Notes

Chapter 2. An Introduction to Insurance in Practice and Theory

1. This point has been made by Marco Arena (2008).
2. Medicare is partly paid for by payroll and general revenue taxes and partly by explicit premiums paid by seniors.
3. The term is also used widely in the academic literature on insurance and economics. See Neil Doherty and Harris Schlesinger (1990, 246) for a representative example.
4. We discuss what happens if the insurer is a mutual insurer in Chapter 5.
5. Investors will expect to get back the ten percent return they would otherwise have earned 99.9 percent of the time, and the extra 0.1 percent will just compensate them for the loss of principal and interest that will happen once in a thousand times.
6. As noted, compared to a situation where it has less capital and is unable to pay full benefits part of the time, if the insurer has more capital it will pay higher expected benefits. The actuarially fair premium will include the expected cost of those additional benefits.
7. As noted by Chris Starmer (2000, 335), “Concavity (of the utility function in money, or diminishing marginal utility) implies risk averse behavior; an agent with a concave utility function will always prefer a certain amount $x$ to any risky prospect with expected value equal to $x$.” James Dyer and Rakesh Sarin (1982) formally show how one can separate diminishing marginal utility from risk aversion in a utility function.

Chapter 3. Anomalies and Rumors of Anomalies

1. A more extended discussion of unwise purchases of insurance can be found in Tobias (1982).
2. Whole life insurance has a somewhat similar feature, but it pays out the policy (death) benefit only in the rare event the individual lives to an advanced age, e.g., 100.
3. See Starmer (2000) for a summary of some of these studies.
4. If the other person has caused the accident and is insured, then Joe will not be responsible for any damage assuming he can collect from the other driver's...
insurance company or successfully sue the person causing the accident unless that driver is uninsured or underinsured and without assets.

5. With the exception of employment-based group health insurance and some group life insurance, the bulk of consumer insurance is bought by individuals.

6. This example was provided by representatives of Towers Perrin at a Wharton Risk Center meeting in February 2002.

7. The managed care backlash exacerbated the problem by pressuring insurers to avoid limits on care they had been planning to use as a way of reducing the cost of health insurance.

**Chapter 4. Behavior Consistent with Benchmark Models**

1. Should coverage be mandated, the actual demand reflects what the consumer is required to purchase, not necessarily what the consumer wants to buy. In some cases, as with homeowners’ insurance required as a condition for a mortgage, we may observe high rates of purchase even if many consumers would have engaged in anomalous behavior had they been allowed to do so.

2. In some cases, insurance will make payments only if the vehicle is repaired. In other cases, the insurer sends the insured a check for the estimated cost of repairs; the insured can then decide whether or not to go ahead with the body work.

3. Loss adjustment expenses include insurer payments for things the consumer would otherwise have had to do, like negotiating the cost of repairs, verifying the need for repairs, and writing a check.

4. Insurers have data only on people who did purchase, but not on those who did not.

5. Those whose cars were financed were forced to have collision coverage, but may not have voluntarily purchased it had they been given that option.

6. Maximum contents coverage for a homeowners’ policy is normally sixty percent of the coverage on the structure.

7. Such a price would still be consistent with a benchmark model of choice that incorporated fixed cost into the analysis.

**Chapter 5. Real-World Complications**

1. Insurers themselves might not be all that certain of the risk either.

2. The classic paper discussing this situation is George Akerlof (1970).


4. Scott Harrington and Greg Niehaus (1999), pp. 132–3. There may be additional costs associated with the tax treatment of returns from reserves compared to the tax treatment of alternative investments (p. 82).

**Chapter 6. Why People Do or Do Not Demand Insurance**

1. The source for this figure is Johnson et al. 1993, 43 (Figure 1).

2. The idea that preferences are constructed, rather than revealed, emerged from many lines of research in the late 1980s and early 1990s (e.g., Chapman and
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3. For empirical data supporting this behavior see Michel-Kerjan, Lemoyne de Forges, and Kunreuther (2011).

Chapter 7. Demand Anomalies

2. Why the insurer was able to charge that much of an excess over claims in a competitive insurance market was not explained.
3. The authors discount the idea that moral hazard might be greater for auto than homeowners’ insurance by saying that the deductibles are typically small relative to the total value of the asset – but of course most auto collision claims are small and so a deductible there might impact use for “fender-benders” and the like to a greater extent than for homeowners’ coverage where the losses are likely to be larger.
4. The insurer offered policies with deductibles of $500, $1,000, $2,000, and $5,000.
5. A large number of accidents may cause a premium increase.
6. For more details on airline insurance, see http://www.travelinsurancecenter.com/.
7. The accident rate is much higher for privately operated planes for which flight insurance is not available.
8. Today, flight insurance is sold (or at least quoted) on the Web, which indicates there is some demand in advance of the airport.
9. Some rental car companies now charge uninsured customers who had an accident the daily rental fee for the number of days the car is out of service (“loss of use”) in addition to the cost of repairs. Unless the car is out of service for months such additional charges still cannot make up for the very high premium loading factor.
10. Employees on business trips are generally told not to buy insurance on rental cars because the company can get the commercial auto insurer to cover all nonowned and hired-car exposures much more cheaply. We are grateful to Jim MacDonald for pointing this out to us.
11. Interesting, a person is much more likely to die from heart disease than cancer, but there are few heart disease specific insurance policies.
13. We thank Jeff Brown and Michael Liersch for helpful comments and discussions on this section.
14. In reality, some advisers often ignore the possibility of a much longer than average life and simply report the income that would be received if the person had about the average life expectancy (Jeff Brown, personal communication, May 2010).
15. States also often require that annuity companies contribute to a guarantee fund to protect the promised income.
16. In the case of Enron, all employees whose entire investment was in company stock had nothing when the firm went bankrupt. We thank Michael Liersch for pointing this out to us.
17. If the person is loss averse and is therefore most concerned with parting with a large amount of wealth (after death) if he or she buys an annuity and dies soon after, he or she may not want to purchase an annuity. In other words, loss aversion will outweigh risk aversion.
18. A knowledgeable investor can combine an annuity with an invested portfolio to achieve the balance between risk and the return he or she desires.
19. Hospital care ($2,100) + chemotherapy ($7,200) + surgery ($5,000) + upfront cash ($5,000) = $19,300; this estimate assumes only one hospital stay of seven days. Additional hospital stays would increase the payout. Another estimate has suggested that a $290 Aflac policy has an expected payout of $16,000 which lends some support to our estimate (Bennett, Weinberg, and Lieberman 1998).

Chapter 8. Descriptive Models of Insurance Supply
1. The exact probability of at least one hurricane occurring during the next decade is (1 – Probability of no hurricanes in Florida during the next ten years) = 1 – (5/6)^10 = .84. This is a good example of the working of the law of large numbers. We don't know where a hurricane will strike in Florida over the next ten years causing at least $10 billion in damage, but we are fairly certain that at least one such event will occur in the state during this period.
2. These arguments also may explain the demand for reinsurance by property/ liability companies (Mayers and Smith 1990). Neil Doherty and Seha Tinić (1982) have argued that demand for reinsurance is generated by insurers anticipating policyholders’ aversion to insolvency.
3. The reason that expected profits will fall is that firms in a competitive market are setting prices on the elastic portion of their demand curves. This implies that if prices are increased, total revenue will fall. If costs are assumed to remain the same, then expected profits will be lower.
4. James Stone also introduces a constraint regarding the stability of the insurer’s operation. However, insurers have traditionally not focused on this constraint in dealing with catastrophic risks.
5. The actuaries and underwriters were also asked to price a policy for leakage of an underground storage tank and for a neutral risk where there was no context specified when either or both the probability and losses were well-specified or ambiguous. Their pricing behavior was similar to that described for the earthquake risk.
6. Over time, many such plans have been converted to for-profit firms.
8. We thank Jim MacDonald for pointing this out to us.
Chapter 9. Anomalies on the Supply Side

1. A more detailed treatment of this decision can be found in Wharton Risk Management Center (2005).

2. If an investor was risk neutral and the risk-free rate of return on capital was eight percent, then it would require a twenty percent return on its capital if it believed that it had only a ninety percent chance of recouping its investment (i.e., $0.9 [1.20] = 1.08$). If the likelihood of a terrorist attack were less than one in ten, then the investor would be better off investing in terrorism insurance than earning an eight percent risk-free return. As the risk-free return decreases from eight percent, then investing in terrorism coverage becomes even more attractive to the investor.

3. In the absence of other large-scale attacks like 9/11 and with the government still being largely involved through a backstop today in some of the largest insurance markets (United States, Europe), prices of terrorism insurance have decreased significantly since 2002. By the end of 2008 in the United States, about two-thirds of large U.S. firms had purchased terrorism insurance at an average cost of 12.5 percent of what they paid for property insurance (Michel-Kerjan, Raschky, and Kunreuther 2009).

4. For more details on the use of catastrophe models in the risk assessment process, see chapter 3 in Grossi and Kunreuther (2005).

5. For more details on the interaction between regulators and insurers see Grace and Klein (2007) and chapter 3 in Kunreuther and Michel-Kerjan (2009).


7. We appreciate the helpful comments by Richard Roth, Jr. on this section of the paper in an e-mail with the authors on September 2, 2010.

8. Insurers may have added a general “fudge factor” to premiums to take account of all of the perils they had not thought of explicitly.

9. For more details on the catastrophe bond market see Michel-Kerjan and Morlaye (2008).

10. A few phone calls can generate premium quotes for car insurance, extended warranties, or life insurance. There is other coverage, such as health insurance, where searching for quotes is more difficult and time-consuming.

Chapter 10. Design Principles for Insurance

1. Compared to cash transfers, earmarked vouchers ensure that every household given them buys at least as much of the specific good (insurance or nourishing food) as the voucher will cover. Households that previously bought large amounts of the good, however, will just substitute the voucher for their private payments.

2. An insurer who provides protection to a policyholder is responsible for losses incurred by the policyholder no matter who caused them. One reason for this
contractual arrangement between insurer and insured is the difficulty in assigning causality for a particular event. With respect to fire damage a classic case is *H. R. Moch Co., Inc. v. Rensselaer Water Co.* 247 N.Y. 160, 159 N.E. 896, which ruled that “A wrongdoer who by negligence sets fire to a building is liable in damages to the owner where the fire has its origin, but not to other owners who are injured when it spreads.” We are indebted to Victor Goldberg who provided us with this case.

3. The state of Mississippi lost this case. For more details see Kunreuther and Michel-Kerjan (2009).

**Chapter 11. Strategies for Dealing with Insurance-Related Anomalies**

1. Portions of this section are based on material in Krantz and Kunreuther (2007).
2. The tool is called the “Medicare Plan Finder” at [www.medicare.gov/find-a-plan/questions/home.aspx](http://www.medicare.gov/find-a-plan/questions/home.aspx).
3. The probability of not collecting the extra premium is \((19/20)^{10} = .60\).
4. The impetus for national health insurance in the United States is generally held to be the large number of low-income people who are uninsured, not the small number of well-off risk takers without coverage, although there are millions of these individuals as well.
5. Depending on the nature of laws and contracts, partial failure to pay need not necessarily result in bankruptcy of the firm.
6. What actually happens when an insurer is unable to pay all claims, or is forecast to be unable to pay all claims, is complex. Regulators usually intervene and various combinations of buyout, merger, receivership, and liquidation are all possible.

**Chapter 12. Innovations in Insurance Markets through Multiyear Contracts**

1. A current smoker defending his habit could note that the higher premiums for health insurance would be paid for fewer additional years because of the higher mortality of smokers, but achieving such potential savings on lifetime health premiums by shortening one’s lifetime would not appeal to most people.
2. The reduction in expected loss for each home is \((1/100 \times \$20,000) = \$200\), so the total reduction in premiums for all 1000 homes with a loading cost of fifty percent is \((1000) \times (\$200) \times (1.50) = \$300,000\).
3. The National Flood Insurance Program was created in 1968 because insurers viewed flood risk as uninsurable and refused to cover it. As of April 2012 the NFIP sold more than 5.5 million policies (compared to 2.5 million in 1992) and covered more than $1.2 trillion in assets (compared to only $237 billion in 1992;

4. This subsection is based on Kunreuther and Michel-Kerjan (2010). For more details on the performance of the National Flood Insurance Program since its inception see Michel-Kerjan (2010).

Chapter 13. Publicly Provided Social Insurance

1. The circumstances surrounding the passage of Social Security had a similar history. Private pensions and annuities provided limited financial support and incomes during working lifetimes during the Great Depression were often insufficient to provide savings for retirement.

2. Even pandemics such as influenza usually affect only a very small share of total health claims.

3. Total beneficiary premiums for Medicare cover only about ten percent of total benefits costs, however.

4. Health care reform will allow somewhat more variation in the future.

5. Even after taking these additional benefits into account as well as lowered cost from improved health, some preventive activities appear to be overused, such as prostate cancer screening.

6. The reason that it costs only $41 million is that only 86,316 of the population of one hundred thousand at age fifty survived to age sixty-five.

7. See Pauly and Blavin (2008) for a discussion of optimal coinsurance when consumer demand differs from a correct reflection of marginal benefit. Roughly speaking, if consumers underestimate the marginal benefit from colonoscopies and so are still not pursuing them up to the point where marginal benefit equals marginal cost when faced with a user price reduced by the cost offset, it will be desirable to reduce cost sharing even more until they get close to what would be optimal. Possible risk protection impacts of insurance also should be taken into account, but there is not much risk associated with the cost of a scheduled routine colonoscopy.

8. The conventional Medicare plan will not cover routine colonoscopies at more frequent intervals for people at normal risk. It will pay for those at elevated risk (family member had colon cancer or personal history of colon cancer or precancerous polyps) every two years. Some of the private Medicare Advantage plans may pay for coverage at more frequent intervals.


10. More than half of the uninsured were found to have household incomes high enough that, even after paying insurance premiums, they would still have enough left over to attain a level of consumption above that for households below the poverty line.
11. Following the implementation of the legislation the uninsured percentage in Massachusetts did fall, but primarily among the population made eligible for Medicaid coverage.

Chapter 14. Conclusions – A Framework for Prescriptive Recommendations

1. If that expectation does change because the loss correctly signals some alteration in the loss-generating process, a premium increase would be appropriate.