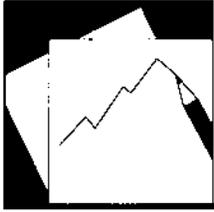


# Working Paper

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## The Limits of Market-Based Risk Transfer and Implications for Managing Systemic Risks

*Todd Groome, Nicolas Blancher,  
Francois Haas, John Kiff, William Lee,  
Paul Mills, Shinobu Nakagawa,  
Parmeshwar Ramlogan,  
Oksana Khadarina, and Yoon Sook Kim*

**IMF Working Paper**

International Capital Markets Department

**THE LIMITS OF MARKET-BASED RISK TRANSFER AND IMPLICATIONS FOR MANAGING  
SYSTEMIC RISKS**

**Prepared by Todd Groome, Nicolas Blancher, Francois Haas, John Kiff, William Lee,  
Paul Mills, Shinobu Nakagawa, Parmeshwar Ramlogan,  
Oksana Khadarina, and Yoon Sook Kim<sup>1</sup>**

Authorized for distribution by Hung Q. Tran

September 2006

**Abstract**

**This Working Paper should not be reported as representing the views of the IMF.**

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

The paper discusses the limits to market-based risk transfer in the financial system and the implications for the management of systemic long-term financial risks. Financial instruments or markets to transfer and better manage these risks across institutions and sectors are, as yet, either nascent or nonexistent. As such, the paper investigates why these markets remain “incomplete.” It also explores a range of options by which policymakers may encourage the development of these markets as part of governments’ role as a risk manager.

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Author’s E-Mail Address: [Tgroome@imf.org](mailto:Tgroome@imf.org)

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## Executive Summary

The paper builds on a series of analytical studies published in the International Monetary Fund's *Global Financial Stability Report* on risk management and the flow of risks in the financial system. It discusses the limits to market-based risk transfer and the implications for the management of systemic long-term risks, such as ageing-related liabilities and risks. Such risks have important implications for economic welfare and broader financial stability. Instruments or markets to transfer and better manage these risks across institutions and sectors are, as yet, either nascent or nonexistent. As such, the paper investigates why these markets remain "incomplete." It also explores a range of options by which policymakers may encourage the development of these markets as part of governments' broader role as a risk manager.

After identifying the major long-gestation, accumulating risks, the paper reviews the structural influences on market behavior and explores why risk transfer activity is absent or to date ineffective in the context of these risks. Key influences include regulatory frameworks, rating agency treatment, tax and accounting policies, market structure, and the availability of data and risk modeling capabilities. The paper highlights the authorities' ability to influence market behavior and risk management practices, in particular through regulatory influences, which may encourage greater innovation in alternative risk transfer markets, similar to the Basel principles for banks. Government policies may also help to improve the measurement of risks and, therefore, the management and potential transfer of risks to holders who are better suited to manage such risks. Efforts to develop such market-based risk management capabilities may also produce a "virtuous circle," and facilitate a more informed public debate regarding these important risks.

Finally, governments need to act as a risk manager, by taking a long-term and proactive approach to the management and possible sharing of such risks across sectors. Three broad complementary potential policy approaches are highlighted: (1) governments may use the many different policy levers at their disposal to encourage private sector and market-based solutions to foster more "complete markets"; (2) governments may determine in some cases that the least cost or most efficient approach is to use their own balance sheet, and to act as the "insurer of last resort"; and/or (3) governments may determine that households, as the ultimate "shareholders" of the system, are best positioned to efficiently and effectively manage or absorb these risks. Given the multigenerational nature of many of the challenges and most of the likely reforms, it is important to move forward more ambitiously and more comprehensively to tackle these risks. Policymakers should therefore seek to build greater public support for more timely policy initiatives.

## I. INTRODUCTION

As documented in various issues of the IMF's *Global Financial Stability Report* (GFSR), risk management in the financial sector of industrial economies has broadly improved in recent years, due in part to greater risk transfer activity which serves to disperse risk and diversify the holders of risk. Accordingly, such studies have found that systemically important financial institutions and the broader financial markets have become more resilient, and that financial stability has been enhanced by risk transfer activities, even if new types of risk may be introduced.

However, there are several significant economic risks facing industrial countries (and many developing economies) in the medium to longer term, which have the potential to produce severe economic costs, and possibly financial market instability. Not surprisingly, given their systemic importance, such events tend to be rooted in real economy developments, with potentially material GDP and economic welfare impacts. Some of the most significant risks relate to global demographic trends and ageing populations, such as pension and health care provision, which are expected to put tremendous pressure on public and private finances in the medium term, causing some countries to rethink the role and scope of the "welfare state." Moreover, such potentially adverse economic and financial stability impacts are likely to be more significant the longer policymakers delay actions designed to mitigate or to better manage these risks and related obligations.

Among G-10 policymakers, there seems a clear recognition that these longer-term risks present challenges to public and private finances during the next several decades. However, a number of policymakers have also indicated that necessary reforms to entitlement systems to address these obligations are politically difficult to implement, and may be delayed or lead to undesirable compromises. This paper seeks to identify the key challenges, and to highlight the significant uncertainty and variability related to these long-term costs and estimates of potential GDP loss. Of course, markets dislike uncertainty, and these long-term risks will serve only to increase market uncertainty. Therefore, at some point, possibly before government actions are taken, as the financial markets begin to more clearly measure and anticipate the economic effects of these challenges, the resulting impact and subsequent adjustments may be disorderly. In short, to delay reform efforts and other policies designed to mitigate or to smooth these large economic and fiscal challenges, governments incur the risk that such policy initiatives may become dictated by, or subject to, adverse financial market reactions, which may heighten financial stability concerns.

The paper begins by outlining what we view as the principal long-term systemic risks. The focus is on certain long-gestation, accumulating risks, which are expected to have a potentially significant and growing impact on national economies and financial markets. In particular, we evaluate pension savings and related challenges, including longevity

risk, health care costs and related liabilities, and house price risk (particularly as it relates to household retirement savings). In industrial countries, the size and uncertainty surrounding the growth of these risks represent significant economic costs and vulnerabilities, with greater GDP impacts than natural catastrophes or similar events. Moreover, given the long-term and accumulating nature of these risks, they may be subject to mitigation or smoothing of potential welfare losses, if addressed at an earlier stage.

The paper then outlines developments in the risk transfer markets, focusing on “non-traditional” risks and related financial market activities. In short, while the financial markets continue to demonstrate significant innovation regarding the management and dispersion of a variety of risks, little activity is occurring at present in some of the most significant long-term risks which are the focus of this paper. Nevertheless, certain of these innovations may provide the building blocks for new risk management instruments and markets. Indeed, capital market transactions are increasingly being used to address various catastrophic risks, including for emerging and low-income countries.

We next turn to the “incomplete markets,” and ask why the important risks highlighted remain largely unaddressed in the capital markets. In doing so, we consider the important structural influences on market behavior, and explore why risk transfer activity is absent or ineffective in the context of these long-term risks. These influences include regulatory frameworks, rating agency treatment, tax and accounting policies, and market structure. In addition, the availability of data and modeling capabilities regarding these complex risks is discussed, as well as the uncertain risk-sharing arrangements which tend to exist in the “grey zone” between public and private sector responsibilities.

Finally, the paper considers how policymakers may more proactively seek to address these long-term risks. It focuses on three broad potential policy approaches: (i) governments may use the different policy levers at their disposal to encourage private sector and market-based solutions, in order to realize more “complete markets”; (ii) governments may determine in some cases that the least cost or most efficient approach is to use their own balance sheet, and to act as the “insurer of last resort”; and/or (iii) it may be determined that households, the ultimate “shareholders” of the system, are best positioned to efficiently and effectively manage or absorb certain risks. This analysis is consistent with our previous studies, which emphasized that governments significantly influence the allocation, flow, and management of risks in the financial system depending on how they implement various policies and related frameworks. Of course, political, cultural, and social factors exercise important influences on public policy regarding these issues, and therefore countries may be expected to pursue different strategies to address these complex challenges.

A very important objective of the paper is to encourage governments to become more proactive managers of these long-term systemic risks. As part of a comprehensive risk management approach, governments may pursue market development policies which are

complementary to other reform efforts designed to address these long-term challenges. Moreover, by seeking at an earlier stage to influence private sector initiatives or to pursue other policies designed to develop certain risk management tools and related market information, governments also may be better able to develop and evaluate public policy initiatives, as well as to monitor and measure policy performance. In this sense, efforts to develop greater market risk management activities may provide a “virtuous circle,” and allow for a more informed and transparent public debate regarding these systemically important, long-term societal issues.

## II. LONG-TERM SYSTEMIC RISKS

This section examines the potential economic and financial stability implications of certain long-term risks: pension-related saving and longevity risk (i.e., the risk of outliving one’s assets); both anticipated and unanticipated health care cost increases; and exposure to real estate (as part of household assets used for long-term saving). The challenge going forward will be to better isolate and measure, and therefore manage, these risks, including through possible market-based mechanisms.

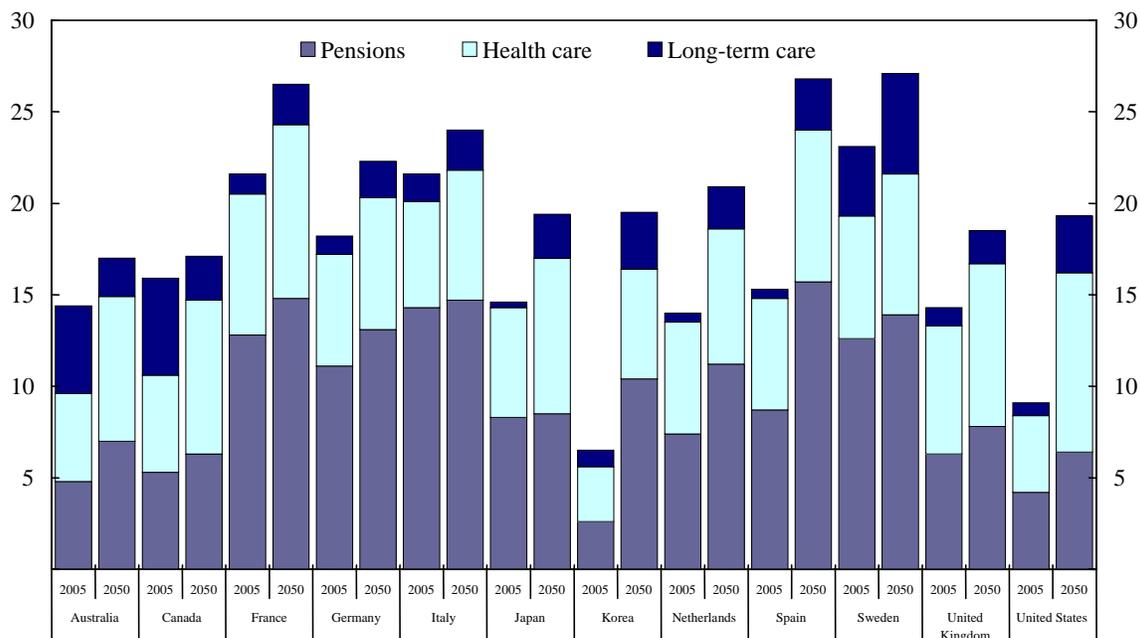
An ageing population brings increased risks and liabilities for governments and households, as well as corporations, asset managers and others, such as pension provision, health care, and long-term care spending.<sup>2</sup> Ultimately, these interconnected exposures are likely to have significant GDP effects, for example through reduced consumption and lower wealth, or by undermining fiscal positions and public sector balance sheets. They may also affect financial stability, as markets can be expected to anticipate and, at some point, adjust to these risks and any related reforms. Therefore, these risks may be considered systemic.

Over the coming decades, public expenditure related to population ageing (i.e., pension, health and long-term care) is widely projected to rise dramatically as a share of GDP, primarily fueled by rising health care and long-term care expenditures (see Figure 1). Ageing-related costs represent explicit liabilities of the state, associated with its role as employer and provider of public social services. In addition, as the primary agent for a variety of systemically significant issues, the responsibilities of the government may go beyond its explicit commitments to encompass the role of “insurer of last resort.” This is a source of additional and possibly significant implicit and contingent liabilities. In many cases, such liabilities may not be fully (or at all) reflected in public accounts, particularly with regard to their variability.

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<sup>2</sup> Previous studies published in the GFSR have analyzed developments in the pension and life insurance industries, household balance sheets and the evolution of the asset management industry.

**Figure 1. Ageing-Related Government Expenditures**  
(In percent of GDP)



Source: Standard & Poor's.

Absent further reforms, significant spending reductions elsewhere, or changes in the distribution or sharing of risks, the growth of ageing-related government liabilities and the uncertainties associated with them have the potential to generate intense pressure on public finances and sovereign ratings. For example, as highlighted by Standard & Poor's (S&P) (Table 1), the fiscal implications could significantly affect public debt dynamics and undermine the credit standing of many countries, including issuers of key benchmark securities, raising the possibility of new benchmark instruments.<sup>3</sup> The magnitude and timing of the deterioration in fiscal positions may differ significantly, reflecting a variety of factors, including demographic trends, the current fiscal position, and the expected impact of recent structural reforms.<sup>4</sup> However, all OECD countries face similar ageing-related trends that cause certain expenditures to grow faster than GDP. Over time, the

<sup>3</sup> For example, if the existing benchmarks are questioned, instruments such as swaps may increasingly be used as pricing references.

<sup>4</sup> See S&P (2006a). The study comprises a sample of 32, mainly industrial countries. Under S&P's base case scenario (i.e., "no policy action"), Japan and the United States become the most highly indebted G7 governments, with net debt/GDP ratios of 530 and 350 percent, respectively. The deterioration in the U.S. position is almost entirely driven by rising Medicare spending. In Sweden, the strongest pressure on ageing-related spending is expected to come from long-term care expenditures, particularly after 2030 as its projected GDP growth rate declines below 2 percent and larger cohorts enter retirement age. Germany, despite its weak starting fiscal position, benefits from the effects of past reforms of health care and pension systems. In contrast, rising pension costs hit Spain at a relatively early stage, in spite of a strong initial fiscal position.

compounding effect (as well as the variability) of rising public expenditures relative to GDP magnifies the systemic nature of the associated risks. For instance, if the annual rate of growth of health care-related costs exceeds the GDP deflator by 1 percent (with volumes constant), the ratio of these expenditures to GDP (i.e., the additional burden to the economy) increases by a factor of 1.22 after 20 years, and 1.49 after 40 years.<sup>5</sup>

**Table 1. Hypothetical Projected Long-term Sovereign Ratings (Base Case Scenario)<sup>6</sup>**

	Australia	Canada	France	Germany	Italy	Japan	Korea	Spain	Sweden	United Kingdom	United States
2005	AAA	AAA	AAA	AAA	AA	AA	A	AAA	AAA	AAA	AAA
2020	AA	AAA	A	AAA	A	Non-IG	A	AAA	AAA	AAA	BBB
2030	BBB	AAA	Non-IG	A	Non-IG	Non-IG	Non-IG	BBB	A	A	Non-IG
2040	Non-IG	AA	Non-IG	Non-IG	Non-IG	Non-IG	Non-IG	Non-IG	Non-IG	Non-IG	Non-IG

Source: S&P (2006a).

Non-IG = Non-Investment Grade.

### A. Pension Savings and Longevity Risk

Demographic trends and related pension liabilities are generating increased pressures on governments. In the European Union (E.U.), public pension-related expenditures are relatively high (for the 25 E.U. countries, they were estimated to represent 10.6 percent of GDP in 2004), and based on European Commission projections are expected to increase further to 11.3 percent and 12.8 percent of GDP in 2025 and 2050, respectively.<sup>7</sup> In the United States, pension-related public expenditures represented 4.2 percent of GDP in 2005, and are expected to rise to 5.7 percent of GDP in 2025 and to 6.5 percent of GDP by 2050. In Japan, while the projected increase in public pension expenditure (from 8.3 percent to 8.5 percent of GDP in the 2005–2050 period) is relatively moderate, estimates strongly depend on the future path of longevity and fertility rates, which are currently quite different from government projections.<sup>8</sup>

A fuller recognition of the substantial, but often undisclosed and unfunded, public sector pension and social security liabilities (i.e., explicit and implicit) on government balance

<sup>5</sup> See Follette and Sheiner (2005) for a discussion on the variability and potential growth effects of health care risks.

<sup>6</sup> S&P's projections are based on current policies and do not consider potential, or even likely, future policy adjustments. Nevertheless, such conditional projections help to illustrate the *potential* impact of unchanged policies on liabilities and perceptions of creditworthiness across countries, and therefore highlight the importance of taking early action to manage such consequences.

<sup>7</sup> European Commission (2006).

<sup>8</sup> S&P (2006a).

sheets would likely have a significant impact on public finances, doubling or even tripling debt levels in some countries.<sup>9</sup> Moreover, given the complexity and sensitivity (i.e., variability) of these calculations to changes in various components or estimates, from a risk management perspective, they present significant challenges. As highlighted below (Table 2), the estimates of implicit public pension liabilities vary widely, reflecting also the uncertainties (including differences in methodology) associated with the measurement of these long-term liabilities.<sup>10</sup> Longevity risk is a major source of uncertainty and complexity in the assessment of ageing-related liabilities, as changes in longevity are dependent on unpredictable or difficult-to-forecast events (such as medical developments), and thus less amenable to statistical modeling. As illustrated by Figure 2, an increase in longevity of five years may raise the level of pension liabilities by approximately a third. Of course, if there is a greater move to fund these projected obligations, the financial markets will assume an even larger role.

**Table 2. Estimates of Implicit Pension Debt—Selected OECD Countries**  
(In percent of GDP)

	OECD (ABO)	IMF (PBO)	Kune (PBO)	Kune (ABO)
Canada	121	94	n.a.	n.a.
Denmark	n.a.	n.a.	117	87
France	216	265	112	83
Germany	157	221	186	138
Greece	n.a.	n.a.	245	185
Ireland	n.a.	n.a.	78	55
Italy	242	357	207	157
Japan	162	166	n.a.	n.a.
Netherlands	n.a.	n.a.	144	103
United Kingdom	156	117	92	68
United States	113	106	n.a.	n.a.

Source: *Holzmann, Palacios and Zviniene, 2004.*

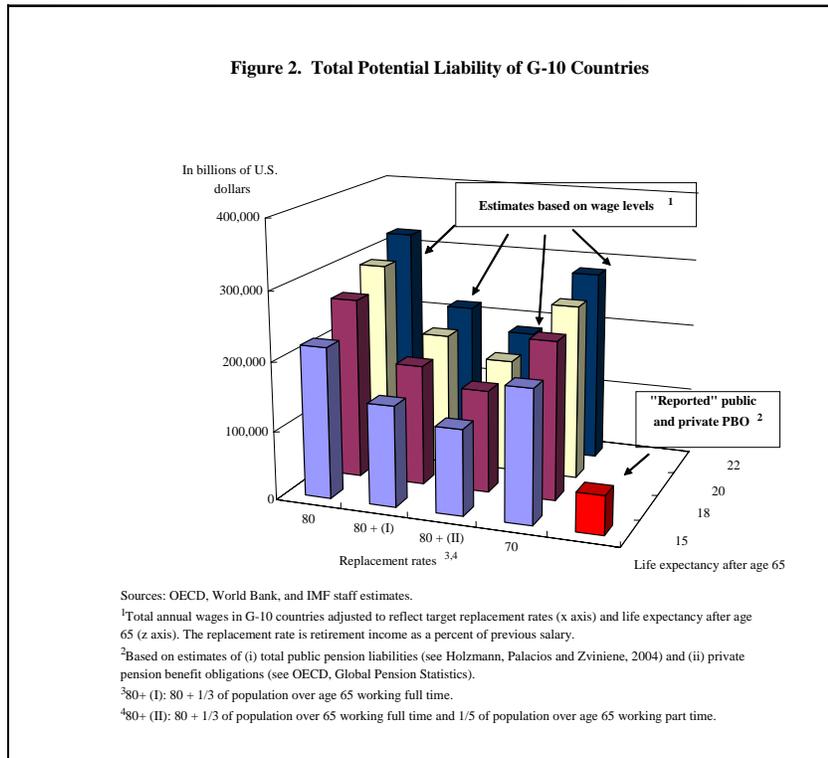
Note: Accumulated Benefit Obligation (ABO); Projected Benefit Obligation (PBO).

The private sector and financial markets are playing an increasingly important role in managing pension-related risks and exposures. While reforms in pension systems in many countries are increasingly shifting a variety of financial and other risks to the household sector, the state (through pillar 1 obligations) and the corporate sector (through

<sup>9</sup> See Holzmann and others (2004) and Frederiksen (2001).

<sup>10</sup> For example, the U.K. Treasury estimates that the liability of unfunded public service occupational pension schemes increased by 15 percent, to around £530 billion, between March 2004 and March 2005, mostly due to changes in the discounting parameters (such as discounting periods and discount rates) and actuarial assumptions (longevity) (H.M. Treasury, 2006). Furthermore, there is no single accepted methodology for calculating the liability of public unfunded pension schemes. Assessing the stock of pension commitments can be conducted on the basis of accrued-to-date liabilities, where only the present value of accrued pension benefits is considered (Accumulated Benefit Obligation, ABO), or on the basis of the projected benefits of current workers and pensioners, and corresponding liability of government (Projected Benefit Obligation, PBO).

occupational defined benefit schemes) remain heavily exposed to many ageing-related risks, including longevity risks.<sup>11</sup> As entities increasingly focus on managing these liabilities and related risks, they may seek to readjust asset portfolios, with potentially significant financial market implications (e.g., pensions funds shifting from equities to fixed-income securities).



As populations age, the total theoretical level of pension liabilities grows, potentially dwarfing levels recognized thus far, reflecting also the uncertainty associated with such liability estimates, as noted above (see Figure 2). Indeed, the growth in liabilities may be much greater than expected, as increases in longevity (for example) have consistently exceeded actuarial forecasts. Therefore, the challenge of managing and maintaining adequate savings levels by the public, corporate, and household sectors have become more urgent. An important issue going forward is the risk management capacity of the recipients of such risks, including households, and related regulatory frameworks.<sup>12</sup> Although accounting and financial reporting requirements have increased, most corporations, as pension plan sponsors, are not subject to comprehensive prudential

<sup>11</sup> See IMF (2004, Chapter III) for a discussion on the “multi-pillar” structure of pension systems.

<sup>12</sup> See IMF (2004, Chapter III) for a discussion of pension fund risk management, and IMF (2005a, Chapter III) for a discussion on household balance sheets and financial education.

requirements regarding their pension and related exposures. In the United Kingdom, for example, with about £900 billion of longevity-linked private pension liabilities outstanding, only £80 billion has been issued by regulated insurers required to put capital against these liabilities.

## **B. Health Care Costs and Liabilities**

The rapid and difficult-to-predict growth of health care costs poses significant financial and risk management challenges for individuals, employers, and governments. In general, the lack of adequate data has hindered the ability to measure or to more actively manage many of these risks. In OECD countries, total health care spending rose from 8.6 to 10.9 percent of GDP from 1990 to 2003.<sup>13</sup> Medical expenses have consistently risen far in excess of general inflation in many countries, reflecting in large part advances in medical technology, as well as factors related to population ageing.<sup>14</sup> In the United States, annual increases in health insurance premiums for employer-sponsored health plans averaged 11 percent between 2000 and 2005, more than four times the average overall inflation rate in this period. At the same time, the pricing of medical services very often remains opaque to beneficiaries, which makes market pricing mechanisms relatively ineffective in limiting the growth of health care spending.

In most countries—but especially where universal publicly-funded health care is predominant, such as in Europe and Japan—health care costs are contributing to significant pressures on government budgets and social welfare systems. In countries where health care coverage is provided primarily by private insurers, more costs fall on employers and households. Faced with such rising costs, businesses, in particular small and medium-size enterprises, increasingly decline to offer or withdraw health care coverage for employees, a situation which ultimately increases pressure on the public health care system.<sup>15</sup> Indeed, in 2004, 18 percent of the U.S. (non-elderly) population was estimated to be uninsured.<sup>16</sup>

Similar to pension liabilities, there is considerable uncertainty regarding health care cost projections, primarily because the large number of variables affecting health care costs and spending are extremely difficult to model and predict. Nevertheless, scenario analyses indicate that the projection of rapid growth of health and long-term care

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<sup>13</sup> See OECD (2005).

<sup>14</sup> Kotlikoff and Hagist (2005) suggest that ageing accounted for 11 percent of the increase in health care spending during 1970–2002.

<sup>15</sup> In the United States, for example, employee health care benefit costs reportedly represent a company's third largest expense, and the fastest-growing cost component (see McKinsey (2004)).

<sup>16</sup> See Kaiser Commission (2006).

spending, including as a significant and rising percentage of GDP, is a fairly robust one.<sup>17</sup> For example, in the United States, according to long-term projections of spending for Medicare and Medicaid made by the Congressional Budget Office (CBO), if spending per enrollee grows at the same rate as per capita GDP, the costs for these two programs would be 7 percent of GDP by 2050 (from 4.2 percent of GDP in 2005). However, if spending by enrollee grew one percentage point faster than per capita GDP, the costs would almost double, and reach 12.6 percent of GDP by 2050.<sup>18</sup> Moreover, unlike pension funds, many companies do not fund their long-term health care obligations, and for companies that do fund these liabilities, the level of funding is generally very low, pointing to additional challenges for the corporate sector.<sup>19</sup>

### C. House Price Risk

As more households regard their homes as long-term savings vehicles, with home equity very often representing over half of household net worth, the potential for house price fluctuations to increase the volatility of savings available for retirement rises (Table 3). Furthermore, housing assets are typically leveraged, relatively illiquid, and undiversifiable from regional and local price fluctuations, exposing the owner to considerable wealth and savings volatility.<sup>20</sup>

**Table 3. Household Real Estate Net Worth and Volatility, 2004**  
(In percent)

	United Kingdom	United States	Japan	Germany	Netherlands
Real estate/household net worth	55.4	38.9	37.6	57.8	56.4
Real estate/ GDP	276.6	160.0	157.7	215.9	245.4
Standard deviation of difference from trend in real house prices (1970–2004)	17.5	8.3	17.2	4.9	22.8

Source: National authorities; BIS; and IMF staff estimates.

Note: For Japan, residential land values (rather than land and house values) are used.

<sup>17</sup> See, for example, Pellikaan and Westerhout (2005).

<sup>18</sup> See CBO (2005a) and (2006b).

<sup>19</sup> Precise figures for health care funding is generally difficult to obtain. However, as of year-end 2003, when the Fortune 500 companies reported (aggregate) pension funding ratios of about 78 percent, one U.S. pension consultant estimated health care-targeted funding to represent approximately 28 percent of potential obligations.

<sup>20</sup> An illustration of the potential for marked divergence in local house prices is provided by Australia. From 2004Q2 to 2006Q2, nominal prices fell 4.0 percent in Sydney but rose 59.8 percent in Perth. In the year to June 2006, Sydney prices fell 0.5 percent, while Perth prices rose 35.4 percent (Australia Bureau of Statistics).

There are numerous potential economic welfare and financial stability benefits from expanding housing-related markets. Such markets could facilitate the smoothing of lifetime consumption by households, and promote housing-related savings. For example, econometric studies generally find that household consumption rises or falls by 3–6 percent of any change in housing wealth. A shock to house prices can therefore affect overall consumption significantly and exacerbate economic cycles.<sup>21</sup> Housing-related risk transfer markets would also allow banks and other investors with concentrated exposures to diversify or hedge their real estate holdings. For all participants, such tools should contribute to reduce transaction costs and improve liquidity related to housing.<sup>22</sup>

A number of recent developments have increased the prospects that house price hedging instruments will become more widely available. Exchange-traded futures and options based on house price indices for ten U.S. cities were launched in May 2006. A major U.S. investment bank reportedly now intends offering forwards and swaps of up to five years' maturity using the same indices. Separately, in September 2006, the Zurich Cantonal Bank began offering mortgages whose payments are indexed to Zurich house prices.<sup>23</sup> These developments demonstrate the value of creating indices, which financial market participants may then utilize to offer a broad range of financial products.

#### **D. Other Risks**

Catastrophe (CAT) risks, including terrorism, weather-related risks, and pandemic outbreaks typically have a different profile from the long-run systemic risks outlined above. Rather than accumulating over long periods of time, they tend to materialize suddenly, and include elements of randomness. Although catastrophes can be devastating for those affected, the macroeconomic effects of such events tend to be shorter-lived, particularly for the large diversified industrial economies. Therefore, for industrial countries, such risks traditionally have not been considered systemic. Nevertheless, they are an important aspect of a country's risk exposure, and need to be a part of a government's overall risk management framework.

Until about a decade ago, insuring against risks such as terrorism and natural catastrophes did not raise major concerns, but the assessment of both the frequency and the severity of such events have changed dramatically in recent periods. Indeed, certain of these risk exposures may now be capable of exhausting the global (re)insurance industry's capacity,

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<sup>21</sup> See Helbing and Terrones (2003), Schnure (2005), and Dynan and others (2005).

<sup>22</sup> See, for example, Case and others (1992), Cocco (2000), and Shiller (2003).

<sup>23</sup> The bank offers two forms of indexed mortgage: with one, the principal is hedged against a fall in house prices over a five-year horizon; with the other, the interest charged is linked to a house price index, within and floor and ceiling (see 'ZKB Index Mortgages: A new approach to financing home ownership,' Zurich Cantonal Bank, September 18<sup>th</sup> 2006).

and in some cases are deemed “uninsurable” by the insurance industry alone (e.g., a tsunami striking a major industrial or financial center). Transferring some of these risks to capital market investors, through securitization and other means, and developing risk-sharing arrangements between the private sector and public authorities can and have helped address these challenges.

## **Terrorism**

The events of September 11, 2001 (9/11) demonstrated that radical terrorist attacks can resemble “acts of war” in their magnitude.<sup>24</sup> As such, certain risks related to terrorism may be effectively uninsurable by the insurance industry alone, and difficult to transfer via the capital markets.<sup>25</sup> On current estimates, a single 9/11-like event would represent 8–10 years of U.S. terrorist insurance premia, and exhaust capital currently dedicated to this peril.<sup>26</sup> Furthermore, much greater losses could arise from attacks on infrastructure networks, or through the use of chemical, biological, radiological, or nuclear (CBRN) weapons.<sup>27</sup>

## **Climate change and flooding**

Annual weather-related economic losses have risen eight-fold since the 1960s, and insured losses 17-fold. Coupled with the greater density of population and rising economic and insurable values in areas vulnerable to extreme weather conditions, the possible impact of climate change on the frequency and severity of weather-related catastrophes, particularly flooding, is making these risks more difficult and costly to insure.<sup>28</sup> Extrapolating current trends, a 2002 U.N. study found that annual economic

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<sup>24</sup> Excluding the \$20.7 billion of insured losses on 9/11, insurance losses from the ten most costly terrorist attacks total \$4.5 billion (Insurance Information Institute).

<sup>25</sup> Thus far, there has been only one instance of terrorist risk being transferred in the capital markets as a catastrophe bond: a CHF 350 million CAT bond was issued in 2003 on behalf of FIFA to insure against the cancellation of the 2006 World Cup for reasons that included terrorism.

<sup>26</sup> Hubbard and others (2005).

<sup>27</sup> Estimated losses from a CBRN attack on New York City may reach \$778 billion (American Academy of Actuaries, 2006).

<sup>28</sup> Total annual losses from flooding in Europe currently run from €6.5 to 8 billion, yet in the most extreme climate change scenarios, estimates suggest they may rise to €100–120 billion per year by 2080 (Association of British Insurers, 2005). In the United States, it is estimated that, as of year-end 2004, the insured value of coastal property in 18 East Coast and Gulf states was \$7.2 trillion, representing approximately 38 percent of insured property values in these states (AIR Worldwide, 2005). Indeed, given the combination of issues such as population growth, development trends, and potential climate change, some public officials and market participants we met consider flooding and increased weather-related events to be among the “major risks.”

losses from extreme weather events may average \$150 billion per year by 2012,<sup>29</sup> necessitating a substantial increase in insurance premiums and capital related to these perils, or increased government intervention and greater risk sharing. Similarly, the prevalence of economic losses due to flooding may rise disproportionately, as population growth and land development alter flood patterns.

In lower income countries, weather and other CAT-related events can have more significant and lasting effects on economic growth, as their cost relative to GDP is often much higher than in developed economies. Combined with the direct impact on often already fragile public infrastructures, the indirect costs of such events are more likely to result in longer-lasting destabilization and humanitarian catastrophes (see Box 1), as scarce resources are diverted from planned investment, possibly resulting in a permanent loss of output.

### **Box 1. Risk Transfer Supporting Humanitarian Aid**

A large number of natural catastrophes occur in emerging market countries, and international agencies and charities cover most of the costs of recovery and reconstruction, as opposed to private insurers. CAT-linked financial instruments may provide an additional source of capital to support such traditional assistance.

For example, in March 2006, the United Nations World Food Program (WFP) insured Ethiopian drought risk (covering the period from March to October 2006) via a derivative transaction with a French insurer.<sup>1</sup> The WFP contracted for the insurer to pay specified amounts if a pre-defined Ethiopian drought index rises above an agreed trigger point. Whereas conventional aid can take many months to arrive, and insurance settlements usually only occur after a lengthy verification process, this capital markets structure delivers the contingent payment within weeks of the trigger being breached.

The World Bank, which was involved in the Ethiopian transaction, has also developed a pilot project to provide Mongolian livestock herders with index-based peak livestock (cattle and yak) mortality protection. It features a tranching structure, whereby commercial insurers will cover losses for mortality rates between 7 and 25 or 30 percent per specie, and the Mongolian government will cover losses in excess of 30 percent. Herders will pay premia for the 7–30 percent protection, based on the value of their herd, which will encourage risk mitigation efforts.<sup>2</sup>

Projects like these serve as important starting points and initiatives for the development of market-based insurance solutions for developing countries and the coverage of a potentially wider variety of risks or perils, and facilitate more objective determinations of disaster planning. In the event of extreme catastrophes, additional relief efforts will not be obviated, but such programs will help governments and potential donors to establish disaster response plans.

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<sup>1</sup> See Syroka (2006). A similar program has been in operation in India since 2003 (see World Bank, 2005).

<sup>2</sup> See Mahul and Skees (2006).

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<sup>29</sup> See UNEPFI (2002). The total damage caused in 2005 by Hurricane Katrina exceeded that figure, prompting the liquidation of Poe Financial, Florida's third largest insurer.

## **Pandemics**

The outbreak of a lethal, easily transmissible disease could have a significant short-term impact on output, although estimates of such an impact are subject to a wide range of uncertainty. For example, public estimates of the immediate impact of a 1918-type flu pandemic on the level of GDP for industrial countries range from 0.3 to 6.0 percent.<sup>30</sup> However, these estimates are subject to numerous uncertainties, and any such costs will be dependent also on the extent of public and private sector preparedness. While such an event would stress the resources of some life insurers, industry analysts do not regard such an event as systemic.<sup>31</sup> Furthermore, reinsurers with material exposures have sought to hedge such risks by issuing bonds designed to transfer peak or extreme mortality risks (in part) to capital market investors.

Some of the risks discussed in this section, particularly the longer-term, cumulating risks, create vulnerabilities that may affect financial market stability. These vulnerabilities are likely to stem from the manner and degree in which financial market participants anticipate such risks will evolve in the future (e.g., tax increases or changes in consumption patterns). The following section outlines the few market-based instruments or mechanisms that have been developed to date, which seek to manage certain major risks. Importantly, these new instruments incorporate concepts and features that may represent the building blocks for further development of market-based risk management tools for a wider variety of risks.

### **III. INNOVATIONS IN RISK TRANSFER MARKETS**

This section discusses market innovations that may help identify, measure, manage, and ultimately transfer systemically important risks, especially those associated with demographic trends and ageing populations. So far, most of the recent applications have been targeted to some of the “non-traditional” risks identified above (e.g., peak mortality and CAT risks). Although these markets are small, important lessons can be learned from studying the characteristics of these relatively successful innovations. These nascent markets and new instruments are likely to provide insights into the building blocks required for developing tools to better measure and manage the longer-term systemic risks.

Many of the financial innovations and new techniques developed over the years to measure, manage and transfer banking sector risks are increasingly finding application

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<sup>30</sup> See CBO (2005b; 2006a), and Jonung and Roeger (2006).

<sup>31</sup> Weisbart (2006).

among insurance risks.<sup>32</sup> Some of the recent market innovations highlight characteristics critical to the development of insurance-oriented risk management tools, including: (i) the capability to define, isolate, and measure risk exposures more precisely or efficiently; (ii) the ability to model and project the evolution of risk; (iii) the ability to mitigate moral hazards in the reporting of risk events and data construction; (iv) regulatory and rating agency recognition of risk mitigation strategies and techniques; and (v) the structuring of such risks to meet global investor requirements.

Many of these characteristics are evident in recently developed market-based risk transfer instruments that have been well received by market participants, as discussed below. Such instruments may be broadly divided into three groups, based generally on how the contingent payments are triggered by the occurrence of the covered risk.

- **Parametric** instruments base the contingent payments on objective data and modeling customized to, and correlated with, the underlying events related to the potential losses of the issuer or insured party.
- Contingent payments of **index** instruments are linked to more generic industry-wide and/or geographic indices that are (more broadly) correlated with the events triggering the covered risks.<sup>33</sup> They are simpler to execute than parametric instruments, although both expose ceders (e.g., reinsured parties) to basis risk (i.e., the risk that the insurance coverage does not exactly match actual losses).
- By contrast, **indemnity** instruments base the contingent payments on the issuer's actual loss experience, which makes them a close substitute for a reinsurance contract. However, loss recovery periods tend to be longer, and investors cite potential moral hazards inherent in these structures.<sup>34</sup>

### **Application of recent innovations to manage non-traditional risks**

The pace of innovation in these non-traditional markets lags the developments in other markets, such as those that have enabled banks to better manage or transfer credit risk.<sup>35</sup>

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<sup>32</sup> Shiller (2003) discusses the development of macro markets for intra- and inter-generational risk sharing. Bodie and Merton (2002) discuss how swaps may allow pensions to share risks across countries with different demographic trends, or at different demographic stages. Such risk sharing arrangements among countries with different demographic positions may supplement more traditional inter-generational risk sharing and transfer arrangements.

<sup>33</sup> A frequently used set of indices for U.S.-based perils is that compiled by Property Claims Services.

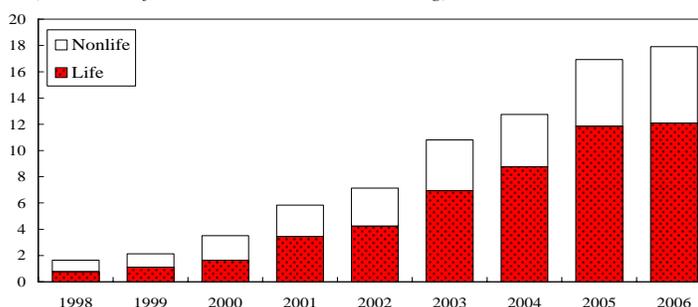
<sup>34</sup> In this context, moral hazard refers to the risk that the reinsured counterparty (typically an insurance company) lowers policy underwriting standards and/or settles claims less efficiently (see Sheehan, 2003).

<sup>35</sup> For example, see IMF (2006, Chapter II) for a discussion of recent developments in credit derivative and structured credit markets.

Moreover, within these newer markets, instruments to help manage the “longer-term” systemic risks (e.g., longevity and health care costs) have proven especially difficult to develop, in part because regulators and rating agencies have not granted relief or benefit to the risk transfer (see below). Nevertheless, the pace of risk transfer and related capital market activity for non-traditional, often insurance-related, risks, resembles in many respects the developments in credit risk management in the early 1990s (e.g., credit cards and mortgages). Since that time, economic capital considerations have increasingly influenced bank balance sheet management (and prudential regulation), and the credit risk transfer market has grown significantly.

The amount of insurance-related risk transfer occurring in the capital markets represents a small fraction of the potential underlying exposure. Life insurance securitizations are often based on well-defined and standardized actuarial risk measurements, which should allow for better understanding and modeling of life risk, similar to mortgage

**Figure 3. Insurance Securitization<sup>1</sup>**  
(In billions of U.S. dollars; amount outstanding)



Source: Swiss Re.  
<sup>1</sup>Data for 2006 are only available through the first quarter.

securitizations. Outstanding life insurance securitizations increased from about \$7 billion at year-end 2003 to about \$12 billion at year-end 2005, with only a handful of reinsurers responsible for almost all transactions during 2005–06 (Figure 3).<sup>36</sup> During the same period, outstanding non-life insurance securitizations increased from about \$1.5 billion to \$5 billion. These transactions have been spread among about ten insurance and reinsurance firms, and have primarily related to natural catastrophe risks, with recent transactions also involving auto and industrial accident insurance.

The securitization of “peak mortality” exposures, primarily related to pandemic-type risks, which have relied on parametric triggers and are generally well-defined, illustrates the application of structuring techniques used in credit markets.<sup>37</sup> These recent transactions illustrate the importance of identifying and measuring precisely the specific

<sup>36</sup> These data do not include three small “life settlement” transactions (where whole life insurance policies are sold by the beneficiary or insured for an amount greater than its surrender value, but lower than the policy’s face or insured value (see Stone and Zissu, 2006)).

<sup>37</sup> In 2005, a \$362 million parametric mortality bond was issued by a Swiss reinsurer (“Vita Capital II”), and in 2006 a Bermudan reinsurer followed up with a similar \$155 million issue (“Tartan Capital”). Prior to 2005, there was one \$400 million issue of extreme mortality bonds by the same Swiss reinsurer, which also featured a mortality index trigger.

risk transferred, including the use, where possible, of an index constructed by an independent agent. Indeed, the development of robust indices may be an important factor in the growth of insurance securitizations, as well as related risk management products. Thus far, such securitizations have been issued as medium-term (four to five-year maturity) tranching notes, with contingent payments (including principal). As these markets develop, more insurers and reinsurers are expected to transfer mortality risks.<sup>38</sup>

A large volume of securitizations by U.S. life insurers has been motivated by Regulation XXX, which became effective in 2000. This regulation requires insurers to set aside statutory reserves against term life insurance policies which are generally viewed as higher than economically warranted by current actuarial experience and data. By shifting some of their risk to capital markets, such securitizations allow insurers to hold less reserves than required by Regulation XXX.<sup>39</sup> Of the \$2.8 billion of life insurance-linked bonds issued globally in 2005, \$1.8 billion were motivated by Regulation XXX and capital management objectives.<sup>40</sup> Liquidity and funding considerations have also been a driver of “embedded value” insurance securitizations. The primary purpose of these indemnity-type transactions is to monetize expected future profits (the “embedded value”) on blocks of life insurance policies, since the associated expenses and regulatory reserves tend to be front-loaded, whereas the profits accrue over the life of the policy.<sup>41</sup>

Non-life exposures (e.g., natural catastrophes) are considered more difficult to define, measure and model, and the amount of natural CAT risk transferred to date has been a small fraction of the total amount of insured CAT exposure.<sup>42</sup> Nevertheless, the continued development of CAT bonds shows that innovations can occur when there are sufficient data and models to predict the evolution of such risks. Although both parametric and

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<sup>38</sup> A French insurer is understood also to be planning to launch a peak mortality bond during 2006 (Bowman, 2006).

<sup>39</sup> The policies are reinsured through a captive special purpose reinsurance vehicle that does not face similarly high reserve requirements, and the transaction is structured so that the losses that exceed economic reserves are transferred to capital markets.

<sup>40</sup> See Cowley and Cummins (2005). Recent transactions have also included monoline credit enhancement to achieve “AAA” ratings on the securities, in large part to attract a broader investor base.

<sup>41</sup> Only \$600 million of embedded value bonds were issued in 2005, and about \$6 billion prior to 2005. By comparison, according to the American Council of Life Insurers, U.S. life insurers collected \$140 billion in premia in 2004, and the amount of life insurance in force was \$17.5 trillion.

<sup>42</sup> Since 1997, natural CAT bond issuance has fluctuated between about \$700 million (1997) and \$1,700 million (2003), with about \$1,500 million issued in 2005 (Swiss Re, 2006a). From 1997 to 2005, of the total \$16 billion CAT bonds issued, \$10.7 billion covered U.S.-based perils, \$2.9 billion European-based perils, and \$2.6 billion Japan-based perils (Guy Carpenter, 2006a). In comparison, global insured natural CAT losses were about \$80 billion in 2005, and ranged from \$10 to \$30 billion in 1990–2004 (Swiss Re, 2006b).

indemnity-type instruments are used to transfer such risks, investor interest is gravitating toward parametric issues, while regulators prefer indemnity instruments. Natural CAT risks are also being transferred to capital markets via CAT swaps and industry loss warranties (ILWs), both relatively new instruments. CAT swaps have typically involved two reinsurers seeking diversification benefits (i.e., by type and/or location of peril—for example, Japanese earthquake for European windstorm risks). More recently, hedge funds and other institutional investors are showing interest in these markets. Hedge funds are also involved in the market for ILWs, which are reinsurance contracts that incorporate derivative-like features.<sup>43</sup>

Public sector use of CAT risk transfer markets has not been significant, with only a few sovereigns issuing CAT bonds. However, recently, Mexico issued a CAT bond covering earthquake risks (Box 2), and the United Nations World Food Programme hedged Ethiopian drought risk by executing a capital markets structured swap transaction (see Box 1 above). These transactions highlight the growing attraction of contingent capital-type transactions and capital market-style instruments with private insurers. Such capital market transactions (often index-linked) provide greater clarity regarding the trigger events, and deliver the contingent payments more quickly to the insured parties. The ability to obtain funds quickly is important for developing countries, as time is of the essence following a natural catastrophe.

Encouraged by the increased public debate regarding pensions in the United Kingdom, investor interest has been stimulated, and financial market initiatives launched to transfer pension-related risks. For example, newly established private equity-style funds have emerged, seeking to acquire the assets and liabilities of closed defined benefit pension plans, including longevity risk. Along with a few existing insurance companies, such funds will seek to purchase and subsequently manage or transfer some of this risk in the financial and reinsurance markets, which may itself stimulate further financial market interest and innovation.

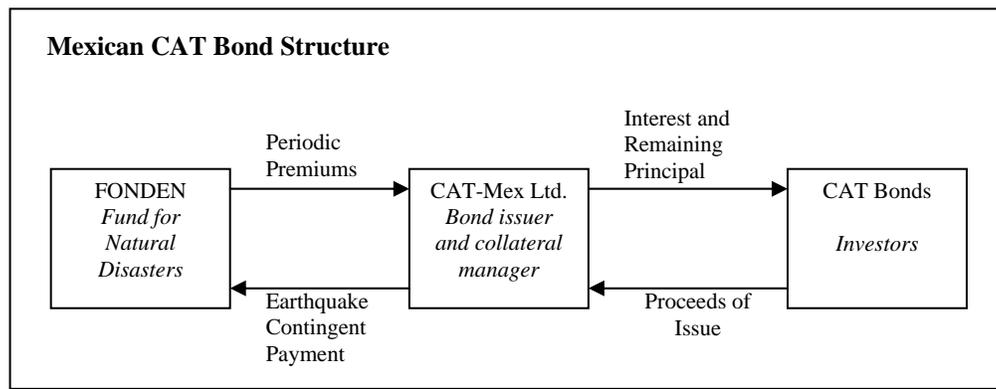
Hedge funds have also provided capital to these markets by forming their own reinsurance companies during periods of rising reinsurance pricing (i.e., “hard markets”), and are increasingly supporting primary market risk transfer activity, similar to other more developed risk transfer markets. For example, in late 2005, about \$10 billion of new capital was raised through Bermudan reinsurers, of which about \$7 billion reflected hedge fund and private equity start-ups, including about \$1.8 billion structured as “side-

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<sup>43</sup> An ILW incorporates indemnity and index triggers, both of which must be realized for a claims payment to be made (see also Green, 2006).

## Box 2. Mexican Earthquake CAT Bond

In May 2006, FONDEN, a Mexican government agency created in 1999 to provide emergency relief for natural disasters, issued a \$160 million parametric CAT bond to reduce the potential fiscal impact of an earthquake of similar or greater magnitude to the one that killed 10,000 people in 1985 (i.e., 7.5 or more on the Richter scale).<sup>1</sup> The bonds were part of a \$450 million three-year insurance transaction.<sup>2</sup> The rationale for a sovereign to issue CAT bonds includes diversification of insurance coverage, and enhancing the coverage and pricing of any remaining insured peril. CAT coverage may be particularly relevant for middle-income countries, for which self-insurance may be less of an option, and coverage is seen as affordable and relatively efficient (i.e., in scope of coverage and timeliness of payment), and complementary to traditional relief funds.



The bonds are rated BB+ by Standard & Poor's, and investors receive a floating rate coupon of LIBOR + 235 basis points, plus the full notional amount at maturity if no earthquake trigger events occur. However, should there be an earthquake that meets the trigger criteria, FONDEN immediately receives the full principal amount from CAT-Mex Ltd., and the bonds are cancelled. The immediate payment feature is important, since reinsurance coverage and some CAT bond structures can involve lengthy waiting periods for the receipt of funds.

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<sup>1</sup> More specifically, the payout trigger is based on one 7.5 magnitude earthquake in and around Mexico City, and/or an 8.0 magnitude earthquake in one of two Pacific Coast areas.

<sup>2</sup> Taiwan (Province of China) issued \$100 million earthquake CAT bonds in 2003. It is also possible that other governments and government-owned CAT insurance agencies are indirectly issuing CAT bonds. For example, market participants believe that the California Earthquake Authority has issued about \$1,350 million CAT bonds via "SR Earthquake Fund" and "Redwood Capital" since 1997.

cars.”<sup>44</sup> A side-car is a limited-purpose reinsurance vehicle with a finite life, typically established to do business with a single reinsurance client and/or to underwrite a particular risk.<sup>45</sup> Bermuda is the domicile of choice for much of the new insurance capital and startups, in large part because of its favorable tax environment, as well as the concentration of insurance expertise.

Broader investor interest in markets for long-term systemic risks will likely require better and timelier data to provide greater certainty of pricing and payment.<sup>46</sup> In addition, index design may play an important role, including with regard to the success of the U.S. house price index futures that began trading on the Chicago Mercantile Exchange (CME) in May 2006.<sup>47</sup> The CME is trading contracts for 10 U.S. metropolitan areas, and settle based on the values of corresponding S&P/Case-Shiller Home Price Indices, which are published monthly.<sup>48</sup> For health care costs, the Milliman Medical Index, first published in 2006, focuses on medical costs based on employer-sponsored managed-care accounts in the United States.<sup>49</sup> This index, which is available for six U.S. cities, reflects actual medical care expenditures (not insurance premiums), and is designed to track employee medical spending on a yearly basis. However, the infrequent updating of the Milliman index (i.e., annually), may hamper its ability to attract liquidity and serve as an effective hedging tool for health care providers and insurers. Nevertheless, these are important financial market developments, which provide a greater ability to measure and therefore to also better manage a number of these long-term economic risks.

As discussed below, key challenges to expanding non-traditional risk management and risk transfer tools include current regulatory and supervisory frameworks, and rating agency expertise and support for recent and continuing financial innovations. For these and other reasons (e.g., investor knowledge, accounting treatment, and market structure),

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<sup>44</sup> See Benfield Group Limited (2005) and Guy Carpenter (2006b).

<sup>45</sup> See Moody’s (2006a).

<sup>46</sup> In January 2006, Credit Suisse introduced a U.S. longevity index based on publicly-available U.S. government mortality tables. The underlying U.S. mortality tables are updated annually with a three-year lag (the 2003 tables became available in April 2006), which is representative of the timeliness of G-10 official mortality data. See also Griffith and Sharma (2006) for some lessons from recent sovereign experiences with GDP-linked financial instruments, such as the warrants issued by Argentina in 2005.

<sup>47</sup> House price index futures also traded on the London Futures and Options Exchange (now part of Euronext-LIFFE) in 1991, but the contract was suspended within the same year, in large part due to index construction problems (Patel, 1994).

<sup>48</sup> See Case and Wachter (2005).

<sup>49</sup> Milliman (2006).

the markets and instruments to support better management of these important risks remain “incomplete.”

#### **IV. INCOMPLETE MARKETS**

The previous section reviewed financial market developments, and concluded that very little market-based risk transfer activity has been observed regarding the long-term systemic risks highlighted in this paper. This section focuses on the potential reasons why insurance- and capital market-based solutions for managing these risks may remain relatively undeveloped compared, for instance, to those used by banks to manage credit risk. Some reasons may reflect the fundamental nature and characteristics of particular risks, as well as their degree of “insurability” or “transferability,” as discussed in Box 3.

Consistent with the methodology used in our previous studies on risk management and risk transfer, the following are some of the key influences on market behavior evaluated below: regulation and supervision; credit rating agencies; accounting and tax policies; market structure; data availability and quality; and risk-sharing arrangements.<sup>50</sup> As these factors will be considered from a policy perspective below, this section will focus on how these influences may explain why certain markets remain “incomplete.”

##### **A. Regulatory Influences**

The Basel regulatory framework has created incentives for banks to increasingly focus on risk measurement and management, and ultimately risk transfer. Most simply, policymakers in industrial countries, as expressed in Basel regulatory principles, have determined that banks should be encouraged through risk-based capital guidelines to measure and more actively manage different credit and balance sheet risks, and thereby increase the resiliency of their financial position. This has led to significant capital market innovations, including increased risk transfer. However, similar regulatory influences on insurance companies’ risk management practices have generally not been forthcoming. Indeed, insurance regulators have often remained ambiguous or ambivalent as to whether insurers should be the ultimate holders of risks, or should seek additional methods to manage and even transfer risks via the capital markets. These two different approaches or philosophies regarding the role of insurers, and how risk may be best managed, are equally valid, and have their own rationale. However, in order to realize the desired result, either approach requires that policymakers provide a clear and internally consistent regulatory framework and incentives.

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<sup>50</sup> See also Group of Thirty (2006).

### **Box 3. What Makes a Risk Insurable or Transferable in the Capital Markets?**

The degree of insurability of various risks, and thus the manner which they may be managed or possibly transferred, depend on a number of considerations. In general, insurability is enhanced when risk is assessable in terms of both frequency and severity (i.e., with frequency usually the more difficult to assess), when insured events are independent and losses relatively uncorrelated, and when risks may be mitigated by seeking diversification benefits through pooling or other means. In addition, transferring risks in the capital markets depends on the ability to identify, measure, and isolate specific risk characteristics, ideally using independent assessments (e.g., by rating agencies or specialized risk modeling firms).

Risks may be managed and possibly transferred either bilaterally (e.g., with a reinsurer) or more broadly using capital market instruments. Indeed, reinsurance companies may also be regarded as a pool of investor capital combined with underwriting and related expertise to acquire certain insurable risks. If certain risks are sufficiently transferable, then insurers or reinsurers may utilize capital market instruments to disperse these risks. Interestingly, perceptions about the types of risk that can be intermediated or transferred change over time due to financial innovations. Moreover, such innovations are themselves very often influenced by regulatory frameworks and technological advances (as discussed in this section), particularly regarding the ability to better measure and decompose complex risk exposures.

Financial innovation acts to expand the boundaries of risk insurability and transferability, as most clearly illustrated by the growing role of credit derivatives for managing credit risk. Advances in financial market techniques allow risks that were previously considered “uninsurable” to be more precisely measured and pro-actively managed, and thus insurable. One method by which insurers approach these issues and classify risks is often by considering whether a risk exposure reflects a “one-sided” or a “two-sided” market. The latter typically involves counterparties with offsetting exposures (e.g., currency risks). As such, two-sided risks are considered most amenable to market-based risk management and risk transfer activity. By contrast, one-sided risks affect all exposed parties in broadly similar ways (e.g., natural catastrophes and longevity), and few, if any, natural counterparties exist. Therefore, managing one-sided risks has traditionally involved pooling by (re)insurers, and charging a premium to warehouse such risks for a period of time. In addition, (re)insurers often also rely on the ability to periodically reprice certain risks, which is a very powerful risk management (and risk sharing) tool.

Interestingly, some risks, previously perceived as one-sided, may become more two-sided, and thereafter may be transferred to a broader group of investors as new technologies and financial instruments are developed. By creating a market price for these risks, such innovations enable insurers and other market participants to more accurately measure and to better manage their exposures, thereby making certain one-sided risks tradable. Indeed, several insurers have indicated that as recently as the late 1990s, they perceived credit risk as a one-sided market, not susceptible to broader market risk transfer, and thus potentially best managed or warehoused by insurers through large diversified pools. However, financial innovations (encouraged by regulatory policy) have made credit risk transferable.

In the absence of a clear approach or regulatory framework regarding the “role of insurers,” only a few of the largest and most innovative insurance companies have begun to pursue market-based risk management techniques. These insurers have been motivated, in part, by economic capital, capacity, and broader balance sheet and return objectives. Insurance companies can face significant difficulty in obtaining regulatory capital relief for such activities.<sup>51</sup> For example, while U.S. insurers can deduct the cost of reinsurance from their gross premiums for the purpose of calculating risk-based capital requirements, they cannot do so when securitizing risks transferred in the capital markets.<sup>52</sup> In some cases, supervisors cite concerns about residual basis risk from capital market transactions (e.g., which may exist with non-indemnity structures, as noted above), that are not considered present with typical reinsurance arrangements. As such, risk reduction methods with pay-offs based on indemnity triggers are more likely to be granted full capital relief, whereas the regulatory treatment of structures with pay-offs based on indices or parametric triggers is typically less certain or less favorable. Relative to bank regulatory treatment, insurers in most countries get little regulatory credit for partial hedges or dynamic hedging strategies (e.g., transactions with term mismatches), which may also discourage risk transfer.

### **B. Rating Agency Clarity**

Like regulators, rating agencies have not been viewed as a driving force in promoting or supporting the use of market-based risk management tools by insurers or the transfer of non-traditional risks. Once again, in contrast to the credit markets, where rating agencies and their risk modeling expertise have had a major influence on credit risk analysis and management, the agencies have not thus far displayed the leadership or expertise needed to similarly support the development of market-based risk management tools in the insurance area. In addition, and similar to the regulators, their recognition of any risk mitigation benefit to an insurer generally depends on the type or structure of risk transfer mechanism used. As such, reinsurance arrangements (i.e., indemnity policies) are often fully recognized (although some allowance may be needed for counterparty risk). In contrast, no (or only partial) relief may be granted for parametric and indexed structures (favored by the capital markets for their trigger and payment clarity), due to the potential basis risk.

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<sup>51</sup> Although the regulatory capital treatment of the “FCC SPARC” French auto securitization transaction remains unclear to outside observers (see IMF, 2006, Box 2.3), most analysts and observers believe there will be no regulatory relief granted.

<sup>52</sup> In the United States, the 1999 “Protected Cell Company Model Act” and the 2004 “Special Purpose Reinsurance Vehicle Model Act” have been proposed by the National Association of Insurance Commissioners (NAIC) to help address these problems. However, they have been implemented by only a limited number of states in the U.S.

However, the major rating agencies are currently revising their rating methodologies for insurance risks, including the use of insurers' in-house capital and risk management models, and together with the larger insurers may contribute to the development of insurance-risk indices.<sup>53</sup> Such developments may provide insurers' with greater incentives to consider market-based risk management practices, including risk transfer, and would likely attract a broader group of market participants and additional capital to these markets.

### **C. Accounting Policies**

Under current accounting rules, transactions with the same economic status or result are not always treated the same, which may hinder the use of market-based risk transfer techniques by insurers. Also, current hedge accounting standards can produce disincentives for insurers to use market-based risk management instruments, especially compared with the treatment given to reinsurance contracts. Indeed, current standards may not recognize any of the economic benefits from less-than-perfect or complete hedges (e.g., index-based CAT instruments), and may act only to increase reported earnings and balance sheet volatility. Such higher volatility may be inconsistent with the underlying economic or financial reality. Rating agencies have also suggested that hedge accounting standards have dissuaded them from providing a clear ratings benefit to market-based risk management techniques compared with reinsurance coverage, as financial reporting volatility may produce increased market volatility for a company's securities.

### **D. Market Structure**

Several market participants and insurance analysts suggested that shareholder pressure to maximize returns on capital in the industry may be relatively less significant than similar pressures in the banking sector, which may contribute to make risk transfer activity less urgent industry wide.<sup>54</sup> In some jurisdictions, the prevalence of mutual insurers may also act to reduce returns on capital.<sup>55</sup> Mutual insurers operate to maximize the benefits to their members, which may include providing coverage at lower cost than otherwise required by a "market" rate of return on capital. Nevertheless, market participants highlight the relative ease with which (non-life) reinsurers are able to raise capital,

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<sup>53</sup> See Fitch Ratings (2006), Moody's (2006b), and S&P (2006b).

<sup>54</sup> While this seems to contradict our belief in financial market efficiency and behavior, this point was made by several major market participants. See also comments by Walter Kielholz, Deputy Chairman of Swiss Re, in Ladbury (2006).

<sup>55</sup> Mutuals accounted for around 70 percent of Japanese life insurance assets at fiscal year end 2004. In Europe, mutuals also have a material presence, often accounting for more than 25 percent of the domestic insurance market in Continental and Scandinavian countries, where mutuals tend to hold larger market shares in property and casualty cover than in life insurance.

especially following a large catastrophe, when premiums are expected to rise. As such, industry participants and observers state repeatedly that the industry is not capital constrained.

On the demand or buy-side of the equation, the absence of well-established benchmarks or indices, and rating agency guidance, as well as a general lack of familiarity with insurance-type risks, have made it difficult to develop a broad and diverse investor base for many insurance-type risks, despite potential portfolio diversification benefits. To date, much of the investor demand has come from other insurers and similar specialists already familiar with such risks and seeking portfolio diversification. Similar to the development of credit risk transfer markets, the diversification and dispersion of risk created even within this specialist market would likely enhance financial stability. Moreover, improved primary market liquidity in these risks may trigger a virtuous circle, whereby the availability of liquid market benchmarks and indices may emerge, and attract new and increasingly diverse sources of capital.

Finally, ongoing consolidation among (re)insurers may eventually limit their ability to increase capacity through traditional risk management practices, such as portfolio risk pooling, and may increase market-based efforts to disperse risk and attract new capital.<sup>56</sup> Moreover, the systemic importance of these institutions is likely to increase as fewer insurers play more significant roles related to certain risks, such as retirement and health care needs. This trend may, in turn, lead authorities to encourage risk transfer outside the insurance industry to reduce risk concentrations or the systemic exposure to any one company or group of companies.

Going forward, there is potential for establishing a broader capital and investor base (and related risk management capacity) in the insurance industry, together with a more return-oriented approach to capital utilization. The recently increased presence of investors such as private equity and hedge funds, including as shareholders and owners of (re)insurers, may indicate the beginnings of such a change.

## **E. Data Availability**

Reliable data are critical for the development of market-based risk management solutions. Indeed, market participants often cite the inadequate availability, reliability, granularity and timeliness of data as reasons for the slow (or lack of) development of markets to manage longevity, health care cost, and other similar risks. Data are needed to support the pricing and trading of risk transfer instruments, develop risk assessment models, and construct benchmarks or indices. Although the underlying data typically exist (e.g.,

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<sup>56</sup> Industry observers have noted that Solvency II may add pressure for further consolidation in the (European) insurance sector (see S&P, 2006c). See also comments by Walter Kielholz, Deputy Chairman of Swiss Re, in Ladbury (2006), and Swiss Re (2006c).

hospital records, death statistics), they are often not systematically compiled or widely disseminated.

Long-term risks, such as retirement and health care costs, are often difficult to measure because the underlying drivers of these costs may be inherently unpredictable, and because forecasts and related risk assessments may only be possible infrequently and with long time lags. For example, market participants emphasize that the pricing of annuity products is materially constrained by the lack of high quality data on mortality at higher age categories (e.g., 85 to 90+ years), or beyond a 15–20 year period for most buyers of annuity products (i.e., typically age 55–70 years). Consequently, the absence of adequate data increases the uncertainty associated with extreme longevity risk, resulting in higher capital requirements. Market participants have stated that approximately 20–25 percent of the “value-at-risk” of annuities sold to 65-year old men in the United Kingdom relates to their potential to live beyond 90 years (see also Box 4).

For each type of risk, increasing data availability should create opportunities for better risk management. As with credit risk transfer markets, better and more specific data help create customized structured products that limit basis risk exposures, meet specific investor or hedging requirements, and more generally attract and contribute to market liquidity.<sup>57</sup> For example, to develop relevant and useful house price index contracts, the underlying data need to reflect “local” market conditions, and to support market liquidity such data should be published/updated on a relatively frequent and regular basis. In this regard, experience with the CME house price futures introduced in May 2006 will provide a useful test. Another example is the health care sector, where the lack of data aggravates the fragmented and local nature of the delivery system (e.g., a variety of specialized health care providers and insurers’ non-standardized systems).<sup>58</sup> These factors make it difficult to compile comparable health care data on a broad basis, and thus deter the development of market-based risk measures and risk management tools.

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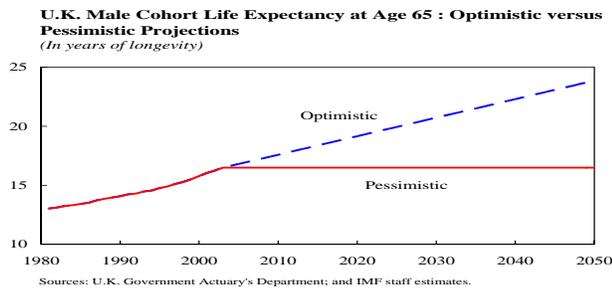
<sup>57</sup> See IMF (2006, Chapter II).

<sup>58</sup> Some health care providers have recently realized the value of their in-house data/information, and have organized subsidiaries to collect, collate, and sell such data to insurers and others.

### Box 4. Annuity Obligations and Longevity Risk

Annuities provide individuals with the opportunity to hedge longevity risk—the risk of outliving one’s assets. In its simplest form, a “life annuity” provides a guaranteed income flow throughout the annuitant’s lifetime, thereby hedging the individual’s longevity exposure.<sup>1</sup> However, annuity providers face the challenge of hedging the aggregate longevity risk associated with annuitant cohorts, because many exogenous factors (e.g., medical advances) cause the longevity risk of all cohort members to be relatively highly correlated.

The contracted rate of return on an individual annuity consists of a market return plus a “mortality credit” from pooling. This mortality credit is a source of risk for the annuity provider that cannot be easily hedged. For example, in a fixed-income annuity pool of 65-year old males, in which about two percent would be expected not to survive one year, pooling provides a first-year mortality credit of about 214 basis points if the rate of return is five percent.<sup>2</sup> The value of this credit rises with the age of the pool of annuitants. For example, it reaches about 1,853 basis points for a group of 90-year old males, of whom 15 percent would not be expected to survive a year. However, if the actual 90-year old male mortality rate was only 14 percent, the available funds to pay the mortality credit would be reduced by 144 basis points, and the annuity provider would have to make up the difference. Indeed, projections of cohort mortality have typically understated future life expectancy, and as highlighted in the figure, there is a great deal of uncertainty about future longevity trends.<sup>3</sup> Given that the increase in longevity, and the uncertainty of projections, affects all annuitants in broadly equivalent ways, it is largely non-diversifiable, and results in relatively more capital being required to cover the annuity providers’ risk exposure to “extreme” longevity.<sup>4</sup>



One way to hedge longevity risk may be to transfer some of the exposure to investors via “longevity bonds” or swaps.<sup>5</sup> However, it is difficult to find potential counterparties to such transactions, who themselves are not already exposed to longevity risk (i.e., a potential one-sided market). Also, the need for long-dated longevity hedging instruments increases concerns about counterparty risks. This may be one reason why governments are frequently viewed as attractive counterparties, notwithstanding that most governments already have large exposures to longevity risk through their public pension and social security commitments. The unsuccessful attempt by the AAA-rated European Investment Bank (EIB) to launch a longevity bond in 2004–05 illustrates how difficult it is to design such market-based longevity risk transfer instruments.<sup>6</sup>

<sup>1</sup> See Poterba (1997) for descriptions of the many variations on standard annuities, and Milevsky (2006) for the mathematics behind many of the concepts discussed here.

<sup>2</sup> The example assumes away survivor benefits, which would reduce the mortality credit. The one-year mortality credit is equal to  $R*(M/(1-M))$ , where R is the gross rate of return and M is the mortality rate. See Milevsky (2006) for more detail.

<sup>3</sup> See Watson Wyatt (2005) for a discussion of the drivers of the “optimistic” and “pessimistic” longevity projections in the figure.

<sup>4</sup> Life insurance business is occasionally viewed as providing some “natural” hedging opportunities (Cox and Lin, 2005), but these are typically significantly less than some assume. Indeed, such hedging opportunities are typically quite limited due to cohort mismatches—the age profile of a typical annuity pool cohort is much older (e.g., 55 years plus) than that of a life insurance portfolio, which tends to reflect events in an insured’s life, such as marriage and having children (Brown and Orszag, 2006).

<sup>5</sup> See Blake and Burrows (2001), Dowd and others (2005), and Lin and Cox (2005).

<sup>6</sup> The failure of the EIB longevity bond has been attributed to several design flaws, including a somewhat narrowly defined underlying index (based on 65-year old English and Welsh males), and (more importantly) its 25-year maturity, which left extreme longevity (i.e., above 90 years) uncovered (Blake and others, 2006).

## F. Uncertain Risk-sharing Outcomes

As noted at the outset of this section, the ability to reprice insurance is a powerful risk management tool for insurers and governments, and may act to reduce their need (real or perceived) to manage longer-term exposures through market-based mechanisms. For instance, the ability to reduce risk through annual increases in premia or reductions in coverage protects non-life insurers (in particular) from material changes in various long-term exposures. Private health insurers and the government—a major player in the health care market—also manage these risks largely by shifting them to or sharing them with households and/or plan sponsors, primarily through repricing mechanisms (usually annual) or, in the case of the government, increases in taxation and/or reduction in benefits. The ability to reprice such coverage and risks is frequently cited as the primary risk management tool for health care provision, and the reason reinsurance is rarely utilized.

There is increasing attention being given to the capacity of governments, insurance companies, corporates, and households to manage these long-term systemic risks. As part of this process, some reconsideration of existing risk-sharing arrangements may occur. Public sector pension and health care benefits are often not legally-binding commitments, or fixed future liabilities of the government. Indeed, details about such arrangements are often changed by subsequent legislation (e.g., the degree of indexation and eligibility criteria). Such uncertainties may act to further deter market developments in this area.

In some countries, the public sector has assumed or warehoused many of these longer-term risks, yet current government accounting standards often do not require the quantification, reporting, or funding of such future obligations.<sup>59</sup> As such, finance ministries frequently do not face a binding requirement, or have strong incentives, to proactively manage pension or health care exposures. Going forward, government accountability for long-term risk management may require revised and improved public accounting and reporting standards, more robust long-term fiscal frameworks, explicit

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<sup>59</sup> For example, the annual *Financial Report of the United States Government* is intended, among other things, to show the implications of the government's long-term financial commitments and obligations. However, the Comptroller General's statement on the 2005 report suggests that the financial reporting system used by the government does not clearly or transparently reveal all of its future liabilities (see GAO, 2006 for details). To present a more accurate and complete picture of the central government's net worth and financial position, France adopted a revised and more comprehensive government accounting framework in 2001 (Loi Organique Relative aux Lois de Finances), adapted from standards used by private sector companies. However, this effort remains a "work in progress," insofar as such accounts currently include only the central government, and omit future/contingent liabilities of public pensions, which are broadly summarized in an annex. Similarly, the United Kingdom is developing a system of balance sheet accounts ("Whole of Government Accounts") that follow U.K. GAAP standards, and are expected to be published for the 2006–2007 fiscal year.

estimates of contingent liabilities, and increased portfolio risk management by finance ministries.

In summary, public authorities and others generally have not encouraged or supported the use of market-based risk management tools by governments, insurance companies, and other market participants. This seems especially to be the case with regard to insurance supervisory frameworks and related rating agency practices, which have provided significant influences on risk management practices in the banking sector. While the nature of the risks themselves may have an impact on the modalities of risk management, financial innovation in insurance risk transfer markets, as in other markets, is likely to be strongly influenced by regulatory and related policies.

## V. POLICY CONSIDERATIONS

Governments should increasingly approach the long-term systemic risks outlined above as a risk manager. However, the policy discussion in many countries often still lacks broad public awareness and understanding of the issues, and therefore a more detailed dialogue or consensus regarding the priorities is frequently absent. If the large systemic risks are to be addressed successfully, either by governments or the private sector, such priorities need to be clearly defined by public authorities. Moreover, from a public sector perspective, realistic estimates of existing and contingent liabilities (along with the uncertainties surrounding such estimates) need to be communicated. This communication and measurement exercise is likely to be an important pre-condition to the development of the political (and societal) willingness to address these risks at an earlier stage, when they may be more manageable.

Governments are market participants and, as such, by implementing various policies they influence financial market behavior. In addition, academics and market participants believe that the financial technologies needed to manage and possibly transfer many of the risks discussed in this paper already exist today, and in many cases (albeit in differing contexts) have been successfully employed in other sectors (e.g., banking). Therefore, as part of their risk management strategy, authorities may choose to promote and potentially use various market-based inputs to better measure, manage and possibly mitigate some of these long-term systemic risks. Broadly speaking, governments may consider three, possibly complementary, approaches: (i) to use various policy levers to encourage the private sector to address incomplete markets; (ii) to act as the “insurer of last resort,” and where deemed appropriate (i.e., based on cost/benefit analysis) or necessary to directly assume (perhaps temporarily) some of these risks; and/or, (iii) to determine that households are best positioned to bear and manage these risks, and support efforts to improve their ability to do so. In these areas, there is no “one size fits all” solution, and

each country is likely to develop an approach to managing these risks that reflects its political, social, and cultural preferences.<sup>60</sup>

### **A. Encourage the Private Sector to Address Incomplete Markets**

Historically, governments or insurance companies have intermediated and typically warehoused many of the long-term risks discussed in this paper. That practice, for a variety of reasons highlighted above, may no longer be a viable approach in the medium to long term concerning certain of these growing risks. As such, policymakers should consider more comprehensive risk management strategies, including the encouragement of broader market solutions to these important economic challenges.

Through the use of various policy levers, governments influence the flow of risks in the financial system, and can encourage the development of new products and risk management tools, contributing to financial stability in the process. This occurred in the credit markets throughout the 1990s. Many observers believed previously that credit risk was inherently “untransferable” or “untradable,” which has proven not to be the case. Similarly, today many insurers and other market participants believe that certain of the risks highlighted in this paper reflect “one-sided” risks or markets, and therefore may only be appropriate for traditional insurance risk management practices, such as portfolio diversification and pooling. However, as with banking, and encouraged by the Basel guidelines, governments may seek to influence these markets and risk management practices. The policy tools available to the authorities to encourage market innovation and alternative risk management activities range from regulatory and supervisory frameworks to taxation, accounting standards, data availability and compulsion. This process does not require new or additional regulations or burdensome standards, but arguably more precise measurements of risk, which has generally been the catalyst to develop better risk management tools and innovative market practices.

#### **Regulatory frameworks**

The regulatory framework for insurers heavily influences their willingness and ability to transfer risk to other market participants and to take on new risks. Traditionally, insurance regulation has focused primarily on consumer protection, and often prescriptive rules related to asset and liability management, rather than more macro prudential and financial stability considerations and related efforts to improve risk management practices. As such, insurance supervisors may often assume that insurers act or should act as “warehousers of risks,” and therefore that static and dedicated reserves are required to ring-fence each of the distinct risks that insurers underwrite. Moreover, reserves are rarely seen by such supervisors as the economic equivalent of capital, to be managed

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<sup>60</sup> See Groome et al. (2006) and Mitchell et al. (2006).

broadly and available to address a variety of risk exposures. As such, based on this view of insurers and insurance regulation, reserve requirements typically are not adjusted if risk is transferred or hedged via the capital markets, since the hedging and dispersion gains are largely irrelevant to dedicated reserve management. Likewise, traditional reinsurance arrangements typically attract reserve relief only if the risk is transferred in its entirety (e.g., to a reinsurer, on an indemnity basis), which usually also requires new dedicated reserves from the reinsurer (often referred to within the industry as “trapped” capital). However, looking at the long-term risks and challenges more broadly, this traditional regulatory approach seems less likely to attract new capital, or to encourage better risk management practices, including market risk transfer activity. Indeed, in some markets (e.g., retail-oriented coverage) we observe insurance capital and capacity being reduced, due in part to regulatory intervention in the pricing of coverage and (and more broadly) considerations related to “trapped” capital.

Insurance regulation stands in sharp contrast to the evolution of prudential regulation for banks. Indeed, by encouraging banks to measure the risk-adjusted return on their assets against required capital, the Basel framework has led banks to focus more on the activities in which they have a comparative advantage, such as credit origination and pricing, and less on loan warehousing. This trend has also led to an increased focus on overall balance sheet exposures and liquidity, which many industry observers believe has reduced the possibility of defaults and systemic risks. In short, the Basel framework has spurred the development of more active and innovative risk management practices, through which risks are increasingly transferred to institutions possibly better able to hold and manage such risks, often related to their different balance sheet structure.

Recently, a number of insurance regulators have started to implement approaches closer to the spirit of the Basel framework and have developed more comprehensive risk-based capital requirements, which recognize the benefits of reinsurance, securitization, and diversification within the risk portfolio. For example, Switzerland is implementing a principles-based supervisory framework, which promotes a greater focus on risk and capital management, and provides insurers with regulatory capital relief for market securitizations.<sup>61</sup> In the Netherlands, the authorities have made significant strides to strengthen the regulation of pensions, particularly through more risk-based supervision, which encourages fund managers to focus more on risk management and asset-liability management. The U.K. Financial Services Authority recently signaled its willingness to promote insurance risk transfer markets through insurance special purpose vehicles, thereby building on its new risk- and principles-based approach to insurers’ capital adequacy.<sup>62</sup> In Asia, some regulators (e.g., the Monetary Authority of Singapore) have

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<sup>61</sup> See “White Paper on the Swiss Solvency Test,” Swiss Federal Office of Private Insurance, November 2004.

<sup>62</sup> U.K. FSA (2006).

also encouraged improved risk and capital management, including the use of insurance market-based risk transfer.<sup>63</sup>

A risk-based approach is also encompassed in the Solvency II framework being developed within the E.U., and in the parallel work being conducted by the International Association of Insurance Supervisors. The Solvency II project is a major initiative to strengthen risk management practices in the European insurance industry. By promoting greater capital management discipline and focus, it is intended to enable E.U. regulators to better align regulatory capital requirements with economic capital models, and may encourage insurers to make greater use of risk transfer markets and related capital market techniques now commonly used by banks, including securitization.

Despite these initiatives, some market participants express doubts regarding the potential for significant cross-border regulatory coordination in the insurance sector. They see the traditional consumer protection versus risk-based approaches, as outlined above, as difficult to reconcile, and unlikely to lead to more common or coordinated international standards.<sup>64</sup> As such, the impact of Solvency II remains difficult to predict, and may not produce the same degree of influence on insurance risk management practices as seen in the banking sector.<sup>65</sup>

In sum, the role of insurers, as determined and envisioned by policymakers, is likely to heavily influence the development of insurance regulatory frameworks and related risk management practices. Where a traditional view of the role of insurers prevails (possibly in jurisdictions with a high concentration of mutuals), insurers may remain the primary “warehousers” of insurance risk, with ring-fenced reserves, but potentially less industry capacity to cover new or certain types of risks. In contrast, where a broader risk or capital management view is preferred, the development of risk transfer markets may allow greater insurance capacity for a wider variety of risks. There is, in principle, no reason to consider either one of these approaches fundamentally superior to the other. Indeed, each approach has its own logic, and reflects a different vision of the role insurers should play in society. However, in either case, the authorities may need to: (i) clarify the desired role of insurance companies, and determine their comparative advantages (relative to other market participants, including governments); (ii) provide clear and consistent prudential treatment of risk management practices, including innovative risk transfer mechanisms,

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<sup>63</sup> See for example the speech by Mr. Ong Chong Tee, Deputy Managing Director, MAS, at the Singapore International Insurance Conference, May 17, 2006.

<sup>64</sup> Industry and public officials have also noted that the fragmented U.S. insurance regulatory framework restricts the United States authorities’ ability to assume a more influential role in international fora on these important issues (e.g., Davies, 2006).

<sup>65</sup> Swiss Re (2006c).

even if basis risk exists; (iii) employ supervisory staff capable of evaluating and influencing risk management mechanisms; (iv) promote contractual certainty in insurance markets, which may facilitate the standardization and securitization of (re)insurance risks; and (v) work for greater international regulatory coordination.

These contrasting views of certain insurance concepts are more than philosophical, and raise some important issues. For example, what is the role of “insurance” in helping to address the major long-term risks and related challenges, and do we wish to attract more capital to these risks and markets? For our part, we generally view insurance as providing “contingent capital,” and therefore tend to prefer more, not less, of such activities. As such, we prefer policies which are more likely to attract additional capital and participants to these risk markets and products, and thus favor frameworks which encourage risk transfer and risk management activities. By allowing households, entrepreneurs, corporations, and even local and national governments to contract with a third-party to provide additional capital, when and if a catastrophe or material insurable loss occurs, at a fraction of the cost of the potential loss, insurance reduces the need for individual precautionary savings. Therefore, considerations related to the “role of insurance” are important to the broader economic landscape, and depending how such questions are answered and related regulatory regimes established, may greatly influence the ability to attract more capital and innovative solutions to existing and emerging risks.

### **Accounting standards**

Accounting standards should not produce disincentives to a greater reliance by insurers on risk transfer markets. This requires that transactions with the same economic status be treated similarly from an accounting perspective or, said differently, that accounting should reasonably reflect economic reality, including the benefits of partial hedging. More broadly, while the shift to fair value accounting principles in many jurisdictions may bring more discipline to insurance and pension fund reporting, it is not clear that the volatility associated with fair value accounting measures properly focuses insurance companies or pension funds on effective risk management objectives.<sup>66</sup> As such, policymakers may also consider whether broader disclosure of the asset and liability structures (including the maturity profile of liabilities, and market and interest rate sensitivities) may provide investors and beneficiaries with more useful information.

### **Tax policy**

The structure of taxation can also have a significant influence on the development of risk transfer markets. Overall, tax policies should weigh costs and benefits within an overall government risk management framework. First, governments need to consider whether

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<sup>66</sup> See IMF (2005b, Chapter III, Module 4).

existing tax systems may inadvertently penalize (and possibly prevent) the transfer of risk to other market participants.<sup>67</sup> For instance, capital losses on derivative instruments and the costs of securitization should be taxed similarly for insurers to ensure neutrality of treatment between market risk transfer, reinsurance, and retaining risk on-balance sheet.

In addition, tax incentives may be considered in some cases, even if temporarily, to encourage desired risk management practices. For instance, tax regimes for company pension funds should be designed to encourage prudent, possibly continuous funding policies, and ideally incentivize companies to build reasonable funding cushions (e.g., two or three years of normal contributions).<sup>68</sup> With regard to the household sector, the clarity and stability of tax regimes is deemed essential to encourage the development of adequate long-term savings and investment products. More broadly, tax incentives may also be considered to facilitate the development of new markets, such as “macro swaps,” through which (for instance) the pension fund and health care industries may swap their complementary cash flows and exposure to longevity.<sup>69</sup> Governments may encourage these transactions (for example) by introducing appropriate tax incentives for the health care industry, perhaps conditioned on certain research or product development efforts targeting the needs of the ageing/retiring population.

## **Compulsion**

The need to pool diversified risks is an important feature of insurance, including annuities and health care coverage. To help reduce adverse selection and bias, governments may require that a minimum degree of insurance is purchased by all persons. Such an option also helps to limit the potential costs that may ultimately be transferred to the public sector. With regard to longevity risk management, mandatory annuitization (similar to more specific risk measurement and capital allocation) may encourage the emergence of more “vanilla” annuity products, and potentially improve households’ understanding and acceptance of such products. In the health care sector, many OECD countries have mandatory universal public or private health care, which may be a way for the government to overcome market limitations. For example, in 2006, the Netherlands introduced compulsory private health care insurance, under which private insurers are

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<sup>67</sup> In some instances, however, achieving neutrality in the taxation of a financial instrument may be effectively impossible for most taxpayers. For instance, the tax-favored position of owner-occupied housing in most countries makes it difficult to treat house price derivatives in a similar manner.

<sup>68</sup> Indeed, the 2006 Pension Protection Act in the United States, for example, raised the maximum tax-deductible contribution to approximately 150 percent (including other criteria) of the applicable funding target (against 100 percent previously).

<sup>69</sup> Longevity increases lead to both greater liabilities for pension funds and higher revenues for health care companies (from increased health care spending by the elderly). The availability of an index reflecting the cumulative survival rate in a given population would provide the basis for both parties to trade their symmetric exposures, and hedge against unexpected changes in longevity.

required to accept any Dutch citizen for “basic” health care coverage, regardless of their health condition or age.<sup>70</sup>

### **Data availability**

Governments may have a comparative advantage and interest in improving the availability, reliability, and timeliness of certain data, necessary for the development of markets to better manage various risks. Indeed, data provision may be a relatively low cost method of supporting market-based solutions. For example, market participants cite the absence of comparable health care data, the unreliability and out-of-date nature of mortality information, and the lack of reliable local data on house price movements as reasons risk management tools have been slow to develop, or are altogether absent from financial market analysis.<sup>71</sup> Finally, such government initiatives may only need to be temporary, until a growing market demand leads to data collection and dissemination by the private sector.

An example of the importance of the combination of regulatory, tax and data considerations is provided by the UK commercial property index derivatives market. The development of this market has been based upon: (i) the existence of reliable and comprehensive commercial property indices, on which contracts for difference, swaps and structured notes are based; (ii) a ruling by the U.K. FSA in November 2002 which allowed property derivatives to qualify as admissible assets for life insurers, thereby counting towards their solvency ratios (in addition, the ability to hedge underlying positions in a property index enables insurers to save capital in the FSA’s new risk-based capital regime); and (iii) a tax change in September 2004 which gave property derivatives the same treatment as other derivatives. As a result, transactions have grown significantly since early 2005 and are expected to reach £6 billion in 2007.

The overarching message is that policymakers need to be aware of the impact their actions can have on market behavior, the flow of risks, and the development of risk management and risk transfer tools. Such consideration applies to insurance regulators, tax officials, and accounting standard-setters, as well as finance ministries and statistical offices. Moreover, by pursuing policies designed and aligned to effectively influence market behavior and risk management practices, policymakers may attract additional

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<sup>70</sup> See also the proposed health care reforms in Germany, which seek to combine a broader funding base for the public health care system, with increased competition and cost transparency among insurers.

<sup>71</sup> The development of liquid housing price index markets would provide savers with opportunities to hedge against price increases (for those saving to buy a home), and homeowners to hedge potential price declines (e.g., as they approach retirement). Moreover, such hedging instruments may facilitate the growth of reverse mortgages or similar equity release products, allowing households to more easily realize an annuity-like income stream, and thus better hedge longevity risk.

capital to these long-term challenges, and thereby potentially mitigate or smooth their economic impacts.

## **B. Government as Insurer of Last Resort**

In some cases, governments may need to act as the “insurer of last resort” to address incomplete markets or to provide solutions where private markets may be unable. This role is already recognized in areas where risks (or related costs) are deemed too great or undiversifiable for the insurance or broader financial market to insure effectively. For example, governments’ role in underwriting bank deposit insurance is seen as a cost-efficient way to promote the stability of the banking system.<sup>72</sup>

Governments may be the most appropriate providers of some forms of protection against systemic risks due to the nature of their balance sheets. For instance, if tax revenues are protected against inflation (e.g., due to proportional tax rates and nominally fixed tax brackets) but expenditures are not, the government may be best-placed to offer inflation protection by issuing index-linked bonds, particularly to pension funds. The greater access to capital markets that the power to tax bestows also may mean that only governments can assume certain extreme catastrophic risks. When the amount of capital required to cover certain costly tail risk events, such as earthquakes and extreme terrorist attacks, is uneconomical for the private sector, government intervention may be the only alternative if a risk is to remain insured.<sup>73</sup>

With regard to longevity risk, which most insurers and pension fund managers describe as unhedgeable, some authorities have considered assuming a limited (but important) portion of longevity exposure, such as extreme longevity risk (e.g., persons over age 90). In this way, by assuming the tail risk, governments may also increase the capacity of the pension and insurance industries to supply annuity protection to sponsor companies, pension beneficiaries and households, and facilitate the broader development of longevity risk markets. However, no government has moved to date to assume extreme longevity risk, and consideration of such a policy is often complicated by existing large exposures to longevity and health care costs, which generally argue against government action.

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<sup>72</sup> Similarly, there may be strong economic reasons for governments to ensure that flooding or terrorism insurance remains available, either by providing or requiring minimum coverage, or by “capping” such exposures and insuring the extreme risks themselves, thereby seeking to attract private capital and additional insurance coverage.

<sup>73</sup> A number of governments now ensure the provision of terrorist risk cover. This may be done either in the form of direct guarantees provided by the state (e.g., CCS in Spain), mutual pools of capital that are then reinsured or indemnified by the state if the pool is exhausted (e.g., GAREAT in France), or co-insurance provided by the state, sharing a proportion of losses with the insurance industry above exclusions (e.g., TRIA in the United States).

As noted above, when considering such a role and assumption of risk, an important consideration is the existing exposure that the state already has to longevity and health care costs through the provision of state pensions, pension guarantee funds, and health care. Where the state provides a substantial public pension benefit, such exposure may limit the scope for the state to take on greater risk. Conversely, where state plans represent more of a safety net (and not a retirement-style pension), or as the level of state pension is reduced in some countries, governments may “free up capacity” to absorb certain risks, ideally in a manner which will also attract private capital and capacity.

In all cases, government intervention should be part of a comprehensive risk management strategy, taking into account expected costs and benefits (i.e., the impact on the public sector balance sheet), the time horizon, and the potential for financial market solutions. Governments often intervene in insurance markets as a result of a crisis or catastrophe, and possibly without carefully considering longer-term objectives. Indeed, government intervention may often need to be tailored to very specific risks or of limited duration, and withdrawn as private financial services develop.<sup>74</sup>

### **C. The Household Sector**

Households, as the “shareholders” of the system, have always been the ultimate bearers of financial and other risks. However, they are increasingly facing additional and new risks more directly as a result of public and private benefits being reduced or restructured.<sup>75</sup> Policy considerations regarding the desirable risk profile of the household sector involve important cultural, social, and political issues, which are likely to be addressed differently across countries or regions. Nevertheless, a greater transfer of risks to households raises the question of how well-equipped households are to bear such risks.<sup>76</sup>

In considering the allocation or sharing of risks, policymakers need to measure the impact of ongoing and proposed changes in pension and welfare systems on the household sector. In particular, they may use or develop statistical tools to capture the distribution of risks across population subgroups, especially age and income cohorts, and develop

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<sup>74</sup> For example, in the area of housing policy, the Mexican authorities introduced in 2001 the *Sociedad Hipotecaria Federal* (SHF), which offers public guarantees and seeks to improve liquidity in the country’s secondary mortgage market. However, the mandate of the SHF is explicitly limited and time bound, as the federal government’s guarantee is to be eliminated in 2014.

<sup>75</sup> Even with government-provided pensions, beneficiaries in some countries are now required to incur longevity risk directly. For instance, in Japan and Portugal (as announced), state pension benefits are indexed to measures of aggregate longevity. The 2006 U.K. Pensions White Paper proposes raising the future state retirement age, in part due to current and expected improvements in longevity.

<sup>76</sup> See, for example, Mitchell et al. (2005).

broader, more forward-looking measures of household wealth. For example, they may try to define an appropriate financial margin measure to evaluate households' financial resources relative to anticipated future obligations.<sup>77</sup>

In many countries, policymakers may also need to communicate more effectively the reasons why certain risks are being shifted to households (e.g., pension- and health care-related risks), in order to help develop a broader understanding and support for reform efforts. In addition, households also need to be informed about the potential scale of these new exposures, so that they can make more appropriate saving decisions. For instance, governments may provide up-to-date data on life expectancy, as well as projections of additional health care costs expected to be borne by households.<sup>78</sup> The publication of better long-term fiscal projections by more countries, with greater emphasis on their range of uncertainty, should also enable households to better anticipate future cost increases or benefit reductions.<sup>79</sup>

Finally, governments should strive to provide households with improved financial literacy, as households generally need a greater understanding of the risks and alternatives related to these long-term financial challenges.<sup>80</sup> Governments and private industry have complementary roles and comparative advantages in this regard, and the incentives for financial advisors to provide long-term, impartial advice to households may need to be re-examined, including relatively simple and stable tax and regulatory regimes that encourage advisers to develop more long-term planning products.<sup>81</sup>

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<sup>77</sup> IMF (2005a, Chapter III). In Sweden, the Sveriges Riksbank has sought to develop such an approach, assessing the financial margin (i.e., post-tax income, after interest expenditure and regular living costs) of Swedish households, and their ability to service their obligations when faced with potential benefit adjustments or economic shocks (e.g., a rise in interest costs and/or a decline in income) (see Sveriges Riksbank, Financial Stability Report, 2004:2).

<sup>78</sup> Simple information, such as how working a few years longer can significantly raise one's retirement income, would be useful to most workers planning for retirement. The U.S. National Retirement Risk Index is a good example of how the complex risks associated with retirement saving can be presented in a relatively simple and usable manner (Munnell and others, 2006).

<sup>79</sup> This is currently done, in rudimentary form, in Japan's *2004 Public Pension Plan Revision*, and various U.S. CBO and Government Accounting Office projections.

<sup>80</sup> See, for example, Blancher (2006).

<sup>81</sup> In the U.S., for example, the 2006 Pension Protection Act allows greater scope for 401(K) plan participants to receive investment advice, and removes regulatory barriers and uncertainty with regard to automatic plan enrollment (with opt-out ability), in an effort to increase plan participation and savings.

#### **D. Government as Risk Manager**

The above discussion has highlighted how policymakers may influence financial market developments and market-based solutions to some of the challenges associated with managing these long-term systemic risks. As such, it focused heavily on how some of the policy levers available to governments may be utilized to progress or complement reform efforts. A central message is that governments need to approach these long-term systemic challenges as a risk manager, considering their explicit, implicit, and contingent obligations. In doing so, they are likely to benefit from greater market inputs and risk management instruments, including the ability to better measure and monitor such obligations (e.g., volatility measures).

To date, only a few governments have approached these long-term financial challenges in this manner. Only in the past few years have long-term projections been prepared and published by some ministries of finance and public auditors addressing the issue of ageing-related spending trends, and long-term fiscal sustainability. Similarly, few central governments publish balance sheets using accounting standards derived from those applied to private corporations, and the risks and magnitude of contingent liabilities in government accounts is still rarely quantified. These emerging practices and trends should be encouraged, and progress in this area would be welcome.<sup>82</sup>

Furthermore, given the focus that rating agencies, in particular, are increasingly applying to sovereign borrowers' long-term fiscal issues, and the potential for rating downgrades if such risks are left unaddressed, greater action may soon be required. Indeed, while the typically shorter-term focus of politicians (and the electorate) may often inhibit more immediate efforts to address these longer-term challenges, greater scrutiny from public auditors and legislators, financial media, international financial institutions, and investors, is only going to increase the emphasis on these long-term systemic challenges, and the need for governments to pursue more comprehensive risk management strategies.

#### **VI. CONCLUSIONS**

Financial markets may play a greater role in the management of the long-term systemic risks. Governments should seek to encourage and to influence market developments in these areas, and reform efforts may need to reconsider the appropriate sharing of risk among the public, private, and household sectors. In some cases, governments may simply provide a framework or otherwise influence market participants to address incomplete markets, such as longevity or house prices. As seen in the banking sector, a clear and consistent regulatory framework can encourage innovation in risk management

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<sup>82</sup> The IMF's Government Finance Statistics Manual (2001) and the Fiscal Transparency Manual have sought to go further by also encouraging contingent liabilities to be included in government budget documents.

techniques. In other cases, governments may need to intervene directly, perhaps temporarily, to provide some minimum and/or extreme insurance coverage, ideally to facilitate the development of private capacity. Lastly, some risks may be best managed by the household sector, although shifting more risks to households will require some additional measures to ensure they have some minimum capability to manage such risks. The alternatives chosen in practice will be influenced by the sophistication and depth of domestic or regional financial markets and institutions, as well as important cultural and social considerations.

The issues related to these long-term systemic risks, and their implications for financial markets, are relevant to all countries. Several governments and international institutions have acted to raise public awareness of the challenges related to these long-term systemic risks, and have begun to address some of the main issues. However, these issues are not going to fade away. On the contrary, these tend to be cumulating risks, and with time may well exacerbate a number of related social, economic, and financial challenges. Moreover, governments, domestic businesses, and financial markets compete globally for investment capital. The potential economic and financial market impact of pension and health care-related obligations may adversely influence their competitive positions, as well as macroeconomic and financial stability. These prospects should strongly encourage policymakers to build greater public support for more immediate policy initiatives designed to mitigate such adverse impacts. Given the multi-generational nature of the challenges and most of the likely reforms, it is important to move forward more ambitiously and more comprehensively to address these risks.

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