Tort Liability, Insurance Rates, and the Insurance Cycle*

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Abstract

I provide an overview of volatility in premiums, coverage availability, and insurers' reported profits in U.S. commercial general liability insurance in the context of expanding tort liability. I first describe the "perfect markets model" of insurance prices and premium rates. I next summarize fluctuations in general liability insurance premiums, reported profits, and coverage availability during the past two decades and discuss whether the perfect markets model can largely explain those fluctuations. I then summarize other factors that may affect insurance market volatility and provide new evidence concerning one alternative: the possibility that aberrant pricing by some firms aggravates soft markets and, by implication, the severity of subsequent hard markets. I conclude with brief discussion of policy implications and areas for future research.

I. Introduction

Markets for many types of property/casualty insurance exhibit soft market periods, where premium rates are stable or falling and coverage is readily available, and subsequent hard market periods, where premium rates and insurers' reported profits significantly increase and less coverage is available. Conventional wisdom among practitioners and other observers is that soft and hard markets occur in a regular "underwriting cycle." Like price fluctuations in equity markets, fluctuations in insurance premium rates and coverage availability are difficult to explain fully by standard economic models that assume rational agents and few market frictions.

The mid-1980s "liability insurance crisis" remains the most infamous hard market in the United States. The dramatic increases in commercial liability insurance premiums and reductions in coverage availability for some sectors received enormous attention and motivated extensive research on those specific problems and on fluctuations in insurance prices and coverage availability more generally. Large catastrophe losses in the United States during the late 1980s and early 1990s spurred further interest in and research on the dynamics of reinsurance and

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primary insurance market pricing following large, industrywide losses. The hard market for commercial property/casualty insurance that began in late 2000 and accelerated following the destruction of the World Trade Center in September 2001 has focused renewed attention on markets for commercial property, medical liability, general liability, and workers' compensation insurance. With respect to general liability and medical liability insurance, substantial debate has arisen concerning the causes of rate increases and reductions in coverage availability and attendant implications for policy, such as tort reform to reduce the expected value and uncertainty of liability insurance claim costs, or additional regulation of insurers to help control allegedly imprudent underwriting and investment.

This paper provides an overview of volatility in premiums, coverage availability, and insurers' reported profits in U.S. commercial general liability insurance and of its broad relation to the U.S. tort liability system.[1] I begin with a synopsis of the "perfect markets model" of insurance prices (sometimes called the arbitrage model) and its implications for commercial liability insurance. I next describe fluctuations in U.S. general liability insurance premiums, coverage availability, and reported profits during the past two decades and whether the perfect markets model is consistent with that evidence. I then summarize other factors that may affect insurance market volatility and provide some new evidence concerning one alternative: that aberrant pricing by some firms contributes to aggravates soft markets and, by implication, the severity of subsequent hard markets. I conclude with a brief summary of policy implications and areas for future research.

II. Competitive Insurance Premiums with Frictionless Capital Markets

With rational insurers and policyholders, competitive insurance markets, and frictionless capital markets, insurance premiums will equal the risk-adjusted discounted value of expected

[1] Parts of this discussion draw from Harrington and Niehaus (2001) and Harrington and Danzon (2001). I addressed many similar issues in my 1988 Brookings paper on the liability insurance crisis (also see Harrington and Litan, 1988).

cash outflows for claims, sales expenses, income taxes, and any other costs, including the tax and agency costs of capital. Premium rate levels and rate changes will coincide with levels and changes in discounted expected costs. Because claim payout patterns for claims incurred in a given year, non-claim expenses, and capital costs should be comparatively stable over time, rate changes will primarily reflect changes in expected (forecast) claim and claim settlement costs and changes in interest rates.

In this "perfect markets" framework, long-run rate levels and short-run changes in general liability insurance premium rates will thus reflect levels and changes in:

1. Expected claim costs (incurred losses) and claim settlement costs;
2. The timing of future claim payments for incurred losses;
3. Interest rates used to discount expected future claim and claim settlement costs;
4. Underwriting expenses (commissions, wages to underwriters, policy issue costs, premium taxes, and so on);
5. Uncertainty about the frequency and severity of claims, including uncertainty about the form and parameters of the relevant probability distributions, which in turn affects the amount of capital that insurers need to hold to achieve low probabilities of insolvency; and
6. The cost of holding capital, including tax and agency costs and any systematic risk that increases shareholders' required returns.

With competitive supply and frictionless capital markets, intertemporal variation in premium rates will be determined by changes in discounted expected costs, and variation in the margin between premiums and discounted reported claim costs (a common construct for the "price" of coverage) will primarily reflect unexpected changes in claim costs. That margin should not be cyclical. Variation in underwriting profits exclusive of investment income should be related to changes in interest rates and should not be cyclical absent accounting and reporting anomalies. Changes in coverage availability should be caused primarily by adverse selection, which may cause low-risk policyholders to reduce their policy limits and cause some coverage to be completely unavailable.

Broad evidence indicates that the modern expansion of tort liability has produced long-run growth in expected claim costs, episodes of rapid short-run cost growth, relatively large claims settlement costs (e.g., for defense), and substantial uncertainty about the frequency and severity of claims (see below). The long claims tail for general liability insurance increases the risk of large errors in forecasting claim costs and aggravates adverse selection. It also makes premiums more sensitive to changes in interest rates. Rapid growth in expected claim costs in conjunction with increased uncertainty about costs and declining interest rates can therefore produce particularly sharp increases in premium rates, and it may be accompanied by increased adverse selection and attendant reductions in policy limits and coverage availability. A key question, however, is whether changes in premium rates and coverage availability are largely explained by these factors, as opposed to other short-run influences that could materially increase insurance market volatility.

III. Premiums and Underwriting Results in U.S. General Liability Insurance

Figure 1 plots percent growth in net (after reinsurance) premiums written for U.S. general liability insurance (including separately reported product liability insurance) during 1982-2002.[2] It also shows percent growth in consolidated property/casualty insurance reported surplus (net worth according to regulatory accounting principles) for that period. Dramatic premium growth during the mid 1980s was followed by a dozen years of relatively stable premiums. Moderate premium growth in 2000 and 2001 was followed by substantial premium growth in 2002.

Substantial premium growth continued through the first quarter of 2003 but has since shown some signs of abatement. Figure 2 shows the distribution of average premium increases by quarter from the third quarter of 2001 through the third quarter of 2003 as reported by large agents and brokers in surveys conducted by the Council of Insurance Agents and Brokers (CIAB). The specific survey questions underlying Figure 2 commenced with the CIAB's survey for the third quarter of 2001. That quarter included the events of September 11, which are expected to produce at least $10 billion of general liability claims and $40-$50 billion in claims overall. Earlier CIAB surveys (in a different format) indicate that general liability insurance rates began to harden toward the end of 2000.

Declining insurer profits in the early 1980s and a decline in industry surplus during 1984 preceded the sharp general liability premium increases of 1985-1987. Substantial surplus growth, including the effects of substantial flows of new capital, accompanied the premium rate increases and increases in reported profits. Material surplus growth continued annually through 1998. Surplus growth was negligible in 1999. Surplus then declined each year through 2002 in conjunction with deteriorating underwriting profits, shrinking investment income (interest and dividends), and declines in the value of insurers' equity holdings. Reported results through the first half of 2003 indicate material surplus growth with improved underwriting profits and some inflow of new capital. The surplus growth shown in Figure 1 does not include the effects of billions of dollars of new capital invested in offshore reinsurance entities to back reinsurance on U.S. property/casualty risks in late 2001 and 2002.

Figure 3 plots consolidated general liability insurance before-tax underwriting and operating profit margins profit margins during 1982-2002. The underwriting margins equal earned premiums less underwriting expenses (on a approximate GAAP basis) less incurred losses (and loss adjustment expenses) as a percent of earned premiums. Reported incurred losses are on a "calendar-year" basis: they equal "accident-year" losses (incurred losses including incurred but not reported losses for events during the year) plus revisions in reported incurred losses for all prior years. The operating margins equal the underwriting margins plus the ratio of net investment income (interest and dividends) plus realized capital gains or losses to earned premiums. The operating and underwriting margins are highly correlated. Operating margins

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[2] All general liability insurance results reported in this paper include separately reported products liability coverage unless otherwise indicated.

were negative during 1982-1986, 1992-1995, and 2001-2002. As I elaborate later, the negative operating margins during 1992-1995 were caused primarily by increased reserves for losses that occurred 10 or more years prior to the report year (e.g., for asbestos and environmental claims for old policies). In contrast to the early 1980s and 2001-2002, those negative margins were not accompanied by sharp increases in premiums.

Figure 4 plots reported general liability insurance incurred losses (including "allocated" claim settlement expenses for defense costs and cost containment) on an accident-year basis during 1982-2002. Two series are shown: (1) losses "initially reported" at the end of the year for events during year t, and (2) losses "developed" through year t+9 or 2001 if sooner, which reflect subsequent revisions to loss estimates for year t.[3] Large premium increases during the mid 1980s were accompanied by sharp increases in initially-reported accident-year losses, as I and others have emphasized in post mortems on the crisis (e.g., Harrington, 1988; Harrington and Litan, 1988). Following those increases, initially reported losses were relatively stable through 2000 and then jumped in 2001 in conjunction with significant premium increases. Developed losses significant exceed initially reported losses for years 1982-1985. However, for 1986 through the mid 1990s, developed losses are less than initially reported losses – forecast revisions in accident-year losses have been downward – with particularly large downward revisions for 1986-1988.

Figure 5 plots three series for 1982-2002: (1) earned premiums less underwriting expenses (including an estimate of non-allocated claim settlement expenses), (2) discounted initially reported accident-year losses, and (3) discounted developed losses. Discounted losses are

[3] Because the data source used, *Best's Aggregates & Averages*, ceased reporting Schedule P information by line of business in the 2003 edition, I did not yet have access to data on accident-year losses for general liability insurance in 2002. The figures that show values for 2002 include estimates assuming that the ratio of accident year to calendar year losses was the same in 2002 as in 2001. Those estimates are indicated with a different data point marker in the figures.

calculated using the cumulative claim payment pattern for general liability insurance for 1992 accidents and spot rates for U.S. Treasury securities.[4]

The margin between premiums and underwriting expenses should correspond fairly closely to the policies that produced losses each year. According to the perfect markets model, that margin should equal discounted expected claim costs and the tax and agency cost of capital. The large gap during 1987-1988 between premium margins and discounted losses would presumably require (1) a significant increase in risk and the amount of capital needed to support the sale of coverage, (2) a significant increase in the tax or agency costs of capital, and/or (3) unexpectedly favorably claim cost realizations for those years following the large increase in discounted initial losses and associated premium increases during 1985-1986.

Figure 6 highlights the difference between the premium-expense margins and discounted losses over time by plotting operating profit margins based on discounted losses. Discounted operating margins based on initially reported losses declined during the early 1980s, increased significantly during 1985-1987, and then declined over the next six years. The discounted operating margin ultimately became negative in 2001. The operating margins based on discounted developed losses were substantially negative during 1982-1985 with particularly large losses during 1883-1984, immediately prior to the mid 1980s premium increases. The operating margins based on discounted developed losses were large and positive in conjunction with those premium increases, peaking at about 35 percent in 1987 and declining thereafter except for year 2000.

Figures 5 and 6 highlight the question of whether changes in costs can plausibly explain most of the changes in premiums. A number of studies of the mid-1980s general liability experience argued or provided evidence that premium growth and availability problems in the

[4] I assume a 12-year payout period with payments made mid-year and that remaining unpaid losses as a proportion of incurred losses after 9 years are paid equally over the next three years. Constant maturity U.S. Treasury yields are reported for 1, 2, 3, 5, 7, and 10-year maturities. I used linear interpolation to generate spot rates for years 4, 6, 8, and 9.

1980s were caused largely by rapid growth in claim cost forecasts, reductions in interest rates (which increased the present value of predicted claim costs), and increases in the uncertainty of future liability claim costs associated with changes in the tort liability system (e.g., Tort Policy Working Group, 1986, Clarke, et al. 1988; Harrington, 1988; Harrington and Litan, 1988; also see Cummins and Danzon, 1997). A number of studies stressed that increased uncertainty associated with tort rules and jury awards increased the amount of capital needed to back coverage and therefore the cost of capital (e.g., Doherty and Garven, 1986, Clarke, et al., 1988; Winter, 1988). Cummins and McDonald (1991) document increased variance in liability insurance claim cost distributions during the early 1980s. Other research argued that increased uncertainty is likely to have increased adverse selection and that the introduction of claims-made coverage and the exclusion of pollution claims in basic liability coverage were efficient methods of separating low-risk and high-risk buyers (Priest, 1987; also see Trebilcock, 1987). In addition, the Tax Reform Act of 1986 likely increased premiums further by increasing insurers' expected taxes (see Bradford and Logue, 1996).

IV. Is the Evidence Broadly Consistent with the Perfect Markets Model?

The view that changes in general liability insurance premium rates are primarily caused by changes in discounted costs has to confront two challenges. First, some observers conclude that the large and abrupt premium increases in the mid 1980s and the larger growth in premiums compared to discounted losses, especially developed losses, cannot plausibly be explained by competitive product markets with frictionless capital. Second, the perfect markets model is not readily reconciled with evidence that underwriting and operating profits for general liability insurance and other lines of business appear cyclical (exhibiting patterns like those shown in Figure 3).

Cycles in Reported Underwriting Results

Studies using data prior to the mid 1980s provide statistical evidence that all-lines loss ratios and reported underwriting profit margins (e.g., one minus the combined ratio) exhibit second-order autoregression that implies a cyclical period of about six years (see Venezian, 1985; Cummins and Outreville, 1987; and Doherty and Kang, 1988). Other studies document cyclical underwriting results in a number of other countries (Cummins and Outreville, 1987; Lamm-Tennant and Weiss, 1997; Chen, Wong, and Lee, 1999). Underwriting results remain cyclical after controlling for the expected effects of changes in interest rates (Smith, 1989; Harrington and Niehaus, 2001); i.e., operating profits including investment income are also cyclical.[5]

Whether empirical regularities in reported underwriting results could largely or exclusively be caused by financial reporting procedures, reserve reporting bias, and/or regulation-induced lags in rate changes is uncertain. Cummins and Outreville (1987) show how accounting and regulatory lags might generate a cycle in reported underwriting margins without either excessive price-cutting during soft markets or sharp reductions in supply during hard markets. They note, however, that regulatory lag and financial reporting procedures are unlikely to explain premium changes in commercial liability insurance in the early to mid-1980s.[6] The small number of annual observations available to analyze underwriting results and changes in the mix of business sold and regulatory environment during the past 50 years make it difficult to draw firm conclusions from studies using aggregate data. The results that imply a regular cycle could be spurious and/or reflect data snooping. Even so, the evidence of second order autoregression is not readily reconciled with the perfect markets model.

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[5] Several studies have considered the short and long-run relation between underwriting margins, interest rates, and other macroeconomic variables using cointegration analysis and error correction models (e.g., Haley, 1993; Grace and Hotchkiss, 1995). Yu and Harrington (2003) question whether underwriting margins are actually nonstationary (also see Choi, Hardigree, and Thistle, 2002).

[6] Analogous to Cummins and Outreville, Doherty and Kang (1988) argue that cyclical patterns in underwriting results reflect slow but presumably rational adjustment of premiums to changes in expected claim costs and interest rates, but they do not consider the causes adjustment lags.

The Forecast Error Problem

The unobservability of insurers' claim cost forecasts at the time policies are priced and the possibility of large but rational forecast errors impede sharp conclusions about the explanatory power of the perfect markets model. Uncertainty concerning the frequency and severity of injuries, tort rules, and jury awards impedes accurate forecasting, especially when many claims for events in the year of coverage may not be paid for a decade or longer. Figure 7 illustrates the length of the claims tails for occurrence and claims-made general liability losses arising from injuries in 1992. For occurrence coverage, a third of estimated ultimate costs (valued as of 2001) had not been paid by year-end 1996. For claims made coverage, less than 20 percent of estimated multiple costs were unpaid at that time. The shorter claims tail for claims-made coverage reduces forecast error risk, which is a major reason for the growth in that form of coverage since the mid 1980s (see Figure 8). Figure 7 also shows that a large proportion of initially reported losses represented estimated costs for claims predicted to have occurred but that had not yet been reported to insurers and for bulk reserves (insurers' forecast of how case reserves in the claim files are likely to develop). IBNR and bulk reserves for occurrence coverage represented over 40 percent of incurred losses in 1994, two years after the end of the 1992 accident year. Both forms of reserves are subject to large forecast errors.

The possibility of large forecast errors, management of reported losses and thus earnings, and accounting conventions that focus on calendar-year rather than accident-year losses all make it difficult to evaluate the relation between premium growth and loss growth. Figure 9 highlights some of the issues for general liability insurance during 1989-2001. It shows (1) initially reported accident-year loss ratios (to earned premiums), (2) calendar-year loss ratios, where calendar-year losses equal accident-year losses plus the change during the year in loss estimates for losses in all prior years, and (3) calendar-year loss ratios only including changes in estimated losses for the preceding nine accident years (year t-9 through t-1). The calendar-year loss ratios provide the basis for reported income and earnings per share in insurers' financial statements. They are higher than the accident-year loss ratios in all but one year during 1989-2001. The high calendar-year loss ratios in the early to mid-1990s were caused exclusively by adverse development of losses for events that occurred 10 or more years earlier. When the revisions of those old loss estimates are excluded, the calendar-year loss ratios were below accident-year losses during 1989-2000, indicating favorable reserve development on losses for years t-9 through t-1, which increased reported income. Consistent with the perfect markets model (and perhaps with incentives to strengthen reserves on old policies when current policies are generating reasonable results), the high calendar year-loss ratios during the mid 1980s did not lead to premium increases.

Cost Growth and Interest Rate Declines

When evaluating the perfect market model's explanatory power, it is necessary to keep in mind that rapid general liability insurance premium growth in the mid-1980s and 2001-2002 was accompanied in both instances by substantial reductions in interest rates, which would amplify the effects on premium rates of growth in expected claim costs. Figure 10 plots the U.S. Treasury term structure (average annual constant maturity rates) for four years: 1984, 1986, 2000, and 2002. Interest rates declined sharply between 1984 and 1986, significantly increasing the present value of insurers' claim cost estimates between 1984 and 1986. Interest rates again fell significantly between 2000 and 2002, increasing the present value of claim cost estimated between those two years.

Holding other factors that affect discounted expected costs constant, Figure 11 plots two-year premium growth rates implied by the perfect markets model for 1984-1986 and 2000-2002 versus hypothetical two-year growth in discounted expected claim costs (using the 1992 accident-year payout factors employed earlier). The 1984-1986 interest rate declines and 40 percent growth in expected claim costs over the two years would produce a 65 percent growth in premiums, other factors held constant. For 2000-2002, 40 percent growth in expected claim costs

(3 percent less than my crude estimate of initially reported accident-year loss growth) would produce 53 percent premium growth. Actual general liability net earned premiums grew by 33 percent during that period; net written premiums grew by 55 percent. Unless reported losses are biased substantially upward, these simple calculations imply that cost growth and interest rate declines may account for the bulk of premium growth during the current hard market.[7]

V. Other Explanations

I now turn to other explanations of volatility in premium rates and coverage availability: (1) costly external finance and capacity constraints, (2) asymmetric information, (3) market power, and (4) irrational insurer behavior with possible aberrant players.

Costly External Finance and Capacity Constraints

The 1980s liability insurance crisis motivated substantial research on the possible effects of shocks to insurer capital on prices and coverage availability. One major development was the capacity constraint model, which posits that (1) industry supply depends on the amount of insurer capital, and (2) industry supply shifts backwards and is sharply upward sloping following large negative shocks to capital due to the greater costs of raising external capital compared with internal capital. The main implication, at least of the original models, is that large, negative shocks to capital (e.g., from catastrophes or unexpected changes in liability claim costs) produce short-run increases in prices and premium rates beyond the levels implied by the perfect markets model, thus materially aggravating hard markets.[8] If insurers could freely restore capital to its pre-shock level (or any new desired level), prices (premium-cost margins) would not increase, and premium rates would increase commensurately with revisions in the discounted expected value of claim costs for new and renewal business. But because the cost of obtaining capital increases following the shock, the post-shock short-run supply curve shifts backwards, increasing

[7] I made the same point in my 1988 paper. Whether subsequent downward revisions in reported losses for the mid-1980s indicated ex ante bias in initially reported loss estimates is an open question.
[8] Similar effects are highlighted in the macro-finance literature (e.g., Greenwald and Stiglitz, 1993).

prices and premium rates. The price increases in turn help insurers to replenish capital through retained earnings, which, along with issues of new capital, gradually eliminates the effects of the shock on supply.

Winter (1988, 1991a, 1994) and Gron (1989, 1994a) developed the basic capacity constraint model, assuming respectively that insurers were constrained to have zero insolvency risk or meet a regulatory constraint mandating a low probability of insolvency.[9] Cummins and Danzon (1997), Cagle and Harrington (1995), and Doherty and Garven (1995) extend the basic model on several dimensions. The cost differential between internal and external funds is generally attributed to floatation costs and the standard "lemons" problem associated with seasoned equity offerings (e.g., Myers and Majluf, 1984). Cummins and Danzon (1997) also stress the overhang problem that arises because new equity issues increase the value of existing policyholders' claims (as in Myers, 1977; also see Gron and Winton, 2001, discussed below).

Existing capacity constraint models are somewhat opaque about price levels in soft markets. Gron (1994a), for example, implies that soft market prices are equal to those implied by the perfect markets model. Winter (1988, 1994) stresses that soft markets persist when shocks are favorable and that soft markets are characterized by excess capital compared with the perfect markets model, because of both the costs of paying out capital and the desire to accumulate capital that will become valuable during a hard market.

The capacity constraint models generally imply that large shocks in liability insurance claim costs can produce correspondingly large increases in premium rates above and beyond increases implied by the perfect markets model. When demand is sensitive to insolvency risk, Cagle and Harrington (1995) show that any hard market price increase will be lower than when demand is

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[9] Winter (1991b) extends the basic capacity constraint story by examining the possible effect of regulation that restricts an insurer's premium-to-surplus ratio to be below a certain level. This regulatory constraint can further exacerbate the reduction in short-run supply following a shock.

risk insensitive. Cummins and Danzon (1997) stress that prices need not increase and could decrease if demand is sufficiently risk sensitive.

Winter emphasizes that uncertainty associated with the tort liability system and the long claims tail for liability insurance can aggravate price and coverage changes during hard markets. Using the framework of Froot, Scharfstein, and Stein (1993) and Froot and Scharfstein (1998), Gron and Winton (2001) explain how "overhang" associated with claim liabilities for long-tailed policies sold in prior years can reduce the supply of coverage when capacity (net worth) is low as result of likely positive correlation between claim costs on old and new policies. The effect will be worse for long-tailed liability lines given the greater amount of "old" liabilities and greater correlation between costs of old and new liabilities compared with short-tailed lines.

The capacity constraint model has a number of policy implications. First, because rate increases in hard markets are competitively determined, rate regulation to hold down rate increases would discourage necessary capacity adjustments and aggravate availability problems. Second, any factors that increase the costs of raising new capital or entry of new firms will make rate changes more volatile. Third, uncertainty associated with claim costs in general and tort liability claims in particular will increase insurers' vulnerability to shocks and increase volatility.

Empirical evidence on the capacity constraint model is inconclusive. Winter (1994) calculates a U.S. all-lines "economic loss ratio" for year t as the present value of calendar-year incurred losses in year t divided by premiums in year t. Consistent with the prediction that higher prices (lower expected loss ratios) occur when capital is low, he finds that the economic loss ratio is negatively related to the lagged value of insurer capital (measured as the deviation from its average value in the previous five years) during the period 1948-1980. However, during the 1980s period that motivated the development of the capacity constraint model, however, he finds that the economic loss ratio is positively related to capital, due in large part to experience during the early 1980s. Winter argues that the 1980s can be explained in part by the omission of international reinsurance capacity in the capital variables (also see Berger, Cummins and Tennyson, 1992).

Gron (1994b) finds that one minus the loss ratio is negatively related to changes in aggregate property/casualty insurer capacity for auto liability, auto physical damage, and homeowners' coverage using annual aggregate data for stock insurers during 1952-1986. However, the relation is positive for general liability insurance, again in contrast to the principal prediction of the basic capacity constraint model. Using panel data during 1980-1988 for 45 insurers that had at least a 0.5 percent share of the general liability insurance market, Cummins and Danzon (1997) find that ratios of the all-lines margin between net premiums and underwriting expenses and dividends to the discounted value of reported accident-year losses (their measures of price), were positively related to loss shocks, again in contrast to the basic capacity constraint model's prediction. Cummins and Danzon (1997) also conclude that the mid-1980s premium increases were largely due to changes in expected costs, not capacity constraints.

Gron (1994a) finds that the difference between all-lines premiums and underwriting expenses and the ratio of premiums to underwriting expenses and changes in those measures are negatively related to lagged values of capacity during 1949-1990. She also finds that her price measures increase following negative capital growth but that the price measures do not decline significantly following positive capital growth, suggesting a different relation is soft and hard markets. Higgins and Thistle (2000) find that all-lines underwriting profit margins during 1933-1993 are cyclical only during periods of constrained capacity. They also find that underwriting profit margins were unrelated to capacity during 1983-1988 even though cyclical during 1968-1991. On the other hand and consistent with the basic capacity constraint model, Choi, Hardigree, and Thistle (2002) find that all-lines economic loss ratios for stock insurers during 1935-1997 are negatively related to capacity (and negatively related to loss ratio conditional volatility, implying that increases in risk increased prices).

In related work, Froot and O'Connell (1997a,b) analyze the relation over time between catastrophe reinsurance premiums and simulated values of expected claim costs parameterized using historical data on U.S. catastrophe losses to provide evidence of whether costly external finance aggravates reinsurance rate changes following large catastrophe losses. They argue (1997a) that changes in expected claim costs ("probability updating") following loss shocks should primarily occur for hazards (e.g., hurricane or earthquake) and regions that are closely related to prior loss shocks. They present evidence that reinsurance rate increases following large catastrophe losses during the early 1990s were broader than implied by revisions in expected claim costs, thus providing indirect evidence that loss shocks reduced capacity with an attendant effect on rates.

Asymmetric Information

Priest (1987, 1991) argues that asymmetric information about liability insurance policyholders' risks of loss can aggravate average premium increases and coverage declines during hard markets – as low risk policyholders reduce their coverage limits and drop coverage – and that coverage may become completely unavailable for some risks as the market for coverage unravels due to adverse selection. He emphasizes that changes in and uncertainty concerning tort liability rules are an underlying cause of these problems (also see Trebilcock, 1987).

Doherty and Posey (1997) develop a model where a different form of asymmetric information produces rationing of coverage. Their model builds on the notion that the risk of correlated losses generally should be shared between insurers and policyholders (Marshall, 1974, Doherty and Dionne, 1993). The optimal contract would pay all of policyholders' idiosyncratic losses, but it would divide losses that are economy-wide (such as the effects of unexpected growth in claim costs or catastrophes) ex post among policyholders. Price increases following correlated losses would produce such sharing indirectly. Doherty and Posey argue that stock insurers have an incentive to overstate the magnitude of correlated losses, making the ideal contract infeasible. They suggest that insurers can signal the amount of correlated losses incurred by selling less coverage at a higher price than would otherwise be optimal. Insurers forego profits through rationing, which credibly signals the magnitude of correlated losses. The main empirical predictions are that premium revenue falls following shocks and that revenue changes will be less for mutual insurers than for stock insurers, given that mutuals have less incentive to overstate correlated losses. Doherty and Posey provide evidence consistent with these predictions for U.S. general liability insurance revenue growth using panel data during 1980-1989.

Market Power

Some observers have questioned whether insurers may have market power due to the costs of new entry during hard markets and that prices increase further as a result (see, e.g., Froot and O'Connell, 1997b, discussing reinsurance following early 1990s catastrophe losses; also see Froot, 2001). Market power is difficult to reconcile with the fragmented structure of commercial general liability insurance markets and the apparent ease of entry for offshore reinsurers. If market power were expected during hard markets, prices would apparently need to be lower than implied by the perfect markets model during soft markets to produce a long-run equilibrium with normal returns on capital.

Some observers have questioned whether insurers' cooperative pricing activities in conjunction with the insurance industry's limited exemption from federal antitrust law might aggravate hard markets. The McCarran-Ferguson Act antitrust exemption applies to the extent that these activities are regulated by the states or unless boycott, coercion, and intimidation are involved. Most studies argue that collusive price increases cannot be reconciled with the industry's competitive structure, with the modern operation of advisory organizations, and with pricing discretion exercised by commercial lines underwriters (e.g., Clarke, et al., 1988; Winter, 1988; Harrington and Litan, 1988; Harrington, 1990; also see Danzon, 1992, and Gron, 1995). Moreover, cooperative ratemaking activities for commercial lines are likely to enhance economic efficiency rather than amplify cyclical fluctuations (see, e.g., Winter, 1988, 1994, and Harrington, 1990). If these activities reduce the likelihood of widespread underpricing in soft markets, they may reduce premium volatility.

Behavioral Influences and Aberrant Players

Capacity shocks should be largely unpredictable. Neither Winter's model nor other capacity constraint stories can readily explain second-order autoregression in profits. The traditional view of underwriting cycles by practitioners and industry analysts emphasizes fluctuations in capacity to write coverage as a result of changes in surplus and insurer expectations of profitability on new business (see Stewart, 1984; also see Berger, 1988). Supply expands when expectations of profits are favorable, but competition then drives prices down, allegedly until inevitable underwriting losses deplete surplus. Supply contracts in response to unfavorable profit expectations and to avert financial collapse. Price increases replenish surplus leading to another round of price-cutting, which ultimately becomes excessive. This explanation of supply contractions is roughly consistent with capacity constraint models, but the explanation of soft markets fails to explain how and why competition would cause rational insurers to cut prices to the point where premiums and anticipated investment income are insufficient to finance optimal forecasts of claim costs (and to ensure a low probability of insurer default).[10]

Why might soft markets culminate in rates that are inadequate ex ante? Winter's model implies that hard markets will be preceded by periods of excess capacity and soft prices, but the folklore about excessive price-cutting during soft markets seems to run deeper than that. One conjecture is that a tendency towards price inadequacy could arise from heterogeneous insurer expectations concerning future loss costs (McGee, 1986, and Harrington, 1988; also see the comments in Stewart, 1984), or from differences in insurers' incentives for safe and sound

[10] Similarly, popular explanations of "cash flow underwriting" usually imply that insurers are irrational in that they reduce rates too much in response to increases in interest rates.

operation (Harrington, 1988).[11] My 1994 paper with Patricia Danzon develops and tests hypotheses based on this intuition and the optimal bidding and moral hazard literatures in the context of alleged underpricing of general liability insurance during the early 1980s. We posited that some firms may have priced below cost because of moral hazard that results from limited liability and risk-insensitive guaranty programs. Other insurers may have priced below cost due to low loss forecasts relative to optimal forecasts, giving rise to winners' curse effects. We stressed that other firms could cut prices in response to such aberrant firms to preserve market share and avoid loss of quasi-rents from renewal business related to investments in tangible and intangible capital. As a result, relatively few aberrant firms could have a disproportionate impact on the market.

We used data from the early 1980s to test whether moral hazard and/or heterogeneous expectations contributed to differences in general liability insurance prices and premium growth rates among firms. Loss forecast revisions were used as a proxy for inadequate prices.[12] We found a positive relation between premium growth and loss forecast revisions and some evidence that appeared consistent with moral hazard.[13] An implication was that increased market or regulatory discipline against low priced insurers with high default risk would reduce price volatility. Since the late 1980s, solvency regulation has been strengthened (e.g., by the adoption of risk-based capital requirements), insurance rating agencies have increased the sophistication of

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[11] McGee (1986) speculated that insurers with optimistic loss forecasts may cause prices to fall below the level implied by industry average forecasts. Winter (1988, 1991a) mentions the possibility of heterogeneous information and winner's curse effects.

[12] We argued that loss forecast revisions will reflect moral hazard induced low prices assuming that low price firms understate initially reported loss forecasts to hide inadequate prices from regulators and other interested parties, but that forecasts are revised upwards as paid claims accumulate. In addition, if prices vary due to differences in loss forecasts at the time of sale, less-informed firms should revise forecasts upwards as information accumulates.

[13] Forecast revisions and premium growth were generally positively and significantly related to the amount of liabilities ceded to reinsurers, consistent with the moral hazard hypothesis that reinsurance was used to conceal low prices and excessive growth. We also found that mutual insurers generally had significantly lower forecast revisions and premium growth than stock insurers, consistent with mutuals being less prone to moral hazard.

their analyses, and there appears to have been increased concern among buyers with insurers' financial strength, thus improving market discipline and disincentives for inadequate rates.[14]

VI. Premium Growth and Loss Experience During the 1990s Soft Market

In this section I take another look at the relationship between insurers' premium growth and underwriting experience during a soft market using data at the insurance group level for general liability occurrence coverage (excluding separately reported products liability coverage) during 1992-2001. I provide evidence of whether abnormal premium growth during an accident year reliably predicts accident-year loss ratios by estimating the following descriptive regression model:

$$y_{jt} = b_0 + b_1 \Delta P_{jt} + b_2 P_{jt-1} + e_{jt} , \qquad (1)$$

where, for firm j and year t, y_{jt} is either the initially reported accident-year incurred loss ratio (ILR), the developed (through 12/01) accident-year loss ratio (DLR), or the difference between the developed and initially reported loss ratio (DLR – ILR), and ΔP_{jt} equals $P_{jt} - P_{jt-1}$, where P_{jt} is log net earned premiums.[15]

Equation (1) can be motivated by the notion that premium growth and realized loss ratios for a given accident year will both depend on a firm's unobservable average price of coverage (i.e., on the ratio of its premiums to the discounted value of rational forecasts of claims costs and other costs of providing coverage). If relatively high premium growth on average indicates a relatively low price, premium growth and realized loss ratios (or loss development) will be positively related ($b_1 > 0$).[16] If so, realized loss ratios should also be positively related to lagged (log) premiums ($b_2 > 0$) if larger firms on average have lower premium growth than smaller firms at a

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[14] My paper with Karen Epermanis provides evidence of significant premium declines for property/casualty insurers that experienced financial strength rating downgrades in the 1990s.

[15] ΔP_{jt} is thus the log premium (continuously compounded) growth rate during the year. The use of log growth diminishes positive skewness compared with percentage premium growth.

given price because of firm life cycle effects. Greater lagged premiums would then imply a lower price for a given ΔP_{jt}. A positive relation between realized loss ratios and lagged premiums also could arise if larger firms have higher expected loss ratios because, for example, they write large accounts with lower underwriting expense ratios, or achieve superior diversification and have commensurately lower capital and capital costs.

A second scenario is that some firms may grow rapidly while exploiting profitable opportunities arising from superior information and risk selection. That scenario would lead to a negative relation between premium growth and loss ratios ($b_1 < 0$). A third scenario is that some firms will shrink premiums in response to poor underwriting experience and that poor performance could persist temporarily, which would likewise lead to a negative relation between premium growth and loss ratios. An important implication is that a positive relation between realized loss ratios and premium growth is most likely for growing firms.

I estimate equation (1), including a vector of time dummy variables to allow for fixed year effects, using panel data for general liability coverage written on an occurrence basis during 1993-2000 and two subperiods: 1993-1996 and 1997-2000. The first subperiod is characterized by positive premium growth and (thus far) favorable reserve development (see, e.g., Figures 5 and 6 and Table 1). The soft market deepened during the latter period prior to the onset of the current hard market, with declining or negligibly growing earned premiums through 1999, increased concern with allegedly excess capacity and lack of underwriting discipline, and (thus far) unfavorable reserve development. The sample includes all insurance groups included in the 2001 NAIC Database with at least $5 million of net earned premiums in any accident-year during 1992-1999. The premium growth and loss ratio variables were Winsorized at the 0.01 and 0.99 values of the distributions for all insurers that had positive general liability insurance net earned premiums during that period.

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[16] If premium growth and loss ratios are each negatively related to unobservable prices, it is easy to show that ΔP_{jt} and the disturbance term in equation (1) will be negatively correlated. The least squares estimate

Table 1 contains descriptive statistics for premium growth and loss ratios for the overall sample period and the two subperiods. Premium growth and loss ratios vary substantially across insurers in each period. Premium growth averaged 4 percent during 1993-1996 and –1 percent during 1997-2000; developed loss ratios on average are lower (higher) than initially reported loss ratios for the former (latter) period. Developed loss ratios are more variable than initially reported loss ratios, as would be expected if initially reported loss ratios are (perhaps even biased) forecasts of ultimate loss ratios.

Table 2 shows least squares estimates of b_1 and b_2 in equation (1) and associated p-values (statistical significance levels) for the coefficients using standard errors that are robust to heteroskedasticity and within-firm correlation in the regression model disturbances. Estimates are shown for each sample period and for subgroups of observations with positive premium growth ($\Delta P_{jt} > 0$) and non-positive premium growth ($\Delta P_{jt} \leq 0$).[17] The coefficients from the difference in loss ratios (DLR – ILR) equations equal the differences in the coefficients for the DLR and ILR equations. The p-values indicate whether the differences in coefficients are statistically significant.

The results shown in Table 2 provide strong evidence of a positive relation between premium growth and developed loss ratios and loss ratio development (DLR – ILR) among firms with positive premium growth during the 1997-2000 soft market period. The positive coefficients on ΔP_{jt} are both economically and statistically significant for that period. For the overall 1993-2000 period, developed loss ratios and the differences between developed and initially reported loss ratios are also positively and significantly related to premium growth among firms with positive premium growth. For 1993-1996 and observations with positive premium growth, the coefficient on ΔP_{jt} equals –0.12 for the ILR equation and 0.12 for the DLR equation. Although

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of b_1 will therefore be biased *against* finding a positive relation between loss ratios and premium growth.

[17] Selection bias is not a significant issue given that the objective is to estimate parameters for the models conditional on positive or negative premium growth.

neither coefficient is statistically significant at conventional significance levels, their difference (0.24) is statistically significant. Relatively high premium growth was reliably associated with adverse loss development during that period as well.

In contrast to the results for observations where $\Delta P_{jt} > 0$, the coefficients on ΔP_{jt} are not significantly positive during any sample period when observations with non-positive premium growth are included in the samples alone or in combination with the observations with positive premium growth. A lack of a significant positive relation in these cases is plausibly attributable to shrinking premiums among some insurers in response to poor underwriting performance.

In summary, the results of these descriptive regressions imply that higher premium growth among firms with growing premiums was reliably associated with higher developed loss ratios (and loss development). It's not clear whether these results would be predicted by some variant of the capacity constraint model that allows for cross-firm heterogeneity. The results are consistent with the hypothesis that aberrant behavior by some firms could aggravate price cutting during soft markets, with low-priced firms capturing market share and ultimately experiencing relatively high loss ratios. A policy implication is that more intensive scrutiny of insurers with abnormally large premium growth by regulators and rating agencies might help deter any "excessive" price cutting in soft markets.

VII. Conclusion

There is little doubt that "much" of the volatility in insurance premium rates – whether for general liability insurance or other types of coverage – is attributable to variation in the discounted value of expected claim costs. Perhaps only a diehard believer in the perfect markets models would argue that "much" means "all" or "almost all." The capacity constraint model provides an intuitively plausible explanation of possible unexplained volatility, but tests of its predictions have produced mixed results, perhaps due to methodological and data problems. We know even less about whether and why insurance prices tend to fall too low during soft markets.

Additional empirical work might provide more evidence on whether costly external capital contributes to hard and soft markets. However, because rational forecasts of claim costs when policies are sold are unobservable, it will likely remain difficult to provide convincing evidence of the extent to which capital costs contribute to volatility in premiums and availability in comparison to changes in discounted expected costs. The relatively small number of usable time series observations and the potential for data snooping bias suggest the need for analyses that make creative use of cross-sectional and panel data. Additional theoretical work on capacity constraint models might further elaborate the relationship between costly external capital and capital structure decisions and pricing prior to any shock.

Despite what we don't know and the desire to know more, available theoretical and empirical research is informative with respect to the policy debate. In the long run and – at least to a large extent – in the short run, liability insurance premium rates track the discounted value of expected claim costs and the tax and agency costs of capital needed to back the sale of coverage. An expanding tort liability system that entails substantial uncertainty about the cost of future claims will inevitably lead to increasingly expensive coverage. The cases for the status quo, for further expansion of tort liability, or for contraction through tort "reform" hinge primarily on the deterrent effects of tort liability, not on whether the perfect markets model fully explains prices and availability.

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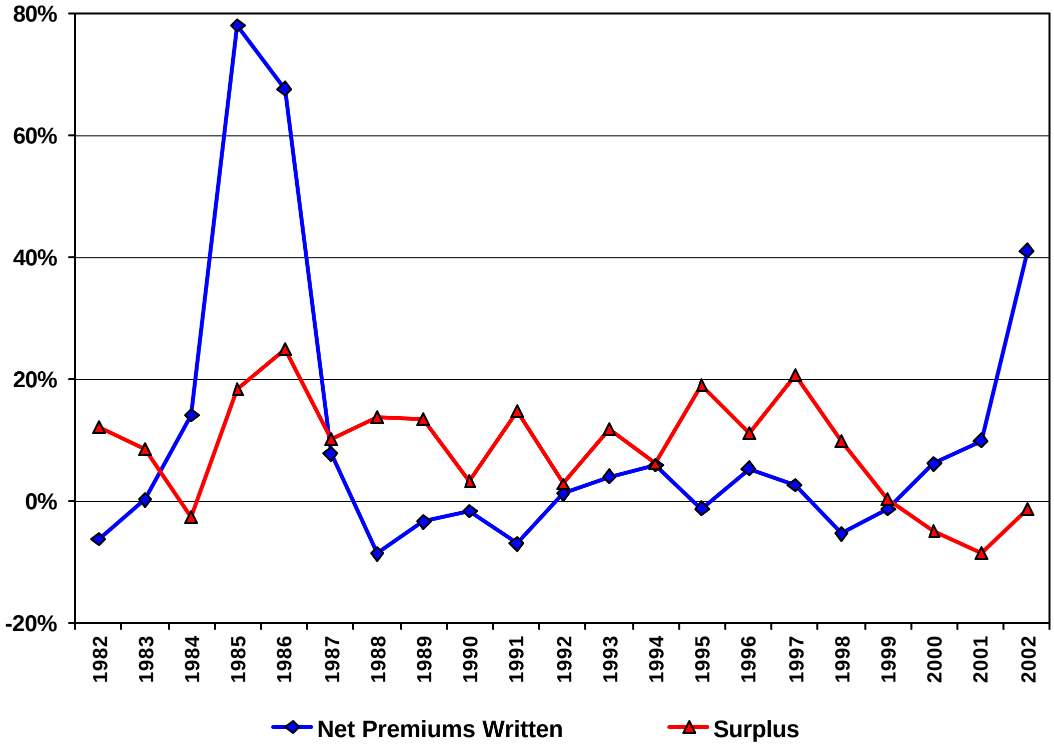
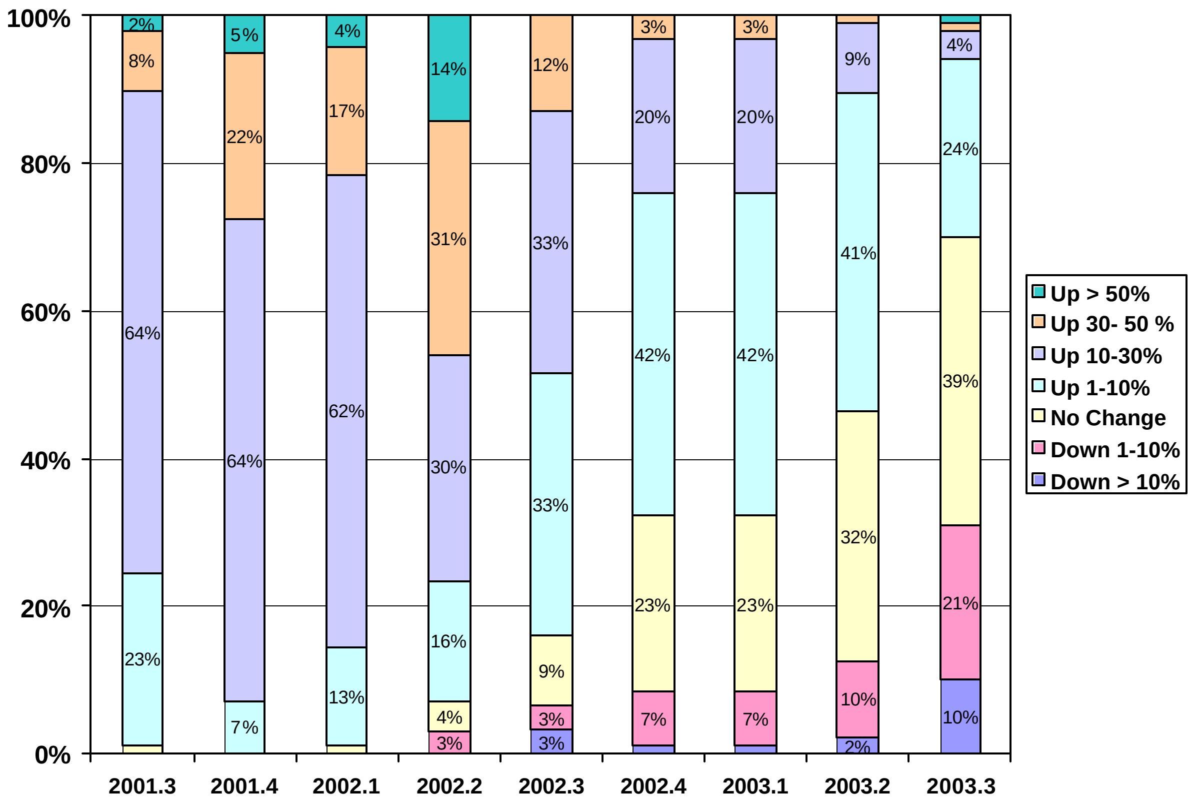
Figure 1
Growth in U.S. Property/Casualty Insurer Surplus and General Liability Insurance Net Premiums Written, 1982-2002



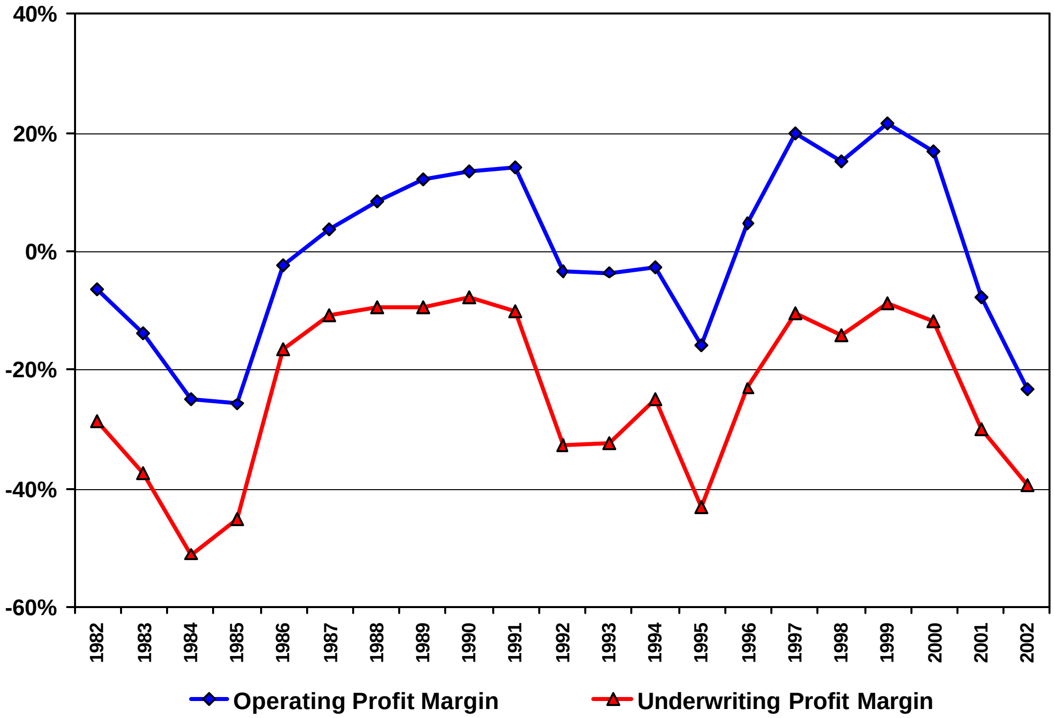
Source: Best's Aggregates & Averages, various editions.

Figure 2
General Liability Insurance Premium Increases,
Third Quarter 2001 – Third Quarter 2003



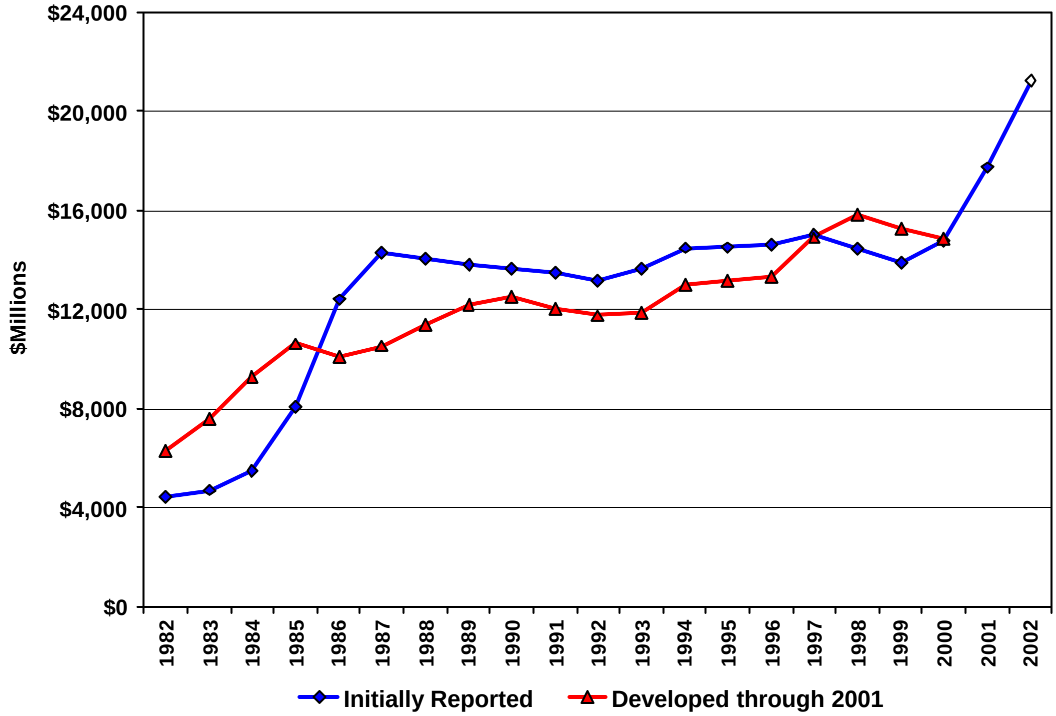
Source: Council of Insurance Agents and Brokers, quarterly surveys.

Figure 3
U.S. General Liability Insurance Before-Tax Operating and Underwriting Profit Margins, 1982-2002



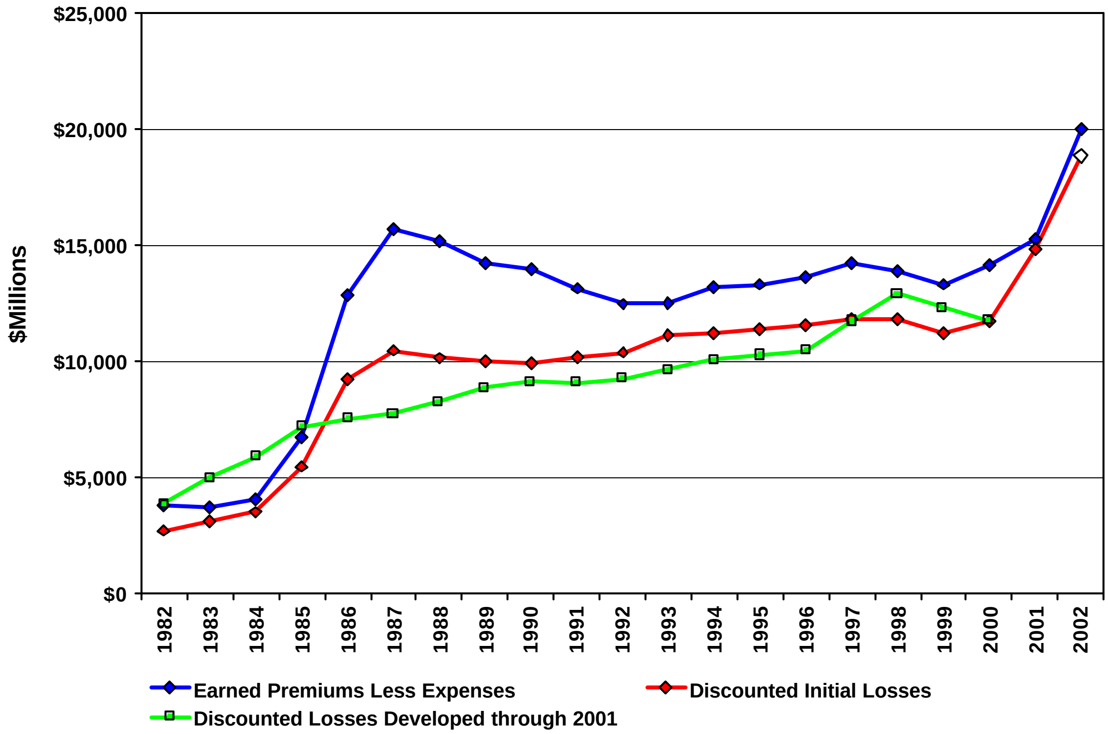
Source: Best's Aggregates & Averages, various editions.

Figure 4
U.S. General Liability Insurance Accident-Year Incurred Losses:
Initially Reported and Developed through 2001
(2002 estimated)



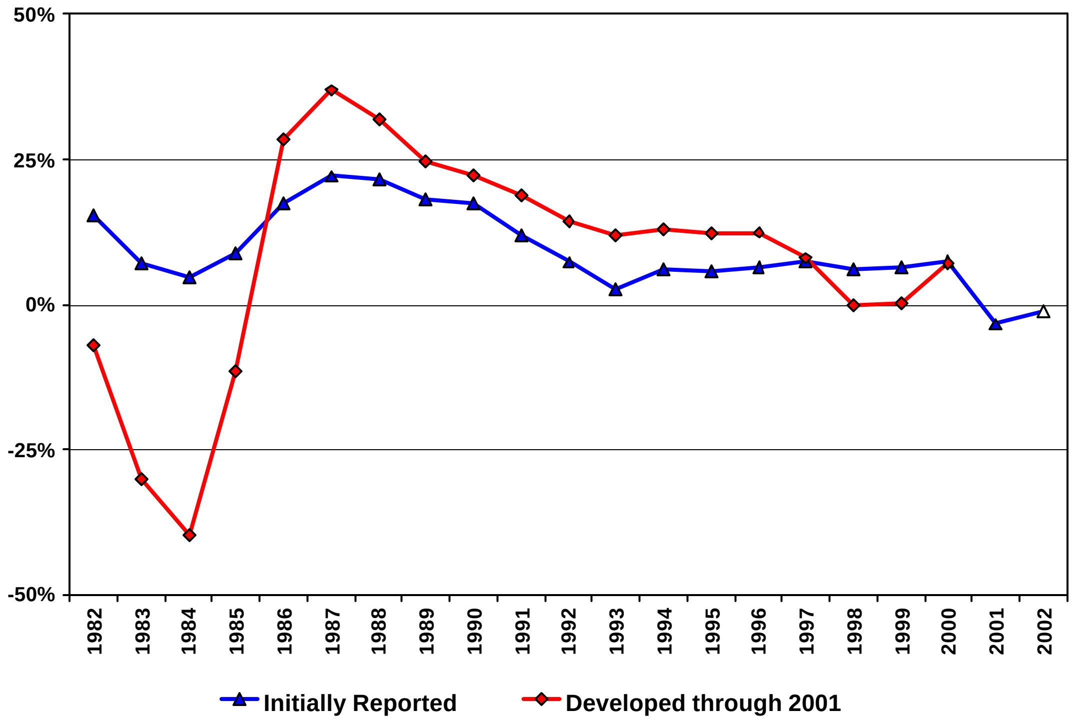
Source: Best's Aggregates & Averages, various editions.

Figure 5
U.S. General Liability Insurance Premium Margins and Estimated Discounted Accident-Year Incurred Losses, 1982-2002
(2002 estimated)



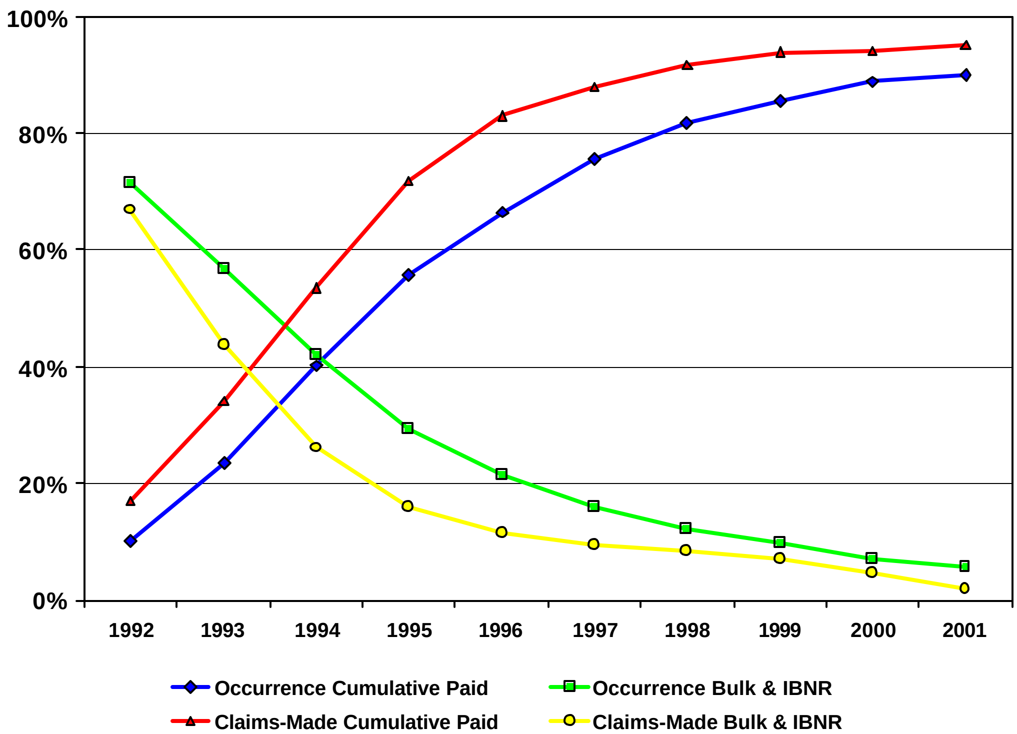
Source: Best's Aggregates & Averages, various editions, and Federal Reserve. Author's calculations.

Figure 6
U.S. General Liability Insurance Estimated Discounted Operating Margins:
Initially Reported and Developed (through 2001) Accident-Year Incurred Losses,
1982-2003 (2002 estimated)



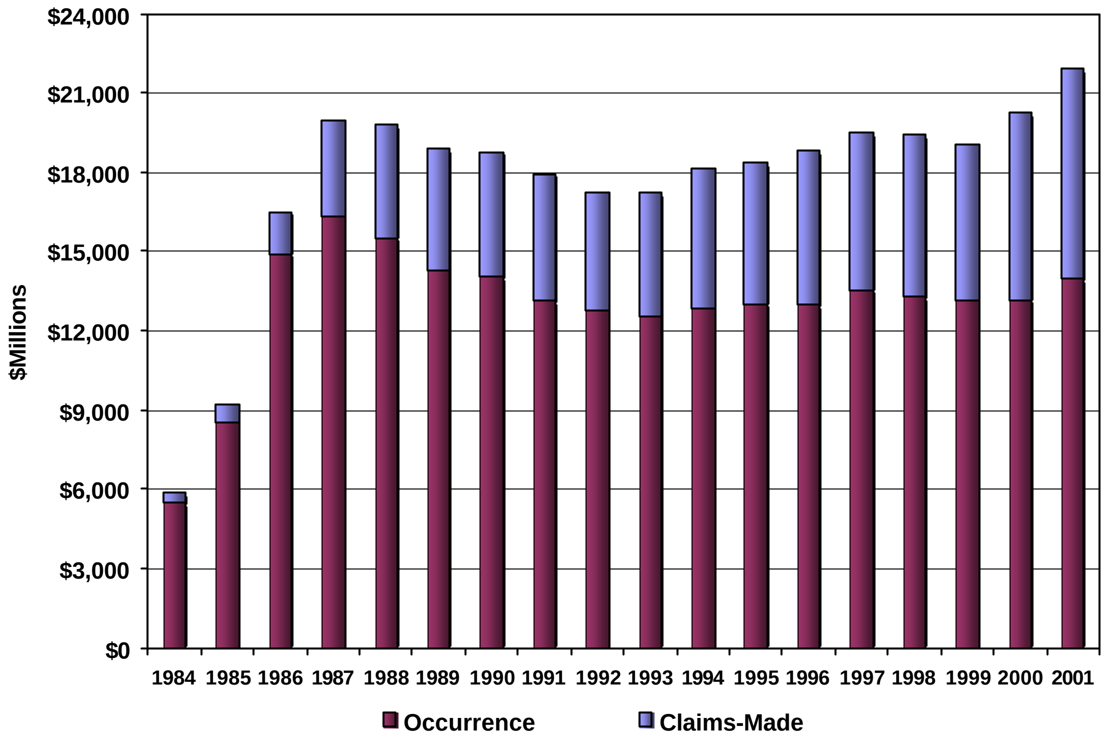
Source: Best's Aggregates & Averages, various editions, and Federal Reserve.
Author's calculations.

Figure 7
U.S. General Liability Insurance Cumulative Paid Claims and Bulk & IBNR Reserves as Proportions of Estimated Ultimate Incurred Losses for 1992 Accident Year:
Occurrence and Claims-Made Coverage



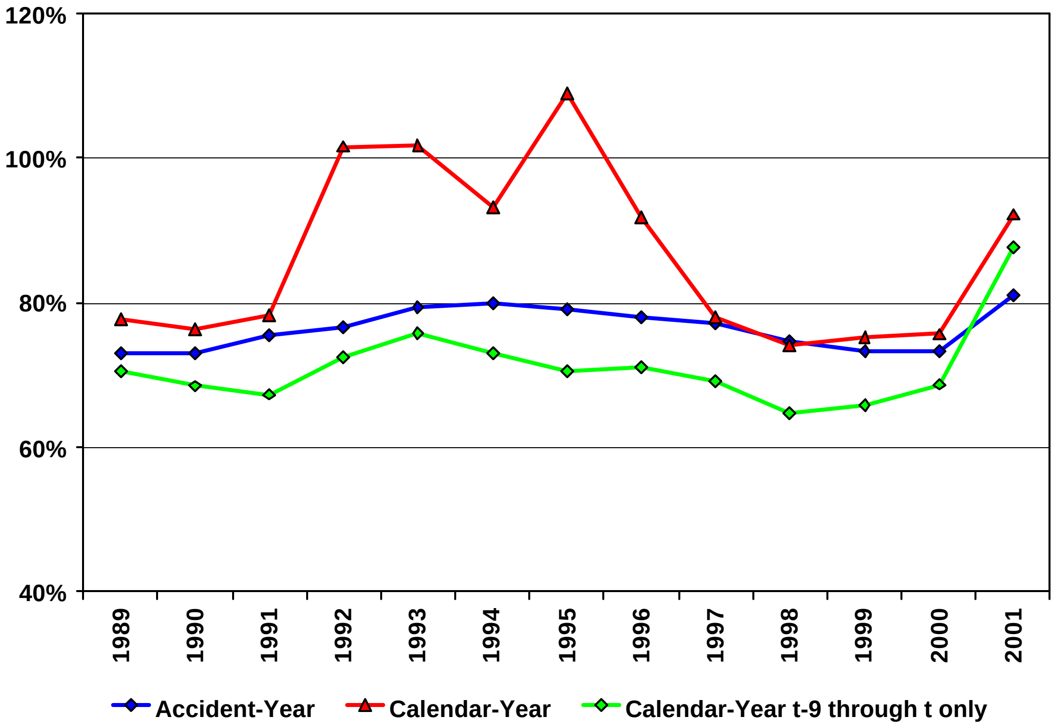
Source: Best's Aggregates & Averages, 2002 edition.

Figure 8
U.S. General Liability Insurance Net Earned Premiums:
Occurrence and Claims-Made Coverage, 1984-2001



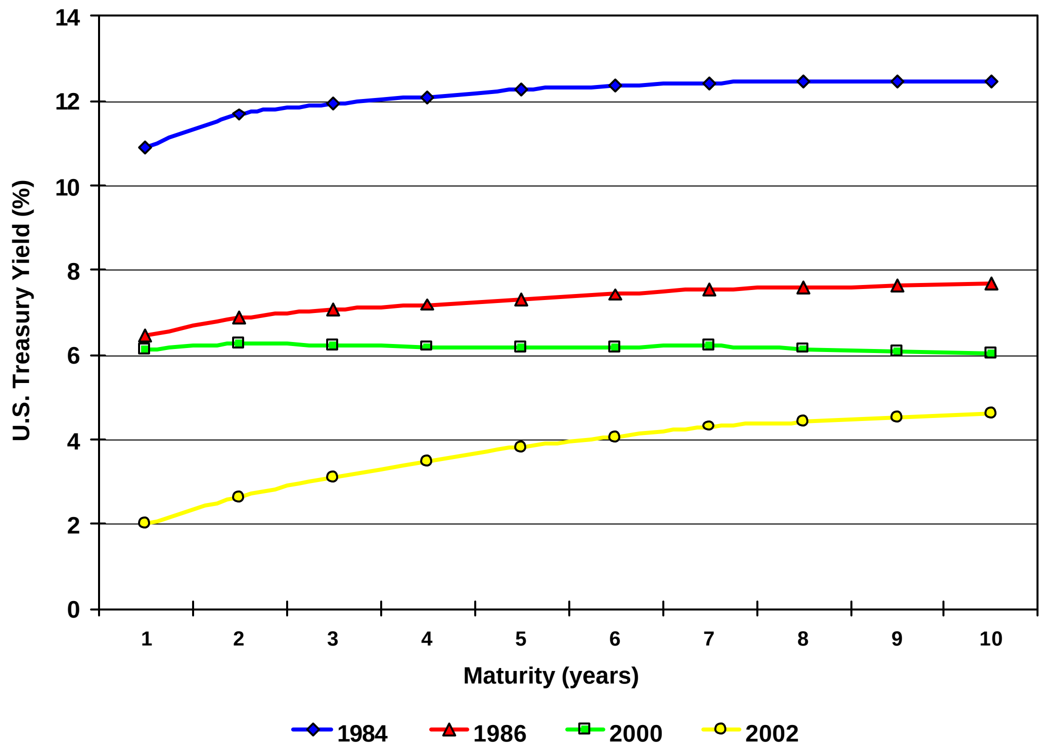
Source: Best's Aggregates & Averages, various editions.

Figure 9
U.S. General Liability Insurance Accident and Calendar-Year Incurred Loss Ratios, 1989-2001



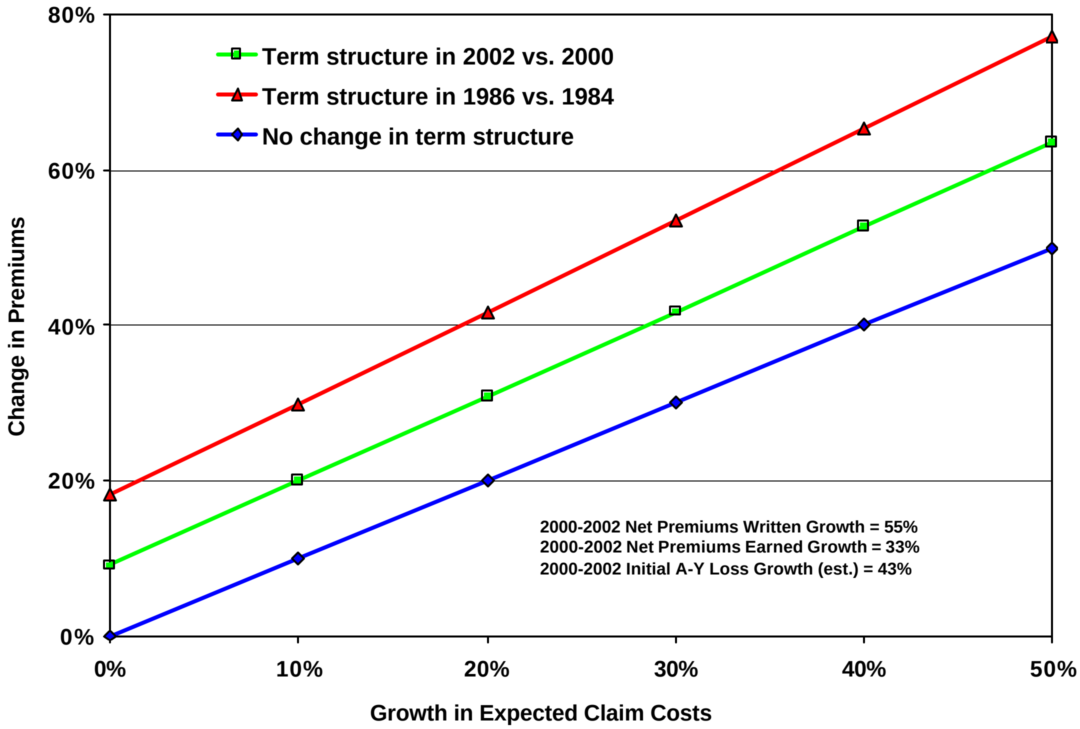
Source: Best's Aggregates & Averages, various editions. Author's calculations.

Figure 10
U.S. Treasury Constant Maturity Yields in Selected Years



Source: Federal Reserve. Author's calculations.

Figure 11
Illustrated Impacts of Growth in Expected Claim Costs and Changes in Interest Rates on General Liability Insurance Premium Growth (Occurrence Coverage)



Source: Author's calculations.

Table 1
Descriptive Statistics for General Liability Insurer Premium Growth and Accident-Year Loss Ratios, 1993-2000

The sample includes all insurance groups included in the 2001 NAIC Database with at least $5 million of general liability (including products liability) net earned premiums in any accident-year during 1992-1999. $\Delta P_{jt} = P_{jt} - P_{jt-1}$, where P_{jt} is log net earned premiums. ILR is the initially reported accident-year incurred loss ratio, and DLR is the developed (through 12/01) accident-year loss ratio (DLR). Variables Winsorized at 0.01 and 0.99 values for all groups with positive net premiums earned in general liability insurance during 1992-2000. N is the sample size (in firm-years); G is the number of firms.

				Percentile						
		Mean	Std.Dev.	5th	10th	25th	50th	75th	90th	95th
1993-1996 N = 442 G = 123	ΔP_t	0.037	0.266	-0.389	-0.186	-0.049	0.060	0.155	0.291	0.389
	ILR	0.709	0.216	0.370	0.487	0.603	0.696	0.810	0.952	1.031
	DLR	0.674	0.254	0.299	0.393	0.513	0.652	0.809	0.995	1.124
	DLR - ILR	-0.035	0.243	-0.349	-0.283	-0.152	-0.052	0.068	0.200	0.340
1997-2000 N = 449 G = 120	ΔP_t	-0.014	0.306	-0.462	-0.288	-0.090	0.031	0.104	0.226	0.345
	ILR	0.723	0.223	0.411	0.465	0.584	0.701	0.839	0.990	1.140
	DLR	0.753	0.310	0.398	0.439	0.553	0.711	0.865	1.080	1.329
	DLR - ILR	0.029	0.244	-0.314	-0.190	-0.074	0.002	0.118	0.280	0.428
1993-2000 N = 891 G = 132	ΔP_t	0.011	-0.289	-0.426	-0.251	-0.066	0.043	0.131	0.259	0.378
	ILR	0.716	0.219	0.398	0.470	0.595	0.698	0.833	0.968	1.093
	DLR	0.714	0.286	0.354	0.421	0.535	0.685	0.844	1.038	1.194
	DLR - ILR	-0.003	0.231	-0.342	-0.227	-0.124	-0.018	0.096	0.235	0.409

Table 2

Least Squares Estimates of Relation Between Loss Ratios and Premium Growth, 1993-1996, 1997-2000, and 1993-2000

The regression equation is: $y_{jt} = b_0 + b_1 \Delta P_{jt} + b_2 P_{jt-1} + d'T + e_{jt}$ where, for firm j and year t, y_{jt} is the initially reported accident-year incurred loss ratio (ILR), the developed (through 12/01) accident-year loss ratio (DLR), or the difference between DLR and ILR (DLR – ILR), $\Delta P_{jt} = P_{jt} - P_{jt-1}$, where P_{jt} is log net earned premiums, and T is a vector of year indicator variables. The sample includes all insurance groups included in the 2001 NAIC Database with at least $5 million of net earned premiums in any accident-year during 1992-1999. R^2 is the adjusted coefficient of determination. N is the sample size (number of firm-years); G is the number of firms. One-tailed p-values based on robust cluster standard errors in parentheses beneath coefficient estimate. Bold values are significant at 0.05 level for a one-tailed test.

Period	Regressor or Statistic	Sample Firms								
		$\Delta P_t > 0$			$\Delta P_t \leq 0$			All		
		ILR	DLR	DLR-ILR	ILR	DLR	DLR-ILR	ILR	DLR	DLR-ILR
1993-1996	ΔP_t	-0.123	0.120	**0.243**	-0.010	0.024	0.034	-0.123	-0.061	0.063
		(0.16)	(0.23)	**(0.01)**	(0.93)	(0.85)	(0.55)	(0.08)	(0.45)	(0.18)
	P_{t-1}	**0.054**	**0.058**	0.004	**0.034**	0.026	-0.008	**0.049**	**0.050**	-0.003
		(0.00)	**(0.00)**	(0.70)	**(0.05)**	(0.23)	(0.57)	**(0.00)**	**(0.00)**	(0.79)
	R^2	0.143	0.109	0.049	0.090	0.044	0.040	0.128	0.067	0.026
	N (G)		289 (109)			153 (89)			442 (123)	
1997-2000	ΔP_t	**0.163**	**0.424**	**0.260**	-0.153	-0.180	-0.025	-0.095	-0.115	-0.020
		(0.03)	**(0.00)**	**(0.01)**	(0.17)	(0.29)	(0.79)	(0.15)	(0.22)	(0.74)
	P_{t-1}	**0.027**	**0.058**	**0.031**	**0.032**	**0.056**	0.023	**0.027**	**0.055**	**0.028**
		(0.03)	**(0.00)**	**(0.01)**	**(0.02)**	**(0.01)**	(0.14)	**(0.01)**	**(0.00)**	**(0.02)**
	R^2	0.057	0.147	0.066	0.077	0.062	0.017	0.042	0.065	0.024
	N (G)		259 (101)			190 (95)			449 (120)	
1993-2000	ΔP_t	0.013	**0.275**	**0.262**	-0.099	-0.098	0.002	**-0.111**	-0.090	0.022
		(0.83)	**(0.00)**	**(0.00)**	(0.22)	(0.39)	(0.98)	**(0.02)**	(0.17)	(0.61)
	P_{t-1}	**0.042**	**0.060**	0.018	**0.033**	**0.040**	0.008	**0.038**	**0.050**	0.012
		(0.00)	**(0.00)**	(0.06)	**(0.01)**	**(0.01)**	(0.54)	**(0.00)**	**(0.00)**	(0.19)
	R^2	0.083	0.138	0.061	0.076	0.060	0.050	0.080	0.083	0.034
	N (G)		548 (120)			343 (120)			891 (132)	