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Storm Alert: Natural Disasters Can Damage Sovereign Creditworthiness

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Table Of Contents

References In Our Sovereign Ratings Criteria

Few Natural Catastrophe-Related Rating Actions So Far

Quantifying The Impact Of Severe Catastrophes

Earthquakes

Tropical Cyclones

Floods

Winter Storms

Who Has Most To Lose?

How Robust Are Ratings Outcomes If Damage Assumptions Change?

Insurance Coverage Can Act As A Mitigant

Climatic Perils Are Likely To Intensify, Hitting Poorer Sovereigns Harder

Related Criteria And Research

Storm Alert: Natural Disasters Can Damage Sovereign Creditworthiness

Earth can be a dangerous planet. When Lisbon residents got up in the morning of All Saints Day 1755, they had no way of knowing that a massive earthquake and the resulting tsunami would almost totally obliterate their city a few hours later, bringing with it a death toll running into the tens of thousands, according to some estimates. The Soufrière Hills volcano on the Caribbean Island of Montserrat erupted in 1995 after a long period of dormancy, destroying the capital city of Plymouth and leaving half the island uninhabitable. The majority of the population left the island in the aftermath. In the very recent past, typhoon Hayan (November 2013) ravaged The Philippines, causing over 6,000 fatalities. An estimated 9,000 people were killed by the consequences of the April 2015 earthquake in Nepal. The list could go on and on.

Although in most inhabited areas living conditions are conducive to human life much of the time, nature can strike at almost any moment. While there appears to be no particular trend in the frequency of natural catastrophes of a geologic nature (earthquakes, tsunamis, volcanic eruptions), the data hint at an inexorable increase in climatic catastrophic events (storms, floods, and temperature extremes). In fact, every day about 3,500 earthquakes are detected with a volcano erupting every week, while annually up to 40 tropical cyclones hit countries in the warmer parts of our planet (McGuire, 2014). The vast majority of these events are relatively benign, and do not cause economic damage of a magnitude that would have any meaningful repercussions on the credit standing of the sovereigns where they occur. However, in the rare cases when severe natural catastrophes hit densely populated and economically developed areas, they bear large economic costs and are more likely to hurt a sovereign's credit standing.

Overview

- Based on a sample of 48 countries, our simulations indicate that natural disasters (earthquakes, tropical storms, floods, and winter storms), which can be expected once in every 250 years, can weaken sovereign ratings.
- The biggest ratings impact in our sample comes from earthquakes and tropical storms: The top five catastrophes for both perils (measured in damages as share of value) could lead to downgrades of around 1.5 notches for the sovereigns affected. Floods and European winter storms are generally unlikely to, by themselves, lead to downgrades.
- One way to mitigate the economic and ratings impact of natural disasters is catastrophe insurance. We find that in the case of the five biggest earthquakes, the rating impact would be a downgrade of more than one if 50% of the damage were insured, compared with almost two notches in the case of no insurance coverage at all.

Risks are rising. The NatCatSERVICE database of reinsurer MunichRe suggests that the frequency of what it calls "great natural disasters" has more than doubled from half a century ago. As evidence of a rise in global mean temperatures is solidifying, one could hypothesize that the frequency and/or severity of extreme weather conditions will likewise continue to rise. Awareness, including public perceptions, of these risks is also growing. Indeed, the

Global Risks 2015 report by the World Economic Forum shows that by and large survey respondents consider that environmental risks are the ones that will, over the next decade, grow faster than any other risk category. This is confirmed by another recent global survey, with respondents from 40 sovereigns citing climate change as the biggest global concern, even ahead of global economic instability and specific regions' security concerns (Pew Research Center, 2015).

References In Our Sovereign Ratings Criteria

The criteria we apply when assigning ratings to sovereigns make passing reference to natural perils (see "Sovereign Rating Methodology," published Dec. 23, 2014, on RatingsDirect). Paragraph 27 of the criteria affords analytical discretion to lower the sovereign indicative rating resulting from the strict application of the sovereign methodology by one notch should we assess as material the risk that "the occurrence of a rare but severe natural catastrophe could also lead to a material deviation from the indicative rating level, depending on the extent of damage." Furthermore, paragraph 53 of the criteria permit another, although less powerful, negative adjustment to the economic assessment to any sovereign whose "economic activity ... (is) vulnerable due to constant exposure to natural disasters or adverse weather conditions."

But in general, the most likely effect of natural catastrophes on sovereign ratings would be indirect rather than direct, through a weakening of the fundamental factors that determine the rating of a sovereign. A natural disaster can hit economic output and growth potential as well as external finances through hampering export performance and requiring additional food and reconstruction-related imports. They can place a heavy burden on public finances, leading to rising debt and deficit ratios. Inflationary pressures are likely to rise and commercial banks could face deteriorating asset qualities as the value of collateral assets and businesses is hit. It can also have lasting effects on societies more broadly as governance and institutions may suffer and security risks mount. All of these factors are integral parts of our economic, external, fiscal, monetary, and institutional assessments, which form the bedrock of our sovereign criteria. Similar to the ratings implications of aging societies (see "Global Aging 2013: Rising To The Challenge," published March 20, 2013), our criteria implicitly capture the effect of natural disasters on the sovereigns we rate.

Few Natural Catastrophe-Related Rating Actions So Far

To date, rating changes directly resulting from catastrophic natural events have been rare. One exception was our 2004 downgrade of the Caribbean island of Grenada as a direct consequence of "the extensive damage the hurricane inflicted on the twin pillars of the Grenadian economy: the tourism and nutmeg industries." (See "Grenada Ratings Lowered, Placed on Watch Neg, in Wake of Hurricane Ivan," published on Sept. 17, 2004). However, the reason for the rarity of disaster-induced downgrades may be specious. Some of the countries most affected by natural disasters did not have a sovereign rating at the time (for example, Nepal in 2015, Haiti 2010, Honduras 1998, and Montserrat in 1995).

In some instances, a natural disaster has contributed to a negative rating action, but was not the only driver. For

example, on April 26, 2011, Standard & Poor's revised the outlook on Japan's "AA-" sovereign rating to negative stating that, among other reasons, the "costs related to the March 11, 2011, earthquake, tsunami, and nuclear power plant disaster will increase Japan's fiscal deficits" (see "Outlook On Japan Sovereign Credit Rating Revised To Negative; Ratings Affirmed At 'AA-/A-1+'," April 26, 2011). Similarly, the downgrade of New Zealand to 'AA' followed "our assessment of the likelihood that New Zealand's external position will deteriorate further at a time when the country's fiscal settings have been weakened by earthquake-related spending pressures and fiscal stimulus to support growth." (See "Long-Term Sovereign Rating On New Zealand Lowered To 'AA' On Weakening Fiscal, External Positions; Outlook Stable," Sept. 29, 2011).

We believe that sovereigns most vulnerable to natural hazards are likely to be small island states with next to no "geographical diversification" and a narrow economic base. Countries in the Caribbean are thus among the most disaster-prone in the world in terms of incidence, percentage of population affected, and relative extent of damage. Even so, we affirmed the ratings on Bermuda ('AA' in 2003) following Hurricane Fabian, Belize (at 'BB' in 2000) following Hurricane Keith, and the Cook Islands (at 'BB-' in 2005, though we placed the ratings on CreditWatch negative for two months) following a series of cyclones (see "Assessing The Impact Of Natural Disasters On Sovereign Credit Ratings," June 14, 2010).

Quantifying The Impact Of Severe Catastrophes

Here, for the first time, Standard & Poor's attempts to quantify the severity of the economic and ratings impact of rare but calamitous natural disasters. We focus on four perils: earthquakes (EQ), tropical storm and surge (TC), winter storms (WS), and floods (FL). Obviously, there are other natural disasters that can damage societies and economies, such as droughts, volcanic eruptions, or tsunamis (although we partly capture the latter in our definition of earthquakes). Because of the limits to available data, we had to omit those catastrophes, but recognize that they too can upend lives and economic activity.

Step 1--Quantifying the direct damage

The starting point of the simulations is the estimated direct property damage as a share of property and infrastructure values following a disaster of a severity that would be expected to occur once every 250 years. As a point of reference, Hurricane Katrina, which hit the U.S. Gulf Coast almost exactly a decade ago, caused \$170 billion in damages, around one-half of the \$320 billion of damages a 250-year U.S. tropical storm event would cause, according to Swiss Re's estimates. The direct damage data include only the estimated value of the physical destruction of private and public property, including infrastructure. It does not include the knock-on effects on economic growth because of the concomitant impact on productive capacity or disrupted supply chains, which we model separately in Step 2. The transmission between physical damage and growth shortfalls is also uncertain, and is likely to depend on the specific circumstances of each incident. (See the forthcoming Methodological Supplement, which describes our assumptions in greater detail.) In absolute terms, six of the top 10 events are earthquakes. The dominance of earthquakes as the most destructive peril remains if put into relation with an economy's total value in terms of fixed property and infrastructure.

The direct damage data have been compiled and provided by reinsurer Swiss Re. The data set is based on the open-source Climada model (Bresch, 2015) and further proprietary information provided by Swiss Re. The data set

includes 34 countries for earthquakes, 16 for tropical storms, 12 for winter storms, and nine for flood. The U.S. appears twice: For earthquake as well as tropical storm risk.

Many of the 130 sovereigns currently rated by Standard & Poor's are not in the sample because data were unavailable and/or damage estimates were considered to be too low to have any impact on ratings. Natural disasters could therefore still be ratings-relevant for sovereigns left out of this report. Finally, our simulations take into account the existing insurance coverage for the sovereigns concerned as made available by Swiss Re. This coverage varies significantly across the sovereigns and perils in the sample, with more advanced sovereigns generally enjoying higher coverage ratios. (Insurance coverage is defined here as the percentage of a big event covered by insurance, expressed as the percentage of the total direct damage amount. For example, 60% insurance coverage means that insurance covers 60% of the replacement cost of direct event damage.)

Damage estimates for rare events are fraught with uncertainty: The underlying events, by definition, seldom occur, and therefore estimations are based on only a few observations. Nevertheless, while they are rare, hard-to-predict, and beyond the realm of normal expectations, they are not unlikely. The actual damage of a 250-year disaster is also a function of geography: A tropical storm will create more damage if landfall touches a major economic and population center, while it would inflict fewer losses if hitting a remote area. We recognize that alternative reasonable specifications and modelling could lead to equally valid but differing damage estimates. Nevertheless, and in full recognition of those caveats, we consider the Swiss Re dataset to be the most comprehensive and cross-country comparable one available to us.

Step 2--Simulating the macroeconomic impact

Given the direct damage assumptions, we simulate the impact of the four above-mentioned perils (earthquakes, tropical storms, winter storms, and floods) on key macroeconomic variables: GDP growth, the balance of payments, as well as on general government debt and deficits. The forthcoming Methodological Supplement includes more detail on the assumed functionality that describes how the damage caused by the disaster will affect the variables that form the benchmarks of our assessment of economic, external, and fiscal flexibility in our sovereign ratings criteria. In our simulation, we do not assume any changes to the other two pillars of our methodology--governance and institutional strength and monetary flexibility. Transmission from damage to those variables is more likely to be indirect and normally relatively modest, unlikely to change sovereign ratings by themselves alone. In fact, this may be a benign interpretation: the example of Honduras, devastated by Hurricane Mitch in 1998, shows that institutional quality and domestic security can suffer persistently in the aftermath of a natural catastrophe. Where this is the case, the adverse ratings implications simulated in this study could be exacerbated. The U.S. National Oceanic and Atmospheric Administration classified Mitch as the deadliest Atlantic Hurricane since 1780.

Sovereign ratings are designed to take a longer-term forward-looking view of creditworthiness. While natural disasters usually hit societies within a short period of time, the economic, external, and fiscal reverberations typically last much longer. If we assume, for simulation purposes, that a natural disaster would hit on New Year's Day 2016, a rating committee would take into account its expectations for a longer time frame, typically around five years. It would thus be inappropriate to assess the potential impact a natural catastrophe can have on the rating by looking only at the outcomes of the year when the disaster strikes (2016 in the example). In general, economies adjust and recover from those events, even if it may take years to return to a semblance of normality. We therefore analyze the economic,

external, and fiscal indicators over a five-year timeframe (through 2020 in the example). The forward-looking approach is reflected in our use of flow numbers (such as GDP growth, current account, and fiscal balances) and stock numbers (net general government debt, and narrow net external debt). In the first case we use an average forecast for 2016-2020, and for the second case we use the results for 2020.

Step 3--Simulating sovereign rating outcomes

In a final step, we convert the economic outcomes simulated in step 2 into a proprietary simplified sovereign rating tool. The hypothetical rating changes this simplified model generates are not to be misunderstood as Standard & Poor's definitive view on likely future ratings trajectories. Our criteria call for placing all risk assessments (including economic, external, and fiscal) into six groups, with the first group being the strongest (see paragraph 9 of "Sovereign Rating Methodology.") Benchmark values of the relevant ratios are typically applied, defining the demarcation between two groups. We then classify the individual risk assessments on the 1-to-6 scale, and compare them with the 1-to-6 classification that would have been assessed in the absence of a catastrophe.

In this simulation however, we use continuous assessment numbers instead of discrete (integer) ones, to avoid jumps in the 1-through-6 numerical assessments and to better emulate the ratings impact of a disaster. We create a continuum of assessments by intrapolation, thus allowing for a more gradual ratings impact. For example, the economic, external, and fiscal indicators may all deteriorate after a disaster, but none of the thresholds defining the 1 to 6 assessments is being breached: all three assessments (economic, external, and fiscal) may have been a "strong 3" (where the ratios were close to the benchmarks defining a "2") before the disaster, but are now all a "weak 3" (where the ratios are close to the benchmarks defining a "4"). The continuous (non-integer) approach allows us to assess that in the given example, the three assessments (economic, external, and fiscal) went, for instance, from "3.2" to "3.9". This is a significant deterioration that may call for a downgrade, but a mechanistic integer-based application of the simulation would have been blind to the erosion. Introducing gradualism by non-integer assessment scores for this exercise is designed to mirror, to the extent possible, the analytical insights applied by a real Standard & Poor's sovereign ratings committee, which would have detected the worsening trends, even if all (integer) assessment scores had remained unchanged.

All other things being equal, a once-in-250-year disaster will worsen the economic, external, or fiscal risk assessment. This may lead to a drop in the indicative sovereign rating, in line with table 2 of the "Sovereign Rating Methodology". Thus, disaster-induced physical damage lowers economic, external, and fiscal indicators, which in turn will lower the respective economic, external, or fiscal assessment, which finally can lead to a lower indicative sovereign rating. Since we assume in the simulations that no changes would be made to the supplemental adjustment factors as defined in our "Sovereign Rating Methodology" (see paragraph 23-27), the simulated change in the indicative rating would translate one to one into an outright ratings change.

All outcomes presented in this research, are the results of simulations and should under no circumstances be interpreted as predictions of future rating actions.

Simulation results

In the following sections, we analyze the results of our simulations for individual perils and assess their vulnerability in the rare case of a severe catastrophe. The benchmark we apply are for disasters that can be expected to hit once every 250 years. Differences between individual perils are recognized in the direct damage estimates, which are the main driver of medium-term macroeconomic and ratings impact. The simulations of economic, external, and budgetary variables are uniformly applied across the sample, and do not discriminate among different perils.

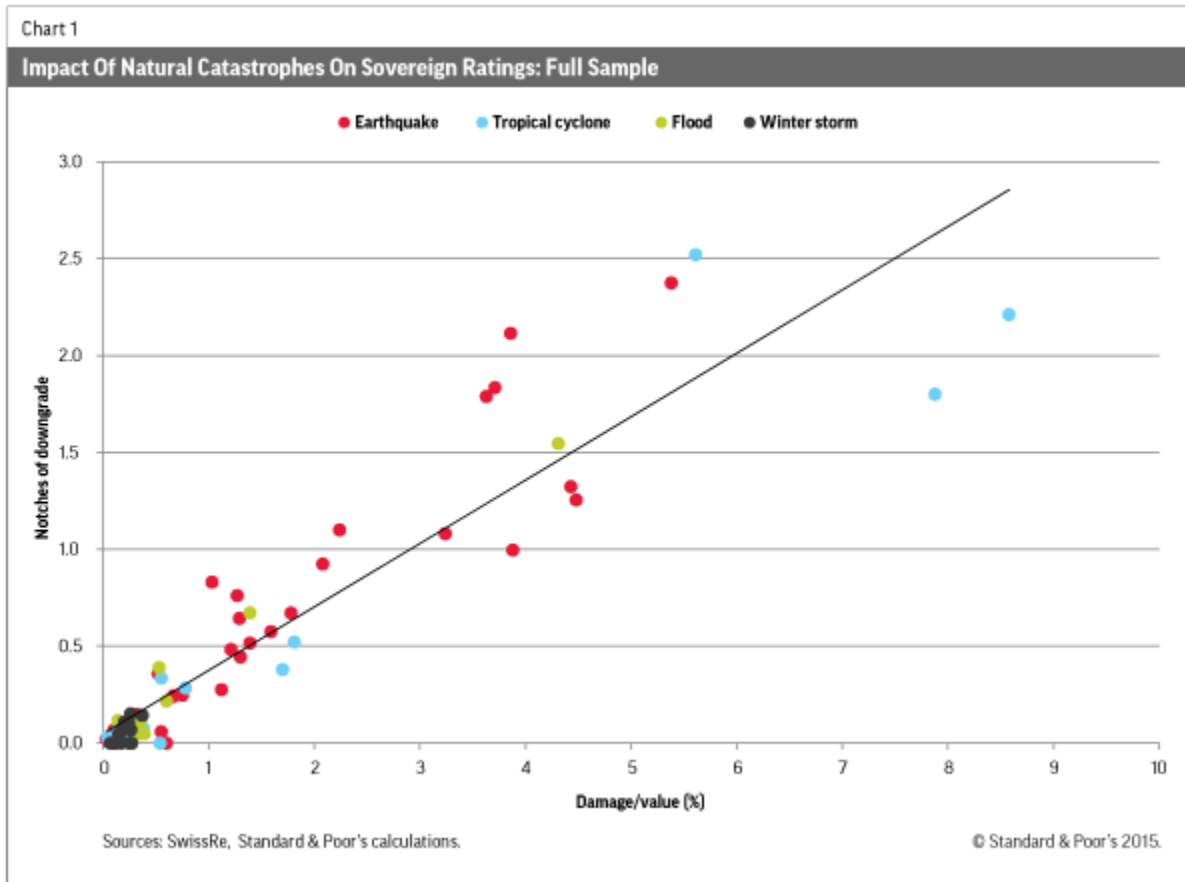
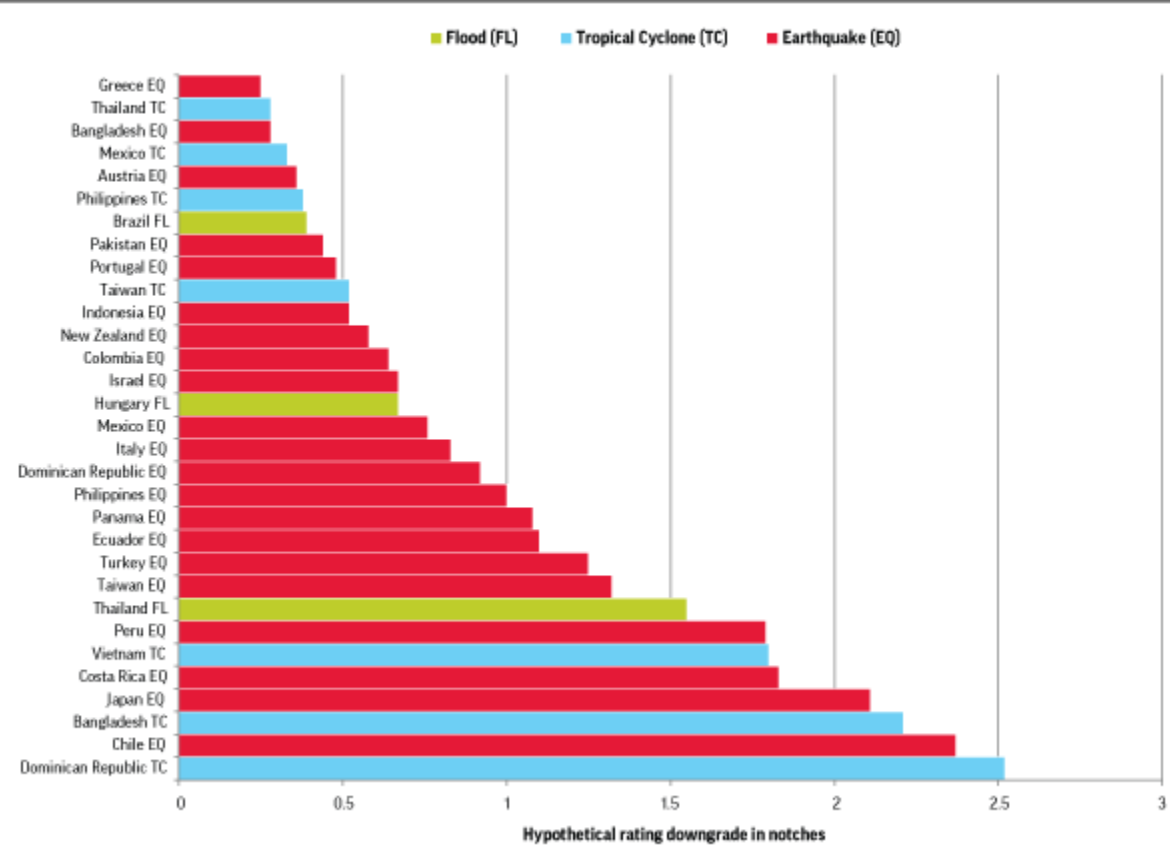


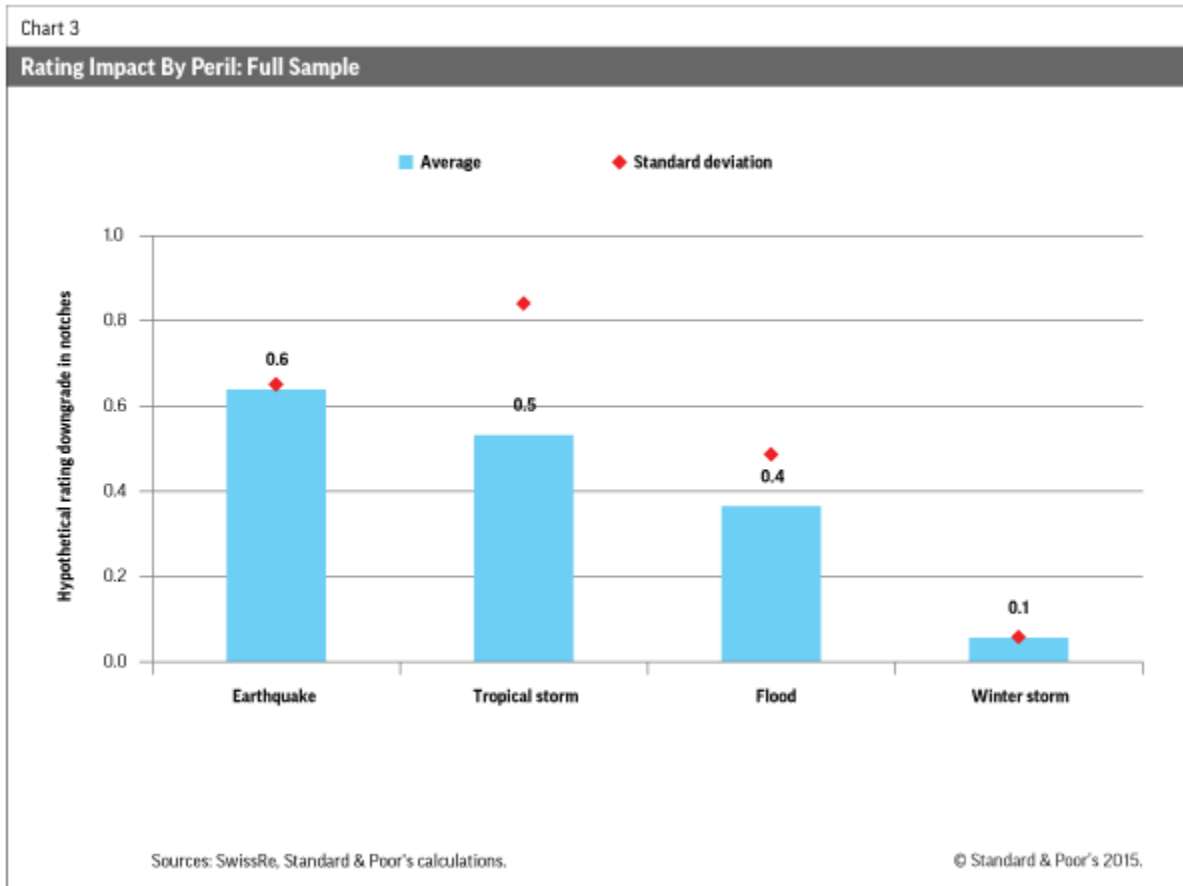
Chart 2

Net Rating Impact By Peril: Cases With More Than 1/4 Notch Impact



Source: SwissRe, Standard & Poor's calculations.

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Earthquakes

- Earthquakes are the most devastating natural hazard covered in this study.
- We see particularly large potential direct economic damage and related pressure on creditworthiness for sovereigns on or close to the edges of Earth's geological plates, for example, around the Pacific Rim (for example, Chile, Costa Rica, Ecuador, Japan, Panama, Peru, Philippines, Taiwan), in the Caribbean (Costa Rica, Dominican Republic, Panama) and on the North Anatolian fault (Turkey).
- In Japan, a 1-in-250-year event could cause a significant economic downturn and a decline in the sovereign rating by at least two notches, with potentially severe economic and financial repercussions for the rest of the world.

Every year about 150 earthquakes reach or exceed magnitude 6 on the Richter scale (with the largest recorded earthquake being 9.5). In 1995, an earthquake of magnitude 7.2 on the Richter scale devastated Kobe, Japan, entailing economic losses of about \$150 billion (McGuire, 2014), making it the world's single most economically costly natural disaster until the 2011 Tohoku earthquake and tsunami--with a cost estimate of \$210 billion. The Swiss Re direct damage data for "once-in-250-year" events in chart 1 above confirm earthquakes as the most devastating natural hazard. For example, the ratio of average damage as a percent of value across the sovereign sample is higher for earthquakes than for any other peril covered here.

The data indicate particularly large potential direct economic damage (of more than 2% of value) in the sovereigns that lie on or close to the edges of the Earth's geologic plates, all around the Pacific Rim (for example, Chile, Costa Rica, Ecuador, Japan, Panama, Peru, Philippines, Taiwan), in the Caribbean (Costa Rica, Dominican Republic, Panama) and North Anatolian fault (Turkey). (See table 3 for detailed data on damage caused as well as key results of our economic simulations.)

For each of the above-listed sovereigns, our damage estimates represent an immediate severe negative economic shock, and our simulations of macroeconomic impact show cumulative U.S. dollar GDP per capita losses ranging from about 3.5% (Dominican Republic, Ecuador) to 8% (Chile) over the five-year projection period, compared with per capita income levels in our base-case simulation without an earthquake. Although we carried out the analysis on a sovereign-by-sovereign basis, the significant downturn that such an event would cause in Japan--a large economy significantly embedded into global commercial and financial channels--would undoubtedly have important economic repercussions for the rest of the world. We believe that in the immediate aftermath, the earthquake would result in a disruption of trade flows, block supply channels, with a simultaneous sell-off of foreign assets held by Japanese residents and partial repatriation of Japanese financial assets held abroad, possibly causing an economic slowdown in the rest of the world and turmoil in global financial markets.

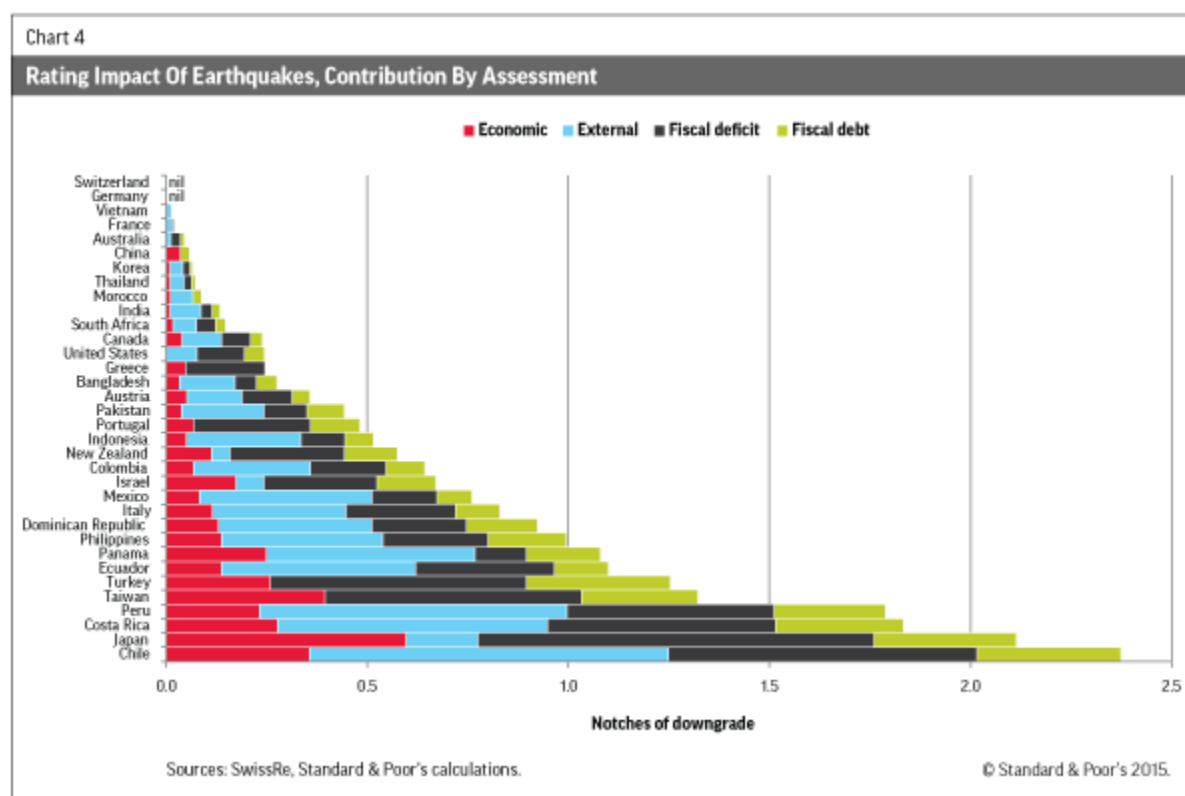
As a result of the economic shock, we would expect government finances to deteriorate due to the necessary public spending on reconstruction following the earthquake, as well as the negative cyclical effect of the economic downturn. As a result, government debt would increase in the most affected sovereigns by between 6% (Dominican Republic) and 28% of GDP (Japan) by 2020, compared with the no-earthquake baseline scenario.

At the same time, the earthquake's devastation of production capacity would likely depress exports and increase imports, such as food, medical supplies and reconstruction-related materials. As a result, the external position of the affected sovereigns would worsen compared with a no-earthquake scenario, especially for sovereigns with a very high share of exports in GDP. For example, while we expect Taiwan in 2015 to post a current account surplus of 13% of GDP, the average post-earthquake annual current account over the five-year projection horizon is simulated at almost 5% of GDP lower than in the baseline scenario. We expect the projected weakening of current account balances, especially the decline in current account receipts, to contribute to a significant deterioration in the external debt position of several sovereigns, in particular in Turkey, Peru, Chile, Costa Rica, and Ecuador.

Earthquakes being the most devastating natural hazard, the projected economic consequences translate into the most adverse average impact on sovereign creditworthiness across the different perils considered in our analysis. We estimate that on average and across the sovereigns in our sample, the simulated sovereign ratings would decline by about two-thirds of a notch, compared with our baseline rating in the absence of the earthquake.

There are wide differences among the sovereigns concerned. For example, for the most affected sovereigns listed above, the hypothetical ratings would decline by at least one notch (for example, for Costa Rica, Ecuador, Panama, Peru, Philippines, Taiwan, and Turkey) and almost two or potentially more (Chile and Japan). In many other sovereigns, the rating impact is at least half a notch, indicating material downward pressure (Colombia, Dominican Republic, Indonesia, Israel, Italy, Mexico, and New Zealand).

Chart 4 and table 2 display the origin of the negative ratings implications (compared with a rating trajectory without a disaster event). The downgrades would be mainly caused by the deterioration in our assessment of external or budget deficit risks (Chile, Costa Rica, Ecuador, Peru, and Philippines). In some sovereigns, like Japan or Taiwan, a worsening of their fiscal deficit risk assessment is accompanied by a significant contribution from deterioration in the economic risk assessment related to a decline in GDP per capita and a lower economic growth trajectory. In Turkey, however, the projected deterioration in its budgetary position in terms of both (deficit and debt levels) explains the bulk of the hypothetical decline in its creditworthiness. That's partly because Turkey's external accounts going into the simulation were (and still are currently) a key ratings weakness (see "Sovereign Ratings Score Snapshot," published Sept. 4, 2015). A one-in-250-year earthquake would exacerbate this weakness, but given the weak external starting position, the scoring of external risk would have little room for further weakening.



Tropical Cyclones

- Tropical cyclones constitute one of the most destructive of all natural hazards, second only to earthquakes.
- Direct damage data by Swiss Re indicate particularly large potential losses of more than 5% of value and consequently, hypothetical rating downgrades in Dominican Republic, Bangladesh, and Vietnam.
- Sovereign ratings in our sample would come under pressure if a one-in-250-year tropical storm hits, although less than in the case of an earthquake scenario.

Tropical cyclones occur in the Earth's warmer climates and constitute one of the most destructive of all natural hazards.

The regions most affected by tropical cyclones are the Caribbean, the Mexican Gulf, the southern U.S., and Southeast Asia. They can cause extreme damage, and related losses are on a clear upward path.

Swiss Re's direct damage data for such powerful tropical cyclones indicate particularly large potential direct damage of more than 1% of value in Taiwan, Philippines, Dominican Republic, Bangladesh, and Vietnam, with potential direct losses in the latter three estimated to be in excess of 5.5% of value (see table 4). Detailed data on damage caused as well as key results of economic simulations of losses from tropical cyclones can be found in table 5.

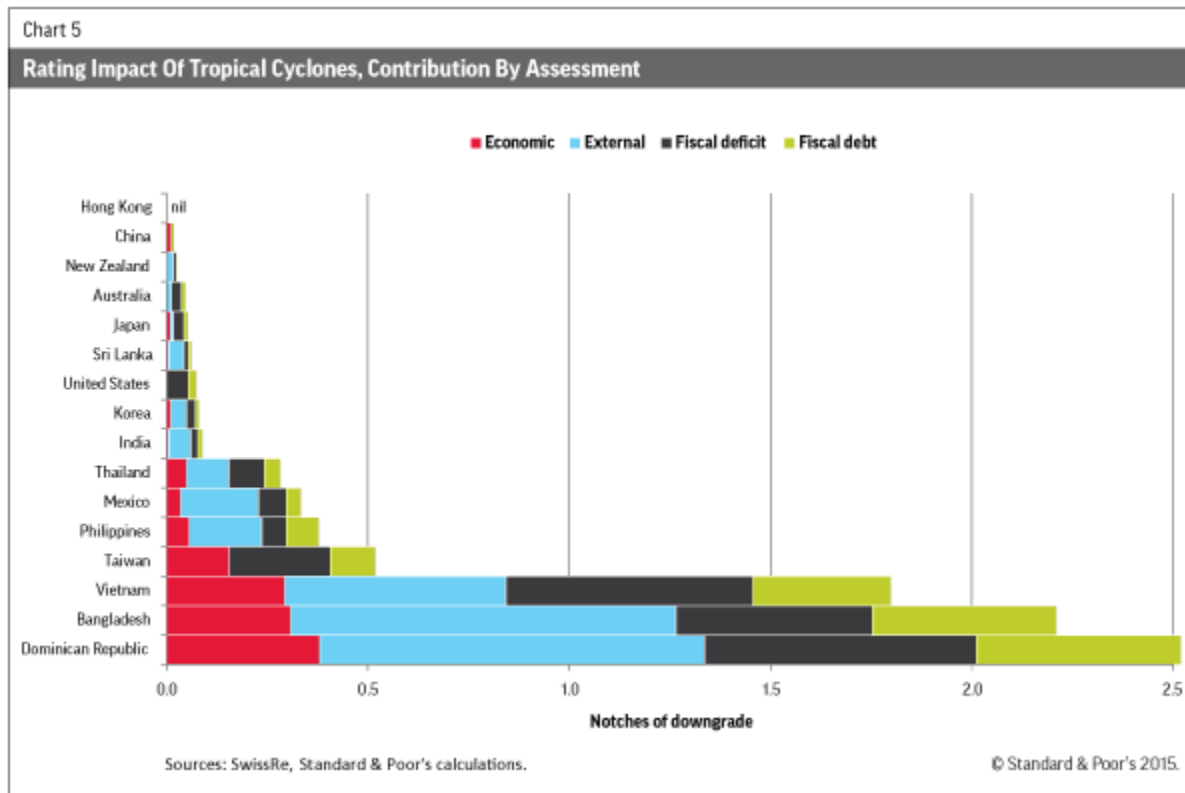
For each of the above-listed sovereigns, we estimate that this would trigger a severe negative economic shock. By 2020, the decline in U.S. dollar GDP per capita would fall short by almost 9% in Vietnam and Dominican Republic, and about 11% in Bangladesh, compared with per capita income levels in the absence of the cyclone.

Government finances would deteriorate following the cyclone, leading to an increase in government debt in the most affected sovereigns from 2016 to 2020 by between 7% in Taiwan and a maximum of 18% of GDP for the Dominican Republic, compared with the non-cyclone simulation.

At the same time, the external positions of the storm-affected sovereigns would likely worsen compared with a no-cyclone scenario, particularly for those that are very open to cross-border trade. In Vietnam, for example, whose current account surplus we estimate at over 5% of GDP in 2015 could, according to our simulations, deteriorate on average by 7% of GDP during 2016-2020.

The exceptionally severe tropical cyclones we analyze in this study would also lower or place downward pressure on the hypothetical sovereign ratings, although by less than in the case of an earthquake scenario. For example, the hypothetical ratings would decline by at least one notch in Vietnam, and at least two notches in Bangladesh and Dominican Republic. The rating impact is at least half a notch for Taiwan. For all other sovereigns included in the sample, we would expect the impact to be less than half a notch.

Chart 5 and table 4 display the composition of the ratings impact by rating factor for the most affected countries (rating impact estimate of 0.5 notch or more). The rating change would for most sovereigns result mainly from the deterioration in the assessment of external or budget risks (Bangladesh, Dominican Republic, and Vietnam). In addition, in Bangladesh and the Dominican Republic, the projected increase in government debt contributes significantly to the downward pressure on their creditworthiness, while deterioration in the economic risk assessment is a significant contributor in the case of Taiwan.



Floods

- For many European sovereigns, including Germany and France, floods represent the most significant natural hazard in potential direct damage as percent of value.
- The economic impact on the most developed sovereigns in Europe, while not negligible, appears to be limited and unlikely to lead to sovereign rating downgrades.
- Among the sovereigns covered in this report, severe floods would cause the most economic damage in Hungary and Thailand, weakening their macroeconomic metrics and creditworthiness.

While generally not as economically damaging as other natural hazards, floods are the natural peril that generally affect the highest number of people. For example in 2011, devastating floods in Thailand affected more than 13 million people and caused damage estimated at \$40 billion (The Brookings Institution, 2012). Floods in China frequently cause over 3,000 yearly fatalities (Munich Re, 2015). More recently, the heaviest rainfall in 120 years is estimated to have caused total losses of \$3 billion in Croatia, Bosnia and Herzegovina, and Serbia.

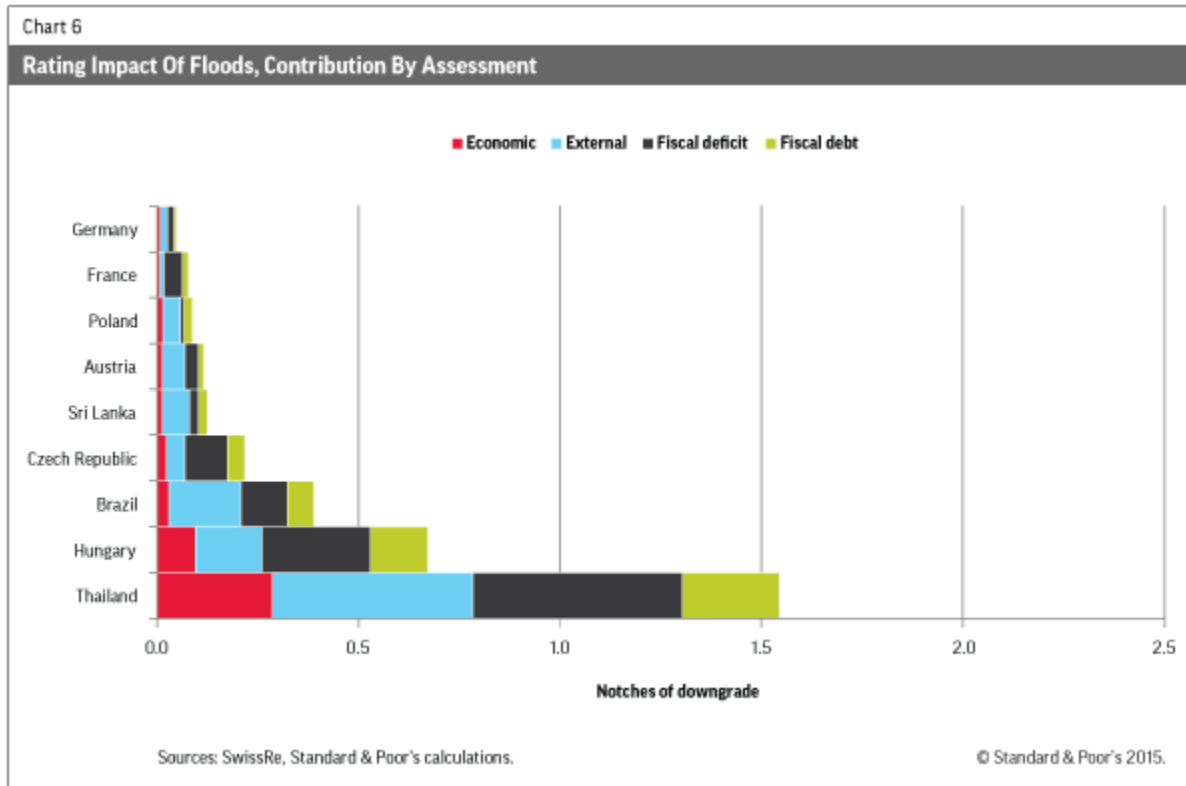
The frequency of heavy precipitation has been on an upward trend over the recent years, resulting in numerous landslides, which exacerbate the direct economic losses for the sovereigns concerned. Importantly, for many European sovereigns, including Germany and France, flood risk represents the most significant natural hazard in terms of potential direct damage as a percent of value.

According to Swiss Re estimates, a severe flood would cause direct economic damage in Hungary (1.4% of value) and

Thailand (4.3% of value) resulting in U.S. dollar GDP per capita in 2020 below the baseline scenario by about 2% and 9%, respectively. While the direct damage of floods is higher in Germany than for any other peril, the economic impact appears to be nevertheless contained. Detailed data on damage caused as well as key results of economic simulations of impact from floods can be found in table 7.

Government finances would deteriorate following the floods, leading to an increase in net government debt by 2020, most significantly in Hungary (8% of GDP) and Thailand (13% of GDP). At the same time, these two sovereigns and Brazil would likely see their external position worsen more than other sovereigns in the sample, as the external debt position of several sovereigns would deteriorate, particularly in the case of Thailand (see table 7).

Ratings implications following floods would be expected to be more limited than in the case of earthquakes or tropical storms. The hypothetical ratings would decline by between one and two notches in Thailand, while the ratings of Hungary would come under moderate downward rating pressure. In terms of composition, the downward rating pressure would for most sovereigns result from the deterioration in the assessment of external or budget deficit risks.



Winter Storms

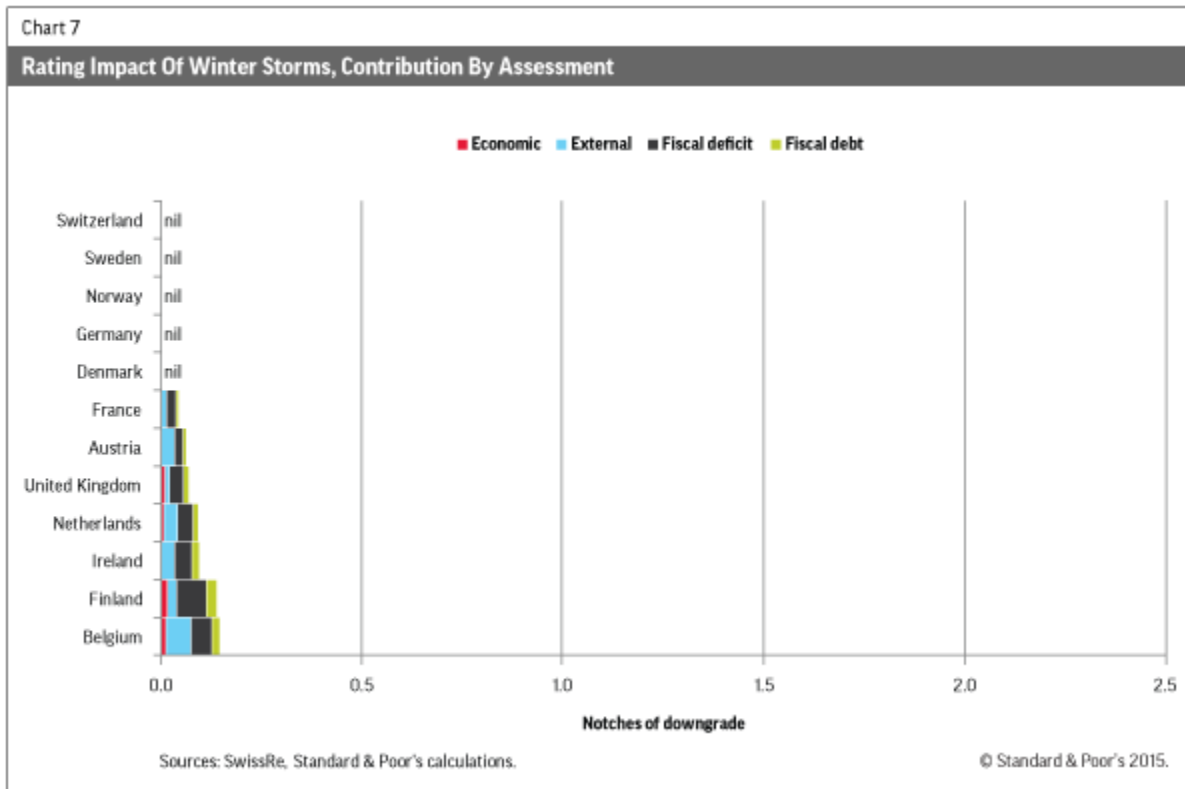
- Sovereigns in Europe are frequently hit by winter storms.
- Given the relatively low direct damage as a percent of value and high insurance coverage, macroeconomic consequences of winter storms do not appear to be significant.
- Winter storms are unlikely to lead to downward pressure on sovereign creditworthiness.

Compared with warmer parts of the Earth regularly hit by tropical cyclones, sovereigns in Europe suffer from devastating winter storms. The 2013-2014 winter windstorms triggered major losses across Europe and their intensity, combined with heavy rainfall, exacerbated flooding in the U.K. In Slovenia and Croatia, winter storms in early 2014 caused major damage to the countries' transport and electric power infrastructure, with total losses estimated at almost \$1 billion, which triggered an announcement of a state of emergency in affected areas (Swiss Re, 2015).

Compared with the other three perils covered in this study, the damage caused by one-in-250-year winter storms is relatively minor at the macroeconomic level. A severe winter storm event would cause direct economic damage of between 0.2% and 0.4% of value in Finland, Norway, Ireland, Belgium, Denmark, the U.K., and the Netherlands (see table 8). Detailed data on damage caused as well as key results of economic simulations of impact from winter storms can be found in table 9.

Given the relatively low estimates of direct damage as a percent of value and in particular, high insurance coverage, which for all sovereigns in the sample is at least 60%, macroeconomic consequences do not appear to be significant. We estimate that income per capita for all sovereigns concerned would not deviate much from their baseline trajectory over 2016-2020. Nevertheless, in cumulative terms, government finances would deteriorate slightly. That's because we assume that governments would step up their efforts to pay for the damage via increased public spending.

In terms of rating impact, on the basis of the low direct damage assumptions and high insurance coverage, our results indicate that economic losses caused by a winter storm for the sovereigns in this study would not put any meaningful downward pressure on their creditworthiness.



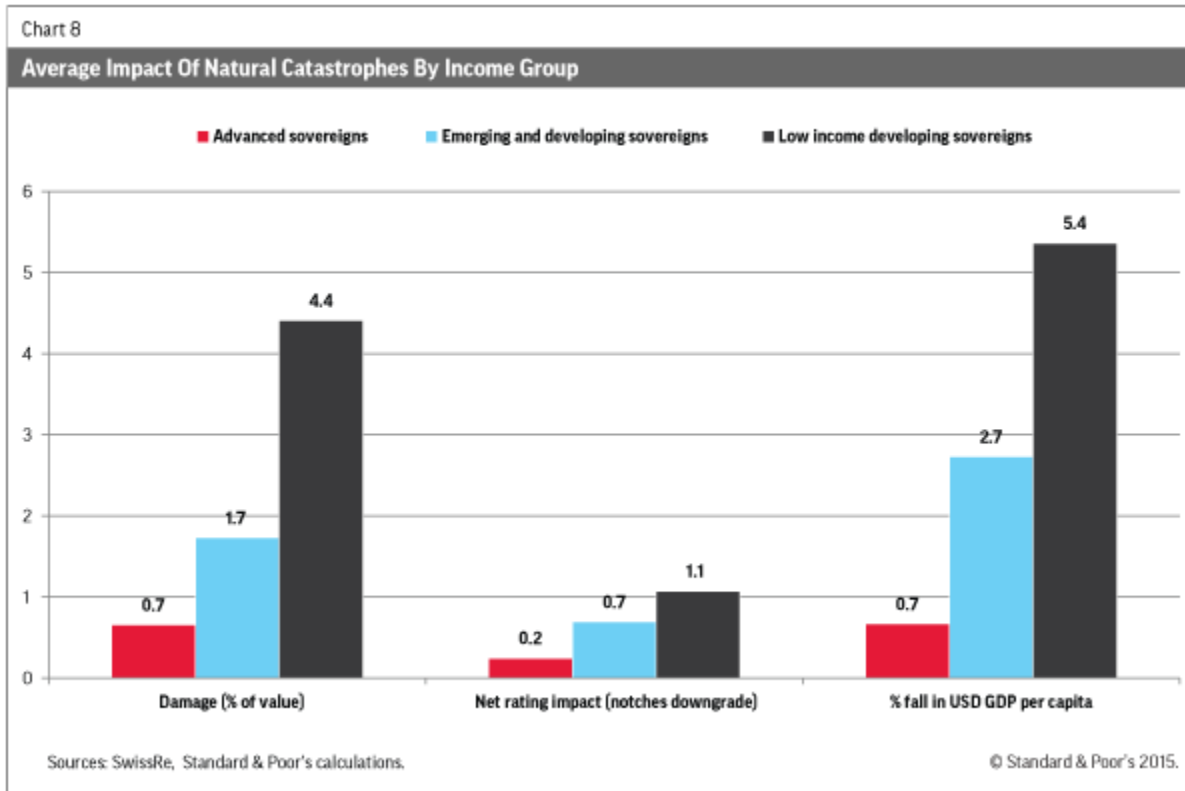
Who Has Most To Lose?

Risks are highest for low-income sovereigns

We believe that level of economic development is inversely correlated with a natural disaster's ratings impact on a sovereign, either due to existing economic and financial vulnerabilities or development of an insurance market (see below). To compare sovereigns at different levels of economic development we used the subgrouping put forward by the International Monetary Fund, which allows for a division of sovereigns into three groups: advanced economies, emerging and developing economies, and low-income developing economies (IMF, 2015). The average direct damage as a share of value would be the highest in the low-income developing sovereigns (4.4%), followed by emerging-market and other developing sovereigns (1.7%) and advanced sovereigns (0.7%; see chart 8).

Analogously, in terms of the impact on the economic growth trajectory, the most affected would be low-income sovereigns, with an estimated decline in income per capita of more than 5% over 2016-2020 compared with the baseline scenario. Emerging and other developing sovereigns would on average suffer a decline in per capita income of almost 3% compared with the baseline, while advanced sovereigns display much more resilience, with a 0.7% decline (see chart 8).

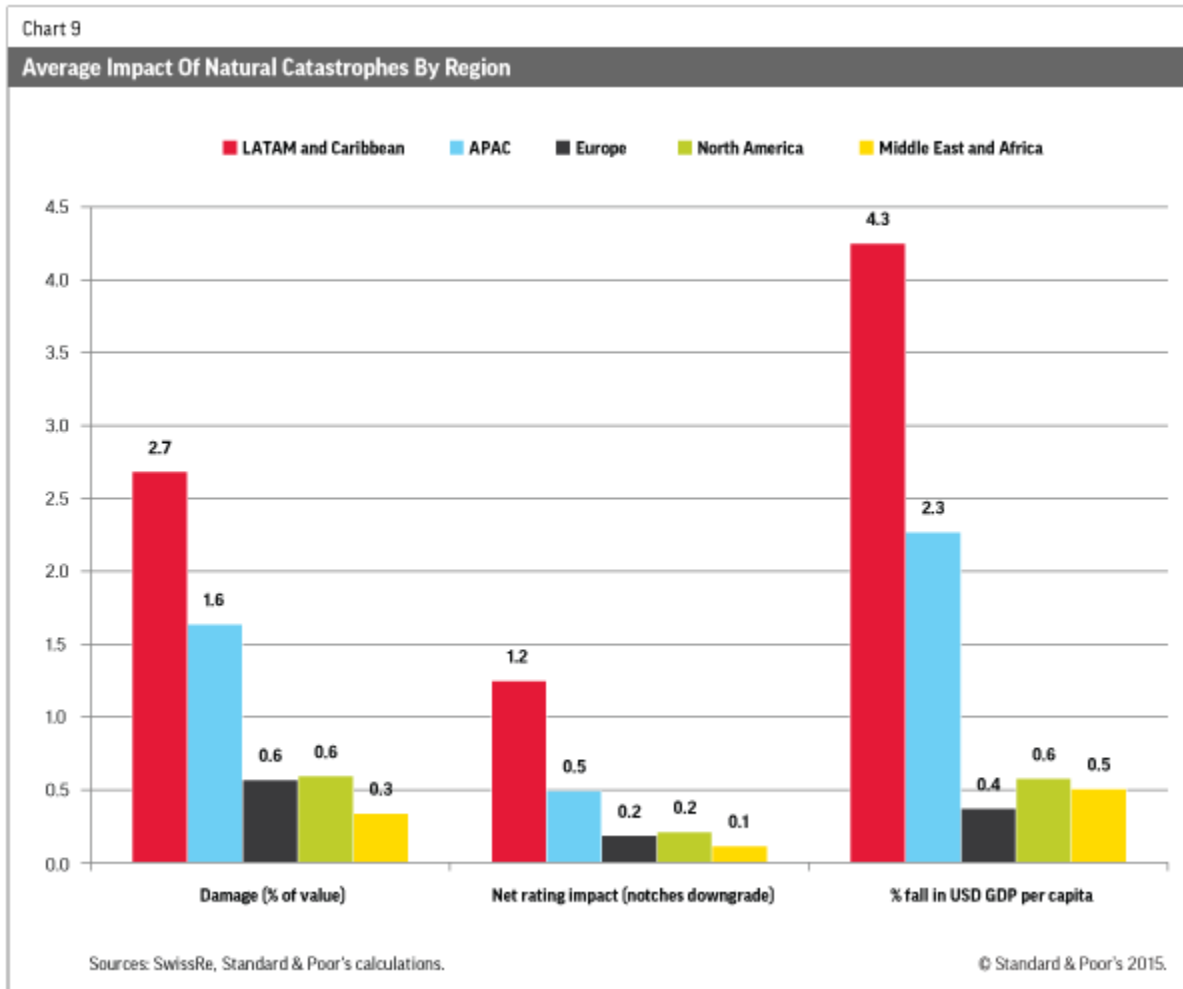
As a result, the average rating impact is the highest for low-income sovereigns as their ratings would on average decline by about one notch, with clear downward rating pressure on emerging and other developing sovereigns, and to a lesser extent on advanced sovereigns. While this comparison may be clouded by the limited number of sovereigns covered in the low-income group (Bangladesh and Vietnam), we would not be surprised if adding other low-income sovereigns would confirm our findings.



Latin America and Asia-Pacific are most at risk

In terms of geographic impact, the average potential direct damage for all the perils considered in this study is the highest for sovereigns in Latin America and the Caribbean (2.7% of value), followed by Asia-Pacific (1.6% of value), reflecting their higher geologic and climatic hazards than in the rest of the world. The average potential direct damage for sovereigns in Europe and North America is lower in relative terms, at 0.6% of value (see chart 9).

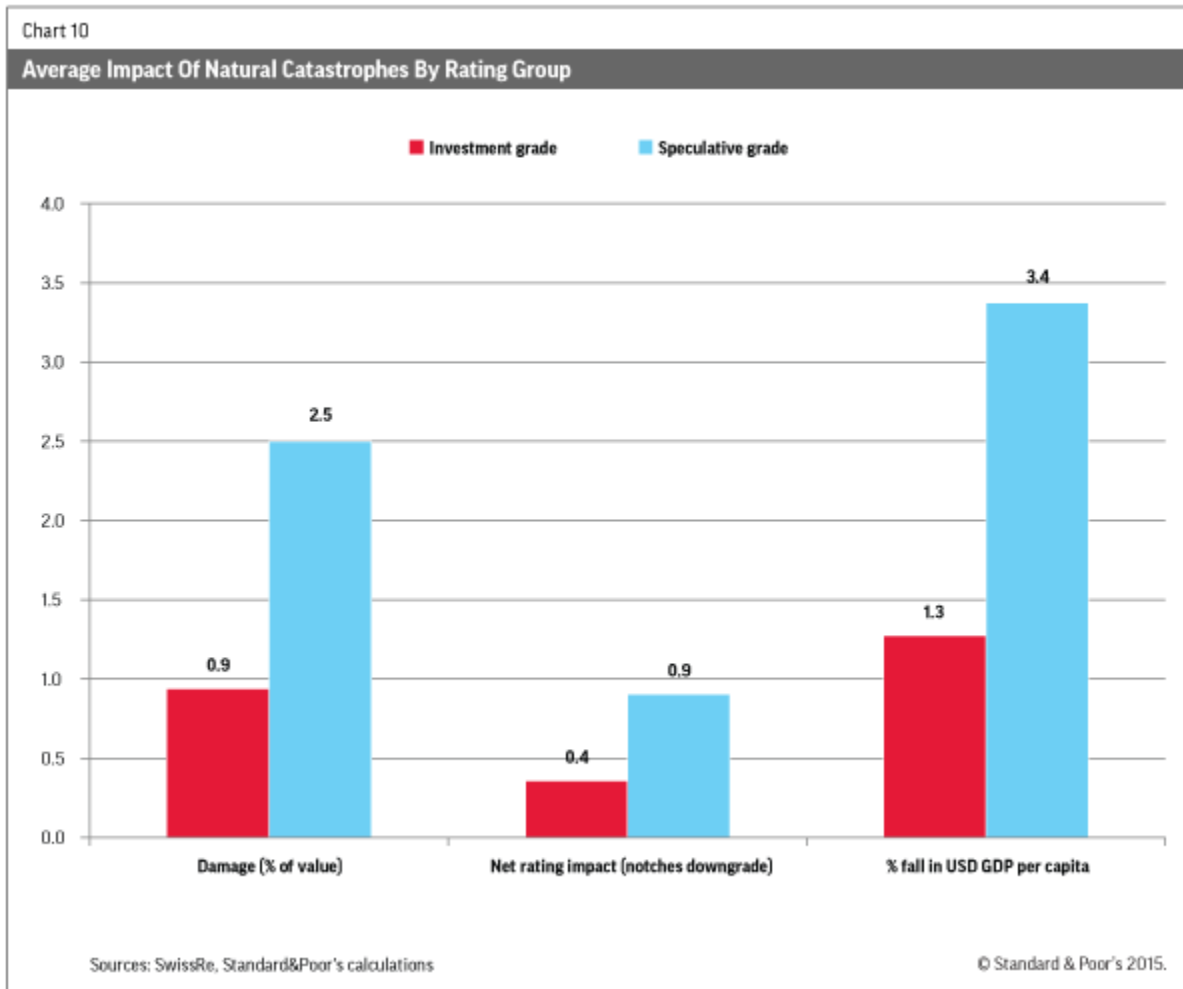
The average rating decline for the Latin America and Caribbean sovereigns in this report would be more than one notch, followed by Asia-Pacific, where the ratings would likely come under pressure (by 0.5 notch). The average rating impact for European and North American sovereigns (0.2 notch) is low and does not point to outright sovereign rating downgrades.



Higher-rated sovereigns are more resilient

Across all four perils, the average direct damage is lower for investment-grade sovereigns ('BBB-' and higher, damage 0.9% of value) than speculative-grade ones ('BB+' and lower, damage 2.5% of value) (see chart 10).

Likewise, the average impact of natural disasters on the economic growth trajectory compared with a steady state is almost three times as large for speculative-grade sovereigns. The decline in income per capita compared with the no-disaster scenario averages -3.4%, compared with the investment-grade average of -1.3%. Finally, our simulations suggest that the rating impact on investment-grade sovereigns is likely to be lower than for speculative-grade sovereigns. Regarding the latter, our analysis points to an average decline in sovereign ratings by roughly one notch (0.9) compared with a no-disaster scenario. For investment-grade sovereigns, the average rating change is lower (0.4), at a level that nonetheless signals potential downward pressure.



How Robust Are Ratings Outcomes If Damage Assumptions Change?

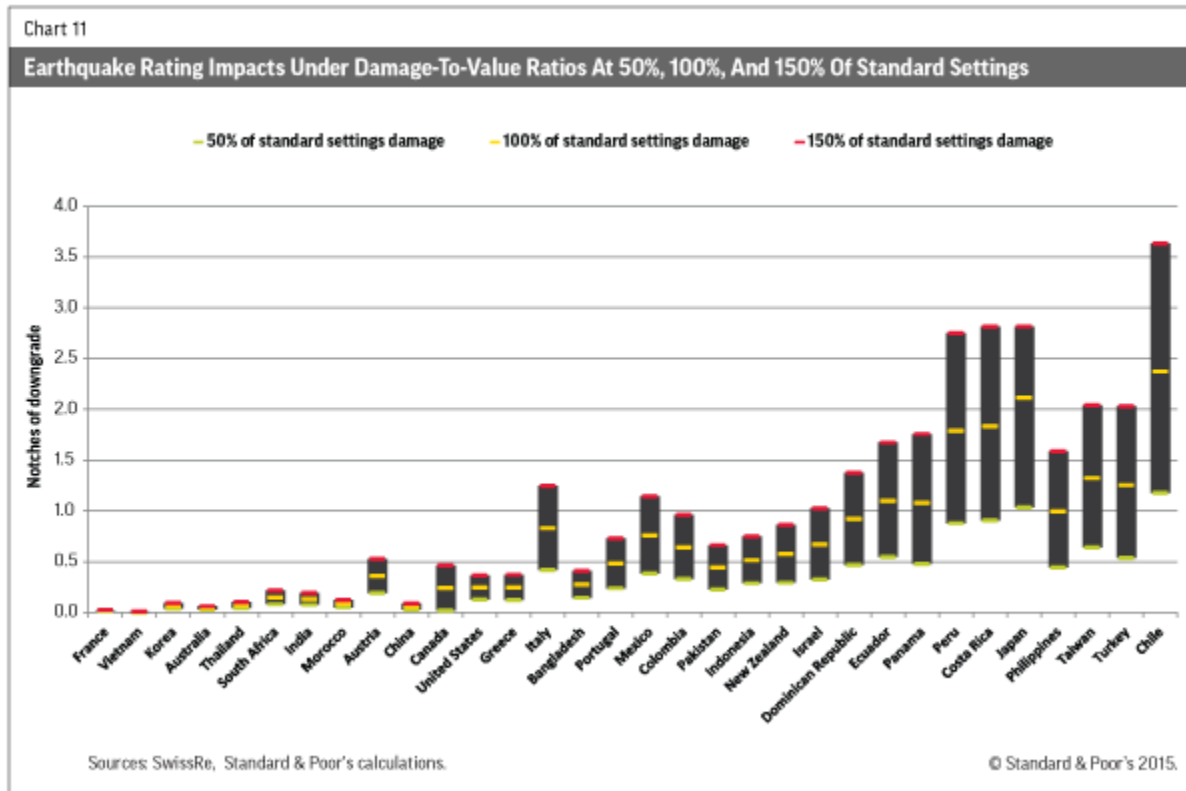
As mentioned earlier, damage estimates for the rare events we are studying here are subject to uncertainty because we have only a few observations of a comparable magnitude—but that's not all. Other factors that play an important role in determining the damage estimates also entail some degree of uncertainty, notably the exact circumstances under which disaster strikes and the resilience of residential and commercial structures, in particular infrastructure. To assess the degree to which potential uncertainty in the damage data translates into ratings outcomes, we conducted the following robustness exercise: We carried out two simulations of ratings outcomes, one where, all other things being equal, we use only 50% of the damage estimates used elsewhere in this report, and one where we scale damage data up to 150% (see chart 11 for the results).

As expected, the sensitivity of ratings outcomes with respect to a +50% and -50% change in damage assumptions depends both on the severity of the central damage assumption as well as the characteristics of the sovereign in question. The resulting difference in rating changes is broadly within expected ranges but can differ due to idiosyncratic features of individual sovereigns.

In this regard, it is instructive to look at some examples. Take Canada and the U.S. In both cases, the damage numbers and net ratings impact are virtually identical. However, Canada is much more sensitive to variations in the damage numbers than the U.S. Why is this? Let's start with the case of a disaster that is more severe than the one actually assumed (150%). The Canadian economy is more open than the U.S. economy. This means Canada is more vulnerable on the external side given greater export disruptions. Moreover, unlike the U.S., Canada does not benefit from having a global reserve currency. This means that a weaker current account following the disaster would also affect key variables driving the ratings, such as external liquidity indicators and per capita income. That's because these variables enter the methodology in U.S. dollar terms. This plays less of a role if we simulate the case of a less severe disaster, where the impact on the fiscal side becomes more important in relative terms. The stronger improvement in Canada is due to a stronger initial fiscal position than in the U.S.

Take Turkey and Taiwan as another instructive example. While the damage is virtually the same for both countries, and the net ratings impact is very similar, Turkey is more sensitive than Taiwan. Here we have a unique case where Taiwan is so strong on the external side, and Turkey is so weak that the disaster shock has no rating impact on the corresponding external variables. On the fiscal side, Taiwan doesn't benefit as much as Turkey from reduced damage assumptions, because government revenues would take a bigger hit given much lower baseline inflation than in Turkey. Conversely, what comes into play at damage numbers higher than the one we actually used (150%) is that about 30% of Turkey's public debt is denominated in foreign currency. Depreciation of the Turkish currency would have a knock-on effect on fiscal metrics underlying the rating.

Looking beyond the specifics of the individual sovereigns and focusing on the magnitude of the central damage assumption, even in the worst case the impact on the rating remains relatively contained. In the case of Chile, the sovereign with the biggest rating impact following a massive earthquake, the downgrade is deeper by an additional 40% if damage is increased by 50% above the assumptions used elsewhere in this research. The generally more or less proportional reaction of ratings impact to modifications in the assumption of damage severity supports our view that the results of our rating simulations are indeed indicative, despite uncertainty about damage estimates.



Insurance Coverage Can Act As A Mitigant

As mentioned above, our simulations have taken into account actual insurance coverage, which varies significantly across the sovereigns and perils in the sample, with more advanced sovereigns generally enjoying higher coverage ratios.

To assess the importance of insurance coverage in cushioning economic and rating impacts, we run a scenario analysis for all covered sovereigns assuming 0% and 50% insurance coverage in a context of a hypothetical natural disaster with a high 5% damage-to-value ratio.

The results of our simulation indicate that the 50% insurance coverage ratio would lessen the hit to growth by about 40% over 2016-2020 compared with a scenario without any insurance coverage. We believe that the insurance industry's reimbursement of insured losses accelerates the restoration of the damaged assets, especially productive capacity and infrastructure, which in turn reduces indirect economic losses in the period following the disaster. In absence of insurance coverage, the cost of reconstruction falls fully on property owners and their capacity to shoulder the reconstruction. As a result, the economy with higher insurance coverage recovers more quickly and suffers from lower cumulative GDP damage than in the absence of insurance coverage (also see the forthcoming Methodological Supplement). Moreover, there are additional channels that convey the potential benefits of coverage, such as the breadth of insurance coverage across different sectors as well as pre- and post-disaster transfer of know-how, through the implementation of natural catastrophe impact-containment measures, for example regarding building construction

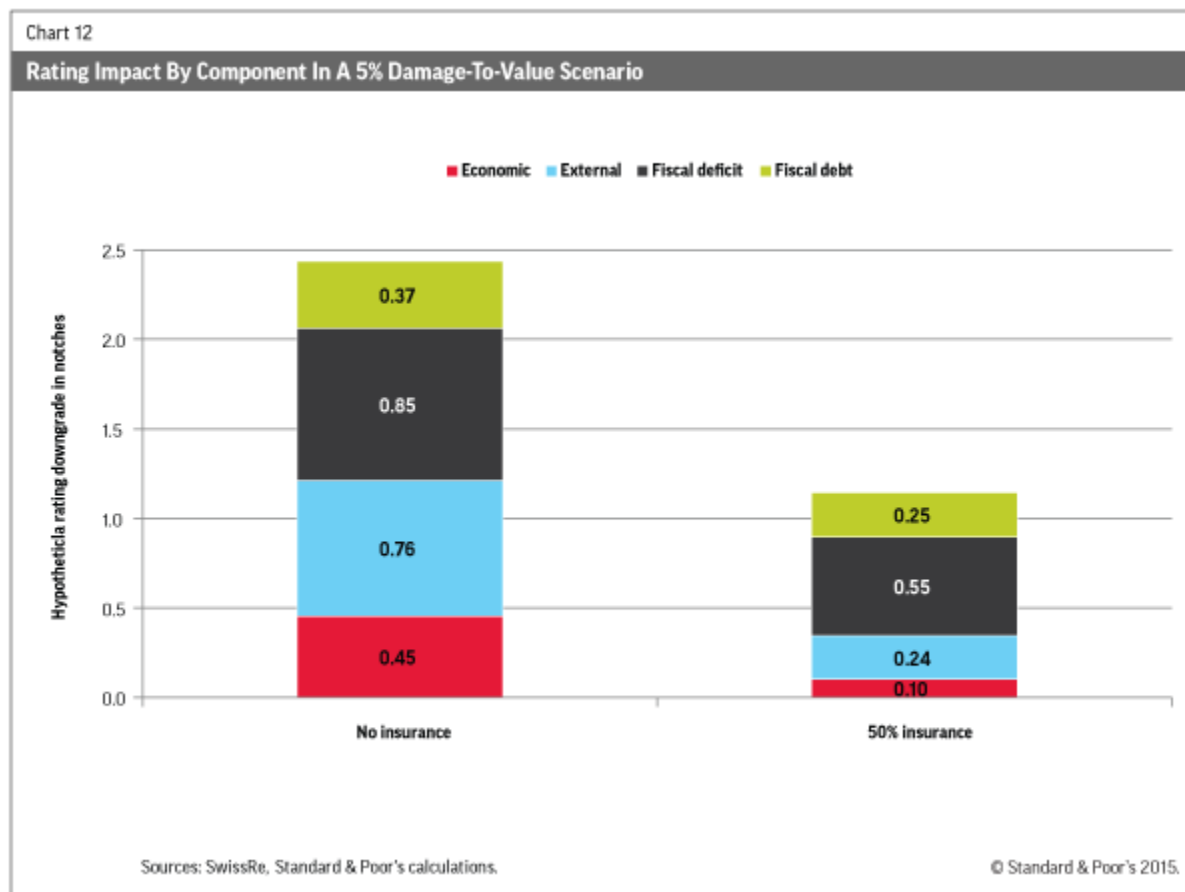
requirements or reconstruction expertise potentially included in insurance contracts (Von Peter, G. et al., 2012). Moreover, if insured losses are shouldered by the private sector, government spending on reconstruction efforts may be lower and better targeted (Melecky and Raddatz, 2011).

The benefits of insurance coverage can also be observed in a potentially lower adverse impact on public finances, with a 50% insurance coverage scenario resulting in weaker deterioration of government accounts, although not to the same extent as for growth trajectory. This is partly because following such an event, we expect the government to increase spending on public investment regardless of the share of insured losses in total losses. Insurance tends to cover private property rather than public infrastructure, therefore limiting the benefits to developments of public finance indicators.

The importance of catastrophe insurance is also significant for external indicators. That's because assuming that the bulk of the ultimate risk is shouldered by internationally operating reinsurance companies, insurance payout-related capital inflows help offset a deteriorating current account balance and help finance capital stock restoration without the need for high external borrowing. Therefore, the higher the insurance coverage, the earlier economic recovery will ensue and the milder the impact on fiscal and, especially, external indicators.

When applying the standardized shock of 5% damage to value, the hypothetical ratings would on average decline by between two and three notches in the no-insurance scenario (see chart 12). This is significantly more than just over one notch in the 50% insurance scenario. In both scenarios, deterioration in the external and fiscal risk assessments drives the rating impact. In line with the argument above, in absence of insurance, the contribution of a weaker economic and external risk assessment would be much greater (about 4.5x and 3x higher, respectively) than in the 50% insurance case.

As a result, we believe that one way to lessen the adverse economic and ratings implications of natural disasters is catastrophe insurance. In New Zealand, close to 80% of the economic losses of the 2010/2011 earthquakes were paid for by insurance; this is to a significant part due to the New Zealand Earthquake Commission, which provides universal coverage for residential assets. In Mexico, extensive measures were undertaken after a series of hurricanes in the 1990s to make the country more financially resilient. This includes establishment of FONDEN, a natural catastrophe scheme that covers government-owned assets as well as disaster relief costs. FONDEN, which purchases significant amounts of reinsurance coverage, issued a catastrophe bond. While the \$315 million cat bond would fall well short of what would likely be required in case one of the hazards discussed above materializes, it indicates the nucleus of a more comprehensive disaster risk financing strategy. Similarly, the Caribbean Catastrophe Reinsurance Facility (CCRIF) and Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) are entities pooling and offloading government risk for small islands in the Caribbean and the Pacific to the insurance and capital markets. As in the case of Mexico, the amounts currently concerned are not yet significant relative to worst-case damages, but the approach appears appropriate for addressing and transferring some of the risks these countries face.



Climatic Perils Are Likely To Intensify, Hitting Poorer Sovereigns Harder

Our simulations indicate that rare but severe natural disasters--those that can be expected once every 250 years--can bring to bear on sovereign ratings. The biggest ratings impact is likely to come from earthquakes, followed by tropical storms. Geographically, ratings of sovereigns in Latin America and the Caribbean appear to be most at risk, followed by Asia-Pacific, taking into account higher geologic and climatic hazards than in the rest of the world.

The ratings of low-income developing sovereigns are particularly vulnerable to severe natural catastrophes, followed by emerging and the less threatened advanced economies. It is therefore no coincidence that sovereigns with lower ratings tend to be more vulnerable to natural catastrophes than higher-rated sovereigns. This is in line with the historical performance of Standard & Poor's sovereign ratings, which have generally exhibited greater stability at higher rating levels ("2014 Annual Sovereign Default Study And Rating Transitions," May 18, 2015).

We believe that one way to mitigate the economic and ratings implications of natural disasters is catastrophe insurance. In the case of the five biggest earthquakes covered in the study, the rating impact would be a downgrade of about one notch if 50% of the damage were reinsured, compared with almost two notches for no insurance coverage at all. We believe that these findings are particularly relevant for emerging and developing sovereigns. They are typically

the most vulnerable to natural disasters in terms of direct and indirect economic losses and, as a result, creditworthiness. It is also in those economies where insurance coverage is typically low.

Looking ahead, we would expect climatic perils to intensify in line with past trends as climate change gathers pace. Specifically we view it as likely that storms and floods will become more frequent and more severe as the average global temperature rises and weather patterns shift. Before long, this could lead to an upward revision of the damage caused by one-in-250-year catastrophes, and thereby also result in a stronger hit to ratings than suggested in this report. We expect that climate change-induced intensification of the frequency and severity of natural disasters would hurt the ratings on poorer sovereigns the most, adding to global ratings inequality (see "Climate Change Is A Global Mega-Trend For Sovereign Risk," published May 15, 2014).

Table 1

Macroeconomic Snapshot (2015 Data)							
Country	Foreign currency rating	GDP per capita (USD)	Real GDP growth (%)	General government balance/GDP (%)	Net general government debt/GDP (%)	Current account balance/GDP (%)	Narrow net external debt/CAR (%)
Australia	AAA	59,908	2.4	(2.9)	18.5	(3.2)	256.0
Austria	AA+	43,098	0.6	(1.9)	79.0	1.7	88.9
Bangladesh	BB-	1,254	6.4	(3.4)	24.3	0.6	8.5
Belgium	AA	40,308	1.2	(2.8)	100.7	1.4	64.5
Brazil	BB+	9,242	(2.0)	(7.5)	52.8	(4.3)	41.2
Canada	AAA	46,302	1.8	(1.3)	67.5	(2.2)	94.2
Chile	AA-	14,200	2.3	(3.0)	3.8	(0.5)	25.3
China	AA-	7,895	6.8	(1.6)	17.7	3.9	(107.2)
Colombia	BBB	7,064	3.0	(2.7)	33.2	(6.0)	67.2
Costa Rica	BB	10,361	3.4	(5.4)	40.1	(3.9)	25.2
Czech Republic	AA-	17,414	2.9	(2.0)	38.5	0.7	21.3
Denmark	AAA	51,129	1.5	(2.5)	31.4	5.0	52.3
Dominican Republic	BB-	6,733	5.0	(4.2)	41.7	(2.2)	81.1
Ecuador	B	6,383	1.0	(5.3)	30.5	(1.8)	83.2
Finland	AA+	41,678	0.4	(2.9)	24.7	(0.4)	209.1
France	AA	36,247	1.3	(3.8)	88.3	(1.0)	202.0
Germany	AAA	40,975	2.0	(0.1)	68.1	7.3	66.7
Greece	CCC+	17,028	(3.0)	(5.3)	177.0	(3.6)	518.6
Hong Kong	AAA	42,419	2.5	1.5	(34.6)	3.2	(51.4)
Hungary	BB+	12,431	3.0	(2.6)	72.3	3.1	45.3
India	BBB-	1,716	7.3	(7.2)	67.1	(1.3)	9.5
Indonesia	BB+	3,647	5.4	(2.3)	22.7	(2.6)	58.5
Ireland	A+	47,123	4.2	(2.8)	98.3	6.7	219.4
Israel	A+	37,774	2.9	(2.8)	63.6	2.0	(25.1)
Italy	BBB-	29,505	0.6	(2.8)	125.4	2.8	235.7
Japan	AA-	35,124	1.5	(6.3)	129.5	1.1	(12.4)
Korea	A+	28,145	3.0	0.1	20.4	6.2	(30.0)

Table 1

Macroeconomic Snapshot (2015 Data) (cont.)							
Mexico	BBB+	9,862	2.5	(2.7)	41.8	(1.7)	41.8
Morocco	BBB-	3,094	4.4	(3.3)	48.4	(3.5)	36.8
Netherlands	AA+	43,322	2.0	(1.8)	64.4	10.8	205.8
New Zealand	AA	45,286	3.0	(1.9)	21.9	(4.5)	161.2
Norway	AAA	84,367	1.1	6.7	(176.1)	7.7	(283.3)
Pakistan	B-	1,437	4.3	(4.5)	57.6	(1.6)	88.0
Panama	BBB	12,708	6.0	(3.3)	13.7	(7.8)	95.0
Peru	BBB+	6,257	2.7	(1.6)	6.9	(4.7)	16.5
Philippines	BBB	2,981	6.0	(0.8)	25.6	5.0	(27.1)
Poland	A-	13,217	3.5	(3.0)	47.4	(0.9)	55.4
Portugal	BB	18,870	1.7	(2.9)	119.1	0.9	297.9
South Africa	BBB-	6,294	2.1	(3.6)	42.4	(4.6)	27.3
Sri Lanka	B+	4,208	5.5	(4.4)	71.1	(1.4)	121.7
Sweden	AAA	54,147	2.8	(1.5)	30.4	6.6	122.1
Switzerland	AAA	81,120	0.7	0.5	24.5	9.5	24.2
Taiwan	AA-	22,780	3.4	(1.6)	42.0	13.3	(86.4)
Thailand	BBB+	6,096	3.4	(0.6)	22.5	4.9	(22.3)
Turkey	BB+	9,654	3.0	(1.5)	30.6	(4.7)	139.9
U.K.	AAA	43,892	2.6	(3.4)	82.3	(4.7)	515.1
U.S.	AA+	56,114	2.3	(4.8)	79.4	(2.5)	338.4
Vietnam	BB-	2,221	6.2	(4.1)	46.4	5.5	(0.1)

Source: Standard & Poor's. All ratings as of Sept. 10, 2015.

Table 2

250-Year Earthquake, Net Rating Impact And Contribution By Assessment								
Country	LT FC rating*	Damage (% of value)	Insurance coverage (% of assets)	Net rating impact	Contribution by assessment			
					Due to economic assessment	Due to external assessment	Due to fiscal deficit assessment	Due to fiscal debt assessment
Australia	AAA	0.13%	70%	0.05	0.00	0.01	0.02	0.01
Austria	AA+	0.52%	35%	0.36	0.05	0.14	0.12	0.05
Bangladesh	BB-	1.12%	5%	0.28	0.03	0.14	0.05	0.05
Canada	AAA	0.66%	25%	0.24	0.04	0.10	0.07	0.03
Chile	AA-	5.38%	30%	2.37	0.36	0.89	0.77	0.36
China	AA-	0.55%	5%	0.06	0.04	0.00	0.00	0.02
Colombia	BBB	1.29%	20%	0.64	0.07	0.29	0.19	0.10
Costa Rica	BB	3.71%	5%	1.83	0.28	0.67	0.57	0.32
Dominican Republic	BB-	2.08%	5%	0.92	0.13	0.38	0.23	0.18
Ecuador	B+	2.24%	5%	1.10	0.14	0.48	0.35	0.13
France	AA	0.03%	80%	0.02	0.00	0.01	0.01	0.00
Germany	AAA	0.12%	25%	0.00	0.00	0.00	0.00	0.00
Greece	CCC+	0.75%	5%	0.25	0.05	0.00	0.20	0.00

Table 2

250-Year Earthquake, Net Rating Impact And Contribution By Assessment (cont.)								
India	BBB-	0.34%	5%	0.13	0.01	0.08	0.03	0.02
Indonesia	BB+	1.39%	5%	0.52	0.05	0.29	0.11	0.07
Israel	A+	1.78%	50%	0.67	0.17	0.07	0.28	0.15
Italy	BBB-	1.03%	20%	0.83	0.12	0.33	0.27	0.11
Japan	AA-	3.86%	15%	2.11	0.60	0.18	0.98	0.35
Korea	A+	0.10%	5%	0.07	0.01	0.03	0.02	0.01
Mexico	BBB+	1.27%	15%	0.76	0.08	0.43	0.16	0.09
Morocco	BBB-	0.36%	10%	0.09	0.01	0.06	0.00	0.02
New Zealand	AA	1.59%	70%	0.58	0.11	0.05	0.29	0.13
Pakistan	B-	1.30%	5%	0.44	0.04	0.20	0.11	0.09
Panama	BBB	3.24%	15%	1.08	0.25	0.52	0.13	0.18
Peru	BBB+	3.63%	5%	1.79	0.23	0.76	0.51	0.28
Philippines	BBB	3.88%	5%	1.00	0.14	0.40	0.26	0.20
Portugal	BB	1.21%	20%	0.48	0.07	0.00	0.29	0.12
South Africa	BBB-	0.32%	15%	0.15	0.02	0.06	0.05	0.02
Switzerland	AAA	0.60%	15%	0.00	0.00	0.00	0.00	0.00
Taiwan	AA-	4.43%	15%	1.32	0.40	0.00	0.64	0.29
Thailand	BBB+	0.17%	5%	0.07	0.01	0.03	0.02	0.01
Turkey	BB+	4.48%	30%	1.25	0.26	0.00	0.64	0.36
U.S.	AA+	0.67%	10%	0.24	0.00	0.08	0.12	0.05
Vietnam	BB-	0.05%	5%	0.01	0.00	0.01	0.00	0.00

*LT FC--Long-term foreign currency. Source: SwissRe and Standard & Poor's calculations.

Table 3

250-Year Earthquake, Economic Impact								
Deviation from baseline (% , five years after disaster)								
	LT FC rating*	Damage (% of value)	Insurance coverage (% of assets)	GDP per capita (\$)	Net general government debt	General government balance (five-year average)	Narrow net external debt	Current account balance (five-year average)
Australia	AAA	0.13%	70%	(0.1)	0.56	(0.1)	1.2	(0.1)
Austria	AA+	0.52%	35%	(0.3)	3.13	(0.6)	5.5	(0.8)
Bangladesh	BB-	1.12%	5%	(1.4)	1.31	(0.3)	10.7	(0.5)
Canada	AAA	0.66%	25%	(0.5)	3.52	(0.7)	7.9	(0.7)
Chile	AA-	5.38%	30%	(7.9)	18.21	(4.1)	67.1	(4.9)
China	AA-	0.55%	5%	(0.9)	1.41	(0.3)	7.7	(0.5)
Colombia	BBB	1.29%	20%	(1.9)	4.61	(1.0)	24.5	(1.0)
Costa Rica	BB	3.71%	5%	(6.5)	14.13	(2.9)	53.3	(3.4)
Dominican Republic	BB-	2.08%	5%	(3.2)	6.28	(1.3)	27.7	(1.5)
Ecuador	B+	2.24%	5%	(3.7)	8.25	(1.8)	38.8	(1.7)
France	AA	0.03%	80%	(0.0)	0.15	(0.0)	1.4	(0.1)
Germany	AAA	0.12%	25%	(0.1)	0.67	(0.1)	2.3	(0.3)

Table 3

250-Year Earthquake, Economic Impact (cont.)								
Greece	CCC+	0.75%	5%	(0.7)	5.79	(1.0)	19.6	(0.9)
India	BBB-	0.34%	5%	(0.5)	0.70	(0.1)	5.6	(0.3)
Indonesia	BB+	1.39%	5%	(2.1)	2.68	(0.6)	23.6	(0.9)
Israel	A+	1.78%	50%	(1.6)	7.69	(1.6)	5.1	(1.0)
Italy	BBB-	1.03%	20%	(0.8)	7.28	(1.3)	14.1	(1.0)
Japan	AA-	3.86%	15%	(5.2)	27.62	(4.9)	25.5	(2.0)
Korea	A+	0.10%	5%	(0.1)	0.39	(0.1)	1.9	(0.2)
Mexico	BBB+	1.27%	15%	(2.2)	4.18	(0.9)	17.6	(1.4)
Morocco	BBB-	0.36%	10%	(0.5)	1.08	(0.2)	4.7	(0.4)
New Zealand	AA	1.59%	70%	(1.3)	6.69	(1.4)	4.5	(1.1)
Pakistan	B-	1.30%	5%	(1.6)	2.82	(0.6)	16.7	(0.6)
Panama	BBB	3.24%	15%	(5.2)	8.34	(1.9)	34.7	(3.5)
Peru	BBB+	3.63%	5%	(6.0)	12.14	(2.7)	67.1	(2.7)
Philippines	BBB	3.88%	5%	(5.7)	8.48	(1.8)	32.7	(2.4)
Portugal	BB	1.21%	20%	(0.9)	7.68	(1.4)	19.6	(1.6)
South Africa	BBB-	0.32%	15%	(0.5)	1.11	(0.2)	5.8	(0.4)
Switzerland	AAA	0.60%	15%	(0.8)	3.11	(0.6)	3.7	(0.7)
Taiwan	AA-	4.43%	15%	(6.7)	16.93	(3.4)	18.8	(4.8)
Thailand	BBB+	0.17%	5%	(0.3)	0.48	(0.1)	2.7	(0.4)
Turkey	BB+	4.48%	30%	(6.4)	17.23	(3.8)	67.7	(3.8)
U.S.	AA+	0.67%	10%	(0.6)	3.15	(0.6)	11.0	(0.3)
Vietnam	BB-	0.05%	5%	0.0	0.07	0.0	1.1	(0.2)

*LT FC--long-term foreign currency. Source: SwissRe and Standard & Poor's calculations.

Table 4

250-Year Tropical Cyclone, Net Rating Impact And Contribution By Assessment								
Country	LT FC rating*	Damage (% of value)	Insurance coverage (% of assets)	Net rating impact	Contribution by assessment			
					Due to economic assessment	Due to external assessment	Due to fiscal deficit assessment	Due to fiscal debt assessment
Australia	AAA	0.14%	70%	0.05	0.00	0.01	0.03	0.01
Bangladesh	BB-	8.58%	5%	2.21	0.31	0.96	0.49	0.46
China	AA-	0.19%	10%	0.02	0.01	0.00	0.00	0.01
Dominican Republic	BB-	5.61%	5%	2.52	0.38	0.95	0.68	0.51
Hong Kong	AAA	0.54%	15%	0.00	0.00	0.00	0.00	0.00
India	BBB-	0.21%	5%	0.09	0.01	0.05	0.02	0.01
Japan	AA-	0.14%	60%	0.05	0.01	0.01	0.03	0.01
Korea	A+	0.15%	30%	0.08	0.01	0.04	0.02	0.01
Mexico	BBB+	0.55%	15%	0.33	0.04	0.19	0.07	0.04
New Zealand	AA	0.04%	70%	0.03	0.00	0.01	0.01	0.00
Philippines	BBB	1.70%	5%	0.38	0.06	0.18	0.06	0.08
Sri Lanka	B+	0.16%	5%	0.06	0.01	0.04	0.01	0.01

Table 4

250-Year Tropical Cyclone, Net Rating Impact And Contribution By Assessment (cont.)								
Taiwan	AA-	1.81%	15%	0.52	0.16	0.00	0.25	0.11
Thailand	BBB+	0.78%	5%	0.28	0.05	0.10	0.09	0.04
U.S.	AA+	0.38%	70%	0.08	0.00	0.00	0.05	0.02
Vietnam	BB-	7.88%	5%	1.80	0.29	0.55	0.61	0.34

*LT FC--long-term foreign currency. Source: SwissRe and Standard & Poor's calculations.

Table 5

250-Year Tropical Cyclone, Economic Impact								
Deviation from baseline (%), five years after disaster								
	LT FC rating*	Damage (% of value)	Insurance coverage (% of assets)	GDP per capita (USD)	Net general government debt	General government balance (five-year average)	Narrow net external debt	Current account balance (five-year average)
Australia	AAA	0.14%	70%	(0.1)	0.61	(0.1)	1.2	(0.1)
Bangladesh	BB-	8.58%	5%	(11.6)	11.93	(2.6)	78.7	(3.6)
China	AA-	0.19%	10%	(0.3)	0.48	(0.1)	3.5	(0.2)
Dominican Republic	BB-	5.61%	5%	(8.9)	18.17	(3.6)	75.1	(4.0)
Hong Kong	AAA	0.54%	15%	(0.4)	1.80	(0.4)	6.3	(3.0)
India	BBB-	0.21%	5%	(0.3)	0.43	(0.1)	4.0	(0.2)
Japan	AA-	0.14%	60%	(0.1)	0.73	(0.1)	1.0	(0.1)
Korea	A+	0.15%	30%	(0.2)	0.53	(0.1)	2.0	(0.3)
Mexico	BBB+	0.55%	15%	(1.0)	1.79	(0.4)	8.4	(0.7)
New Zealand	AA	0.04%	70%	(0.0)	0.18	(0.0)	1.5	(0.1)
Philippines	BBB	1.70%	5%	(2.4)	3.56	(0.8)	14.8	(1.1)
Sri Lanka	B+	0.16%	5%	(0.2)	0.30	(0.1)	3.1	(0.2)
Taiwan	AA-	1.81%	15%	(2.8)	6.62	(1.3)	8.8	(2.1)
Thailand	BBB+	0.78%	5%	(1.6)	2.21	(0.5)	8.0	(1.3)
U.S.	AA+	0.38%	70%	(0.1)	1.39	(0.3)	0.0	(0.2)
Vietnam	BB-	7.88%	5%	(8.7)	18.44	(4.3)	43.7	(7.0)

*LT FC--long-term foreign currency. Source: SwissRe and Standard & Poor's calculations.

Table 6

250-Year Flood, Net Rating Impact And Contribution By Assessment								
Contribution by assessment								
	LT FC rating*	Damage (% of value)	Insurance coverage (% of assets)	Net rating impact	Due to economic assessment	Due to external assessment	Due to fiscal deficit assessment	Due to fiscal debt assessment
Austria	AA+	0.14%	35%	0.12	0.01	0.06	0.03	0.01
Brazil	BB+	0.53%	10%	0.39	0.03	0.18	0.12	0.07
Czech Republic	AA-	0.60%	50%	0.22	0.02	0.05	0.11	0.04
France	AA	0.24%	80%	0.08	0.01	0.01	0.05	0.02
Germany	AAA	0.39%	25%	0.05	0.01	0.02	0.02	0.01

Table 6

250-Year Flood, Net Rating Impact And Contribution By Assessment (cont.)								
Hungary	BB+	1.39%	10%	0.67	0.10	0.16	0.27	0.14
Poland	A-	0.34%	60%	0.09	0.01	0.04	0.01	0.02
Sri Lanka	B+	0.36%	5%	0.12	0.01	0.07	0.02	0.02
Thailand	BBB+	4.31%	10%	1.55	0.29	0.50	0.52	0.24

*LT FC--long-term foreign currency. Source: SwissRe and Standard & Poor's calculations.

Table 7

250-Year Flood, Economic Impact								
Deviation from baseline (% , five years after disaster)								
	LT FC rating*	Damage (% of value)	Insurance coverage (% of assets)	GDP per capita (\$)	Net general government debt	General government balance (five-year average)	Narrow net external debt	Current account balance (five-year average)
Austria	AA+	0.14%	35%	(0.1)	0.86	(0.2)	2.7	(0.4)
Brazil	BB+	0.53%	10%	(0.4)	2.45	(0.5)	18.1	(0.4)
Czech Republic	AA-	0.60%	50%	(0.4)	2.80	(0.6)	3.1	(0.8)
France	AA	0.24%	80%	(0.0)	1.15	(0.2)	1.0	(0.3)
Germany	AAA	0.39%	25%	(0.3)	2.22	(0.4)	4.3	(0.6)
Hungary	BB+	1.39%	10%	(2.1)	8.17	(1.6)	11.5	(2.1)
Poland	A-	0.34%	60%	(0.4)	1.31	(0.3)	3.4	(0.5)
Sri Lanka	B+	0.36%	5%	(0.5)	0.67	(0.1)	5.3	(0.3)
Thailand	BBB+	4.31%	10%	(8.7)	12.99	(2.8)	37.2	(6.1)

*LT FC--long-term foreign currency. Source: SwissRe and Standard & Poor's calculations.

Table 8

250-Year Winter Storm, Net Rating Impact And Contribution By Assessment								
Contribution by assessment								
	LT FC rating*	Damage (% of value)	Insurance coverage (% of assets)	Net rating impact	Due to economic assessment	Due to external assessment	Due to fiscal deficit assessment	Due to fiscal debt assessment
Austria	AA+	0.11%	80%	0.07	0.00	0.03	0.02	0.01
Belgium	AA	0.26%	60%	0.15	0.02	0.06	0.05	0.02
Denmark	AAA	0.25%	80%	0.00	0.00	0.00	0.00	0.00
Finland	AA+	0.37%	65%	0.14	0.02	0.02	0.08	0.03
France	AA	0.13%	80%	0.05	0.00	0.01	0.02	0.01
Germany	AAA	0.07%	65%	0.00	0.00	0.00	0.00	0.00
Ireland	A+	0.28%	80%	0.10	0.00	0.04	0.04	0.02
Netherlands	AA+	0.20%	65%	0.10	0.01	0.03	0.04	0.01
Norway	AAA	0.27%	80%	0.00	0.00	0.00	0.00	0.00
Sweden	AAA	0.10%	80%	0.00	0.00	0.00	0.00	0.00
Switzerland	AAA	0.17%	80%	0.00	0.00	0.00	0.00	0.00
U.K.	AAA	0.24%	80%	0.07	0.01	0.01	0.04	0.01

*LT FC--long-term foreign currency. Source: SwissRe and Standard & Poor's calculations.

Table 9

250-Year Winter Storm, Economic Impact								
Deviation from baseline (% , five years after disaster)								
	LT FC rating*	Damage (% of value)	Insurance coverage (% of assets)	GDP per capita (\$)	Net general government debt	General government balance (five-year average)	Narrow net external debt	Current account balance (five-year average)
Austria	AA+	0.11%	80%	0.0	0.55	(0.1)	1.7	(0.3)
Belgium	AA	0.26%	60%	(0.1)	1.37	(0.3)	3.2	(0.7)
Denmark	AAA	0.25%	80%	(0.1)	1.15	(0.2)	0.7	(0.3)
Finland	AA+	0.37%	65%	(0.1)	1.90	(0.4)	2.2	(0.4)
France	AA	0.13%	80%	(0.0)	0.61	(0.1)	1.3	(0.2)
Germany	AAA	0.07%	65%	(0.0)	0.34	(0.1)	1.5	(0.2)
Ireland	A+	0.28%	80%	(0.1)	1.10	(0.2)	2.0	(0.8)
Netherlands	AA+	0.20%	65%	(0.1)	1.01	(0.2)	1.8	(0.6)
Norway	AAA	0.27%	80%	(0.1)	1.12	(0.3)	0.0	(0.2)
Sweden	AAA	0.10%	80%	(0.0)	0.41	(0.1)	0.9	(0.2)
Switzerland	AAA	0.17%	80%	0.0	0.70	(0.1)	0.7	(0.2)
U.K.	AAA	0.24%	80%	(0.1)	0.89	(0.2)	1.6	(0.2)

*LT FC--long-term foreign currency. Source: SwissRe and Standard & Poor's calculations.

Related Criteria And Research

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