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The robustness of flood insurance regimes given changing risk resulting from climate change

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ABSTRACT

The changing risk of flooding associated with climate change presents different challenges for the different flood insurance market models in use around the world, which vary in respect of consumer structure and their risk transfer mechanism. A review of international models has been undertaken against three broad criteria for the functioning and sustainability of a flood insurance scheme: knowing the nature of the insurable risk; the availability of an insurable population; and the presence of a solvent insurer. The solvency of insurance markets appears strong, partly because insurers and reinsurers can choose to exclude markets which would give rise to insolvency or can diversify their portfolios to include offsetting perils. Changing risk may threaten solvency if increasing risk is not recognised and adjusted for but insurability of flood risk may be facilitated by the use of market based and hybrid schemes offering greater diversification and more flexibility. While encouragement of mitigation is in theory boosted by risk based pricing, availability and affordability of insurance may be negatively impacted. This threatens the sustainability of an insurable population, therefore the inclusion of the state in partnership is beneficial in ensuring continuity of cover, addressing equity issues and incentivising mitigation.

Introduction

It is generally accepted that our climate is changing and the resulting hydro-meteorological variations could cause variations in risk from sea level rise, extreme weather and hazards (IPCC, 2012). Flooding is the most prevalent natural hazard event, occurring frequently across all continents (EM-DAT, 2012). Insurance against the impact of flooding would therefore benefit a significant proportion of the global population and yet much of the worldwide flood damage remains uninsured.

Partly this is because appropriate and affordable flood insurance is not widely available. Insurance against the existing extent and severity of flooding is more problematic to price than other hazards due to the uncertain behaviour of flood waters in urban environments. At a global level there is a great deal of uncertainty about the scale and timing of potential climatic changes, dependent on the assumptions inherent in predicting future climate drivers, particularly the economic scenario chosen (Solomon and Qin, 2007). This uncertainty in itself presents a challenge for those in the business of insuring flood risks in the future. Flood risk is categorized as low probability/high-consequences and with spatial correlation across

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losses. Therefore highly detailed information is necessary to price flood risk accurately and investment in this information may be a barrier to new entrants in the market, particularly for private companies in small markets (White, 2011). Changing climates bring extra challenges because in downscaling global climate models to appropriate spatial scales the forecasts become inherently less precise (Lopez, 2012; IPCC, 2012). These issues have led to the view in some markets that flood risk is so problematic to insure that the market alone cannot provide universal cover (Swiss Re, 2010a).

Low affordability also restricts levels of insurance coverage, particularly in emerging economies where spare resources for insurance premiums are non-existent (Churchill, 2006; Swiss Re, 2010b). Potentially, changes in flood risk associated with climate change, could make this significantly worse. Particularly germane in this respect is the expected increase in the extreme events that cause large single losses, lift the probable maximum loss threshold, and may trigger premium increases in areas affected.

This paper examines whether a changing climate is detrimental to the provision and functioning of flood insurance and which approaches are relatively more or less vulnerable to future climate risks. The comparison of approaches encompasses insurability of risk, affordability of cover, solvency of insurers, and the role of insurance in stimulating risk reduction. The first section below briefly touches on the coverage of flood insurance worldwide. The three basic requirements for sustainable flood insurance arrangements are discussed and a broad categorisation of approaches presented. This is followed by an assessment of the robustness of the approaches to the challenges of changing risk.

Context

Reported global economic losses from flooding have increased in recent decades from an annual median average of about $0.5 billion in the 1980s to around $20 billion in the first decade of this century (EM-DAT, 2012). The majority of losses are not covered by insurance, varying from less than 1% in countries such as Taiwan to almost 100% in exceptional countries such as Spain and Switzerland (Table 1). On the whole developed nations have higher coverage rates whereas insured losses in developing countries rarely represent more than 25% of total economic losses (Jha et al., 2011).

In predicting climate impacts on flood risks the expectation from the latest IPCC report (IPCC, 2012) is that global rainfall will remain fairly constant, but some regions will experience more rainfall and others less (Christensen and Hewitson, 2007). This means that national insurers in some countries may be facing rising losses due to wetter conditions, for example in the UK. Even in regions where average rainfall remains stable or declines, incidence of extreme rainfall events is expected to increase and seasonal rainfall distribution is predicted to change. Few regions or countries have taken the step of translating these IPCC climate forecasts into detailed flood damage estimates, a notable exception being the UK Foresight report which estimated that the increasing risk of urban flooding in the UK alone might cost from 1 to10 billion pounds a year by 2080 (Evans et al., 2008; Office of Science and Technology, 2003).

Observed increases in flood related damages are not due wholly to changing climates. Analysis shows that past growth in losses can be largely explained by changes in the reporting of events, increased wealth and larger populations exposed to hazard (Pielke, 2006; Crompton and McAneney, 2008; Swiss Re, 2010a; Munich Re, 2011; Barthel and Neumayer, 2012). In the short term, growth is expected to follow a similar pattern, with exposure a more important driver than climate change (IPCC, 2012). Thus it is crucial to consider the potential of insurance to encourage redistribution of exposed assets and thereby contribute to risk reduction or moderate its growth. Schemes that enhance risk reduction will remain more affordable in the future and be less sensitive to changes in climate.

Definition of key requirements

A functioning and sustainable insurance scheme requires that there is an insurable risk that is quantifiable, distributed, and affordable. It also requires that there is an insurable population aware of risk, willing to insure and one that that can afford the necessary premiums (Walker et al., 2009; Dlugolecki et al., 2009). Finally, what is needed is a solvent insurer that is willing and can afford to run the scheme and pay claims; and has arrangements in place to cover any abnormally large losses (Walker et al., 2009; Monti, 2009; Cummins and Mahul, 2009; Dlugolecki et al., 2009).

Looking forward in time there are significant threats to the viability of flood insurance regimes. Climate change threatens insurability – a combination of our first two requirements – because uncertainty means that the hazard will be less quantifiable, could be more subject to clustering of claims and less affordable because, due to increased uncertainty and clustering, premiums may increase more rapidly than the incomes of those at risk. In this respect there is a balancing act: climate change raises awareness and willingness in populations to insure but threatens the affordability and availability of cover (Aseervatham et al., 2012).

Taking the last of the three criteria – the solvent insurer – most insurance is based on for-profit companies that generally only provide cover if it is beneficial to the company to do so. Given that many insurance policies renew annually withdrawal can be swift. Market based insurers may choose to withdraw new cover at any moment unless there are agreements or legislation tying them in (Bouwer et al., 2007) and exisiting policyholders will find it hard to renew. This has happened in the United States on a large scale (Mills et al., 2005) and in the United Kingdom on an individual insurer basis (Stevenson, 2002). Withdrawal becomes more likely if, due to climate change, the cost of capital to support risk portfolios rises with increased uncertainty and larger probable maximum losses (Dlugolecki et al., 2009) and profitability is threatened.