

Chicago Fed Letter

How do property and casualty insurers manage risk? The role of reinsurance

by Andy Polacek, senior associate economist

By tempering financial losses, the insurance industry lends resilience to the economy and helps homeowners and businesses recover from natural disasters and other catastrophes. In order to do this, however, the insurance industry must itself be resilient.

In 2005, U.S. property and casualty (P&C) insurance companies paid out a record \$72.2 billion in natural disaster- and catastrophe-related claims, more than double the claims paid in 2004, yet very

few insurers faced insolvency as a result.¹

Hurricane Katrina, one of the most destructive storms in U.S. history, caused more than \$108 billion in damage in 2005. Insurance played an important role in the Gulf Coast's recovery from the hurricane, with private insurers covering \$41.1 billion in damages from property and homeowners' insurance claims, as well as over \$2 billion in insured damages to offshore energy facilities. In addition, the

National Flood Insurance Program (NFIP) covered \$25.8 billion in losses that were due to flooding.² This *Chicago Fed Letter* discusses how property and casualty insurers manage risk, focusing in particular on reinsurance.

Insurance and reinsurance

Most Americans have some form of insurance, whether it is car insurance,

homeowners insurance, or an extended warranty for an iPhone. In each case, the policyholder pays a premium and the insurer agrees to pay for damages specified in the insurance policy that occur during the life of the contract. Insurers make money when the returns they earn by investing premiums plus the premiums themselves exceed their payments to policyholders.

However, insurers do not know the true cost of an individual policy until after the contract has expired and any losses are known. For example, in a given year, one insured driver may have no accidents, while another causes a five-car pileup that leads to millions of dollars in damages. In order to control the risk of their overall portfolio of insured drivers, insurers rely on the law of large numbers. It is difficult to predict if an individual driver will have an accident in a given year and even more difficult to predict the insured losses due to that accident. However, if a company insures 100,000 drivers, it can estimate the approximate fraction of drivers who will have an accident and predict the total losses within a tight range. By insuring many drivers, the insurance company can better predict average losses per policyholder and set premium prices appropriately. A similar logic applies to other types of insurance as well. However, the law of large numbers does not make it easier to manage some risks, particularly

1. Premiums ceded to reinsurers by business line, 2013

| Business line | Direct premiums (billions of dollars) | Percent ceded |
|-----------------------------------|------------------------------------------|------------------|
| Auto lines combined | 208.7 | 4.3 |
| Financial and mortgage guaranty | 5.2 | 5.9 |
| Fidelity and surety | 6.5 | 9.0 |
| Medical professional liability | 9.8 | 9.5 |
| Homeowners and farm owners | 85.6 | 11.6 |
| Workers compensation | 52.5 | 12.0 |
| Commercial multiple peril | 37.9 | 12.5 |
| Accident and health | 6.7 | 15.0 |
| Other and product liability lines | 58.2 | 19.7 |
| Other commercial | 7.7 | 27.8 |
| Fire and allied lines combined | 44.5 | 36.6 |
| Marine lines combined | 21.2 | 38.0 |
| Aircraft (all perils) | 1.7 | 39.5 |

SOURCES: SNL Financial and author's calculations.

Nonproportional reinsurance

Nonproportional reinsurance contracts are typically written to protect the primary insurer from a large-loss event.⁵ In a nonproportional agreement, the reinsurer covers losses that exceed some threshold. These policies usually specify the maximum amount of losses that the reinsurer will cover as well.

Consider, for example, a block of California fire insurance policies that are expected to have \$1.5 million in claims in an average year, but might experience claims in excess of \$10 million during a bad wildfire season. To protect itself from a bad wildfire season, the primary insurer could enter into a nonproportional reinsurance agreement, whereby the reinsurer agrees to cover losses between \$10 million and \$110 million, while the primary insurer covers losses up to \$10 million. Often, nonproportional contracts are written with multiple reinsurers, whereby the different reinsurers cover different “layers” of losses. In our example, a collection of five reinsurers might each agree to cover \$20 million in potential losses, with one reinsurer covering losses ranging from \$10 to \$30 million, another covering losses from \$30 to \$50 million, and so on. Not only does this arrangement benefit the primary insurer by limiting its maximum loss to \$10 million, but it strengthens the insurance industry. Spreading out the potential losses from the California fire insurance policies over multiple companies limits the possibility of an insurance company becoming insolvent as a result of a bad wildfire season.

P&C reinsurance market⁶

Reinsurance is a crucial part of the P&C insurance industry. In 2013, U.S.-based P&C insurers wrote \$535 billion in direct premiums and ceded almost \$72 billion of those premiums through reinsurance contracts. However, not all direct P&C insurers use reinsurance to the same extent or for the same purposes. In particular, smaller firms and firms in business lines with more-concentrated risks tend to use reinsurance more.

In 2013, the top 20% of P&C insurers by assets ceded 13% of their premiums through reinsurance contracts, while

the bottom 80% of firms ceded over 22% of premiums. Larger insurers tend to be less likely to use reinsurance because they are more diversified, both geographically and across business lines.

Consider Travelers Companies Inc., the fourth-largest U.S.-based P&C insurer with assets of \$75 billion. In 2013, Travelers received over \$22 billion in premiums and insured individuals and companies in every state, as well as Canada. Travelers ceded 7.7% of total premiums received in 2013 to reinsurers. In comparison, Florida Peninsula Holdings LLC (FPH) received \$310 million in premiums in 2013, almost entirely for Florida homeowners insurance. The company ceded 58% of those premiums through reinsurance in 2013. Small firms, like FPH, are more reliant on reinsurance to diversify their portfolios and protect against a concentrated loss event such as a Category 5 hurricane.

The use of reinsurance also varies greatly across business lines. Auto insurance (4.3%) is the least reinsured product line, while aircraft insurance (39.5%) is the most reinsured (see figure 1). There are three main reasons why auto insurance requires less reinsurance. First, car accidents are typically uncorrelated events. When a driver insured by Insurance Company A gets into an accident, the likelihood that other Insurance Company A drivers will have accidents does not change. Second, the average car accident claim is relatively inexpensive, even in cases where there are injuries. In 2010, only 2% of payouts exceeded \$300,000, and the largest claim paid by insurers was \$13 million.⁷ Finally, the total number of auto accidents does not change much from year to year, which makes losses fairly predictable and extreme losses unlikely.

In contrast, commercial airline crashes are very rare and, hence, more difficult to predict. In addition, when they do occur, insurance payouts can be very large. So far in 2014, there have been seven commercial airline crashes and tens of millions of flights without incident. For the insurance industry, the most expensive of those disasters will likely be Malaysian Airlines Flight 17.

Payouts to the families of plane crash victims are usually capped at \$150,000 per passenger, but if Malaysian Airlines is found to have been negligent because it allowed its planes to fly over a war zone, the cap on payouts would be lifted and claims could exceed \$1 billion.⁸

A loss in the range of \$1 billion would be difficult for even the largest P&C insurers to absorb. This is why primary insurers use reinsurance to make sure that they will not be in the position of having to cover such a large loss themselves. Reinsurance allows the costs of a major disaster to be shared among a primary insurer and potentially several reinsurers and makes insuring large risks, such as those associated with commercial aviation, feasible and more affordable.

The reinsurance industry itself is dominated by large firms. In 2013, the ten largest U.S.-based reinsurers by premiums assumed accounted for \$27.1 billion of the total \$42.9 billion in premiums ceded by U.S. insurers to U.S. reinsurers (figure 2). An additional \$28.6 billion was ceded to non-U.S.-based reinsurers, and the global reinsurance market is also highly concentrated. Approximately 55% of the \$190 billion in global

Charles L. Evans, *President*; Daniel G. Sullivan, *Executive Vice President and Director of Research*; Spencer Krane, *Senior Vice President and Economic Advisor*; David Marshall, *Senior Vice President, financial markets group*; Daniel Aaronson, *Vice President, microeconomic policy research*; Jonas D. M. Fisher, *Vice President, macroeconomic policy research*; Richard Heckinger, *Vice President, markets team*; Anna L. Paulson, *Vice President, finance team*; William A. Testa, *Vice President, regional programs, and Economics Editor*; Helen O'D. Koshy and Han Y. Choi, *Editors*; Rita Molloy and Julia Baker, *Production Editors*; Sheila A. Mangler, *Editorial Assistant*.

Chicago Fed Letter is published by the Economic Research Department of the Federal Reserve Bank of Chicago. The views expressed are the authors' and do not necessarily reflect the views of the Federal Reserve Bank of Chicago or the Federal Reserve System.

© 2015 Federal Reserve Bank of Chicago
Chicago Fed Letter articles may be reproduced in whole or in part, provided the articles are not reproduced or distributed for commercial gain and provided the source is appropriately credited. Prior written permission must be obtained for any other reproduction, distribution, republication, or creation of derivative works of *Chicago Fed Letter* articles. To request permission, please contact Helen Koshy, senior editor, at 312-322-5830 or email Helen.Koshy@chi.frb.org. *Chicago Fed Letter* and other Bank publications are available at <https://www.chicagofed.org>.

ISSN 0895-0164

reinsurance premiums were assumed by the ten largest global reinsurers, measured by premiums assumed in 2013.⁹

When a primary insurer uses reinsurance, the primary insurer is exposed to counterparty risk, which is the risk that the reinsurer (the counterparty) will not be able to honor its obligations. Because larger, more diversified reinsurers are likely to be able to cope better with out-sized claims, nonproportional reinsurance

is more concentrated than proportional reinsurance. In 2013, the top ten U.S.-based reinsurers by premiums assumed accounted for 76% of the total \$15.3 billion in nonproportional premiums ceded to U.S. reinsurers, compared with just 56% for proportional reinsurance.

Conclusion

Reinsurance plays a critical risk-management role in the property and

casualty insurance industry. Reinsurance allows P&C insurers to manage risks associated with concentrated exposures to business lines and geographies. Without reinsurance, insurance premiums would likely be higher, less insurance would be offered, and some insurance for infrequent events that cause large, concentrated losses, such as natural catastrophes, might not even exist.

¹ See www.iii.org/issue-update/catastrophes-insurance-issues and www.acegroup.com/bm-en/assets/3q2010newsletterrevised.pdf.

² www.nhc.noaa.gov/pdf/TCR-AL122005_Katrina.pdf.

³ Data from SNL Financial and author's calculations.

⁴ Underwriting a policy means the insurer guarantees to pay the policyholder in the event that loss or damage occurs.

⁵ Antonio Azzano, 2014, "Reinsurance: How insurers protect themselves (part 2)," *Generali Group*, available at www.generali.com/308819/Reinsurance-part-2.pdf.

⁶ Data from SNL Financial and author's calculations. Note, premiums ceded include only unaffiliated reinsurance transactions. Premiums assumed only include premiums assumed from nonaffiliates.

⁷ See [www.nytimes.com/2012/08/25/your-money/auto-insurance/how-to-know-if-](http://www.nytimes.com/2012/08/25/your-money/auto-insurance/how-to-know-if)

you-have-enough-auto-insurance.html?pagewanted=all&r=0.

⁸ See www.washingtonpost.com/blogs/wonkblog/wp/2014/07/19/total-liability-in-mh17-crash-could-climb-to-1-billion/.

⁹ Data from A.M. Best Company and <http://reports.swissre.com/2013/financial-report/financial-year/market-environment/reinsurance-non-life.html>.