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Attorneys, Fraud, and Claims Abuse: Improving
contracts by manipulating the threat points*

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1 Abstract

The paper examines ex post bargaining between claimants and insurers. The principal findings flow from a model of attorney involvement. Three elements of the analysis are characteristic: insurer and claimant are treated symmetrically, non contractible variables are central in the operation of the contract, and courts tailor their decisions to encourage out-of-court settlement. All of the elements have precedents, but taken in a group they supply useful new insights into insurance claims behavior.

2 Fraud is a two-way street

Recent papers have looked at fraud by insurance claimants¹. The behavior they study covers a spectrum that runs from clever claiming tactics and selective memory to perjury and staged accidents. Some studies concern themselves with surveys of consumers' attitudes towards particular manipulations of claims². A

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¹For instance, Dionne and St-Michel, 1991; Derrig, Weisberg and Chen, 1994; Cummins and Tennyson 1996; Browne and Puelz 1996, 1999; Tennyson 1997; Tennyson and Salsas-Forn 2002, Crocker and Tennyson, 2002.

²Tennyson 1997.

significant fraction of the population finds shady practices acceptable. Lumped together, the various types of strategic claiming are surely important.

Similarly, the long-ago study of automobile liability adjusters by H. Laurence Ross (1970) describes the various ways in which adjusters cut corners on claims, report selectively, and press for early release of liability. The behaviors described by Ross create a context in which strategic claiming tactics and unscrupulous attitudes toward claims inflation do not seem so egregious. Taken together, these two strands of analysis suggest that both sides of the claiming game should be examined together.

Some theoretical studies have examined fraud from the viewpoint of optimum contracts. The optimizing viewpoint is by nature asymmetric: the client is a Stackleberg follower and the insurer is the leader, albeit a leader with magnanimous objectives. Optimizing models such as those of Picard (1996), Bond and Crocker (1997), or Bourgeon and Picard (2000) consider the informational problems that exist ex post, and in that way anticipate some of the concerns that are addressed here. Nevertheless, the optimum in those models is an ex ante construction. Ex post incentives for the faithful execution of the ex ante plan are left out of the account, and that is the point at which further study can make a contribution.

3 Contract theory

Contracts involve two kinds of variables. Those that courts can cheaply assess and enforce are the *contractible variables*. Other variables are important to the relationship between insured and insurer, but are not readily or cheaply enforced by a court. Those are the *non contractible variables*. The full benefit of the relationship in the contract is achieved only when the parties make an efficient allocation of those variables as well.

Non contractible variables are especially invoked in the study of health insurance. The client cannot enter a contract to use the health care system only moderately, regardless of the severity of illness. He might promise to do so, but in the event of illness he can decide upon the health care services he wants to consume and report himself more ill than he really is in order to justify the expense as "moderate." The managed care movement has tried with mixed results to render such promises contractible.

An example from consumer property insurance is described in Marshall (2003). A client has a claim for a home that has been destroyed by fire. The policy has a replacement cost clause of a standard type. That is, the client can, at his option, choose to have the home restored to its pre-fire condition at the expense of the insurer, and the insurer can force such restoration, at her option. Moreover in these contracts the sum supposedly paid by the insurer in case the property is not restored is the economic value of the damage. However, the economic value is non contractible because markets for urban land are thin. Replacement cost is contractible in case the property is restored, for in that case the receipts for the cost of restoration are definitive evidence. Replacement cost

ceases to be contractible when the property is not restored.

Another example is the tradesman who contracts to install home improvements. Some variables are fixed by the contract, and some contingencies remain. Perhaps some additional problems are uncovered in the course of the work and further work is needed to make a good job. The tradesman expects some more money, the homeowner expects that it is not too much. The contingencies and, indeed, the eventual quality of the job are not contractible, but in a successful contractual relationship they are managed efficiently.

Management of the non contractible variables is best thought of as a bargain. There is a surplus available in which the parties can share. Disputes and court cases arise from failure of the bargain over non contractible variables and not from confusion about the contractible variables, which are, by definition, easily enforced and not confusing. The real issues are not the contractible values but instead the strategic, non contractible ones.

The final idea is that the courts and contract writers recognize the non contractible variables. These are the values for which courts are occasionally asked to make hard decisions. The courts know about the failed bargaining situations, and they recognize that every failed bargain is a waste of resources. Their motive is to encourage economic efficiency, which means that they tailor their decisions in ways that encourage bargainers to settle efficiently. By shaping its decisions appropriately, the court moves the threat point for all future, similar bargains. Contract writers, on the other hand, try to anticipate the bargaining problem and arrange the contract in such a way that the bargain is more likely to succeed.

The ideas here are foreshadowed by major trends in thinking about the law. During the 1960's legal scholars began to recognize that most decisions of a legal flavor are actually made outside of court. The field of law and economics began to pick up momentum in the next decade, when the idea of courts as promoting economic efficiency was extensively applied. In the 80's scholars looked at bargaining theory as a way to describe the behavior of plaintiffs, defendants, attorneys, and judges as reviewed by Cooter and Rubinfeld (1989). The viewpoint taken in this paper is therefore not a very surprising one.

In this idea spending on litigation has a supporting role. It is easily identified as a non contractible variable. It does not have the leading role because the surplus generated by cooperation on the other non contractible actions is ordinarily even greater.

4 Example: A claims bargain with an outside option

To illustrate the concepts, consider settlement of a property insurance contract with the standard replacement cost clause. The insured home sits where a filling station would prosper. When the home is heavily damaged, the surplus at stake in the bargain between an insurer Alice and the claimant Bob is the value of

converting to the filling station. The value of the house is 2 and the value of the land on which it sits is 1 or, more properly, the value will be 1 if Bob is free to build the service station. The table summarizes the wealth implications.

		pre-indemnity wealth	cost(-), value	net
Restoration	Alice	4	-2	2
	Bob	1	1	2
Conversion	Alice	4	-1-m	3-m
	Bob	1	1+m	2+m

Briefly, after the fire but before the indemnity, Alice has a wealth of 4, and Bob has a wealth of 1. The contractible restoration cost is 2, but the non contractible economic loss is only 1. Under the replacement cost clause, Bob can restore the home at a cost of 2 to insurer Alice, receiving for himself a benefit of 1. The resulting wealth distribution is (2, 2) and total wealth is 4. This is the threat point of the basic bargain, and it is such because restoration cost is the contractible variable. It is also a point both players want to avoid. Alternatively, they can agree on a settlement for $1 + m$ and then Bob is free to convert the property to a filling station, raising their aggregate wealth to 5.

It may be asked again why such a contract exists? The reason is that the land value is not contractible because of the thinness of urban land markets. Since land value is not contractible, neither is the economic loss. The cost of restoration when restoration is performed is, however, fully contractible because it can be justified by the actual payments.

The situation fits the Nash paradigm. Alice and Bob are bargaining for shares of the surplus of 1. The threat point is (2, 2). Either party can compel the threat point, Bob by electing to restore the property, Alice by invoking the clause in the contract that makes her free to require restoration. The threats are not meant to be executed, of course. Both parties want to convert the property and share the surplus.

4.1 Unknown options

The solution concept here is the one-step ultimatum in which Alice makes a settlement offer and Bob must accept or reject it. She offers $1 + m$ very slightly larger than unity and Bob is compelled to accept. So far there is no reason for the bargain to fail, but the interesting questions start to arise when bargains do occasionally fail. But why would bargainers propel themselves into court? In some papers about litigation the parties suffer from reciprocal hyperoptimism regarding the probable outcome in a court battle. Here the probability of failure should be generated by some other factor.

The means chosen here is an outside option available to the claimant Bob. He can first restore the house, using the full restoration indemnity and fulfilling the replacement clause of the insurance contract, and then he can make a conversion not to a filling station, the highest valued use, but by changing some doors and interior walls he can produce a few offices for attorneys, realtors, and

accountants. The value in that third use is t known to Bob, and it gives him a type of bargaining strength. Alice does not know t but she does know that it is uniformly distributed on $[0, 1]$. Aside from Bob's specific type, all aspects of the model are common knowledge. Because of the unknown type, Alice might not make an acceptable offer, in which case the contract is adjudicated and the surplus is lost.

What happens when the bargain fails? Bob sets out to restore the property. Alice goes to court to escape the payment, arguing that the economic value of loss is much lower. Her argument doesn't work because the economic value depends upon land value, which is something that courts can determine only at considerable cost. The objective of the court is to promote efficiency in this and all similar cases. That means reducing expected lost surplus. To achieve that goal the court gears its decision in a way that reduces Alice's wealth by a and Bob's by b . The reductions can take the form of allocated court costs, shifting of attorneys' fees, or modifications in the judgment itself. If $a + b = 0$ the court is merely transferring wealth from one to another. In the case of $a + b \neq 0$ the net proceeds are not considered to be a social cost but are viewed as a transfer to some other worthy use.

Alice and Bob are risk neutral. Bob has an option that is worth t to him. If he exercises his option the bargain fails and produces the threat point for both players. Bob knows the value of the option, but Alice doesn't know it, and he can't signal the value to her in any credible way.

Play begins when Alice offers an allocation $(3 - m, 2 + m)$, that is, $3 - m$ for Alice and $2 + m$ for Bob. Bob can accept or reject the offer. He is guided in that decision by his outside option, of course. The structure and payoffs are indicated below, the significant novelty being the disincentives to failed bargains that come into play if the offer is rejected.

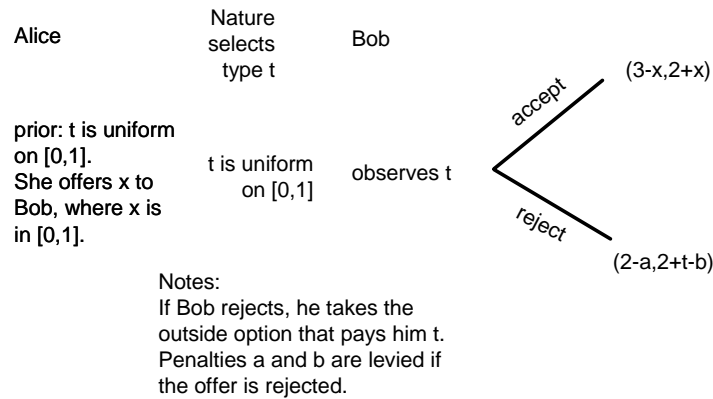


Figure 1: Unknown options

The decision that matters is Alice's choice of m . Her payoff is

$$w(m, a, b) = 2 + (1 - m) \int_{t=0}^{t=m+b} dt - a \int_{t=m+b}^{t=1} dt \quad (1)$$

which reduces to

$$w(m, a, b) = -m^2 + (1 - b + a)m - a + ab + 2 \quad (2)$$

Denote the solution value of m by $m^*(a, b)$ and find

$$m^*(a, b) = \frac{1}{2}(1 + a - b) \quad (3)$$

Notice that Alice always chooses $m \geq b$, for if she does not, every type of Bob will reject the offer. The solution value for Alice is

$$\begin{aligned} V(a, b) &= w(m^*(a, b), a, b) \\ &= \frac{1}{4}(1 + a - b)^2 - a + ab + 2 \end{aligned} \quad (4)$$

To build intuition, consider the case in which $a = b = 0$, and think just about the gains from the bargain, not about the threat point. Then Alice offers $(\frac{1}{2}, \frac{1}{2})$. The probability that Bob has no better option is $\frac{1}{2}$. Alice gets the $\frac{1}{2}$ she suggested for herself with probability $\frac{1}{2}$. Her expected payoff is $\frac{1}{4}$. A type- t Bob has a payoff of $\max(t, \frac{1}{2})$. The average Bob has payoff of $.625 = \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{2} E(t | t > \frac{1}{2}) = \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{2} \cdot \frac{3}{4}$.

Moving the threat point can reduce the efficiency loss. The probability of rejection is

$$\begin{aligned} \pi(a, b) &= \int_{t=m^*(a, b)+b}^1 dt \\ &= 1 - (m^*(a, b) + b) \\ &= \frac{1}{2} - \frac{a + b}{2} \end{aligned} \quad (5)$$

The probability vanishes if $a + b = 1$. Further checking shows that it also vanishes for all values of (a, b) satisfying $a + b > 1, a \geq 0,$ and $b \geq 0$. As another check, look at the social loss. When a bargain is accepted, the total payoff is unity. When a bargain is rejected, the total payoff is t and the lost surplus is $1 - t$. Then the expected social loss is

$$\Delta(a, b) = \int_{t=1-m^*(a, b)+b}^1 (1 - t) dt \quad (6)$$

which can be shown to equal

$$\Delta(a, b) = \frac{1}{8}(1 - (a + b))^2 \quad (7)$$

which reaches its minimum any time that $a + b \geq 1, a \geq 0,$ and $b \geq 0$.

It fix ideas, suppose that $a = b = \frac{1}{2}$. Alice offers $m = \frac{1}{2}$. The highest type of Bob has $t = 1$ and gets $t - b = \frac{1}{2}$ from rejecting the offer. Lower types get lower rewards. Thus the probability of a rejection is zero. Full efficiency is realized.

The result is obviously sensitive to the solution concept and the abstract nature of the supposed bargaining process, but that is not so significant. The significant thing is the attainment of the Pareto frontier in a successful bargain or the wasteful retreat to the threat point. In practice a small fraction of insurance claims end in court, perhaps as little as one percent. The decisions in these cases are therefore more important for their influence in defining the threat points in future bargains than for the sake of the current disputants.

4.2 Tough bargainers and imaginary options:

In one variation of the model, Bob's type is not an option but an irrational sticking point. The payoffs are as in Figure 1. except that in the lower right the payoff to Bob is not $t - b$ but $-b$. Notice that Alice's payoffs are exactly as before. Therefore the optimum strategy for her is still $m^*(a, b)$. The probability of rejection is the same, too. Here social loss is 1 whenever the bargain fails. Thus expected social loss is the same as the probability of rejection. Again, social loss is minimized when $a + b \geq 1$. The outcome is not much different, in spite of the irrationality involved. The change in the model doesn't upset any of the earlier observations about its meaning for the concept of fraud.

5 Lawyers and random threats

The main purpose of the paper is to study the role of attorneys and claims investigators in insurance claims negotiations. The motivating idea is that investigations, suits and attorneys are a waste of resources. The overall structure of the paper is to show how tightening a particular constraint on their behavior progressively changes the environment of settlements. The model works either for investigations or attorneys. The first consideration is attorneys.

The idea behind attorney involvement here is part bargaining and part signalling. The insurer knows the threat point and the claimant doesn't. Thus the situation is asymmetric information about the threat point. The settlement offer of the insurer is the signal. After the players agree on the threat point, they subsequently bargain over the settlement.

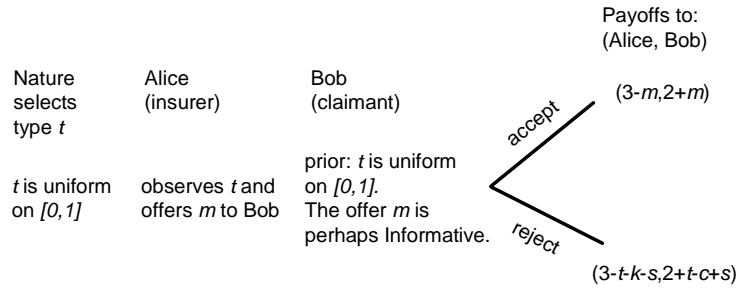
Specifically, the model involves the same two parties as before, the insurer Alice and the claimant Bob. Bob has a claim for a home that has been destroyed by fire. As before, the economic cost is 1, but now the replacement cost is $1 + t$. (This is not the same t as in the previous section, but it has a parallel role. Hence the abuse of notation. As in much game theory literature, it is the type.) Here t is the surplus over which the players bargain. It is known to the insurer Alice and not known by the claimant Bob. However, Bob is confident that the extra replacement cost will be fairly determined by the court and consequently that, if he goes to the threat point, he will have 2 as before. He hopes to end up with more than that by retaining a share of the surplus. Alice knows the difference t . Bob knows only that it is uniformly distributed on the unit interval. Insurer Alice moves first by making an offer. Claimant Bob can accept

or reject the offer. If the latter, he hires the attorney at cost c who reveals the unknown surplus t to him, after which further negotiation takes place to divide the conversion surplus.

		pre-indemnity wealth	cost(-), value	net
Restoration	Alice	4	-1-t	3-t
	Bob	1	1	2
Conversion	Alice	4	-1-m	3-m
	Bob	1	1+m	2+m

The game proceeds as follows, and as illustrated in Figure 2. Alice sees t and makes an offer m to settle the whole bargain. Bob sees m but still does not know t . He can accept the offer, and because it is comprehensive, the bargain leads without further ado to payoffs $(3 - m, 2 + m)$. Alternatively, Bob can reject the offer and hire an attorney at a cost c . The attorney tells Bob the value of t , takes the insurer to court, and wins all of the surplus t for him. Bob was already assured of receiving the economic cost, 1, so he gains $1 + t$ plus additional sums the court may assign him. The court penalizes Alice, the losing party, by charging court costs k and making her pay a portion s of Bob's attorney fees. Thus the payoffs of rejection are $(3 - t - k - s, 2 + t - c + s)$.

Figure 2 illustrates the game. Formally, nature moves first by drawing a value t at random from the uniform distribution on the unit interval.



Note: c is the cost of the attorney,
 k is the penalty of the court on the insurer, Alice, and
 s is the part of Bob's attorney cost shifted onto Alice.

Figure 2. Attorneys and the savvy adjuster

5.1 The static court

This section examines the situation for given values of the court variables k and s . To do that effectively, some limitations are needed. Assume that $c < \frac{1}{4}$, that is, the cost of the attorney is less than $\frac{1}{2}$ the average value of the surplus. Cost shifting s is limited by $s \leq c$. There is also an upper limit on the court costs, say \bar{k} , and to initiate the discussion assume that $\bar{k} < \frac{1}{2} - 2c$, which is reasonable because it means that the maximum court cost \bar{k} is at a minimum equal to $\frac{1}{4}$,

which is half the average surplus. The situations of negative s and of higher \bar{k} and k have important implications that are examined later on.

The actions of Alice and Bob in this environment are not too clear. Game theory addresses situations of this type with the concept of perfect Bayesian equilibrium. It involves the actions of the players as functions of what they observe and it has specific requirements that confirm the reasonableness of behavior on both sides. Briefly, the actions are reciprocally optimizing, and the probability judgments involved are consistent with the facts they can observe.

Alice plays first, offering a settlement of $m(t)$ which is, in equilibrium, optimum in the sense of reducing expected payouts as much as possible given the strategy of Bob. Bob plays second. His strategy $b(m)$ optimizes his payoffs given the offer m that he has received and given the beliefs that he reasonably holds.

Strategies for both players involve a "good offer"

$$\theta = 1 - k + s - 2c \quad (8)$$

that is meant to be accepted and is accepted, and they involve a range of bad offers

$$m \in (-\infty, \theta - \frac{1}{2}] \quad (9)$$

that are not accepted nor meant to be. These offers are on the equilibrium path. There Bob's strategy is

$$\begin{aligned} b(m) &= \text{accept and receive } 2 + m \text{ if } m = \theta \\ &= \text{reject and receive } 2 + t - c + s \text{ if } m \in (-\infty, \theta - \frac{1}{2}] \end{aligned} \quad (10)$$

Treatment of other offers is a little different. Off the equilibrium path,

$$\begin{aligned} b(m) &= \text{accept and receive } 2 + m \text{ if } m \in (\theta, 1] \\ &= \text{reject and receive } 2 + t - c + s \text{ if } m \in (\theta - \frac{1}{2}, \theta) \end{aligned} \quad (11)$$

Alice's strategy is

$$\begin{aligned} m(t) &= \theta \text{ if } t \geq \theta - k - s \\ &\in (-\infty, \theta - \frac{1}{2}] \text{ if } t < \theta - k - s \end{aligned} \quad (12)$$

Most aspects of the equilibrium are summarized in the diagram below. Checking the validity of the equilibrium follows.

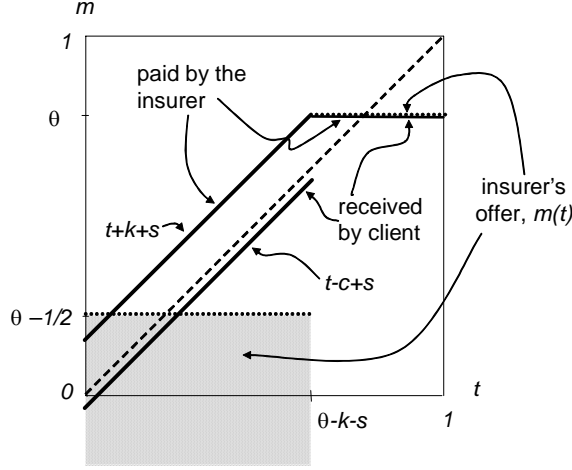


Figure 3. Adjustment abuse and attorneys

The first check is that Alice's strategy is optimizing given that of Bob. Suppose Alice observes $t \geq \theta - k - s$. She could think of offering $m > \theta$, which Bob would accept, but a lesser offer of θ wins acceptance at lower cost. Or she could think of offering $m \in (\theta - \frac{1}{2}, \theta)$ which is off the equilibrium path and is rejected, or she could offer $m \in (-\infty, \theta - \frac{1}{2}]$ which is on the equilibrium path and also is rejected. Either way, she pays $t + k + s \geq \theta$. Her optimizing move is therefore $m = \theta$.

Continuing with Alice's strategy, suppose that $t < \theta - k - s$. An offer of $m \geq \theta$ would be accepted but in that case she pays more than $t + k + s$. Or she could think of offering $m \in (\theta - \frac{1}{2}, \theta)$ which is off the equilibrium path and is rejected, or $m \in (-\infty, \theta - \frac{1}{2}]$ which is on the equilibrium path and also is rejected. Either way, she pays $t + k + s \leq \theta$. The move $m \in (-\infty, \theta - \frac{1}{2}]$ is optimizing. In summary, Alice's strategy optimizes given Bob's strategy.

So far the numerical value θ has not been revealed. It is determined from Bob's optimum strategy and beliefs, which must be checked for consistency. Bob's prior is $t \in U[0, 1]$. On the equilibrium path he sees offers of either $m = \theta$ or $m \in (-\infty, \theta - \frac{1}{2}]$. Suppose that he sees the offer $m = \theta$. From Alice's strategy he knows that $t \geq \theta - k - s$ and hence his posterior probability distribution is $t \in U[\theta - k - s, 1]$. This inference satisfies one requirement of Bayesian consistency in beliefs. Given the inference, Bob's expectation of t is

$$E(t|\theta) = \frac{1}{2} + \frac{\theta - k - s}{2} \quad (13)$$

and his expected payoff from rejecting is

$$E(t|\theta) - c + s = \frac{1}{2} + \frac{\theta - k - s}{2} - c + s \quad (14)$$

The value of θ is determined here by the condition that accepting or rejecting

the offer is equally attractive. Thus θ satisfies

$$\theta = \frac{1}{2} + \frac{\theta - k - s}{2} - c + s \quad (15)$$

which agrees with the definition above at equation (8). Consequently accepting $m = \theta$ is an optimum (as is rejecting it, but that doesn't matter here).

When Bob sees an on-path offer $m \in (-\infty, \theta - \frac{1}{2}]$, he infers that $t \in U[0, \theta - k - s]$, which satisfies another requirement for consistency of beliefs. Expectation of gain from rejecting the offer is

$$\begin{aligned} E(t|m \in (-\infty, \theta - \frac{1}{2}]) - c + s &= \frac{1}{2}(\theta - k - s) - c + s \\ &= \theta - \frac{1}{2} \end{aligned} \quad (16)$$

The latter equals or exceeds the offer, which Bob optimally rejects.

Values of m off the equilibrium path lead to different inferences. When Bob sees an off-path offer, he knows that Alice has made a mistake, but he does not regard the offer as purely random. He still thinks she is offering no more money than she would pay if he retained an attorney. Thus he infers that $t \geq m - k - s$. His posterior belief is $t \in U[m - k - s, 1]$. When $m > \theta$, rejection gives him

$$\begin{aligned} E(t) - c + s &= \frac{1}{2} + \frac{1}{2}(m - k - s) - c + s \\ &= \frac{1}{2} + \frac{1}{2}(\theta + (m - \theta) - k - s) - c + s \\ &= \theta + \frac{1}{2}(m - \theta) \\ &< \theta + (m - \theta) \\ &= m \end{aligned} \quad (17)$$

He accepts m optimally.

When $m \in (\theta - \frac{1}{2}, \theta)$, another off-path situation, consistency requires that Bob believes $t \in U[m - k - s, 1]$. The payoff from rejecting is as immediately above but now $m - \theta < 0$. Therefore

$$\begin{aligned} E(t) - c + s &= \theta + \frac{1}{2}(m - \theta) \\ &> \theta + (m - \theta) \\ &= m \end{aligned} \quad (18)$$

Bob rejects optimally. The literature on perfect Bayesian equilibrium directs critical attention to the off-path beliefs of Bob because they are less constrained by the requirements of equilibrium and therefore might be chosen in unreasonable ways. Bob's off-path beliefs are reasonable. That and the checks above establish perfect Bayesian equilibrium. In an equilibrium, Alice makes unacceptable offers of $m \in (-\infty, \theta - \frac{1}{2})$ with some probability distribution. That

distribution can be almost anything, producing a whole array of technically different but essentially similar equilibria.

This type of equilibrium separates claimants into categories. It might seem that a better idea would be to pool them all, and that would make perfect sense if attorneys fees and court costs were very high. A later section describes the pitfalls of trying to enforce pooling by raising court costs. However, pooling is not available as an equilibrium for moderate values of the cost parameters. To see that, consider a candidate pooling equilibrium in which Alice offers $m = \frac{1}{2} - c + s$ to every Bob regardless of t . All Bobs accept the offer – barely – but given that universal acceptance, Alice’s strategy is not optimum for her. She can do better by offering $m = 0$ when Bob has a low t . For instance, if $t = 0$ and she offers zero, she ends up paying $t + k + s = k + s$. It is assumed here as above that $\bar{k} < \frac{1}{2} - 2c$, so the amount Alice pays if offering $\frac{1}{2} - c + s$ is greater than the amount $k + s$ she pays if she offers $m \in (-\infty, \theta - \frac{1}{2})$. Pooling equilibrium does not exist given the restriction on the allocation of court costs.

In another bad candidate for equilibrium, Alice would offer an honest $m = t$ for all t and Bob would believe and accept each offer. The idea is attractive because it avoids all attorney costs, but it is not an equilibrium. Given such a compliant Bob, Alice’s best strategy is to offer $m = 0$ for every t , and that makes Bob’s beliefs unreasonable.

Is it possible that Alice would offer the honest $m = t$ in order to build up a reputation for honesty? That might be the topic of a formal model, but an entirely new element would have to be introduced to make it work. Specifically, in the present model Bob has an independent check on the value of t only when he hires an attorney. In a model of the honest adjuster, attorneys are never hired and therefore no one independently checks on the values of t . A reputation model would have to solve that lack.

5.2 Discussion

Insurance is sometimes supposed to pay the economic value of loss. Very little of that ideal remains in this analysis of claims settlement. The insurer Alice offers her true opinion of the value only in the probability-zero case of $t = \theta$. The good offers are made to a group of highly qualified claimants, and the other offers are abusive.

One source of difficulty is the lack of any credible means for the insurer Alice to communicate her knowledge of type. In a sense she welcomes the attorney in cases of liability t below the critical value $\theta - k - s$. She can’t deliver the news of low t in any convincing fashion and by making a very low offer she assigns that task to the attorney.

Claimant Bob is well advised to reject any offer less than θ and to hire an attorney. He would be poorer if he decided to forego the attorney and accept a bad offer. This part of the model is consistent with studies showing that the presence of an attorney typically raises the settlement value an insurance claim. Looking at the whole range of settlements in the model, the story is different. Claimants having high values are persuaded by generous offers not to retain

attorneys. Clients with low values retain attorneys in spite of the bad news delivered in the low offer. They end with lower payoffs and extract less compensation from the insurer. Studies showing the extent to which attorney presence leads to higher settlements are subject to some doubt on econometric grounds. Perhaps the mixed message of this model will encourage further examination of those issues and inspire new estimates of the effects of attorney involvement.

5.3 The efficiency-minded court.

Now consider variation in the court-determined payments k and s . The court's objective is efficiency, but the available instruments are unlikely to achieve full efficiency. Specifically, the money spent on attorneys is wasted in this viewpoint. The court wants to minimize the probability of rejection, which is $\theta - k - s = 1 - 2k - 2c$. The shift of attorney's fees does not affect the probability of rejection, but has a role in assuring stability, as described farther below. The social loss is reduced by driving the probability down as much as possible, and the instrument for doing that is allocation of court costs.

Full efficiency requires that the court costs allocated to insurer Alice should satisfy $k \geq \frac{1}{2} - c$, which is about the same as the average value of the claim. Most likely the upper limit on court costs will become binding before full efficiency is reached. Then the probability of rejection would be $1 - 2\bar{k} - 2c > 0$. The population of claimants is still separated for $t \leq \theta - \bar{k} - s = 1 - 2\bar{k} - 2c$ and pooled for claimants above that level.

The limitation on k is important. Schemes to relax that constraint do not have attractive properties. For instance, when the court wants a penalty greater than court costs k , it might try generating wasteful expenditures on more attorneys' hours, witnesses, and court dates. These expenditures are themselves social costs, which the court will take into account as it seeks to promote efficiency. A court that conscientiously seeks to minimize social costs will

$$\text{minimize } [c(1 - 2k - 2c) + \max(0, k - \bar{k})] \quad (19)$$

Recalling that $c < \frac{1}{4}$, the minimum occurs at $k = \bar{k}$. The efficiency-minded court does not induce litigants to make wasteful expenditures.

Suppose, however, that the court wanted to pursue efficiency to a fault with higher k . It would encounter some obstacles that have been avoided up to this point by the assumption that $k \leq \bar{k} < \frac{1}{2} - 2c$. To see the difficulty, think of k gradually rising up to the level at which full efficiency is attained $k = \frac{1}{2} - c$. In this process, θ is falling towards $\frac{1}{2} - (c - s)$. The lower part of the on-path offers is $(-\infty, \theta - \frac{1}{2})$. Its upper limit is falling and reaches zero when $k = \frac{1}{2} - 2c + s$. Unless $s = c$, the bad offers become negative before the probability of getting the bad offer falls to zero. Negative values of the offer require imaginative interpretation. Perhaps the adjuster threatens to prosecute the claimant for a false filing. As the process continues, the probability of rejection falls to zero at $k = \frac{1}{2} - c$. At that point Bob gets the offer of $\theta = \frac{1}{2} - (c - s)$ with probability one. Such an offer does not change Bob's priors and he accepts it because it is no

less than what he could expect to have by hiring an attorney. Thus shifting the client's attorney costs onto the insurer facilitates the transition to full efficiency.

Full efficiency is a pooling equilibrium. It is desirably simpler and perhaps fairer than the partially separated equilibrium that is prevalent. However, the very high court costs that support it are unrealistic and there is the problem of disorganized behavior in the transition. Still imagining that the k parameter is gradually raised to this point, the regime change from separating to pooling should probably be interpreted as creating some chaotic or random behavior before settling down to the new equilibrium. The need for a negative offer would just be part of that chaos. If courts want to force the pooling equilibrium, they should not do it gradually but abruptly in a discrete jump from the status quo. Pushing the court variables to such an extent is probably a bad idea anyway.

Note, finally, that in the fully efficient solution claimant Bob gives up the prospect of a variable indemnity and settles for an indemnity that is sometimes excessive and sometimes inadequate. The function of insurance is wholly defeated in the pooling equilibrium.

5.4 Symmetry and Fraud

The model of adjustment abuse is readily transformed into a model of claims inflation. Now the claimant Bob is the one who is better informed. He knows the true loss t and has the first move in making a claim m . The insurer Alice knows only that $t \in U[0, 1]$ She either accepts the claim or else rejects it and initiates an investigation at cost c . Alice's investigation leads to knowledge of t and subsequently to a payment in that amount to Bob. The equilibrium is essentially as before. Briefly, when claimant Bob sees a true claim that is not very large, he claims a modest sum. Alice sees the claim, updates her prior, thinks of the cost of investigation, and optimally accepts the claim. When Bob has a large loss, he optimally submits such a large claim that Alice rejects it. As before, the strategies are reciprocally optimum and the beliefs satisfy requirements of Bayesian updating.

Particularly, $m(t)$ is the strategy of Bob for making the claim and is, in equilibrium, optimum in the sense of reducing expected payouts as much as possible given the strategy of Alice, who plays second. Her strategy $a(m)$ minimizes her payouts given the claim m that she has received and given the beliefs that she reasonably holds. Strategies involve a modest claim

$$\sigma = 2c + k - s \tag{20}$$

that is meant to be accepted and is accepted, and they involve a range of bold claims

$$m \in [\sigma + \frac{1}{2}, \infty) \tag{21}$$

that are not accepted nor meant to be. For claims on the equilibrium path,

Alice's strategy is

$$\begin{aligned} a(m) &= \text{accept and pay } m \text{ if } m = \sigma & (22) \\ &= \text{reject and pay } t + c - s \text{ if } m \in [\sigma + \frac{1}{2}, \infty) \end{aligned}$$

Treatment of claims that are off the equilibrium path is a little different.

$$\begin{aligned} a(m) &= \text{accept and pay } m \text{ if } m \in [0, \sigma) & (23) \\ &= \text{reject and pay } t + c - s \text{ if } m \in (\sigma, \sigma + \frac{1}{2}) \end{aligned}$$

Bob's strategy is

$$\begin{aligned} m(t) &= \sigma \text{ if } t \leq \sigma + k + s & (24) \\ &\in [\sigma + \frac{1}{2}, \infty) \text{ if } t > \sigma + k + s \end{aligned}$$

Figure 4 summarizes the equilibrium and reveals its similarity to Figure 3 rotated 180 degrees.

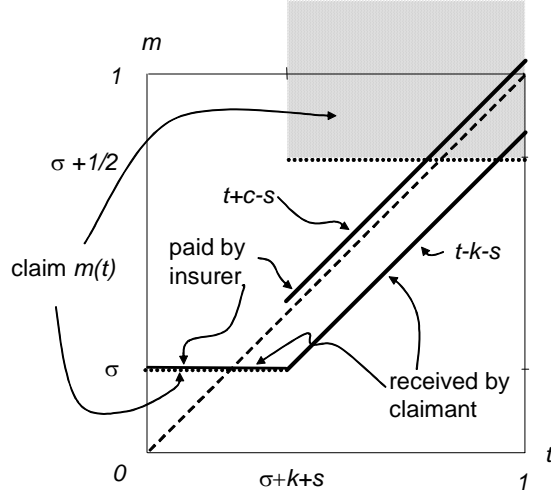


Figure 4. Inflation and investigation

Checking the validity of the equilibrium follows.

The first check is that Bob's strategy is optimizing given that of Alice. Suppose Bob observes $t \leq \sigma + k + s$. He could think of claiming $m < \sigma$, which Alice would accept, but a higher claim of σ wins acceptance at a higher level. Or he could think of claiming $m \in (\sigma, \sigma + \frac{1}{2})$ which is off the equilibrium path or $m \in [\sigma + \frac{1}{2}, \infty)$ which is on it. Either way the claim is rejected and he gets $t - k - s \leq \sigma$. His optimizing move is therefore $m = \sigma$.

Suppose that Bob sees $t > \sigma + k + s$. A claim of $m \leq \sigma$ would be accepted but in that case he would get less than $t - k - s$. Or he could claim $m \in (\sigma, \sigma + \frac{1}{2})$

or $m \in [\sigma + \frac{1}{2}, \infty)$. Either way, he gets $t - k - s > \sigma$. The move $m \in [\sigma + \frac{1}{2}, \infty)$ is optimizing. In summary, Bob's strategy optimizes given Alice's strategy.

The numerical value σ is determined from Alice's optimum strategy and beliefs. Alice's prior is $t \in U[0, 1]$. On the equilibrium path she sees claims of either $m = \sigma$ or $m \in [\sigma + \frac{1}{2}, \infty)$. In case of the former, she knows from Bob's strategy that $t \leq \sigma + k + s$ and hence her posterior probability distribution is $t \in U[0, \sigma + k + s]$. Given the inference, her expectation of t is

$$E(t|\theta) = \frac{\sigma + k + s}{2} \quad (25)$$

and the expected pay out from rejecting is

$$E(t|\theta) + c - s = \frac{\sigma + k + s}{2} + c - s \quad (26)$$

The value of σ is determined here by the condition that accepting or rejecting the claim is equally attractive. Thus σ satisfies

$$\sigma = \frac{\sigma + k + s}{2} + c - s \quad (27)$$

which agrees with the definition above at equation (20). Consequently accepting $m = \sigma$ is an optimum.

When Alice sees an on-path claim $m \in [\sigma + \frac{1}{2}, \infty)$, she infers that $t \in U[\sigma + k + s, 1]$. Expectation of payout from rejecting the claim is

$$\begin{aligned} E(t|m \in [\sigma + \frac{1}{2}, \infty)) + c - s &= \frac{\sigma + k + s}{2} + \frac{1}{2} + c - s \\ &= \sigma + \frac{1}{2} \end{aligned} \quad (28)$$

The latter equals or exceeds the claim, which Alice optimally rejects.

When Alice sees an off-path claim, she knows that Bob has made a mistake, but she does not regard the claim as purely random. She still thinks he is claiming no less money than he would get if she investigated the claim. Thus she infers that $t - k - s \leq m$. Her posterior belief is $t \in U[0, m + k + s]$. When $m < \sigma$, rejection requires her to pay

$$\begin{aligned} E(t) - c + s &= \frac{1}{2}(m + k + s) + c - s \\ &= \frac{1}{2}(\sigma + (m - \sigma) + k + s) + c - s \\ &= \sigma + \frac{1}{2}(m - \sigma) \\ &> \sigma + (m - \sigma) \\ &= m \end{aligned} \quad (29)$$

She accepts m optimally.

When $m \in (\sigma, \sigma + \frac{1}{2})$, another off-path situation, Alice believes $t \in U[0, m + k + s]$. The payout from rejecting is as immediately above but now $m - \sigma > 0$. Therefore

$$\begin{aligned} E(t) - c + s &= \sigma + \frac{1}{2}(m - \sigma) \\ &> \sigma + (m - \sigma) \\ &= m \end{aligned} \tag{30}$$

She rejects optimally. That completes the check of equilibrium conditions.

The situation here is similar to that found by Bond and Crocker in their optimizing model of evasion and claims. The insurer concedes claims that are small relative to the cost of investigating. The claimant who observes a low surplus t prefers to have a high cost of investigation because, here, that raises σ and widens the range over which σ is accepted. He might evade investigation by slipping into the population that has the high investigation costs. That can be deterred by changes in court costs k and cost shifting s , reducing k and increasing s as the cost of investigation rises, but that is the opposite of the motives of an efficiency-minded court, which views an increase in out-of-court settlements as a favorable development. The policy of the efficiency-minded court would in fact be similar to that in Bond and Crocker: increase the generosity of settlements in the population having low investigation cost. That would occur through increases in k and reductions in s .

Perhaps unexpected is the extreme nature of claims that are not small. It arises because the claimant has no credible means of communicating the true value of t to the insurer. Unlike the situation in optimizing models, here the insurer has no motive to learn the truth and use it to fulfill an ex ante optimum. She is interested in settling at least cost, regardless of the implication of suboptimum insurance for the client. Moreover, the signal is not independent of the settlement, as it is in Bourgeon and Picard (2000). It is itself a proposed settlement that must either be accepted as is or rejected at a cost. For these reasons, and perhaps some others due to the mysteries of perfect Bayesian equilibrium, a very bold claim is needed to provoke the desired investigation.

6 Limits on claims and offers

The models reveal important aspects of claiming and settlement-offering, but further modeling is needed. In reality investigations are made somewhat at random among all but the lowest claims, and attorneys are involved in high-valued settlements as well as in low-valued ones. In the case of the claimant, aggressive claims are deterred by heavy legal penalties for attempted fraud and probably by other sanctions associated with absurdly large claims. On the insurer's side, statutes such as the California Unfair Claims Practices Act restrain adjusters from making claims that are lower than the amounts that similar claims are receiving in court. Legal sanctions seem likely, then, to modify the very low settlement offers and the very high claims needed in the equilibria described

above. To understand the effects of these limitations, a new model is needed. For specificity, claims behavior is the topic here.

The situation is the same as in the previous section. The replacement cost of the destroyed house is $1+t$, and t is the surplus over which further bargaining takes place. The insurer Alice has no bargaining power and accepts the claim unless she can, by investigation, discredit it. In case of investigation of the inflated claim, claimant Bob is ordered to pay a sum s to Alice and a penalty k in court costs.

The strategies available to Bob include some possibilities that were unused in the previous section's equilibrium. After observing his t , Bob can randomize over at most two claims, a bold claim and a modest one. The modest claim is t . The bold claim is t plus a fixed limit u . Alternatively, Bob can use one of his two possible claims to be a sub modest claim, as required for equilibrium in the previous section. The modest claim is t and continues to be t even when the true value of the claim is very low. Thus Bob's bounded rationality can direct him to make a claim so low that the insurer would never, remotely, think of investigating it. It can be checked that these amplifications of Bob's strategy space do not undermine the equilibrium derived in the previous section, provided that the upper limit is not binding.

Strictly speaking, the amount of the bold claim should be an optimum in the presence of an increasing marginal disincentive to boldness. Because the penalties for being caught in a bold claim do not vary with the amount of boldness, Bob would never venture claims below the point at which the marginal disincentive just outweighs the marginal benefit. In the presence of increasing marginal disincentive, a slightly bold claim is never made.

Thus Bob's strategy is to see t and then form a probability $q(t)$ of making the modest claim. Otherwise he makes the bold claim $t+u$ where u is a constant independent of t . The payoff of the modest claim is t , but when a bold claim is investigated and found to be excessive, a penalty of $k+s$ applies. Thus the bold claim earns $t-k-s$ if the insurer investigates it or $t+u$ if she does not. The strategy is the function $q(t)$.

The insurer Alice sees the claim m . Her strategy is to investigate claims with probability $r(m)$. Investigation has a cost c . The payout of the insurer is m if she does not investigate. If she investigates and the claim is modest, she pays $m+c$, but if the claim is bold she pays only $t+c-s$. As before there is a uniform prior distribution $p(t)$ of the variable t .

The interesting equilibria involve random play. For the client, random play is optimum only if

$$t = (1 - r(t + u))(t + u) + r(t + u)(t - k - s) \quad (31)$$

For the insurer the condition for random play is

$$m = c + \frac{q(m)m + (1 - q(m - u))(m - u - s)}{q(m) + 1 - q(m - u)} \quad (32)$$

The implied behavior is not too complex. The condition of random play by the client in equation (31) determines the strategy of the insurer as a constant

function. The other condition leads to a first-order difference equation that tends towards a steady state. Therefore consider a steady-state version of the game that has a solution in constant functions $r(m) = r$ and $q(t) = q$. The steady state might be thought of as a game without an upper or a lower limit to the quality variable t . For the steady state, r and q must satisfy equations (31) and (32) above, which become

$$t = (1 - r)(t + u) + r(t - k - s) \quad (33)$$

and

$$m = c + qm + (1 - q)(m - u - s) \quad (34)$$

The solution for the probability of the adjuster's investigating claims is,

$$r = \frac{u}{u + k + s} \quad (35)$$

and for the probability of the client's making a modest claim it is

$$q = \frac{u - c + s}{u + s} \quad (36)$$

The difficult part of the model is the behavior induced by boundaries. Start by looking at claims that are near the upper boundary. In particular propose a solution in which $q(t) = 1$ for all $m \in (1 - u, 1]$. Let m_o be such a value. There is a linkage connecting m_o to $m_1 = m_o - u$, $m_2 = m_o - 2u$, etc. It arises from equation (32) which boils down to

$$q(m - u) = 1 - \frac{c}{u - c + s}q(m) \quad (37)$$

For clarity define the difference scheme $y_n = q(m_o - nu)$. It satisfies

$$y_n = 1 - \frac{c}{u - c + s}y_{n-1} \quad (38)$$

The sequence of values $y_o = q(m_o)$, $y_1 = q(m_o - u)$, $y_2 = q(m_o - 2u)$, etc. is thus a linear difference equation with constant coefficients. A particular solution to the inhomogeneous equation is the steady state value found above in equation (36). Represent that solution here by

$$\bar{y} = \frac{u - c + s}{u + s} \quad (39)$$

The homogeneous equation has a solution of the form

$$y_n = x^n \quad (40)$$

The unknown x must satisfy

$$x + \frac{c}{u - c + s} = 0 \quad (41)$$

which implies the value

$$x = -\frac{c}{u - c + s} \quad (42)$$

The requirement for a convergent solution is $|x| < 1$ which reduces to the condition

$$2c < u + s \quad (43)$$

It will appear again.

The general solution is then dependent on a parameter A and has the form

$$y_m = \bar{y} + Ax^n \quad (44)$$

The A is selected to satisfy the initial condition $y_o = 1$. The result is $A = 1 - \bar{y}$ and the whole equation is

$$y_m = \bar{y} + (1 - \bar{y})x^n \quad (45)$$

The solution starts at $y_o = 1$ and converges towards the steady \bar{y} of equation (39) which is surely in the interval $(0, 1)$. There is some concern that y_1 or y_2 might not fall in the unit interval. That must be checked directly by substituting with the result

$$y_1 = \frac{u - c + s}{u + s} \left[1 - \left(\frac{c}{u - c + s} \right)^2 \right] \quad (46)$$

This value is positive under the cost condition of equation (43) above. The next value is

$$y_2 = \frac{u - c + s}{u + s} \left[1 + \left(\frac{c}{u - c + s} \right)^3 \right] \quad (47)$$

This value must be less than unity, and after much derivation it can be seen that it is less than unity under the cost condition of equation (43). Because the sequence is converging towards an interior point, higher n 's do not require checking. The application of the difference scheme to equilibrium ceases when the next value of m_n would be a negative number.

The adjustment at the lower boundary has implications for the behavior of the insurer Alice. In equilibrium, she will know that a claim $m \in [0, u]$ must be a modest one. Therefore $r(m) = 0$ in this domain. The irrationality of the claimant Bob in this area limits him to just the true, modest claim. That concludes the solution for a single chain of claims.

The difference scheme for each other $m \in (1 - u, 1]$ is the same and gives rise to the same difference equation and solutions. The modifications at the lower extreme are the same. Thus blocks of values of width u are connected by the difference equation and within each block all behavior is the same. That completes the establishment of equilibrium whose character is summarized in the words "top-down."

The top-down equilibrium is valid as long as the cost condition $2c < u + s$ is satisfied. Relaxing the assumption is important. For the case of $2c = u + s$, equilibrium is typified by the difference equation derived above, but now the probabilities $q(m)$ of modest claims vibrate between zero and unity. Thus

starting at some $m_o \in (1 - u, 1]$, $q(m_o) = 1$, $q(m_1) = 0$, $q(m_2) = 1$, $q(m_3) = 0$, and so on. As a result insurer Alice receives on-path messages in the alternating blocks $(1 - u, 1]$, $(1 - 3u, 1 - 2u]$ etc. She still randomizes investigation in those intervals (at the rate $r(m) = .5$). A message in one of the other intervals is off the equilibrium path. Seeing such a claim, Alice reasonably infers that the claim has a probability .5 of being a modest claim (an escapee from the block above) and .5 of being bold (an upstart from the block below). These are the same as the probabilities of modest claims in the on-path intervals because $2c = u + s$, and consequently her optimum response is to investigate at the same rate as in the on-path intervals. This off-path behavior supports the behavior in the on-path segments. The equilibrium is zebra-striped.

The case of $2c > u + s$ is treated differently. The equilibrium is defined by a bottom-up difference scheme. Where the top-down equilibrium starts with every claimant in the top interval playing the modest claim, this equilibrium requires that every claimant in the bottom interval, i.e., in $[0, u)$ should make a bold claim. Those claims form the initial point of a difference equation in equilibrium conditions for mixed plays that marches up the value scale in blocks of width u . In the last step the bounded rationality of the claimant has him claiming impossible values above unity. The insurer takes full advantage, investigates them all and wins every case. This is similar to the slight irrationality around very low values in the previous case.

Qualitatively the situation is not much different from before. There is a steady state which is the limit of a convergent sequence but is never fully reached because the true values leave the unit interval after a finite number of steps.

6.1 Relations of the equilibria

Suppose one imagines that the upper limit u in this section is present but not binding in the pure strategy claiming equilibrium. Let the upper limit be lowered slowly and observe the sequence of equilibria that occur. As part of the process, the cost of investigation is rising. That makes sense because discrediting a very bold claim is not very costly, but discrediting one that is just at the edge of credibility is more so.

The sequence of equilibria is as follows: At first, the upper limit is more than .5, which will be the first point at which it becomes binding. Equilibrium is in pure strategies as described in a previous section. As the upper limit descends but is not yet binding, the cost of investigation might rise, moving σ higher and extending the area in which it is claimed. At $u < .5$, the pure strategy equilibrium cannot stand. When Bob sees values of $t \in (\sigma + k + s, \sigma + \frac{1}{2} - u)$ he can no longer place his claim in the on-path region $[\sigma + \frac{1}{2}, \infty)$. A lower claim must be made, it must become an on-path claim, and when it does it eliminates σ as an on-path claim. The pure strategy equilibrium has broken down.

In this situation, the cost of investigation is still low because the upper limit is permissive. One reasonably supposes that $2c < u + s$. Therefore the top-down equilibrium exists. Further lowering of u and raising of c leads to the zebra equilibrium and then to the bottom-up kind.

6.1.1 Comparative statics of mixed strategy equilibrium:

The mixed-strategy equilibria are complex. A complete analysis of the comparative statics would be extremely complex. As a beginning, consider the comparative statics of the steady state as reflected in equations (35) and (36) which are repeated here:

$$r = \frac{u}{u + k + s} \quad (48)$$

$$q = \frac{u - c + s}{u + s} \quad (49)$$

The comparative statics are not wholly intuitive. The court cost variable affects the probability of investigation, not the probability of bold claiming. Similarly, the cost of investigation affects only the probability of bold claiming, not the probability of investigation.

The interesting variable is r because of its relation to socially wasteful expenditure on investigations. One idea is to end all investigation by imposing a very low value of u . Setting u to zero is not needed. In fact, at $u < c - s$, the condition of randomization by the insurer (equation (49)) no longer holds, the insurer never investigates, and the probability of bold claims reaches unity. Thus the good outcome has the odd property that all claims are bold. The result is efficient in the sense of resolving all matters outside of court. Perhaps this is the outcome envisioned in laws penalizing fraud and claims abuse. However, the result depends heavily on having some mechanism for enforcing the upper limit u , that is, for detecting fraudulent claims. In this equilibrium that mechanism is entirely independent of screening by the insurers. So the situation may not be very realistic.

6.2 Discussion:

Courts and legislatures try to limit aggressive behavior in claiming and claims adjustment by restraints like the one studied here. The complexities of the behavior implied by the restraints limitations are perhaps not anticipated. The interpretation is that actual behavior probably is near to the game theory equilibrium but within that vicinity it is unpredictable and inconstant. The probabilities of bold claiming and of investigations are volatile.

The analysis suggests an important distinction between targets and instruments. Build-up and adjustment abuse are not themselves objectives to be minimized in the context of economic efficiency. The objective is to minimize the wasteful responses, that is to minimize claims investigations and the hiring of attorneys. The underlying behaviors will still be there, taking on equilibrium values.

The main point of this paper is the symmetry between the activities of aggressive claimants and those of stingy adjusters. Essentially the same models give insights into the activities of both.

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