lines leads to more complex organizations and significant challenges for management. So the presence or not of scope economies is far from obvious, and the diversity of business models in banking suggests that there is no clear consensus among bankers as to whether the pursuit synergy gains through complexity is worthwhile.\(^5\) Certainly, a number of innovations in the financial

\(^5\) Indeed the conversion of Sandy Weil, the father of Citigroup, to the view that smaller, simpler banking may be better shows that a single banker may be of two minds on the question.
industry have widened the services provided by the banks; yet, the traditional banking business, which relies on collecting deposits and allocating loans to SMEs, is still a major source of income for most of the banks in the U.S..

There is surprisingly little previous research on economies of scope in banking, and the evidence of significant scope economies is limited. Allen and Rai (1996) study banking efficiency in 15 countries during the period 1988–92. They split the sample into “separated” and “universal” banking countries. Separated banks are found to be relatively more X-inefficient and have higher risk exposure. Cavallo and Rossi (2001) study European banks during the period 1992–97. They find scope economies exist, but only for the largest banks. Vander Vennet (2002) finds that financial conglomerates and universal banks are more cost efficient than specialized banks when both traditional and nontraditional banking activities (non-interest income related) are taken into account. Baele et al (2007) use Tobin’s Q adjusted for a frontier estimate of X-inefficiency as a proxy for franchise value and find this is an increasing function of noninterest income share in sample of large European banks between 1989 and 2004. They interpret this as supporting the hypothesis that diversification of income sources is value creating.

In this paper, we explore the hypothesis that there are economies of scope in wholesale banking. We estimate the determinants of returns to bank shareholders, of rents accruing to bankers and of the two combined. In addition, we develop a measure of banking scope based on detailed line of business data available from the U.S. regulatory filings. When combined with controls for scale, funding efficiency, presence in wholesale banking markets and leverage, we find that there is strong and robust evidence of economies of scope and that these efficiency gains accrue particularly to bank shareholders. One possible explanation for these results is that the interdependence between business lines in large global banks serves to counterbalance the bargaining power of bankers in any single business line. We use these results to shed light on the evolution of the business models of some of the largest U.S. banks between 2003 and 2012.

For a description of the estimation of scope economies used in traditional static efficiency studies and a review of past literature, see Hughes and Mester (2010).
2. Understanding complexity in banking

We start from the observation that the emergence of very large banks has also been a move toward more complex banks.\(^7\) In big banks, as in other large, complex organizations, an important challenge is how to mobilize a large workforce with specialized skills in a coordinated fashion. Human capital development and information technology are central to this task. Wholesale banking, in particular, is an example of a knowledge-based industry. This has been described as “the new enterprise” by Rajan and Zingales (2000). They argue that, “But perhaps the most significant change has been to human capital. Recent changes in the nature of organizations, the extent and requirements of markets, and the availability of financing have made specialized human capital much more important, and also much more mobile. But human capital is inalienable, and power over it has to be obtained through mechanisms other than ownership.”

The observation that human capital is a crucial input into the provision of banking services is at the heart of our approach. What is described as the inalienability of human capital means that if a worker develops particular skills or knowledge in one firm, these attributes tend to adhere to them. If they choose to move to another firm or setup on their own, there are limits to the ability of their old firm to retain the key skills and knowledge they embodied.

There are abundant examples of this in banking. When a corporate finance specialist moves to another firm, clients from previous M&A deals may decide to look to the banker rather than their previous bank when they consider their next deal. Following several good years a team of traders in a specialized niche security may be lured away by a rival bank with offers of guaranteed bonuses and other attractions. One reason that this feature of human capital is important in understanding how banks achieve efficiency and grow is that the bank with a competitive edge may be able to gain a powerful position in some of its lines of business, and in this way produce some extra-normal returns or rents. But mobile,

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\(^7\) This is not to suggest that banks that have pursued a strong growth strategy have actively sought complexity. Complexity of the bank’s business model may be the result of trying to achieve synergy gains across a range of banking products, which may not be complex in themselves.
and therefore powerful, employees may be able to extract some of these benefits in the form of superior bonuses, perquisites or other forms of compensation.

This “rent extraction” hypothesis has long been part of the labor economics literature [see, for example, Van Reenan (1996)], but it is absent from the static efficiency methodology that has been adopted by virtually all past studies of banking efficiency. In our view this is key to resolving the “big bank puzzle.” \textbf{Figure 1} illustrates this reasoning. We suppose a bank’s business will generate returns for both investors and for bankers. Following the principal/agent paradigm [see, for example, DeMarzo and Fishman (2007)], an efficient bank is one that maximizes the return to investors for a given amount of return for bankers. The figure depicts hypothetical efficiency frontiers for two classes of banks characterized as “large” and “small.” To compare the efficiency of these classes of banks we need to look at the distance between one frontier and the other. For example, we could measure the distance from the origin along a ray for each class and then take the ratio of the outer frontier to the inner frontier. In \textbf{Figure 1} large banks are 25% more efficient than small banks by that measure.

From \textbf{Figure 1} it is also clear that omitting returns to bankers from an analysis of returns to scale can lead to erroneous conclusions. For example, suppose that most observations for “small banks” are clustered close to the point “S,” and at the same time observations for “big banks” are clustered near the large bank frontier at the point “B.” Then, a regression of shareholders’ returns on size would find a negative relationship; whereas, the analysis combining shareholders’ and bankers’ returns reveals increasing returns to scale.

This framework can be implemented using a model of the form, \[ \text{total return} = f(\text{return to investors, return to bankers}) \]

Return to investors is measured by return on book equity (ROE), because equity holders have ownership rights and have ultimate say in setting compensation policy.\footnote{We have also explored alternative specifications, including return on assets (ROA) and risk adjusted returns on equity using stock price volatility. The results were robust to these modifications.}
We define bankers’ return as the rate of excess compensation over a “competitive” rate of compensation. First we calculate bankers’ excess compensation as the maximum of zero or total employee compensation minus the competitive wage bill. The competitive wage bill is total employee head-count times a competitive wage rate calculated as the average total compensation per employee based on banks with less than U.S.$1 billion in total assets and at least 50 employees. The resulting excess compensation measure is then scaled by dividing by total book equity in order to make this comparable to investors’ return. We label this as the bankers’ return (mxlrrentseq). Note that this measure covers compensation of all employees. There is an advantage to this measure, as compared with using only top manager compensation (e.g., as reported in Execucomp), because often top compensation is paid to senior investment bankers or top traders who do not figure among the top executives of the bank.⁹

Returns to investors and returns to bankers are combined to give a total return (trentseq) using the equation.

\[ \text{trentseq} = [(1 + r_i)^\tau + (1 + r_t)^\tau]^{\frac{1}{\tau}} \]

This functional form gives rise to downward sloping, concave frontiers as in Figure 1.

We estimate return relations of the form,

\[ \text{return}_{k,t} = \alpha_t + \beta X_{k,t} + \varepsilon_{k,t} \]  \hspace{1cm} (1)

where return is a measure of bank returns (either investors’, bankers’ or total return), \( X \) is a vector of explanatory variables, \( k \) is the index of the bank, \( t \) is the fiscal year, and \( \varepsilon \) is an i.i.d. error term. Explanatory variables included are as follows: as a measure of scale we use total assets (at) and also allow for a nonlinearity effective at very large size with a

⁹ We have done a variety of robustness checks including alternative specifications of the competitive wage rate and using compensation per employee rather than excess compensation and found qualitative very similar results.
dummy for 10th decile of total assets (at10). We include net interest margin (nim), which proxies for relative funding efficiency. We also interact nim and at10. Presence in wholesale banking activities is captured by noninterest income share to total income (niish) and niish interacted with at10. Capital ratio (ilev) is included to control for risk-taking. And macro and business cycle factors are controlled for by year dummies.

As we have already noted, our central concern is whether the creation of more complex banking structures has produced any net efficiency gains, that is, are there positive economies of scope in banking. Banks increase their scope for a variety of reasons. Combining securities market activities of a broker/dealer with a commercial bank with a rich deposit base may bestow a funding advantage by reducing the need for volatile wholesale funding markets. Large corporate clients may find it efficient to consolidate their diverse banking needs in a single large bank. Reciprocally, banks working with clients on a variety of products may have an information advantage that improves their monitoring efficiency or gives them a richer set of tools to mitigate counterparty risk. Of course, expanding a bank’s operations into new products or new geographies may come with significant cost that can outweigh the benefits.\(^{10}\)

In addition to these possible considerations in a bank’s decision to expand its scope, our rent extraction perspective suggests an additional benefit for a bank to embrace a wide scope, namely, that banks with wide scope may find that they can better resist compensation demands of bankers in certain business lines. Indeed in our earlier work we did find that, to a significant degree, the higher returns associated with the biggest banks accrue disproportionately to bankers rather than to bank shareholders. Furthermore, we find that the degree to which bankers are able to retain the benefits of size for themselves is

\(^{10}\) This has been the theme of the branch of the corporate finance literature that has estimated the "conglomerate discount," i.e., the possibility that the value of an integrated firm may be less than sum of the values of its parts. This methodology has recently been applied to the financial sector by Schmid and Walter (2014). Using a sample of financial firms including banks, insurance companies and other financial firms and employing several alternative definitions of diversification, they find a significant diversification discount in most years. However, the size of the discount was smaller than in previous studies and also became insignificant in the recent financial crisis.
dependent upon the mix of businesses that the bank pursues, that is, on the bank’s business model. Some banks may seek advantage through funding efficiency achieved through a rich, cost-effective branch network. Others may seek critical mass in trading and sales through wholesale funding and leverage. These choices have important implications for the bargaining power of bankers. In particular, we found that pursuit of dominance in wholesale markets, even if it means reliance on relatively expensive wholesale finance, tends to be very beneficial to bankers, if not to bank shareholders.

In banking, top managers and active shareholders are well aware of the kind of power that experienced bankers can acquire. As pointed out by Rajan and Zingales, investors need to find the means of asserting themselves in the face of powerful employees who otherwise may have the upper hand in bargaining. A bargaining chip that may tip the balance in the bank investors’ favor may take the form of a specific resource in the bank that the employees may not be able to find upon moving to a rival. Examples might be access to a system or payments technology or perhaps a funding source, that cannot be easily found in other competitive banks. Complex systems that have been used to link different lines of business in a large wholesale bank are prime examples of these difficult-to-replicate resources.

The conclusion from this discussion is that by broadening the scope of its operations a bank can generate efficiency gains, but, in addition, it can increase the share of gains that accrue to shareholders. In order to test this hypothesis, we look to information about banks’ lines of business in order to construct a measure of scope and use this measure as an additional determinant in our model (1). Our scope measure is based upon data from U.S. bank holding companies (BHC) collected through their Fed regulatory filings FRY9–C. These data have two advantages for our purposes. First, economies of scope may be generated through the combination of diverse businesses that may be housed in different legal entities. However, they should be reflected in return data for the consolidated group. In the U.S., consolidation is done at the BHC level. Second, the Fed regulatory filings is the richest source of information on diverse business lines that is collected on a standardized basis.
The specific measure of banking scope that we employ is based on income statement information. Here, we are able to identify five lines of business: commercial banking, global markets, investment banking, private banking and fund management. From the FRY9–c data we map income into these lines of business as follows. Commercial banking includes the interest income from loans and leases as well as other non-interest income. Global markets includes the income from the trading activities and interest and dividends from securities. Investment banking includes income from investment banking activities, fees from brokerage, income from insurance and reinsurance, venture capital income and net securitization income. Private banking includes income from fiduciary activities and fund management includes net servicing fees. From these we define a concentration index, cindx, calculated as the income shares squared and summed across lines of business. That is for bank k in year t,

$$cindx_{k,t} = \sum \left( \frac{inc_{k,t,i}}{\sum inc_{k,t,i}} \right)^2$$

(2)

where inc_{k,t,i} is bank k's income from business line i in year t. This index has value between 0.2 and 1. The higher index value means that the bank income streams are more concentrated. For example, if all income comes from commercial banking activities the index will have value 1 and if the income is equally split between commercial banking and investment banking activities the index will have value 0.5. The bank with lower index value follows a more diversified business model. The cindx is our preferred measure of scope because in our view the five lines of business fit reasonably well with the way most large-scale bank categorize their businesses.

3. Statistical results

Our dataset covers U.S. bank holding companies regulated by the Federal Reserve over the years 2003 to 2012. The data start in 2003 because in that year there were important modifications in the FRY9-C report on lines of business that allow us to construct our scope index. This is a large dataset covering most of the largest deposit taking institutions in the U.S. It excludes small banks that fall below the reporting limit, thrift institutions that until 2011 were regulated by the Office of Thrift Supervision, foreign banks, and investment banks that were not organized as bank holding companies until 2008.
(e.g., Goldman Sachs and Morgan Stanley). There are a number of missing observations among small banks. We include in the sample only banks within the top five size deciles. After cleaning the data for missing observations and outliers, there are 6763 observations in the sample, or an average of 676 banks per year.

In Table 1, we report summary statistics. Mean return to investors is 5.5% and to bankers 2.2%. As shown in Anderson and Jõeveer (2013), both variables are much higher for larger banks. Mean value of the scope indices cindx is 0.719. This suggests that most banks are not very diversified in their business activity. Inspection of the data confirms that most banks included are heavily concentrated in commercial banking. The size distribution of banks is heavily skewed, as reflected in the mean of total assets of U.S.$16.9 billion compared to a median of U.S.$1.1 billion.

Table 2 reports the simple correlation coefficients among the variables in the sample. The correlations among the explanatory variables are not very high, suggesting that they capture different aspects of bank characteristics.

The results of the estimation of our model (1) are reported in Tables 3 and 4. The regressions of niseq and trentseq are estimated by OLS. The mxlrrentseq model is estimated by Tobit regression. T-ratios reported are based on clustered standard errors. Table 3 combines measures of the scale (at and at10) with cindx, our measure of scope. In columns 1–3 of that table we see evidence of positive economies of scale in the absence of other controls. Bank size enters positively and is significant in returns to investors, returns to bankers and total returns, and the top size decile is positive and significant in the bankers return and total return regressions.

When the diversification across business lines is included (cindx) the pattern changes markedly. In the investor return regression (column 4) the cindx is negative and highly significant; whereas, the scale measures are now insignificant. The cindx enters negatively and is significant in the return to bankers (column 5) and total returns (column 6) regression as well; however, the scale indicators remain positive and significant there. The magnitude of the coefficient on cindx is larger in the investor return regression than in the bankers’ return regression. So overall, the results are in line with the hypothesis that increased scope will be particularly beneficial to shareholders.
These results are reinforced when additional controls are included in the analysis as in Table 4. In column 4 of that table the coefficient of cindx is negative and highly significant; whereas, in column 5 it is negative but insignificant. The economic magnitude of the predicted effect of a change in scope is roughly 10 times greater for shareholders than for bankers. For example, an increase of scope of 10 percentage points (say from cindx=0.60 to cindx=0.50) is predicted to increase investor returns by 1.14%; whereas, banker returns are predicted to rise 0.17%.

The results related to other explanatory variables nim, niish and ilev are rather insensitive to the inclusion of the scope index cindx, suggesting that they are capturing different determinants of bank business models. We find that funding efficiency (nim) is positively related to investors' return but negatively related to bankers' return, while the interaction of this term with at10 has a statistically significant positive effect on all bank return measures. Non-interest income share to total income (niish) turns out to have a positive statistically significant coefficient while its interaction with 10th decile dummy has low predictive power. The capital ratio enters with positive sign in investors' return and with negative sign into bankers' return estimations (though the latter is not statistically significant). Hence, the high capitalization of the bank is beneficial to the investors while there is no effect on bankers. The inclusion of those additional estimates causes size and at10 to lose statistical significance but cindx remains highly significant for investors and total return estimations. Consequently, even though the additional explanatory variables are able to explain the scale effect, they are unable to capture the scope effect. Hence, the diversification of the bank income streams is an important factor for banks' returns.

To summarize our main results, we have found that the scope of business activities is an important determinant of the returns to bank shareholders. Measuring scope as the degree of diversity of income derived from five lines of banking business (commercial banking, global markets, investment banking, private banking and fund management), we find evidence of positive economies of scope in the determination of returns to shareholders. The sensitivity of shareholder returns to increased scope is approximately 10 times the
sensitivity of bankers’ returns. This result supports the hypothesis presented in Section 2 that scope favors shareholders because it enables them to retain a larger share of returns relative to the rents conceded to powerful employees. The scope effect is robust to including other determinants of banking returns, namely, funding efficiency, share of non-interest income and leverage. Scope plus these variables largely account for apparent economies of scale in shareholder returns.

4. Bank business models
The statistical results in Section 3 suggest that diversifying activities away from traditional commercial banking into other banking business lines has had a large impact on returns in banking. It can increase the total return in banking, but, sometimes just as important, it can affect the way increased value is allocated between shareholders and bankers. The characteristics that have been identified as drivers of this are scope, funding efficiency, presence in wholesale markets, leverage and, to a lesser extent, scale. Of course, in reality banks cannot easily change these drivers of value one at a time, independently of one another. Instead, major changes in a bank’s strategy may affect some or all of them. For example, penetration into wholesale banking may be accomplished through a major acquisition, which will also affect value by increasing its scope and scale. The same acquisition may alter a bank’s funding strategy by increasing its reliance on wholesale funding, which results in a reduction of its net interest margin. Furthermore, such major changes in a bank’s strategy can have important consequences for the bank’s compensation practices. This can affect the way total value created by a bank’s strategy is shared out between bankers and shareholders.

In this section, we use our statistical model to study the way that some of the largest U.S. banks have modified their business models in the last 10 years and how this has impacted both their efficiency and the allocation of returns to shareholders and investors. For this purpose, we use the total bank return regression reported in Table 4 column 6.

It should be recognized that by confining ourselves to only the very large banks we are focusing on banks that are already rather different from most small- and medium-sized banks that remain very much based on a traditional commercial banking model. This is reflected in Figure 2, which plots the estimated efficiency frontier for banks grouped within
each of the top 5 size deciles. In this calculation, for each group we evaluate the total return model at the mean value of all the explanatory values used in the regression model. As can be seen from the figure, the largest banks (those among the top size decile) typically achieve an estimated efficiency well beyond that achieved by the smaller banks.

As noted already, these biggest banks include some that have diversified their business lines most. In Figure 3, we have plotted representative efficiency frontiers for the banks group into quintiles based on their scope (as measured by cindx). Again, these frontiers are derived from the estimated equation from Table 4 column 6, evaluated using the group mean values of the explanatory variables. The figure shows that the banks that have the widest scope in their business lines (i.e., in the first quintile grouped by cindx) also achieve the highest estimated frontier efficiency.

Over the last 10 years, changes in banks' business models necessarily reflect how banks have been affected by the major crisis commencing in 2007 and by the large changes in regulation and business practices that have followed this. This experience has been different for the largest banks, as compared to their smaller counterparts. This is illustrated in Figure 4, where in the top half we have plotted the median return to shareholders and to bankers by year for all banks in our sample (i.e., the top five size deciles of the U.S. bank holding companies reporting to the Federal Reserve). In the bottom half of this figure we report the median returns to shareholders and bankers only for the top size decile banks. The shareholders' return pattern is similar for the full sample and the large bank sample. During the crisis, shareholder returns fell from high levels by a factor of 80% and have been slowly recovering thereafter. However, the story is different for bankers' returns. The median of the full sample bankers' returns were completely wiped out by the crisis and have only slightly returned to positive in 2011. In contrast, for the largest 10% of banks, the decline of banker returns in the crisis was more moderate, a factor of about 50%, and they recovered steadily from 2009 to 2011.

We now turn to the issue of how over the last 10 years some of the largest U.S. banks have changed their business models, as characterized by our statistical models, and what this has meant for their efficiency. In Figure 5 we report evolution of our measure of scope based on diversity of income across business lines, cindx.
Although they were all very large by 2003, there was considerable diversity of business models across the eight selected banks, as can be seen by the degree of scope. In that year, the bank with the widest scope (lowest cindx) by a considerable margin was JP Morgan Chase, followed by State Street and Citigroup. All three were very prominent in a wide range of wholesale banking services. JP Morgan and Citi had grown through mergers and major acquisitions to become global universal banks. State Street differed from these two by not possessing a very large retail banking activity and by being best known as a global custodian bank. Nevertheless, it had diversified its earnings across distinct business lines. At the opposite end of the scope spectrum were the super-regional banks: Wells Fargo, U.S. Bank and Fifth Third Bank. All 3 had grown over the preceding 15 years through an active process of acquisitions of smaller commercial banks in order to create dense regional networks. In 2003, they were still heavily focused on commercial banking. Bank of America and Wachovia occupied somewhat intermediate positions. They were super-regional banks that had developed clear strengths in areas outside traditional retail and commercial banking.

In the years that followed, these banks went through a number of very significant changes and some of these are clearly visible in the evolution of the scope measure in Figure 5. In particular, there is a rather clear downward trend in the cindx of Wells Fargo, reflecting a diversification away from commercial banking and an increase in the scope of income sources. An important step in this process was the acquisition of Wachovia in 2008, which diversified it geographically but also increased its presence in fund management and private banking. In contrast, the other super-regionals, U.S. Bank and Fifth Third, have stayed firmly committed to the commercial banking model and over time have even become somewhat less diversified in their income sources by lines of business (although they are both very highly diversified geographically).

Turning to the banks with the widest scope in 2003, JP Morgan Chase underwent major changes first through the merger with Bank One in 2004, which dramatically increased its retail network and geographic footprint, and then later through further acquisitions, notably Bear Stearns and Washington Mutual in 2008. These changes have coincided with a perceptible decline in the bank’s scope as reflected in an upward trend in cindx. This suggests that the bank has somewhat reinforced the role of commercial banking while still
maintaining a large presence in wholesale market activities. Over the last 10 years, Citi has also seen a decline in scope, as indicated by the evolution of cindx. This has taken place largely since the onset of the crisis and is a reflection of underperformance linked to its difficulties in the mortgage market and more recently certain asset disposals as it has concentrated business lines considered to part of its long-term core. In contrast, State Street has not undergone any comparable transformation and has maintained its presence across a wide range of wholesale banking markets. This is reflected in a very stable cindx, which meant that by this measure it had the broadest scope in 2012. Finally, over this period Bank of America has diversified its business through the acquisition of Merrill Lynch, and this has resulted in a noticeable decline in cindx.

**Figure 6** plots the predicted efficiency frontiers in 2003 for the selected banks. This is based on the total return estimates in Table 4 column 6 evaluated at the observed values of the explanatory variable for each bank. The frontiers predicted for the three banks with the widest scope, JP Morgan Chase, Citi and State Street, are virtually identical and are to the northeast of all the other banks. The predicted return frontiers for Bank of America, Wachovia and U.S. Bank are very close to each other. Comparing these two sets of banks, we see that the wide-scope banks are more efficient than the banks heavily concentrated in commercial banking by about 4 percentage points (i.e., total returns of 25% versus 21% of book equity). Wells Fargo occupied a position intermediate between the other super-regionals and the wholesale/global banks. Its predicted efficiency is higher than the other banks heavily concentrated on commercial banking, largely because it achieved a relatively high funding efficiency (as measured by net interest margin). The relatively low predicted efficiency of Fifth Third is largely accounted for by its relatively low net interest margin.

Also in **Figure 6**, the diamonds plot the realized returns to shareholders and bankers for the selected banks in 2003. The banks with highest banker returns were JP Morgan Chase and State Street followed by Wachovia, Citi and Bank of America. These were the banks with the widest scope at that time. In contrast, the super-regional commercial banks, Wells Fargo, Fifth Third and U.S. Bank had the lowest returns to bankers. This suggests that the compensation practices differ substantially between complex, highly diversified banks and the banks heavily concentrated in traditional commercial banking. The difference in banker payout rates for JP Morgan Chase and State Street on the one hand and Citi on the other
might be explained by the relatively high shares of income earned in investment banking and private banking by the first two versus Citi where global markets was particularly dominant.

Figures 7, 8 and 9 depict the predicted efficiency frontiers of the selected banks in 2006, 2009 and 2012 respectively. Through these we can trace the effect on predicted bank returns of the various changes these banks made to their business models. Comparing Figure 6 and Figure 7 we note that in 2006, JP Morgan Chase was the bank that attained the highest predicted efficiency. This reflected in part the merger with Bank One, which significantly increased its retail network and appears to have contributed to an improvement in its net interest margin. Also, there is a noticeable decrease in JP Morgan Chase realized bankers’ return. This also may be attributable to the merger with Bank One, as the latter had much lower bankers’ return before the merger.

The predicted total returns for the selected banks in 2009 are seen in Figure 8. They reflect the effects of the crisis and are lower overall. JP Morgan Chase is sometimes depicted as one of the winners in the crisis. However, based on our predicted efficiency, its seems to have suffered in relative terms. JP Morgan Chase now lags State Street and Wells Fargo by about 2 percentage points of total return. The crisis was also harsh for Citi, which in this year had the lowest predicted efficiency of all the banks included in this comparison. In each case, the downturn in securities depressed the non-interest income share of earnings, which outweighed the positive effects of some improvement in the net interest margin.

As seen in Figure 9, by 2012 the changes in the characteristics of the banks resulted in distinct differences in their predicted total returns. Here, State Street is predicted to exceed the total returns of JP Morgan Chase and Wells Fargo by about 4 percentage points (20% versus 16%). These three were followed by Bank of America (14.5%), U.S. Bank (14%), Fifth Third (13%) and Citi (10%). The low relative efficiency predicted for Citi was due largely to the very low share of non-interest income, as its global markets and investment banking businesses continued to struggle. In contrast, Wells Fargo in 2012 had a non-interest income share of nearly 50%, not far short of that of JP Morgan Chase. Thus, its transformation from a super-regional commercial bank into something resembling a
global bank, at least in terms of its presence in wholesale banking markets if not necessarily in its geographic footprint, seemed to be confirmed. The figure also shows that Bank of America’s realized return fell far short of its predicted performance. This suggests it was still struggling with the impact of some of the acquisitions (e.g., Countrywide).

5. Conclusions
In this paper, we have examined the evidence of economies of scope in banking in a large sample of U.S. bank holding companies. Our approach allows for the possibility that a bank may achieve market power in some business lines and that some of the rents created by this advantageous position may be extracted by bankers rather than shareholders. By achieving scope in diversifying across business lines a bank may generate pure efficiency gains, but this can also enhance the ability of shareholders to retain a greater fraction of rents that the bank produces. Our statistical results support the hypothesis that banks that achieve effective diversification across lines of business also achieve higher returns. In search of this diversification a bank may enter a more sophisticated line of business, and the bankers needed to do this successfully may command premium compensation. But the organizational complexity needed to achieve a competitive advantage in several wholesale banking businesses simultaneously favors shareholders because it serves to moderate bankers’ rent extraction. These forces help us understand the evolution of the business models of some of the largest banks in the last 10 years.
Scale, scope and complexity: assessing banking business models

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A brave new world?
Making sense of practitioner and regulator perspectives on risk culture

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Abstract
The risk culture of financial organizations is a popular area of focus at the current time, with regulators, advisory organizations, professional/trade institutes and financial organizations themselves all providing their view on the subject. However, despite the wealth of commentary there remain many unanswered questions, and to the extent that there is any consensus, there is a danger of overemphasizing certain elements. We provide a critical, but constructive, review of the practitioner literature on risk culture, the aim being to shed further light on some key questions. Specifically: what does risk culture do, can risk culture be modeled, is there a risk culture ideal (in terms of the elements of an appropriate risk culture) and can risk culture be regulated? We argue that there are no easy answers to these questions, and we also challenge some of the existing answers that have been provided. We suggest that to better answer these questions there is a need to look beneath the tip of the risk culture iceberg, focusing less on the more tangible and visible aspects of risk culture (incentives, risk management processes and procedures, etc.) and more on the human-social elements of organizations (such as communication networks and social relationships).
**Introduction**

Interest in risk culture has increased significantly in recent years. Where financial organizations and their regulators once spent their time and energy on quantifying risk and developing risk models for regulatory capital purposes, now they are diverting more of their attention to the “softer” topic of risk culture.

Events such as the financial crisis, as well as the more recent LIBOR, Payment Protection Insurance and “London Whale” scandals have played a key part in stimulating this growth in interest. In each case, a variety of post-mortems have identified “weaknesses” in risk culture as playing a key causal role. Moreover, regulators are looking to combat these weaknesses in risk culture via much more direct supervision, as exemplified by the recent Financial Stability Board (FSB) paper on risk culture [FSB (2014)].

All of this interest has generated a lot of “output”, especially on the part of advisory organizations, professional institutes and regulators. Risk culture, it would seem, is very much on trend. A review of this output reveals that there are areas where consensus is emerging, though whether this consensus is targeting the right issues/elements is another matter. However, there remain many unanswered questions and we are a long way from identifying the common elements (whether positive or negative) that may comprise an organization’s risk culture, or agreeing how to monitor and manage risk culture effectively - if indeed such utopian ideals really exist.

In what follows we provide a critical, but constructive, review of the growing regulatory and practitioner literature on risk culture. Identifying some of the key questions that have been explored in the literature and providing a more academic perspective based on our research project that investigated “Risk culture in financial organizations” [Power et al (2013)]. Our aim is to shed further light on the meaning and management of risk culture, while at the same time helping to avoid some blind and potentially destructive alleys.

Each of the questions outlined below relates to a key component in the discourse on risk culture. Notably, we explore questions on the role of risk culture, the elements of a “strong” risk culture and whether risk culture can actually be modelled or regulated. The answers to these questions are far from straightforward, and it is likely that they can
never be answered in full. Nevertheless, if we are to better understand risk culture, more considered answers to each of these questions are required. We end our paper with a brief conclusion and reflection on the future of risk culture in financial organizations.

**Question 1: What does risk culture actually do?**
Risk culture is often perceived as an enabler, helping to improve the effectiveness of risk management decisions and embed processes and procedures relating to governance, risk and compliance (GRC). Here, the focus is on controlling and limiting risk, risk culture being a mechanism for reinforcing more visible policies and procedures (enabling, embedding and controlling perspective), though in a few cases it is acknowledged that risk culture may support risk-taking, as well as control (the risk taking and control perspective).

A good example of the enabling, embedding and controlling perspective on risk culture comes from Protiviti (2012). In a survey of insurance firms Protiviti explains that risk culture is a “vital component” (p3) in the effectiveness of risk management processes and practices, helping employees to understand and accept that risk management is “part of everyone’s role and responsibility” (p3). Protiviti also stresses the importance of ‘aligning’ risk culture with an insurer’s risk management framework and practices.

Several of the larger audit/consulting firms (e.g., KPMG and PWC) share the enabling, embedding and controlling view. KPMG [Farrell and Hoon (2009)] emphasizes the behavioral and internal control aspects of risk culture, suggesting that it is a means to ensure that employees are “doing the right thing” and that they “understand risk and compliance rules,” leading them to make appropriate decisions. This is further developed in KPMG (2011), where risk culture forms the foundations for effective risk management – underpinning three more tangible pillars of effectiveness: risk identification and assessment, risk quantification/mitigation and risk monitoring/reporting.

Similarly PWC (2012) links risk culture to “effective and sustainable ERM,” suggesting that risk culture helps employees to understand the level of “acceptable” risk along with how risk information should influence their decisions. PWC further makes the claim that there are “studies” which show that a strong risk culture can lead to a reduction in loss events,
along with better performance management; however, no evidence is provided to back up this claim. We are not aware of any such studies.

In comparison, EY [De Jonghe et al. (2013)] adopts a risk-taking and control perspective on risk culture. The authors argue that risk appetite and risk culture are closely related “reinforcing” mechanisms. The mechanism for this relationship is that an organization’s stated risk appetite should affect decision-making behaviors and hence risk culture; while an organization’s risk culture helps to determine whether its stated risk appetite is embedded and accepted. So in this respect risk appetite is seen to represent a more formal and tangible perspective on risk attitudes; risk culture a more informal and implicit one. The authors go on to suggest that a “strong” risk culture will allow organizations to achieve an appropriate balance between risk and return, while those with “weak” risk cultures will either take too little or too much risk – though excessive risk-taking is assumed to be the most common case.

Regulatory and professional organizations have also commented on the role of risk culture. An important example of the risk-taking and control perspective comes from the Institute of International Finance (IIF, 2009), which comments that: “A robust risk culture is a substantial determinant of whether a firm is able successfully to execute its chosen strategy within its defined risk appetite ... The risk appetite determined by the firm will be only as effective as the formal and informal network in which such appetite is disseminated as well as the way in which it shapes employees’ decision making. Having in place set processes and controls is not enough to give Boards and executives confidence that the risk appetite they set will be adhered to; they must ensure that all employees be aware of what risks they are taking, make the right decisions, and raise objections when necessary – the key attributes of a strong risk culture.” [IIF (2009), pAIII.1]

So here, as with EY, risk culture and risk appetite are seen as mutual reinforcing organizational features (risk appetite being a more visible manifestation of an organization’s risk culture). This point is reiterated in the IIF’s definition of risk culture: “Risk culture can be defined as the norms and traditions of behavior of individuals and of
groups within an organization that determine the way in which they identify, understand, discuss, and act on the risks the organization confronts and the risks it takes.” [IIF (2009), pAIII.2]

Less clear-cut is the work of the Institute of Risk Management [IRM (2012)]. At first, the IRM links risk culture to an organization’s ability to manage downside risks; however, later they explain that certain risk cultures may also stifle risk-taking. So, while their work arguably fits best with the risk-taking and control perspective, it also highlights a tension between risk-taking and control. Even within the IRM’s and EY’s work, risk management and risk culture are linked to reducing downside risk or at best, the downside elements of more speculative risks. It would seem that there is a persistent notion in parts of the practitioner community that risk is predominantly bad and should only be taken grudgingly to achieve strategic objectives. Risk culture, therefore, is predominantly consigned to a risk reduction role.

Regulatory views on the role of risk culture are much less ambiguous and are clearly aligned with the enabling, embedding and controlling perspective. This is especially evident in the work of the Basel Committee (see Question 4, below), which talks about a risk management culture, rather than a risk culture. The idea being that culture underpins processes and procedures for the management, and predominantly the reduction, of risk, including rigid structural control tools, such as the three lines of defense approach to risk governance.

Similarly, the FSB’s earlier work on risk culture very much emphasized the enabling, embedding and controlling perspective, the focus being on risk culture as a risk reduction/avoidance tool. The FSB’s original November 2013 consultation paper on the supervision of risk culture exemplifies this viewpoint (see especially the underlined statement): “A financial institution’s risk culture plays an important role in influencing the actions and decisions taken by individuals within the institution and in shaping the institution’s attitude toward its stakeholders, including its supervisors. A risk culture that promotes prudent risk-taking and discourages unrestrained profit maximization without due regard to risks supports an environment that is conducive to ensuring that emerging risks that will have a material impact on a financial institution, and any risk-taking activities
beyond the institution’s risk appetite, are recognized, assessed, escalated, and addressed in a timely manner.” [FSB (2013), p1]

This highly risk averse perspective creates the danger of a prudence drag, whereby risk culture is used to reduce risk-taking to such an extent that it may damage the long-term financial sustainability of financial organizations. While we accept that a financial organization’s risk culture can help to provide an implicit constraint on what might be considered “bad” risk management behaviors, such as excessive risk-taking, or resistance to GRC-related processes and procedures, we do not accept that risk culture is only about control. Risk management is equally about effective risk-taking; financial organizations have to take risk in order to achieve a return and, in the light of events such as the financial crisis, it would seem wise to incorporate risk-taking within organized risk management activities. Therefore, it stands to reason that the role of a financial organization’s risk culture is to support, in equal measure, both its risk-taking and control activities.

Our research on “Risk culture in financial organizations” supports this argument. While the organizations we visited recognized the controlling aspects of risk culture, many also accepted that risk culture can have a more strategic, risk-taking, role. The trick, of course, is to develop a culture that facilitates the “right” sort of risk taking (i.e., taking those risks that generate an expected level of return that is sufficient to offset any associated volatilities), while reducing those risks that may threaten the reputation, efficiency or financial viability of the organization.

That is not to say that these organizations placed no limits on risk-taking. Rather, they used their risk appetite frameworks to significant effect, in order to limit certain types of risk. However, within this limit framework they were also prepared to take risks, providing such risks were properly understood and generated appropriate levels of reward. This reflects the notion of core/value adding business risks versus non-core preventable or external risks [see Nocco and Stultz (2006); Kaplan and Mikes (2012)], where some of our participants did not see the risks directly associated with their primary business activities (e.g., insurance underwriting or credit provision) as being “risky” in the same sense as their
non-core risks – since taking these core business risks was an essential part of their mission and identity.

One participant took this point a little further, acknowledging the acceptability of risk taking in certain contexts: “people can play within the sandbox;” going on to state that senior management and the directors of the organization are the “guardians of the sandbox and the toys within it.”

We labeled such organization’s “sandbox guardians” since, while they placed limits on risk within certain areas/activities, they also permitted and even encouraged risk taking in other areas – especially in relation to new strategic initiatives. Hence, protected sandbox environments were created to allow risk taking where appropriate and within a suitably monitored and protected environment.

In this vein, it is worth noting that the FSB removed all references to prudence in its final guidance on risk culture [FSB (2014)], which was in response to some negative feedback on the original 2013 paper (see Question 4 below). The FSB's revised work is certainly much closer to that shared by the “sandbox guardians” that we observed, however the tone remains highly procedural and governance orientated: “A sound risk culture consistently supports appropriate risk awareness, behaviors and judgments about risk-taking within a strong risk governance framework. A sound risk culture bolsters effective risk management, promotes sound risk-taking, and ensures that emerging risks or risk-taking activities beyond the institution's risk appetite are recognized, assessed, escalated and addressed in a timely manner.” [FSB (2014), p1]

This raises further questions about the central role of risk culture. While an organization's risk culture may well support the operation of formal risk management and risk governance processes, risk culture can also be used to support flexible and adaptive risk-taking, helping financial organizations to make risky decisions in complex environments with competing stakeholder expectations and to even deviate from the “rules” from time to time, especially in response to unfamiliar circumstances (e.g., to seize a new opportunity or respond to a crisis).
From an academic perspective the work of Weick and Sutcliffe (2007, Ch. 6) provides an interesting perspective on this last point. Weick and Sutcliffe argue that the role of culture from a risk perspective is to help promote a collective sense of the diverse/ changing nature of risk and uncertainty (i.e., “mindfulness” or big picture “situation awareness”), as well as to support collective and coordinated action in response to this dynamic environment. In such a context, rigid processes and procedures, including defined risk limits, may be more of a hindrance than a help. Instead, what may be more important is a flexible culture, which adjusts to sudden changes; in conjunction with a learning culture, where there is a preparedness to revise pre-existing assumptions and convert “lessons learned” into action.\(^1\)\(^2\)

**Question 2: Positivism and auditability, can risk culture be modeled?**

Nearly all advisory, professional and regulatory organizations adopt a modeling perspective, and identify a range of elements that can be used to assess and benchmark organizational risk cultures. These elements are then distilled into a smaller number of broader factor categories, which are often presented in graphical form (for example, using some form of “wheel” in which the various spokes are grouped according to the broader factor categories).

*Table 1* provides a summary of the factor categories that have been identified by organizations that have developed relatively formal “models” of risk culture.\(^3\)

From *Table 1*, it is clear that there are many differences between the proposed “models” of risk culture. However, some factor categories are more popular and common than others. One popular factor is leadership and “tone from the top” in particular, a concept borrowed from the mainstream literature on organizational culture and in particular Schein (2010). Also popular are categories relating to compensation and performance

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\(^1\) We understand that EY is developing a new model, but no public information is currently available. The new model includes four main factors: incentives, leadership, organization (governance structure and accountability) and “risk framework” (communication and risk appetite).

\(^2\) The IRM’s 4 categories of “tone at the top”, “decisions”, “governance” and “competency” are quite broad and cover more than 3-4 of the factors listed here. The same is also the case for the IIF (2009), PWC (2012) and Towers Watson [Davidson et al. (2012).]

\(^3\) Table 1 represents an updated version of the table found in Power et al. (2014).
management – the idea being that risk culture is reflected in the financial motivations of employees. Similarly, organizational structure and governance is a common category, as is risk communication and reporting. This further reinforces the notion of risk culture as a control tool – it being reflected in how employees are constrained in terms of their decision making (through monitoring, incentives, etc.).

What we also observe within the modeling perspective is a strong philosophical bias toward the measurement and auditability of risk culture, especially on the part of advisory organizations. Following the review of an organization's risk culture, using an advisory organization's model, it then follows that “gaps” are identified and actions/interventions planned and executed in order to close these “gaps”. It is also common for these advisory organization models to generate percentage risk scores for the identified risk culture factors, scores which may then be rated as “red”, “amber” or “green” (RAG). No significant public information is provided on the mechanisms used to generate these scores or the means by which RAG thresholds have been determined. However, we presume that the idea here is to help organizations to somehow quantify their risk culture and prioritize “weaknesses” that require action.

The modeling perspective reflects the persistent managerialist notion that “if it can't be measured, it can't be managed,” a quote often misapplied to the management guru Prof. Peter Drucker⁴ and even repeated in the IRM's work to develop their Risk Culture Aspects Model TM [IRM (2012, p13)]. However, a fuller investigation of the works of management gurus, such as Drucker or Deming will reveal that they do not share the myopic notion that management requires measurement. Indeed, Deming explicitly warned against running a company on visible figures alone in his seven deadly diseases of management [Deming (1986)].

While we understand the desire to model and measure risk culture, we are concerned that there is too much emphasis on this in the current literature from advisory, professional and regulatory organizations. As we discovered from our own research, risk culture is an

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⁴ See: http://thedx.druckerinstitute.com/2013/07/measurement-myopia/
inherently pluralistic and fuzzy concept and attempts to model it in one specific way will provide a partial picture at best, possibly even a misleading one. That is not to say that some of the more visible elements of risk culture cannot be modeled (e.g., those that relate to processes, procedures or organizational structures and possibly even “tone”). However, these elements represent the tip of the cultural iceberg.

Many of the financial organizations that we visited had taken steps to assess their risk culture, with a view to identifying weaknesses in their risk cultures or even validate a notion amongst senior management that they had a strong risk culture. However, in many cases there was skepticism about the relatively generic risk culture models developed by advisory organizations.

Risk culture is something that can be very idiosyncratic and specific to a financial organization and, to date, attempts to model it in general terms have added little to our understanding of the concept. While advisory, professional and regulatory organizations have the advantage of a helicopter view – being able to examine multiple organizations and share practice – their attempts to model risk culture often remain at the level of abstract principles. What is needed is an approach that can reflect the plurality of the concept and the range of trade-offs that need to be considered when assessing and managing risk culture. We return to this point in our discussion of Question 3.

**Question 3: Is there an ideal risk culture?**

Building on the modeling perspective from Question 2, there is a popular view among advisory, professional and regulatory organizations that it is possible to differentiate between “strong” and “weak” risk cultures and that organizational risk cultures can be managed toward some kind of utopian ideal (the idealist perspective). Though, just as with the risk culture elements identified in Table 1, there is less consistency over the specific attributes of a strong risk culture.

What also strikes us, when reviewing the factors summarized in Table 1, is that many reflect generic good management behaviors and structures/processes, rather than anything that might be considered risk culture specific. A good example of this is the Risk Intelligent Culture framework proposed by Deloitte (2012). Deloitte’s work highlights
various “enablers” (for example: leadership commitment, communication, measurement and reporting and program management) to help “strengthen” an organization’s risk culture and promote “continuous cultural improvement.” [Deloitte (2012, p4)]. So here there are close parallels with the managerial concept of “total quality management” (TQM) and the established philosophy of “continuous improvement.”

EY appear to share the idealist perspective, [notably: De Jonghe et al. (2013)]; however, they draw more from “good” GRC practices, particularly using the results from their own 2011 post financial crisis survey of risk governance practices [EY (2011)]. EY emphasizes the following elements of a strong risk culture: a consistent “tone from the top,” appropriate metrics that are monitored regularly, effective escalation processes and an “open” culture in which employees feel able to raise concerns, and the enforcement of process/limit breaches. Such a GRC orientation is also shared by Protiviti (2012) that uses survey evidence to highlight two key factors: non-executive challenge on a firm’s risk management activities and the frequency of board discussions on risk management.

Building on this GRC orientation of the idealist perspective KPMG [Farrell and Hoon (2009)] and McKinsey [Levy et al. (2010)] add further examples of effective GRC behaviors and structures/ processes for good measure:

- Leaders/managers, which set a clear risk strategy and support their organizations’ risk management policies and procedures, so that their teams know that non-compliance will not be tolerated (again this implies risk culture as a risk reducing control mechanism)
- The clear and consistent communication of an organization’s values and ethical codes of conduct by management
- Incentives to behave appropriately and “do the right thing” from both a risk management and an ethical perspective
- Having a consistent process for considering risk when making decisions
- Recruiting the right staff – those who are compatible with the prevailing risk culture

Professional institutes and regulators further reinforce the idealist perspective. One influential piece of work is by the Institute of International Finance [IIF (2009)], which devotes a lot of attention to the attributes of a strong risk culture and further links these
attributes to how risky decisions are governed and controlled. These attributes of a strong culture include: employee incentives, an effective governance structure with clear accountabilities for risk and risk tolerance limits, escalation of risk issues and the "tone from the top." Thus, despite providing a relatively positive definition of risk culture, much of the IIF’s work on the elements of a “strong” risk culture further reinforce the view that risk culture primarily exists to limit risk-taking, not to facilitate it.

In contrast, the IRM explains that a “successful” risk culture should reflect an organization’s stance on both risk-taking and control/governance [IRM (2012)]. However, the IRM still outlines 10 (why this continued obsession with “top 10s”?) relatively generic elements of a successful risk culture, elements that include: “tone from the top,” commitment to ethical principles, risk reporting, acceptance of the importance of risk management, and so on.

The idealist theme continues with the regulatory literature on risk culture. Although in their latest work the FSB acknowledges the complexity associated with risk culture, they also emphasize three foundational elements of a “sound” risk culture: risk governance, risk appetite and employee compensation [FSB (2014)]. The FSB then specifies a number of indicators of a sound risk culture, built around four categories: “tone from the top,” “accountability” for risk taking and control, “effective communication and challenge” of risks and decision-making and finally “incentives”. Again, the quest for a risk culture ideal is very much in evidence, as is the generic managerial/governance nature of the FSB’s attributes.

While we understand the desire to identify the ideal attributes of a “strong” or “sound” risk culture, our own research suggests that this is a complex area characterized by a high degree of plurality. In short, what may be a strong attribute for one financial organization might be a weakness for another. For example, we found that some of the organizations we visited exhibited more of an organic approach to managing their risk culture, while others adopted what we call an “engineered” approach. Those more organic firms tended to place much less emphasis on formal controls, for example, relying instead on less formal networks of social interaction. In the absence of any clear evidence, who is to say that one approach is better than the other? Tensions were also identified in our research in the
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implementation of the increasingly centralized and “independent” risk oversight functions that many (such as the IIF and FSB) emphasize as important elements in developing a “strong” or “sound” risk culture. However, again we observed that too much centralization and independence can drive a wedge between the risk function and other business functions, preventing joined up decision-making. As one of our project participants observed on the issues of centralization and independence [Ashby et al. (2012, p15)]: “You go to a management meeting and you talk about management issues and then you go to a risk committee and you talk about risk issues. And sometimes you talk about the same issues in both but people get very confused and I don’t know … I don’t know how right it is but I really think you should be talking about risk when you talk about your management issues because it kind of feels to me again culturally that’s where we are.”

That does not mean to say that there may be no common attributes of a strong risk culture, especially if these attributes are presented at a sufficiently macro level. However, the current piecemeal approach, and a lack of evidence to support the claims made by different organizations (including regulators), means that it is impossible to verify the proposed attributes of a strong risk culture. Identifying the attributes of a strong/sound risk culture will require careful evidence-based research, using appropriate investigative techniques (e.g., ethnographic study). In our own work, for example, we identify a number of trade-offs that can be involved in achieving a suitable risk culture, as well as the dangers of risk culture drift - where financial organizations may fail to review and manage their risk cultures in a mindful way. However, our work only represents the first tentative steps toward the development of a grounded theoretical framework based on observed practices that are consistently proven to be effective.

**Question 4: Can risk culture be regulated?**

The growth in political and regulatory attention to risk culture began following the financial crisis, and there appears to be increasing consensus within the international regulatory community that risk culture can and should be subject to regulatory supervision (the regulatory perspective). This is especially striking given the community’s previously ambivalent stance on regulating risk management practices: “It is not the Committee’s intention to dictate the form or operational detail of banks’ risk management policies and practices.” [Basel (2006, p 2)]
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In terms of regulating risk culture, the Basel Committee offered some initial thoughts in its 2009 Basel 2.5 reforms, which were developed further in guidance for internationally active banks and their supervisors on corporate governance [Basel (2010)] and operational risk management [Basel (2011)]. These two guidance documents have a strong focus on the more tangible and structural GRC aspects of risk culture, with the committee highlighting factors such as compensation policies (suggesting they should be long-term and linked to clear risk management objectives) and the role of risk culture in helping to cement the three lines of defense approach to governance (e.g., by helping decision-makers to understand and accept their roles and those of the other three lines). However, the Basel Committee did not completely ignore the more behavioral aspects of risk culture. Notably, in the governance guidance paper [Basel (2010)] the Committee calls for the development of corporate cultures that highlight and embed appropriate norms and incentives for professional and responsible behavior, linking this to the creation of an appropriate “tone from the top” and the setting of professional standards, values and incentives that promote integrity and clarify appropriate and inappropriate behaviors. This view was reiterated in the Committee’s operational risk paper [Basel (2011)], where “Principle 1” states that a bank’s “risk management culture” must embody professional and responsible behaviors (though they do also state that standards and incentives must be set to ensure that these behaviors are adopted). The paper also suggests a link between a bank’s risk management culture and ethical business practices – though this is not developed further.

However, the most significant international regulatory development on risk culture has come from the FSB, whose work we have already commented on at several points above. Although the FSB may not have direct rule-making powers, it has influence over the direction of both international and domestic regulatory regimes, and as such the FSB’s work represents a landmark shift in the regulation and supervision of risk culture. The FSB make it very clear that supervisory attention to risk culture is an important part of their mission to increase the intensity and effectiveness of supervision and act more preemptively in relation to activities and behaviors that supervisors believe may threaten the financial system [see FSB (2013, 2014)]. The FSB adds that supervisors are in a “unique position” [FSB (2014, p4)] to gain insights into the risk cultures of financial organizations, given their privileged access rights across the sector.
Closer to home, the E.U.’s recently published Capital Requirements Directive (CRD IV) includes a new regulatory requirement on risk culture, stating that: “Member States should introduce principles and standards to ensure effective oversight by the management body, promote a sound risk culture at all levels of credit institutions and investment firms ...” [DIRECTIVE 2013/36/EU, paragraph 54]

This statement enshrines in European law the importance of risk culture for banking and securities organizations, but provides no further explanatory detail. As is customary under the Lamfalussy process of European regulation, further policy development is left to the European Banking Agency (which replaced the Committee of European Banking Supervisors) along with local regulatory agencies, such as the Prudential Regulatory Authority and the Financial Conduct Authority in the U.K. To date, little further regulation has been forthcoming, though that is not to say that local regulators are not talking about it, as indicated in the U.K., below.

Though international regulators may be looking to increase the level of regulatory and supervisory scrutiny over risk culture, many outside of this community have concerns about this development. This skepticism about regulation perspective is exemplified in some of the responses to the FSB’s consultation paper on risk culture, which both questions the ability of supervisors to assess risk culture effectively and, in some cases, suggests that risk culture supervision may do more harm than good.

A good example of this skepticism perspective comes from Paradigm Risk Consulting’s response to the FSB consultation paper on risk culture [Paradigm Risk (2014)]. Paradigm Risk suggests that regulators have climbed on the “risk culture bandwagon” (p5) and that the FSB’s approach is overly superficial and lacks an appropriate academic foundation. In this regard, they suggest that the risk culture indicators proposed by the FSB do not get sufficiently deep into the less visible human/social aspects of risk culture. They also warn

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5 See: http://www.fsa.gov.uk/about/what/international/european/lamfalussy
6 For one key exception see CEBS (2010), which provides further European level guidance on risk culture in its high level principles for risk management. This includes the importance of creating a “strong, institution-wide, risk culture,” as well as an enterprise-wide risk function that covers all risks and is independent. So again there is a strong internal control theme.
of a nonlinear relationship between management action and risk culture (linking this to chaos theory), where formal attempts to manage risk culture through the use of risk culture indicators may promote an overly mechanistic checklist approach, which leads to ineffective and potentially counterproductive interventions. Paradigm Risk is particularly skeptical of supervisory efforts to intervene in risk culture: “The presumption of efficacy of supervisory intervention in relation to culture or ‘risk culture’ rests on the sequence of reliability of observation and diagnosis through to reporting and prescription for action in the firm and the absence of unintended consequences. Supervisors should regard intervention in relation to specific behaviors or cultural elements as a ‘nuclear option’.” [Paradigm Risk (2014, p19)]

They go on to state that: “The presumption that supervisors will know pretty quickly what is a firm’s culture is simply hubristic; the expectation that they will be able to prescribe an effective solution is more so. While specific behaviors are safer ground for intervention, firms are unlikely to respond to such intervention in the way the supervisor may desire; response internally is equally likely to be personalized and punitive as enlightened and effective.” [Paradigm Risk (2014, p19)]

Though less critical of the FSB’s proposals, HSBC makes it clear that it is for the board and senior managers to assess risk culture, not supervisors, who they believe may lose their objectivity if their constant assessment of risk culture means they get too close to the organizations they are supervising [HSBC (2014)]. HSBC also warns that the FSB’s proposed approach to risk culture supervision may result in supervisors becoming “shadow directors” (p4), who become too involved in decision-making. Likewise, the CRO Forum of European insurance company Chief Risk Officers [CRO Forum (2014)] state that supervisors should not supervise risk culture directly, but only consider it via an assessment of risk appetite. They also challenge the FSB’s original notion [FSB (2013)] that a sound culture should be a prudent one, explaining that financial organizations have to take risk to remain in business. They state that: “CRO Forum members strongly believe that risk culture, together with risk appetite, should not necessarily reflect a prudent approach, but fit the business purpose of the firm.” [CRO Forum (2014, p1)]

Finally, several respondents challenge the elements of a sound risk culture proposed by the FSB (although many others do agree with them). For example, the Global Federation of
Insurance Associations states: “Best practices for risk culture are highly specific to each company and will vary depending on the nature, scale and complexity of the risk exposure .... What is a best practice for one company may not be a best practice for another company and yet the same level of policyholder protection can still be achieved.” [GFIA (2014, p2)]

This view is also supported by the International Actuarial Association: “‘Culture’ is a much more complex and fluid notion than suggested in the paper, and this needs to be recognized more explicitly lest regulators end up with a very narrow view of this important factor.” [IAA (2014, p2)]

The International Actuarial Association also warns of some damaging consequences from the regulation and supervision of risk culture: “Forcing all institutions into a single culture will greatly increase systemic risk since if there is any flaw in the proscribed risk culture, the entire financial sector will be subject to risks that are taken or mismanaged because of that flaw. Variety of practice, not uniformity, is an important aspect of systemic resilience.” [IAA (2014, p4)]

“Willingness to document things for the supervisor is not, in and of itself, an indication of risk culture. Documentation needs to be sufficient to convey the intended risk culture in situations where that is not being well conveyed by interpersonal communications. Over documentation of a good risk culture may end up undermining that culture, making it seem more like a set of restrictive rules when, in fact, it is a process of empowering employees to make good risk decisions on behalf of the company.” [IAA (2014, p6)]

In terms of the U.K. regulation neither the PRA or the FCA (or the former FSA) has produced specific regulation on risk culture. However, both the PRA and FCA have indicated that culture and risk culture are areas they intend to consider when supervising firms (as supervisors have always done, albeit informally). More concerning is the link made between risk culture and prudence, with the PRA making clear that to meet its Principle of Safety and Soundness banks and insurers must have a culture that supports this
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[PRA (2013a, b)]. The PRA also states that it expects banks and insurers to “minimize incentives for excessive risk taking” via: appropriate incentives; ensuring that responsibilities for risk management are considered as a central part of front line management and through risk and control functions that carry “real weight.”

The FCA is even less specific and prescriptive, but has laid out its position in a speech by Clive Adamson [Adamson (2013)]. Here, Adamson suggests that the FCA will not assess or legislate on culture directly, but that it will “join the dots” using a kind of meta-analysis of existing data and findings: “Our approach today is to draw conclusions about culture from what we observe about a firm – in other words, joining the dots rather than assessing culture directly. This can be through a range of different measures, such as how a firm responds to, and deals with, regulatory issues; what customers are actually experiencing when they buy a product or service from front-line staff; how a firm runs its product approval process and the considerations around these; the manner in which decisions are made or escalated; the behavior of that firm on certain markets and even the remuneration structures.” [Adamson (2013)]

As explained in Power et al. (2014), we find this joining the dots approach compelling and pragmatic. This approach reflects the plurality of risk culture practice and should help to minimize the potential for unintended consequences, through the absence of direct rules or guidance on risk culture. However, it is clear that such an approach will mean less regulatory certainty for financial organizations and require more judgment on the part of supervisors. To help detect the “hidden” clues about risk culture, supervisors will need to develop a disciplined approach to the gathering of field notes during the supervisory process, drawing on unfamiliar ethnographic skills. In our own activity as researchers, we reflected on how we were received and treated in the 14 different organizations where we were able to conduct interviews (e.g., whether we were offered refreshments, whether we were allowed to record interviews, the level of “small talk,” etc.). These and other dimensions of the way organizations are open to, and engage with, outsiders are potential indicators of their internal risk culture.

**Recommendations for senior managers and boards**

Given all these unanswered questions, it is difficult to be prescriptive about risk culture. However, that does not mean that it is impossible to provide any guidance for the senior
managers and boards of financial organizations. In particular, we would suggest that ignoring risk culture, and allowing your risk culture to drift, is not an option. Senior managers and boards must work to improve their awareness and understanding of their organization's risk culture, identifying areas where attitudes and behaviors (toward both risk taking and control) need to be challenged, as well as examining factors, such as the internal authority of the risk function, levels of interaction between “business facing” and “control” functions and how well management across the organization understand its appetite for risk.

Remember also that it is the senior managers/board who will understand an organization's risk culture best. That does not mean advisory organizations, and possibly even regulators, have no role to play here, especially as they may have experience of a wider range of risk cultures. However, just because a particular risk culture works for one organization, does not mean that it will necessarily work for another. If any advisory organization that you talk to is unable to appreciate this then find one that does. Also, resist any attempts by regulators to mold your organization into a particular cultural stereotype (e.g., by forcing you to become excessively prudent).

Finally, on the management of risk culture, remember that it is neither easy nor wise to fundamentally change risk culture overnight, especially via large-scale, time-limited change projects. Except in extreme situations, the effective management of risk culture requires regular and often quite small-scale inputs to “nudge” an organization's risk culture into the direction desired by senior managers/boards. We would also emphasize that while the management of risk culture may well involve making changes to tangible risk management processes, procedures and frameworks (risk appetite, risk reporting, risk assessment, etc.), it is the more human-social side of the equation that can have a deeper and more far reaching effect (e.g., by building effective relationships between business and risk functions, facilitating informal interaction between staff, challenging established perceptions about risk management, etc.).
Conclusions
The work by advisory, professional and regulatory organizations on risk culture makes an important contribution to our understanding of the concept and how it is both understood and managed within financial organizations. However, the advisory, professional and regulatory literature is characterized by a lack of consensus, coupled with a managerial orientation that is rooted in the belief that risk is “bad” and that risk culture is something that can be assessed and controlled in a highly structured way.

These mutually exclusive positions – vagueness over the nature and meaning of risk culture, coupled with a very structured and procedural approach to its management – do little to help progress the debate and may lead to stagnation in our understanding of risk culture.

Currently, there remain more questions than answers in the discourse on risk culture. While we are sure that there are more answers to be found, it is unlikely that these will be as black and white as some professional, advisory and regulatory organizations might like. Tangible risk management/governance structures and procedures represent the tip of the iceberg when understanding risk culture, which is much more about investigating the hidden clues that characterize how risk taking and control decisions are made within organizations, clues which are predominantly human-social, rather than structural or procedural. This refocusing on the more informal networks and relationships, which are an essential part of any organization’s risk-taking and control activities, will require a new set of skills for those concerned with the management and regulation/supervision of risk management. Whether the field of financial services is really prepared to embrace new forms of knowledge and practice remains to be seen.
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Abstract
Globalization is driving business for today's insurance executive. Opportunities for global expansion into new markets represent a powerful force accelerating the growth in insurance premiums today — especially as economic performance languishes in much of the developed world. As a result, insurance executives are forced to continuously evaluate and refresh their strategies to identify which international markets are most likely to offer the best prospects for focus and investment. As regional markets around the world become more interconnected and complex, however, understanding how best to optimize the balance between opportunities and risks in individual countries remains a significant challenge. This article aims to help executives better understand the rebalancing now taking place across the insurance landscape in rapid-growth markets and highlight future growth opportunities in specific countries around the globe. Our analysis focuses on key markets, regulatory trends and new marketing innovations, and seeks to offer perspective on potential market risks. While some large economies, such as the BRICs (Brazil, Russia, India and China), appear to have entered a period of slower growth, the overall contribution of rapid-growth markets to insurance premium growth will continue to be very significant. That makes it even more important for global insurance executives to consider markets that might not previously have attracted their attention, especially as new waves of liberalization and rapid consumer adoption of new technologies open additional markets to foreign firms. However, while this shifting insurance landscape presents significant opportunities for international growth, choosing which economies to invest in today is more complicated than a decade ago. We propose that developing a “portfolio approach,” in which individual markets are segmented based on their potential risk and reward, can be a fruitful approach.
Waves of change: investing in emerging markets for insurance firms

1. Introduction
For today’s insurance executive, globalization represents one clear path to boosting business growth. As trade expands and financial flows accelerate across the world, the desire to capture additional revenue from emerging markets both fascinates and bedevils market leaders who hope to expand their business footprint and boost their bottom lines.

Recent evidence suggests that rapid expansion in emerging markets can improve a company’s growth trajectory and revenues. In addition, in an era when developing markets sometimes outpace mature ones in their scope and pace of innovation, exposure to new lines of coverage as well as new markets can often lead insurance firms to develop innovative new products or uncover promising new customer segments. In theory, innovations uncovered in one market can be adopted and expanded into others.

But venturing into emerging markets – virtually by definition – also poses potential additional risks to any insurance firm, even as it offers the potential for outsized growth. The risk and reward tradeoff must always be addressed before entering a new market, yet, in the past few years the need to make such careful calculations has grown fundamentally more problematical.

After all, just a decade ago, the conversation about emerging markets focused routinely, and sometimes naively, on just five big countries: Brazil, Russia, India, China and South Africa, the five so-called BRICS, as first named by Goldman Sachs economist Jim O’Neill. All five offered potentially high growth and relatively large populations, which made them highly attractive targets for international investment.

Over the past few years, however, the investment picture for emerging markets has grown more complex, as each of these economies has experienced significant turmoil. Brazil has seen its economic attractiveness weighed down by slowing growth amid rising inflation and a leveling off of its once-impressive productivity gains. Russia has been subject to sanction by Western nations because of its invasion of Crimea. India failed to live up to its high growth expectations, though a new reformminded administration may alter this trajectory. China has been attempting a series of government interventions to keep credit flowing and
the economic expansion continuing, even if skeptics see a credit, real estate and banking crisis in the offing. South Africa's growth has been slowed by political unrest and strikes in the nation's mining sector, which is a key segment of the economy.

Given the uncertainties now facing the BRICS, insurance carriers that want to increase their presence in rapid-growth markets (RGMs) must now consider looking further afield, to markets that have traditionally received less attention than the five traditional BRICS, as they seek promising new investment targets. However, moving to the next phase of engagement with RGMs also requires that firms develop a rigorous set of investment priorities so that they can best determine which regions or economies match up with the firm's requirements and expectations.

As regional markets around the world become more interconnected and complex, however, understanding how best to optimize the balance between opportunities and risks in individual countries remains a significant challenge. In just the past two years we have already witnessed capital flight from less mature markets because of a belief that the U.S. Federal Reserve was about to end its Quantitative Easing. Moreover, insurance markets are highly regulated within individual nations. So even though our world may be more closely linked together by macroeconomic trends, mobile phones and the internet, regulatory and cultural differences still persist, and even nations that share a common border may diverge markedly when it comes to the assessment of future risk.

In this paper, we look at the opportunities, trends and risks in the insurance markets of the developing economies to help executives better understand the changes rippling across the insurance landscape. By looking at these waves of change, future growth prospects and possible risks that are transforming the face of the industry, we were able to obtain a clearer picture of insurance investment possibilities in RGMs.

2. Some new leaders in rapid growth markets

For most of the past decade, focusing on the four leading BRIC economies (minus South Africa) seemed a simple strategy for insurance companies seeking to expand their business in RGMs. In 2007, for example, average GDP growth in these four economies was 9.6%.
Today, however, the pace has slowed markedly, especially in Brazil and India. According to recent forecasts from Oxford Economics, the average growth rate of real GDP in the BRICs was 5.5% in 2013, and that is expected to remain broadly stable at a growth of 5.6% a year between 2014 and 2018. These growth numbers are still stronger than those projected for much of the developed world, which is why the focus on RGMS is not unwarranted. Nevertheless, growth in other RGMs will likely be affected by this deceleration in the BRICs.

It is critically important to put the growth potential of the insurance markets in RGMs in a broader perspective, which only underlines their increasing importance. Between 2001 and 2011, insurance premiums grew by an average of 11% per year across all emerging markets, compared to a scant 1.3% per year in the developed economies. As a direct consequence, the emerging-market share of global insurance premiums rose from 5% to 14% in life, and from 7% to 16% in nonlife over the same period.¹ According to Swiss Re, premiums grew 6.8% in emerging-markets in 2012, compared to only 1.7% in the advanced markets.² Given these longer-term trends, there is little reason to believe the overall attractiveness of RGMS will erode in the next decade (see Figures 1 and 2 for our forecast of GDP growth and premium growth through 2015).

Indeed, these significant opportunities for future growth appear sustainable across a range of RGMS. But navigating this increasingly complex and evolving environment is not easy. To help judge the growth potential in specific markets, we created a matrix that analyzes the risks and opportunities across 21 RGMS in the Americas, Europe, the Middle East, Africa and Asia.

To carry out this analysis, we assigned two scores to RGMS. One was tied to our ranking for opportunity, based on the anticipated growth in the insurance market over the next two to three years, the other was correlated to risk, based on the extent that macroeconomic issues may cause difficulties, complicate business transactions and reduce potential profitability for insurance firms.

¹ Swiss Re Emerging Markets Report 2011
² Swiss Re Sigma Report 2013
We created our growth forecast for insurance premiums based on an analysis of historical data as well as our proprietary model that develops economic projections of future growth. This analysis encompassed a number of key metrics, including the current and anticipated levels of insurance penetration, the projected growth rate of the underlining economy and per capita income growth projections and changing demographic factors, including the pace at which a national population is aging. We also attempted to assess potential regulatory changes, including pension, health and tax policies, as well as possible changes in the insurance sector regulation, as these could have major effects in nations that may soon open up their insurance industries to greater outside investment.

We also needed to capture some means of quantifying risk, especially potential macroeconomic volatility and threats to liquidity, so that we might better anticipate how these could affect the balance of payments in specific countries. But macroeconomic risk is not the only risk insurance carriers face. To create a proxy of potential corruption risk, for example, we employed scores assigned by Transparency International to measure perceived corruption in individual economies, as this can be a significant barrier to doing business.

Through this exercise we identified six RGMs that qualified as top-tier opportunities, markets that would appear to be particularly attractive for insurance investment over the next decades. These are Turkey, Indonesia, China, Malaysia, Hong Kong and the UAE.

As Figure 3 shows, China merits the highest risk-adjusted opportunity ranking, mostly because of the immense scale of the potential market. Rapid growth in incomes, which in turn drive purchase of homes and auto ownership, along with an aging population and increased government support for insurance, clearly generate significant opportunities for insurance growth.

But this high ranking is also undercut by enormous regulatory hurdles and the somewhat uncertain outlook for insurance liberalization. Foreign insurers still face an uphill battle to enter this market, making investment challenging. Chinese officials have regularly suggested that they will widen market access for foreign insurers in China, but the wait continues. Across the border in Hong Kong, which today is a special administrative region
of China, the insurance market ranks much lower on the opportunity scale, since the territory’s population is quite small, but Hong Kong also presents the least amount of risk. For many firms it may serve as an important springboard into the rest of Asia.

Malaysia and the UAE also score high on our matrix thanks to growth opportunities generated by their rising incomes, an ongoing construction boom and increased product innovation, especially as carriers become more conversant in creating sharia-compliant insurance, for which the market appears to be expanding. According to our forecasts, Indonesia is second in insurance premium growth to China and Vietnam because of its robust outlook for growth. However, foreign access to licenses remains limited. As a result, the main entry route into Indonesia’s insurance market remains through the acquisition of a local firm.

Turkey offers a higher level of opportunity than any other surveyed RGMs, but inherent risks associated with political instability, regional turmoil and large fiscal deficits leave open the possibility of an economic downturn. Like China, the Turkish government is determined to generate stronger growth in the insurance sector and offers a supportive policy environment. The country’s exposure to Greece and the Eurozone crisis, and its dependence on international capital flows, presents sizable risks, however, and, indeed, our overall risk assessment survey was completed before the incursion by ISIS fundamentalists sparked renewed crisis in neighboring Iraq, which has the potential to further exacerbate political and economic uncertainties.

Colombia is also notable as a market that ranks relatively high in opportunity and only moderately on the risk scale. Despite low interest rates, the insurance market there has expanded at greater than 10% annually over the past four years, and offers high growth potential because of relatively low insurance penetration. Significant regulatory liberalization that took effect in 2013 has also created new opportunities for foreign firms.

Beyond these top-priority economies, it is also possible to identify a second tier of RGMs that show considerable promise. Brazil is the most accessible of the BRIC economies for foreign insurance companies, though growth rates there have been slowing and consumer momentum has faltered recently. According to Oxford Economics projections, because of
the persistence of weak investment trends, Brazil is expected to grow by only 0.7% in 2014 and 1.4% in 2015. Yet, Brazil also has the third-largest forecasted growth in insurance premiums, following China and India. Close behind in premium growth is South Africa, which, in addition to its sizable scale, could represent a trading base from which carriers can plan strategies to enter into sub-Saharan and other African markets.

In percentage terms, Vietnam’s income and premium growth rates place it in the top two markets we assessed, although corruption and sovereign risks remain. According to some measures, Mexico represents the most open insurance market analyzed in the study. But Mexico’s pace and unpredictability of regulatory change can be risky for investors. Finally, India’s growth is impossible to ignore, but a complex and challenging regulatory environment and increasing liquidity risks dog investors.

Overall, our analysis suggests that investment in RGMs will be increasingly vital for global insurance firms, but returns will not come easily. Companies must carefully tailor products and develop market-specific strategies for particular economies in order to remain competitive and reap the greatest rewards. As always, there is a trade-off between opportunities and risks (see Table 1 for our country scores in these categories).

3. Assessing waves of change
The waves of change convulsing across the global insurance landscape affect individual RGMs in different ways. For instance, some RGMs, such as South Africa and Mexico, are moving quickly to adopt insurance regulations that reflect global standards, and they may soon surpass developed economies in terms of the stringency of their approaches to risk-based regulation and consumer protection. Likewise, in a broad cluster of RGMs, the rise of social media and the growing popularity of overseas educational experiences, which expose young consumers to the economic realities of different cultures, are breaking down traditional barriers to insurance penetration, especially as the middle class grows rapidly in some RGMs. Because of the gradual but seemingly inevitable elimination of these educational and cultural barriers, countries such as Vietnam and Saudi Arabia are now experiencing rapid premium growth.
For those looking to invest in RGMs, a thorough understanding of the government’s goals for the development of the insurance market is also critical. For example, the availability of tax incentives for insurance products can affect how, and to what extent, customers choose these services. On the other hand, a lack of confidence in public pension and welfare programs can encourage the growth of private insurance plans.

Compared to just a few years ago, government policymakers in most RGMs today view the insurance sector as a strategically important part of the economy, in part because of the role insurance plays in facilitating savings, investment, and entrepreneurship for the rising middle classes. But that does not mean all governments treat the sector alike.

When considering investments in RGMs, insurance executives will want to carefully consider four important vectors of change that may materially affect their strategies:

1. **The speed of regulatory change:** Some RGMs, such as South Africa and Mexico, are moving quickly to adopt new insurance regulations. To the surprise of some executives in more mature economies, the stringency of their risk-based regulation or consumer protection requirements may well surpass those in the more advanced economies.

2. **Customer adoption of insurance products:** The rise of social media and the growing popularity of overseas educational experiences are among the forces breaking down traditional barriers to insurance penetration. Many markets where traditional cultures tended to limit adoption of insurance products, such as Vietnam and Saudi Arabia, are now experiencing rapid premium growth as the middle class expands.

3. **Government fiscal policy:** Offering tax incentives for insurance products can significantly affect how customers choose savings and pension services. At the same time, a lack of confidence in public pension and welfare schemes can encourage adoption of private insurance alternatives.

4. **Government attitude:** In most RGMs, the government considers the insurance sector “strategic” – in part because of the crucial role insurance plays in facilitating savings, investment, and entrepreneurship. Understanding the government’s intentions regarding the sector’s long-term development is, therefore, crucial. Some governments will focus on the potential growth benefits of insurance development, and seek as much
foreign expertise as possible in developing the insurance sector. Others will wish to have the insurance market dominated by domestic companies over the long term to encourage local firms to gain deeper skills and market knowledge.

While keeping these variables in mind, potential growth over the long term – not just the next several years – must also be considered as a factor in choosing the sequencing of when to invest in specific RGMs. For example, despite the current slowdown in Brazil, we forecast a renaissance in the nation’s economic prospects by 2020, while, by contrast, slowdowns appear likely in Indonesia, Malaysia and the UAE in the medium term. Our economic and premium forecasts also reinforce the view that, over the longer term, China will continue to play an outsized role in driving premium growth in international markets, even if the pace of regulatory change is less rapid than many international firms would hope.

While the growth potential within RGMs may seem evident, less well understood is that several RGMs, including Turkey, South Africa, Thailand and Poland, actually exhibit greater financial sector stability than their developed-market counterparts. Healthy capital markets tend to encourage the growth of insurance markets and foster new product development, and in the years following the financial crisis of 2008–09, the average stability of the financial sectors in the 21 RGMs began to exceed the developed market (DM) average (Figure 4). For example, the recent growth of credit-related life products in Russia has been bolstered by the expansion of consumer loans. A similar phenomenon has occurred in Latin America. Meanwhile, a recovery in India’s capital markets is likely to boost unit-linked products and pension sales.

Additionally, Asia’s widespread interest in pension reform is also boosting financial-sector stability and creating growth opportunities for insurers. Governments are now seeking value for money, focusing on fees and efficiency and revising social welfare and

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3 Swiss Re Sigma Report 2013
4 Swiss Re Emerging Markets Report 2011
5 Swiss Re Sigma Report 2013
pension systems. These revisions, along with continued growth in many of these economies, are likely to create opportunities for global insurers.

Protecting investor rights is another area where RGMs may soon overtake DMs. Colombia, for example, has tightened capital markets regulations in recent years, and has moved ahead of the DM average, and Poland’s control of corruption is nearing the average of developed markets.

Moving into new RGMs also allows global carriers to better understand and develop new channels for distribution. International firms should not discount the possibility that innovations being pioneered in specific RGMs may be exportable to more mature markets, especially in an era when digital technologies are forcing carriers to come up with new models for interacting with their clients.

Indeed, new distribution channels are proving to be a leading factor for growth in many RGMs. Bancassurance – a partnership that allows banks to sell insurance policies – accounted for 49% of life premium sales in 2007 in Malaysia, for example. In China, the figure was even higher – it accounted for 64% of new life insurance sales in 2010. Retail stores in Chile account for 10.1% of insurance sales. Elsewhere, utility and other affinity groups are being used to sell policies in RGMs. And, of course, digital channels are becoming a critical method of distribution around the world, yet our research shows that insurers often lag in their adoption of digital technologies.

RGMs present a perfect opportunity for insurers to reinvent their offerings to meet new market needs. Micro-insurance, index-based weather insurance and sharia-compliant insurance are other examples of innovative and relatively recent advances that can boost premium growth in RGMs. Today, we estimate that the global micro-insurance market alone exceeds U.S.$40 billion. Brazil is one country that has become particularly adept at promoting micro-insurance, with offerings that include a simplified approval process and premium payment options available via prepaid and electronic debit cards.
India and Mexico offer policies that pay out when levels of rainfall or temperatures deviate from climatology standards. Takaful, or sharia-compliant, insurance is boosting growth in Muslim countries, where, in principle, charging interest for loans is not permissible. Malaysia has become the world's biggest takaful market, with total premiums estimated at U.S.$1 billion in 2010, though takaful represents just 10% of the insurance market.

The growth of the middle classes in RGMs, which in turn spurs home and vehicle purchases, also helps promote the growth of insurance products. This can be seen in the compound annual growth rates in insurance premiums per capita recorded in Indonesia, Vietnam and Saudi Arabia, where each saw expansion that exceeded 10% from 2008 to 2012. And China has now become the world's largest market for auto insurance – compulsory third-party liability coverage accounted for 72% of the country's nonlife premiums in 2012. In a forecast for growth in car ownership by 2015, Indonesia is projected to join China and Brazil in the top three (Figure 5).

The changing diet and lifestyle that accompanies the expansion of the middle classes means that shifts in health patterns in many RGMs are beginning to mimic patterns seen across the developed world. We once may have thought about RGMs as places where infectious diseases, such as malaria and cholera are epidemic, but today chronic and degenerative illnesses, such as heart disease, cancer and diabetes are on the rise in these economies. Combined with an aging population, the burden on health care systems is expected to increase, along with needs for life and health insurance. Moreover, in many RGMs, consumer confidence in the ability of the state to fund and maintain the social “safety net” is waning, sparking new interest in private insurance or pension plans.

Regulatory change can also make or break a firm's effort to successfully expand into new markets. Many RGMs have opened their insurance markets by privatizing state-owned organizations, encouraging foreign investment and reducing tariffs. While worldwide deregulation of the insurance sector has come relatively late, reduced government intervention and the opening of domestic markets has created an array of opportunities for insurers.
It is clear, however, that global insurers can gain significant market share when formerly restricted domestic markets are liberalized and opened to outside investors. This pattern of increasing liberalization is especially noteworthy in Latin America, where the insurance sector was dominated by state monopolies until a decade ago. Indeed, the last remaining insurance monopoly in Latin America, which persisted in Costa Rica, was finally broken up in 2008. In 2013, Colombia introduced new rules that allowed foreign insurers to establish branches and operate as local insurers. As these insurance markets become available to foreign insurers, the relative openness to foreign investment in RGMs is fast approaching that of developed markets.

Similar changes, allowing more open insurance markets, also appear to be on the horizon in Asia. As part of its entry into the World Trade Organization, China allowed foreign ownership of insurance ventures to rise to 51% in 2012, as well as opening the market for compulsory auto liability insurance to foreign insurers. In India, the Parliament continues to promise to unlock the insurance market to foreign players. Yet deregulation may also have its downside. India's decision in 2007 to deregulate nonlife insurance rates allowed many new firms to enter the market. But this in turn led to deep discounts, deteriorating growth in the sector and to a significant rise in consumer complaints, which led to a reversal, and moves to re-regulate. Likewise, in Turkey, deregulation led to a price war between foreign investors trying to gain a foothold in the domestic insurance industry, creating less optimistic prospects for profitability.

While deregulation – opening the overall market – is broadly taking shape in many RGMs, the global financial crisis and the U.S. Government's forced bailout of insurance carrier AIG has prompted many governments to increase regulatory scrutiny on all insurers to guard against a reprise of the 2008 financial crisis. Such additional scrutiny offers some benefits while also imposing additional costs. They could well lower risks and create more structural stability in the long run, even if they could increase operating costs and organizational complexity in the near term as firms seek to comply with new rules.

4. New regulatory scrutiny

Recently, the Financial Stability Board named nine global insurers as “Global Systemically Important Insurers,” or G-SIIs. These insurers now face the prospects of closer regulatory
scrutiny and tougher capital standards. The precise form these new regulations will take is not yet clear, but the largest insurers are likely to find themselves saddled with new capital requirements.

Even before new rules affecting G-SIIs are promulgated, however, a number of governments in RGMs are taking their own, independent action to impose more stringent reporting and higher capital requirements. In Latin America, Mexico has modeled an insurance law on Solvency II, which took effect in early 2014, Chile is expected to increase risk-based supervision in the near future and Brazil is moving toward risk-based capital requirements and adopted International Financial Reporting Standards as guiding standards for insurers in 2010. Across Asia, regulators are transitioning to risk-based capital standards and models based on Solvency I/II.

These new regulations may slow market growth temporarily, but these stringent rules may offer a competitive edge for insurers who use sophisticated risk and capital management applications. Regulation can also stimulate growth in RGMs by forcing consumers to purchase insurance. Compulsory third-party auto liability insurance pushed China to be the largest market for auto insurance, for example.

Whatever the potential opportunities in individual RGMs, carriers must also be sure to understand the risk profile when planning to invest in new markets. RGMs are inherently riskier than more advanced economies, and more vulnerable to currency fluctuations, social or political turmoil and the impact of natural disasters. We identified three measures of volatility intrinsically linked with the performance of insurance markets in RGMS: macroeconomic conditions, liquidity and corruption.

4.1 Macroeconomic risks
Macroeconomic risks can be especially prevalent in the BRIC economics, since they tend to be less mature than developed markets. Moreover, high-frequency indicators of economic activity showed a pause in 2013. At the same time, emerging-market equity indices have fallen (Figure 6).
We identified Brazil, South Africa and Mexico as the RGMs most exposed to potential macroeconomic risks, while Indonesia, China and Chile were identified as least exposed to those risks. Naturally, any marked slowdown in RGMs will limit premium growth as, for example, weak car sales and housing markets would clearly affect prospects for the nonlife market, and sluggish financial markets would curtail growth in life insurance premiums. Among RGMS, Mexico, the Czech Republic and Poland are experiencing the biggest slowdowns in private consumption and income levels.

It should be noted, however, that in some economies a slowdown may provide a benefit for insurers in the long run, as it can lead to more even and stable growth. China’s slowdown, for example, can be attributable in part to its efforts to clamp down on shadow banking and curtail credit, which, in the longer term, will actually benefit the insurance industry. Government support of the automotive sector in China and Brazil fostered healthy growth in the auto insurance market despite overall slowdowns in the larger economy.

As part of our analysis, we also considered three possible future macroeconomic scenarios and their possible effects. A Eurozone breakup, precipitated by the exit of Greece, would strain the remaining economies and could possibly lead to the departures of nations, such as Ireland, Portugal, Spain, Italy and Cyprus from the Eurozone. This scenario would have far-reaching global repercussions, likely driving Mexico, the Czech Republic and Poland into recession, with GDP falling by more than 8% in some instances. Even more robust RGMs, such as Indonesia, would experience a significant slowdown in this scenario.

The BRICs could also experience a bigger downturn if a financial crisis in China is triggered by sudden upheaval or credit concerns centered on the fast-growing shadow banking sector. This scenario could result in China’s GDP level falling by about 15% below the baseline and unemployment rising by almost 5 percentage points. Due to the interdependence of many RGMs on the Chinese economy – many RGMs are deeply involved in providing raw materials to China – the potential effects would be widely spread and quite negative.

Finally, if the Federal Reserve tapers Quantitative Easing (QE) faster than investors currently expect, greater financial volatility could result. Rising interest rates in the U.S.
could lead more funds back to the developed world from RGMs, but at the same, rising
rates and falling asset prices could constrain U.S. growth and also create new obstacles
within RGMs. RGMs would likely face higher borrowing costs for governments, corporations
and individuals, and a reversal of the long period of zero interest rates, which helped stoke
equity-price inflation, could result in a broad-based slowdown, especially in investment.
While the impact on the insurance sector might not be dramatic, a slowing in premium
growth rates cannot be completely overlooked.

4.2 Liquidity
The Quantitative Easing policy carried out by the Federal Reserve over the past several
years has generated enormous liquidity worldwide, and a significant portion of new funds
has flowed into emerging economics in search of higher returns. These flows, in turn,
boosted growth and pushed up asset prices, most noticeably in real estate prices in China.
As QE is scaled back, however, as the U.S. recovery takes firmer hold, insurers should
be braced to expect to be exposed to increasing stock market volatility, potential exchange
rate shocks and even a breakdown in exchange transfer in some smaller and more
vulnerable RGMs. From time to time, the potential for such disruptions has already been
felt episodically in Brazil, Turkey and Indonesia. In India this spring, for example, exchange
rates fell rapidly as interest rates rose on the eve of national elections. According to the
analysis in our matrix, the economies of Turkey, Morocco and Kenya appear to be those
that would be most exposed to liquidity risks in the near future.

Turkey is highly dependent on external capital flows, although this is buffered by high
levels of stable direct investment. Morocco's large fiscal and current-account deficits create
significant reliance on international liquidity. Among RGMs surveyed, Kenya's liquidity
risk is the most challenging. It is currently dealing with a large current account deficit along
with rising investor concerns. These risk perceptions are likely to reduce the tourism
revenues that remain critically important to national accounts.

4.3 Corruption
Even though governance is improving in most RGMs, high levels of corruption persist in
some markets and will continue to pose difficulties for potential foreign carriers entering
new markets. Corruption can expose insurers to fraud-related losses, especially
in nonlife sectors. Even if an insurer has strong internal fraud and risk controls, opportunities can be stunted if anti-fraud laws are not enforced by local authorities. Oxford Economics has utilized survey results compiled by Transparency International to assess current corruption risks, and unlike its economic projections, pointedly did not attempt to assess whether it was likely that corruption in an individual economy might intensify or becoming less significant in the medium-term future.

Transparency International corruption ratings suggest that the highest fraud risks among RGMs are in Nigeria, Kenya and Russia.

Kenya's ability to enforce anti-fraud regulation is particularly weak, though improvements have been made in accountability and transparency. Nigeria's limited transparency and accountability creates an environment of “grand corruption” among leading business and political leaders. And despite Russia's comparatively high economic development, its ability to battle corruption is questionable, and some claim a political influence over its judicial processes.

On the other hand, some RGMs handle fraud and corruption risks extremely well. The RGMs with the lowest fraud and corruption risks are Hong Kong, which has a strong rule of law and judicial freedoms compared to advanced economies, Chile, which has strong judicial independence and fiscal transparency along with ongoing institutional reform, and the UAE, which has high regulatory quality and financial transparency.

4.4 Sovereign risk
Insurers considering which foreign markets may seem most attractive must also consider sovereign risk, which remains a significant threat in some RGMs, particularly Kenya, Nigeria and Morocco. Both Kenya and Morocco grapple with an acute reliance on international capital flows as well as outside perceptions of significant political risks. The uncertainties across Africa have been dramatized by the Boko Haram kidnappings of young girls in Nigeria, which only adds to the political uncertainty, and the country's exposure to volatile commodity prices exacerbates concerns over the financial sector.
Hong Kong ranks again as the RGM with the lowest sovereign risk, even though the territory remains exposed to economic shocks from China, and recent demonstrations highlight new strains around political representation in the former British colony. UAE and Saudi Arabia have the next-lowest sovereign risks, despite their looming demographic and fiscal challenges.

The importance of RGMs to the global insurance portfolio of international carriers will only expand in the foreseeable future, and may well be the critical difference in whether individual firms gain market share and revenues amid the potential for slower growth in mature markets. Already, many firms in developed markets are redirecting their focus as the growth in their RGM business exceeds the returns from their home markets. Yet, it will remain important for firms to be attuned to the risks and rewards of specific RGMs. We arrived at several calls to action for any insurance firms wanting to expand into RGMs:

- **Attune global strategies to potential regulatory changes and have plans in place for those new rules:** a number of RGMs (most notably India) have promised to open their domestic market to foreign firms. At the same time, many RGMs are implementing European-driven capital regulations similar to Solvency II as the potential requirements for more extensive consumer disclosures of potential risks and fees increase across many RGMs.
- **Adapt to changing consumer behaviors in specific markets:** digital technologies are increasingly an important channel for attracting customers and selling and servicing insurance. This will create vast potential in a number of RGMs, though cultural and regulatory barriers vary country to country.
- **Understand changing government attitudes:** some RGMs have more proactive governments creating incentives for insurance firms and will seek active foreign participation.
- **Consider macroeconomic trends:** consider the pattern of foreign direct investment (FDI) within an individual market. Does it favor long-term, patient capital investment? Or is it more speculative and more likely to disappear should the currency weaken or
trade patterns shift? The composition of FDI will help firms determine the risk and volatility in an individual market.

- **Recognize that shared services can be effective in some — but not all — circumstances:** while incentives and back-office efficiencies can encourage firms to develop shared services operations, limitations may exist. Thus, this solution may not be appropriate in all circumstances.

- **Recognize that local culture matters:** when starting operations in a new market or region, many companies are tempted to ignore cultural differences across RGMs that potentially can affect the design of the operation and employ a “one model fits all” structure. But this might not be the right approach. Putting together a custom regional structure, integrating people, processes and technology effectively can demand a significant strategic review and continuing management focus.

5. **Conclusion**

The relatively modest rebound of developed economies around the globe since the 2008 recession suggests that global carriers will continue to seek more robust growth opportunities in new, more dispersed and often less-developed geographic areas. Especially as technological advances and upgrades in software capabilities make it easier than ever before for carriers to develop integrated back-office capabilities to support regional management, the RGMs will continue to seem attractive.

As a result, investment in RGMs will surely continue to be a major factor for firms wishing to remain competitive in an increasingly global economy. A thorough understanding of the shifting insurance landscape for these emerging markets will be crucial for firms that want to maximize their capital returns and generate additional growth. By carefully evaluating the growth potential and plausible risk scenarios in each individual market, and by developing a “portfolio” approach to investments in specific markets, competitive firms can gain higher growth while still tempering their firm’s overall inclination to assume risk.
Abstract
In the wake of the financial crisis, the Dodd–Frank Act established the Financial Stability Oversight Council (FSOC) and the Office of Financial Research (OFR) to address the concern that policymakers lacked sufficient data to anticipate emerging threats to financial stability. Although most discussions about systemic risk have focused on the private sector, the U.S. Federal Government is the world's largest and most interconnected financial institution, and through its activities – as a banker, rule-maker and regulator – represents a major source of systemic risk. This paper makes the qualitative and quantitative case that the government is a significant source of such risks, discusses the nature of the risks and offers suggestions for how the OFR, through its data initiatives and analyses, could help illuminate and mitigate those risks.

1 I would like to thank Zvi Bodie, Arlene Holen, Andrew Lo and David Torregrosa for helpful suggestions, and Douglas Elliott for generously allowing me to reproduce his graphs.
1. Introduction
The financial crisis of 2007-08 and its aftermath led to widespread calls for changes in the regulatory system, and to the enactment on 21 July 2010 of the Dodd-Frank Wall Street Reform and Consumer Protection Act. Among its many provisions, the Dodd-Frank Act established the Financial Stability Oversight Council (FSOC) and the Office of Financial Research (OFR) to address the concern that policymakers and investors lacked sufficient data to anticipate emerging threats to financial stability or assess how shocks to one financial firm could impact the system as a whole. Specifically, the FSOC is charged with three primary purposes:

1. To identify risks to the financial stability of the U.S. that could arise from the material financial distress or failure, or ongoing activities, of large, interconnected bank holding companies or nonbank financial companies, or that could arise outside the financial services marketplace;
2. To promote market discipline, by eliminating expectations on the part of shareholders, creditors and counterparties of such companies that the U.S. Government will shield them from losses in the event of failure;
3. To respond to emerging threats to the stability of the U.S. financial system.

To help support the FSOC’s mission, the OFR is tasked with improving the quality of financial data available to policymakers and with facilitating more robust and sophisticated analyses of the financial system.

In that context, most discussions about systemic risk and the need for additional monitoring and data collection have focused on private sector financial institutions. However, the U.S. Federal Government is the world’s largest and most interconnected financial institution, and through its activities – as a banker, rule-maker and regulator – arguably represents a major source of systemic risk. The government is subject to little market discipline because its counterparties and creditors assume that they will be shielded from losses by taxpayers. In some respect, federal financial institutions are less

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Evaluating the government as a source of systemic risk

transparent and more lightly scrutinized than their counterparts in the private sector. The financial activities of state and local governments may also pose risks to the broader financial system.

This paper makes the case that the government is a significant source of systemic risk, and hence it falls under the mandate of the FSOC and OFR to monitor and study it. To that end, I present several measures of the size and scope of the government’s role in financial markets, discuss some of the mechanisms by which government actions (or inactions) may give rise to systemic risk and suggest some specific areas where the OFR through its data initiatives and analysis could help illuminate the risks that are identified and contribute to their mitigation.

Several factors support the contention that the government is a significant source of systemic risk. The most obvious is its sheer size as a financial institution (or more accurately, a collection of loosely affiliated financial institutions). Calculations presented in the paper show that just through its traditional credit programs, the government comprised a U.S.$3 trillion financial institution in 2013, and that figure increases to more than U.S.$18 trillion when Fannie Mae, Freddie Mac, the Federal Home Loan Banks, deposit insurance, and the Pension Benefit Guarantee Corporation (PBOC) are included. However, probably more important for systemic risk than the government’s direct effect on the allocation and riskiness of credit is its influence on the incentives facing private individuals and institutions through its regulatory, tax and other policies. The government’s policies reflect a variety of sometimes competing political objectives, and there is no “invisible hand” guiding the government toward adopting policies that foster efficiency and avoid the buildup of systemic risks. In fact, systemic risks arising from government actions may be relatively hard for policymakers and the public to identify because of the lack of transparency surrounding government activities.

There are a few important caveats. Clearly, the government can act as an important counterweight to systemic risk rather than being a cause of it; that role has been discussed
Evaluating the government as a source of systemic risk

Extensively in the literature. The analysis here is meant to be a first step and is by no means exhaustive. For instance, many activities of the Federal Reserve and other financial regulatory agencies are only touched on briefly, and the risks that arise from fiscal imbalances and high levels of government debt are not discussed at all. Furthermore, I have not attempted to rank the sources of government-induced systemic risk that are identified by size or likelihood, or to compare the magnitude of the risks with those arising from private sector activities. It is hoped that those important and challenging issues will be addressed by future research.

The paper is organized as follows: Section 2 presents data on the size and scope of federal financial activities. Section 3 describes some of the channels through which the government can be an important source of systemic risk. To illustrate some of those possibilities, Section 4 takes a closer look at the residential mortgage market and discusses how the government’s actions there could have systemic consequences. Section 5 concludes with some suggestions for which additional data collection, dissemination and analysis could make the potential risks more transparent and thereby help to reduce them.

2. Sizing up the federal government as a financial institution

It is well understood that the federal government engages in a broad range of activities involving the assumption of credit and other financial risks, but relatively little attention has been paid to its aggregate size as a financial institution or its consolidated credit risk exposure. The inventory here provides a rough size estimate based on the total face value of federally backed credit outstanding. That metric was chosen because simple stock measures (obligations outstanding or obligations insured) are readily available and relatively reliable. In principle, financial exposures could be measured by the flow of new commitments in a given year, by value-at-risk calculations, or by the value of the subsidies provided to program participants. Furthermore, because the government’s credit activities give rise to both assets and liabilities, its risk exposure might best be evaluated based on its net contingent liabilities.

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3 For analyses of the government as a stabilizing as well as a destabilizing influence, see for example Acharya and Richardson (2009).
The federal government’s activities as a financial institution include providing loan guarantees and making direct loans for housing, education, agriculture, small businesses, energy and trade; implicitly or explicitly guaranteeing the obligations of government sponsored enterprises such as Fannie Mae and Freddie Mac, the Federal Home Loan Banks and the Farm Credit System; and insuring bank deposits and defined benefit pension plans.  

For a history of the government’s credit programs and more information about them, see Elliot (2011).

2.1 Traditional federal direct loan and loan guarantee programs
A narrow measure of the federal government as a financial institution is the size of its traditional direct lending and loan guarantee programs. The 2014 Credit Supplement to the Federal Budget shows that the government runs more than 100 loan programs that are administered by various federal agencies and bureaus.

Figure 1 shows the outstanding balances of federal direct loans and loan guarantees originated over the period from 1998 to 2010 (excluding emergency lending associated with the financial crisis), grouped by major loan type: housing, education, agriculture, business or other. Housing is the single-largest category in all years, but its relative size has varied over time. The federal student loan programs have undergone the most rapid growth, particularly since the mid-2000s. The total amount of federal guaranteed and direct loans outstanding roughly doubled over that period, and those lending activities have continued to grow rapidly since that time. The 2015 Analytical Perspectives section of the Federal Budget reports outstanding balances for federal credit programs of U.S.$3.1 trillion for 2013.

2.2 Federal loan programs including Fannie Mae and Freddie Mac
The federal government’s direct involvement in credit markets has increased dramatically as a result of its responses to the financial crisis. The biggest change is due to its takeover

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4 A broader accounting of the government’s financial activities would include its insurance programs that are not treated as credit programs in the federal budget (e.g., for disasters, floods, nuclear power and terrorism), its provision of pension benefits to federal civilian and military employees, social security and its assumption of other contingent financial liabilities.
of Fannie Mae and Freddie Mac. That action converted those two government-sponsored enterprises (GSEs) from private companies with implicit government guarantees to entities that are almost fully owned by the government and whose losses the government has a legal obligation to absorb. As of January 2014, the GSEs’ total book of mortgages owned or guaranteed stood at U.S.$5 trillion, reflecting their continuing dominance in the conforming mortgage market. Figure 2 shows the historical growth in federal credit programs that include the credit obligations of Fannie Mae and Freddie Mac, and some of the emergency programs of the FDIC and the Federal Reserve.¹

2.3 Broader measures of federal credit
The tabulations above include loan programs where the federal government has a fairly direct role in determining eligibility and underwriting standards for the credit it backs. Broader measures of obligations where the federal government assumes credit risk and influences the incentives of others for risk-taking also include:

- **Insured deposits:** The FDIC is an independent federal agency that reports insured deposits of U.S.$6.0 trillion for year-end 2013, slightly down from insured deposits of U.S.$6.2 trillion in 2010.

- **Pension guarantees:** The Pension Benefit Guarantee Corporation (PBGC) is an independent federal agency that insures benefits for more than 42 million private sector workers in defined benefit pension plans. Data from yearend 2013 suggests it insures pension liabilities that stand at about U.S.$3.3 trillion.² By comparison, Munnell et. al. (2008) estimate that private defined benefit plans had liabilities of about U.S.$2.8 trillion in 2007, most of which were covered by the PBGC.

- **Implicit guarantees to the federal home loan banks (FHLBs) and the farm credit system (FCS):** The FHLBs and FCS are GSEs that channel funds to commercial banks and other financial institutions, which in turn make loans for housing, agriculture and other activities. The FCS also does some direct lending. The perception of federal credit

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¹ The amounts in Figure 2 for the FDIC are emergency programs only and do not include its regular deposit insurance program. Similarly, the amounts attributed to the Federal Reserve do not include their regular balance sheet holdings.

² The Federal Reserve reports defined benefit pension assets of U.S.$3.1 trillion, and the consultancy Mercer, Towers Watson reports plans in the Fortune 1000 were 93% funded.
backing lowers those institutions’ funding costs. In 2013, the liabilities of the FHLBs totaled about U.S.$770 billion, slightly down from U.S.$800 billion in 2010 and also down from their peak at about U.S.$1.4 trillion in 2008. The loan portfolio of the FCS totaled about U.S.$200 billion in both 2010 and 2013.

Troubled Asset Relief Program (TARP): Financial assets acquired through the TARP, including purchases of preferred stock in financial and nonfinancial institutions, exposed the federal government to considerable financial risk for several years following the financial crisis. Those holdings peaked at about U.S.$540 billion in 2009, but have since declined to low levels as companies have repurchased the shares.

Federal Reserve: The Federal Reserve held a little over U.S.$4 trillion of assets on its balance sheet as of year-end 2013, up from U.S.$2.4 trillion in 2010. Those assets expose the government to interest rate and prepayment risk, but to very little incremental credit risk. Consequently, the liabilities backing those assets are not included in the estimate here of the government’s total credit risk exposure.

2.4 Comparisons to aggregate debt measures and private financial institutions
The tabulations presented above show that by the narrow measure of the direct loans and loan guarantees that it supports through its established credit programs, the federal government represented a U.S.$3 trillion financial institution in 2013. A broader accounting that also includes the mortgages owned or guaranteed by Fannie Mae and Freddie Mac brings the total to about U.S.$8 trillion in that year. Including in addition credit exposures from deposit insurance, private defined benefit pensions, implicit guarantees of the FHLBs and the FCS increases the tally to over U.S.$18 trillion.

How do those figures compare to aggregate measures of different types of credit? Flow-of-funds data for 2013 indicate household and nonprofit mortgage debt outstanding of U.S.$9.5 trillion, other consumer credit of U.S.$3.1 trillion, nonfinancial corporate bonds of U.S.$6.4 trillion, state and local government debt of U.S.$2.9 trillion and federal debt held by the public of U.S.$12.4 trillion. By comparison, the market capitalization of

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7 The Fed’s large holdings of mortgage-backed securities are already insured against default risk by other federal entities.
the U.S. stock market stood at about U.S.$18.7 trillion at year-end 2012, according to the World Bank.

Another way to roughly scale the size of the federal government as a financial institution is by comparison to large bank holding companies. Table 1 shows the assets of the top-five U.S. bank holding companies in 2013. That comparison suggests that even by the narrowest measure of the government’s financial activities, the federal government is among the largest financial institution in the country.8

3. The government as a source of systemic risk

“Systemic risk” can be defined in various ways, but here it is defined broadly to mean the risk that the activities of one market participant will have adverse repercussions on other market participants and on the wider economy due to the interlocking nature of financial markets.9

A list of attributes that make a financial institution a candidate source of systemic risk would include first and foremost its size (both in absolute terms and relative to key sectors of the economy where it has a large influence), its interconnectedness, lack of transparency and inadequate supervision. In this section, I consider the extent to which the government exhibits each of those attributes, and discuss some of the systemic risks that those characteristics of the government may give rise to.

Although the characteristics that make the government a source of systemic risk are similar to those that raise concerns about private sector financial institutions, there are differences between the government and the private sector that cause the nature of the systemic risks they create to be different as well. Special attributes of the government that need to be taken into consideration include the fact that it makes the rules (and exempts itself from many of them, including some that foster transparency), that it is motivated by sometimes competing political considerations rather than by a more predictable profit motive and that it is generally slow in its ability to react

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8 Inclusion of the banks’ off-balance-sheet exposures would, of course, increase their relative size.
9 This is a slight modification of the definition offered by the CFTC in their glossary of financial terms.
or make changes. Furthermore, because different government financial institutions have different missions and mandates, it is possible that their actions interact in a way that has unintended systemic consequences [see for example, Khandani et. al. (2009)].

Unlike private sector institutions, the government tends to be a low-frequency contributor to systemic risk through the incentives created by its rules and regulations, and through its influence on the allocation of credit. Importantly, it does not engage in rapid trading of derivative contracts. In fact, apart from the Federal Reserve’s open market operations, the government rarely trades in secondary markets. Because the government’s financial activities tend to occur at a much less frenetic pace than those of private financial institutions, the systemic risks that it creates are likely to build up more gradually over time, which may make them less likely to attract notice. A final difference perhaps worth noting is that the government is usually not considered to be a source of counterparty risk.

3.1 Size
The statistics presented earlier suggest that the government qualifies as a systemically important financial institution on the basis of its size alone. It is the dominant provider of credit for housing, student loans and agriculture, which amplifies its systemic importance in those sectors.

In theory, a financial institution could be very large but have little systemic importance if it acted as a passive conduit of funds and did not influence prices, allocations or incentives. As noted by Gale (1991), extensive lending activity does not necessarily imply that federal credit policies have important effects on the economy. However, Gale finds that through its major credit programs, the government significantly influences both the allocation and the price of credit. Furthermore, as many economists have emphasized, government credit programs can have a significant effect on incentives; for example, through its large-scale provision of deposit and pension insurance, as well as its implicit guarantees to GSEs and too-big-to-fail private institutions, the government is thought to increase the incentives for risk-taking by systemically important institutions [Pennacchi (2006)].
3.2 Interconnections through the financial infrastructure

The government is directly interconnected with other financial institutions through the “financial infrastructure” as well as its credit and insurance activities. Bodie and Merton (1995) define financial infrastructure as “the legal and accounting procedures, the organization of trading and clearing facilities, and the regulatory structures that govern the relations among the users of the financial system.” Those government activities and policies have a major effect on the interconnections between financial institutions and on the risk exposure of the entire system.

The government’s capital and accounting rules – both the reporting rules that it sets for the private sector and self-imposed rules – are an important part of the financial infrastructure, and can have significant effects on systemic risk. An example is the interaction of regulatory capital requirements and fair value accounting standards. Those, separately and together, have been identified as possible contributors to systemic risk through at least two channels: downward liquidity spirals and capital requirements that are less stringent in booms than in busts. Those channels are briefly described here to illustrate how the government’s choices about the financial infrastructure can affect systemic risk. However, the question of what combination of accounting rules and capital requirements would best promote financial stability is not addressed.

Downward liquidity spirals have been suggested as amplification mechanisms for financial shocks by a number of researchers [see Brunnermeier and Petersen (2009), and references therein]. The basic idea is that a fall in asset prices causes capital and margin requirements to become more binding on banks, further reducing their demand for assets or even triggering fire sales, which causes prices to drop further. Kiyotaki and Moore (1991) demonstrate how such price spirals could occur even in the absence of distortionary government policies, but some have argued that requiring banks to use more fair value accounting exacerbates that type of feedback mechanism [Wallison (2008)]. Others, however, find that fair value rules do not appear to have contributed to the recent crisis, and that they may in fact mitigate problems of systemic risk [Laux and Leuz (2010)]. Fair value reporting requirements for banks are also sometimes faulted for causing bank capital to be inadequate in good times and excessive in bad times. However, as discussed in Heaton et al. (2010), the problem can be viewed as reflecting shortcomings in the
regulatory definition of capital requirements: by redefining capital standards to take into account the effects of fair value accounting, the government could maintain its advantages and avoid the adverse consequences from the interaction of fair value accounting rules and poorly designed capital requirements.

3.3 Transparency
Government financial institutions are not particularly transparent, but whether they are more opaque than their counterparts in the private sector is difficult to evaluate. While various factors influence transparency, here I focus on the quality of the government’s financial disclosures, and briefly discuss a number of factors that limit the usefulness of those disclosures for evaluating the systemic risks posed by the government:

- The quality and scope of financial disclosures vary markedly across government agencies.
- Accounting standards differ across government entities, and between the public and private sectors.
- Market price or fair value information is generally not available for government financial activities.
- Government accounting, for example, for the valuation of state and local pension liabilities, for capital investment projects and for budgetary cost of credit programs, generally does not incorporate the price of market risk.

Government agencies release audited annual financial reports that describe their operations and provide selected financial data. Additional information may be obtained through Freedom of Information Act requests (although that process is onerous and not widely used). However, agency disclosures tend to emphasize mission-oriented metrics, such as the number of loans made to target populations. Little information tends to be released that can be used to assess systemic risk, such as timely measures of credit quality, delinquency rates and loss experience. Whereas the structure and content of the periodically mandated filings (e.g., annual reports) of publicly traded financial institutions are uniform enough to facilitate comparisons across institutions, there is no similar standardization of reporting of credit quality metrics across federal agencies. There is also
no central electronic repository of financial information like the SEC's Edgar, which has greatly increased the accessibility of financial information about publicly traded firms.

The purposes and uses of public and private sector financial disclosures are not identical, and it would not make sense to require identical reports from every financial institution. Nevertheless, best practices for financial reporting tend to evolve over time, and similar considerations would be expected to apply to both the government and the private sectors. However, there is no law or formal mechanism to compel harmonization of accounting standards or practices, either across government agencies, across different levels of government, or between the government and the private sector.

The differing accounting standards that apply at various levels of government, and the differences between government and private sector accounting standards, make it quite difficult to evaluate performance or risk on a consistent basis. Achieving coordination of rules is further complicated by the large number of standard-setters: Federal financial accounting standards are influenced by the Federal Accounting Standards Advisory Board (FASAB); federal budgetary accounting is governed by statute and by the administrative practices of the Office of Management and Budget (OMB) and the Congressional Budget Office (CBO); the Federal Reserve System follows its own accounting rules; state and local governments often follow the guidelines of the Government Accounting Standards Board (GASB); and U.S.-based private financial institutions are subject to the disclosure rules governed by the Financial Accounting Standards Board (FASB), and to various regulatory accounting requirements.

Market price signals serve as a check on risk-taking by private sector financial institutions. For example, excessive risk-taking may come to light when an institution's stock price drops sharply; and decisions about whether to bring new financial products to market are informed by market-based estimates of cost. For the government, however, market price signals are rarely available or relied upon. Instead, accounting numbers are used to assess the costs and risks of the government's financial activities. When those accounting numbers are systematically different from market prices or fair values, distortions can result that give rise to systemic risks. Two examples of this phenomenon are given here: the rules for valuation of state and local government defined benefit pension
liabilities and the rules for calculating the budgetary cost of federal direct loans and loan guarantees.

Most state and local pension plans for retired government workers are underfunded. Those funding shortfalls are considered a potential source of systemic risk because they could lead to state and local fiscal crises and to pressure for federal bailouts. Government accounting rules affect the perceived size and urgency of addressing those underfunding problems, and also the incentives of pension fund managers to invest in risky assets. Most states and localities follow GASB guidelines for pension accounting. The GASB approach significantly understates the value of pension liabilities relative to a fair value estimate (which can be thought of as the upfront payment that a well-capitalized insurance company would require to assume full responsibility for meeting those obligations). By contrast, FASB’s rules have moved in the direction of requiring fair value reporting for pensions on corporate balance sheets. For example, in 2009 underfunding by state and local pension plans stood at about U.S.$700 billion as measured on a GASB basis. Novy-Marx and Rauh (2011) estimate the underfunding that year to be more than twice as large (between U.S.$2 trillion and U.S.$3 trillion) on a fair value basis. Some have argued that the GASB approach also encourages greater risk-taking by pension fund managers because it allows them to effectively book the equity premium as profit (rather than treating it as revenue with an offsetting risk cost). Specifically, GASB prescribes that projected liability payments be discounted at the expected return on assets, which means that holding a riskier portfolio with a higher average rate of return could be used to justify a lower reported value for liabilities [see Bodie (2011) for a more complete discussion of this and related issues].

Transparency about the full cost to the government of its federal direct loan and loan guarantee programs is hindered by the rules that govern the budgetary accounting for most federal credit programs [Lucas and Phaup (2010)]. By law, budgetary costs are calculated by discounting the expected future net cash flows associated with the loan or guarantee at Treasury interest rates, thereby treating market risk as costless to the government. The effect is to make government credit provision appear relatively cheap;

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10 Although the government can borrow at Treasury rates, its cost of capital for a risky loan also includes the cost of insurance provided by taxpayers, who must absorb any undiversified risk the loan entails.
in fact the federal budget records the government as making money on its newly extended credit in most years. Distorted signals about the cost of federal credit assistance encourage lawmakers to rely more heavily on credit than on other forms of subsidy as a policy tool, particularly at a time of severe budgetary pressures, which has the effect of increasing the size of government credit programs and the systemic risks that they entail.

3.4 Adequacy of supervision
The Federal Reserve, as the systemic risk regulator for private financial institutions, has three major tools: disclosure requirements, supervision and regulation, and setting capital standards. It uses none of those tools, however, to control risks arising from government financial institutions.

Because government financial institutions are designed to achieve public purposes, and their activities are overseen internally by inspector generals, and externally by other executive branch agencies, by the legislature and by the judiciary, it may seem odd to describe them as inadequately supervised. Yet, similarly to private firms, the objectives of government institutions tend to be narrowly mission-focused and their managers generally do not take into consideration the effect of their activities on the stability of the broader financial system or the economy (with the notable exception of the Federal Reserve). Hence, the reasoning that justifies the creation of a new systemic risk regulator to oversee already regulated private financial institutions also suggests why there is a need for additional oversight of the government’s financial activities.

4. Systemic risk from federally backed residential mortgages
The case for the government being a source of poorly monitored systemic risk in the mortgage market is straightforward, as the government is the main source of mortgage credit for U.S. households. Its rules influence the amount of credit channeled to the housing market, the allocation of that credit and whether excessive risks are thereby created. Its mortgage-related activities have given rise to large losses to taxpayers. Although federal mortgage policies may enhance social welfare on net, no regulator is charged with monitoring their overall effect on the stability of the U.S. financial system.

The government assumes the credit risk on residential mortgages through credit programs run by the Federal Housing Administration (FHA), the Department of Veterans Affairs (VA)
and other smaller agencies like the Rural Housing Administration, as well as through Fannie Mae and Freddie Mac. In 2010, Fannie Mae and Freddie Mac owned or guaranteed roughly half of all outstanding mortgages in the U.S., and they financed 63% of the new mortgages originated that year. Including the 23% of home loans insured by federal agencies such as FHA and VA, which are securitized by Ginnie Mae, about 96% of new mortgages made in 2010 carried a federal guarantee. In 2011, the federal share rose to 98% of originations and it has remained at about that level since that time. **Figure 3**, based on data from CBO, shows MBS issuance amounts and market share for government and non-government originators between 1995 and 2013. Over that period, the majority of mortgages originated had some type of federal backing, but private label issuers had been gaining ground on the GSEs, and particularly on the FHA, prior to the crisis.

The federal government’s prominent role in housing finance dates back to the Great Depression. The FHA was founded in 1934 to provide mortgage insurance in response to the extraordinarily high rates of foreclosure and default at that time. In its current incarnation, the FHA’s largest program, which offers single-family mortgage insurance, extends access to home ownership to people who lack the savings, credit history or income to qualify for a conventional mortgage. Under that program, the FHA insures 15-year and 30-year fixed-rate and adjustable-rate amortizing mortgages for home purchases or for refinancing, in exchange for an up-front fee and annual premiums. By design, it deals in risky mortgages: guarantees are available to poor credit quality borrowers with down payments as low as 3.5% of a property’s appraised value. Similarly, VA provides federal guarantees on residential mortgages for qualifying active and retired military personnel, without requiring a down payment. The volume of VA mortgages outstanding has been fairly stable over the last decade. Mortgages carrying FHA or VA guarantees are securitized by Ginnie Mae, a fully owned government corporation that bundles the mortgages and guarantees timely payment of principal and interest.

Fannie Mae was established in 1938 as a fully governmental agency to support the secondary mortgage market. It was partially privatized more than 40 years ago, when

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11 Some of this discussion is drawn from CBO (2010), which provides a more detailed account of the history of federal housing institutions and analysis of the weaknesses of the pre-crisis system.
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Fannie Mae and Freddie Mac were chartered as GSEs by Congress with a mandate to provide a stable source of private funding for residential mortgages across the U.S., including for low- and moderate-income households.

4.1 Too big to fail
Before September 2008, when they were taken into federal conservatorship, the GSEs’ debt securities and MBSs that funded those mortgages were not officially backed by the federal government. Nevertheless, most investors believed that the government would not allow Fannie Mae and Freddie Mac to default on those obligations. That perception of an implicit federal guarantee allowed Fannie Mae and Freddie Mac to borrow to fund their portfolio holdings of mortgages and MBSs at lower interest rates than those paid by fully private financial institutions of otherwise comparable risk. Investors also valued the GSEs’ credit guarantees more highly than those issued by fully private guarantors. These benefits, combined with the other regulatory advantages, allowed them to establish and maintain a dominant market share in the segments of the market in which they were allowed to participate, reinforcing their systemic importance.

The GSEs’ low levels of capital reserves and lack of diversification outside of the housing sector left them highly exposed to housing price and prepayment rate shocks. That exposure posed a risk to the larger financial system because the consequences of letting Fannie Mae or Freddie Mac fail could have been extremely damaging to the housing market. It also would threaten investors in agency debt and MBSs. Those investors include numerous U.S. banks and foreign central banks. Although banks are somewhat restricted by regulation in the amounts of credit exposure to a given company they can take on, such limits do not apply to agency debt. If Fannie Mae or Freddie Mac defaulted on their obligations, the solvency of other financial institutions would be threatened. Moreover, the willingness of foreign central banks to hold Treasury securities could be compromised if they saw such a default as a signal of greater willingness of the U.S. Government to default. That situation is an example of how relatively lax oversight of financial transactions involving government-backed institutions can create systemic risk.
The supposition that the government-backed mortgage institutions were too big to fail was proved true during the financial crisis of 2007–08. With falling housing prices and rising delinquencies threatening the solvency of Fannie Mae and Freddie Mac and their ability to issue debt, the federal government assumed control of the two GSEs in September 2008. Using the authority provided in the newly enacted Housing and Economic Recovery Act, their regulator placed them in conservatorship and the Treasury guaranteed their obligations through 2012. In addition, the Federal Reserve supported Fannie Mae and Freddie Mac by purchasing U.S.$1.25 trillion of their MBSs and more than U.S.$100 billion of their debt. Those actions gave the government control over the two institutions and effectively made the government's backing of their debt securities and MBS guarantees explicit. Between November 2008 and the end of March 2012, the government provided about U.S.$188 billion in capital to Fannie Mae and Freddie Mac.

The financial crisis and downturn in housing also led to large losses for the FHA as default rates climbed and recovery rates fell [CBO (2011)]. While the infusion of federal dollars into Fannie Mae and Freddie Mac was widely perceived as a federal bailout, it is less well known that the FHA received considerably more money from Treasury than was originally budgeted for. Over the 1999–2011 period, estimated subsidy costs for the FHA’s singlefamily program were revised upward by a net total of U.S.$44 billion [CBO (2011)].

An explanation for how such a large cost overrun at the FHA could go largely unnoticed is the opacity of how federal credit programs are budgeted for: indefinite budgetary authority covers re-estimates of the cost of federal credit programs, which means that no legislative action is necessary to provide funds to cover unanticipated shortfalls. Pressure to control the FHA’s risk exposure may also be muted because the program appears to make money for the government; despite the elevated risks in the housing market, the budget deficit in the years following the crisis was routinely shown to be reduced by the activities of the FHA because budgetary accounting does not take into account the

12 The U.S.$44 billion is not directly comparable to the U.S.$188 billion cash infusion reported for the GSEs because the FHA cost estimates are reported on an accrual basis.
price of market risk. (The FHA did raise its fees in response to the crisis, but they remain at subsidized levels in comparison to the fair value of the guarantees provided.)

4.3 Systemic imbalances arising from mortgage policies
The government influences the pricing, allocation and risks associated with mortgage credit through its credit and regulatory policies. It sets eligibility standards, down-payment requirements, underwriting standards (e.g., loan-to-value ratios, minimum credit scores), guarantee pricing and thereby subsidy levels and determines the types of mortgage products offered (e.g., fixed, floating, prepayment options) and how they are financed (e.g., via securitization or on bank balance sheets). More indirectly, it sets the capital requirements for banks on their holdings of agency and other mortgage securities, and regulates mortgage-related derivatives.

Many commentators have pointed to those government policies as contributing to the housing bubble that precipitated the financial crisis [Levine (2010)]. For instance, the affordable housing goals that regulators set for Fannie Mae and Freddie Mac are often cited as an important reason for the credit-risk buildup in their portfolios. More generally, those observers assert that the affordable housing goals may have helped fuel the housing bubble by accommodating the increasing demand for housing. However, others have countered that excessive risk-taking was even more prevalent among private sector institutions, and that although the GSEs and other federal housing policies contributed to the problems, they were not the root cause [Avery and Brevoort (2011)]. Furthermore, the glut of credit and unsustainable rise in housing prices was an international phenomenon, which could not have been brought about primarily by flaws in U.S. regulatory policy. Although the debate over the precipitating causes of the house price bubble may remain unresolved, the views of both sides are consistent with the need for increased and ongoing scrutiny of the systemic consequences of government policies in the mortgage market and other credit markets where policy plays a major role.

13 See the Report of the Financial Crisis Inquiry Commission (2011), for lively arguments on both sides of this debate.
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5. Some suggestions for initiatives and analyses
This section concludes with a few specific examples of how the OFR, through its initiatives and analyses, could help to mitigate some of the systemic risks arising from the government’s financial activities that were identified earlier.

The first suggestion is to initiate a “regulatory audit” whereby the OFR undertakes a systematic evaluation of federal financial regulations across agencies to identify unintended consequences that could give rise to systemic risk. The goal would be to address concerns about government regulations causing or exacerbating systemic risks – for instance, through the interaction of bank capital requirements and fair value accounting requirements or because prohibitions on an activity may cause financial institutions to use alternative mechanisms that are even riskier.¹⁴

Several other possible initiatives would aim to increase the transparency of government financial institutions, thereby making it easier for policymakers, researchers and the general public to identify emerging risks and imbalances:

- Commence a study that compares government and private sector accounting standards and assesses best practices: GASB’s rules for pension accounting were discussed earlier as an example of government accounting practices that generate potentially misleading information, and which deviate from the FASB and international accounting standards. Such a study could identify other areas where there are significant differences across accounting standards, and evaluate what is likely to represent the best practice for government reporting across jurisdictions. The analysis could serve as an input and impetus to more rapid harmonization of accounting standards and practices.

- Improve and standardize financial disclosures: as discussed in section 3.3, unlike the private sector, which is subject to SEC and other disclosure requirements, financial

¹⁴ This suggestion is related to the idea put forth by Merton and Bodie (1995) that functional regulation is necessary to avoid unintended consequences. They give the example of forcing marked-to-market collateral requirements on OTC derivatives but not on loans and other “traditional” investments, which could cause a shift back to structures like parallel loans that actually increase the systemic exposure of the system by increasing counterparty exposure.
reporting across government financial institutions of risk-related metrics is not standardized, nor is there a central website that serves as an accessible repository for such information. The OFR could help to address those shortcomings by working with federal financial institutions, and with academic and private accounting experts, to develop more uniform and informative reporting standards. The goal would be to ensure that the information available about the financial condition and prospective risk exposures informative as they are for private sector financial institutions. The OFR could also house a website that would make those disclosures readily available to the public.

- **Encourage the provision of fair value disclosures**: to help address the lack of market price information that could help signal the risks involved in the government’s financial activities, the OFR could also work with government financial institutions to develop standard approaches to producing fair value estimates for their credit-related assets and liabilities (and for their off-balance-sheet obligations) and to encourage the public disclosure of that information. Fair value accounting could also make costs more transparent in the legislative process, when the government is affecting the allocation of credit because it would more clearly reveal the size of subsidies than under the current budgetary rules for credit subsidy calculations.

Another set of possible initiatives would involve data collection, dissemination and analysis:

- **Evaluate unmet data needs for assessing systemic risk from federal credit programs**: government credit programs collect from borrowers the information that is necessary to evaluate their program eligibility, but that information may be insufficient for the purposes of assessing the systemic risks arising from the program. A potentially important example arises from the federal student loan program, which collects almost no information on borrower credit quality. Underwriting is not necessary because student loans are a categorical entitlement and eligibility does not depend on assessed ability to repay the loan. Nevertheless, student loans can be a source of systemic risk. The rapid growth of lending under those programs in recent years has added significantly to household debt levels, and some observers have expressed concern about whether the loans were creating unmanageable debt levels that could have adverse effects for individuals and for the economy.
Create data sets that combine information on federal and private credit at the household level: household indebtedness often involves a combination of government-backed and private loans. Assessing the amount of financial stress households are experiencing, and the likelihood that they will default, requires data on both types of obligations. An example of where that type of matching would greatly improve the ability to assess stresses currently would be to combine loan level or household level data on first and second mortgages.

Disseminate data on federal credit programs: loan level data from federal credit programs is generally not released by federal agencies, although it may be obtained through Freedom of Information Act requests. (The exception is data on home mortgages, which can be purchased, albeit at a steep price, from private data services such as CoreLogic.) Greater availability of data would encourage more research on federal credit programs, which in turn could increase transparency and encourage agencies to improve the quality of their data and the attention they pay to it. The data could also be informative for private financial institutions in evaluating the riskiness of their own products and of the financial system. Releasing that data raises fewer concerns than for data from private institutions about protecting proprietary information. Borrower privacy concerns could be addressed by removing identifying information and other standard methods. It is costly and time-consuming to make data available in an easily usable form, and there is little incentive for individual federal agencies to devote their limited resources for doing so. However, it seems in keeping with the objectives of the OFR to devote some of its resources to that task, there may be efficiencies in having a single agency coordinating such efforts.
Evaluating the government as a source of systemic risk

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The recent global financial crisis highlighted the risks arising from an international monetary system that mainly relies on the U.S. dollar as the international currency. Shortages of dollar funding in numerous advanced and emerging economies spilled over into the real economy, contributing to significant economic slowdown. A sound international monetary system in the 21st century requires a number of major currencies to act as world reserve currencies. The Chinese currency could emerge as one of the major world reserve currencies over time. The purpose of this article is to analyze the factors that could contribute to the emergence of the Chinese currency (renminbi/yuan) as an international currency. To this end, this article provides an overview of what an international currency is, and the costs and benefits of currency internationalization. Next, it discusses the initiatives Chinese policymakers have undertaken to date, in order to increase international usage of the yuan. Finally, it examines the prerequisites of an international currency, and compares China's structural factors against these prerequisites to identify and examine the structural factors that policymakers must first address before currency internationalization will occur.
1. Introduction
The international monetary system has evolved over time, as global and national economies have changed. National financial systems have also gone through significant changes. The history of monetary systems also indicates that there have been a number of attempts to unify a few currencies as part of one currency. For instance, in Europe, there was an attempt made in 1800 to create an international currency referred to as the Latin Monetary Union. In the 19th century, Germany and America went through the process of creating a single national currency for their respective nations. At the same time, the gold standard monetary system of the 19th century served many national economies until 1914 and then for a short period of time after the First World War.

With the emergence of the Great Depression and the Second World War, the global economy became receptive to the idea of a new international monetary system. As part of this evolution, the Bretton Woods Institutions emerged (from which the IMF, the World Bank and General Agreements on Trade and Tariffs emerged). The Bretton Woods system was the first globally negotiated international monetary system. This global framework allowed for national currencies to be pegged to the U.S. dollar. At the same time, the U.S. dollar was the only currency convertible to gold. However, the collapse of the Bretton Woods system in 1971 led all reserve currencies to become fiat currencies. At the same time, most major currencies that were fixed became flexible exchange rates.

Since the collapse of the Bretton Woods system and the emergence of the flexible exchange rate regime in different parts of the world, the U.S. dollar has remained the main international currency. In addition to the U.S. dollar as the main world currency, other major currencies such as the Deutsch Mark (until it was replaced by the euro), the Japanese yen, the pound sterling and the Swiss franc have contributed to global financial stability and global financial liquidity. In recent years, the Canadian and the Australian dollars have been in high demand by both central banks and investors.

Furthermore, the emergence of the euro as a single currency for the Eurozone has created a new impetus for a more diverse international monetary system in the 21st century. The recent global financial crisis revealed weaknesses in the international monetary system based on the high reliance on the U.S. dollar. Despite the buildup of dollar reserves over
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the past decade, severe dollar shortages translated into spillovers into the real economy of many countries, especially emerging economies.

Furthermore, the recent political deadlock in the U.S. Congress regarding the U.S. debt and deficit has raised doubt about the viability of the U.S. dollar as the predominant world currency over time. The importance of having more than one or two major world currencies has become increasingly apparent with the rise of Asia as a major continent and the emergence of more than 800 million middle income consumers. These new middle income consumers are increasingly demanding more financial assets and more diverse international currencies. Furthermore, as financial globalization deepens and more financial assets are demanded around the world, the need for more viable international currencies and a much broader and deeper global financial system will become some of the essential requirements of the 21st century international monetary system. The rise of China as the second-largest world economy and its appetite for more bilateral trade agreements and increasing investment in China is putting pressure on the Chinese authorities to fast-track the process of converting the yuan to an international currency. It is difficult to determine when the People’s Republic of China (PRC) first adopted the goal of making the yuan an international currency. However, a key moment was the release of the report on “The timing, path, and strategies of RMB internationalization” by a study group established by the People’s Bank of China (PBOC) in 2006. Since then, gradual steps have been taken toward this goal. However, the PBOC has been “noticeably cautious” [Cohen (2011)], which may be due to its concerns about the impact internationalization will have on the PRC’s export growth strategy.

The purpose of this paper is to focus on the process of convertibility of the Chinese yuan to an international currency, as part of the emergence of a more stable international monetary system in the 21st century.

An important distinction must be made between the goals of currency dominance and currency normalization that have been debated in the literature around the internationalization of the yuan. Many commentators argue that the yuan could replace the U.S. dollar in the coming decades [see Subramanian (2011)]. However, others suggest that what we are currently seeing is a “currency normalization” as the Chinese yuan becomes one of a
A number of international currencies, befitting China’s status as the world’s second-largest economy [Bowles and Wang (2013)]. It is the second scenario that we are examining – the potential of the yuan to become an international currency, but not the dominant currency.

The remainder of this paper is structured as follows: section 2 discusses the characteristics of an international currency; section 3 analyzes the motivation of the PRC in internationalizing the yuan, including an analysis of the costs and benefits of currency internationalization; section 4 discusses the PRC’s progress in internationalizing the yuan, including references to trade, finance and cross-border capital flows; section 5 discusses the remaining challenges for the yuan to become an international currency and section 6 concludes.

2. An international currency
An international currency is a currency that is used outside its home country [Chinn and Frankel (2008)], and not merely for transactions with residents, but also for transactions between residents and nonresidents and between nonresidents and nonresidents [Kenen (2009)]. Theoretical analysis of currency internationalization usually proceeds by examining the functional uses of an international currency based on a standard taxonomy advanced by Cohen (1971). Thus, an international currency can be decomposed according to actor (private or government) and the different functions of money (store of value, medium of exchange, unit of account) (Table 1). Private uses of an international currency include use as an investment currency (store of value) and in settling trade and financial transactions (medium of exchange) and denominating trade and financial transactions (unit of account). Public uses of an international currency include use as international reserves (store of value), as a vehicle currency for foreign exchange market intervention (medium of exchange) and as an anchor currency (unit of account).

3. The benefits and costs of internationalization
There are also significant benefits in having an international currency. There are four key benefits arising from internationalization:

1. **Reduced transaction costs and foreign exchange risk** - transaction costs and foreign exchange risk will be reduced or eliminated if domestic firms and financial institutions...
are able to use the domestic currency in international trade and financial transactions rather than foreign currencies. It helps the issuing currency's importers and exporters reduce exchange rate risk, especially where payment is made long after the goods are ordered. It also allows an issuing country's firms and financial institutions to access international financial markets and borrow more cheaply and on a larger scale without incurring exchange rate risk [Kenen (2009)].

2. **Increased business for domestic country's financial institutions** - it stands to reason that the internationalization of a domestic currency will increase the business of the domestic country's financial institutions, as they have a competitive advantage over foreign competitors in dealing in their domestic currency [Frankel (2012)]. This will expand the size of the domestic country's financial sector.

3. **Reduced seigniorage** - seigniorage refers to the profit made by a government from the printing of money (the face value less the cost of printing it). With the internationalization of the yuan, the need for the PRC to hold dollar reserves will decrease, which means the PRC will reduce the seigniorage paid to the U.S. Yu (2012) further notes that given the probability the dollar will devalue in the long run, and that the U.S. is likely to inflate away its debt burden by monetizing its budget deficit (as is the perception with the recent quantitative easing), reduced dollar reserves will mean less capital losses.

4. **Increased international status and prestige** - at a symbolic level, international usage of the yuan would increase the PRC's international status, and provide a form of “soft power” in world monetary affairs [Cohen (2011)]. Frankel (2012) notes that the decline of the sterling as the key international currency was simultaneous with Britain's gradual loss of political and military preeminence. Moreover, Cohen (1998) and Helleiner (2003) have established empirically the importance of soft power in world monetary affairs.

There are, however, three substantive disadvantages to having an international currency. These reasons may explain why Japan and Germany were reluctant in their past to have their currencies used and held internationally, and may explain why China remains cautious in liberalizing its current account and establishing full convertibility [Kenen (2009)]. These three disadvantages are:
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1. **Incompatibility between fixed exchange rate and domestically oriented monetary policy** - commentators have stressed the impossibility of maintaining both a fixed exchange rate and a domestically oriented monetary policy in the face of unfettered capital flows. The unfettered flows would arise as currency internationalization requires capital account liberalization. While currency internationalization does not necessitate removal of all capital account controls, the increased capital flows resulting from it would restrict the ability of the central bank to pursue both a fixed exchange rate and domestically oriented monetary policy.

2. **An increase in average demand for the currency** - in the 1960s and 1970s, Japan and Germany, with very large manufacturing sectors, were particularly concerned that currency internationalization would lead to greater demand for their currencies, and the appreciation of their currencies, rendering exporters less competitive [Frankel (2012)]. It is likely China would have similar concerns regarding the competitiveness of their very large manufacturing sector, which would explain the cautious steps China has taken so far to liberalize its capital account.

3. **Burden of responsibility** - the monetary authorities of economies with a leading international currency may be constrained in their ability to pursue domestic goals using monetary policy because they may be required to consider the broader macroeconomic and macrofinancial implications of their actions on world markets [Frankel (2012)]. Kenen (2009) comments that the historic reluctance of U.S. monetary authorities to internationalize the dollar may be due to their reluctance to accept this burden of responsibility.

While the PRC’s intentions and objectives in seeking to internationalize the yuan are unclear, both the economic and political benefits surveyed above are likely to be significant enticements. However, it seems that a major concern for the PRC would be the impact on its current export growth strategy. This likely underlies the PRC’s caution in internationalizing the yuan, making so far only incremental changes to its capital account controls.

4. **The PRC’s progress in internationalizing the yuan**
The PRC has pursued yuan internationalization along two main tracks [Subacchi (2010)]. Cohen (2011) argues these tracks have been designed to target the three roles (out of the six discussed previously) that are critical to enhancing an issuing country’s power in
international affairs, which is likely one of the PRC’s objectives. These three roles are the investment and trade roles, which naturally lead to the reserve currency role, because the composition of central bank reserves tends to reflect the currency choice of its residents in trade and investment. The first track is aimed at increasing the use of the yuan in intercountry trade transactions. Here, the PRC has entered currency swap agreements with central banks to facilitate the use of the yuan in settlements, and regulations have also been eased to enable trade settlements to occur in yuan. The second is aimed at enhancing the yuan's investment role. The PRC has to date focused on developing offshore markets, especially in its financially active neighbor Hong Kong, for yuan deposits and yuan-denominated bonds. This track also supports the trade role as foreign importers and exporters can find suitable assets to place their yuan balances in. Related to this second track, the PRC has also taken steps to gradually open its capital account to portfolio flows, such as the qualified investor programs, to provide selected nonresidents with limited access to its financial markets.

### 4.1 Trade
The PBOC has established a series of bilateral swap lines with other central banks in order to expand the use of the yuan in international trade and finance. The PBOC had in fact begun to establish currency swap agreements with other central banks to provide liquidity support even before it began to promote the internationalization of the yuan. Under the terms, the PRC would provide dollars in exchange for the central bank’s local currency. However, since 2008, the bilateral swap lines established with central banks have directly supported the greater international use of the yuan by being designed to supply yuan for bilateral trade when desired, though their liquidity support role remains [Liao and McDowell (2013)]. Since 2008, the PBOC has established 24 currency swap agreements with other central banks, signing 8 alone in 2013, with the outstanding total value equivalent to RMB2.5 trillion. Most notable among these bilateral agreements are the deals established by the PBOC with the European Central Bank and the Bank of England in 2013.

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1 This was based on the exchange rate obtained on the 26th of May 2014.
Furthermore, the PRC has relaxed regulations, enabling a wider range of intercountry trade transactions to be settled in yuan. Informally, the yuan has long been accepted as a settlement currency in border trade with neighboring countries such as Mongolia, Myanmar, Nepal, North Korea, Russia and Vietnam [Cohen (2011)]. Formal initiatives to allow the use of the yuan in trade settlement began in mid-2009, with a pilot program allowing 365 firms selected in 5 mainland cities – Shanghai, Guangdong, Shenzhen, Dongguan and Zhuhai – to settle trade transactions (both export invoicing and import payment) with counterparts in Hong Kong in yuan. There are two avenues for RMB trade settlement to be conducted. Firstly, through clearing banks in Hong Kong and Macao, and secondly, through domestic commercial banks acting as agencies of overseas commercial banks [Cui (2013)]. Banks in selected areas outside the PRC were permitted to provide related yuan services such as currency exchange, remittances and trade finance. Coverage of the program expanded a year later to include all foreign trade between 20 provinces, and Hong Kong, Macau and ASEAN countries. By 2011, more than 67,000 firms were participating in the program. Since mid-2009, cross-border trade settlement in yuan expanded rapidly from less than 1% at the inception of the program to 16.5% of the PRC’s total trade by the end of the second quarter of 2013 [Eichengreen and Kawai (2014)]. Furthermore, the share of the RMB in the international payment system has more than doubled to 1.39% in January 2014, as compared to the previous year, when it accounted for 0.63% of world payments [Swift (2014)].

However, approximately 90% of trade settlement in yuan has been with the Hong Kong Special Administrative Region alone [Cui (2013)], indicating the use of the yuan in trade settlement is not as widespread as suggested.

4.2 Finance
The PBOC has pursued increased use of the yuan in international finance through experiments with establishing offshore markets for yuan products. The main offshore market is in Hong Kong, its neighbor, where the PRC has taken advantage of its status as an international financial center. The two main offshore markets are for yuan deposits and yuan-denominated bonds, also called “dim sum” bonds.
In 2004, the Hong Kong Monetary Authority established the Renminbi Business Scheme, which allowed banks in Hong Kong to open yuan deposit accounts for some individuals and for businesses. Initially, yuan deposits grew slowly. However, two groups of initiatives introduced around 2007 and 2010 by Chinese authorities increased the attractiveness of holding yuan balances, leading to acceleration in the growth of yuan deposits. The first was the introduction of the yuan trade settlement scheme in mid-2009.

The second group of initiatives involved reforms in the way yuan deposits could be utilized, making it more attractive to hold yuan deposits. Initially, Hong Kong banks accepting yuan deposits could only deposit the funds with the Bank of China (Hong Kong), which serves as the clearing bank. The Bank of China only pays 0.600% on 12-month CNY fixed deposits, making it unattractive to hold yuan balances. To increase the attractiveness of holding yuan balances, Chinese authorities have implemented two initiatives. First, in mid-2007, the dim sum bond market in Hong Kong was created, which are yuan-denominated bonds issued in Hong Kong. Initially, specific PRC financial institutions and the Ministry of Finance were the only institutions permitted to issue dim sum bonds, but later permission was given in 2010 for Chinese nonfinancial firms, and foreign multinational corporations operating in the PRC, to issue dim sum bonds. Other mainland bank issues, and also the first by an overseas bank, HSBC in 2009, followed this. From 2007 to 2010, yearly RMB-denominated bond issuance nearly quadrupled from about CNY 9.1 billion (about U.S.$1.465 billion using the U.S. to CNY exchange rate of U.S.$1 = CNY6.21 as on 13 June 2014. This exchange rate will be used throughout this article.) to about CNY 36.4 billion (about U.S.$5.862 billion) in 2010, and issuance was approximately CNY113.6 billion (about U.S.$18.293 billion) in 2013 [Standard Chartered (2014)]. The acceleration reflects the permission given in 2010 for Chinese nonfinancial firms, and foreign multinational corporations operating in the PRC, to issue dim sum bonds. Since 2007, a

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2 Parallel to the dim sum market, an onshore market for yuan-denominated bonds issued by non-Chinese firms (Panda bonds) has slowly developed since 2005, centered in Shanghai. This slow pace contrasts with a pledge by China's State Council to establish Shanghai as an international financial center by no later than 2020. At the start of 2011, there had only been five issues, amounting to a total of just CNY5 billion [Cohen (2011)]. There is also limited access for nonresidents, as to all of China's financial markets. The first corporate Panda bond was issued by Daimler AG in 2014.
A variety of companies from different industries have issued dim sum bonds, including mainland banks, Hopewell Highway Infrastructure Limited, McDonald's, Unilever, Tesco, the Royal Bank of Scotland and Volkswagen. However, despite this rapid growth, overall volume is insignificant. The total value of bonds outstanding as at end-2013 was about CNY325 billion (about U.S.$52.335 billion), which is a small share of global bond issuance and may be due to the strict limitations imposed by PRC authorities on how much of the proceeds from bond sales can be transferred for use in the PRC. However, the planned introduction of the CNH Hong Kong Interbank Offered Rate (HIBOR) may potentially foster the growth of offshore RMB-denominated products [Ballantyne et al. (2013)]. The acceleration also reflects new rules introduced in mid-2010. The new rules permitted daily trading of the yuan on the Hong Kong foreign exchange market, and permitted local financial institutions to open yuan accounts of their own. As a result, Hong Kong yuan deposits grew from less than CNY65 billion (about U.S.$10.467 billion) at the end of 2009, to more than CNY812 billion (about U.S.$130.757 billion) in March 2013 [Craig et al. (2013)].

Furthermore, since August 2010, Chinese authorities have allowed Hong Kong banks involved in yuan cross-border trade settlement to access the onshore interbank market. Thus, Hong Kong banks can now access more attractive, higher-yielding yuan-denominated bonds, rather than holding low-yielding deposits with the Bank of China (Hong Kong). Subsequently, they can offer higher interest rates for yuan deposits.

4.2.1 Cross-border capital flows
Apart from establishing offshore markets, the other way Chinese authorities have sought to increase the use of the yuan is through partially opening the capital account to more stable portfolio investment flows. These include the qualified investor schemes.

Firstly, the qualified investor schemes enables certain, more stable, forms of cross-border portfolio flows. The Qualified Foreign Institutional Investors (QFII) program began in 2003, and allowed approved foreign institutional investors to convert currency into yuan and invest in China's capital markets, but mainly the stock market. The program began with few investors and with a limited quota, but has since been expanded. As of 2009, the quota was expanded to U.S.$1 billion from U.S.$0.8 billion, and as of January 2013, 213 foreign
institutional investors were qualified [Bowles and Wang (2013)]. The Renminbi Qualified Foreign Institutional Investors Scheme (RQFII) was initiated in December 2011. The scheme allows foreign investors approved by the China Securities Regulatory Commission (CSRC) to invest in the PRC’s A-share markets [Cui (2013)]. Since its initiation, the RFQII quota has increased from CNY20 billion to CNY200 billion in November 2012 [Yu (2014)]. There is also a Qualified Domestic Institutional Investors program, where Chinese residents can convert yuan and invest in the Hong Kong stock market.

5. Remaining challenges to currency internationalization
Having surveyed the PRC’s progress to date in internationalizing the yuan, this section will now examine the remaining challenges the PRC faces to achieving an international currency. Commentators highlight four essential prerequisites to establishing an international currency capable of fulfilling the roles previously discussed. These four essential prerequisites are (1) “network externalities,” which are broad transactional networks to ensure an adequate user base for the currency, (2) confidence in the currency’s future value, stability and security, (3) qualities of “exchange convenience” and “capital certainty,” meaning a high level of transactional liquidity and reasonable predictability of asset value and (4) an open capital account, or relatively free convertibility of the currency.

As to the first, it is necessary for the issuing country to be large in absolute size, and integrated into global markets. As to the second, three key aspects of this are political stability in the issuing country, as well as confidence in the issuing country’s macroeconomic policies to achieve low inflation, and low inflation variability. As to the third, broad and deep financial markets are essential for users to invest currency balances in products that meet their varied investment demands, and in markets that are well-regulated and supervised to mitigate financial stability risks. As to the fourth, an open capital account will most likely necessitate a more flexible market-determined exchange rate.

5.1 Broad transactional network
The PRC clearly meets one of the four prerequisites – a large transactional network. The PRC’s 2013 nominal GDP was U.S.$9.8 trillion, according to the Bureau of Statistics of the
People’s Republic of China, making it one of the world’s largest economies, second only to the U.S. Furthermore, during 2013, the PRC is estimated to have exported U.S.$2.2 trillion and imported U.S.$1.8 trillion, according to the CIA World Factbook, placing it first and second, respectively, for these economic indicators.

The PRC has sought to exploit its strong trade interconnectedness through the policies discussed previously to increase demand for the yuan. However, relying upon the PRC’s large transactional network is not sufficient to garner greater international use of the yuan. While the issuing country’s economic size matters for the trade role, it matters much less for other roles such as the investment and reserve currency roles [Cohen (2011)]. For these two roles, the last three prerequisites matter much more. But these prerequisites are noticeably lacking in the PRC.

5.2 Confidence in the currency’s future value, stability and security
The second prerequisite is confidence in the currency’s future value, stability and security. It must be conceded that inflation has been relatively stable in the PRC, despite the constraints on the flexibility of its central bank in addressing inflation imposed by maintaining the tightly managed exchange rate. Over the last 24 months, the PRC has maintained a monthly year-on-year inflation range as 2%-3.6%. Over the same period, the economies of the global reserve currencies, the U.S. dollar and the euro experienced greater fluctuations in their inflation rates, between 1% and 2.9% and from 0.7% to 2.7%, respectively. Thus from an inflationary perspective, the PRC compares favorably with reserve currency economies.

However, other features of China’s political landscape do not provide a high level of confidence to any potential constituencies of the yuan. The ruling political party is autocratic in nature, while its governance structure lacks adequate transparency and accountability. Neither does the rule of law provide adequate assurance to potential users of the security of their wealth if they were to invest large sums of yuan. There is wide consensus about the shortcomings inhibiting the rule of law being enforced in the PRC, and such legal institutions are more characteristic of mature democracies, of which the PRC is clearly not [Eichengreen and Kawai (2014)]. Political stability is clearly
important to engender confidence in the yuan among nonresidents. However, it is not clear whether the PRC can achieve political stability anytime soon.

5.3 A high level of transactional liquidity
The third prerequisite is a high level of transactional liquidity, which requires broad and deep financial markets to meet the varied and voluminous demands of potential users. Liquidity refers to a high level of turnover. Breadth refers to the availability of financial instruments, including markets for secondary instruments to hedge risk. Depth refers to the volume of financial instruments in any specific market. As a benchmark, the U.S. dollar is the dominant international currency due to its broad, deep and liquid financial markets allowing investors to confidently invest U.S. dollars in a wide range of financial products that meet their investment demands.

China's financial markets, however, are still nascent, which is a key obstacle to its attractiveness as a currency to foreign investors. China's financial markets are lacking breadth. Financing remains dominated by banks with few alternative market-based instruments. Data available for the quarter ended June 2013 from the Asian Development Bank's Asian Bonds Online database shows that credit provided by the domestic banking sector accounted for about 65% of the total U.S.$21.65 trillion of domestic financing. Bonds and equities contributed 19% and 16%, respectively, to the domestic financing profile. The liquidity of China's debt markets is also less than that of reserve currency countries. Comparatively, the U.S. government bond market is the most liquid. Per the U.S. Financial Accounts for the period ending December 2013, the average U.S. Treasury securities outstanding for 2013 totaled U.S.$11.95 trillion and had a turnover ratio of 11.62, based on data from the Securities Industry and Financial Markets Association, compared with about U.S.$2.97 trillion of PRC government bonds outstanding, having a turnover ratio of 1.1 during 2013, based on data from the Asian Bonds Online database. The turnover for the PRC's corporate bond market is higher than other reserve currency countries, at 1.8 during 2013 compared to approximately 0.64 for the U.S. However, the depth of the PRC corporate debt market is insubstantial. Moreover, Prasad and Yu (2012) note that China's domestic debt market is larger than the debt markets of two reserve currency countries – the U.K. and Switzerland (the domestic debt markets of the U.S., the Eurozone and Japan are much larger), so size alone is not an impediment to
China, however, has made significant progress in developing its corporate equity markets. Market capitalization and turnover surged immediately after reforms in 2005 enabled non-tradable shares in Chinese companies to float freely. Market capitalization grew over fourfold from U.S.$0.78 trillion at the end of 2005 to U.S.$3.70 trillion by the end of 2012, based on data from the World Bank. Similarly, stock market turnover increased nearly twofold between 2005 and 2012, with the turnover ratio increasing from 82.5% to 164.4%. Nonetheless, significant restrictions on foreign investors' participation provide a barrier to increased foreign demand for the yuan.

The PRC has also committed to other financial reforms that will, when implemented, facilitate the development of its financial markets. In 2011, China established a program of reforms in its 12th Five-year Plan for the Development and Reform of the Financial Industry for 2011–2015. These reforms include market-based interest rates, financial innovation and coverage and more sophisticated risk management and surveillance, with some goals being achieved such as the liberalization of lending rates [European Central Bank (2014)]. Moreover, the PRC Governor has announced the PRC’s intention to liberalize interest rates within one to two years [Shao and Yao (2014)].

5.4 An open capital account and convertibility
The fourth prerequisite for internationalization of the yuan is an open capital account. This is necessary to supporting international demand for the yuan by nonresidents by allowing them to access the financial markets in which to invest their yuan balances. There are two ways to measure capital account openness – de jure and de facto measures. De jure measures are based on the number of capital account transaction items that are subject to restrictions. De facto measures proxy the effectiveness of capital controls in reality based on the idea that the greater the quantity of external assets or liabilities, the less effective its capital controls are. On both measures, China’s capital controls appear tighter than all other G20 economies except for India [Hooley (2013)].
In order to increase international demand for the yuan then, the PRC must liberalize its capital account. There are three prerequisites for relaxing restrictions on capital flows and liberalizing the capital account: a strong domestic banking system, well-developed financial markets and a flexible exchange rate. However, on all three fronts the PRC is lacking [Lardy and Douglass (2011)], and reforms are needed before liberalizing the capital account in order to avoid destabilizing the PRC’s economy.

5.4.1 A strong domestic banking system
First, the PRC must have a strong domestic banking system. Otherwise, it may lead to a destabilizing outflow of funds from the banking system once the capital account is liberalized, a decline in the value of the domestic currency and a credit crisis if there are significant currency mismatches in the structure of household debt [Lardy and Douglass (2011)]. This is because when capital controls are relaxed, typically some domestic residents diversify the currency composition of their assets, resulting in an outflow of money from the domestic banking system. If a country’s banking system is perceived as weak, this may exacerbate the outflow of money as residents move funds toward the perceived safety of foreign banks. If sufficiently large, this can have destabilizing effects. Lardy and Douglass (2011) suggest deposits from households and nonfinancial corporations are likely to migrate out of Chinese banks in anticipation or in the early stages of a crisis.

This is a particular concern for China. Based on the most recent data for end of March 2014 from the People’s Bank of China Monetary Policy Report, domestic deposits stood at CNY109.1 trillion (about U.S.$17.57 trillion), equivalent to approximately 180.5% of 2013 full-year GDP. Of these deposits, 78.5% are controlled by households and nonfinancial corporations, having increased from 76% in Q3 2013.

There are further issues that would increase the extent of outflows. First, the PRC will necessarily have to liberalize interest rates through liberalizing the capital account. This is a concern because Chinese banks’ net income would be reduced through interest rate liberalization in two ways [Lardy and Douglass (2011)]. First, they argue Chinese banks’ strength is overstated because bank income is inflated by the central bank’s control of lending and deposit rates, providing Chinese banks with an appreciable net margin on
their loans. They calculate in 2009 bank profits were inflated by as much as 45% compared to a non-liberalized banking environment, with a similar inflation for return on assets and equity. Second, Chinese banks rely greatly on household deposits to generate income, representing the dominant source of funding for Chinese banks, as well as providing the highest net interest spread of all lending activities. Were interest rates to be liberalized, Chinese banks would have to raise interest rates on deposits to compete against more attractive foreign banks paying higher interest, further reducing net income for banks. Consequently, interest rate liberalization would substantially reduce Chinese bank profits, and would make them look weaker in comparison to foreign banks. Subsequently, liberalizing the capital account under such conditions would lead to a massive outflow of deposits from China's banking system.

Second, the rising risks from the PRC's rapidly growing shadow banking system may have implications for the perceived strength of China's domestic banking system. The Financial Stability Board, which is currently overseeing the global financial regulatory reforms being spearheaded by the G20, broadly describes shadow banking as credit intermediation that occurs outside the regular banking system, or nonbank credit intermediation [Financial Stability Board (2012)]. While these shadow banks function like banks in that they provide credit intermediation services, they are not regulated like banks because (i) do not take deposits from the public, (ii) they do not have access to liquidity backstops and (iii) they are not covered by an implicit government guarantee. Shadow banking entities may include money market funds, private equity funds, hedge funds, securities lenders, and structured investment vehicles and conduits.

In China, the shadow banking system has grown rapidly. It accounted for 30% of the CNY17.3 trillion (about U.S.$2.786 trillion) issued in credit in 2013, up from 23% of aggregate financing in 2012 [Mitchell (2014)]. Two main reasons are (1) the PRC's overregulated banking sector, which makes bank lending to non-state owned entities difficult and (2) the interest rates offered on shadow banking products are much higher than the artificially depressed interest rates offered on bank deposits.

The rapid growth in shadow banking has implications for the overall domestic Chinese banking system. The two main shadow banking products are trust and wealth management
products (WMPs). Chinese banks issue the majority of WMPs, the proceeds from which are pooled and invested in a wide variety of assets. These not only include relatively safe assets such as money market funds and bonds, but can also include illiquid and risky assets such as SME loans, real estate loans and local governing financing vehicle loans [Li (2013)]. These products typically have short maturities, leading to maturity mismatches if invested in long-term assets. Further, trust companies and Chinese banks are interrelated. For example, it is common practice for banks to hold controlling shares in trust companies, and banks also regularly channel funds to trust companies through entrusted loans, which are then used to make loans at higher interest rates to small or risky borrowers that have difficulty accessing bank credit [Li (2013)]. Consequently, risks in the shadow banking sector related to trust products may potentially spill over into the domestic banking system. Thus, the growing risks posed by the expanding shadow banking sector may weigh on the perceived strength of the PRC’s domestic banking system, which may exacerbate outflows if the PRC were to liberalize its capital account.

The foregoing analysis logically suggests Chinese authorities must gradually liberalize interest rates before they can consider liberalizing the capital account to avoid destabilizing its financial system. In a recent conference, the head of the PBOC announced that interest rates would be liberalized within one to two years, the most explicit time frame to date [Shao and Yao (2014)]. However, this interest rate liberalization must be gradual to allow Chinese banks sufficient time to adjust to higher deposit funding costs and increase their competitiveness and strength in a liberalized interest rate environment without destabilizing them. In addition, there must be sufficient time given for this adjustment process before the capital account is liberalized so that Chinese banks can operate competitively against foreign banks when the capital account is liberalized. Further, policymakers must effectively address the growing risks from the shadow banking sector. One significant measure to address these risks would be tied with liberalizing interest rates. The current artificial interest rate environment prevailing in the PRC significantly contributes to the (it is submitted dangerous) growth of the shadow banking sector, and prevents proper pricing of the credit risk associated with these products. Thus, the announcement of interest rate liberalization by the governor of the PBOC has a dual significance in addressing both these factors that contribute to the risks associated with the shadow banking sector.
5.4.2 Well-developed financial markets
The second prerequisite to liberalizing the capital account is that the country must have well-developed financial markets. The reasons why well-developed financial markets are necessary for capital account liberalization are distinct from the reasons why well-developed financial markets are a prerequisite for increasing international usage of a currency. In relation to currency internationalization, well-developed financial markets are necessary to facilitate demand for the currency by nonresidents. However, in relation to capital account liberalization, well-developed financial markets are necessary to mitigate the transitional risks involved, which arise due to the increased cross-border capital flows that result from capital account liberalization.

There are at least two ways in which well-developed financial markets help mitigate risks. First, deep financial markets can absorb large capital inflows, preventing them from creating destabilizing asset bubbles, while also continuing to satisfy domestic financing needs so that domestic firms do not need to borrow from abroad, reducing the extent of maturity and currency mismatches [Lardy and Douglass (2011)]. Second, and related to the first point, well-developed financial markets are necessary to ensure capital inflows are not mis-diverted to the shadow banking sector as a result of mis-priced credit. In relation to China, this is particularly important given the growing concerns regarding its shadow banking sector.

As discussed previously under 5.3, Chinese policymakers have made significant progress in broadening and deepening financial markets. However, there is still significant work to be done in order to establish financial markets that can cope with the risks that would arise from capital account liberalization.

5.4.3 A flexible exchange rate
The third prerequisite is a flexible exchange rate. There are at least two reasons for this. First, countries operating a fixed exchange rate combined with an open capital account have experienced currency crises, such as the Asian Financial Crisis in 1997, where deteriorating economic and financial fundamentals triggered a run on the currencies involved. While China’s large foreign reserves insulate it from speculative attacks, the risk nevertheless remains. Second, it would be impossible to maintain both a fixed exchange
rate regime and domestically oriented exchange rate regime with unfettered capital flows. In the PRC’s context, the general speculation of yuan appreciation may attract large speculative inflows were controls to be lifted. This would either compromise monetary policy, or require Chinese authorities to allow the yuan to float. The PRC must, therefore, move to a market-based system of flexible exchange rates prior to capital account liberalization to avoid such risks.

6. Conclusion
The recent global financial crisis highlighted the risks arising from an international monetary system that relies predominantly on the U.S. Treasury to back global liquidity. Shortages of dollar funding in numerous advanced and emerging economies spilled over into the real economy, leading to significant economic slowdown. In recent decades, the global economy has expanded strongly, partly due to strong economic growth in Asia, which has generated more than 800 million new middle income consumers. One would expect that the international monetary system in the 21st century should be able to accommodate an increasing demand for financial assets, enable greater international diversification opportunities, and provide more effective mechanisms for sustaining global financial liquidity, in the wake of unforeseen financial crises. To this end, over and above the U.S. dollar, as the predominant international currency, other major currencies should also play an important role in contributing to a more effective international monetary system. One such currency (over and above other currencies such as the euro) is the Chinese yuan.

This article analyses the factors that could contribute to the emergence of the yuan as an international currency. To this end, this article provides an overview of what an international currency is, and the costs and benefits of currency internationalization. Next, it discusses the initiatives Chinese policymakers have undertaken, to date, to increase international usage of the yuan. Finally, it examines the prerequisites of an international currency, and compares China's structural factors against these. It finds that China is lacking in many of these structural factors, and policymakers must first address these before currency internationalization can occur.
The renminbi as an additional international reserve currency?

The process of financial globalization has intensified partly due to the rapid development of technological factors and partly due to an increase in the flow of capital around the world, particularly to Asia, where strong economic growth has been occurring in the last few decades. An international monetary system that relies on a few major currencies such as the U.S. dollar, the euro and potentially the Chinese yuan could create a more stable and more diverse global financial system. Over time, an international monetary system that could provide liquidity and financial stability, independent from national currencies and national political factors, could breathe even more confidence into the global financial markets. The emergence of some major currencies such the euro and potentially the Chinese yuan as additional international currencies could be the foundation of a superstructure that could provide a more stable and sustainable global financial system which will not be shaken should further unexpected financial crises arise in the future.

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Should investors avoid or seek out currency risk? How to resolve a long-standing puzzle

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Abstract
The question of how to manage currency risk in institutional portfolios has been controversial since the modern surge in global investing started to take root in the 1970s. Fund managers tend to hedge some or all of their embedded currency exposure, but few pursue currency returns separately with a specially designed currency investment plan. In this paper, we argue that institutional investors ought to hedge a larger portion, and logically all, of the currency exposure in their underlying assets and then make use of the resulting portfolio risk reduction to engage in purposeful currency investing designed to produce alpha- and beta-style returns that are largely uncorrelated with traditional risky assets.

1 The views expressed in this paper are those of the authors and do not necessarily reflect the opinions of Fischer Francis Trees & Watts Inc. or the New York University Stern School of Business.
The overlooked asset class

Over most of the last decade, we have extensively investigated the theory and practice of currency investing. Our research has developed empirical evidence on the risk and return of the most prominent styles of currency investing. We have measured the returns of individual currency managers as well as groups of managers and assessed their performance against conventional and more demanding benchmarks. And we have studied how different currency investment styles can impact the performance of a well-diversified portfolio of global stocks and bonds. At the heart of this research, there remains a fundamental question: “Does currency investment, whether in the form of style investing that seeks to earn beta returns or discretionary managers mandated to hunt for alpha, deserve to have a place in an institutional portfolio?”

The question is controversial. As a result and as we will elaborate, currency investing appears to be overlooked and has yet to establish itself as one of the essential asset classes for institutional investors. However, based on our research as well as others who have contributed to the literature, there is strong evidence to conclude that in most cases even a small allocation to currency investing could improve the overall performance of institutional investors. At least three reasons support this conclusion.

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2 See http://people.stern.nyu.edu/rlevich/research.html for more than a dozen coauthored papers and essays, including *A new look at currency investing*, published in 2012 by the CFA Research Foundation. In *The role of currency in institutional portfolios* (2014, forthcoming) we have assembled a new set of studies by academics and market practitioners. Collectively, these studies offer a strong case supporting a greater role for currency in institutional portfolios.

3 It is important to stress early in this discussion that we use the term “currency investing” to mean taking on exposure to currency risk with the intent of earning a risk premium or excess return as distinct from holding currency risk that happens to be embedded in foreign stocks or bonds or other assets.
First, various established currency trading strategies have tended to produce returns, which can be proxied by style or risk factors and have the nature of beta returns. These returns tend to be imperfectly correlated with traditional equity market returns. Second, even if a more demanding expected return benchmark based on style factor returns is used, some currency managers produce alpha. Persistence of both alpha- and betastyle currency returns heightens the appeal of the currency asset class. And finally, the global currency market offers enormous liquidity and continues to function uninterrupted throughout the depths of the recent Global Financial Crisis. While a global recession may provoke a decline in all equity markets, currency values and returns depend on the relative performance of economies. And so, the opportunities for profitable currency investing are likely to persist throughout business cycles, and may even be enhanced by an economic shock that impacts only one economy or region.

**Two basic currency investment mandates**

Institutional investors have a choice of two basic types of currency mandates commonly known as “currency overlay” and “absolute return.” Either mandate can be implemented using passive or active investment strategies.

In currency overlay mandates, the investor already owns a portfolio of foreign debt or equity. The objective of the currency overlay is to reduce or possibly completely eliminate currency risk from the portfolio. The manager could follow a passive strategy by hedging a predefined fraction from 0% to 100% of FX exposure in the underlying portfolio. With an active currency overlay, the manager retains discretion to vary the size of the hedge.

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4 Three basic trading strategies (carry, trend and value) and the volatility of the FX market explain the bulk of the returns generated by professional currency managers. The carry strategy is a bet that higher yielding currencies will not depreciate enough against low-yielding currencies to outweigh the interest rate differential. Trend-following strategies and related technical trading strategies assume that patterns in the past data can be used to predict future currency movements. Value strategies involve buying undervalued currencies and selling overvalued currencies with “fair value” determined by macroeconomic variables.

5 For example, if the portfolio held British shares valued at £1,000,000 a full currency hedge would entail selling £1,000,000 in the forward market for delivery in one month and then rolling over the forward contract at maturity. This standard approach ignores the composition of the British equity portfolio and the currency exposure embedded in each of the underlying companies.
The manager may be opportunistic and decide not to hedge currencies expected to be strong and hedge larger fractions of currencies expected to be weak.

By comparison, in an absolute return mandate, the investor seeks to earn a positive return by taking on currency exposure subject to acceptable risk levels. An absolute return currency mandate could be implemented with a passive investment style designed to follow predefined strategies for carry, trend and value. These passive strategies deliver beta returns. Alternatively, an absolute return mandate could be pursued with an active strategy whereby the manager exercises discretion in taking currency positions subject to a predefined target or maximum risk level. These active strategies deliver alpha returns.

In theory, a currency overlay with passive hedging will reduce the risk of the portfolio with little impact on the return. Stated differently, the expected long-term return on hedged foreign assets is the same as the expected long-term return on unhedged foreign assets. On the other hand, absolute return mandates have the potential to add value with little impact on the volatility as currency investment strategies are typically uncorrelated to traditional assets. Importantly, manager selection is crucial as some managers offer greater benefits than others.

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6 A systematic approach, referred to as “dynamic hedging,” attempts to combine risk reduction with return enhancement by varying the hedge ratio for each foreign currency between 0% and 100%. Such a constrained approach is typically suboptimal, as neither risk-reduction nor return-enhancement is achieved in an efficient way: tracking volatility can remain high due to large swings in the hedge ratio of key currencies, while return enhancement is typically low due to the severely constrained and asymmetric use of currency opportunities. This type of approach used to be popular in the early days of currency management until it became clear that risk reduction and return enhancement should be addressed and evaluated explicitly as distinct activities.

7 When the manager hedges, they are effectively locking in a value of their foreign assets at today’s one-month forward rate, $F(t, 1 \text{ month})$. By not hedging, the manager will value their foreign assets at the spot rate one month in the future, $S(t + 1 \text{ month})$. These values are identical when uncovered interest parity holds (the forward rate equals the expected value of the future spot rate). This implies that there is no expected opportunity cost from currency hedging, and so no impact on average returns. And because the forward rate is set near the middle of the range of possible realized future spot rates, $\sigma(F) < \sigma(S(t+1))$ meaning that the currency hedged portfolio has lower volatility.

8 See Jones and Wermers (2011) for a recent survey of the literature on the value of active management. They show that the average manager does not outperform but that a significant minority of active managers do add value.
Nevertheless, despite the growing numbers of empirical studies making the case for currency investing, currencies appear to be an underutilized asset class. Indeed, BarclayHedge estimates that assets under management (AUM) at specialized currency funds is roughly U.S.$20 billion as of Q1 2014, while Hedge Fund Research estimates AUM at all hedge funds is close to U.S.$2 trillion. Of course, currency strategies are one of the various strategies used as a source of alpha by global macro hedge funds, as well as emerging market debt funds and global fixed income funds that may rely more on currency overlay rather than absolute return strategies. Nevertheless, the AUM estimates by BarclayHedge highlight that currency remains an underutilized asset class among institutional investors.

**Why investors might avoid currency markets and currency risk**

A number of factors – some historical, some institutional and others grounded in economic theory and policy-making – help explain why currency investing is often viewed differently than equity or bond investing. The history of currency investing and market experience with fluctuating exchange rates is relatively brief compared with the much longer historical experience for equities and bonds. A shorter history means there is less familiarity and accumulated technical expertise in currency compared to other financial markets. Moreover, the number of freely floating currencies is limited and some emerging market currencies are subject to limited capital mobility and the possibility of capital controls, which raises questions about the diversification potential within an FX-only portfolio.

On the institutional side, the foreign exchange market is not a place you can visit like the New York Stock Exchange or the Chicago Mercantile Exchange. Currency trades in an interbank market through many banks and trading rooms around the world. There are no set trading hours, no centralized record of transactions and no unique closing price as there is for a listed stock or futures contract. Currency markets lack significant regulatory oversight. Foreign exchange uses a different infrastructure for trading, it uses a different

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9 For quarterly AUM at currency funds since 2006 see http://www.barclayhedge.com/research/indices/cta/mum/Currency_Traders.html
quotation system, it relies on different means of contracting using different platforms, and so institutions need a separate apparatus or infrastructure to deal in foreign exchange.

On the theoretical side, currency values are notoriously difficult to model, more so than equities or bonds. As a result, currency valuation can be elusive. Economists have debated for years whether currencies move randomly or are predictable. And despite evidence to the contrary, reflected in part by the profitability of well-known currency strategies, many professionals still harbor the belief that currencies are not predictable. In addition, currencies are prone to central bank intervention and may be used as instruments of political and/or economic policy.

These aspects, reinforced by the fact that currency trades in its own market with its own institutions for clearing and settlement, help explain why currency has earned a reputation in some quarters as being a highly specialized area for currency professionals only. As a result, many institutional investors have avoided carving out an allocation for currency in their portfolios.

While the landscape of active currency management has changed dramatically over the last 25 years, following Black’s (1989) seminal article on universal hedging investors have focused predominantly on hedging and less on using currencies as a source of alpha. In practice, currencies are often viewed as an unwanted by-product of international portfolio diversification.

**Gauging the impact of currency investing on institutional portfolios**

In a recent study, we investigated the impact of both mandates on institutional portfolios and the empirical results are as expected [Pojarliev et al. (2014)]. Our research found that both absolutereturn and currency hedging mandates can have a positive impact on institutional investor portfolios.

*Figure 1* illustrates the benefits of both types of mandates. Our benchmark is a typical institutional portfolio which holds 60% in equities (comprising 27.5% U.S., 25% non-U.S. developed market, and 7.5% emerging market shares) and 40% in U.S. bonds. Our benchmark further assumes a currency hedge ratio of 50% for the non-U.S. developed
equity part of the portfolio. We evaluate this benchmark portfolio against three alternative portfolios (points P1, P2 and P3 in Figure 1) with some exposure to currency risk. Each of the alternative portfolios hedges 70% instead of 50% of its non-U.S. developed equity part of the portfolio, which frees up risk budget to allocate to absolute return currency strategies.

As Figure 1 shows, passive hedging tends to reduce portfolio volatility with little impact on returns. By hedging more, i.e., 70% instead of 50%, portfolio risk declines from 10.71% to 10.46% with only an 8 basis point impact on returns, falling from 4.01% to 3.93% as shown by points A and B. By comparison, absolute return mandates have the potential to increase the portfolio return with little impact on volatility. Point P1 with a 10% allocation to currency style factors illustrates this effect. Comparing point P1 with point P2 suggests that beta grazers delivered little additional return relative to the style factors, but provided better diversification benefits; the volatility of P1 is the lowest at 10.33%. Importantly, however, differentiating between managers who simply follow common currency investment strategies (beta grazers, as shown with point P2) and managers who show little correlation to the common strategies (alpha hunters, as shown with point P3) can be useful for manager selection. Not surprisingly, alpha hunters offer greater benefits than beta grazers. What may seem startling, however, is that portfolios P2 and P3 each with a 10%

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10 Given that managers face the choice of hedging 0% or 100% or any point in between, Strange (1998) argued that a 50% hedge ratio became the most popular choice. A currency manager is deemed to add value if the manager outperforms a naive strategy of hedging half the exposure, which is the position a manager would take if they had no expertise to determine whether a currency was rising or falling relative to its forward premium.

11 A portfolio with “no overlay,” i.e., 0% hedge, would have had a volatility of 11.38% and a return of 4.17%.

12 Investment theory today commonly separates the return of an investment into the contribution resulting from risk exposure (risk premium or beta) and from skill-based investing (alpha). This forms the basis for active and passive investing (indexing). Respectively, managers can be classified as “beta grazers,” whose returns can be tightly linked to risk factors, or “alpha hunters,” who exhibit no significant exposure to the risk factors. The terms “alpha hunters” and “beta grazers” were coined by Leibowitz (2005).
allocation to active currency investment produced higher return and lower risk than the benchmark portfolio A.\textsuperscript{13}

**Conclusions and implications for the role of currency in investment management**

Without question, the marketplace for currencies is one of the largest in the world, offering liquidity and robust systems for trading, clearing and settlement of transactions sized for institutional investors. This is especially true among the largest developed country currencies while emerging market currencies are growing in volume and depth of financial products. Empirical evidence shows that various well-known currency strategies based on carry, trend-following, value and volatility have been profitable over much of the last 30–40 years, although there is some evidence to suggest that profitability has been on the decline. Part of the decline in profitability may be related to the general decrease in currency volatility and compression of interest rates worldwide, in part the result of quantitative easing policies followed by several major central banks. The risks of currency investing in the recent environment should not be ignored.\textsuperscript{14}

On the other hand, the decline in AUM managed by specialized currency funds could be interpreted as good news for currency managers.\textsuperscript{15} Pastor et al. (2014) investigate the link between scale and skill and show strong evidence of decreasing returns at the industry level: as the size of the active mutual fund industry increases, a fund’s ability to outperform passive benchmarks declines. This could be interpreted as good news for currency managers; as AUM in specialized currency funds has dropped, it could become easier for the survivors to generate alpha. As some contributors to our recent book [(Pojarliev and

\textsuperscript{13} The value added by the alpha hunters at 31 basis points might seem economically insignificant, but this is because the impact is calculated on the whole portfolio. On a stand-alone basis, the alpha hunters delivered 3.75% return annually with 2.40% volatility.

\textsuperscript{14} Two prominent, high-profile currency investment firms, each with long histories and substantial expertise in markets, closed their funds within the last 12 months. FX Concepts, a currency-focused hedge fund, announced in October 2013 that it was winding down operations due to client withdrawals and poor performance. The firm was founded in 1981 and assets under management hit U.S.$14 billion in 2007 before dwindling below U.S.$1 billion in 2013. In January 2014, another hedge fund closely associated with currency investing (QFS Asset Management) announced it would cease operations, citing difficult market conditions.

\textsuperscript{15} BarclayHedge estimates that AUM in specialized currency funds is down by about 25% since 2011.
Levich (2014) have noted, the experience of the last 10 years and monetary policies since the Global Financial Crisis may be unusual outcomes and not a new normal. If so, excess returns from currency investing may return as countries manage their own national economies with less regard for other countries and the exchange rate. The results illustrated in Figure 1 suggest that the role of currencies in institutional portfolios could be addressed by the following steps:

- **Adopt higher strategic hedge ratios for foreign currency exposure in the underlying asset portfolio:** currency risk is a significant component of the overall risk of a typical institutional portfolio. The investor is not compensated for the volatility introduced into the portfolio through embedded currency exposure. This suggests that the currency hedge ratio should be set higher. Passive hedging frees up a risk budget that can be allocated to absolute return currency strategies.

- **Allocate the risk-reduction savings from increased passive hedging to an absolute return currency program:** consider, for example, a U.S.-based investor who is exposed to foreign currency exposure through investments in international equities. Over the last 10 years, increasing the passive hedge from 0% to 70% would have reduced portfolio volatility by 3.69% (from 18.94% to 14.81%) with little impact on the overall return. The 3.69% risk reduction can then be allocated to an absolute return currency program. A 3.69% risk allocation translates into 36.9% notional portfolio allocation with a 10% volatility target.

- **Choose the right managers whether beta grazers or alpha hunters:** absolute return strategies can be pursued in a passive mode to earn beta-style returns or in an active mode to earn alpha. While we have highlighted a short list of generic currency investment strategies – carry, trend-following, value and volatility – there are numerous ways to implement each one in either G10 or emerging market currencies. Persistent, robust performance, low cost and small tracking errors are useful metrics for deciding among beta strategies. For investors seeking alpha, it is critical to differentiate between managers who simply follow common currency investment strategies and managers who

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16 These results are based on monthly data from April 2004 until March 2014 and using the MSCI All Country World Index (ACWI) ex U.S. as proxy for international equities.
show little correlation to the common strategies. The success of any absolute return currency program will at the end depend on the manager selection.

Our general prescription – that institutional investors hedge more of the embedded currency risk in their underlying assets, and instead take on exposure to currency risk separately in a dedicated and purposeful fashion designed to earn risk premiums – is not an entirely new idea. Stylized, theoretical international capital asset pricing models going back to Solnik (1974) argued that in equilibrium, it would be optimal for investors to hold combinations of two portfolios: a risky portfolio of assets common to all investors, and a personalized hedge portfolio designed to reduce purchasing power risks as investors consume goods and services in different countries subject to different inflation risks. More than 25 years ago, Perold and Schulman (1988) put this idea center stage and coined the phrase “the free lunch in currency hedging” to signify that currency hedging should be the norm, unless managers have skill in forecasting exchange rates to time their hedging. The new idea our research supports is that currency investing belongs in a separate bucket, not only as a means to hedge inflation risks (the currency overlay) but also as a distinct set of strategies designed to earn risk premiums (the absolute return strategy) that are largely uncorrelated with traditional risky assets.

While there are logical explanations for why institutional investors may have overlooked or avoided currency investments in the past, it seems clear that adding currency to the menu of suitable asset classes could enhance overall performance going forward.

17 See Solnik (1993), pp. 25-30 for an early discussion of international capital asset pricing and the role of currency risk hedging in global portfolios. See Brusa et al. (2014) for an updated discussion and other references.

18 Perold and Schulman (1988) explain that “The key to our argument is that, from the perspective of long-run policy, investors should think of currency hedging as having zero expected return. Therein lies the free lunch: on average, currency hedging gives you substantial risk reduction at no loss of expected return.”
Should investors avoid or seek out currency risk? How to resolve a long-standing puzzle

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Risk, ethics, leadership and the holy grail!

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Abstract
The impact of the recent financial crisis on organizations has been to drive a set of immediate responses that might not be the best long-term solution. The laudable desire to stop things going wrong could be leading some to focus on the “quick fix” while missing the underlying causes. People do not generally deliberately do things wrong, so maybe it is because they do not realize what they are doing is wrong that is the cause. This often places organizational failures within the responsibilities of leadership, not “bad” employees. Having employees who care about the organization and know what its objectives and values are will not only enable more effective risk management but also potentially add to profitability. Revisiting what we are seeking to achieve via leadership and how we do it may provide the long-term solution to many of our organizational challenges, not just those related to risk.
Over the past few years in the financial services sector, many organizations say that they have been trying to change their culture and manage risk more effectively. This, they say, is driven by the need to ensure that nothing can ever go wrong in their organizations in the future. What they really mean is that never again will things go so very badly wrong as they did in the financial crisis. Having nothing go wrong in an organization populated with human beings is an impossibility. Things will go wrong. What they are really seeking is the prevention of the fall of one domino hitting another and starting a ripple effect across the globe which spreads and multiplies the damage.

Some might suggest that we should aggressively seek to prevent any errors occurring, but that will result in a culture where making any mistake is seen as seriously career limiting. This will then inevitably lead to people at all levels either not doing anything in an attempt to avoid mistakes or trying to cover up the inevitable mistakes that do occur even if the organization needs to be aware of what has happened. Eventually, one of these will get through the system and cause a major issue, particularly in combination with other small mistakes. Combinations of a number of small mistakes can result in disasters. The sinking of the Titanic was one of these. For example, had a last minute change in the crew officers not occurred the key to the binocular cabinet would not have been taken off the ship, and the ice look-outs would have had binoculars and the disaster might have been averted.

The chief risk officer of a well-known global bank said to me over lunch one day, “You know Chris with 80,000+ people worldwide it’s clear that someone somewhere must be doing something wrong 24 hours a day. My systems just stop a problem from becoming a disaster, but if I could stop people from doing things wrong in the first place then I would sleep easier at night.” That was just before the financial crisis; which rather proved the point.

From my perspective, the political hype about the widespread risk taking in banks, the regulators’ ever-louder calls for “better culture” (when most of them have no idea what that means in practice) and some institutions’ use of the traditional knee-jerk responses via online tests and workshops have in themselves created a dangerous culture. This is the “we must be seen to do something so just do anything that comes to mind even if we have no idea at all if it will have any real effect” view. In reality, they are both counterproductive
and dangerous. Counterproductive, as it distracts time and resources from actions that could make a real difference, and dangerous as it inevitably creates a false sense of security, e.g., that everything is now safe as everyone has been through a risk workshop and signed an undertaking. If only it was that simple.

In my view, a much deeper analysis of why things go wrong in organizations would have enabled much greater impact and value in risk management and development of ethics. This would have shown that a proportion of errors will occur statistically in any set of operations and that while the desire may be to stop all errors the reality is that some will occur. It is then a case of minimizing the number that do and then minimizing the damage that those errors cause by dealing with them and containing the impact.

The reality is that virtually no one goes to work with the intention of making errors. It is not something anyone other than the criminal or malicious would do. Thus, other than that extremely small group of individuals any other mistake is just that – a mistake. However, it is not quite that simple. If we delve deeper into these “mistakes,” we find that they fall into two categories: things that people did but should not have done and things that people did not do and they should have. This does not apply only to financial services. In the vast majority of serious organizational failures over the past 50 years, from the financial crisis to Gulf of Mexico or Bhopal to air accidents, the causes of each can be attributed to one of these failures. Example of things that were not done but should have been are: “yes lets reduce the maintenance on this refinery to save money and make more profit,” or “yes lets deal in these products without really taking time to assess the risk as they make a lot of money.” Conversely, there are the things done that should not have been done, such as “it might be immoral but as it makes money and it’s not illegal then let’s do it.”

Time and again, in organizations across the globe, things that should not have happened do for one of these reasons, or indeed a combination of both come together and bring about a disaster. Given that we cannot prevent these things totally, the logic is to minimize them and then ensure they are contained.

Minimization is not only a systems issue – it is, in reality, more of a leadership issue. Systems only catch what has been started, whereas leadership, both directly from leaders
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and indirectly via culture, creates a psychological framework that minimize even the starting of actions that might lead to mistakes and problems. This is often called the “moral compass” that some organizations occasionally seem to mislay at their cost.

The other complication is that the location of the risk has moved in the past few years, making an effective solution more difficult. This has been driven by a greater awareness and understanding of the dangers of getting it wrong at the top of organizations, which has moved the potential risk profile downwards.

Research from CEB/SHL data for the Wall Street Journal from December 2013\(^1\) help clarify this. They examined 20,000 managers on their approach to decision-making (understanding risk and its impacts) and communications (making sure everyone is clear on key objectives and caveats). What they found from the data in Europe, for example, was that at the most senior levels just 1 in 21 leaders was perceived as presenting a risk to the organization. The global average is 1 in 14. At the next level down this rose to an average of 1 in 14, by the middle management level it was 1 in 8, and potentially even higher when you get to the junior management level.

Junior management levels are undoubtedly worse because of lack of experience. But the greatest danger is at middle management level, because they are able to make operational decisions that initiate potential disasters of numerous types. Moreover, they are in key positions to monitor and develop junior leaders. The CEB/WSJ, to some degree, lays the blame for this at the door of over-promotion of technical experts. I would rather say it is a failure to make sure that any technical experts who are needed in such roles are also effective leaders.

Regulation may deal with certain issues but it is impossible to regulate for every eventuality, and there are many things that one of your people could do that might not be contrary to legislation or regulation but might be seriously damaging to your reputation. Reputational risk is an even more complex issue. It links not to defined rules but variable

\(^1\) http://chrisroebuck.co/files/2014/02/Companies-need-to-be-more-aware-of-risk.pdf
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interpretations of what the “right” behavior is in any situation. Here, there are sometimes no common perspective, and what is viewed as acceptable inside the organization may not be viewed as such from the outside. This reputational risk can only be dealt with via culture and leadership and poses one of the greatest threats to organizations going forward. The ability of “reputational bad news” about your organization to spread virally through social media and other channels is something regulation can do nothing to halt and which is becoming more and more powerful.

What is interesting is that this “risk” is often separated from “leadership.” For some reason, risk management is dealt with as a different issue from leadership. This is despite all the evidence, too voluminous to list here, that leadership is the key determinant of risk behavior in terms of its direct and indirect effects. So the analysis of the problem “we have to do something about risk” and indeed “we have to do something about ethics” should lead to “so we have to do something about leadership;” but it rarely does. This is true even in those financial institutions where significant action is being taken on risk and ethics but where it is not being linked with leadership issues in sufficient depth to make sure an effective solution is delivered, which is then embedded into day-to-day behavior.

The change in mindset required to deal with the issues around risk and ethics are unlikely to be solved by a “course” as it requires a coordinated refocusing of the way people think and work. This involves everything from senior management to line managers and systems to policies. It also involves emotion as well as rational argument. Making such a change work is a significant undertaking and its impact is much wider and has much greater potential than just dealing with the current hot topics of “risk” and “ethics.” Inherently, in changing employee mindset you are able to influence their approach to many things, not just risk and ethics.

It impacts on their wider performance, through the degree to which they apply effort or not, the things they apply that effort to, their ability to work with others and how they enable organizational objectives to be achieved. This obviously includes things other than risk and ethics. My view is that, to get the risk and ethics right you have to get the complete picture right or you are delivering a partial solution.
The development of a holistic approach to employee behavior brings about greater potential benefits that are significant. As well as managing risk better and developing ethical behavior your organization could (1) get up to 57% more effort and 20% more performance from your people,² (2) improve the performance of new team members by 25% in the first year;³ (3) deliver better customer service,⁴ (4) as an individual leader get within the top 8% of your peers so that you have a 75% chance of being a top performer at the next level – thus increase your chances of promotion,⁵ (5) improve organizational operating income by 52%,⁶ (6) be significantly more effective financially than competitors,⁷ (7) increase total shareholder return by 9.6% over 3 years,⁸ (8) reduce the chances of your talent being taken by competitors by 87%,⁹ (9) increase the willingness to innovate from 3% of employees to 59%,¹⁰ (10) increase profits by 5.8% year-on-year more than comparable business units,¹¹ and (11) more than halve sickness absence.¹²

Thus, if you need to change mindsets to deal with the risk and ethics challenges and that change could deliver the sort of benefits outlined above, why wouldn’t you do it?

Sadly, even now there is inherently something going wrong in organizations around current leadership generally. Data from Hay Group paints a picture where about 60% of employees

⁵ Corporate leadership Council, 2005, “Realizing the full potential of rising talent,” p89
⁶ Towers Perrin, 2006, ISR employee engagement report
⁸ Corporate leadership Council, 2005, “Realizing the full potential of rising talent,” p6
¹¹ Gallup, 2008
globally are keen to give their best, but that on average 33%, rising to 42% in Europe and the Middle East, feel that their organizations obstruct them from delivering it.¹³
Set against this background, the chances of getting people to think and behave differently about risk and ethics, unless the issues causing this underlying problem are also solved, is nonexistent.

Further, the financial crisis made the situation more difficult for those at work as the headcount reductions it drove mean there are now fewer people in organizations to deliver what is required. In most places headcounts have often been reduced more than workloads. As a result, employees are under more and more pressure. Research by the Corporate Executive Board [CEB (2013)]¹⁴ and supported by other studies shows that between 2009 and 2012 88% of employees had experienced an increase in workload, 56% had increased hours of work and 78% had experienced an increase in the team workload.

The percentage of employees who said that they did not have sufficient time to complete the work they were expected to do increased from 32% to 55% over the same period, and the proportion of time spent multitasking increased by 15%. Furthermore, everyone is now having to deal with more information, with 76% of employees saying that they are spending more time either finding or dealing with data. This is probably distracting them from higher priorities. All of the above increase the chances of people making mistakes.

In addition, there is still a mindset among senior leaders that “delivery” is more important than anything else. For many, this means focus on only delivery. The problem is that pure delivery focus is counterproductive. While the evidence based on figures alone might suggest that a leader is performing and delivering what is required, this maybe a poison chalice. Delivery “addicted” leaders seems to be having more impact on organizations and it is a negative one. The delivery addicted individual not only wants to deliver for career purposes but also views it as the key internal driver for their self-respect. The problem is that they fail to recognize the impact this has on others. If leaders focus too much on the task and delivery without developing their relationship with people, it will reduce

¹⁴ Corporate Executive Board, 2013, “Driving breakthrough performance in the new work environment”
the performance of the team long term. Further, there is a danger that too much pressure on the team from an excessive drive to deliver and achieve ends up causing short cuts, poor communications, increased risk and poor collaboration and reduces trust and morale.

Research has been done on the effects of failing to balance the desire to achieve with bringing the team with you through collaboration rather than dragging them by coercion. Spreier et al. (2006) show that those leaders seen as high-achieving fell into two groups – those that just pushed the team hard by pace setting, which led to demotivation in the team, and those leaders who delivered results by creating a high performance environment using collaboration, vision, coaching and participation as well as pushing the pace. Thus, even the seemingly “high performing” line manager could, in reality, be creating both damage and risk for the organization.

So, set against this background, the pressure to deliver improved performance from fewer people is, potentially, more likely to be encouraging people to take risk and forget ethics rather than focus more on them. Contradictory messages are being sent down through organizations yet again. “Deliver the financials but also manage risk and be ethical.” Something has to give, and it is probably going to be the ethics and risk. Many organizations seem to have a problem managing the ambiguity of doing both.

From a practical perspective, having 55% of employees saying they don’t have enough time to deliver what they have been asked to deliver poses very significant questions about the quality of existing leadership. How can you be a competent leader if you give people more work than they can do in the time you have allowed?

Further, the new slimmed-down structures mean that people not only have more to do but have to work together better and the traditional more siloed approach is no longer effective. Partnership working and collaboration is key for the future. According to the CEB (2013), between 2002 and 2012 the relative importance to business unit profitability of

individuals collaborating across the organization as opposed to working on their own tasks changed dramatically. The importance of individual task working fell from 78% to 51% and the importance of collaboration increased from 22% to 49%. This represents a doubling of the importance of collaboration in these slimmed-down organizations, which makes collaboration with others as important to profitability as working on your own tasks. Getting 50% of employees to contribute organizationally through collaboration could add 4% to profitability, and if all of your staff reaches that collaborative level you could add 12%. It is good news if you can make that happen. But there is little evidence that it is, and ineffective collaboration increases risk.

But it gets worse. Despite all the current challenges about workloads, complexity, demanding customers and limited resources discussed above, organizations, CEOs and investors are expecting better and better performance. The annual objectives set by many organizations demand constant improvements year-on-year. CEB (2013) study shows that in general terms, most CEOs and senior executives say they need a 20% increase in performance to achieve their targets. Set that against the current environment where people are already close to, or at their limits, then something has to change to make this possible, or things will “go wrong” again.

Is there a solution? The answer is “yes”, and one that will deal with all the associated issues of concern at the same time – risk, ethics, performance, customer service, innovation and more – by taking a holistic approach to employee behavior, not one that focuses on ad hoc initiatives that cover only a small element of what is needed.

Taking a simple approach is what works. The basics must be in place before adding the more complex elements. Only two steps are needed:

1. Maximize the discretionary effort of your staff by motivating and inspiring them – Mach 1 leadership
2. Deliver maximum return by focusing that effort onto what optimizes personal and organizational benefit – Mach 2 leadership
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The impact of both of these components on organizational performance is significant. But the power of the combination is that it also impacts all the critical elements that the organization needs to get right, from risk and ethics to cost efficiency and brand building. This is because the change in mindset enables the creation of an aligned community of effort and collaboration that breaks through the barriers of the traditional silo structures that restrict collaboration. It enables staff to fully understand and operate within the required risk or ethics frameworks more easily. The evidence this works is clear. Both strategic leaders and operational leaders have a role to play.

As well at getting risk and ethics right overall this could deliver up to 30% more effort from 60% of staff in the same time for the same money. Line managers could get significant improvements in effort from individuals. This is by simple day-to-day actions, such as:16

- Explaining to an individual or team how what they do fits into the bigger picture (+30.3%)
- Making sure that they give fair and accurate day-to-day feedback on performance (+39%)
- Making sure that every team member has a plan to develop them and their performance that the line manager helps them implement (+38%)
- Showing they respect their people as people can increase performance by +26.1%

But senior leaders must contribute as well via personal example and by creating the right environment through culture and systems. They must create a new more collaborative world of work. CEO and senior managers can improve how much discretionary effort their staff make if they show that they:17

- Are open to new ideas (+22.9%)
- Care deeply about employees (+20.7%)
- Make employee development a priority (+19.7%)
- Are strong in leading and managing people (+15.6%)
- Are strong in strategy selection and implementation (+15.6%).

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As was hinted before, it is not all about rational analysis. Emotion is absolutely key. We know that an employee's decision to give high performance is 57% rational and 43% emotional. Furthermore, 80% of the emotional element is under the control of the individual's line manager. Giving a rational business case to do something is sufficient to get base level performance, but providing an emotional driver will get the best from people. But, it is also about building loyalty. It is even more powerful if the organization can create a strong emotional link with the employee – it can increase their effort by up to 43.2%\(^\text{18}\) and a line manager who achieves this can reduce the chance of talent loss to competitors by up to 87%.

So this is not just about being nice to your staff, it is about delivering the best performance possible but within your risk and ethics framework.

On the capacity issue raised earlier, the fact that 55% of employees say they don't have enough time to do the work they are given, does not mean, in my perception, there is no spare capacity. It is likely that some of this is caused by ineffective prioritization, with work that is not critical to the organization's success taking up too much time. Employees who are not delivering maximum effort will not be effectively prioritizing. Bureaucracy also compounds the problem by removing focus from key priorities. So, it is probably wrong to assume that these figures mean that people have no capability to add more value to the organization.

Thus, while there are significant challenges to organizations in developing performance and delivery while managing risk effectively and maintaining ethics, it is a possibility if a more holistic approach through Mach 1 and Mach 2 leadership is taken. The practical evidence for this exists in a number of environments that I have practical experience in from the Harvard case study: “UBS towards the integrated firm” to application of Mach 1 and 2 to the UK National Health Service and other organizations globally. The undoubted reason for the success of the process is that by using a holistic approach you make sure that everyone in your organization: a) is aware of your strategy b) knows how they

\(^\text{18}\) Corporate Leadership Council, 2005, “Driving employee performance and retention through engagement,” p 37
contribute to it, c) understands what they need to do to achieve that and d) wants to do so. It is impossible to envisage a scenario where any organization could maximize its effectiveness without all of these in place.

This ensures that effort is maximized and that the only effort that is applied in the organization is that which delivers the organization's strategy. There are no wasted resources, no wasted time, no confusion, and full clarity to allow maximum return on investment. Risk and ethics are dealt with as employees understand the “moral compass” and genuinely want to protect their organization. Furthermore, if things ever do go wrong, armed with the knowledge of the organization’s desired destination, those involved can quickly adapt plans to enable a change of operational action, but one which still meets the strategic objective. Just as important, they can do so without having to wait a long time for clarification on what they should do from those higher up as they already have the knowledge they need.

In the final analysis, this is based on thinking about the risk and ethics issues not from the perspective of senior management but from the perspective of those members of the senior management who want to implement the process. Too often, we forget that “beauty is in the eye of the receiver, not the giver,” so if what we tell people to do has no relevance or benefit from their perspective they won’t fully engage with it, and therefore don’t do it properly and to the best of their ability.

If we get this right we will get the holy grail, effective operational and strategic risk management and ethical behavior. You also get an aligned community of effort and collaboration that delivers world class performance as well. Just through two simple steps. As a finance director said, “This is a ‘no brainer,’ we should have been doing this years ago.” But it seems that many organizations just cannot understand that risk and ethics are part of a much wider picture.

**Conclusion**

The challenge for strategic leaders is to move from silo thinking to holistic thinking if this is not something they have been gradually developed to do as they become more senior. It is a simple fact that organizations work more effectively when they operate as one
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organization rather than a collection of associated functional units that seek their own slightly unaligned objectives and do not see the value in collaboration for the common good. Creating this holistic mindset in both self and others is the first step on the road to success. When followed by clear communication of what is needed, why and how it benefits everyone, the vision and operational delivery combine into aligned action.

In the end, the more senior leaders can create “an aligned community of effort and collaboration,” the better the organization is likely to do in all areas from risk management to customer service, innovation, cost efficiency and everything else that drive success. The evidence for this is now indisputable; the road map to implement is clear, so there is no further excuse for inaction.
Are structured products a sustainable financial innovation?
A lesson from the European markets

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Abstract
Structured products are a complex outcome of the financial innovation process, and what many would like to know is who profits from this kind of financial innovation and whether issuers are influenced by market trends. Taking into account the complexity of structured products, we analyze the payoff of 14,701 products issued in Europe that expired between January 2008 and December 2012. Observing the issuers’ time-to-market, we find a negative relationship between the volumes issued and the number of listed products, which could be construed as a signal for pushing behavior on the part of issuers. Considering that, the product intervention approach by the regulators could be useful in discouraging the pushing behaviors.
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1. Introduction
Structured products are one of the most complex outcomes of the financial innovation process. And in recent years, there has been a lot of debate about their social welfare implications [Arcand et al. (2012), Palmer (2012), Law and Singh (2014)] and on whether they need to be regulated [Lerner and Tufano (2011)].

Similar to options and futures, structured products result in zero-sum outcomes, one side's losses is the other side's gains [Chang et al. (2012)]. In our research, we focus on structured product because, due to their characteristics, they offer a fascinating overview of financial innovation. Through the market for structured products, for example, investors are now able to take positions in international markets, commodity markets, exchange rates, or even on the directionality of single shares or indices. The exposure can be linear, benefit from leverage or be limited. Finally, it can completely, or partially, guarantee the capital invested.

In this paper, we aim to find answers to the following questions about structured products. Firstly, we wish to understand who profits from structured products (“cui prodest?”). Our findings could have broad implications from a financial regulation perspective. As most studies have demonstrated, structured products are complex [Hens and Rieger (2009), Wallmeier (2011), Henderson and Pearson (2011), Célérier and Vallée, 2013], which is why we try to keep the research methodology as simple as possible, by simply looking at their payoff frequency. We analyzed a basket of 14,701 structured products, issued in Italy, Germany, France, Switzerland, Belgium, the U.K., Spain, the Netherlands and Austria that expired from 1 January 2008 to 31 December 2012. By the end of 2012, those countries dominated the market with 89.9% of total volumes in Europe.

Secondly, we aim to investigate the behavior of issuers in proposing new products and examine whether, and to what extent, the financial innovation process is influenced by market trends. Adopting this point of view, we analyze 2,210,830 structured products, issued in Italy, Germany, France, Switzerland, Belgium, the U.K., Spain, the Netherlands and Austria from 1 January 2008 to 31 December 2012. The second question has important implications from the perspective of financial fragility [Gennaioli et al. (2012)]. Due to the short-time horizon analyzed, though this period is quite interesting from a
volatility perspective, our analysis can only be considered indicative. However, our work has two original elements. First, it adopts a simple, but clear methodology, based on the analysis of the performance actually achieved by these products and the timing of new product launches. Second, each phase of the research is conducted through a proprietary database that is hand collected and built specifically on the cognitive needs of the research question at each stage. The results of our work are relevant for regulators who are engaged in the debate and in the design of a regulatory architecture capable of responding to increasingly complex needs. They are also important for investors who are interested in a product with great potential, but whose characteristics require a high degree of financial knowledge. Finally, our findings could be useful to issuers of structured products; those who are willing to increase the level of transparency of their products and who would like to help their clients better understand their products and their features.

2. Do we really need this kind of financial innovation? A literature review

Our interest in this topic emanates from the recent discussions taking place within academic and public policy circles about the social welfare implications of financial innovation and whether they should be more, or less, regulated.

Today, we are very far from the time when “looking at financial innovations – from the perspective of physiology rather than pathology – one sees them as the force driving the global financial system toward its goal of greater economic efficiency.” [Merton (1995)] The view that every type of financial innovation is useful to “complete the market” was challenged by the recent financial crisis. Learning from the crisis, we “recognize that not all financial innovation is valuable” [Turner (2009)] and that “some innovations... contributed to the financial crisis and/or amplified the downturn in the economy when it started.” [Litan (2010)]. “Therefore, assessing the social consequences of financial innovation can be very challenging.” [Lerner and Tufano (2011)]. In her speech Griffith (2012) fully supports this approach: “In the wake of the crisis, we talked a great deal about the need to curb harmful financial innovation, the kind of financial innovation that seems to be good mainly because it helps to maximize profits for parts of the financial system.
It reflected a lot of creativity in financial engineering, but has tended to generate more systemic risk rather than leading to better risk management and diminishing risk, which are the goals of the financial system.” Sriram et al. (2012) suggested that the “crisis demonstrated the downside of unfettered innovation and strengthened the case for ‘responsible innovation’.”

Based on the aforementioned discussion, our first objective with this article is to determine who profits from this kind of financial innovation (“cui prodest?”). To find the answer, we use a database of European structured products. Since structured products are complex, our objective is to at least keep our research methodology as simple as possible. Hence, we simply look at the payoff frequency. We are aware this might limit the significance of our findings, but our aim is to provide some easy to understand results for the final investors.

There are already numerous studies of structured products, with the common observation being that they are complex. For example, Hens and Rieger (2009), looking at the “dark side of the moon,” “come to the conclusion that by and large the market for structured products, which is a huge business for banks, offers a utility gain for investors which is most likely only an illusion.”

Wallmeier (2011), observing the structured product markets in Germany and Switzerland, affirms that “the payoff functions often have special characteristics, such as a minimum or maximum payoff and a nonlinear profile in between. This allows sophisticated investors to optimize their portfolios with respect to the degree of risk aversion, their market expectations and hedging concerns. However, this view is challenged by observations about product design and actual investor behavior. In particular, some products appear to be overly complex.”

Henderson and Pearson (2011) also underlined this critical point by stating that: “The ability to create securities providing state-contingent payoffs tailored to specific investors seems conducive to improving allocative efficiency. But if some investors assign incorrect
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probability weights to events, financial institutions can exploit these errors by creating financial instruments that investors overvalue ... the hypothesis is that investment banks design structured products to exploit investors' valuation errors.”

FSA (2011) concluded that “Product complexity may be a necessary feature to obtain benefits for the customer (such as the range of illnesses covered by critical illness policies). Or the complexity may be an unnecessary complication, providing limited benefits that the consumer could have obtained elsewhere with a simpler, cheaper strategy.” Complexity increases opacity, so it is difficult for non-expert investors to evaluate what they are buying.

Célérier and Vallée (2013) develop a measure of product complexity based on a lexicographic analysis and applied to a comprehensive European dataset of retail structured products. They “observe that financial complexity is more prevalent among distributors, targeting low sophisticated investors and during high volatility periods and show that financial institutions strategically use financial complexity to escape competition.”

Given this framework and looking forward, our first research question is also related to the degree to which the financial innovation process should be regulated.

According to Litan (2010), “policymakers must do a much better job than they have in the past of stopping destructive innovation and the misuse of constructive innovation.” Sinha (2012) believes that the need for regulation is a bitter lesson from crisis: “Structured and derivatives products will need to be carefully evaluated in terms of the pace of introduction and their suitability and appropriateness for customers. Consumer protection policies and their implementation will have to be strengthened considerably in order to strike a judicious balance between financial innovation and financial stability.” Palmer (2012) suggests that “The crisis has highlighted one specific area of difficulty: judging the sophistication of a client ... Even supposedly expert investors may not know what they are getting into.” An interesting option suggested by Haldane (2012) is that “Complex environments often instead call for simple decision rules.”
Many European financial authorities are already moving in this direction, focused on both the structured products distribution phase and the production phase.

In Norway, starting from March 2008, the sale of structured products has become more difficult. Kredittilsynet, the Norway’s Financial Supervisory Authority, requires that institutions do not sell structured products or other complex products to customers who cannot be regarded as professional investors [Kredittilsynet (2008)].

In Italy, CONSOB (2009), given “the framework of significant information asymmetries on illiquid products in the relationship between intermediaries and retail clients,” sets up the criteria for the identification of illiquid financial products during the distribution phase.

In Belgium, the Financial Services and Markets Authority (FSMA) calls upon the financial sector not to distribute to individual investors structured products that are considered particularly complex. Distributors that sign on to the moratorium commit themselves not to distribute structured products that do not fulfill the criteria that have been established. The “voluntary” moratorium started on 1 August 2011 [FSMA (2012)].

In Austria, during the UCITS III implementation phase, the Austrian Financial Market Authority [FMA (2012)] stated that “despite the good intention, the UCITS III framework introduced unintended complexity and regulatory ambiguities (e.g., to allow indirect investments in non-eligible assets by adding additional counterparty risk in the case of “structured products”). This complexity leads to products with unpredictable risk/return-profiles which are not suitable for retail investors, and most probably not even for professional investors... Since the legal formal definition of the use of derivatives failed to protect investors from complexity, it is necessary to find less complex ways in defining which derivatives are eligible and which are not eligible. We believe that this could be achieved by analyzing the pay off profile of derivatives.”

In the U.K., according to the “product intervention” approach, FSA (2012) affirms: “Structured products are rising in popularity and we are concerned that the growing number of structured product sales, as well as increasing product complexity, is placing a strain on firms’ systems and controls. A lack of robustness in firms’ product development
and marketing processes can increase the risk of poorly designed products and lead to mis-selling, or mis-buying by consumers... We still want to see innovation, but only where it is in the interests of consumers."¹

The MiFID review process is aligned with this view [EC (2011)]. In July 2013, the ESMA’s report on “Retailization in E.U.” underlines that retail investors may face obstacles to understanding the drivers of risk and returns of structured products [ESMA (2013)]. On 27 March 2014 ESMA issued an opinion on certain aspects of manufacturing and distribution of structured products (SRP), and stated that “Good practices for product governance arrangements.” In this opinion ESMA “considers that sound product governance arrangements are fundamental for investor protection purposes, and can reduce the need for product intervention actions by competent authorities ... ESMA considers that, when supervising firms manufacturing or distributing an SRP, competent authorities should promote, in their supervisory approach, the examples of good practices for firms.” [ESMA (2013, 2014)]

The good practices guidelines are intended to cover both product design and product distribution phase. On 23 April 2014, the European Commission, seeking ESMA’s technical advice on all of the MiFID review framework, underlined that “the Directive extends the scope of complex financial instrument, including by introducing the concept of structure which makes it difficult for the client to understand the risk involved.” [EC (2014b)]. Recently, the debate on MiFID has come to an end and the new Directive was published. The MiFID 2 Directive, in order to increase the investor protection, is introducing product governance procedures for investment companies and is enforcing the product intervention approach [EC (2014a)]. It is rational to expect from national supervisory

¹ On the Financial Conduct Authority’s website, according to the “product intervention” approach “due to the number of products available, some of which are becoming more complicated to understand, we are concerned that you could potentially be sold a product that is not suitable for your needs ... Following our review, we want firms to consider the following when creating structured products and explaining them to the people who sell the products to you: identify customers’ needs and then design products that meet these needs; pre-test new products to ensure that they are likely to perform for the customer as they were designed to do; have a thorough checking process for new products before they reach the market; and monitor details of sales to ensure the product is delivered to the type of customer it was designed for.” – http://www.fca.org.uk/
authorities the launch of discussions on the sale of complex products to investors, especially retail, as already preceded with a proper consultation process, such as those undertaken by the Italian authorities [CONSOB (2014)].

Our second research question is related to the question of how much of this kind of financial innovation is influenced by exogenous elements, especially market trends. This research question has important implications from the perspective of financial fragility. Gennaioli et al. (2012) argue that financial innovation can increase financial fragility. They suggest that while they recognize the benefits of financial innovation, they “take a more skeptical view about the social value of liquidity creation when investors neglect certain risks. In such a system, security issuance can be excessive and lead to fragility and welfare losses, even in the absence of leverage.”

3. Data and methodology
3.1 Empirical methods
We begin our analysis from the position that not only are the payoffs of structured products very complex for the final investors to understand [Hens and Rieger (2009), Wallmeier (2011), Célérier and Vallée (2013), ESMA (2013)], but that in many cases even qualified investors cannot fully understand them. We also believe that it is very important for the final investor to understand the probability of their payoff [Wallmeier (2011)]. In fact, if investors were aware of the historical frequency of payoffs, they would be much more conscious of their decisions.

In our first research hypothesis we want to understand who profits from structured products (“cui prodest?”). We have already pointed out that the issue and sale of structured products is a zero-sum game. So the first research question is: looking at the final performances, what is the overall performance of the structured products that have expired in Italy, Germany, France, Switzerland, Belgium, the U.K., Spain, the Netherlands and Austria (in order of outstanding volume of sales) from 1 January 2008 to 31 December 2012. Together, they represent 85.0% of the total outstanding volume of sales in Europe (Figures 1 and 2).
For the expired structured products complete of all information, it is possible to calculate the investor's performance: if the investor buys the instrument at issuance and holds it until maturity date, the return is the difference between the purchase price and the redemption price, plus any coupons received. If the investor sells the product before its termination date, the overall investment return can be calculated by looking at the returns obtained by the issuer; a negative return corresponds to a gain by the issuer, regardless of the dynamics of market trading. The performance results are calculated gross of transaction costs, due to the broker, and any other fees and without regard to the tax profile. The performance of each instrument was calculated by comparing the issue price and the value of final redemption (although some certificates are issued below par). If the certificate had paid coupons, cash flows were taken into account, capitalized and added to the redemption price. The result was expressed in terms of future value of an investment of €100; for example, a redemption value of 120 is equivalent to a performance of 20% over the entire life of the instrument.

We are conscious of the fact that by using this methodology we are ignoring the single investor overview, but given the complexity of the instruments we prefer to use a simple method of analysis and avoid adding complexity to complexity. Looking at the final performances, our perspective is much more focused on the market as a whole, than on the single investor. In this zero-sum game the investors are playing a game with sellers that have a significant advantage; that is why they need clear and simple information.

In our second research hypothesis, we sought to investigate the behavior of issuers in marketing new products. More precisely, we would like to determine whether market momentum increases the likelihood that intermediaries will issue new instruments.

To understand the propensity of financial intermediaries to issue new products, we develop specific linear regression models. The exchange markets, where the instruments are traded, are mainly domestic; thus, we conduct separate OLS regressions for each country.

We select the number of products issued each month as the dependent variable. We try to investigate whether the market sentiment could boost the number of issues.
As independent variable, we use the log-return of the last six months in the domestic stock exchange. For this purpose, in each country, we assume the main equity index as proxy of the market: FTSE MIB for Italy, DAX for Germany, CAC 40 for France, SMI for Switzerland, BEL 20 for Belgium, FTSE 100 for the U.K., IBEX 35 for Spain, AEX for the Netherlands and ATX for Austria. In the OLS model we also introduce volume sold as an independent variable. This allows us to investigate not only the number of instruments issued but also the amount of capital raised from investors. In other words, the regression model for each country brings together the number of products issued, with the performance of the domestic market in the last six months and the monthly issues volume.

3.2 Data collection
In Europe there is not a unique database of structured instruments held by public authorities. National exchanges, where the structured products are traded, have different levels of transparency. In no country is it possible to get information about the expired products through the exchange company. Information available on the websites of the exchange concern only products still negotiable.

Our database comes from Structured Retail Product (SRP). SRP collects information on all structured products issued in 41 different countries. Despite the high numbers of product and volumes monitored by SRP, it is difficult to assess the quality of the data, since there is no benchmark available and there is no comparable competitor. For this reason, we double checked the data collected by also looking at different sources, as well as exchange websites, local data vendors and public authorities.

As of December 2012, volumes sold and the number of outstanding structured products in Europe were respectively €826,487 and €1,109,404. Italy, Germany, France, Switzerland, Belgium, the U.K., Spain, the Netherlands and Austria dominate the market with 89.9% of the total volumes in Europe; hence they are more than representative of the continent. Table 1 presents the volume and number of outstanding structured products by country.

In order to answer the two questions posed, we adopt two separate databases from the same data vendor (Structured Retail Product). To answer the first research question we
need the closing prices at the time of maturity in order to calculate the total return on a product bought at issuance and held to maturity.

To test our second research hypothesis we need the data on the day of issuance. Keeping the two samples distinct has allowed us to significantly increase the survey sample and make the analysis more reliable.

Regarding the first research hypothesis, the data on the closing price is reported for a small number of instruments. Only for Italy was it possible to use a domestic data vendor [Certificati eDerivati (CeD)], which was useful in that it allowed us to cross-check the data and get a very representative sample. We analyze a basket of 14,701 structured products issued in Italy, Germany, France, Switzerland, Belgium, the U.K., Spain, the Netherlands and Austria and that expired between 1 January 2008 and 31 December 2012.

To answer our second research hypothesis we focus on the time of issuance of new products. For the majority of structured products in the market it is possible to have the date of issuance. In addition, we included in our sample those instruments that have as yet not matured and those that were issued during the period of investigation. Hence, we were able to develop a specific criterion for extracting the total number of instruments issued in a given time period from the SRP database. This process has greatly increased the sample size of the survey. We focus our analysis on 2,210,830 structured products launched in the markets between 1 January 2008 and 31 December 2012. The survey took place on a monthly basis. The data concerning volume of issues has been obtained from the same data vendor, SRP. The time series of market indices (FTSE MIB, DAX, CAC 40, SMI, BEL 20, FTSE 100, IBEX 35, AEX and ATX) are easily collectable from different sources, but we chose Datastream. Table 2 presents the data concerning the structured products in the two survey samples

3.3 Results
In our opinion, investors focus too much on the profile of payoffs and neglect the information about the probability of a specific result. According to Wallmeier (2011): “The complexity and diversity of the products leads to low transparency. The lack of transparency leads to incorrect assessment of the probability density function by the
investor [...]. There is some evidence that typically investors underestimate the probability of hitting the barrier …”

**Table 3** shows the results of our study of the payoffs of the instruments per class. The payoff value represents the upper limit of the class (not included into the class). The frequency is equal to the number of certificates whose payoff is less than the maximum limit.

According to **Table 3**, 63.0% of our sample is “above par,” 13.3% is repaid “at par” (without considering transaction costs) and 23.7% of the sample is “under par.” This is the investor’s view as a whole. Since the information about the final payoff does not allow us to isolate the specific performance of individual investors, they can negotiate on market days when price trends in the specific subperiod is favorable to them.

The results presented above can easily be further analyzed from a national perspective. **Table 4** presents the payoffs of the products within each the individual domestic samples (for more detailed data please contact the authors).

Comparative analysis of the samples can reach various conclusions, depending on the country. With regard to products with negative performance, “under par,” the results are mixed. The data range from a low of 2.6% in the U.K. to 55.7% in Italy. The same observation is true for products whose yield to maturity is 0% and return only the invested capital. The data range from a low of 3.1% in Switzerland to the U.K., where more than a quarter of the products issued (28.3%) is repaid at par. Regarding the products with good performance, all countries, except Italy and Netherlands report that more than half of the products have a positive yield to maturity.

The most positive is France, where 80.6% of the products have a positive yield to maturity.

The more representative sample, compared to the total of the market, both in terms of the number of products and in terms of volumes is Italy, which accounted for 25.9% of volume of the European market for structured product and is ranked first in terms of sales volume. This has been made possible by the availability of data from sources other than the original. In this sample, the gross performance data of the products are much more
negative than in all the others, only 27.1% of the Italian sample is “above par,” 17.1% is repaid “at par” and 55.7% is “under par.”

The results of the Italian sample are different from those of other countries. The payoffs of structured products show negative returns with higher frequencies and higher losses when compared with the rest of the sample. This atypical behavior led us to look deeper into the data. The data shows the industry concentration on a few financial intermediaries. More than half of the sample (54.2%) was due to only 3 issuers. The first 7 intermediaries issue 87.3% of the products. The cross-analysis between issuers and payoff does not show significant differences in performance between different issuers (please contact authors for further details).

It is interesting to note that out of a total of 2,558 investment certificates that expired between 1 January 2008 and 31 December 2012 (49.0%), 1,261 are “conditionally-capital protected certificates,” for which the protection applies up to a certain level [SeDeX (2014)]. That means they just give a conditioned capital protection promise. With the full capital protection, the repayment of the full initial investment amount is guaranteed by the issuer at maturity, whereas with the conditional capital protection, the protection might apply, only if the underlying does not fall below a predefined threshold. In our sample, 625 of the 1,261 conditionally-capital protected certificates (49.6%) fall below the knockout barrier and 589 of them are repaid “under par” (46.7%).

Another analysis concerns the assets underlying Italian structured products. More than half of the sample (50.4%) is built on securities traded in the Italian equity market. The disappointing performance can be explained by the extraordinarily negative period of the Italian markets during the time horizon of analysis (please contact authors for further details).

The difficulty in obtaining complete data for all the analyzed products and the differences among the samples of countries led us to hypothesize that we might have some selection bias in our dataset. In other words, it seems that the information is more readily available, the more positive the performances.
Regarding the second research hypothesis, we tried to analyze the behavior of issuers with respect to market dynamics. We sought to investigate the behavior of issuers in proposing new products. We have built the survey sample focusing on the issue date of each instrument. This information is found to be much more readily available in the original database. For this reason, the survey is based on a much larger sample. The issue date is available for 2,210,830 instruments in the sample. The survey period runs from January 2008 to December 2012 for a total of 60 months.

We ran an OLS regressions model, where the dependent variable \( N_{\text{New Prod}} \) is the sum of the new issues recorded in the month, Constant term equals the constant term of our regressions, LogRet_6m is the log-return of the last six months of the domestic index (stated between brackets) and Vol is the volume of products in the domestic currency issued in the month. The regression equation is:

\[
N_{\text{New Prod},i} = \text{constant terms} + \beta_1 \text{LogRet}_{6m,i} + \beta_2 \text{Vol}_i + \epsilon_i
\]

Our aim is to find a connection between the behavior of issuers and different market phases. The analysis was not run for predictive purposes; we do not intend to estimate the number of expected issues at a given time in the market.

Table 5 details the descriptive statistics of the variables in the model, and Table 6 displays the results of the estimates. In all the countries, except in the Netherlands and Austria, the regression produces significant coefficients for the constant term. The presence of the constant shows the tendency of issuers to maintain a minimum number of instruments available. In other words, at maturity, issuers issue at least a minimum number of products with similar characteristics to those just expired.

Looking at the new issuance of structured products, the analysis presents a very interesting relationship between the volumes issued and the number of listed products.

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2 Regarding the variable Vol, we also undertook the same analyses with the value delayed by one period \( t-1 \). The results show no significant differences and are therefore omitted.
In Germany, Switzerland, Belgium and the U.K. the data shows that an increase in the number of products is related to a reduction in the volume of issued products and purchased. The same relationship, at lower significance, applies also in Italy and Spain. This phenomenon is compatible with a process of stimulating demand. In other words, it is fair to assume that issuers tend to stimulate demand for structured products in the months when subscription is low. This stimulus takes place through the issuance of new products.

With regard to the impact of market trends on the behavior of issuers, the model identifies a positive relationship between the number of issued products and the domestic market trends in Italy, Germany, Belgium and the U.K. The positive coefficient between the phenomenon under investigation and the issuers' time-to-market notes the tendency to increase the number of instruments issued during positive market trends, when investors are more likely to accept the offers for investment in new products. Conversely, during periods of negative market the number of instruments issued is reduced substantially. The same correlation, at lower significance applies also in Switzerland.

4. Conclusions
After the financial turmoil, the literature's view on the financial innovation process has significantly changed. No longer accepting the notion that any financial innovation is an opportunity to complete the market, the approach is more critical, looking at the positive, but also negative externalities and the social consequences of financial innovation.

This paper starts from the observation that the market of structured products in Europe is concentrated in few countries. Italy, Germany, France, Switzerland, Belgium, the U.K., Spain, the Netherlands and Austria dominate the market with 89.9% of total volumes sold in Europe.

We then try to understand, looking at the historical frequency of their payoff, who profits from this kind of financial innovation (“cui prodest?”). Structured products could be very complex, and hence we chose to keep our methodology as simple as possible. We know that could limit the strength of our findings, but our aim is to give some results, easy to understand, also for the final investors. Using a sample of 14,701 structured products issued in Italy, Germany, France, Switzerland, Belgium, the U.K. and Spain, we find that
63.0% is “above par,” 13.3% is repaid “at par” and 23.7% of the sample is “under par,” with interesting distinctions among countries. For example, looking at the Italian sample only 27.1% is “above par,” 17.1% is repaid “at par” and 55.7% of the sample is “under par.” In addition, looking at the issuers’ time-to-market, our research finds a very interesting relationship between the volumes issued and the number of listed products. Increasing numbers of new products relates to a reduction in the volumes of the products issued in the same market. This result was unexpected. This trend could be a signal of a stimulating demand process by the issuers, trying to attract investors. Additionally, we note the tendency to increase the number of instruments issued during positive market periods, when investors are more likely to invest in new products.

Given the asymmetries in terms of payoff among the different European countries and the pushing attitude of the structured product issuers, the “product governance” strengthening and the “product intervention approach,” driven by the MiFID 2, in our view, are welcome.
Are structured products a sustainable financial innovation?
A lesson from the European markets

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The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

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Abstract
Among the many changes and revolutions that the (re)insurance industry will face in the next few years, introduction of the new standard IFRS 4 phase 2 is one that will certainly impact the way in which the (re)insurance business is managed. Not only will this new standard impact insurance accounting schemes, but it will also impact the performance evaluation of the whole insurance industry in general and each line of business being underwritten by the industry. As a result, some companies may decide to withdraw from some lines of business and/or to concentrate on other lines of business.

Given that the final stage of implementation is still years away, it seems that many are not spending the time necessary to consider the timing and stress issues that the (re)insurance industry will face when it comes to implementing the new standard. We suggest that these issues need to be considered soon, since they will most likely result in significant organizational changes involving actuaries, finance, risk modeling and investor relations. This small article highlights some of the major issues that (re)insurance companies will face when coming to implement the new standard and proposes some practical solutions to tackle the most pressing ones.

1 The views expressed in this article are entirely our own and should not be taken as representing those of our firm.
The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

**Introduction**

In 2004, the publication and subsequent enforcement of IFRS 4 phase 1 allowed for a diversity of insurance contract accounting; for example, at that point liabilities could still be evaluated using local accounting rules. In order to have a universally accepted standard for insurance contract accounting, the International Accounting Standard Board (hereinafter “IASB”) issued on 20 June 2013 its exposure draft “insurance contracts.” Comments on this exposure draft (ED) were to be submitted to the IASB by 25 October 2013.

Following the reception of the comments, some further refinements are expected and the accounting standard IFRS 4 phase 2 could come in force by 2018. Even though the final date is not yet known, a few well-defined building blocks related to this standard seem to emerge. These building blocks include:

- The expected present value of future liability cash flow involving the calculation of discounted future cash flows
- A risk adjustment margin (explained further in [Section 2](#))
- A contractual service margin (explained further in [Section 2](#)).

Compared to the current standard, IFRS 4 phase 1, all of these elements indicate that insurance contract accounting is going to become increasingly computation-and time-intensive.

In particular, in Europe, the implementation of this standard will happen almost at the same time as the new Solvency II regulation. It is recognized that Solvency II and IFRS 4 phase 2 standards have some common features. For example, the Solvency II “economic balance sheet” also relies on the expected present value of future cash flows to which a risk margin is added. However, the simultaneous enforcement of Solvency II and IFRS 4 phase 2 will certainly result in a lot of stress for insurance organizations and, especially, their quantitative experts. In this context, it is likely that insurance organizations will seek to optimize their resources on finding out the common features between Solvency II and IFRS 4 phase 2.
Based on our experience within different insurance organizations, this article intends to show the potential challenges that the calculation requirements for IFRS 4 phase 2 are likely to bring about. Some foreseeable solutions to these challenges are also given.

This article is structured as follows: section 2 will provide a brief introduction to insurance contract accounting under IFRS 4 phase 2 considering the latest information on the exposure drafts. Section 3 will focus on the risk adjustment margin and the current uncertainties related to its calculation. Section 4 will describe the foreseeable challenges of evaluating the insurance liabilities under the new proposed standard on a quarterly basis. Section 5 will propose some alternatives to the described challenges. Section 6 will illustrate the challenges and alternatives through an example.

2. Insurance liability evaluation under IFRS 4 phase 2

The insurance contract measurement principles set out in the 2013 ED are similar to those in the 2010 ED. This requires entities to measure their insurance contracts using the current measurement model, where current estimates are re-estimated every reporting period. The current measurement model is based on a building block approach which includes:

- An explicit and unbiased estimate of the current expected present value of future cash flows that are expected to arise as the (re)insurer fulfils the contract. This involves adjusting the future cash flows for the time value of money.
- A risk adjustment margin, which is an explicit adjustment, to reflect the uncertainty in the amount and timing of the future cashflows as the (re)insurer fulfills the contract, taking into account the diversification benefit that the entity considers.
- The expected contract profit\(^2\) that eliminates any gain at the inception of the contract. This is known as the contractual service margin (referred to as residual margin in the 2010 ED).

\(^2\) In the insurance pricing of any contract, there is a profit embedded which has to be put into the contractual service margin according to IFRS 4 phase 2.
IFRS 4 phase 2 does not provide explicit guidance on the valuation techniques to be used for calculating the undiscounted probability weighted future cash flows (unlike Solvency II) and will be open to interpretation. Best estimate assumptions will be used as a mean basis (i.e., no implicit prudence) for projecting cash flows.

**Figure 1** gives a fictitious example of how the building block approach could impact the technical reserves (gross of reinsurance) in the financial statements of a nonlife (re)insurance company.

In this example the IFRS 4 phase 2 insurance contract liability is shown to be slightly lower than current technical reserves. The impact on the technical reserves will vary from one (re)insurance company to the other depending, for example, on the level of prudence contained in the current reserves, the nature of the business written (i.e., mix of long-tailed and short-tailed), the diversification benefits considered by the entity and profit profile.

A simplified approach is permitted for contracts with coverage periods of one year or less and for those contracts with coverage of more than one year if the measurement provides a reasonable approximation to applying the building block approach. It is not clear how an entity would be able to prove the simplified approach in a reasonable approximation for contracts with coverage of more than one year without needing to carry out the building block approach.

The 2013 ED proposes unlocking (adjusting) the contractual service margin to reflect changes in estimates for future cash flows. Although this is conceptually a suitable approach, such adjustments bring additional complexity into the new standard. This is one of five areas that have significantly changed since the previous ED and are now re-exposed.

There still remains uncertainty surrounding the calculation of the risk adjustment margin. The 2013 ED permits that the risk adjustment reflects the diversification benefit that the (re)insurer would consider in assessing the compensation it requires for bearing risk. Previously, the 2010 ED had proposed that only those effects on diversification that arise within a portfolio should be reflected within the risk adjustment. This change now corresponds to the risk margin under Solvency II but unlike the Solvency II standard, does
not prescribe the calculation method. In the next section, we will discuss in further detail
the risk adjustment margin and the uncertainties surrounding its calculation.

3. Uncertainty surrounding the calculation of the risk adjustment margin
The risk adjustment measures the compensation that an entity requires for bearing the
uncertainty about the amount and timing of the cash flows that arise as the entity fulfills
the insurance contract. An explicit estimate of the effects of uncertainty about future cash
flows is required with re-measurement at each reporting period. Effects of diversification
between portfolios of insurance contracts are allowed but with no unit of account
prescribed. In practice, this may lead to different interpretations of diversification
between (re)insurers.

The 2013 ED eliminates the guidance included in the 2010 ED that only permitted three
methods for estimating the risk adjustment (confidence interval, conditional tail
expectation and cost of capital). Instead, guidance focuses on setting out the
characteristics that the risk adjustment should meet (e.g., the risk adjustment is measured
in an explicit way and risks should not be double-counted) and does not specify or restrict
a specific measurement technique. This allows management to come up with a risk
measure that properly reflects the risk to the business. The International Actuarial
Association (IAA) is expected to publish a monograph on recommended methods for
estimating the risk adjustment.\(^3\) However, there are only a small number of well-established
methodologies currently available, each with their own weaknesses.

We expect that (re)insurers have not yet given much thought to the risk adjustment
measure for IFRS 4 phase 2. In particular, many (re)insurers will need to consider where to
reflect surplus/deficiencies in the current booked reserves. One attractive option is the use
of the value at risk (VaR) or the tail value at risk (TVaR), where the resulting quantile would

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\(^3\) For details, see http://www.actuaries.org/LIBRARY/News_Release/2012/NR_Jan16.html and IAA
(2013).
reflect the level of surplus or deficiency. However, due to the current developments of Solvency II, in Europe it can be assumed that the risk adjustment measure will in many instances apply the cost of capital (CoC) approach. In the following sections, we will assume that entities, in order to reconcile Solvency II and IFRS 4 balance sheets, will choose to use the CoC method for estimating the risk adjustment.

The CoC method, as illustrated in the Solvency II guidance, essentially involves projecting the insurance risk and operational risk components of the overall required capital at each future year-end. The percentage cost of capital is applied to these projected risk components, with the resulting cost of capital discounted at each future year end to the present time using a risk-free rate of interest. This can be described by the following simplified formula:

\[
MVM = \text{CoC} \sum_{i=1}^{n} \frac{E[\text{SCR}(i)]}{[1 + r_0(i+1)]^{i-1}}
\]  

(1)

where CoC is the cost of capital rate, SCR(i) is the solvency capital requirement at time i, E[.] stands for the expected value and \( r_0 \) is the risk-free rate.

Under Solvency II, the CoC rate is prescribed to be equal to the additional rate, above the relevant risk-free interest rate, that a (re)insurance undertaking would incur holding an amount of eligible own funds equal to the solvency capital requirement necessary to support the (re)insurance obligation over the lifetime of that obligation. The CoC method has been applied in the context of the Swiss solvency test (SST), based on a CoC of 6% per annum in excess of the risk-free rate of interest.

4. Challenges
4.1 Risk adjustment margin

4.1.1 Year-end accounts
As we discussed in the previous sections, the liability evaluation will be based on the discounted future cash flows to which two margins are added: the contractual service margin and the risk adjustment margin. We assume the latter margin is likely to be based on a CoC approach, which involves a quarterly calculation of the solvency capital
The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

requirement (hereinafter “SCR”). This quarterly calculation of the SCR could prove to be very challenging. In fact, for users of the standard formula, this could mean a “simple” recalculation of the market risk component only of the overall capital. The applicability of such “simple” quarterly calculation in the reality of insurance organizations (and the potential audit burden of such elements) is questionable at this point. This is illustrated in Figure 2.

- **Step 4:** Currently, it is compulsory to deliver the final SST report to Finma (the Swiss supervisor) by 30th April.
- **Step 3:** Management (Chief Risk Officer, Executive Committee, Board of Directors) usually takes one month to approve the report. It is quite challenging for all of these committees to be able to effectively read and approve the report in such a small timeframe. As a consequence, the draft report needs to be ready by 31st March.
- **Step 2:** Review groups peer-review the following elements in one month: (1) data inputs including reserves, premium, asset values and planned data for the year to come and (2) first outputs of each risk module (nonlife risk, natcat risk, life risk, credit risk, asset risk, final consolidation and risk margin). A few rounds of model runs are necessary to reach the final results. As a consequence, the first results need to be produced by 28th February.
- **Step 1:** Before the first run, data needs to be input into the model. The data relates not only to known amounts such as reserves or asset values but also to planned data like expected premium for the current year and to protection being bought by the company (e.g., retrosessions). In certain cases, the planned data is still subject to discussion at the beginning of the year. In addition, the time necessary to input the data and to check the quality of it can create delay until the first run of the model can effectively be launched. In the best case, it is possible to start the very first run with the real data by 31st January.

With this example, we see that, for the most efficient company, it would take three months to produce the final SCR starting from the beginning of the year. Due to the data input including, in particular, plan data and retrocession structure, it is difficult to imagine starting data input earlier than at the beginning of the year. With this timing constraint and bearing in mind that with IFRS 4 phase 2 the reserves depend on the calculated SCR.
through the risk margin when using a cost of capital approach, it seems that the production of audited IFRS accounts for year end within the existing investor’s requirements (e.g., publication of accounts around March/April) looks like an unachievable target with the current organizations.

In addition to the pure reserve amounts, IFRS 4 also requires disclosures on the nature and extent of risks that may affect the amount, timing and uncertainty of the cash flows. Such disclosure includes general information on risk exposure, risk management policy, credit risk, claims development and liquidity risks. The production of these disclosures is also closely related to the SCR production and consistency between IFRS and SCR should be monitored.

4.1.2 Quarterly accounts
The above example has illustrated the difficulties related to the production of year-end accounts. For quarterly accounts produced in Q1, Q2 and Q3, the proposed ED could prove even more challenging. In theory, the SCR and the risk margin should be recalculated and audited at each quarter. However, it is unlikely that an internal model would be re-run in Q1 and Q3, for example, for the purpose of re-estimating the risk margin. In this context, simplification will be sought that could be accepted by the auditors. At this point, however, such discussions have not started yet.

4.2 Further challenges
There are many further challenges envisaged in producing quarterly IFRS 4 phase 2 accounts besides those associated with the computation of the risk adjustment margin. In this section, we highlight some further challenges in explaining quarterly movements in the insurance contract liabilities.

The impact of discounting on the reserves will have to be explained quarterly by checking the movement of yield curves by currency. For (re)insurance companies with multi-currency exposures, the work of explaining reserve movements will be doubled. On the one hand, the undiscounted best estimate will move according to the last known loss information, while, on the other hand, the impact of discounting due to the different
movements of yield curves (by currency) could fully (or partially) compensate the movements of the undiscounted best estimate.

Finally, the movements of the contractual service margin (hereinafter “CSM”) will include the increase of service margin due to the new contracts being underwritten during the quarter and the decrease of the margin due to the amortization of inforce business as well as an increase/decrease from adjusting the CSM for the impact of changes to cash flows related to future services. As an example of the difficulties related to this element of the reserves, it is likely that the review of the service margin coming from the pricing tools could be challenging if the contracts have specific features, such as for finite contracts. In addition, as described in IAA (2013), “the definition between items that impact the CSM and those that do not is not clear” and “use of not locked in discount rates […] would be simpler and less costly.” Based on the concerns raised by the IAA, the treatment of the CSM still seems to be subject to significant uncertainties. As the example in section 6 will show, the CSM is likely to be a significant contributor to the Profit & Loss accounts due to its nature of embedded profits. As a consequence, full clarity on its treatment should be provided so that the primary objective of transparency of insurance accounting through the introduction of IFRS 4 phase 2 can be fulfilled.

All in all, the work for the quarterly account production will increase significantly both on the side of (re)insurance companies and of auditing companies. The next section will try to provide some alternatives to the timing and workload issues described above.

5. Potential solutions
5.1 Risk adjustment margin
We first consider some potential solutions to addressing the challenges stated above in computing the risk adjustment margin. Obviously a number of simplifications in the above year-end SCR calculation process have to be implemented:

- The approval of the SCR by management has to become a light process whereby such approval could be fully delegated to the Chief Risk Officer or the Executive Committee with no further reporting. Generally, the implementation of IFRS 4 phase 2 should be accompanied by organizational changes.
The review groups would limit their level of reviews.

In general, a larger trust should be put to the capital model, its outputs and the people who run it. At this point, solvency models are still new in the (re)insurance industry and management has shown a great deal of interest in them. In the long run, however, capital models should increasingly become like reserving models, with little interest being put on the “engine” but more on the outputs only.

However, even with this much leaner process, it is not certain that the production of the IFRS accounts will take place within a reasonable time frame. Further simplifications of the quarterly SCR estimations will therefore have to be done. Among these simplifications, we can think of the following:

- The use of simple capitalization ratios. At SCOR, the target capitalization ratios at group level are embedded and disclosed in the strategic plan as a range. Such target ratios could be used as a proxy or a benchmark in the quarterly recalculation (apart from the year-end full recalculation). The challenge for this simplification lies in the acceptance by auditors.
- Using the above benchmarks, a refinement would be in the evidencing of SCR movements through the analysis of the available capital movements.

5.2 Other insurance liability components
There needs to be some simplifying solutions to help understand movements in insurance liabilities due to discounting and to CSM, which address some of the other challenges stated in the previous section.

One solution to help understand movements in liabilities due to discounting could be to survey the modified duration (and potential convexity) of the liabilities in a multi-currency environment. The modified duration is currently used in bond markets as a price sensitivity measure, defined as the percentage derivative of price with respect to yield. The modified duration of the liabilities could be used to estimate a proxy for the value change of the discounted liabilities quarter by quarter with respect to changes in the yield curves. In order to amortize the CSM in a systematic way over the remaining coverage period of the contract, simplified amortization assumptions will be required for those contracts.
with specific features. Given that the selection of the amortization pattern is likely to be a key driver of future profits for certain contracts, care should be taken to perform sensitivity analysis on the applied assumptions.

6. Example
In this section, we are going to illustrate all the above described challenges and proposed alternatives through the example of a nonlife reinsurance company having a few contracts in its portfolio. The first subsection will describe the portfolio and the different assumptions that need to be made and the following subsections will establish the balance sheet of this company for two subsequent quarters under IFRS 4 phase 1 and phase 2 for comparison purposes.

6.1 Portfolio and assumptions
In this section, we provide a high-level overview of the portfolio and different assumptions that are needed to be made to establish a balance sheet of this company under IFRS 4 phase 1 and phase 2. Further details of the portfolio and assumptions are included in the Appendix.

The portfolio of the reinsurance company is supposed to include eight nonlife contracts. We specify the currency, inception date, premium, ultimate loss ratio (ULR) and commission rate for each of these contracts (see Appendix Table A1).

The payment pattern, premium earning pattern, commission earning pattern and margin earning pattern are supposed to be the same (see Appendix Table A2).

On the basis of the above elements, it is possible to estimate the reserves, unearned premium under IFRS 4 phase 1 as on 1 January 2014. For the margin, we will assume a simplified formula whereby the margin is the part of the premium above the combined ratio. The formulae (i), (ii) and (iii) used are shown in the Appendix.
The estimated unearned premium, reserves and margin for each contract are shown in table A3 of the Appendix. In total, across all contracts, we estimate at 1 January 2014:

- Total UPR (EUR) = €967.5
- Total reserves = €825.4
- Total margin = €128.8

In order to calculate the MVM according to equation (1), we need further assumptions primarily to estimate the capital:

- First, and for the purpose of simplification, we are going to assume that all the risk is only related to reserve risk. In the reality, such an assumption cannot be taken.
- Second, we are assuming that the reserve risk follows a lognormal distribution the parameters of which are provided by the reserve amount estimated under IFRS 4 phase 1 and by the coefficient of variation (hereinafter “CoV”) of the reserves of each individual contract as provided in Appendix Table 4. The parameters μ and σ of the lognormal can then be derived using the formulae (iv) shown in the Appendix.
- Third, the risk measure is the value at risk at 99.5% (see formula (v) in Appendix).
- Fourth, we are assuming full independence between the 8 contracts (see formula (vi) in Appendix).

The CoV and capital for each contract, as well as the overall capital, can be calculated using the above set of assumptions (see Table A4 in the Appendix). The overall capital is estimated to be €651.2.

As a final set of assumptions, we specify the yield curves for both currencies as at 1 January 2014 (see Table A5 in the Appendix).

The discounting feature retained for this example is simple; we use a discrete discounting method:

\[
\text{Net present value of reserves} = \sum_{t=2015}^{2019} \frac{\text{Pattern}_{2014} \times \text{Reserves}_{t,2014} \times \text{Phase1}_{2014}}{(1 + \text{Yield}_{t,2014})^{t-2014}}
\]
As shown above, the set of assumptions necessary to build an IFRS 4 phase 2 balance sheet is significant.

6.2 Balance sheets as at 1 January 2014

*Figure 3* provides a comparison of IFRS 4 phase 1 balance sheet with IFRS 4 phase 2. Details of the different components are provided in *Tables A6, A7 and A8* in the Appendix.

Overall, the reserve levels are the same between both the phases. However, the split of the reserves is different.

The following elements of the different components should be noted:

- On the basis of the above IFRS 4 phase 1 claims reserve of €825.4, the modified duration as on 1 January 2014 is estimated to be 1.92. This information will be used in further subsections.
- It can be noted that the proposed MVM calculation is simplified as all the amounts are first converted into euros and then the patterns and discounting are estimated.
- The CSM for each contract is estimated as the product of the total contract margin as on 1 January 2014 and the margin earning pattern.

In this subsection, we have estimated the different components of the IFRS 4 phase 2 balance sheet as on 1 January 2014. In some cases, we have performed some simplifications (e.g., MVM) in order to have an acceptable level of complexity in the proposed calculations. However, we must keep in mind the extremely simple portfolio that is included for this article. For a “real-life” (re)insurance company, the calculations could rapidly become extremely complicated. In the next subsections, we are going to analyze the potential movements of the above balance sheet in the following quarter (i.e., as in 1Q 2014) of activity, assuming there is no new contract signed.

6.3 Balance sheets as at 1 April 2014 assuming no changes

In order to estimate the balance sheets as in 1Q 2014 assuming no changes in ULR, CoV, yield curve, FX and commissions, we are just making the following shortcuts:
The patterns for calendar year 2014 as in 1Q 2014 are equal to 75% of the patterns for calendar year 2014 as on 1 January 2014 (see Table A9 in the Appendix).

The discounting will be done on the basis of three quarters for year 2014 (see Table A10 in the Appendix).

Due to the pattern changes, we have the following movements on the IFRS 4 phase 1 balance sheet:

- UPR movement (EUR) of -112.2
- Claims reserve movement (EUR) of -95.9

In the same way as presented in the previous subsection, it is possible to calculate the different elements of the IFRS 4 phase 2 balance sheet starting from the IFRS 4 phase 1 balance sheet. All these elements are presented in Figure 4. Details of the different components are provided in Tables A11, A12 and A13 in the Appendix.

6.4 Balance sheets as at 1 April 2014 assuming yield curve changes

In this subsection, starting from the above balance sheet, we are going to assume a change in the yield curves (see Table A14 in the Appendix).

The yield curve change impacts the four elements of the IFRS 4 phase 2 balance sheets as shown in Figure 5.

As mentioned in subsection 5b, it is possible to have a proxy for the above yield curve impacts on the different elements of the balance sheet using the modified duration of these elements. As indicated above and due to the use of the same pattern for premium, claims reserves, CSM and MVM, we have a modified duration of all these four elements of 1.80 as at 1Q 2014 and before yield curve change. The proxy for estimating the impact of yield curve stems from bond pricing where the change of the bond value is related to change in the yield through the equation below:

\[ \Delta \text{value} \approx - \text{value} \times \text{modified duration} \times \Delta \text{yield} \]  

(2)
The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

The application of equation (2) provides the comparison in Table 1. Generally, the proposed proxy gives a fair amount of the potential impacts of yield curve changes on the balance sheet.

6.5 Balance sheets as at 1 April 2014 assuming yield curve and ULR changes

In this subsection, in addition to the yield curve changes, we are going to assume a reduction in all the ULR by 5%. The reduction results in three main impacts: a mechanical decrease in the claims reserves, a mechanical increase in the CSM due to the way in which we estimate it in this paper and a decrease in the MVM.

All the above impacts are given in Table A15 in the Appendix.

The increase in the CSM will certainly create most of the issues for the balance sheet management under IFRS 4 phase 2 in future. Using this example, the CSM has increased from 80.2 to 119.9, corresponding roughly to the claims reserve reduction (except for contract 5 whose margin was negative before ULR change). The current balance sheet management under IFRS 4 phase 1 anticipates a positive P&L impact when ULRs are reduced: such movement is usually called “reserve release.” In the new IFRS 4 phase 2 accounting standard, the reserve release will increase the CSM, which is similar to deferred profits. In this sense, IFRS 4 phase 2 accounting standard is closer to an embedded value standard. For nonlife business, the CSM earning pattern will, therefore, play a crucial role in the way the balance sheet is managed, allowing (or not) for P&L impacts resulting from reserve releases. This new accounting feature is best described in a paper from Credit Suisse (2013): “In essence, the [accounting] proposals would pull forward earnings and cash flows quicker so it should actually be a positive for equity values all else equal, but managements would have less discretion over the timing of favorable development of loss reserves (as reserves are more formulaic under the proposals.”

Based on the ULR changes alone, there is limited P&L impact (movement of 3.4 only, see Table A16 in the Appendix for further details) and there is a transfer of the surplus reserves to the CSM. The CSM will then be released as the contracts are providing the services to the customers. Such a release mechanism of the CSM seems to be criticized in the paper from Credit Suisse (2013): “Specifically, this revenue recognition model will result in difficulty in financial modeling, as it is harder to tell when coverage is being
provided without knowing granular details on an insurer’s entire book of business.” With this example, it is very obvious that the modelling requires a very detailed knowledge of the portfolio which, in fact, will be difficult to estimate by companies’ quantitative experts. In particular, the difficulties would come from the granularity of data to gather, the required modelling and its IT applications including CPU/run-time and the complexity of validating results coming out of the models in order to reach reliable estimates.

When we now combine both yield curve changes and ULR changes, we should add both impacts on the reserves estimation. However, in addition to these two impacts, there is a second-order effect which appears: it consists of the impact of the yield curve change over the ULR movements. Such second-order effect can be approximated with formula (2). Table 2 presents a comparison of the approximation using formula (2) and of the real impact of the second-order effect.

Finally, Figure 6 provides a summary of both ULR changes and second-order effects.

As a conclusion to this simple example, contrary to IFRS 4 phase 1, where the impacts of the different management decisions could always be added and explained easily, in IFRS 4 phase 2, second-order effects may play a role in explaining balance sheets and P&L movements. Such second-order effects can, in certain cases, be explained but considering the overall complexity of this accounting standard, it is likely that, in other cases, tracing accounting movements will become much harder, leading the management of the company to feel that they are losing control of their businesses. This is certainly a significant risk for the acceptance of this accounting standard.

7. Conclusion
As described in this article, the implementation of IFRS 4 phase 2 in the existing (re)insurance organizations is likely to be a challenge for all the departments of the companies (e.g., actuarial reserving, finance and risk management etc.) Management will be under pressure to validate rapidly the results of complex models so that audited accounts can be produced in a timely manner and the quantitative resources of the companies will have to produce, explain and re-run their models several times to reach acceptable results by management.
Within the actuarial and finance community, IFRS 4 phase 2 is seen as both a blessing and a nightmare. On the one hand, the implementation of such complex models provides work and job security for a generation. On the other hand, mastering and explaining such models to a management who is already under pressure to keep and produce new profitable businesses is almost “mission impossible.” In some cases, we could even wonder if resources needed to produce such complex models for the entire (re)insurance market are there: experts in auditing, actuarial, finance and risk management fields are still limited in numbers.

As a conclusion, the risk of issuing such a complex accounting standard is that companies may simply decide not to apply IFRS standards. As a result, companies would then apply alternative standards such as U.S. GAAP or local standards. However, with significant changes also expected in U.S. GAAP standards over the next several years, (re)insurance companies are unlikely to be able to completely avoid the increasing complexities associated with evolving accounting standards.

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The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

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Abstract
Leverage entails a unique set of risks, such as margin calls, which can force investors to liquidate securities at adverse prices. Modern Portfolio Theory (MPT) fails to account for these unique risks. Investors often use portfolio optimization with a leverage constraint to mitigate the risks of leverage, but MPT provides no guidance as to where to set the leverage constraint. Fortunately, MPT can be fixed by explicitly incorporating a term for investor leverage aversion, as well as volatility aversion, allowing each investor to determine the right amount of leverage given that investor’s preferred trade-offs between expected return, volatility risk and leverage risk. Incorporating leverage aversion into the portfolio optimization process produces portfolios that better reflect investor preferences. Furthermore, to the extent that portfolio leverage levels are reduced, systemic risk in the financial system may also be reduced.

1 This article is based on a presentation given at a conference of the Jacobs Levy Equity Management Center for Quantitative Financial Research of the Wharton School, held in New York City, 23 October 2013. Slides and video of the talk, entitled “Leverage aversion – a third dimension in portfolio theory and practice,” are available at: http://jacobslevycenter.wharton.upenn.edu/conference/forum-2013/  
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Modern Portfolio Theory (MPT) asserts that investors prefer portfolios with higher expected returns and lower volatility. Holding a diversified set of assets generally lowers volatility because the price movements of individual assets within a portfolio are partially offsetting; as the price of one security declines, for example, the price of another may rise. As a result, the value of the portfolio tends to vary less than the volatility of its individual assets would suggest.

When Harry Markowitz first advanced this theory in 1952, leverage – that is, borrowing – was not commonly used in investment portfolios [Markowitz (1952) and Markowitz (1959)]. Since then, we have witnessed the rising popularity of instruments that allow high levels of portfolio leverage, such as structured finance products, futures and options. We have also seen increased borrowing of securities to effect short sales and borrowing of cash to purchase securities [Jacobs and Levy (2013a)].

A portfolio with leverage differs in a fundamental way from a portfolio without leverage. Consider two portfolios having the same expected return and volatility. One uses leverage while the other is unleveraged. These portfolios may appear equally desirable, but they are not, because the leveraged portfolio is exposed to a number of unique risks. During market declines, an investor who has borrowed cash to purchase securities may face margin calls from lenders (demands for collateral payments) just when it is difficult to access additional cash; this investor might then have to sell assets at adverse prices due to illiquidity. When markets rise, short-sellers may have to pay elevated prices to repurchase securities that have been sold short, thus incurring losses. Furthermore, leverage raises the possibilities of losses exceeding the capital invested and, for borrowers unable to cover obligations, bankruptcy [Jacobs and Levy (2012)]. Leverage can thus have significant adverse effects on portfolio value.

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2 A short sale is a technique for profiting from a stock's price decline. Typically, a short-seller borrows stock shares from a broker and immediately sells them, hoping to repurchase them later at a lower price. The repurchased shares are then returned to the broker.

3 Leverage and illiquidity are different because illiquid portfolios without any leverage are not exposed to margin calls and cannot lose more than the capital invested. Note that leverage increases portfolio illiquidity.

4 Certain legal entities, such as limited partnerships and corporations, can limit investors' losses to their capital in the entity. Losses in excess of capital would be borne by others, such as general partners who have unlimited liability or prime brokers.
In extreme cases, the adverse consequences of leverage can spread beyond the portfolio in question and impact the stability of markets and even the economy. In 1929, individual investors borrowing on margin were forced to sell in order to meet margin calls, exacerbating the stock market’s decline [Jacobs (1999)]. In 1998, the unraveling of the hedge fund Long-Term Capital Management, which aimed for a leverage ratio of 25:1, roiled stock and bond markets [Jacobs and Levy (2005)]. In the summer of 2007, losses at a number of large, highly leveraged hedge funds led to problems for quantitative managers holding similar positions [Khandani and Lo (2007)]. And, of course, the 2008 financial crisis, with its deleterious effects on economies worldwide, was precipitated by the collapse of a highly leveraged housing sector, the highly leveraged debt instruments supporting it and the highly leveraged Wall Street firms, Bear Stearns and Lehman Brothers [Jacobs (2009)].

Given these risks, rational investors would prefer an unleveraged portfolio to a leveraged portfolio that offers the same expected return and level of volatility risk. In other words, investors behave as if they are leverage averse. The question is, how can this leverage aversion be incorporated into the portfolio optimization process to identify the best portfolio?

This article considers various methods for doing so. We first look at the conventional portfolio construction method based on MPT, known as mean-variance (MV) optimization. We will see that conventional MV optimization fails to account for the unique risks of leverage, and hence cannot help an investor determine the right amount of leverage. We next look at the traditional way of controlling leverage within the MV optimization framework – the addition of a leverage constraint. We show that this approach also gives investors no guidance as to the appropriate leverage level.

We then extend MV optimization with an additional term that explicitly includes investor tolerance for leverage. Mean-variance-leverage (MVL) optimization allows each investor to determine the right amount of portfolio leverage, given that investor’s preferred trade-offs between expected return, volatility risk and leverage risk. We will demonstrate that MVL optimization provides a more useful guide for investors who are averse to leverage.
The limitations of mean-variance optimization

Let us begin by defining the components of the MV optimization process. Mean is a measure of the average expected return to a security or portfolio. Variance and its square root, standard deviation, measure the extent to which returns vacillate around the average return. The term “volatility” can be used for either measure.

The MV optimization process considers the means and variances of securities, taking into account their covariances (the way in which a given security's return is related to the returns of the other securities). Individual securities are selected and weighted to generate efficient portfolios. Each efficient portfolio offers the maximum expected return for a given level of variance (or, stated another way, the minimum variance for a given level of expected return). These efficient portfolios, offering a continuum of expected returns for a continuum of variance levels, constitute the “efficient frontier.” Which portfolio along this efficient frontier is optimal for a given investor will depend upon the investor’s tolerance for (or, inversely, aversion to) volatility. In MV optimization, portfolio optimality is determined by using a utility function that represents the investor’s preferred trade-off between expected return and volatility risk:

\[ U = \alpha_r \cdot 1/2\tau_r \cdot \sigma_r^2 \]  

Here, \( U \) is a measure of the “utility” of the portfolio to a specific investor, where utility can be thought of as the extent to which the portfolio satisfies the investor’s preferences. The term \( \alpha_r \) is the portfolio’s expected active return, or the difference between the portfolio’s expected return and that of the benchmark. The term \( \sigma_r \) is the variance of the portfolio’s active return. The term \( \tau_r \) in the denominator represents the investor’s tolerance for active return volatility. The lower the investor’s tolerance for volatility, the greater the penalty for portfolio volatility. The aim of MV optimization is to find the portfolio having values of expected active return and volatility that maximize \( U \), given the investor’s volatility tolerance.

The MV utility function allows investors to balance their desire for higher returns against their dislike of volatility risk. It says little about leverage. To the extent leverage increases portfolio volatility, traditional MV optimization recognizes some of the risks associated with
leverage. But it fails to recognize the unique risks of leverage noted above. In effect, MV optimization implicitly assumes that investors have an infinite tolerance for (or inversely, no aversion to) the unique risks of leverage. As a result, it can produce “optimal” portfolios that have very high levels of leverage.

Below, we will show how investors using MV optimization usually control portfolio leverage. We will then introduce a more useful method that considers the economic trade-offs when leverage tolerance is incorporated into the utility function.

**Mean-variance optimization with leverage constraints**

Throughout this paper, we will use enhanced active equity (EAE) portfolios for illustration. EAE portfolios allow for short sales equal to some percentage of capital. Short-sale proceeds are then used to buy additional securities long beyond 100% of capital. For example, securities equal to 30% of capital are sold short and the proceeds are used to increase long positions by 30%, to 130%. This enhancement of 30% incremental long positions and 30% incremental short positions gives rise to an enhanced active 130-30 portfolio, with leverage of 60% and enhancement of 30%. Net exposure to the equity benchmark portfolio is 100% (130% long minus 30% short) [Jacobs and Levy (2007)].

Using daily returns for stocks in the S&P 100 index over the two-year period ending 30 September 2011, we estimate expected active returns (versus the S&P 100 benchmark), variances, covariances and security betas [Jacobs and Levy (2012)]. To ensure adequate diversification, we constrain each security’s active weight (the difference between its weight in the portfolio and its weight in the benchmark) to be within plus-or-minus 10% of its weight in the benchmark. To simplify the discussion, we assume the strategy is

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5 In a section entitled “The effect of leverage,” Kroll et al. (1984) stated: “Leverage increases the risk of the portfolio. If the investor borrows part of the funds invested in the risky portfolio, then the fluctuations of the return on these leveraged portfolios will be proportionately greater.” In the present article, we consider other risks unique to using leverage and the trade-offs between expected return, volatility risk and leverage risk.

6 Markowitz (2013), in response to Jacobs and Levy (2013b), suggested another method: a stochastic margin call model (SMCM) to anticipate portfolio margin calls. However, such a model is yet to be developed. For a response to this suggestion, see Jacobs and Levy (2013c).
self-financing (although in practice there would be financing costs such as stock loan fees, with higher fees for hard-to-borrow stocks).

We will first look at EAE portfolios that are considered optimal using an MV utility function. As noted above, MV optimization implicitly assumes infinite tolerance for the unique risks of leverage. In order to control portfolio leverage, investors using MV optimization typically add a constraint on leverage; for example, leverage may be constrained to equal 20% of capital.\(^7\)

Figure 1 shows six efficient frontiers from MV optimizations subject to leverage constraints of 0%, 20%, 40%, 60%, 80% and 100%.\(^8\) These leverage levels, represented by the Greek symbol $\Lambda$, correspond to enhancements ranging from 0% (an unleveraged, long-only portfolio) to 50% (a 150-50 EAE portfolio). To trace out each of these efficient frontiers, we assume that volatility tolerance ranges in value from near 0 (little volatility tolerance) to 2 (higher volatility tolerance).\(^9\)

As the investor's tolerance for volatility increases, the optimal portfolio moves out along each frontier, incurring higher levels of volatility (measured here as standard deviation of active return) to achieve higher levels of expected active return. Also note that the frontiers representing higher levels of leverage (or enhancement) dominate (lie above)

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\(^7\) Markowitz (1959) shows how to use individual security and portfolio constraints in MV optimization. A leading provider of portfolio optimization software, MSCI Barra, permits the user to apply such constraints. The software allows users to tilt their portfolios toward specific leverage targets for compliance, regulatory or investment policy reasons [Stefek et al. (2012)]. MSCI Barra suggests using a leverage-constrained range or a penalty for deviations from the leverage constraint, rather than using a fixed leverage constraint, to allow the optimizer some flexibility to determine a more optimal portfolio [Liu and Xu (2010)]. However, this approach provides no guidance as to where to set the leverage-constrained range or how to determine the penalty. Moreover, MSCI Barra's definition of the optimal portfolio considers volatility risk, without consideration of the unique risks of leverage [Melas and Suryanarayanan (2008)].

\(^8\) The frontiers are also subject to the standard EAE constraints requiring that the portfolio be fully invested and have a beta of 1 relative to the benchmark.

\(^9\) A volatility tolerance of 1 produces results consistent with those of a utility function often used in the finance literature [Levy and Markowitz (1979)].
those representing lower levels of leverage. This means that for any given level of volatility, a higher leverage level results in a higher expected return. Based on MV utility, an investor would prefer the 150-50 EAE frontier to the 140-40 EAE frontier, and so on, with the 100-0 (long-only) frontier being the least desirable.

*Figure 1* identifies the portfolio on each of these six efficient frontiers that is optimal for an MV investor with a volatility tolerance of 1. We will refer to such investors as MV(1) investors, to their preferred portfolios as MV(1) optimal portfolios and to the utility derived from these portfolios as MV(1) utility. The MV(1) portfolios are labeled “a” through “f.” For instance, “c” is the portfolio on the 120-20 frontier that offers the highest utility for an MV(1) investor.

The solid line in *Figure 2* plots the MV(1) utility of optimal portfolios with the 10% security active-weight constraint as the enhancement (one-half of leverage) is increased from 0% to beyond 400%. Portfolios “a” through “f” are the same leverage-constrained portfolios depicted in *Figure 1*. Portfolio “z” represents the optimal MV(1) portfolio when there is no constraint on leverage. This point corresponds to a 492-392 portfolio with enhancement of 392% and leverage of 7.84 times net capital. The portfolio’s expected active return falls sharply after portfolio leverage (enhancement) reaches this level. Further leverage would require taking positions in securities whose expected active returns would reduce portfolio expected return, since the most attractive securities would already be held at their maximum constrained weights.

The dashed line in *Figure 2* plots the utility of MV(1) optimal portfolios when there are no security active-weight constraints. The MV(1) optimal portfolio with no leverage constraint peaks at an extremely high leverage level, one that is literally off the chart. This is a 4,650-4,550 EAE portfolio with an enhancement of 4,550% and leverage of 91 times net capital. The amount of leverage the MV(1) optimal portfolio takes on is not unlimited, even though we assume no financing costs: as the portfolio’s volatility continues to rise with greater leverage, the volatility-aversion term in the MV utility function eventually reduces utility by more than the expected-return term increases utility; thus utility reaches a maximum, although at an extremely high level of leverage.
Table 1 gives the characteristics of those MV(1) optimal portfolios with security active-weight constraints identified in Figure 2. Standard deviation of active return, expected active return and utility all increase with the amount of leverage. Of the portfolios “a” through “f,” portfolio “f,” the 150-50 portfolio, offers the highest MV(1) utility. But the extremely leveraged portfolio “z,” the 492-392 portfolio, offers the highest utility of all the MV(1) optimal portfolios.

Conventional MV analysis implicitly assumes that investors have no aversion to the unique risks of leverage. And while an investor can select a portfolio different from “z” at a lower level of leverage, MV optimization offers no guidance as to where to set that level.

Mean-variance-leverage optimization

The lack of consideration of the unique risks of leverage in conventional MV optimization motivated us to develop the MVL model, which incorporates investor leverage tolerance. The MVL utility function, shown below, contains terms for the portfolio’s expected active return and the investor’s tolerance for variance of active return, as in Equation (1). However, it also contains a third term that allows for expression of the investor’s leverage tolerance:

$$U = \alpha + 1/2\tau_v \cdot \sigma_v^2 + 1/2\tau_L \cdot \sigma_L^2$$  \hspace{1cm} (2)
The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

The symbol $\sigma^2$ represents the variance of the leveraged portfolio’s total return. When it comes to leverage, the portfolio’s total-return variance matters, because it is the volatility of the total return that can give rise to margin calls. Leverage, $\Lambda$, is squared because the risk of a margin call increases at an increasing rate as portfolio leverage increases, just as margin call risk increases at an increasing rate as portfolio total volatility increases. The leverage and total-variance terms are multiplied because leveraging more-volatile stocks entails a higher risk of margin calls than leveraging less-volatile stocks. The symbol $\tau_L$ stands for the investor’s leverage tolerance and is analogous to $\tau_V$, investor volatility tolerance.

One way to use the MVL utility function is to calculate the utility that a leverage-averse investor would obtain from MV optimal portfolios. Consider the MV(1) optimal portfolios “a” through “f” from Figure 1. Figure 3 plots the MVL utilities of these portfolios for an investor with volatility-tolerance and leverage-tolerance levels of 1. We will refer to investors with these tolerances as MVL(1,1) investors, to their preferred portfolios as MVL(1,1) optimal portfolios and to the utility they derive from these portfolios as MVL(1,1) utility.

In order to create the curve shown in Figure 3, we determined more than 1,000 optimal MV(1) EAE portfolios by increasing the leverage constraint from 0% to more than 100% in increments of 0.1% (corresponding to enhancements ranging from 0% to more than 50% in increments of 0.05%). We maintained the 10% active-weight constraint on each security.

11 We assume that investors have the same aversion to leveraged long positions that they have to short positions. This assumption may not be the case in practice, because short positions have potentially unlimited liability and are susceptible to short squeezes. One could model the aversion to long and short positions asymmetrically, but this would have complicated the algebra, so for simplicity we used a common leverage tolerance [Jacobs and Levy (2012)].
The resulting arch-shaped curve in Figure 3 peaks at portfolio “g,” a 129-29 EAE portfolio. This portfolio offers the MVL(1,1) investor the highest utility. The peak in investor utility occurs because, as the portfolio’s enhancement increases beyond that of portfolio “g,” the leverage-aversion and volatility-aversion terms reduce utility by more than the expected-return term increases utility.

Table 2 displays these portfolios’ characteristics. Although the standard deviation of active return and expected active return increase with leverage (note that they have the same values as in Table 1), investor utility does not. For our MVL(1,1) investor, the optimal portfolio “g” corresponds to an optimal MV(1) portfolio with leverage constrained to 58% (29% enhancement). Other leverage constraints provide less utility because they are either too tight (less than 58%) or too loose (greater than 58%).

By considering numerous optimal MV(1) portfolios – each constrained at a different leverage level – and applying an MVL(1,1) utility function to evaluate each portfolio, we are able to determine which MV(1) portfolio offers an MVL(1,1) investor the highest utility. MV optimization cannot locate this highest-utility portfolio if the leverage-averse investor’s MVL utility function is not known.

Optimal mean-variance-leverage portfolios and efficient frontiers
Rather than finding the MVL(\(\tau_v,\tau_r\)) utilities of numerous leverage-constrained MV(\(\tau_r\)) portfolios, the investor can take the more direct approach of using MVL(\(\tau_v,\tau_r\)) optimization directly. With MVL optimization, investors gain the ability to trade off expected return against volatility risk and leverage risk [Jacobs and Levy (2013b)]. As we will see, the results of MVL optimization will not coincide with the results of MV optimization, except in a few special cases.

Figure 4 shows the efficient frontier based on MVL optimization for a range of investor volatility tolerances (0 to 2) when leverage tolerance is 0 (\(\tau_v = 0\)) and there is a 10%
constraint on security active weights. When no leverage is tolerated, all the efficient portfolios are long-only portfolios. The efficient frontier begins at the origin, corresponding to the efficient portfolio when volatility tolerance is zero; this portfolio is an index fund with zero expected active return and zero standard deviation of active return. As the volatility increases, the frontier rises at a declining rate, and efficient portfolios take more concentrated positions in securities with higher expected returns. In all cases, however, the leverage level remains 0; every portfolio along the frontier is a 100-0 portfolio, meaning it is invested 100% long, with no short or leveraged long positions. The MVL-efficient frontier with zero leverage tolerance and the MV-efficient frontier with a zero-leverage constraint are identical.

**Figure 5** illustrates the efficient frontier based on MVL optimization over the same range of volatility-tolerance levels when leverage tolerance is 1 ($\tau_L = 1$). Again, individual security positions are subject to the 10% active-weight constraint. Here, increasing volatility is accompanied by increasing leverage. The portfolios on the frontier go from 0 leverage to enhanced active portfolios of 110-10 to 130-30. From a comparison with **Figure 4** (0 leverage tolerance), it can be seen that leverage allows a higher return at any given volatility level. Higher return and volatility risk can be achieved with less concentration of positions when leverage is allowed than when leverage is not allowed. For an investor with leverage tolerance of 1, any of the portfolios on the **Figure 5** frontier can be optimal, depending on the investor’s level of volatility tolerance.

**Figure 6** illustrates the efficient frontier across a range of volatility tolerances when leverage tolerance is infinite ($\tau_L = \infty$). As the investor’s volatility tolerance increases, the portfolios on the frontier go from 0 leverage to enhanced active portfolios of 200-100 to 400-300. Relative to the investor with leverage tolerance of 1 (**Figure 5**), the investor with infinite leverage tolerance can achieve a higher expected return at any given level of volatility, albeit with increasing leverage risk. As discussed earlier, conventional MV

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13 The MVL utility function (Equation 2) reduces to the MV utility function (Equation 1) as the investor’s leverage tolerance, $\tau_L$, approaches zero.
optimization implicitly assumes investors have infinite tolerance for the unique risks of leverage; thus the MV-efficient frontier is identical to the MVL-efficient frontier when MVL optimization is based on infinite leverage tolerance.\textsuperscript{14}

\textbf{Figure 7} illustrates the efficient frontier based on MVL optimization when investor leverage tolerance is infinite ($\tau_L = \infty$) and when there are no constraints on individual security active weights. Again, leverage increases as volatility tolerance increases. Because each portfolio holds the same set of active positions at increasing levels of leverage, the efficient frontier is simply a straight line. Ever-higher levels of leverage are used to achieve ever-higher expected return along with ever-higher standard deviation of return. As with \textbf{Figure 6}, MVL optimization results in the same frontier as MV optimization, since the investor is assumed to have infinite leverage tolerance. The assumption of infinite leverage tolerance inherent in MV optimization can give rise to portfolios with unrealistically high levels of leverage.

\textbf{Figure 8} displays efficient frontiers based on MVL optimization for a range of investor volatility tolerances (0 to 2) and leverage-tolerance levels corresponding to 0 (the same as in \textbf{Figure 4}), 0.5, 1.0 (the same as \textbf{Figure 5}), 1.5 and 2.0. Each frontier corresponds to one of these leverage-tolerance levels. Again, zero leverage tolerance represents an investor unwilling to use leverage, and higher efficient frontiers correspond to investors with greater tolerances for leverage. The 10% security active-weight constraint applies to all the portfolios.

It might at first appear that the highest level of leverage tolerance results in the dominant efficient frontier; that is, higher leverage allows the investor to achieve higher expected returns at any given level of volatility. But when leverage aversion is considered, the optimal portfolio may lie on other frontiers, depending on the investor’s level of leverage tolerance.

Consider, for example, the three portfolios represented by the points labeled A, B and C in \textbf{Figure 8}. These portfolios’ characteristics are provided in \textbf{Table 3}. Portfolio A is optimal for

\textsuperscript{14} The MVL utility function (Equation 2) reduces to the MV utility function (Equation 1) as the investor’s leverage tolerance, $\tau_L$, increases without limit.
Investor A, who has a leverage tolerance ($\tau_L$) of 1 and a volatility tolerance ($\tau_V$) of 0.24. This is a 125-25 portfolio with a standard deviation of active return ($\sigma_P$) of 5% and an expected active return ($\alpha_P$) of 3.93%.

The last column of Table 3 shows that Investor A’s utility ($U_A$) of Portfolio A is 2.93. In other words, Investor A is indifferent between Portfolio A, which has an expected active return of 3.93% along with volatility risk and leverage risk, and a hypothetical portfolio with a certain active return of 2.93% and no volatility or leverage risk. Put another way, it takes one full percentage point of additional return to get Investor A to accept the added volatility and leverage risk of Portfolio A in lieu of the hypothetical riskless portfolio.

Portfolio B offers a higher expected active return than Portfolio A (4.39% versus 3.93%) at the same volatility-risk level. But it is only optimal for an investor with a leverage tolerance of 2 and volatility tolerance of 0.14; it is suboptimal for Investor A, who has a lower leverage tolerance of 1. Portfolio B represents a 139-39 enhanced active portfolio; it entails significantly more leverage than the 125-25 Portfolio A.

For Investor A, the utility of Portfolio B is 2.72, lower than the 2.93 utility of Portfolio A. This investor's desire to avoid additional leverage risk more than offsets the benefit of the incremental expected return.

Finally, consider Portfolio C, which has the same 3.93% expected active return as Portfolio A. This is the optimal portfolio for an investor who has a leverage tolerance of 2 and a volatility tolerance of 0.09. In a traditional MV framework, this portfolio dominates Portfolio A because it offers the same expected return at a lower standard deviation of active return. But it is nevertheless suboptimal for Investor A, who has a leverage tolerance of 1, for the same reason that Portfolio B is suboptimal: it entails more leverage than Portfolio A, 135-35 versus 125-25. Again, for Investor A, the lower expected volatility of Portfolio C is not enough to compensate for the increase in leverage risk. Investor A receives utility of 2.68 from Portfolio C, lower than the 2.93 from Portfolio A.
The mean-variance-leverage-efficient region

The traditional MV-efficient frontier depicts the two-dimensional trade-off between mean and variance. MVL optimization adds a third dimension, leverage, allowing for trade-offs between mean, variance and leverage. Figure 9 depicts an efficient region of these trade-offs for investors with volatility tolerances between 0 and 2 and leverage tolerances between 0 and 2. There are no constraints on security weights. Which portfolio is optimal for a given investor depends on the investor's tolerances for volatility risk and leverage risk. Figure 9 illustrates two-dimensional MV-efficient frontiers for several leverage-tolerance levels (the grey curved lines) and two-dimensional MV-efficient frontiers for several volatility-tolerance levels (the colored curved lines). The MVL optimal portfolio for a leverage-averse investor is at the intersection of the efficient frontier for the investor’s volatility-tolerance level and the efficient frontier for the investor’s leverage-tolerance level. For example, the MVL(1,1) optimal portfolio is found where the efficient frontier for a leverage tolerance of 1 ($\tau_l = 1$) intersects with the black-colored frontier representing a volatility tolerance of 1 ($\tau_v = 1$).

The mean-variance-leverage-efficient surface

A three-dimensional depiction of the MVL-efficient surface is presented in Figure 10. This surface was generated from 10,000 MVL optimizations using 100×100 pairs of volatility and leverage tolerances covering a range of values from 0.001 to 2 [Jacobs and Levy (2014)]. Note that the figure has three axes, one for volatility tolerance, one for leverage tolerance and one for level of enhancement (one-half of leverage). The optimal level of enhancement emerges from an MVL optimization that considers both volatility tolerance and leverage tolerance.

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15 Because Figure 9 assumes no constraint on security active weights, each curve linking the optimal portfolios for an investor with a particular leverage tolerance level is smooth (unlike in Figure 8). Furthermore, without security active-weight constraints, both the standard deviation of active return and the expected active return for each efficient frontier range higher than in Figure 8.

16 To estimate their tolerances for volatility and leverage, investors could select different portfolios from the efficient surface, and for each portfolio run a Monte Carlo simulation that generates a probability distribution of ending wealth. Investors could then infer their volatility and leverage tolerances based on their preferred ending wealth distribution. Alternatively, investors could use asynchronous simulation, which can account for the occurrences of margin calls, including security liquidations at adverse prices [Jacobs et al. (2004, 2010)].
When leverage tolerance is zero, the optimal portfolios lie along the volatility-tolerance axis, having no leverage and hence no enhancement. They are long-only portfolios, taking active positions in accordance with the investor’s level of volatility tolerance. In this case, the same portfolios would be generated by either MV optimization or MVL optimization. As the investor’s leverage tolerance increases, however, the optimal level of enhancement increases at a slowly declining rate of increase.

When volatility tolerance is zero, the portfolios lie along the leverage-tolerance axis, having no active return volatility and hence holding benchmark weights in each security (an index fund). Again, either MV optimization or MVL optimization will produce the same portfolio. As investor volatility tolerance increases, however, the optimal level of enhancement picks up rapidly.

Another way to look at the relationships between optimal enhancement and volatility and leverage tolerances is to take horizontal cuts through the MVL-efficient surface. Figure 11 provides a contour map of such cuts, with the color of each line corresponding to the same-colored enhancement on the MVL-efficient surface in Figure 10. Each line shows the combinations of volatility tolerance and leverage tolerance for which a given level of enhancement is optimal. For example, the 20% line shows the various combinations of volatility and leverage tolerances that lead to a 20% optimal enhancement. Optimal enhancement increases with leverage tolerance, but is approximately independent of volatility tolerance, if the latter is large enough.

The two solid black lines drawn over the efficient surface in Figure 10 and the contour map in Figure 11 correspond to optimal portfolios for investors having a volatility tolerance of 1 (and a range of values of leverage tolerance) and those for investors having a leverage tolerance of 1 (and a range of values of volatility tolerance). The MVL(1,1) optimal portfolio would lie at the intersection of these two lines. In both figures, this portfolio is labeled “G.” The enhancement for this optimal portfolio is 29%, resulting in a 129-29 EAE portfolio. This portfolio provides the MVL(1,1) investor the highest utility of all the portfolios on the efficient surface.
Portfolio “G,” the optimal MVL(1,1) portfolio, has the same enhancement level as portfolio “g” in Figure 3. It also has the same standard deviation of active return and expected active return. In fact, portfolios “G” and “g” are identical: that is, they have the same holdings, and hence the same active weights. Portfolio “g,” however, was determined by considering numerous leverage-constrained MV(1) optimal portfolios and selecting the one that has the highest utility for an MVL(1,1) investor, according to an MVL utility function. In contrast, portfolio “G” was determined directly from an MVL(1,1) optimization, without the need for a leverage constraint.

The solid black line representing MVL optimal portfolios on the efficient surface or contour map at a volatility tolerance of 1 can be extended for levels of leverage tolerance beyond 2. Consider an MVL(1,∞) investor — that is, an investor with infinite leverage tolerance, or no leverage aversion. This investor is identical to an MV(1) investor with no leverage constraint. Now consider subjecting this investor to a leverage constraint, such that enhancement is required to equal 29%. With this constraint, portfolio “G” is the optimal portfolio for an MV(1) investor, as it is for a leverage-unconstrained MVL(1,1) investor.

Alternatively, consider the yellow 29% contour line in Figure 11 (or the dashed line in Figure 10). This contour represents all portfolios on the efficient surface that have an enhancement of 29%. When the enhancement is constrained to equal 29%, the optimal portfolio must be somewhere on the 29% contour. Optimal portfolios for investors with a volatility tolerance of 1 (whatever their leverage tolerance) lie on the solid black vertical line representing a volatility tolerance of 1. Thus, portfolio “G” (the point at which the 29% contour intersects the solid vertical line representing a volatility tolerance of 1) is optimal for an MV(1) investor who constrains the enhancement at 29%. Portfolios that are on the 29% contour, but not on the solid vertical line (representing a volatility tolerance of 1) would have lower utility than portfolio “G,” because the implied volatility tolerance of those portfolios would either be less than or greater than 1, departing from the investor’s volatility tolerance.

To the right of portfolio “G” in Figure 10, the dashed line is slightly below the solid line, but is visually indistinguishable from it.
Optimal mean-variance-leverage portfolios versus optimal mean-variance portfolios
As we have discussed, as leverage tolerance approaches infinity, the optimal MVL portfolios approach those determined by a conventional MV utility function. Figure 12 shows characteristics of optimal MVL(1,τ_v) portfolios, with security active-weight constraints, as investor leverage tolerance, τ_v, increases from near 0 to 1,000. The characteristics displayed are enhancement, standard deviation of active return, expected active return and MVL(1,τ_v) utility. The horizontal lines represent the levels associated with the optimal MV(1) portfolio “z” shown in Table 1.

All the characteristics initially rise rapidly and continue to increase, at a declining rate, as they converge to those of portfolio “z” as leverage tolerance approaches infinity. Except in the case of extreme leverage tolerance, the characteristics of the optimal MVL (1,τ_v) portfolios are quite different from those of the optimal MV(1) portfolio, which are represented by the horizontal lines. Figure 12 shows that only by assuming an unreasonably large value for leverage tolerance would the solution to the MVL(1,τ_v) problem be close to that of the MV(1) portfolio.

Volatility and leverage in real-life situations
The optimal level of leverage in a portfolio is more than a theoretical concern. Figure 13 illustrates examples of various real-life combinations of volatility and leverage, ranging from the safe to the perilous. The top left of the figure, with low volatility and low leverage, is a long-only index fund. It represents the “safe” extreme, having no leverage and no active-return volatility.

At the bottom left, illustrating low volatility and high leverage, is the strategy pursued by Long-Term Capital Management (LTCM), the hedge fund that imploded in 1998. Its underlying holdings were supposedly low-risk arbitrage positions; however, the strategies were highly leveraged using shorting, borrowing and derivatives.

High volatility, even at low leverage levels, illustrated at top right, can also be perilous, as employees of Enron, the failed energy company, discovered. Many of them invested their savings in the company’s stock. When Enron declared bankruptcy in 2001, those employees learned how risky a volatile, undiversified portfolio can be.
The high-volatility, high-leverage extreme, at bottom right, is illustrated by the strategy followed by the chief executive officer of Chesapeake Energy. He borrowed on margin to leverage his bet on the company's stock. Falling prices forced him to sell his leveraged position at a loss of nearly U.S. $2 billion in 2008.

Presumably, most of us are not at the extremes of either volatility or leverage, although we may have some leverage (a home mortgage, for example) and some volatile securities. The key is to make the optimal trade-off between expected return, volatility risk and leverage risk.

**Conclusion**

Using the MV model, an investor can address volatility tolerance and optimize a portfolio to provide the maximum level of expected return for any given level of volatility risk. Or alternatively, an investor can optimize a portfolio to provide the minimum level of volatility risk for any desired level of expected return. In either case, tolerance for the unique risks of leverage is not addressed, and MV optimal portfolios can be highly leveraged.

But we know that investors are willing to sacrifice some expected return in order to reduce leverage risk, just as they sacrifice some expected return in order to reduce volatility risk. Investors seeking to control portfolio leverage often choose a desired level of leverage based on the volatility of the securities, then impose that level by incorporating a leverage constraint in an MV optimization. As we have seen, however, MV optimization with leverage constraints will lead to the optimal portfolio for a leverage-averse investor only by chance.

The MVL model explicitly considers investor leverage tolerance as well as investor volatility tolerance. It thus allows the investor to determine, for any combination of leverage tolerance and volatility tolerance, the optimal portfolio. MVL optimization shows that an investor’s level of leverage tolerance can have a large effect on portfolio choice.

Incorporating leverage aversion into portfolio optimization will result in less-leveraged portfolios than those produced with conventional MV optimization. This will be beneficial for leverage-averse investors because their portfolios will better reflect their preferences. A lower level of leverage in the financial system may also reduce the systemic risk that has repeatedly roiled the global economy.
The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

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Abstract
Many firms use the “3 lines of defense” (3LOD) model to clarify responsibility for risk management but this approach has limitations, as three distinct “lines” do not always enable sufficient clarity, mindsets formed through deployment in one business can be difficult to break when considering another and simplistic and inaccurate generalizations can be made about those in each LOD. In the complex environment of financial services, there is increasing discontent with the 3LOD model. This article explains a new way of describing risk management responsibility and how it can be used to optimize alignment and address “red flag” formations that can occur.
1. Introduction
Organizations can face significant challenges when trying to clarify responsibility and accountability for the management of risk.

The frequently used 3 lines of defense (3LOD) model has served many firms well in terms of improving the understanding that some people, usually the 2nd and 3rd lines, might be involved in the management of risk without having any direct responsibility for risk, which is typically the responsibility of the 1st line. This would seem to have helped with the development of 2nd line risk functions in financial services and other industries.

However, the 3LOD model has some limitations: three distinct categories (lines) are not always sufficient to enable clarity on responsibilities; mindsets associated with how the 3LOD model is deployed in one business can be difficult to break when considering how it is applied differently in another; simplistic generalizations can be made about those belonging to each line of defense, which can sometimes be unhelpful in firms.

These limitations are part of the reason why after so many years since the start of the financial crisis we still have the situation where responsibility for the management of risk in financial institutions is sometimes unclear. Unclear responsibility impacts the management of risk in many ways, including:

- Inability to provide confident attestations or statements on the effectiveness of risk management, including the controls in place
- Aggregate risk exposures at different organizational levels may not be given proper consideration, resulting in a lack of ability to track against appetite. As a result, actual risk levels may be significantly higher, or lower, than that expected or preferred
- The same individuals having conflicting responsibilities for the management of risk
- Restricted ability to bring about behavioral changes that will over time lead to improved risk culture
- Decisions can be made and actions executed without full use of specialist input and/or senior endorsement
- Lack of action in starting/stopping risk-taking
- Inability to report risks to stakeholders
Inability to articulate and understand risk management capability development plans. It can be difficult to move the firm forward in relation to improving the management of risk, if responsibilities are unclear.

It is easy to understand from these limitations, why improved clarity can be useful for stakeholders.

Alternatives to the 3LOD model typically relate to more lines of defense, i.e., 4 lines of defense or 5 lines of defense, or “the 1.5 line of defense”. While being interesting, these alternative models can be subject to similar limitations as the 3LOD.

In an attempt to stimulate thinking on better alternatives, we set out to try and develop an entirely different way of approaching the challenge of clarifying responsibility for risk management.

2. The 3LOD Model Has Its Limitations - Even in Relatively Simple Organizations
A framework for clarity on roles and responsibilities is of fundamental importance in an increasingly complex and challenging environment. At first glance, the 3LOD model seems very straightforward and easy to understand and implement. However, it appears in practice that the implementation of the model is not uniform or consistent across financial services. Even beyond the refinement necessary to reflect different organizational designs, the basic application of the model is inconsistent. This inconsistency can make it difficult to bring about change and improvements using the existing, familiar terminology alone.

However, change and improvement are still desirable in many firms because there are regulatory and business reasons to clarify roles and responsibilities at the organizational and individual levels.

To demonstrate the problems associated with the current use of the 3LOD approach, we formed a small brainstorming group and considered a football club as a test case. We thought this to be a relatively simple and straightforward type of organization.
Case Study
To start with, we asked ourselves which members of staff will be assigned to which 3LOD layer.

The easiest ones were the players on the pitch - nobody disagreed in our initial brainstorming ... they were “first line.” They take the decisions in the game along the lines laid out by the manager and they are responsible for delivering the actions.

We then discussed the position of the manager in the 3LOD model - he is not actually on the pitch but sets the formation prior to the game, ensures players have their objectives, motivates, shouts out orders, adjusts the team tactics during the game, etc. We had a bit more debate about this but eventually concluded that he was probably 1st line too (our rationale was that he would normally take ultimate responsibility for the team’s performance and could take significant decisions which directly would affect the on-pitch performance even if he could not physically control it on the pitch himself. Moreover, he is responsible for the “team” and their objectives when playing. He is, after all, the boss and line manager of all the individuals on the pitch).

We thought about the substitutes on the bench and B-team members and thought they would probably be 1st line, even though during any particular A-team game they might not actually be involved directly (unless they were shouting advice from the touchline, in which case they ... we left it there, with a distinct impression that using the 3LOD model in a football club might turn out to be a bit more tricky than we had initially thought).

We then turned our attention to medics and fitness coaches. Would they be 1st line too? Well, they are not on the pitch. Also, they have no direct control over the activities on the pitch or the tasks players are assigned. However, they can influence who gets on to the pitch in the first place as they do play a part in the fitness of the individuals and can give “advice” to the manager on players’ fitness and ability to play. This made us start to think about the fitness coach as 2nd line.
Case study continued
Then we realized that they could take decisions about a player’s fitness after injury – affecting whether the player is selected. There could even be times when a fitness coach states that “under no circumstances should this player play until his injury has fully repaired.” That would be fairly direct involvement. Maybe they could be overruled by the Manager? Is the fitness coach expected to be “independent,” or shouldn’t his advice be tempered somehow in the light of the value of the player to the team?

Our debate continued. Does the fitness coach have any responsibility for the results on the pitch? Clearly he does on an indirect basis. Does he have any direct control over what happens on the pitch? Well, although our initial reaction was “no,” we soon realized that under certain circumstances, “yes.” If a player is badly injured in the middle of a game, then the fitness coach might make the call to substitute him rather than run the risk of letting him play on, injured. Does that mean the coach is 1st line then even though it is the manager who decides which substitute to bring on?

Maybe the fitness coach would be what some refer to as line 1.5 … which would mean a break from the 3LOD model. The team felt this was a good example of how responsibilities can become foggy, just like in many other types of organizations.

Throughout this session, there were times when members of the brainstorming team felt they could describe, with confidence, how the 3LOD works in a football team but as time passed, we began to recognize that there were sometimes different, but equally confident, assertions being made. We concluded that strong but inconsistent views of how the 3LOD model would work needed to be reconciled somehow and we found this a challenge.

A football team, just like an insurance company or a bank, consists of people with certain skills, knowledge and talent. The team is formed from the resources that are available to the football club, like the managers, trainers, training facilities and fitness coaches. There are small teams and large teams with different styles and capabilities. For each game, every
Case study continued

player has a purpose or task assigned, just like a department, employee or committee in a financial services business. Every team does have the obligation to field a certain number of players, but can choose the formation in which they play.

Formations are defined or set according to the circumstances, opponents or wishes of the supporters. There are many factors that influence the choice of formation of a football team.

There are also a great number of different formations. They can play an offensive style or a defensive style, which will depend on the club’s culture, philosophy and most importantly on the opponent of that day. Playing against Real Madrid is in many ways different than playing against Derby County.

A certain standard formation (independent of the opponent) can also be set by the manager, which means that the team has found an “optimized” way of playing. This all depends on the internal factors in the team and the external factors that impact the team and its organization.

The goal is to set the formation of the team in such a way that an optimal result is achieved. For this to succeed, the coach needs to be able to choose not just from one formation.
We began to realize that even in an organization as simple as a football club, the use of the 3LOD model to clarify responsibilities has its shortcomings. It is perhaps no surprise then that in complex organizational structures like those in many financial services businesses, the 3LOD of defense model has its limitations.

3. A new alternative approach - risk management formations
3.1 Risk management purpose and formations

3.1.1 Purpose and formations from our case study
In setting out to try and develop an entirely different way of approaching the challenge of clarifying responsibility for risk management in financial services, we did think back to the example of our football club case study.

We then thought about whether “purpose” and “formation” could be used as the basis for a better way to describe risk management responsibilities.

3.1.2 Risk management purpose angles
Whatever their strategic objectives, tactical focus and stakeholder priorities, we considered that people serve one or more of the purposes described in Figure 1 when contributing to the management of risk.

We think it could be possible to describe all risk management roles using these five purpose angles. Individuals/teams/committees and boards could possibly use these angles to clarify what they are (are not) intended to do in relation to any particular area of risk in any part of an organization.

The purpose angles are not always mutually exclusive. Different individuals or groups will have different purposes in addressing the same risks.

For effective and efficient risk management in financial services organizations, the optimum combinations and permutations of purposes for different risks need to be formed and we considered that the use of formations could be a good way to do this.
3.1.3 Formations

The 3LOD model describes a formation of individuals and groups with specific purpose but is very rigid in structure and the activities are not always understood on the one hand and sometimes duplicated on the other.

Similar internal factors can be considered in financial services, such as risk culture, people traits, skills and resources available. There are external factors too, like the business cycle, regulatory expectations, customer expectations, market movements, etc. Every factor has a different impact on the company, its organization and the overall effectiveness of its risk management.

When addressing risk management, including the governance and control of an organization, defining the “right” formation is crucial. Roles and responsibilities need to be defined in such a way that everyone knows what their individual purpose is within a broader, cohesive group. Individuals need to be able to deliver on their purpose so constraints need to be considered, such as available resources. The ultimate goal is to achieve a formation, which delivers the required level of control and confidence in an optimized way, at the right point in time.

Holding on to a fixed formation, which is rigid and not well understood or implemented can reduce risk management effectiveness. It can be frustrating for all those involved.

3.2 Risk management formations

Risk management formations can be used to clarify the roles of individuals or groups. The key is to create a collective set of formations that suits the organization.

Different companies will have different formations. Smaller, less complex firms with fewer employees might adopt different formations than larger, more complex ones.

Table 1, shows single and multipurpose formations that could be adopted by individuals or groups in relation to certain aspects of risk. The same individuals or groups may, at the same time, adopt similar or different formations in relation to other areas of risk.
The important thing is that there is clarity on their individual and collective formations in relation to each area of risk.

Being clear on single-purpose formations for certain areas of risk can be useful in ensuring that all the roles are performed by at least one individual or group for each area of risk.

Certain single or dual-purpose (or multipurpose) formations can, however, create challenges.

The expectations of supervisors and other shareholders are often such that certain formations could be deemed to be undesirable or unacceptable. We have highlighted these “red flag formations” in the table.

For example, if someone has responsibility for taking risk (T) but not for keeping score (K), then this is a red flag (or in some cases grey) formation under the model because it suggests an inability to understand the level of aggregate risk being taken. A single T formation might not be acceptable, but a TK formation could be okay.

Another example is an individual with the purpose of taking risk (T) could most likely not also have a purpose of stopping the same risk (S). Although technically not desirable under our model, we think this could exist in practice and an individual could have and believe they have both roles. Hence, in our model, TS is deemed a “red flag” formation because of the lack of clarity on purpose.

Using the formations model, every purpose needs to be assigned in the organization for every area of risk. This means that for every risk there is responsibility for individuals and/or groups to take the risk, help take the risk, stop someone taking the risk (if necessary) and keep score of a certain risk. Additionally, independent review is undertaken but, by definition, the “I” formation cannot be combined with any other … for an individual or group, it only exists in single-purpose “I” formation form. Any other combination would therefore be a “red flag” formation.

“Amber flag” formations exist largely because of the principal of proportionality. In smaller, less complex firms, it may not always be possible to have different individuals performing
combined roles that would typically be organized separately in larger, more complex organizations. Given the principal of proportionality, these formations might not always be deemed unacceptable but they are likely to be the subject of more scrutiny from stakeholders to ensure that certain responsibilities are not being missed.

3.2.1 Examples of red flag formations in an investment bank trading environment

3.2.1.1 TK formation example
Part of a trader's day-to-day responsibility is to manage the effect of price movements (market risk) that they are exposed to. As a result, there will typically be a TK formation on a trading desk, so that traders can accurately capture the risk they are exposed to and inform their hedging activity, while also reporting this activity to the functions responsible for policing their risk-taking. At a local level, this could work well.

However, there are other factors to consider for a full evaluation:

- For example, risks that are more subjective, such as reputational risks, may be harder to quantify and not necessarily recorded, resulting in a T formation. For example, a trader may structure a trade that is perfectly hedged so that no risk is recorded from a market risk perspective; however, if the trader takes advantage of various tax loopholes to increase profits on that trade, this may present the bank with a significant reputational risk that is not monitored.
- Another example could be aggregation of risk levels across desks and organizational levels. In other words, a trader might seem to be keeping score but they might only be doing it in relation to their own risks. Unless someone else is keeping score (K) effectively at the aggregate risk level then when looked at in the broader context, there is only a T formation in place (a red flag formation) at that higher aggregate level. Heads of trading desks often play this role, but the principal still applies further up the organization where the ability to keep score on an aggregate level can be more challenging.
3.2.1.2 TS formation example
On a trading desk in an investment bank, often the first “policing influence” that traders face comes from the head of the trading desk. They will typically have to approve trades that exceed certain thresholds and monitor the risk taken by the desk throughout the day.

However, in some instances a TS (red flag) formation may occur where the head of the trading desk is also responsible for their own trading activity, without anyone else on the desk providing a policing role. This local level red flag formation could be countered by S activity existing at a higher level and exerting a policing influence on the head of the desk, meaning that at a more overarching level, the TS formation does not exist and there is a more acceptable formation in existence (e.g., separate T and separate S formations). However, if it does not exist or is ineffective, then the local TS formation would probably be deemed unacceptable.

3.3 Application of formations to organizations

3.3.1 Scoping and applying formations to the organization
Having an understanding of the formations adopted by different parties facilitates clear articulation of accountability for particular areas of risk.

However, for full clarity, the “area of risk” needs to itself be defined clearly and proper structure is necessary for precise delineation.

This particular subject is not the focus of this paper, but we have included references to it because not all firms have robust mechanisms for enabling specific assessments of risk management effectiveness.

We consider that risk management effectiveness scoping includes consideration of (1) the risk management toolkit (policies, procedures, systems) as applied to (2) specific risks in the underlying business processes and activity by (3) individuals or groups, all underpinned by (4) the cultural environment of the business. Effectiveness assessments can be scoped using combinations of these four dimensions. Application of risk management formations can, therefore, be done using the same approach to pinpointing areas of risk.
3.3.2 Groups
Groups of companies can present particular challenges when it comes to responsibility and accountability for the management of risk. This paper does not address these in detail but we include references to them in recognition that most firms will need to take organizational layers and matrices into account when clarifying responsibilities using the formations model.

The example provided earlier in relation to the absence of a TK formation at an aggregate level (even though TK formations were present at a desk level) shows how organizational layers present challenges that need to be addressed.

This can be a complex task and is already addressed by many firms using the 3LOD model. In large and complex groups, those operating at group level in the first LOD often comment that they are in fact operating in the second LOD because they challenge the underlying businesses where many of the risk-taking decisions are made. Whether that is a correct interpretation or not is another matter, but we would suggest that the use of our formations model should also help those firms grappling with the possible ambiguity that the 3LOD model brings.

3.3.3 Dynamic and optimized use of formations
Organizations tend to want to achieve different things at different points in time. It is not unreasonable, therefore, to expect that resource allocation in relation to risk management activity might change over time. It follows then that the formations adopted by individuals and groups within organizations might change from time to time. Clearly, if changes are too frequent then there can be a loss of clarity in relation to accountability because even if the individual or group concerned is clear on what its roles and responsibilities are at any point in time, it can be difficult for others in the organization to keep up – running the risk that they believe someone is still responsible for something when in fact they no longer are, etc.

However, there needs to be some degree of dynamism in order that risk management activity remains cost-effective in relation to the business goals of the organization.
As circumstances change and the organization changes, the risk management formations can change with them. Individuals/groups can adopt different formations at different points in time but using the formations framework helps ensure clarity, effectiveness and efficiency at any particular point in time. This should, in turn, also help ensure that changes in responsibility are accompanied by appropriate training and necessary supporting resources.

Clearer responsibility is not just helpful in terms of understanding accountability. Clarity of the roles and responsibilities can also help ensure that a process can be designed more effectively in the first place.

### 3.3.4 How formations influence risk culture

Risk culture underpins the effectiveness of governance because it influences the behavior of individuals and groups—whatever their role. It is a complex and wide-ranging topic centered on “the way things are done around here” and representing the apparent collective values and beliefs of employees.

How people react, respond, manage and escalate are key behavioral factors that contribute to and are influenced by the risk culture of an organization.

Ambiguity in relation to responsibility and accountability means that the anchor points for measuring behaviors, and the effectiveness of overall governance, will not be clear. Although risk culture might improve behaviors in situations where responsibility and accountability is unclear, risk culture is unlikely to be optimized if the responsibility and accountability is unclear in the first place; because the ability to measure behavior against expectations will be limited. Reward mechanisms are examples of mechanisms that in turn may not operate as well as they could.

Consequently, using the formations approach to better articulate responsibility and accountability should assist with optimizing the risk culture of an organization, a topic which is of growing interest across financial institutions.
3.3.5 Responsibilities in operational risk and control assessment processes

Much progress has been made by some firms in relation to clarifying roles and responsibilities for operational risk and control, including where operational risk and control influences exposure to all other risk categories. More advanced firms tend to have assigned responsibilities by process, by risk and by control as well as responsibilities for the operational risk and control framework itself.

Although this is not the focus of this paper, we recognize that progress has been made in this respect. In comparison to our formations model, we consider that such approaches are not designed to enable clear identification of red or amber formations, although we acknowledge that conflicts of interest may be identified and dealt with during control design and/or evaluation of the effectiveness of individual controls.

We, therefore, believe that our formations model is compatible with approaches typically used for the purposes of operational risk and control assessment frameworks.

4. Conclusion

Limitations of the 3LOD model could be overcome by the use of risk management formations that can make responsibilities clearer and accountability more precise. The risk management formations approach makes it easier to identify and deal with “red flag” formations that could constrain the effectiveness of risk management systems in organizations. It also enables optimized alignment of risk management activities in organizations – helping firms take risks in a suitably controlled manner that meets the expectations of shareholders, customers and regulators.

3LOD terminology is so prevalent in financial services that it is unlikely that firms could easily move away from using the terminology in internal and external dialog. However, the use of the risk management formations approach in conjunction with 3LOD terminology should help firms ensure that they can overcome the limitations of 3LOD and provide a platform for better risk-taking.
Reinsurance and stability: catering to the needs of countries at different stages of development

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Abstract
Against the backdrop of increasing losses from natural catastrophes, this paper analyzes the role of reinsurance. In this regard, we distinguish between two dimensions of stability: financial and economic. This distinction helps us identify the differing needs of high- and low-income countries in terms of reinsurance regulation and data requirements. These can be inferred from the scheme we introduce to analyze the cascade of peak risk transfer. This scheme could be used as input to macroprudential analyses as well as for assessing catastrophe preparedness.

1 The authors thank seminar participants at the Bank for International Settlements, the International Association of Insurance Supervisors, the World Bank, the International Monetary Fund, the United Nations, the Understanding Risk Conference 2014, the Global Facility for Disaster Reduction and Recovery, the Asian Development Bank, and the Inter-American Development Bank for helpful comments. They are also grateful to Anamaria Illes for assistance with the figures. Some of the figures and their descriptions have previously appeared in von Dahlen and von Peter (2012). The views presented in this paper are solely those of the authors and do not necessarily reflect the views of the BIS, the IAIS or any affiliated organization.
1. Introduction
The role and functioning of the global reinsurance market has received increasing attention in recent years. While rising losses from natural catastrophes have heightened awareness of the role of peak risk transfer by reinsurance companies, the fallout from the global financial crisis has intensified scrutiny of all parts of the financial sector, including reinsurance.

This paper argues that reinsurance-related stability analysis should consider both financial and economic stability. In practice, the different emphasis on the two dimensions of stability could lead to a conflict of objectives. For instance, ring-fencing a national insurance market for financial stability reasons prevents the country from transferring peak risk abroad; this reduces countries’ catastrophe preparedness and risks exacerbating the economic consequences of natural disasters.

Our distinction between financial and economic stability helps to identify high- and low-income countries’ differing needs for (re)insurance regulation and related data. In this context, our paper discusses distinct features of peak risk transfer and introduces a parsimonious scheme to analyze the cascade of losses that ripple through the (global) insurance market after a natural catastrophe. While countries at different stages of development have distinct needs for the two dimensions of stability, we argue that national and international public sector bodies could usefully combine the objectives of financial and economic stability. This notion relates to the finding that catastrophe preparedness typically also comes with measurable positive effects on the real economy.

This paper proceeds as follows. The next section explains why reinsurers have existed for more than 100 years, and offers some insights into recent research findings on the macroeconomic effects of peak risk transfer by reinsurers. In section 3, we introduce the risk transfer cascade to help identify the ultimate bearers of risk. In view of these findings, section 4 describes recent developments in the global regulatory arena. Section 5 concludes.
2. Why does reinsurance exist?
Several major catastrophes in the 19th century illustrated the limitations of primary insurance companies in dealing with peak risks. Many insurance companies had a limited geographic focus, implying a concentration of insured risks, and were thus ill-prepared to withstand the financial consequences of insuring peak risks, such as the destruction of entire cities through fire. As a result, the first professional reinsurance companies were formed to help diversify such risks. A case in point is Cologne Re, an independent reinsurer established in 1842 following the conflagration that destroyed the city of Hamburg (Germany). Another example is the creation of Swiss Re in 1863 in the aftermath of the fire destroying the city of Glarus (Switzerland). The formation of Munich Re dates back to 1880, and it has become the world's largest reinsurance company alongside Swiss Re, based on premium volume in 2013. More than a century ago, those companies established reinsurance as an international business when they paid out large sums in compensation to the victims of the 1906 San Francisco earthquake.

Reinsurance is insurance protection bought by primary insurers. Demand is typically based on the fact that reinsurance protection contributes to reducing the volatility of claims. In other words, reinsurance makes the business for primary insurers more predictable even in the presence of unpredictable catastrophes. Reinsurance companies, in turn, hold a portfolio of numerous peak risks. Their capability to handle peak risks relies on their ability to diversify their portfolio in various ways. They essentially diversify across types of risk, by geography and over time. Based on statistics relating to the occurrence of independent physical events, reinsurers calculate risk-based premiums. Reserving techniques and a steady flow of premium income help reinsurers to offer cover against peak risks. In so doing, reinsurance protection helps primary insurers avoid accumulation of risks.

As part of their core business, reinsurers typically provide a bundle of activities involving risk transfer, risk finance and information services. Risk transfer helps stabilize the financial results of primary insurers by distributing major unforeseen losses when peak risks materialize. Risk financing often provides a replacement for equity at the primary insurer.

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2 Our discussion focuses on traditional reinsurance for the transfer of insurance risk. For additional insights into financial reinsurance contracts that can be used for capital management, solvency relief, or for smoothing profit and loss results, see Gurenko et al. (2013).
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in the sense that the transfer of risks to the reinsurer alleviates the primary insurer’s regulatory capital charge. Information services offered by reinsurers support insurance companies in various ways, ranging from the improvement of new or existing products to the pricing of risks and overall risk management across primary insurers’ portfolio.

Ever since the formation of independent professional reinsurance companies in the second half of the 19th century, the number of reinsurers, as well as the aggregate premiums they receive, has grown significantly. However, the overall number of independent professional reinsurance companies – some 200 entities – remains comparatively small. Since 2000, the combined market share of the 10 largest reinsurers has fluctuated between 50% and 40% of the global nonlife reinsurance market, gravitating toward 40% recently [von Dahlen and von Peter (2012)]. The overall premium volume earned for the risks accepted by reinsurance companies amounts to approximately U.S.$220 billion. **Table 1** characterizes the total premium income of both life and nonlife reinsurance companies.

Reinsurance focuses on the compensation of direct losses, with the purpose of redistributing risk to those institutions best placed to manage risks on a large scale. However, (re)insurance coverage can also give rise to indirect macroeconomic benefits. Our recent work measures the macroeconomic consequences of natural catastrophes while taking risk transfer into account [von Peter et al. (2012)]. **Figure 1** illustrates how the presence of risk transfer can alter a typical country’s growth path following a major natural catastrophe. In the absence of catastrophes, the growth rate would remain at its long-run average rate (normalized to 0 in the figure). In response to a major catastrophe, however, the simulation shows that the growth rate falls below its long-run average for several years (top panel), resulting in a cumulative macroeconomic cost in the form of forgone output (bottom panel).

The lines represent various insurance coverage ratios in steps of 10%. The lower bound represents the impulse response to an entirely uninsured event, the upper bound simulates the response to a hypothetical event where all losses are fully insured, and the interior paths show growth responses under various coverage ratios (of 10, 20, ... 90%). The red line shows the coverage level that hypothetically sets the estimated cumulative effect equal to zero.
Figure 1 thus illustrates the macroeconomic value of risk transfer. Higher insurance coverage mitigates the contractionary effects of a major catastrophe, and thus contributes to lower output volatility in the longer run. While such growth-enhancing effects are observable for both high- and low-income countries, they are more pronounced for smaller and poorer countries [see von Peter et al. (2012), Table 3]. The macroeconomic value of risk transfer may thus be particularly high for those nations that lack the capacity to (re)insure themselves against major natural disasters, based on their physical size or stage of development. Unfortunately, the literature on finance and growth has largely ignored the role of insurance, focusing instead on banks and stock markets [Levine and Zervos (1998)]. Based on the initial results above, we regard the link between (re)insurance and economic stability as a promising area for future research.

3. Where are the ultimate bearers of risk?
This section introduces the concept of a risk cascade to help assess the impact of major losses on the global insurance market, taking the physical damage caused by natural catastrophes as the starting point. Reinsurance companies sell protection against peak risks, and when major natural or man-made disasters materialize, it is important to know where realized losses ultimately end up. A concentration of risks in certain “pockets” could ultimately lead to the failure of reinsurance companies. Although such failures have been few and limited in scope in the past, they can trigger repercussions within the financial sector and could affect growth and economic stability through the channel described in section 2. This section introduces a simple scheme to characterize the risk transfer in the global market, as a starting point for a broader analytical framework. Devising such a framework will be essential for identifying, collecting and analyzing data on the ultimate bearers of risk in the system. This is particularly important as natural catastrophes resulting in significant financial losses have become more frequent over the past three decades [Kunreuther and Michel-Kerjan (2009), Cummins and Mahul (2009)].

Several intertwined developments have contributed to this trend. An increase in destructive physical events, such as storms, compounded by rising population density and property values in catastrophe-prone regions, has led to a surge in insured and reinsured losses over the past 30 years (Figure 2). This is reflected in the frequency of catastrophes, both for major events (yellow line) as well as for all categories combined (grey line).
The most severe and costliest events to date occurred in 2005 (Hurricanes Katrina, Rita and Wilma hitting the U.S. Gulf Cost) and 2011 (Great East Japan earthquake and tsunami in Japan).

Future catastrophes are largely unpredictable in terms of geographic location and destructive potential. However, it is reasonable to expect further increases in both the frequency and the severity of (re)insured disasters. These developments reinforce the need to understand how risk is distributed through the system and to identify possible risk concentrations among the ultimate bearers of risks.

One can think of the global insurance market as organizing risk transfer in a hierarchical way, from policyholders all the way to the ultimate bearer of risk. In exchange for the right to transfer a single risk or a portfolio of risks, the insured, and accordingly the reinsured, pay a risk-based premium. If a predefined (re)insured event occurs, the insurer – and often the reinsurer – will have to pay compensation in line with contractual obligations. The public and private sectors spent a combined total of about U.S.$4.6 trillion in 2012 to buy insurance protection with primary insurance companies. These companies in turn spent some U.S.$220 billion to buy protection from reinsurance companies (Table 1). At the next step in the hierarchy, reinsurance companies may purchase cover against peak risks from financial institutions, or transfer some of the insured and reinsured risks to the financial market via securitization. Counterparties to such transactions typically involve mutual funds, banks, pension funds and hedge funds.

If a disaster strikes, losses ripple through the system from the policyholders via primary insurers to reinsurance companies and then to the ultimate bearers of risk. To illustrate this process, Figure 3 summarizes the cascade of losses due to natural catastrophes in 2011. On a global basis, losses from physical damage caused by natural catastrophes amounted to U.S.$386 billion. The Great East Japan earthquake and tsunami alone amounted to an economic loss of U.S.$210 billion. Insurers, reinsurers and all other parties who had accepted risks now have to reimburse losses based on their contractual obligations. The physical damage produced losses covered by primary insurers of U.S.$110 billion. Reinsurers in turn paid compensation for losses to the tune of U.S.$64 billion. Reinsurance companies recouped almost U.S.$10 billion from retrocession and
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securitization arrangements, although most of it was through transfer within the reinsurance sector. A look at premium volume also suggests that the reinsurance industry retains most of the risks it contracts.

Another form of reinsurance is conducted through captives, in the form of a transfer of risk to a subsidiary that insures certain risks of its parent company. This form of reinsurance has grown significantly in recent years, reportedly from U.S.$130 billion in 2006 to about U.S.$394 billion in 2012 [Adrian et al. (2013)]. According to a report from the New York State Department of Financial Services [Lawsky (2013)], this increase has been driven at least partly by regulatory arbitrage. The Department also concluded that not all captive insurance contracts “actually transfer the risk for those insurance policies because, in many instances, the parent company is ultimately still on the hook for paying claims if the shell company’s weaker reserves are exhausted (a parental guarantee)” [Lawsky (2013), page 1]. Under these circumstances, the locus of ultimate risk becomes blurred and requires regulatory monitoring.

Reinsured disaster risk can also be transferred to financial markets through insurance-linked securities. While catastrophe bond issuance has increased in recent years, the market remains smaller than industry experts had expected [Jaffee and Russell (1997), Froot (2001)]. This assessment is based on the observation that the outstanding capital at risk remains well below U.S.$20 billion, with aggregate bond issuance per year usually below U.S.$6 billion (Figure 4). Very few catastrophe bonds have been triggered to date. The 2011 earthquake and tsunami in Japan, for example, triggered one known catastrophe bond, resulting in a payout of less than U.S.$300 million. This pales in comparison with reinsured losses of U.S.$64 billion in the same year.

While the securitization of reinsured risks broadens diversification, it also increases interconnectedness with financial markets. Securitization arrangements involve a number of institutions beyond the insurance sector, as illustrated in Figure 5. Issuing notes to

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3 A captive insurance company typically insures risks emanating from their parent group or groups, which can be financial or nonfinancial sector entities, including, for example, pharmaceutical companies. In some jurisdictions, insurance captives are given preferred regulatory treatment.
various financial market participants is the main purpose of a special purpose vehicle (SPV). SPVs often invest proceeds in government bonds that are held in a collateral trust. If a predefined peak risk, such as an earthquake in Japan, materializes, the sponsoring reinsurer receives the assets held in the collateral trust. In case no catastrophe occurs, investors recoup the full principal. From a financial stability perspective, it is important to know more about the financial market investors. The Lehman Brothers bankruptcy in 2008 was a case in point: four catastrophe bonds were impaired due to the fact that Lehman Brothers had acted as a counterparty by way of a total return swap, which was then no longer fully funded. This episode of impaired catastrophe bonds, which was not due to a natural catastrophe, reminded investors that despite the exogenous nature of natural catastrophes, catastrophe bonds are not immune to “unnatural disasters” such as institutional failures.

A related macroprudential analysis should answer the following questions: is there a concentration of counterparties with respect to peak risks in the financial market? To what extent is the reinsurer, which securitized the risks in the first place, also involved as investor in the bonds? The latter could mask the concentration of risk at a reinsurance company.

Despite the comparatively small size of the specific market segment, the availability of data on the financial linkages within the global reinsurance market and between insurers and financial markets leaves much to be desired. Even the aggregate numbers on the worldwide transfer of peak risks in Figure 3, for example, were not available. A number of specific data gaps remain. Data on the securitization of insured and reinsured risks to financial markets are rather limited. Similarly, while retrocession between reinsurance companies remains limited in size, linkages produced through this activity cannot be fully assessed either owing to a lack of data. Further linkages can arise when reinsurers go beyond their traditional insurance business to engage in financial market activities such as investment banking or CDS (credit default swaps) writing. This state of affairs seriously limits the scope for macroprudential surveillance and financial stability analysis. Our parsimonious scheme [compare Figure 3] to analyze peak risks that affect the global insurance market could become a building block of a wider analytical framework to increase transparency. This would help to better identify the ultimate bearers of insured
and reinsured risks, and to conduct a meaningful analysis of the size, interconnectedness and substitutability of individual (re)insurance companies.

4. Who monitors the global reinsurance market?
Following the global financial crisis, interest in the systemic importance of financial institutions has surged [see, for example, BIS-FSB-IMF (2009)]. While banks and insurers are typically supervised at the domestic level and on a legal entity basis, regulatory reform and initiatives to close data gaps are increasingly conducted at the global level. Global regulators have already identified a list of global, systemically important banks (G-SIBs) based on size, interconnectedness, the lack of readily available substitutes for the services they provide, global activity and complexity. While the crisis was not triggered by (re)insurers and their activities, it has become clear that the scope of future macroprudential surveillance will increasingly include the (re)insurance sector.

Existing and envisaged activities that aim to monitor the global reinsurance market can be divided into two strands. The first concerns activities focusing primarily on individual companies (microprudential focus). The second strand aims at a more thorough understanding of the entire reinsurance market and possible repercussions within the wider financial system and spillovers to the real economy (macroprudential focus). While these two strands are interwoven in various ways, the considerations on (re)insurance and macroprudential surveillance are still regarded as “work in progress” in its early stages [Ramella and von Dahlen (2014)]. Amid conceptual and methodological deliberations underway, the institutional arrangements for the global macroprudential setup in insurance is still under (some) consideration. For example, the question of who is in charge still remains unanswered for the time being [von Dahlen and Ramella (2014)], despite the fact that a number of global and regional bodies have started to work on macroprudential surveillance in insurance.

The Financial Stability Board (FSB) is among the leading international bodies to have identified a need for additional surveillance of reinsurers and the reinsurance market more broadly. Specifically, the FSB stated: “A decision on the G-SII status of, and appropriate risk mitigating measures for, major reinsurers will be made in July 2014” [FSB (2013a), page 2]. Based on the assessment methodology developed by the International Association
of Insurance Supervisors (IAIS), the FSB and national authorities, in consultation with the IAIS, identify companies to be included on the list of global systemically important insurers (G-SIIs). An initial list of primary insurance companies was published in July 2013 [FSB (2013b)]. Alongside the banks identified as G-SIBs, these G-SIIs belong to the group of global systemically important financial institutions, G-SIFIs [FSB (2010), and FSB (2014)].

While the G-SIFIs identified so far constitute a key element within a broader macroprudential framework, the results from macroprudential surveillance activities will likely lead to future revisions of the G-SIFI list. Related to the identification of G-SIIs, the IAIS has also opined on the systemic importance of insurers [IAIS (2011)] and reinsurers [IAIS (2012a)]. This comes in addition to a number of IAIS-based contributions regarding macroprudential surveillance [IAIS (2013), and IAIS (2010)], such as the IAIS Insurance Core Principle (ICP) 24, on “Macroprudential surveillance and insurance supervision.”

The IAIS is currently advancing a number of issues that will be essential in supporting future macroprudential assessments of the global insurance and reinsurance market. Despite the fact that much critical work still needs to be done, the envisaged global backstop capital requirement (BCR) for insurers could become a key element. At the same time, the IAIS is working toward analytical macroprudential tools that could then be used by different jurisdictions.

In making progress toward an analytical framework, financial indicators will constitute an important element for assessing the overall resilience of the reinsurance market. For example, a joint analysis, as displayed in Figure 6, of shareholder equity and the combined ratio contributes to a better understanding of whether the reinsurance sector has the ability to withstand unforeseen events. Temporary spikes in the combined ratio (yellow line) reflect the losses due to natural catastrophes in 2005 and 2011. Shareholder equity, on the other hand, remained resilient in spite of the exposure of reinsurers to these catastrophic events. Shareholder equity (black line) declined much more significantly during the financial crisis in 2008, when the market value of insurance companies plunged.

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4 The full list of ICPs is available on the IAIS website: http://www.iaisweb.org/Supervisory-Material/ICP-online-tool-689.
by 59% (grey line). This share price drop was much more pronounced than for any natural catastrophe to date.

Monitoring interconnectedness is of a different order, as it requires going beyond simple financial indicators into the analysis of bilateral institutional data. The topic had been on the IAIS agenda since 2003 when it started to collect data on the linkages between reinsurance companies and the wider financial markets. Since then, specific data have been collected, analyzed and published, for example on the credit risk transfer from reinsurers to banks and vice versa [IAIS (2012b)]. Additional IAIS-based monitoring and analysis covered, for example, the securitization [IAIS (2009)] of insured and reinsured risks as well as new data in the area of insurance and reinsurance captives [IAIS (2012b)].

Who should lead the monitoring of the reinsurance market will depend, to some extent, on the stage of development. Countries differ widely in various dimensions of their financial development [as Čihák et al. (2013) document in this journal]. One relevant dimension is insurance density, the premium per capita that insurance companies receive for domestically insuring nonlife (property and casualty) risks. While regions with a high insurance density are more likely to focus their monitoring on financial stability, regions with a low insurance density are typically more concerned about increasing access to insurance in order to promote economic stability. Such differences in emphasis matter when assessing the linkages between reinsurers and the wider financial markets and possible effects on the real economy.

Depending on the specific implementation of financial stability-related measures, it is in principle possible to end up with a conflict of aims between financial and economic stability. With a view to the importance of reinsurance companies in offering protection against peak risks, the regulatory requirements for reinsurers need to be carefully calibrated. Reinsurance regulation should not only establish a framework that helps safeguard financial stability, but also ensure that reinsurers remain in a position to allocate sufficient resources for peak risk reduction around the world. This ability could be reduced by, for example, increasing costs of conducting business and any additional barriers for cross-border business. Even nowadays, the risk transfer available varies significantly from continent to continent. This also results in differing data demands, depending on whether the focus is on financial or on economic stability.
To flesh out this argument with recent data, Figure 7 (top panel) shows the different degrees of insurance density by region. North America accounts for the highest insurance density, followed by Oceania and Europe, while Latin America, Asia and Africa are below the worldwide average. Over time, this ordering also leads to different magnitudes in insured losses from natural catastrophes. In aggregate, North America accounts for the bulk of insured losses (Figure 7, bottom panel), followed by those from Asia and Europe. However, significant differences prevail from year to year. In 2010, for example, Latin America’s contribution to worldwide insured losses stemming from natural catastrophes was well above its long-term average, in spite of its relatively low regional insurance density. We find a similar pattern with respect to Australia and Oceania in 2011.

The regional differences in insurance density conceal much greater variation in the availability and quality of data on insurance, reinsurance and catastrophe more broadly. Data unavailability and inconsistencies restrict sovereigns’ ability to assess and improve the resilience of their economies or financial systems [Jerven (2013)]. This observation is of particular importance when it comes to effective prevention [World Bank and United Nations (2010)] or catastrophe risk-financing in developing countries. Overall, it is important to address the different stages in the development of, for example, supervisory and regulatory frameworks, while aiming for catastrophe preparedness [Cummins and Mahul (2009)].

5. Conclusion
In addressing the topic of reinsurance and stability, it is essential to distinguish between financial and economic stability. Recent research has substantiated the importance of peak risk transfer for economic stability, or the volatility of growth. While economic stability is important for both high- and low-income countries, in recent years many high-income countries have focused exclusively on financial stability in the context of reinsurance. The two perspectives place different emphasis on (re)insurance regulation and data requirements.
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While many reinsurance companies assess their own exposures on a global basis, there is a lack of country-based analysis of the macroeconomic impact of peak risk going beyond the assessment of individual firms. Such a comprehensive assessment could lead to a better understanding – and help mitigate – the macroeconomic risks posed by major natural catastrophes. The World Bank [Galbraith (2013)] and the United Nations [UN (2013)], for instance as part of the Hyogo Framework, lead global efforts to close the gap with respect to sovereign disaster risk financing and insurance.

This leads us to conclude that international bodies that are more concerned with financial stability in the context of (re)insurance could usefully increase their engagement with those that are more focused on economic stability, and vice versa. One avenue is for regulatory frameworks to strengthen (re)insurers against rising disaster-related losses without impairing any country’s access to cross-border risk transfer. For example, the documented increases in losses from natural catastrophes could be better recognized within the regulatory framework. Meanwhile, some countries still need to implement a reliable regulatory and supervisory environment in the first place.
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Appendix

Scale, scope and complexity: assessing banking business models
APPENDIX: Scale, scope and complexity: assessing banking business models

Figure 1: Mis-specification error from omitting bankers' return
APPENDIX: Scale, scope and complexity: assessing banking business models

Table 1: Summary statistics

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</tbody>
</table>

niseq is return on equity, mxlrrentseq is bankers’ rent as a per dollar of equity, trentseq is total rent, cindx is concentration index based on income structure, at is total assets (million dollars), nim is net interest margin (percent), niish is share cent of non-interest income in total revenues and ilev is ratio of book equity to total assets.
Table 2: Correlations

<table>
<thead>
<tr>
<th></th>
<th>niseq</th>
<th>mxlrrentseq</th>
<th>trentseq</th>
<th>cindx</th>
<th>at</th>
<th>nim</th>
<th>niish</th>
<th>ilev</th>
</tr>
</thead>
<tbody>
<tr>
<td>niseq</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mxlrrentseq</td>
<td>-0.069</td>
<td>1.000</td>
<td>0.044</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>trentseq</td>
<td>0.678</td>
<td>0.300</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cindx</td>
<td>-0.082</td>
<td>-0.166</td>
<td>-0.114</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at</td>
<td>0.015</td>
<td>0.115</td>
<td>0.046</td>
<td>-0.208</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nim</td>
<td>0.133</td>
<td>-0.124</td>
<td>0.133</td>
<td>0.248</td>
<td>-0.041</td>
<td>1.000</td>
<td></td>
<td></td>
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<tr>
<td>niish</td>
<td>0.147</td>
<td>0.374</td>
<td>0.294</td>
<td>-0.284</td>
<td>0.202</td>
<td>-0.118</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>ilev</td>
<td>0.188</td>
<td>0.023</td>
<td>0.137</td>
<td>-0.034</td>
<td>-0.004</td>
<td>0.169</td>
<td>0.253</td>
<td>1.000</td>
</tr>
</tbody>
</table>

niseq is return on equity, mxlrrentseq is bankers’ rent as a per dollar of equity, trentseq is total rent, cindx is concentration index based on income structure, at is total assets (million dollars), nim is net interest margin (percent), niish is share cent of non-interest income in total revenues and ilev is ratio of book equity to total assets.
Table 3: Return regressions: scale and scope

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>niseq</th>
<th>mxlrrentseq</th>
<th>trentseq</th>
<th>niseq</th>
<th>mxlrrentseq</th>
<th>trentseq</th>
</tr>
</thead>
<tbody>
<tr>
<td>at</td>
<td>0.000 b (2.40)</td>
<td>0.000 a (4.25)</td>
<td>0.000 a (2.87)</td>
<td>0.000 a (1.22)</td>
<td>0.000 b (3.41)</td>
<td>0.000 b (2.17)</td>
</tr>
<tr>
<td>at10</td>
<td>0.001 (0.08)</td>
<td>0.027 a (4.72)</td>
<td>0.009 a (1.86)</td>
<td>-0.008 (0.82)</td>
<td>0.021 a (3.94)</td>
<td>0.005 (0.95)</td>
</tr>
<tr>
<td>cindx</td>
<td>-0.104 a (-4.00)</td>
<td>-0.057 a (-3.15)</td>
<td>-0.053 a (-3.57)</td>
<td>-0.104 a (-4.00)</td>
<td>-0.057 a (-3.15)</td>
<td>-0.053 a (-3.57)</td>
</tr>
<tr>
<td>Cons</td>
<td>0.128 a (39.74)</td>
<td>0.013 a (3.26)</td>
<td>1.524 a (644.09)</td>
<td>0.201 a (10.90)</td>
<td>0.031 b (6.91)</td>
<td>1.562 a (146.79)</td>
</tr>
<tr>
<td>yr dummy</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>R sq</td>
<td>0.112</td>
<td>0.168</td>
<td>0.116</td>
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<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>N obs</td>
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<td>6763</td>
<td>6763</td>
<td>6763</td>
<td>6763</td>
<td>6763</td>
</tr>
</tbody>
</table>

The dependent variables are return on equity (niseq), bankers’ rent as a percent of equity (mxlrrentseq), and total rent (trentseq). The explanatory variables are total assets (at), a dummy variable if a bank is in the 10th size decile (at10), concentration index based on income structure (cindx), and year dummies. The regressions of niseq and trentseq are estimated by OLS. The mxlrrentseq model is estimated by Tobit regression. T-ratios based on clustered standard errors are reported in parentheses. a, b and c indicates significant at the 1%, 5% and 10% levels respectively.
APPENDIX: Scale, scope and complexity: assessing banking business models

Table 4: Return regressions: scale, scope plus additional controls

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>niseq</th>
<th>mxlrrentseq</th>
<th>trentseq</th>
<th>niseq</th>
<th>mxlrrentseq</th>
<th>trentseq</th>
</tr>
</thead>
<tbody>
<tr>
<td>at</td>
<td>0.000 (1.37)</td>
<td>0.000° (2.57)</td>
<td>0.000 (0.28)</td>
<td>0.000 (0.25)</td>
<td>0.000° (1.98)</td>
<td>-0.000 (-0.61)</td>
</tr>
<tr>
<td>at10</td>
<td>-0.086° (-1.65)</td>
<td>-0.039° (-1.92)</td>
<td>-0.045° (-2.56)</td>
<td>-0.096° (-1.80)</td>
<td>-0.040° (-1.99)</td>
<td>-0.049° (-2.72)</td>
</tr>
<tr>
<td>nim</td>
<td>0.018a (2.62)</td>
<td>-0.007° (-2.24)</td>
<td>0.012± (5.50)</td>
<td>0.021± (2.80)</td>
<td>-0.006 (1.92)</td>
<td>0.013± (5.34)</td>
</tr>
<tr>
<td>nim at10</td>
<td>0.022c (1.82)</td>
<td>0.010° (1.84)</td>
<td>0.009° (2.28)</td>
<td>0.022± (1.80)</td>
<td>0.010° (1.83)</td>
<td>0.009° (2.26)</td>
</tr>
<tr>
<td>niish</td>
<td>0.189a (4.63)</td>
<td>0.106° (3.14)</td>
<td>0.185° (7.62)</td>
<td>0.169° (4.05)</td>
<td>0.103a (2.92)</td>
<td>0.178° (6.93)</td>
</tr>
<tr>
<td>niish at10</td>
<td>-0.016 (-0.23)</td>
<td>0.064 (1.64)</td>
<td>0.031 (0.94)</td>
<td>-0.007 (1.01)</td>
<td>0.065 (1.65)</td>
<td>0.034 (1.03)</td>
</tr>
<tr>
<td>ilev</td>
<td>0.761a (3.60)</td>
<td>-0.060 (-1.09)</td>
<td>0.103 (1.91)</td>
<td>0.756 (3.90)</td>
<td>-0.060 (-1.08)</td>
<td>0.101 (1.93)</td>
</tr>
<tr>
<td>cindx</td>
<td>-0.114° (-3.74)</td>
<td>-0.017 (-0.91)</td>
<td>-0.041° (-2.67)</td>
<td>-0.114° (-3.74)</td>
<td>-0.017 (-0.91)</td>
<td>-0.041° (-2.67)</td>
</tr>
<tr>
<td>cons</td>
<td>-0.048 (-1.57)</td>
<td>-0.005 (-0.50)</td>
<td>1.429° (162.87)</td>
<td>0.026 (0.74)</td>
<td>0.007 (0.37)</td>
<td>1.456° (109.94)</td>
</tr>
<tr>
<td>yr dummy</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>R²</td>
<td>0.167</td>
<td>0.268</td>
<td>0.172</td>
<td>0.268</td>
<td>0.172</td>
<td>0.270</td>
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<td>6763</td>
<td>6763</td>
<td>6763</td>
<td>6763</td>
<td>6763</td>
</tr>
</tbody>
</table>

The dependent variables are return on equity (niseq), bankers’ rent as a percent of equity (mxlrrentseq), and total rent (trentseq). The explanatory variables are total assets (at), a dummy variable if a bank is in the 10th size decile (at10), net interest margin (nim), nim interacted with at10 (nim at10), percent of non-interest income in total revenues (niish), niish interacted with at10 (niish at10), ratio of book equity to total assets (ilev), concentration index based on income structure (cindx) and year dummies. The regressions of niseq and trentseq are estimated by OLS. The mxlrrentseq model is estimated by Tobit regression. T-ratios are reported in parentheses. a, b and c indicates significant at the 1%, 5% and 10% levels, respectively.
APPENDIX: Scale, scope and complexity: assessing banking business models

Figure 2: Efficiency frontiers across size deciles in 2006
APPENDIX: Scale, scope and complexity: assessing banking business models

Figure 3: Efficiency frontiers across scope quintiles in 2006
APPENDIX: Scale, scope and complexity: assessing banking business models

Figure 4: Banking returns since 2003

Returns to banking (medians, top 5 size deciles)

Returns to banking (medians, top decile only)
APPENDIX: Scale, scope and complexity: assessing banking business models

Figure 5: Cindx over years for selected banks
APPENDIX: Scale, scope and complexity: assessing banking business models

Figure 6: Efficiency frontiers for selected banks in 2003
APPENDIX: Scale, scope and complexity: assessing banking business models

Figure 7: Efficiency frontiers for selected banks in 2006
Figure 8: Efficiency frontiers for selected banks in 2009
APPENDIX: Scale, scope and complexity: assessing banking business models

Figure 9: Efficiency frontiers for selected banks in 2012
Appendix

A brave new world? Making sense of practitioner and regulator perspectives on risk culture
APPENDIX: A brave new world? Making sense of practitioner and regulator perspectives on risk culture

Table 1: Summary of risk culture model factors by organization

<table>
<thead>
<tr>
<th>Factor categories</th>
<th>Deloitte</th>
<th>EY</th>
<th>FSB</th>
<th>IIF</th>
<th>IRM</th>
<th>KPMG</th>
<th>McKinsey</th>
<th>PWC</th>
<th>Towers Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acknowledgement of risk (potential for over confidence, effective challenge)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Communication (regular risk reporting and escalation of risk issues)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Compensation and performance management</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>➥</td>
<td></td>
</tr>
<tr>
<td>IT Systems</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Leadership (‘tone from the top’)</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Relationships (between employees)</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Respect for risk (potential for gaming the system)</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Responsiveness to risk (ability to react to risk issues)</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Risk competencies (of employees)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Risk facilitation (status of risk function and ability to support business)</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
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<tr>
<td>Risk management processes and procedures</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Risk ownership (clear accountabilities)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Strategy and budget (e.g., aggressive revenue targets, budget for risk function)</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Structure of organization and governance</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
Appendix

Waves of change: investing in emerging markets for insurance firms
APPENDIX: Waves of change: investing in emerging markets for insurance firms

Figure 1: Short-term economic growth forecasts for the RGMs

Source: Oxford Economics/Haver Analytics
Figure 2: Short-term premium growth forecasts for the RGMs

APPENDIX: Waves of change: investing in emerging markets for insurance firms
APPENDIX: Waves of change: investing in emerging markets for insurance firms

Figure 3: Matrix of opportunity and risk for insurance investments

Size of bubble is the current market size BRIC countries highlighted in yellow Note: The scales for each indicator are adjusted so that “0” is worst and “100” is best. The size of each bubble represents the amount of premiums written in 2012 – an indicator of market opportunity. The BRICs are colored yellow to distinguish them from the RGMs and to not obscure the markets that lie behind or overlap them.
Box 1 - Building the matrix

The ranking matrix we developed plots 21 rapid-growth markets based on an analysis of their potential risk and opportunity. It was designed to help insurance executives weigh the opportunities against the risks of doing business in individual economies, and the analysis reflects a variety of indicators and forecasts. These include the following:

- **Insurance premium growth:** we used a model to forecast insurance market premium growth, drawing on historical data on insurance penetration, including underlying economic growth rates, income per capita, automobile ownership, share prices and demographic factors such as the rate of population aging.
- **Regulatory change:** we analyzed multiple regulatory factors that can affect insurance market growth, including pension policies, health policies, tax policies and insurance sector regulation.
- **Macroeconomic volatility:** we assessed the impact of macroeconomic shifts on insurance premium growth, including private consumption, income and unemployment.
- **Liquidity risks:** shifts in liquidity and current-account positions can affect the availability of capital, as well as exchange and interest rates. The tapering of quantitative easing (QE) that started in 2014 will reduce global liquidity and is likely to hurt balance of payments in some emerging economies.
- **Corruption risk:** corruption can expose insurers to fraud-related losses. To represent broader risks in the business environment, the Corruption Perceptions score assigned by Transparency International, based on multiple surveys, was collated for each RGM in the study.

For each market, we then assigned two scores: one designating its “opportunity,” determined by the degree to which regulatory, demographic and economic factors are expected to accelerate growth in that insurance market over the next two to three years, and another for “risk,” based on the extent to which macroeconomic issues, liquidity and corruption risks may cause concerns for insurance firms.
APPENDIX: Waves of change: investing in emerging markets for insurance firms

Table 1: Country ranking by highest opportunity and lowest risk

<table>
<thead>
<tr>
<th>Country</th>
<th>Score</th>
<th>Country</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey</td>
<td>92.49</td>
<td>Hong Kong</td>
<td>6.78</td>
</tr>
<tr>
<td>Indonesia</td>
<td>81.19</td>
<td>UAE</td>
<td>23.16</td>
</tr>
<tr>
<td>China</td>
<td>70.90</td>
<td>Chile</td>
<td>23.77</td>
</tr>
<tr>
<td>Colombia</td>
<td>66.39</td>
<td>China</td>
<td>33.63</td>
</tr>
<tr>
<td>Russia</td>
<td>63.89</td>
<td>Saudi Arabia</td>
<td>35.11</td>
</tr>
<tr>
<td>Malaysia</td>
<td>62.57</td>
<td>Malaysia</td>
<td>35.96</td>
</tr>
<tr>
<td>Vietnam</td>
<td>62.50</td>
<td>Czech Republic</td>
<td>40.56</td>
</tr>
<tr>
<td>Mexico</td>
<td>62.08</td>
<td>Thailand</td>
<td>44.62</td>
</tr>
<tr>
<td>UAE</td>
<td>57.47</td>
<td>Morocco</td>
<td>50.07</td>
</tr>
<tr>
<td>Brazil</td>
<td>57.45</td>
<td>Poland</td>
<td>51.62</td>
</tr>
<tr>
<td>India</td>
<td>57.25</td>
<td>Mexico</td>
<td>52.04</td>
</tr>
<tr>
<td>Morocco</td>
<td>56.15</td>
<td>Colombia</td>
<td>54.13</td>
</tr>
<tr>
<td>Thailand</td>
<td>54.86</td>
<td>South Africa</td>
<td>54.68</td>
</tr>
<tr>
<td>Chile</td>
<td>52.21</td>
<td>Brazil</td>
<td>57.22</td>
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<tr>
<td>Czech Republic</td>
<td>49.92</td>
<td>India</td>
<td>58.39</td>
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<td>Saudi Arabia</td>
<td>47.29</td>
<td>Turkey</td>
<td>59.57</td>
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<td>Nigeria</td>
<td>44.44</td>
<td>Indonesia</td>
<td>59.72</td>
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<tr>
<td>South Africa</td>
<td>41.30</td>
<td>Vietnam</td>
<td>63.9</td>
</tr>
<tr>
<td>Poland</td>
<td>35.35</td>
<td>Russia</td>
<td>65.25</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>34.72</td>
<td>Kenya</td>
<td>74.08</td>
</tr>
<tr>
<td>Kenya</td>
<td>12.50</td>
<td>Nigeria</td>
<td>74.77</td>
</tr>
</tbody>
</table>
APPENDIX: Waves of change: investing in emerging markets for insurance firms

**Figure 4: Financial sectors are now healthier in RGMs than in developed markets**

Dotted lines show rapid-growth market (RGM) and developed market (DM) averages
Solid lines indicate RGMs improving significantly since 2006-07 (more than a one point increase)
Source: World Economic Forum
APPENDIX: Waves of change: investing in emerging markets for insurance firms

Figure 5: Projected growth in vehicle ownership by 2015

![Bar chart showing projected growth in vehicle ownership by 2015 for various countries]

Source: Oxford Economics; Haver Analytics
APPENDIX: Waves of change: investing in emerging markets for insurance firms

Figure 6: Indicators of an emerging-markets slowdown

Source: PMI; Markit; China NBS; Haver Analytics
Appendix

Evaluating the government as a source of systemic risk
APPENDIX: Evaluating the government as a source of systemic risk

Figure 1: Total non-emergency federal loans outstanding direct and guaranteed by category (1998–2010)

Source: Budget of the U.S. Government, Analytical Perspectives, FY2001-2012, as presented in Uncle Sam in pinstripes by Douglas Elliot
APPENDIX: Evaluating the government as a source of systemic risk

Figure 2: Total federal loans and GSE obligations outstanding (direct and guarantees) (1998-2010)

Source: Budget of the U.S. Government, Analytical Perspectives, FY2001-2012, as presented in Uncle Sam in pinstripes by Douglas Elliot
APPENDIX: Evaluating the government as a source of systemic risk

Table 1: Largest banks in the U.S. by total assets (Q2 2013)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Institution name</th>
<th>Total assets (U.S.$ billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>JP Morgan Chase &amp; Co.</td>
<td>2,439</td>
</tr>
<tr>
<td>2</td>
<td>Bank of America Corp</td>
<td>2,123</td>
</tr>
<tr>
<td>3</td>
<td>Citigroup Inc.</td>
<td>1,883</td>
</tr>
<tr>
<td>4</td>
<td>Wells Fargo &amp; Co.</td>
<td>1,440</td>
</tr>
<tr>
<td>5</td>
<td>Bank of New York Mellon Corp.</td>
<td>360</td>
</tr>
</tbody>
</table>

Source: SNL Financial as reported in the Wall Street Journal.
APPENDIX: Evaluating the government as a source of systemic risk

Figure 3: Mortgaged-back securities, by issuer

Source: Congressional Budget Office
Appendix

The renminbi as an additional international reserve currency?
APPENDIX: The renminbi as an additional international reserve currency?

Table 1

<table>
<thead>
<tr>
<th>Function of money</th>
<th>Government</th>
<th>Private actors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store of value</td>
<td>International reserves</td>
<td>Investment currency (including currency substitution)</td>
</tr>
<tr>
<td>Medium of exchange</td>
<td>Vehicle currency for foreign currency intervention</td>
<td>Settlement currency for trade and financial transactions</td>
</tr>
<tr>
<td>Unit of account</td>
<td>Anchor for pegging local currency</td>
<td>Denomination currency for trade and financial transactions</td>
</tr>
</tbody>
</table>

Source: Cohen (2011)
Appendix

Should investors avoid or seek out currency risk? How to resolve a long-standing puzzle
APPENDIX: Should investors avoid or seek out currency risk? How to resolve a long-standing puzzle

Figure 1: Impact of currency management

Source: Pojarliev et al. (2014)
Note: Benchmark Portfolio: 27.5% MSCI U.S. Index as proxy for U.S. equity, 25% MSCI World ex-U.S. Index as proxy for non-U.S. developed equity, 7.5% MSCI EM Index as proxy for emerging equity and 40% Barclays Aggregate U.S. Index as proxy for U.S. bonds. Only the non-U.S. developed equity part is 50% hedged. Time Period: January 2006 to March 2013.
**The “currency beta” portfolio has an equal-weighted exposure to three naïve currency indices, the “beta grazers” portfolio has an equal allocation to the top 3 managers with the highest R-square to FX beta and the “alpha hunters” portfolio has an equal exposure to the top 3 managers with the highest alpha estimate.
Appendix

Are structured products a sustainable financial innovation?  
A lesson from the European markets
APPENDIX: Are structured products a sustainable financial innovation? A lesson from the European markets

Figure 1: Total number of structured products - new issues

Source: SRP database
APPENDIX: Are structured products a sustainable financial innovation?  
A lesson from the European markets

Figure 2: Total issuance of new structured products - 2004-12 (€m)

Source: SRP database
APPENDIX: Are structured products a sustainable financial innovation?  
A lesson from the European markets

Table 1: Structured products: volume and numbers of outstanding by country  
(31 December 2012).

<table>
<thead>
<tr>
<th>Country</th>
<th>Total outstanding number of products</th>
<th>Total outstanding volume of sales (€m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>4,789</td>
<td>213,883</td>
</tr>
<tr>
<td>Germany</td>
<td>1,023,798</td>
<td>136,430</td>
</tr>
<tr>
<td>France</td>
<td>22,607</td>
<td>86,046</td>
</tr>
<tr>
<td>Switzerland</td>
<td>165,433</td>
<td>78,989</td>
</tr>
<tr>
<td>Belgium</td>
<td>20,219</td>
<td>78,435</td>
</tr>
<tr>
<td>U.K.</td>
<td>4,500</td>
<td>61,519</td>
</tr>
<tr>
<td>Spain</td>
<td>2,188</td>
<td>46,944</td>
</tr>
<tr>
<td>Netherlands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>361,427</td>
<td>20,007</td>
</tr>
<tr>
<td>Total</td>
<td>1,625,599</td>
<td>742,960</td>
</tr>
</tbody>
</table>

Source: Structured Retail Product (SRP)
APPENDIX: Are structured products a sustainable financial innovation?  
A lesson from the European markets

### Table 2: Sample: numbers of structured products by research hypothesis

<table>
<thead>
<tr>
<th>Country</th>
<th>First RH: products with performance</th>
<th>Second RH: products issue date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>2,135</td>
<td>7,714</td>
</tr>
<tr>
<td>Germany</td>
<td>3,323</td>
<td>1,108,503</td>
</tr>
<tr>
<td>France</td>
<td>774</td>
<td>38,034</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1,796</td>
<td>224,370</td>
</tr>
<tr>
<td>Belgium</td>
<td>1,267</td>
<td>15,123</td>
</tr>
<tr>
<td>U.K.</td>
<td>1,423</td>
<td>5,253</td>
</tr>
<tr>
<td>Spain</td>
<td>730</td>
<td>8,148</td>
</tr>
<tr>
<td>Netherlands</td>
<td>764</td>
<td>23,094</td>
</tr>
<tr>
<td>Austria</td>
<td>2,489</td>
<td>788,731</td>
</tr>
<tr>
<td>Total</td>
<td>14,701</td>
<td>2,210,830</td>
</tr>
</tbody>
</table>

Source: Author analysis of SRP and CeD data.
APPENDIX: Are structured products a sustainable financial innovation? A lesson from the European markets

Table 3: Frequency and cumulative distribution of the payoff for the structured products expired between 1 January 2008 and 31 December 2012

<table>
<thead>
<tr>
<th>Class</th>
<th>Frequency</th>
<th>% Freq.</th>
<th>Cumulative</th>
<th>% Cum.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>274</td>
<td>1.9%</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>20</td>
<td>51</td>
<td>0.3%</td>
<td>325</td>
<td>2.2%</td>
</tr>
<tr>
<td>30</td>
<td>52</td>
<td>0.4%</td>
<td>377</td>
<td>2.6%</td>
</tr>
<tr>
<td>40</td>
<td>119</td>
<td>0.8%</td>
<td>496</td>
<td>3.4%</td>
</tr>
<tr>
<td>50</td>
<td>208</td>
<td>1.4%</td>
<td>704</td>
<td>4.8%</td>
</tr>
<tr>
<td>60</td>
<td>373</td>
<td>2.5%</td>
<td>1,077</td>
<td>7.3%</td>
</tr>
<tr>
<td>70</td>
<td>464</td>
<td>3.2%</td>
<td>1,541</td>
<td>10.5%</td>
</tr>
<tr>
<td>80</td>
<td>469</td>
<td>3.2%</td>
<td>2,010</td>
<td>13.7%</td>
</tr>
<tr>
<td>90</td>
<td>594</td>
<td>4.0%</td>
<td>2,604</td>
<td>17.7%</td>
</tr>
<tr>
<td>100</td>
<td>881</td>
<td>6.0%</td>
<td>3,485</td>
<td>23.7%</td>
</tr>
<tr>
<td>At par</td>
<td>1,948</td>
<td>13.3%</td>
<td>5,433</td>
<td>37.0%</td>
</tr>
<tr>
<td>110</td>
<td>4,915</td>
<td>33.4%</td>
<td>10,348</td>
<td>70.4%</td>
</tr>
<tr>
<td>120</td>
<td>2,372</td>
<td>16.1%</td>
<td>12,720</td>
<td>86.5%</td>
</tr>
<tr>
<td>130</td>
<td>908</td>
<td>6.2%</td>
<td>13,628</td>
<td>92.7%</td>
</tr>
<tr>
<td>140</td>
<td>426</td>
<td>2.9%</td>
<td>14,054</td>
<td>95.6%</td>
</tr>
<tr>
<td>150</td>
<td>224</td>
<td>1.5%</td>
<td>14,278</td>
<td>97.1%</td>
</tr>
<tr>
<td>160</td>
<td>115</td>
<td>0.8%</td>
<td>14,393</td>
<td>97.9%</td>
</tr>
<tr>
<td>170</td>
<td>73</td>
<td>0.5%</td>
<td>14,466</td>
<td>98.4%</td>
</tr>
<tr>
<td>180</td>
<td>34</td>
<td>0.2%</td>
<td>14,500</td>
<td>98.6%</td>
</tr>
<tr>
<td>190</td>
<td>25</td>
<td>0.2%</td>
<td>14,525</td>
<td>98.8%</td>
</tr>
<tr>
<td>200</td>
<td>26</td>
<td>0.2%</td>
<td>14,551</td>
<td>99.0%</td>
</tr>
<tr>
<td>Other</td>
<td>150</td>
<td>1.0%</td>
<td>14,701</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Source: Author analysis of SRP and CeD data.
APPENDIX: Are structured products a sustainable financial innovation?  
A lesson from the European markets

Table 4: Frequency and cumulative distribution of the payoff for the structured products that expired from 1 January 2008 to 31 December 2012 by countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Under par</th>
<th>At par</th>
<th>Above par</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>1,190</td>
<td>366</td>
<td>579</td>
</tr>
<tr>
<td>At par</td>
<td>366</td>
<td>264</td>
<td>2,528</td>
</tr>
<tr>
<td>Above par</td>
<td>579</td>
<td>2,528</td>
<td>76.1%</td>
</tr>
<tr>
<td>Germany</td>
<td>531</td>
<td>93</td>
<td>624</td>
</tr>
<tr>
<td>At par</td>
<td>264</td>
<td>93</td>
<td>80.6%</td>
</tr>
<tr>
<td>Above par</td>
<td>2,528</td>
<td>624</td>
<td>12.0%</td>
</tr>
<tr>
<td>France</td>
<td>57</td>
<td>93</td>
<td>2,528</td>
</tr>
<tr>
<td>At par</td>
<td>333</td>
<td>93</td>
<td>80.6%</td>
</tr>
<tr>
<td>Above par</td>
<td>2,528</td>
<td>624</td>
<td>76.1%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>754</td>
<td>56</td>
<td>986</td>
</tr>
<tr>
<td>At par</td>
<td>256</td>
<td>56</td>
<td>54.9%</td>
</tr>
<tr>
<td>Above par</td>
<td>986</td>
<td>624</td>
<td>76.1%</td>
</tr>
<tr>
<td>Belgium</td>
<td>162</td>
<td>236</td>
<td>869</td>
</tr>
<tr>
<td>At par</td>
<td>402</td>
<td>236</td>
<td>68.6%</td>
</tr>
<tr>
<td>Above par</td>
<td>869</td>
<td>624</td>
<td>76.1%</td>
</tr>
<tr>
<td>U.K.</td>
<td>37</td>
<td>402</td>
<td>984</td>
</tr>
<tr>
<td>At par</td>
<td>256</td>
<td>402</td>
<td>69.1%</td>
</tr>
<tr>
<td>Above par</td>
<td>984</td>
<td>624</td>
<td>76.1%</td>
</tr>
<tr>
<td>Spain</td>
<td>54</td>
<td>142</td>
<td>534</td>
</tr>
<tr>
<td>At par</td>
<td>256</td>
<td>142</td>
<td>54.9%</td>
</tr>
<tr>
<td>Above par</td>
<td>534</td>
<td>624</td>
<td>76.1%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>253</td>
<td>161</td>
<td>350</td>
</tr>
<tr>
<td>At par</td>
<td>161</td>
<td>161</td>
<td>45.8%</td>
</tr>
<tr>
<td>Above par</td>
<td>350</td>
<td>624</td>
<td>76.1%</td>
</tr>
<tr>
<td>Austria</td>
<td>447</td>
<td>228</td>
<td>1,814</td>
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<tr>
<td>At par</td>
<td>228</td>
<td>228</td>
<td>72.9%</td>
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<tr>
<td>Above par</td>
<td>1,814</td>
<td>624</td>
<td>76.1%</td>
</tr>
<tr>
<td>Total</td>
<td>3,485</td>
<td>1,948</td>
<td>9,268</td>
</tr>
<tr>
<td>Under par</td>
<td>3,485</td>
<td>1,948</td>
<td>63.0%</td>
</tr>
</tbody>
</table>

Source: Author analysis of SRP and CeD data.
APPENDIX: Are structured products a sustainable financial innovation? A lesson from the European markets

Table 5: Descriptive statistics of the variables

<table>
<thead>
<tr>
<th>Country</th>
<th>N_New_Prod</th>
<th>Vol (€m)</th>
<th>LogRet_6m_FTSE MIB</th>
<th>N_New_Prod</th>
<th>Vol (€m)</th>
<th>LogRet_6m_DAX</th>
<th>N_New_Prod</th>
<th>Vol (€m)</th>
<th>LogRet_6m_CAC 40</th>
<th>N_New_Prod</th>
<th>Vol (€m)</th>
<th>LogRet_6m_SMI</th>
<th>N_New_Prod</th>
<th>Vol (€m)</th>
<th>LogRet_6m_AEX</th>
<th>N_New_Prod</th>
<th>Vol (€m)</th>
<th>LogRet_6m_ATX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>128.57</td>
<td>123.00</td>
<td>25.00</td>
<td>269.00</td>
<td>51.44</td>
<td>0.36</td>
<td>-0.03</td>
<td>123.00</td>
<td>227.50</td>
<td>0</td>
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<td></td>
</tr>
<tr>
<td>Germany</td>
<td>471.34</td>
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<td>16970.00</td>
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<td>28545.10</td>
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<td>99019.65</td>
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<tr>
<td>France</td>
<td>633.90</td>
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<td>1957.00</td>
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<td>-0.06</td>
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<tr>
<td>Switz</td>
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<td>21744.00</td>
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<td>-0.13</td>
<td>6117.00</td>
<td>20803.00</td>
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<tr>
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<td>252.05</td>
<td>228.00</td>
<td>28.00</td>
<td>952.00</td>
<td>190.10</td>
<td>1.13</td>
<td>1.88</td>
<td>228.00</td>
<td>595.80</td>
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</tr>
<tr>
<td>Belgium</td>
<td>813.30</td>
<td>750.50</td>
<td>240.00</td>
<td>1458.00</td>
<td>309.10</td>
<td>0.24</td>
<td>-0.83</td>
<td>750.50</td>
<td>1384.80</td>
<td>0</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Belgium</td>
<td>859.52</td>
<td>6117.00</td>
<td>2392.00</td>
<td>31744.00</td>
<td>6437.12</td>
<td>0.95</td>
<td>-0.13</td>
<td>6117.00</td>
<td>20803.00</td>
<td>0</td>
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<td></td>
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</tr>
<tr>
<td>Spain</td>
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<td>3033.50</td>
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<td>4266.40</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>13145.52</td>
<td>8222.00</td>
<td>1732.00</td>
<td>45790.00</td>
<td>12622.43</td>
<td>1.34</td>
<td>0.87</td>
<td>8222.00</td>
<td>43108.60</td>
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</tr>
<tr>
<td>Austria</td>
<td>225.32</td>
<td>219.00</td>
<td>80.00</td>
<td>502.00</td>
<td>82.91</td>
<td>0.92</td>
<td>1.17</td>
<td>219.00</td>
<td>391.85</td>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Austria</td>
<td>384.90</td>
<td>310.00</td>
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<td>1277.00</td>
<td>253.69</td>
<td>1.34</td>
<td>1.78</td>
<td>310.00</td>
<td>915.95</td>
<td>0</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherland</td>
<td>205.58</td>
<td>142.50</td>
<td>13.00</td>
<td>739.00</td>
<td>171.94</td>
<td>1.13</td>
<td>0.63</td>
<td>142.50</td>
<td>521.80</td>
<td>0</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Author analysis of SRP and Datastream data.
APPENDIX: Are structured products a sustainable financial innovation?  
A lesson from the European markets

Table 6: Multiple linear regression OLS model

<table>
<thead>
<tr>
<th></th>
<th>Italy</th>
<th>Germany</th>
<th>France</th>
<th>Switzerland</th>
<th>Belgium</th>
<th>U.K.</th>
<th>Spain</th>
<th>Netherlands</th>
<th>Austria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant term</td>
<td>73.13</td>
<td>2559.67</td>
<td>811.12</td>
<td>2179.05</td>
<td>451.56</td>
<td>52.52</td>
<td>158.39</td>
<td>458.99</td>
<td>17179.00</td>
</tr>
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<td></td>
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<td></td>
</tr>
<tr>
<td>LogRet_6m DAX</td>
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<tr>
<td>LogRet_6m CAC 40</td>
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<tr>
<td>LogRet_6m SMI</td>
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</tr>
<tr>
<td>LogRet_6m BEL 20</td>
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<td>188.06</td>
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<td>LogRet_6m FTSE 100</td>
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<td>LogRet_6m IBEX 35</td>
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<td>LogRet_6m AEX</td>
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<td></td>
<td>110.94</td>
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<tr>
<td>Vol</td>
<td>-0.09</td>
<td>-0.011</td>
<td>-0.52</td>
<td>-0.23</td>
<td>-45.89</td>
<td>-11.36</td>
<td>-0.33</td>
<td>-0.33</td>
<td>-15.35</td>
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<tr>
<td>R^2-adj</td>
<td>0.34</td>
<td>0.29</td>
<td>0.09</td>
<td>0.32</td>
<td>0.15</td>
<td>0.43</td>
<td>0.03</td>
<td>0.02</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Between brackets are shown the statistics of significance (c = p<0.05, b = p<0.01, a = p<0.001).  
Source: Authors’ elaboration on SRP data.
Appendix

The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Figure 1: Building block approach from IFRS 4 phase 1 to IFRS 4 phase 2
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Figure 2: Swiss solvency test production schedule based on year-end figures
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Figure 3: Comparison of balance sheets as at 1 January 2014 between phases 1 and 2
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Figure 4: Comparison of balance sheets as at 1Q 2014 between phases 1 and 2

<table>
<thead>
<tr>
<th>IFRS 4 phase 1 1.1.2014</th>
<th>Mvt Q1 2014</th>
<th>IFRS 4 phase 1 1.4.2014</th>
<th>Discounting Impact</th>
<th>MVM</th>
<th>CSM</th>
<th>IFRS 4 phase 2 1.4.2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total 1792.9</td>
<td>UPR -112.2</td>
<td>Total 1584.8</td>
<td>UPR -57.7</td>
<td>31.7</td>
<td>77.6</td>
<td>Total 1587.5</td>
</tr>
<tr>
<td>UPR 967.5</td>
<td>Reserves -95.9</td>
<td>UPR 855.3</td>
<td>Reserves -49.0</td>
<td></td>
<td></td>
<td>CSM 77.6</td>
</tr>
<tr>
<td>Claims reserves 825.4</td>
<td></td>
<td>Claims reserves 729.5</td>
<td></td>
<td></td>
<td></td>
<td>NPV premium reserves 797.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NPV claims reserve 680.5</td>
</tr>
</tbody>
</table>
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Figure 5: Impact of yield curve changes on balance sheet as in 1Q 2014

<table>
<thead>
<tr>
<th>IFRS 4 phase 2 1.4.2014</th>
<th>Additional discounting impact</th>
<th>MVM</th>
<th>CSM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total 1587.5</td>
<td></td>
<td>0.9</td>
<td>2.7</td>
</tr>
<tr>
<td>CSM 77.6</td>
<td>NPV premium 27.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MVM 31.7</td>
<td>NPV claims 22.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPV premium reserves 797.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPV claims reserve 680.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With yield curve impact</td>
<td>Total 1640.8</td>
<td>80.2</td>
<td>32.6</td>
</tr>
<tr>
<td>CSM 80.2</td>
<td>NPV premium reserves 824.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MVM 32.6</td>
<td>NPV claims reserve 703.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Table 1: Proxy estimation of yield curve changes

<table>
<thead>
<tr>
<th></th>
<th>Value before change</th>
<th>Modified duration</th>
<th>Yield change(1)</th>
<th>Proxy</th>
<th>Actual change</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVM</td>
<td>31.7</td>
<td>1.80</td>
<td>-1.84%</td>
<td>1.05</td>
<td>0.85</td>
</tr>
<tr>
<td>CSM</td>
<td>77.6</td>
<td>1.80</td>
<td>-1.84%</td>
<td>2.58</td>
<td>2.66</td>
</tr>
<tr>
<td>NPV claims reserves</td>
<td>680.5</td>
<td>1.80</td>
<td>-1.84%</td>
<td>22.59</td>
<td>22.81</td>
</tr>
<tr>
<td>NPV Premium reserves</td>
<td>797.7</td>
<td>1.80</td>
<td>-1.84%</td>
<td>26.48</td>
<td>27.02</td>
</tr>
<tr>
<td>Total</td>
<td>1587.5</td>
<td>1.80</td>
<td>-1.84%</td>
<td>52.70</td>
<td>53.34</td>
</tr>
</tbody>
</table>

Note (1): The yield change considered for the above calculation is taken on year 2 of the yield curve as the modified duration is 1.8. In addition, it is taken as a weighted average of U.S.$/euro based on claims reserves.
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Table 2: Comparison of the proxy and of the exact amount of second-order effect

<table>
<thead>
<tr>
<th>Second-order effect</th>
<th>Proxy</th>
<th>Exact amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVM</td>
<td>-0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>CSM</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>NPV claims reserves</td>
<td>-1.3</td>
<td>-1.4</td>
</tr>
<tr>
<td>NPV premium reserves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (euros)</td>
<td>-0.1</td>
<td>-0.1</td>
</tr>
</tbody>
</table>
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

**Figure 6: Impact of ULR changes and of the second-order effect**
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Portfolio and assumptions

Table A1: Portfolio of the reinsurance company

<table>
<thead>
<tr>
<th>Contract Nb</th>
<th>Contract type</th>
<th>Currency</th>
<th>Inception</th>
<th>Premium</th>
<th>ULR</th>
<th>Commission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract 1</td>
<td>Casualty prop U.S.</td>
<td>U.S.$</td>
<td>01/01/2010</td>
<td>200</td>
<td>80%</td>
<td>10%</td>
</tr>
<tr>
<td>Contract 2</td>
<td>Prop engineering</td>
<td>U.S.$</td>
<td>01/01/2012</td>
<td>300</td>
<td>85%</td>
<td>10%</td>
</tr>
<tr>
<td>Contract 3</td>
<td>NP motor</td>
<td>EUR</td>
<td>01/01/2013</td>
<td>150</td>
<td>90%</td>
<td>0%</td>
</tr>
<tr>
<td>Contract 4</td>
<td>NP property</td>
<td>EUR</td>
<td>01/01/2014</td>
<td>250</td>
<td>90%</td>
<td>0%</td>
</tr>
<tr>
<td>Contract 5</td>
<td>Prop credit</td>
<td>U.S.$</td>
<td>01/01/2013</td>
<td>100</td>
<td>70%</td>
<td>35%</td>
</tr>
<tr>
<td>Contract 6</td>
<td>NP aviation</td>
<td>U.S.$</td>
<td>01/01/2014</td>
<td>150</td>
<td>80%</td>
<td>0%</td>
</tr>
<tr>
<td>Contract 7</td>
<td>Prop agriculture</td>
<td>EUR</td>
<td>01/01/2012</td>
<td>200</td>
<td>75%</td>
<td>20%</td>
</tr>
<tr>
<td>Contract 8</td>
<td>Casualty NP Europe</td>
<td>EUR</td>
<td>01/01/2011</td>
<td>300</td>
<td>90%</td>
<td>0%</td>
</tr>
</tbody>
</table>

We are assuming an FX rate of 1 U.S.$ = 0.75 EUR. Note: These are one year contracts. ULR stands for ultimate loss ratio.
As an example of the use of patterns shown in Table A2, for contract 1, we are assuming that 10% of the premium will be earned between 1 January 2014 and 1 January 2015.

Formulae used to calculate unearned premium, reserves and margin:

Unearned premium = Premium × Σ Payment Pattern \((i)\)
Reserves = Premium × ULR × Σ Payment Pattern \((ii)\)
Margin = \((1 - ULR - \text{Commission})\) Premium \((iii)\)

Table A2: Payment pattern, premium earning pattern, commission earning pattern and margin earning pattern as at 1 January 2014

<table>
<thead>
<tr>
<th>Contract Nb</th>
<th>1/01/10</th>
<th>1/01/11</th>
<th>1/01/12</th>
<th>1/01/13</th>
<th>1/01/14</th>
<th>1/01/15</th>
<th>1/01/16</th>
<th>1/01/17</th>
<th>1/01/18</th>
<th>1/01/19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract 1</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Contract 2</td>
<td></td>
<td>30%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>10%</td>
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</tr>
<tr>
<td>Contract 3</td>
<td></td>
<td></td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>15%</td>
<td>15%</td>
<td>15%</td>
<td>15%</td>
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<td>Contract 4</td>
<td></td>
<td></td>
<td></td>
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<td>75%</td>
<td>25%</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Contract 5</td>
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<td></td>
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<td>25%</td>
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</tr>
<tr>
<td>Contract 6</td>
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<td></td>
<td></td>
<td></td>
<td>60%</td>
<td>20%</td>
<td>20%</td>
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</tr>
<tr>
<td>Contract 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Contract 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15%</td>
<td>15%</td>
</tr>
</tbody>
</table>

As an example of the use of patterns shown in Table A2, for contract 1, we are assuming that 10% of the premium will be earned between 1 January 2014 and 1 January 2015.
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Portfolio and assumptions continued

Table A3: Margin, UPR and reserves under IFRS 4 phase 1 calculated using above formulae

<table>
<thead>
<tr>
<th>Contract Nb</th>
<th>Currency</th>
<th>Margin</th>
<th>UPR (phase 1)</th>
<th>Reserves (phase 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract 1</td>
<td>U.S.$</td>
<td>20</td>
<td>120</td>
<td>96</td>
</tr>
<tr>
<td>Contract 2</td>
<td>U.S.$</td>
<td>15</td>
<td>150</td>
<td>128</td>
</tr>
<tr>
<td>Contract 3</td>
<td>EUR</td>
<td>15</td>
<td>120</td>
<td>108</td>
</tr>
<tr>
<td>Contract 4</td>
<td>EUR</td>
<td>25</td>
<td>250</td>
<td>225</td>
</tr>
<tr>
<td>Contract 5</td>
<td>U.S.$</td>
<td>-</td>
<td>50</td>
<td>35</td>
</tr>
<tr>
<td>Contract 6</td>
<td>U.S.$</td>
<td>30</td>
<td>150</td>
<td>120</td>
</tr>
<tr>
<td>Contract 7</td>
<td>EUR</td>
<td>10</td>
<td>80</td>
<td>60</td>
</tr>
<tr>
<td>Contract 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total (EUR)</strong></td>
<td></td>
<td><strong>129</strong></td>
<td><strong>968</strong></td>
<td><strong>825</strong></td>
</tr>
</tbody>
</table>

Note: UPR stands for unearned premium reserve
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Portfolio and assumptions continued

Table A4: CoV and capital for each contract as well as the overall capital

<table>
<thead>
<tr>
<th>Contract Nb</th>
<th>Currency</th>
<th>CoV</th>
<th>Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract 1</td>
<td>U.S.$</td>
<td>20%</td>
<td>156.78</td>
</tr>
<tr>
<td>Contract 2</td>
<td>U.S.$</td>
<td>15%</td>
<td>185.16</td>
</tr>
<tr>
<td>Contract 3</td>
<td>EUR</td>
<td>25%</td>
<td>197.56</td>
</tr>
<tr>
<td>Contract 4</td>
<td>EUR</td>
<td>30%</td>
<td>459.06</td>
</tr>
<tr>
<td>Contract 5</td>
<td>U.S.$</td>
<td>20%</td>
<td>57.16</td>
</tr>
<tr>
<td>Contract 6</td>
<td>U.S.$</td>
<td>35%</td>
<td>271.87</td>
</tr>
<tr>
<td>Contract 7</td>
<td>EUR</td>
<td>10%</td>
<td>77.19</td>
</tr>
<tr>
<td>Contract 8</td>
<td>EUR</td>
<td>30%</td>
<td>302.98</td>
</tr>
<tr>
<td><strong>Total (EUR)</strong></td>
<td></td>
<td></td>
<td><strong>651.19</strong></td>
</tr>
</tbody>
</table>

CoV calculation – The parameters $\mu$ and $\sigma$ of the lognormal are derived as follows:

\[ \sigma = \sqrt{\ln(1 + \text{CoV}^2)} \]
\[ \mu = \ln(\text{Reserves}) - \sigma^2/2 \]  \hspace{1cm} (iv)

The capital for each contract based on VaR 99.5% is estimated as:

\[ \text{Capital}_{\text{current}} = \exp(\mu + 2.575829\sigma) \]  \hspace{1cm} (v)

Overall capital requirement is calculated as:

\[ \text{Capital} = \sqrt{\Sigma \text{Capital}_{\text{contract}}} \]  \hspace{1cm} (vi)
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Portfolio and assumptions continued

**Table A5: Yield curve as at 1 January 2014**

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUR</td>
<td>2.50%</td>
<td>3.50%</td>
<td>3.70%</td>
<td>3.80%</td>
<td>3.90%</td>
<td>4.00%</td>
</tr>
<tr>
<td>U.S.$</td>
<td>3.50%</td>
<td>4.50%</td>
<td>4.70%</td>
<td>4.80%</td>
<td>4.90%</td>
<td>5.00%</td>
</tr>
</tbody>
</table>
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Balance sheets as at 1 January 2014

Table A6: Details of reserves calculation and discounting impact for balance sheets as at 1 January 2014

<table>
<thead>
<tr>
<th>Year</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>Total</th>
<th>Discounting impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield curve</td>
<td>EUR</td>
<td>2.50%</td>
<td>3.50%</td>
<td>3.70%</td>
<td>3.80%</td>
<td>3.90%</td>
<td>4.00%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>U.S.$</td>
<td>3.50%</td>
<td>4.50%</td>
<td>4.70%</td>
<td>4.80%</td>
<td>4.90%</td>
<td>5.00%</td>
<td></td>
</tr>
<tr>
<td>Claims reserves</td>
<td>Cash flows EUR</td>
<td>266.3</td>
<td>147.0</td>
<td>60.8</td>
<td>47.3</td>
<td>20.3</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cash flows U.S.$</td>
<td>156.5</td>
<td>108.5</td>
<td>65.5</td>
<td>16.0</td>
<td>16.0</td>
<td>16.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total cash flows (EUR)</td>
<td>383.6</td>
<td>228.4</td>
<td>109.9</td>
<td>59.3</td>
<td>32.3</td>
<td>12.0</td>
<td>825.4</td>
</tr>
<tr>
<td></td>
<td>Discounted cash flows EUR</td>
<td>259.8</td>
<td>137.2</td>
<td>54.5</td>
<td>40.7</td>
<td>16.7</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discounted cash flows U.S.$</td>
<td>151.2</td>
<td>99.4</td>
<td>57.1</td>
<td>13.3</td>
<td>12.6</td>
<td>11.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total discounted cash flows (EUR)</td>
<td>373.2</td>
<td>211.7</td>
<td>97.3</td>
<td>50.6</td>
<td>26.2</td>
<td>9.0</td>
<td>768.0 -57.4</td>
</tr>
<tr>
<td>Premium reserves</td>
<td>Cash flows EUR</td>
<td>302.5</td>
<td>170.0</td>
<td>67.5</td>
<td>52.5</td>
<td>22.5</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cash flows U.S.$</td>
<td>195.0</td>
<td>135.0</td>
<td>80.0</td>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total cash flows (EUR)</td>
<td>448.8</td>
<td>271.3</td>
<td>127.5</td>
<td>67.5</td>
<td>37.5</td>
<td>15.0</td>
<td>967.5</td>
</tr>
<tr>
<td></td>
<td>Discounted cash flows EUR</td>
<td>295.1</td>
<td>158.7</td>
<td>60.5</td>
<td>45.2</td>
<td>18.6</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discounted cash flows U.S.$</td>
<td>188.4</td>
<td>123.6</td>
<td>69.7</td>
<td>16.6</td>
<td>15.7</td>
<td>14.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total discounted cash flows (EUR)</td>
<td>436.4</td>
<td>251.4</td>
<td>112.8</td>
<td>57.7</td>
<td>30.4</td>
<td>11.2</td>
<td>899.9 -67.6</td>
</tr>
</tbody>
</table>
Note (1): The future capital requirements are estimated as the product of the overall capital requirement as at 1 January 2014 (See Table A4: 651.19) and the claims reserve patterns. This is based on the assumption that the future capital requirements will be proportional to the amount of reserves remaining. Such assumption is generally accepted for internal model purpose (e.g., SST or Solvency II).

Note (2): The MVM is estimated as 6% of the sum of the discounted future capital requirements.

APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Balance sheets as at 1 January 2014 continued

Table A7: Details of MVM calculation for balance sheets as at 1 January 2014

<table>
<thead>
<tr>
<th>Year end</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
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<tbody>
<tr>
<td>Yield curve (EUR)</td>
<td>2.50%</td>
<td>3.50%</td>
<td>3.70%</td>
<td>3.80%</td>
<td>3.90%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Claims reserve cash flow</td>
<td>383.6</td>
<td>228.4</td>
<td>109.9</td>
<td>59.3</td>
<td>32.3</td>
<td>12.0</td>
</tr>
<tr>
<td>Claims reserve pattern</td>
<td>46.5%</td>
<td>27.7%</td>
<td>13.3%</td>
<td>7.2%</td>
<td>3.9%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Future capital requirement</td>
<td>302.7</td>
<td>180.2</td>
<td>86.7</td>
<td>46.7</td>
<td>25.4</td>
<td>9.5</td>
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<tr>
<td>Discounted future capital requirement</td>
<td>295.3</td>
<td>168.2</td>
<td>77.7</td>
<td>40.3</td>
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<tr>
<td>MVM</td>
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<td></td>
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<td></td>
<td></td>
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Note (1): The future capital requirements are estimated as the product of the overall capital requirement as at 1 January 2014 (See Table A4: 651.19) and the claims reserve patterns. This is based on the assumption that the future capital requirements will be proportional to the amount of reserves remaining. Such assumption is generally accepted for internal model purpose (e.g., SST or Solvency II).

Note (2): The MVM is estimated as 6% of the sum of the discounted future capital requirements.
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Balance sheets as at 1 January 2014 continued

Table A8: Details of CSM calculation for balance sheets as at 1 January 2014

<table>
<thead>
<tr>
<th>Year end</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract 1</td>
<td>U.S.$</td>
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<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
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<td>Contract 2</td>
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<td>3.0</td>
<td>1.5</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Contract 3</td>
<td>EUR</td>
<td>3.0</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Contract 4</td>
<td>EUR</td>
<td>18.8</td>
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<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Contract 5</td>
<td>U.S.$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Contract 6</td>
<td>U.S.$</td>
<td>18.0</td>
<td>6.0</td>
<td>6.0</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Contract 7</td>
<td>EUR</td>
<td>2.0</td>
<td>2.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>Contract 8</td>
<td>EUR</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
<td>3.0</td>
<td>-</td>
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<td>15.0</td>
<td>6.8</td>
<td>5.3</td>
<td>2.3</td>
</tr>
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<td>CSM (USD)</td>
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<td>23.0</td>
<td>11.0</td>
<td>9.5</td>
<td>2.0</td>
<td>2.0</td>
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<tr>
<td>Total CSM (EUR)</td>
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<td>45.5</td>
<td>23.3</td>
<td>13.9</td>
<td>6.8</td>
<td>3.8</td>
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<td>Discounted CSM (EUR)</td>
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<td>27.6</td>
<td>14.0</td>
<td>6.1</td>
<td>4.5</td>
<td>1.9</td>
</tr>
<tr>
<td>Discounted CSM (U.S.)</td>
<td></td>
<td>22.2</td>
<td>10.1</td>
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<td>1.6</td>
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<tr>
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<td>44.2</td>
<td>21.6</td>
<td>12.3</td>
<td>5.8</td>
<td>3.0</td>
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Total 88.0
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Balance sheets as at 1 April 2014 assuming no changes

Table A9: Pattern as at 1Q 2014

<table>
<thead>
<tr>
<th>Contract Nb</th>
<th>Contract type</th>
<th>Currency</th>
<th>01/04/2014</th>
<th>01/01/2015</th>
<th>01/01/2016</th>
<th>01/01/2017</th>
<th>01/01/2018</th>
<th>01/01/2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract 1</td>
<td>Casualty property U.S.</td>
<td>U.S.$</td>
<td>7.5%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Contract 2</td>
<td>Prop engineering</td>
<td>U.S.$</td>
<td>15.0%</td>
<td>20%</td>
<td>10%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract 3</td>
<td>NP motor</td>
<td>EUR</td>
<td>15.0%</td>
<td>15%</td>
<td>15%</td>
<td>15%</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>Contract 4</td>
<td>NP property</td>
<td>EUR</td>
<td>56.3%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract 5</td>
<td>Prop credit</td>
<td>U.S.$</td>
<td>18.8%</td>
<td>25%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract 6</td>
<td>NP aviation</td>
<td>U.S.$</td>
<td>45.0%</td>
<td>20%</td>
<td>20%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract 7</td>
<td>Prop agriculture</td>
<td>EUR</td>
<td>15.0%</td>
<td>20%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract 8</td>
<td>Casualty NP Europe</td>
<td>EUR</td>
<td>11.3%</td>
<td>15%</td>
<td>15%</td>
<td>10%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Balance sheets as at 1 April 2014 assuming no changes continued

Table A10: Yield curve as at 1Q 2014

<table>
<thead>
<tr>
<th>Year of discounting</th>
<th>0.75</th>
<th>1.75</th>
<th>2.75</th>
<th>3.75</th>
<th>4.75</th>
<th>5.75</th>
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</thead>
<tbody>
<tr>
<td>EUR</td>
<td>2.50%</td>
<td>3.50%</td>
<td>3.70%</td>
<td>3.80%</td>
<td>3.90%</td>
<td>4.00%</td>
</tr>
<tr>
<td>USD</td>
<td>3.50%</td>
<td>4.50%</td>
<td>4.70%</td>
<td>4.80%</td>
<td>4.90%</td>
<td>5.00%</td>
</tr>
</tbody>
</table>
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Balance sheets as at 1 April 2014 assuming no changes continued

Table A11: Details of reserves calculation and discounting impact for balance sheets as at 1 April 2014 assuming no changes

<table>
<thead>
<tr>
<th>Year</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>Total</th>
<th>Discounting impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield curve</td>
<td>EUR</td>
<td>2.50%</td>
<td>3.50%</td>
<td>3.70%</td>
<td>3.80%</td>
<td>3.90%</td>
<td>4.00%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>U.S.$</td>
<td>3.50%</td>
<td>4.50%</td>
<td>4.70%</td>
<td>4.80%</td>
<td>4.90%</td>
<td>5.00%</td>
<td></td>
</tr>
<tr>
<td>Claims Reserves</td>
<td>Cash flows EUR</td>
<td>199.7</td>
<td>147.0</td>
<td>60.8</td>
<td>47.3</td>
<td>20.3</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cash flows U.S.$</td>
<td>117.4</td>
<td>108.5</td>
<td>65.5</td>
<td>16.0</td>
<td>16.0</td>
<td>16.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total cash flows (EUR)</td>
<td>287.7</td>
<td>228.4</td>
<td>109.9</td>
<td>59.3</td>
<td>32.3</td>
<td>12.0</td>
<td>729.5</td>
</tr>
<tr>
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<td>Discounted cash flows EUR</td>
<td>196.0</td>
<td>138.4</td>
<td>55.0</td>
<td>41.1</td>
<td>16.9</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discounted cash flows U.S.$</td>
<td>114.0</td>
<td>100.5</td>
<td>57.7</td>
<td>13.4</td>
<td>12.7</td>
<td>12.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total discounted cash flows (EUR)</td>
<td>281.8</td>
<td>213.8</td>
<td>98.3</td>
<td>51.1</td>
<td>26.4</td>
<td>9.1</td>
<td>680.5</td>
</tr>
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<td>Premium Reserves</td>
<td>Cash flows EUR</td>
<td>226.9</td>
<td>170.0</td>
<td>67.5</td>
<td>52.5</td>
<td>22.5</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cash flows U.S.$</td>
<td>146.3</td>
<td>135.0</td>
<td>80.0</td>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total cash flows (EUR)</td>
<td>336.6</td>
<td>271.3</td>
<td>127.5</td>
<td>67.5</td>
<td>37.5</td>
<td>15.0</td>
<td>855.3</td>
</tr>
<tr>
<td></td>
<td>Discounted cash flows EUR</td>
<td>222.7</td>
<td>160.1</td>
<td>61.1</td>
<td>45.6</td>
<td>18.8</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discounted cash flows U.S.$</td>
<td>142.5</td>
<td>125.0</td>
<td>70.5</td>
<td>16.8</td>
<td>15.9</td>
<td>15.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total discounted cash flows (EUR)</td>
<td>329.6</td>
<td>253.8</td>
<td>114.0</td>
<td>58.2</td>
<td>30.7</td>
<td>11.3</td>
<td>797.7</td>
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</table>
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Balance sheets as at 1 April 2014 assuming no changes continued

Table A12: Details of MVM calculation for balance sheets as at 1 April 2014 assuming no changes

<table>
<thead>
<tr>
<th>Year end</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield curve (EUR)</td>
<td>2.50%</td>
<td>3.50%</td>
<td>3.70%</td>
<td>3.80%</td>
<td>3.90%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Claims reserve cash flow</td>
<td>287.7</td>
<td>228.4</td>
<td>109.9</td>
<td>59.3</td>
<td>32.3</td>
<td>12.0</td>
</tr>
<tr>
<td>Claims reserve pattern</td>
<td>39.4%</td>
<td>31.3%</td>
<td>15.1%</td>
<td>8.1%</td>
<td>4.4%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Future capital requirement(1)</td>
<td>222.2</td>
<td>176.4</td>
<td>84.9</td>
<td>45.8</td>
<td>24.9</td>
<td>9.3</td>
</tr>
<tr>
<td>Discounted future capital requirement</td>
<td>218.2</td>
<td>166.1</td>
<td>76.8</td>
<td>39.8</td>
<td>20.8</td>
<td>7.4</td>
</tr>
<tr>
<td>MVM (2)</td>
<td>31.7</td>
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<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Note (1): The future capital requirements are estimated as the product of the overall capital requirement as at 1 April 2014 (563.43) and the claims reserve patterns. This is based on the assumption that the future capital requirements will be proportional to the amount of reserves remaining. Such assumption is generally accepted for internal model purpose (e.g., SST or Solvency II).

Note (2): The MVM is estimated as 6% of the sum of the discounted future capital requirements.
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Balance sheets as at 1 April 2014 assuming no changes continued

Table A13: Details of CSM calculation for balance sheets as at 1 April 2014

<table>
<thead>
<tr>
<th>Year end</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract 1</td>
<td>U.S.$</td>
<td>1.5</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Contract 2</td>
<td>U.S.$</td>
<td>2.3</td>
<td>3.0</td>
<td>1.5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Contract 3</td>
<td>EUR</td>
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<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Contract 4</td>
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<td>14.1</td>
<td>6.3</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Contract 5</td>
<td>U.S.$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
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<td>6.0</td>
<td>6.0</td>
<td>-</td>
<td>-</td>
</tr>
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<td>Contract 7</td>
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<td>2.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Contract 8</td>
<td>EUR</td>
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<td>4.5</td>
<td>4.5</td>
<td>3.0</td>
<td>-</td>
</tr>
<tr>
<td>CSM (EUR)</td>
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<td>21.2</td>
<td>15.0</td>
<td>6.8</td>
<td>5.3</td>
<td>2.3</td>
</tr>
<tr>
<td>CSM (U.S.$)</td>
<td></td>
<td>17.3</td>
<td>11.0</td>
<td>9.5</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Total CSM (EUR)</td>
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<td>34.1</td>
<td>23.3</td>
<td>13.9</td>
<td>6.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Discounted CSM (EUR)</td>
<td></td>
<td>20.8</td>
<td>14.1</td>
<td>6.1</td>
<td>6.1</td>
<td>1.9</td>
</tr>
<tr>
<td>Discounted CSM (U.S.$)</td>
<td></td>
<td>16.8</td>
<td>10.2</td>
<td>8.4</td>
<td>1.7</td>
<td>1.5</td>
</tr>
<tr>
<td>Total discounted CSM (EUR)</td>
<td></td>
<td>33.4</td>
<td>21.8</td>
<td>12.4</td>
<td>5.8</td>
<td>3.1</td>
</tr>
</tbody>
</table>
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Balance sheets as at 1 April 2014 assuming no changes continued

Table A14: Yield curve as at 1Q 2014 after changes

<table>
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<tr>
<th></th>
<th>0.75</th>
<th>1.75</th>
<th>2.75</th>
<th>3.75</th>
<th>4.75</th>
<th>5.75</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUR</td>
<td>1.00%</td>
<td>2.00%</td>
<td>2.20%</td>
<td>2.30%</td>
<td>2.40%</td>
<td>2.50%</td>
</tr>
<tr>
<td>USD</td>
<td>1.00%</td>
<td>2.00%</td>
<td>2.20%</td>
<td>2.30%</td>
<td>2.40%</td>
<td>2.50%</td>
</tr>
</tbody>
</table>
APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2

Balance sheets as at 1 April 2014 assuming no changes continued

Table A15: Impact of ULR changes on margin, claims reserves and capital requirement

<table>
<thead>
<tr>
<th>Contract Nb</th>
<th>Currency</th>
<th>Premium</th>
<th>ULR</th>
<th>Commission</th>
<th>Margin</th>
<th>Claims reserves</th>
<th>Capital</th>
</tr>
</thead>
<tbody>
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<td>Contract 1</td>
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<td>200</td>
<td>75.00%</td>
<td>10%</td>
<td>17.3</td>
<td>86.3</td>
<td>140.9</td>
</tr>
<tr>
<td>Contract 2</td>
<td>U.S.$</td>
<td>300</td>
<td>80.00%</td>
<td>10%</td>
<td>13.5</td>
<td>108.0</td>
<td>156.8</td>
</tr>
<tr>
<td>Contract 3</td>
<td>EUR</td>
<td>150</td>
<td>85.00%</td>
<td>0%</td>
<td>16.9</td>
<td>95.6</td>
<td>174.9</td>
</tr>
<tr>
<td>Contract 4</td>
<td>EUR</td>
<td>250</td>
<td>85.00%</td>
<td>0%</td>
<td>30.5</td>
<td>172.7</td>
<td>352.3</td>
</tr>
<tr>
<td>Contract 5</td>
<td>U.S.$</td>
<td>100</td>
<td>65.00%</td>
<td>35%</td>
<td>0.0</td>
<td>28.4</td>
<td>46.4</td>
</tr>
<tr>
<td>Contract 6</td>
<td>U.S.$</td>
<td>150</td>
<td>75.00%</td>
<td>0%</td>
<td>31.9</td>
<td>95.6</td>
<td>216.6</td>
</tr>
<tr>
<td>Contract 7</td>
<td>EUR</td>
<td>200</td>
<td>70.00%</td>
<td>20%</td>
<td>7.0</td>
<td>49.0</td>
<td>63.0</td>
</tr>
<tr>
<td>Contract 8</td>
<td>EUR</td>
<td>300</td>
<td>85.00%</td>
<td>0%</td>
<td>23.1</td>
<td>130.7</td>
<td>266.6</td>
</tr>
<tr>
<td>Total (EUR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>124.4</td>
<td>686.7</td>
<td>531.4</td>
</tr>
</tbody>
</table>
Based on the ULR changes only, the IFRS 4 phase 2 balance sheet is modified as follows compared to the balance sheet as at 1 April 2014 assuming no changes:

### Table 16: Impact of ULR changes on IFRS 4 phase 2 balance sheet

<table>
<thead>
<tr>
<th></th>
<th>Value after ULR change</th>
<th>Movement due to ULR change</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVM</td>
<td>29.9</td>
<td>-1.8</td>
</tr>
<tr>
<td>CSM</td>
<td>115.9</td>
<td>38.3</td>
</tr>
<tr>
<td>NPV claims reserves</td>
<td>640.6</td>
<td>-39.9</td>
</tr>
<tr>
<td>NPV premium reserves</td>
<td>797.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Total (EUR)</td>
<td>1584.1</td>
<td>-3.4</td>
</tr>
</tbody>
</table>

APPENDIX: The computational and timing challenge of quarterly nonlife (re)insurance liability evaluation under IFRS 4 phase 2
Appendix

The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

Figure 1: MV-efficient frontiers for various leverage constraints

Source: Jacobs and Levy (2014)
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

Figure 2: MV(1) utility of optimal MV(1) portfolios as a function of enhancement

Source: Jacobs and Levy (2014)
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

Table 1: Characteristics of optimal MV(1) portfolios from the perspective of an MV(1) investor

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>EAE</th>
<th>Leverage</th>
<th>Standard deviation of active return</th>
<th>Expected active return</th>
<th>Utility for an MV(1) investor</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>100-0</td>
<td>0</td>
<td>4.52</td>
<td>2.77</td>
<td>2.67</td>
</tr>
<tr>
<td>b</td>
<td>110-10</td>
<td>0.2</td>
<td>4.91</td>
<td>3.27</td>
<td>3.15</td>
</tr>
<tr>
<td>c</td>
<td>120-20</td>
<td>0.4</td>
<td>5.42</td>
<td>3.76</td>
<td>3.61</td>
</tr>
<tr>
<td>d</td>
<td>130-30</td>
<td>0.6</td>
<td>5.94</td>
<td>4.23</td>
<td>4.06</td>
</tr>
<tr>
<td>e</td>
<td>140-40</td>
<td>0.8</td>
<td>6.53</td>
<td>4.70</td>
<td>4.48</td>
</tr>
<tr>
<td>f</td>
<td>150-50</td>
<td>1.0</td>
<td>7.03</td>
<td>5.14</td>
<td>4.90</td>
</tr>
<tr>
<td>z</td>
<td>492-392</td>
<td>7.84</td>
<td>15.43</td>
<td>11.55</td>
<td>10.36</td>
</tr>
</tbody>
</table>

Source: Jacobs and Levy (2014)
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

Table 2: Characteristics of optimal MV(1) portfolios from the perspective of an MVL(1,1) investor

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>EAE</th>
<th>Leverage</th>
<th>Standard deviation of active return</th>
<th>Expected active return</th>
<th>Utility for an MVL(1,1) investor</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>100-0</td>
<td>0</td>
<td>4.52</td>
<td>2.77</td>
<td>2.67</td>
</tr>
<tr>
<td>b</td>
<td>110-10</td>
<td>0.2</td>
<td>4.91</td>
<td>3.27</td>
<td>3.08</td>
</tr>
<tr>
<td>c</td>
<td>120-20</td>
<td>0.4</td>
<td>5.42</td>
<td>3.76</td>
<td>3.32</td>
</tr>
<tr>
<td>g</td>
<td>129-29</td>
<td>0.58</td>
<td>5.89</td>
<td>4.18</td>
<td>3.39</td>
</tr>
<tr>
<td>d</td>
<td>130-30</td>
<td>0.6</td>
<td>5.94</td>
<td>4.23</td>
<td>3.38</td>
</tr>
<tr>
<td>e</td>
<td>140-40</td>
<td>0.8</td>
<td>6.53</td>
<td>4.70</td>
<td>3.27</td>
</tr>
<tr>
<td>f</td>
<td>150-50</td>
<td>1.0</td>
<td>7.03</td>
<td>5.14</td>
<td>2.97</td>
</tr>
</tbody>
</table>

Source: Jacobs and Levy (2014)
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

Figure 3: MVL(1,1) utility of optimal MV(1) portfolios as a function of enhancement

Source: Jacobs and Levy (2014)
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

Figure 4: MVL-efficient frontier for zero leverage tolerance

Source: Jacobs and Levy (2013b)
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

Figure 5: MVL-efficient frontier for leverage tolerance of 1

Source: Jacobs and Levy (2013b)
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

Figure 6: MVL-efficient frontier for infinite leverage tolerance

Source: Jacobs and Levy (2013b)
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

Figure 7: MVL-efficient frontier for infinite leverage tolerance with no security active-weight constraint
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

Figure 8: MVL-efficient frontiers for various leverage-tolerance cases with the 10% security active-weight constraint

Source: Jacobs and Levy (2013b)
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

**Table 3: Characteristics of MVL ($\tau_v$, $\tau_L$) portfolios A, B and C**

<table>
<thead>
<tr>
<th></th>
<th>$\tau_L$</th>
<th>$\tau_v$</th>
<th>EAE</th>
<th>$\sigma_p$</th>
<th>$\alpha_p$</th>
<th>$U_A$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.00</td>
<td>0.24</td>
<td>125-25</td>
<td>5.00</td>
<td>3.93</td>
<td>2.93</td>
</tr>
<tr>
<td>B</td>
<td>2.00</td>
<td>0.14</td>
<td>139-39</td>
<td>5.00</td>
<td>4.39</td>
<td>2.72</td>
</tr>
<tr>
<td>C</td>
<td>2.00</td>
<td>0.09</td>
<td>135-35</td>
<td>4.21</td>
<td>3.93</td>
<td>2.68</td>
</tr>
</tbody>
</table>

Source: Jacobs and Levy (2013b)
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

Figure 9: MVL-efficient region for various leverage and volatility-tolerance cases with no security active-weight constraint

Source: Jacobs and Levy (2013b)
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

**Figure 10: MVL-efficient surface**

Source: Jacobs and Levy (2014)
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

**Figure 11: Contour map of the efficient surface**

Source: Jacobs and Levy (2014)
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

Figure 12: Characteristics of optimal MVL(1, τ_L) portfolios

Source: Jacobs and Levy (2014)
APPENDIX: The unique risks of portfolio leverage: why modern portfolio theory fails and how to fix it

Figure 13: Volatility and leverage polar cases

<table>
<thead>
<tr>
<th>Portfolio leverage</th>
<th>Underlying portfolio volatility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Long-only index fund</td>
</tr>
<tr>
<td></td>
<td>Enron employee's single-stock holding</td>
</tr>
<tr>
<td></td>
<td>LTCM's leveraged low-risk arbitrage positions</td>
</tr>
<tr>
<td></td>
<td>CEO's leveraged Chesapeake Energy stock</td>
</tr>
</tbody>
</table>
Appendix

Risk management formations - an alternative approach to the 3 lines of defense model
APPENDIX: Risk management formations – an alternative approach to the 3 lines of defense model

Figure 1: Risk management purpose angles

1. **Take risk**
   - The purpose of those involved here is to take risks.

2. **Help others take risk**
   - These individuals help others take risk by providing insight and support.

3. **Stop others taking certain risks**
   - These individuals exercise a policing role to prevent others taking certain risks.

4. **Keep score on risk levels**
   - These individuals provide information on the level of risk exposure taken by others.

5. **Independently review risk taking**
   - The purpose of these individuals is to provide independent reviews on the risk management activity of others.
APPENDIX: Risk management formations – an alternative approach to the 3 lines of defense model

Table 1: Formation table

<table>
<thead>
<tr>
<th>Formations</th>
<th>Description</th>
<th>Take</th>
<th>Help</th>
<th>Stop</th>
<th>Keep</th>
<th>Ind.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take</td>
<td>Those using the T formation have responsibility for taking risks effectively. They do not have direct responsibility for reporting/monitoring risk levels.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Help</td>
<td>H formation does not hold responsibility for taking risk but its purpose is to provide insight and assistance to help others take risk. Those adopting H do not have direct responsibility for reporting/monitoring overall risk levels.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stop</td>
<td>Those using the S formation role are there to exert a “policing influence” on the risks taken by others. Their job is primarily to ensure that certain risks and/or levels of risk are not taken by others. They do not have direct responsibility for reporting/monitoring overall risk levels.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keep</td>
<td>K has responsibility for ensuring that there is sufficient transparency and reporting of the risks being taken. However, they have no direct responsibility for taking risks or for helping others to take risk. They have no direct responsibility for policing the risk-taking of others.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take and keep score</td>
<td>Those using the TK formation have responsibility for taking risks effectively and for ensuring that there is sufficient transparency and reporting of the risks being taken.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take and help</td>
<td>The TH formation takes risk and helps in taking the same risks by providing insight and information. It does not make sense for an individual to perform both at the same time in our model because they would be taking risk and helping themselves to take risk simultaneously. In substance, this would be more like the T formation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take, help and stop</td>
<td>The THS formation takes risk and helps in taking a certain risk by providing information and oversight. However, it also stops risk-taking at the same time. It is not desirable for these roles to be performed by an individual at the same time in our model and the T and S combination, in particular, makes this red.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take, help, stop and keep score</td>
<td>Those using the THSK formation take risk, help take risk, stop risk-taking and keep score, all at the same time. This is not desirable for an individual in our model and, in particular, the T and S combination makes this red.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take, help and keep score</td>
<td>Those using the THK formation take risk, help take risk and keep score. The combination of T and H does not make sense for an individual in our model and in substance this would be more like the TK formation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take and stop</td>
<td>Those using the TS formation take risks and stop taking risks at the same time. It is not desirable for the same individual to have both roles as a primary purpose at the same time. However, in recognition that it might exist in practice (and in our view it needs to be corrected), we have given it a red flag status.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take, stop and keep score</td>
<td>TSK formation takes and stop risk while keeping score. It is not desirable for the same individual to take and stop risk at the same time. However, in recognition that it might exist, we have given it a red flag status.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Help and stop</td>
<td>The HS formation helps in assessing and giving insight in certain risks and ensuring that people do not take certain risks.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Help, stop and keep score</td>
<td>HSK formation does not hold responsibility for taking risk but does have responsibility for helping to take risk, stopping risk and keeping score.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Help and keep score</td>
<td>HK formation does not hold responsibility for taking risk but its purpose is to provide insight and assistance to help others take risk. HK also has responsibility for ensuring that there is sufficient transparency and reporting of the risks being taken.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stop and keep score</td>
<td>Those using the SK formation role are there to exert a “policing influence” on the taking of risks by others. Their job is primarily to ensure that certain risks and/or levels of risk are not taken by others. SK also has responsibility for ensuring that there is sufficient transparency and reporting of the risks being taken.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Classification: white boxes represent good formation, which means there are no apparent problems and the formation could contribute to effective risk management. Amber boxes, which represent amber flag formations, may be problematic but could be acceptable for proportionality purposes as long as the implications are understood. Red boxes, which represent red flag formations, are likely to be problematic for managing risk because they appear to contain conflicts of interest for individuals. Grey boxes, which represent grey formations, do not have red or amber properties but they also seem to be nonsensical in nature. If applied in practice they would in substance be the same as a different, more straightforward and easier to understand, formation.

*The inclusion of “I” in combination with any other purpose would automatically make that formation a red flag formation. Note that the role of “quality assurance” within an internal audit department has not been included in this model but would likely be treated as an additional column in this table with conflict potentially arising in the event of a formation which combined “I” with the new column.
Appendix

Reinsurance and stability: catering to the needs of countries at different stages of development
APPENDIX: Reinsurance and stability: catering to the needs of countries at different stages of development

Table 1: Reinsurers’ worldwide premium income (U.S.$ billion)

<table>
<thead>
<tr>
<th>Reinsurance protection</th>
<th>Nonlife</th>
<th>Life</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worldwide aggregated premium</td>
<td>166</td>
<td>54</td>
<td>220</td>
</tr>
</tbody>
</table>

Source: IAIS (2012a)
APPENDIX: Reinsurance and stability: catering to the needs of countries at different stages of development

Figure 1: Risk transfer and the growth response to natural catastrophes

Source: Authors’ simulations based on results in von Peter et al. (2012).
APPENDIX: Reinsurance and stability: catering to the needs of countries at different stages of development

Figure 2: Natural catastrophes – frequency and losses

Source: Authors' calculations based on Munich Re NatCatSERVICE; the Centre for Research on the Epidemiology of Disasters EM-DAT database.
APPENDIX: Reinsurance and stability: catering to the needs of countries at different stages of development

Figure 3: A scheme to analyze peak risks affecting the global insurance market

This figure illustrates catastrophe risk transfer based on the materialization of peak risks, with the size of arrows proportional to the volume of losses caused by natural catastrophes in 2011. The single most important event during that year was the Tohoku earthquake and tsunami which affected large parts of Japan.

Sources: Company reports; authors’ calculations and estimates.
APPENDIX: Reinsurance and stability: catering to the needs of countries at different stages of development

Figure 4: Catastrophe bond issuance by type of risk

Sources: Artemis; Guy Carpenter; authors’ calculations.
APPENDIX: Reinsurance and stability: catering to the needs of countries at different stages of development

Figure 5: Securitization of peak risks

The solid black lines show payments made ex ante with certainty. The green arrow depicts repayment that takes place if the specified catastrophe does not materialize. If the catastrophe occurs, the investments are liquidated and proceeds are transferred to the sponsoring reinsurance company for meeting claims.
Sources: National Association of Insurance Commissions and Center for Insurance Policy and Research; authors’ adaptation.

1 Special purpose vehicle that issues natural catastrophe bonds and places assets in a trust fund.
APPENDIX: Reinsurance and stability: catering to the needs of countries at different stages of development

Figure 6: Reinsurance financial indicators

Sources: Bloomberg; Standard & Poor’s, Global Reinsurance Highlights; authors’ calculations.
1 The vertical lines indicate the dates of Hurricanes Katrina (29 August 2005), Rita (24 September 2005) and Wilma (22 October 2005) and the Great East Japan earthquake and tsunami (11 March 2011). The shaded area represents the period between the Lehman Brothers bankruptcy (15 September 2008) and the equity market trough (9 March 2009).
2 The MSCI insurance sub-index and shareholder equity are rebased: 31 December 2007 = 100. The combined ratio weighted is in percent.
3 Ten largest companies, excluding Berkshire Hathaway and Reinsurance Group of America, weighted by their yearly respective market share in gross premium income. The combined ratio expresses losses plus expenses as a share of premium income.
APPENDIX: Reinsurance and stability: catering to the needs of countries at different stages of development

Figure 7: Insurance density and catastrophe losses

Sources: Munich Re NatCatSERVICE; SwissRe Sigma database; authors’ calculations.
1 Insurance density is measured as the premium volume per capita that insurance companies receive for domestically insuring non-life (property and casualty) risks. 2 The stacked bars represent the annual insured losses from natural catastrophes since 1980, broken down by the continents in which the events occurred.
2 Oceania includes Australia, New Zealand and Pacific islands.
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