Earthquakes: Risk & Insurance Issues

An earthquake is a sudden and rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth’s surface. This shaking can sometimes trigger landslides, avalanches, flash floods, fires and tsunamis. Unlike other natural disasters such as hurricanes, there are no specific seasons for earthquakes.

Earthquakes in the United States are not covered under standard homeowners or business insurance policies. Coverage is usually available for earthquake damage in the form of an endorsement to a home or business insurance policy. However, insurers that don’t sell earthquake insurance may still be impacted by these catastrophes due to losses from fire following a quake. These losses could involve claims for business interruption and additional living expenses as well. Cars and other vehicles are covered for earthquake damage under the comprehensive part of the auto insurance policy.

In the United States about 5,000 quakes strike each year. Since 1900, earthquakes have occurred in 39 states and caused damage in all 50. One of the worst catastrophes in U.S. history, the San Francisco Earthquake of 1906, would have caused insured losses of $96 billion, were the quake to hit under current economic and demographic conditions, according to AIR Worldwide.

The Northridge earthquake, which struck Southern California on January 17, 1994, was the most costly quake in U.S. history, causing an estimated $20 billion in total property damage, including $12.5 billion in insured losses. The California Earthquake Authority is one of the world’s leading residential earthquake insurers, with 800,000 policies in force and 17 participating insurers. However, only about 12 percent of homeowners in California now buy earthquake coverage.

RECENT DEVELOPMENTS

2011 Earthquakes: Natural catastrophes and man-made disasters caused economic losses of $350 billion in 2011, according to preliminary estimates released by Swiss Re on December 15. Insured losses were estimated at $108 billion, making it the second costliest year ever after 2005. Insured losses for earthquakes, at over $47 billion, are the highest ever recorded. The Japan earthquake cost the insurance industry an estimated $35 billion, a fraction of the total losses, which are now estimated at $210 billion. Economic losses are expected to rise significantly once damage at nuclear facilities and disruption to worldwide supply chains are included. The earthquake that hit New Zealand in February caused economic losses of $15 billion but because of high earthquake insurance penetration the insurance industry will pay most of the losses, about $12 billion.

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2010 Earthquakes: A report released by the reinsurer Swiss Re in March 2011 found that population growth and rising wealth in seismically active areas is resulting in earthquakes that are more deadly and costly even if no long-term trend of increasing global earthquake activity has emerged. In 2010 natural catastrophes and man-made disasters cost the global insurance industry $43 billion, with earthquakes accounting for almost a third of these losses. In fact two of the three costliest earthquakes since 1970 occurred in 2010, the one in Chile and the one in New Zealand, see below. Economic losses were $218 billion, according to Swiss Re.

According to another reinsurer, Munich Re, worldwide economic losses from natural catastrophes in 2010 were $130 billion. Natural catastrophes cost the global insurance industry about $37 billion. The most deadly catastrophe was by far the 7.0 magnitude earthquake that struck near the capital city of Port-au-Prince in Haiti on January 12, killing 222,570 people. Munich Re put overall losses at about $8 billion and insured losses at $200 million. Haiti’s private insurance market is very small but its government provides a level of insurance coverage to its citizens by being a member of the Caribbean Catastrophe Risk Insurance Facility (CCRIF). CCRIF was created to limit the financial impact of catastrophic hurricanes and earthquakes to Caribbean governments by quickly providing short-term liquidity when a policy is triggered.

The most expensive natural catastrophe of 2010, ranked by insured losses, was the huge 8.8 magnitude earthquake that struck central Chile north of Concepción, the second-largest city in the South American nation, on February 27. Munich Re reports that the quake caused over $8 billion in insured losses and more than $30 billion in total damages. About 520 people were killed by the quake. Though more powerful than the January 2010 Haiti earthquake, the Chile quake was less deadly and destructive as its epicenter was located in a region with relatively low population density and because Chile’s history of damaging quakes has led to strict building codes.

Other major earthquakes of 2010 include the April 13 magnitude 7.1 earthquake that jolted Qinghai Province in the northwestern region of China, killing an estimated 2,700 people, according to Munich Re, and the September 3 magnitude of 7.1 earthquake that hit off the coast of New Zealand’s South Island, causing insured damages of about $3.3 billion.

Earthquake Forecasts: In April 2008 experts from the U.S. Geological Survey, USC’s Southern California Earthquake Center and the State Geological Survey released an earthquake forecast indicating that a huge quake is far more likely in Southern California than in Northern California in the next 30 years. The report also concluded that the state is virtually certain to be hit by a major earthquake by 2028. The researchers found that the chance of a 6.7 magnitude temblor, equal to the 1994 Northridge quake, is 97 percent in Southern California and 93 percent in Northern California. The likelihood of a 7.5 quake, which is 16 times more intense than a 6.7 quake, is 37 percent in Southern California and 15 percent in Northern California. The study used new information about prehistoric earthquakes, locations of faults and their slip rates, and satellite data of the movement of the Earth’s crust to calculate the likelihood of earthquakes in the state.

Earthquake Coverage: The California Earthquake Authority (CEA) was created in 1996 two years after the devastating Northridge Earthquake caused huge losses for homeowners insurers in the state. Fearing insolvency from another massive earthquake, the vast majority of insurers in the state’s homeowners insurance market severely restricted or ceased writing coverage altogether. To ensure the availability of homeowners coverage and end a serious threat to the vitality of the state’s housing market, the California Legislature established the CEA as a publicly managed, largely privately funded entity. At its inception the CEA lacked reserves, so the original agreement called for participating companies to cover up to $2.2 billion in claims before the state made $8 billion available in the event of a catastrophic quake. That agreement

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expired in December 2008. In 2007 the current 17 participating companies said they wanted to cut the amount they would have to pay before the CEA’s contribution kicks in. Insurers argued that by now the CEA had sufficient reserves to cover even a quake similar to the 1906 San Francisco earthquake, which would generate between $5 billion and $6 billion in claims in today’s dollars. The CEA has paid out only $3.6 million in losses since its inception in 1996. In September 2007 an agreement was reached, calling for participating insurers to commit $1.3 billion to the fund. In an effort to diversify its risk, in 2011 the CEA began a catastrophe bond program. Through the special purpose reinsurance vehicle, Bermuda-based Embarcadero Reinsurance Ltd., the CEA plans to issue relatively small cat bonds, two or three times a year. The first is a three-year $150 million bond, which would be triggered by CEA losses exceeding $3.29 billion. It was purchased by 25 investors.

In March 2011 Sens. Barbara Boxer and Dianne Feinstein (both D-Calif.) introduced into Congress a bill that would authorize the U.S. Department of the Treasury to guarantee up to $5 billion in bonds to help public entities such as the California Earthquake Authority (CEA) recover from a disaster. Since the sale of bonds would reduce the need for reinsurance, insurance coverage would become more affordable. If the bill were to be enacted, the CEA would be able to lower premiums by one-third, CEA officials say, and pay back the debt with moderate adjustments to premiums.

According to SNL Financial, direct premiums written for earthquake coverage in California totaled $1.6 billion in 2010, including $602 million for the CEA, the largest provider of earthquake insurance in the state (see Background). The CEA’s share of the market was about 37.9 percent. The CEA has some 800,000 policies in force in the state. The average CEA premium for a home with a limit of $400,000 was $800 in 2010. Only about 12 percent of Californians now purchase earthquake coverage.

**Insurance Coverage for Earthquakes in the United States:** Standard homeowners, renters and business insurance policies do not cover damage from earthquakes. Coverage is available either in the form of an endorsement or as a separate policy for homeowners, renters and small business owners. Unlike flood insurance, earthquake coverage is available from private insurance companies rather than from the government. In California, homeowners can also get coverage from the California Earthquake Authority (CEA), a privately funded, publicly managed organization.

Earthquake insurance provides protection from the shaking and cracking that can destroy buildings and personal possessions. Coverage for other kinds of damage that may result from earthquakes, such as fire and water damage due to burst gas and water pipes, is provided by standard home and business insurance policies in most states. Cars and other vehicles are covered for earthquake damage by comprehensive insurance which also provides protection against flood and hurricane damage as well as theft.

**Deductibles and Costs:** Earthquake insurance carries a deductible, generally in the form of a percentage rather than a dollar amount. Deductibles can range anywhere from 2 percent to 20 percent of the replacement value of the structure. This means that if it cost $100,000 to rebuild a home and there was 2 percent deductible, the consumer would be responsible for the first $2,000 dollars. Insurers in states like Washington, Nevada and Utah, with higher than average risk of earthquakes, often set minimum deductibles at around 10 percent. In most cases, consumers can get higher deductibles to save money on earthquake premiums.

The standard CEA policy includes a deductible that is 15 percent of the home’s replacement cost. The basic policy covers only the house (other structures such as garages, pools, etc. are not covered). Personal possessions are covered up to $5,000 and “loss of use” expenses, the additional cost of living elsewhere while home repairs are made, are covered up to $1,500.

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Recognizing that some people want more comprehensive coverage, the CEA also offers a 10 percent deductible, insurance for other structures, personal items coverage up to $100,000 and $15,000 in “loss of use” coverage. Premiums vary widely among the 19 rating territories, based on the type of house, its age, the nature of the soil, and proximity to known fault lines. The CEA has reserves of about $9 billion.

Premiums also differ widely by location, insurer and the type of structure that is covered. Generally, older buildings cost more to insure than new ones. Wood frame structures generally benefit from lower rates than brick buildings because they tend to withstand quakes better. Regions are graded on a scale of 1 to 5 for likelihood of quakes, and this may be reflected in insurance rates offered in those areas. The cost of earthquake insurance is calculated on “per $1,000 basis.” For instance, a frame house in the Pacific Northwest might cost between one to three dollars per $1,000 worth of coverage, while it may cost less than fifty cents per $1,000 on the East coast.

A brick home would cost approximately $3 to $15 dollars per $1,000 in the Pacific Northwest, while it would cost between 60 to 90 cents in New York. Earthquake insurance is available from most insurance companies in most states. California law requires homeowners insurance companies to offer earthquake coverage to their homeowners insurance policyholders. Homeowners can decide to purchase it, purchase a policy from another insurer or decline it altogether.

In January 1994 the Northridge earthquake, a magnitude 6.8 quake (see section on Earthquake Measurement), struck Southern California, causing an estimated $12.5 billion in insured losses, according to ISO. The insurance industry ended up paying out more in claims for this quake than it had collected in earthquake premiums over the preceding 30 years. While no insurer became insolvent, some came very close. To recover their financial strength and to be better prepared for the next earthquake, most insurers began to limit their exposure to earthquakes by writing fewer new homeowners insurance policies. In addition, most insurers filed for both rate increases and increases in deductibles from the 10 percent that was current then to 15 percent or higher. This triggered a crisis that by mid-1996 threatened the vitality of the state’s housing market and stalled the state’s recovery from recession.

**Earthquake Risk in the Western United States:** Although the entire Northwest of the United States is at high risk of earthquakes, nine of the most costly earthquakes in the last century occurred in California. According to the U.S. Geological Survey, there is a 70 percent probability that an earthquake of magnitude 6.7 or larger will strike the San Francisco Bay area over the next 30 years. The San Francisco earthquake in 1906 measured 8.3 on the Richter scale and caused direct quake losses of about $24 million, as well as fire losses of about $500 million, according to the National Geophysical Data Center. Beside the 1994 Northridge quake, large, recent quakes in California include the 7.6 magnitude Landers quake in 1992 that caused $92 million dollars of insured losses; the 6.9 magnitude Eureka quake in 1992 that resulted in $66 million dollars of insured losses; and the 7.0 Loma Prieta quake in 1989 that resulted in more than $7 billion in insured losses, 62 deaths and 3,757 injuries.

**Earthquake Measurement:** The size and magnitude of an earthquake is measured in several different ways. The Richter Scale measures the size of earthquake waves. It was developed by Charles Richter in the 1930s and is a logarithmic measurement of the amount of energy released by an earthquake, see below. The Mercalli Intensity Scale evaluates the intensity of a quake according to observed severity at specific locations. It rates the intensity on a Roman numeral scale that ranges from I to XII. Today, seismologists are using the Moment Magnitude Scale, which measures the size of the earthquake’s fault, and how much of the earth slips.

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at the time of the quake. A number of readings are taken, averaged and then adjusted to generate numbers similar to the Richter Scale. This allows the magnitude of earthquakes measured on these new scales to be compared with earthquakes recorded earlier. According to the Moment Magnitude Scale, the severity of an earthquake is categorized as the following:

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<thead>
<tr>
<th>Magnitude</th>
<th>Size</th>
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<tbody>
<tr>
<td>5.0</td>
<td>Small</td>
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<tr>
<td>5.0 – 6.0</td>
<td>Moderate</td>
</tr>
<tr>
<td>6.0 – 7.0</td>
<td>Large</td>
</tr>
<tr>
<td>7.0 - 7.8</td>
<td>Major</td>
</tr>
<tr>
<td>7.8</td>
<td>Great</td>
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An increase of one unit of magnitude, for example, from a 4.0 to a 5.0 quake, is a 10-fold increase in wave amplitude on a seismogram, or about a 30-fold increase in energy released. Thus, the difference between a 4.0 and a 6.0 magnitude quake would be a release of energy 900 times (30 times 30) as great as a 4.0 magnitude quake since the magnitude is a logarithmic value.

**Earthquake Safety/Loss Mitigation:** Although earthquakes cannot be prevented, science and engineering provide tools that can be used to reduce their damage. Science can now identify, with considerable accuracy, where earthquakes are likely to occur and what forces they will generate. Engineering can help provide design and construction techniques so that buildings and other structures can survive the tremendous forces of earthquakes.

To produce estimates of earthquake loss by geographic area, FEMA uses an earthquake loss estimation methodology called Hazards U.S. (HAZUS), developed in cooperation with the National Institute of Building Sciences. The loss estimation methodology is a software program that uses mathematical formulas and information about building stock, local geology and the location and size of potential earthquakes, economic data, and other information to estimate losses from a potential earthquake. HAZUS is capable of using two separate geographic information systems (MapInfo® and ArcView®) to map and display ground shaking, the pattern of building damage, and demographic information about a community. Once the location and size of a hypothetical earthquake is identified, HAZUS will estimate the violence of ground shaking, the number of buildings damaged, the number of casualties, the amount of damage to transportation systems, disruption to the electrical and water utilities, the number of people displaced from their homes, and the estimated cost of repairing projected damage and other effects.