INSURANCE PRICE AND PROFIT DYNAMICS: UNDERWRITING CYCLES CAN OCCUR IN COMPETITIVE MARKETS

BY ANNE GRON, PH.D. [1]

NERA Economic Consulting

Insurance prices are often compared to what are deemed "competitive insurance" prices to assess the performance of insurance markets. These prices, which I refer to as benchmark prices, are typically based on discounted cash flow models or similar approaches. Benchmark insurance prices are essentially equal to the present value of expected claims plus expenses.[2] In many insurance markets, however, actual prices deviate from these benchmark prices for extended periods of time.[3] In particular, many property casualty insurance markets and health insurance markets experience underwriting cycles which exhibit alternating periods of high profitability-hard markets and low profitability soft markets. The high profitability periods are often accompanied by reductions in output. Some policyholders are able to renew their policies but only with more restrictive coverage in the form of lower limits and/or higher deductibles; in extreme cases some policyholders may be unable to renew their coverage.

One reaction to this difference between observed prices and benchmark prices is to look for evidence of collusive or cooperative behavior among insurers that would result in the periods of higher profitability and restricted output. Those who think collusion may be at work often cite the insurance industry's limited antitrust exemptions under the McCarran-Ferguson Act. Many insurance markets, however, are structurally competitive with low barriers to entry, making successful collusion unlikely. Researchers have therefore developed models of insurance market dynamics that produce underwriting cycles in competitive markets. This article presents such a model, often called the capacity constraint model.

Underwriting cycles

Both property casualty insurance and health insurance markets experience repeating periods of high profitability followed by low profitability known as underwriting cycles. The typical property casualty cycle has four phases defined by movements in price, quantity and profits. The first stage is marked by a period of low profitability and prices. In the second stage prices and profitability rapidly increase, typically accompanied by a decline in availability. This transition from soft to hard market is sometimes described as an insurance crisis when policyholders experience particularly large increases in price and availability declines. In the third phase the market stabilizes to a hard market; profitability remains high and availability is tight but the market is no longer shrinking. Profitability gradually declines during the fourth phase as the industry returns to a period of low profitability.

On a national level, the property casualty industry has experienced eight complete cycles since World War II.[4] Hard markets typically follow large, unanticipated losses or follow periods of low industry profitability that depletes insurer capital. Different lines of insurance may experience greater cyclic effects across cycles. For example, liability lines (including medical malpractice) experienced rapidly increasing prices and declining availability in the mid 1980s hard market, catastrophe insurance experienced price increases and quantity restrictions in the mid 1990s, and commercial liability lines including medical malpractice were again affected by a hard market beginning around 2001.

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Health insurance underwriting cycles have been observed since the mid 1960s.[5] A typical health underwriting cycle has several years of high profitability and prices followed by several years of low profitability and prices before the market turns again. The change from soft market to hard market can be marked by rapidly increasing prices and profitability.[6] More recent cycles have been longer than some of the earlier cycles, perhaps due to changes in health insurance brought on by increased use of managed care in the early 1990s and the subsequent move away

[1] Dr. Gron is Senior Consultant at NERA Economic Consulting's Chicago office.

[2] In addition to discounted cash flow models, researchers have applied the capital asset pricing model and arbitrage pricing theory to the problem to generate benchmark prices that are essentially the present value of claims plus expenses (see, for example W. B. Fairley, "Investment Income and Profit Margins in Property-Liability Insurance: Theory and Empirical Results," *Bell Journal of Economics* 10 (1979): 192-210; and S. C. Myers and R. A. Cohen "A Discounted Flow Approach to Property-Liability Insurance Rate Regulation," In *Fair Rate of Return in Property-Liability Insurance*, ed. J. D. Cummins and S. E. Harrington (Boston: Kluwer-Nijhoff Publishing, 1987): 55-78.

[3] Price is defined for a unit of output. In insurance, that unit might be a given policy with particular policy limits, deductibles and so on, or it might be the amount paid per dollar expected loss purchased. In the case where the unit is a particular policy, the price is equivalent to the premium.

[4] Insurance cycles are often measured from trough to trough in profitability, since price and quantity series over longer periods are not available. The eight complete postwar cycles are 1946-1952, 1952-1957, 1957-1964, 1964-1969, 1969-1975, 1975-1984, 1984-1992, 1992-2001, measuring cycles from peak to peak in the combined ratio (an accounting ratio equal to the sum of incurred losses plus loss adjustment expenses divided by earned premiums plus selling expenses divided by written premium; essentially a ratio of costs to revenues)(see B. D. Stewart, "Profit Cycles in Property-Liability Insurance," in vol. 1, *Issues in Insurance*, ed. J. D. Long and E. D. Randall, 3rd ed. (Malvern, PA: American Institute for Property and Liability Underwriters, 1984); and R. P. Hartwig, "The Insurance Cycle, Financial Crisis and Catastrophes: Impacts and Implications for the Texas P/C Insurance Markets," Insurance Information Institute Presentation, Insurance Council of Texas Annual Symposium, (Austin, TX, July 23, 2009), available at www.iii.org/presentations/ICT-TX072309). Cycles can also be measured using total insurer profitability which also includes investment income. Total insurer profitability identifies the same cyclic episodes.

[5] Although consistent health insurance industry data are not available over longer periods of time, data from various sources and industry observations indicate the presence of the health insurance underwriting cycle (J. Gabel, R. Formisano, B. Lohr, and S. DiCarlo, "Tracing the Cycle of Health Insurance," *Health Affairs* (Winter 1991): 48-61.; and R. Kipp, J. P. Cookson, and L. L. Mattie, "Health Insurance Underwriting Cycle Effect on Health Plan Premiums and Profitability (Milliman, USA: April 10, 2003).

[6] Gabel et al (1991), p. 50.

from some of the more restrictive policies, as well as other recent changes in health care provision and government regulation.

INSURANCE PRICING MODELS

The Traditional Economic Model of Competitive Insurance Prices:

Traditional economic models of competitive insurance prices provide an intuitive and straightforward result: prices are essentially equal to the present value of expected claims costs, expenses, and a competitive profit. Since the insurer collects a premium at the beginning of the insurance contract and does not expect to pay any claims until sometime into (or after) the policy period, the premium is based upon the present value of expected claim payments. Two common methodologies used for developing benchmark prices from these costs are discounted cash flow models and capital asset pricing models.

A key assumption in the traditional insurance pricing model is that financial capital held by insurers adjusts quickly and costlessly. Insurers hold capital in order to be able to pay actual claims, which might be higher or lower than expected claims due to random variation or unexpected changes in cost factors, claim frequency or claim severity. Insurer capital provides a cushion for unexpected, negative claims outcomes and protects policyholders from the probability an insurer will have insufficient funds to pay claims. Regulations to promote solvency require insurers to hold a minimum level of capital for the amount of insurance they sell.[7] When capital capital adjusts quickly and costlessly, the industry can supply any amount of insurance at the benchmark price. In terms of the standard economic supply and demand graphs, the industry supply curve is a horizontal line at the benchmark price. If demand increases, insurers can quickly and costlessly expand their capital and supply more insurance; if demand decreases insurers can quickly and costlessly reduce capital.

In the traditional competitive insurance pricing models, price changes occur only when there are changes in expected losses or in the systematic risk of losses. Moreover, since capital adjusts quickly, these models can't explain the accompanying reductions in quantity that occur in underwriting cycles.

[7] A minimum capital requirement could also arise from market incentives such as buyers' response to limited liability, or bankruptcy costs.

The Capacity Constraint Model

A theory of underwriting cycles in competitive insurance markets must address the persistence of premiums above benchmark prices and the quantity restrictions that accompany the hard market phase.[8] Capacity constraint models rely on three central assumptions: that the amount of insurance that an insurer can write at a given probability of bankruptcy is related to its level of capital, that there are industry level, random shocks to insurance capital from shocks to claims and asset values, and that capital market frictions make it costly to quickly adjust capital. Capacity is a measure of supply capability relative to long run equilibrium supply capability (the long run equilibrium level for those conditions). Under the capacity constraint hypothesis, insurer net worth determines short run supply capability. Capacity constraint models typically assume that the industry is structurally competitive, consistent with the actual market structure in many insurance lines.

Capacity constraint models, like traditional insurance pricing models, assume that insurers must hold a minimum level of capital to limit bankruptcy risk. An insurer's level of capital will thus determine the maximum amount of insurance the insurer can sell at a given price.[9] Insurer capital is subject to random shocks, including correlated shocks to claims and asset values. The correlated shocks are the not random, independent shocks whose effects can be largely removed through diversification; they are positively correlated across policies where many policies are affected at once. Some correlated loss shocks are small increases per policy but occur across a large number of policies resulting in a large aggregate shock. Examples include higher than anticipated costs of auto repair replacement parts, increased medical care costs and increases in accident frequency. Other correlated shocks result in large increases in each claim such as catastrophic losses associated with hurricanes, earthquakes, and fires. Insurer capital may also be adversely affected by declining asset values—significant declines in stock market values can affect insurers with substantial equity investments.

[8] Some markets experience particularly abrupt changes from the soft market to the hard market phase, with rapidly increasing prices and substantial declines in availability leaving some policyholders without coverage. Such episodes are often termed 'insurance crises.' Such events have been more prevalent in property casualty insurance markets than in health insurance. The capacity constraint theory also explains such sudden changes in market conditions as well as the differential impact of the hard market across lines of insurance.

[9] Reinsurance, namely insurers' purchase of insurance, can supplement the insurance industry's level of net worth. Reinsurance is essentially another form of insurance and can easily be accommodated in the capacity constraint model as well.

The third key assumption is that capital market frictions cause internal capital to be preferred to external capital. Insurers are funded by equity or equity-like instruments; asymmetric information between the firms and investors makes external equity costly in that in addition to the direct costs of issuing equity, firms' stock prices typically fall upon announcement of an equity issue.[10] To understand why, suppose there are two types of firms that issue equity—those with good future investment opportunities and those whose stock price is temporarily overvalued. Because investors cannot distinguish among the two, a firm's stock price falls after announcing it will make an equity offering to reflect investors' increased probability that the stock price was overvalued. The cost differential between internal and external capital means that insurers who experience a negative capital shock do not immediately readjust their capital level by accessing external capital markets. Capital from internal sources such as retained earnings is favored over external sources. While insurers may use some external capital to adjust, they will prefer to wait to accumulate retained earnings in order to fully adjust.

It might appear that such asymmetric information problems would be smaller at times when insurance prices and profitability are rising and expected to be high in the near future. However, it is precisely at this time that asymmetric information issues between insurers and investors are large. Hard markets typically follow industry losses—for example from unexpected inflation or catastrophic losses. Not all insurers will be similarly affected by the losses; the impact on any one insurer will depend upon their business mix, the type of contracts in place, and reinsurance. It may take months or more before the total costs are known and paid out by insurers even for catastrophic

[10] S.C. Myers and N.S. Majluf, "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have," *J. of Financial Econ.* 13 (1984): 187-221.

events like hurricanes and earthquakes. Until that time, insurers recognize the expected losses in their accrual based accounting by increasing their loss reserves. It is difficult for investors to verify which insurers have correctly estimated and fully recognized their expected losses and which have additional losses yet to come and may be currently overvalued because they have not fully realized those losses.

The three assumptions—that an insurer's supply of insurance (at a given maximum probability of bankruptcy) is related to its level of capital, that there are random shocks to insurance capital, and that capital market frictions prevent insurer net worth from quickly adjusting—mean that there is a maximum amount of insurance that can be supplied at the benchmark price, a given maximum bankruptcy probability and a given level of capital. That is, the level of insurer net worth determines the maximum amount of insurance the firm can sell at the benchmark price.

The quantity constraint is not absolute, however. For a given level of net worth and bankruptcy risk, the insurer can sell more insurance but only by receiving a higher price per policy. At a higher price, the insurance not only covers the expected claims costs and expenses, but it also includes additional capital thus allowing the insurer to increase output and still maintain a given level of bankruptcy risk. In the context of the typical supply-demand graph, this produces an upward-sloping portion of the short run supply curve—past some level of quantity the price must rise in order to increase output.

"The failure of insurance prices to follow benchmark prices does not, by itself, indicate noncompetitive behavior."

At the industry level, net worth shocks generate the market conditions associated with the underwriting cycle. To go from the firm level discussion to the industry level, note that because each insurer's ability to bear risk is related to its individual level of capital, the aggregate risk that the industry will assume at a reasonable probability of solvency is related to the aggregate level of capital that insurers have in the short run. Thus in terms of the supply-demand graph, the short run industry supply curve will also include an upward sloping portion. Large adverse shocks to claims or asset values, such as unanticipated inflation, large catastrophes, unexpected increases in interest rates, or declines in the stock market, can substantially reduce industry capacity. The industry supply curve shifts to the left and industry accounting profit increases, reflecting the increased opportunity cost of scarce capital.[11] As new capital and retained earnings increase industry net worth over time, the supply curve shifts to the right, causing premiums and profitability to decline toward their long run equilibrium levels.[12]

The capacity constraint model of insurance pricing has considerable empirical support in property casualty insurance markets.[13] Unexpected declines in insurance capacity precede increases in profitability as the model predicts. The model also explains many features of underwriting cycles including the fact that, in hard markets, prices are typically higher and availability is lower for greater coverage. Extensions of the model provide explanations for insurers' decisions not to renew and even to cancel some policies during abrupt transitions to hard markets.[14]

Discussion

An important criterion for determining if insurance markets function well is to examine whether market prices correspond to those that would prevail in a perfectly competitive marketplace. In such assessments observed insurance prices are typically compared to benchmark prices that are essentially the present value of expected claims plus expenses. Such benchmark prices assume that insurance supply can adjust quickly and costlessly to cost shocks or demand changes. Instead, as shown by the capacity constraint model of insurance prices, if insurance supply cannot be adjusted quickly and costlessly, competitive insurance prices can deviate for periods of time from benchmark prices. The failure of insurance prices to follow benchmark prices does not, by itself, indicate noncompetitive behavior.

The two models provide different interpretations of high insurance prices in hard markets. In the capacity constraint model, high prices signal a temporary shortage of industry capital. They provide a return on scarce industry capital and an incentive for additional capital to enter. High insurance prices play an important role in the market adjustment to capital shocks. In contrast, in traditional competitive insurance pricing models, persistent, high insurance prices are anomalies and must be explained by other forces.

[11] Demand for risk sharing (insurance) is generally considered relatively stable, whereas there seem to be substantial periodic supply disruptions. For individuals and households, insurance is a perishable product with few, if any, close demand substitutes and for some activities purchase is mandatory. For commercial buyers there are an increasing number of alternatives to 'traditional' insurance, many of which involve entry into insurance via captives or other risk bearing mechanisms. Sometimes, however, reductions in industry capacity are likely to be accompanied by increases in demand, compounding the net capacity effect. For example, demand is likely to increase after a large catastrophic event, or a large, highly publicized liability ruling which signals increased liability risk; these are also events likely to reduce industry net worth.

[12] One might wonder why new entrants do not immediately enter the industry and provide insurance when prices begin to rise, quickly bringing prices and profitability back to benchmark model levels. Such a scenario presumes the ability to quickly and costlessly enter the insurance industry. In general, however, immediate, large-scale entry in insurance involves costs to set up and run an insurance company. In addition, insurers, whether new or existing, often experience adverse selection when rapidly expanding because current insurers have more accurate loss expectations on their policyholders than other insurers. This does not mean that new entry does not occur or that there are large barriers to entry. New entry does occur at times of capacity shortages, but it is not fast enough to immediately return the industry to benchmark pricing levels. For example, following the catastrophe insurance crisis of the mid 1990s a number of new catastrophe reinsurers entered to provide industry capacity and after September 11, 2001 new capital entered insurance and reinsurance markets.

[13] See, for example, A. Gron, "Capacity Constraints and Cycles in Property-Casualty Insurance Markets," *Rand J. of Econ.* 25, no. 1 (Spring 1994): 110-127; A. Gron, "Evidence of Capacity Constraints in Insurance Markets," *J. of Law and Econ.* 37, no. 2 (October 1994); R. Winter, "The Dynamics of Competitive Insurance Markets," *J. of Financial Intermediation* 3 (1994): 379-415; and A. Gron and A. Winton, "Risk Overhang and Market Behavior," *J. of Business* 74, no. 4 (2001): 591-612.

[14] Gron and Winton (2001) provide one such model.

References

Born, P. and R.E. Santerre. "Unraveling the Health Insurance Underwriting Cycle." *J. of Insurance Regulation* 26 (Spring 2008): 65-84.

Fairley, W. B. "Investment Income and Profit Margins in Property-Liability Insurance: Theory and Empirical Results." *Bell J. of Econ.* 10 (1979): 192-210.

Gabel, J., R. Formisano, B. Lohr, and S. DiCarlo. "Tracing the Cycle of Health Insurance." *Health Affairs* (Winter 1991): 48-61.

Gron, A. "Capacity Constraints and Cycles in Property-Casualty Insurance Markets." *Rand J. of Econ.* 25, no. 1 (Spring 1994).

Gron, A. "Evidence of Capacity Constraints in Insurance Markets." *J. of Law and Econ.* 37, no. 2 (October 1994): 110-127.

Gron, A., and A. Winton. "Risk Overhang and Market Behavior." *J. of Business* 74, no. 4 (2001): 591-612.

Grossman, J. M., and P. B. Ginsburg. "As the Health Insurance Underwriting Cycle Turns: What Next?" *Health Affairs* 23, no. 6 (November/December 2004): 91-102.

Hartwig, R. P. "The Insurance Cycle, Financial Crisis and Catastrophes: Impacts and Implications for the Texas P/C Insurance Markets." Insurance Information Institute Presentation. Insurance Council of Texas Annual Symposium. Austin, TX. July 23, 2009. Available at www.iii.org/presentations/ICT-TX072309.

Kipp, R., Cookson, J. P., and Mattie, L. L. "Health Insurance Underwriting Cycle Effect on Health Plan Premiums and Profitability. Milliman, USA: April 10, 2003.

Myers, S. C., and R.A. Cohen. "A Discounted Flow Approach to Property-Liability Insurance Rate Regulation." In *Fair Rate of Return in Property-Liability Insurance*, ed. J.D. Cummins and S.E. Harrington. Boston: Kluwer-Nijhoff Publishing, 1987: 55-78.

Myers, S. C., and N. S. Majluf. "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have." *J. of Financial Econ.* 13 (1984): 187-221.

Rosenblatt, A. "Perspective: The Underwriting Cycle: The Rule of Six." *Health Affairs* 23, no. 6 (November/December 2004): 103-106.

Stewart, B. D. "Profit Cycles in Property-Liability Insurance." In Vol. 1, *Issues in Insurance.* Ed. J. D. Long and E. D. Randall. 3rd ed. Malvern, PA: American Institute for Property and Liability Underwriters, 1984.

Winter, R. "The Liability Crisis and the Dynamics of Competitive Insurance Markets." *Yale J. on Regulation* 5 (1988): 455-499.

Winter, R. "The Dynamics of Competitive Insurance Markets." *J. of Financial Intermediation* 3 (1994): 379-415.