Litigation under Loss Aversion

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April 18, 2018

Abstract

In this paper, we build a model to show how loss aversion affects people’s behavior in litigation. We find that a loss-averse plaintiff demands a higher offer for small claims to maintain her threat to proceed to trial compared to a loss-neutral plaintiff. For large claims, a loss-averse plaintiff demands a lower offer to increase the settlement probability as loss pains her extra in trial. We also investigate how fee-shifting rules and an in-court settlement system affect loss-averse litigants’ decisions.

1 Introduction

Starting with Kahneman and Tversky’s prospect theory (Kahneman and Tversky 1979), numerous studies have established that decision makers evaluate options based on gains and losses in comparison with a reference point. The evaluation is asymmetric: losses loom larger than same-sized gains. This phenomenon is typically referred to as loss aversion. Loss aversion is observed in many real-world contexts, lab and field experiments. It has been proven to be a powerful explaining tool. For instance, combining loss aversion and myopia, Benatzi and Thaler (1993) provided an explanation to the equity premium puzzle. Camerer et al. (1997) used loss aversion to make sense of cab drivers’ decisions on their daily working hours. Several studies (Thaler 1980, Knetsch and Sinden 1984, and Thaler and Johnson 1990) used loss aversion to explain the fact that people place higher value on objects which they already have compared to those they do not have (endowment effect). Loss aversion also helps to explain the sunk cost fallacy or the escalation of commitment (Arkes and Bloomer 1985). It has an important impact on legal theories as well. For example, Zamir and Ritov (2010) used loss aversion to explain the popularity of contingent-fee arrangement, which costs 2 or 3 times higher than a hourly rate or fixed amount arrangement. Wistrich and Rachlinski (2012) found that loss aversion and the sunk-cost fallacy lead experienced lawyers to prolong litigation, which hurts their clients. In this paper, we study how loss aversion affects participants’ litigation choices about settlement.

Litigation is one of the most important aspects of a modern legal system. In 2000, about 2.3 million noncriminal cases were filed in US federal courts and approximately 20.1 million noncriminal cases were filed in State courts (Ostrom, Kauder, and LaFountain 2001). However, most cases do not go to trial: they are dropped, resolved by motions, or settled in some way. Data on US State courts show that over 96 percent of civil cases do not go to trial (Ostrom, Kauder, and LaFountain 2001). Similarly, data on federal courts demonstrate that, for fiscal year 2001, almost 98 percent of civil cases were resolved without trial (Judicial Business of the United States Courts: 2001).
The economic theories of litigation started with Landes (1971) and Gould (1973). Subsequently, scholars started to use asymmetric information to model litigation and settlement behavior. In the litigation setting, the plaintiff may have private information of the damages she has suffered and the defendant may have private information about his liability for the accident. Farber and White (1991) and Osborne (1999) provided empirical evidence for the existence and the importance of asymmetric information in litigation. P’ng (1983) and Reinganum and Wilde (1986) used a signaling model where the informed party makes the settlement offer. In P’ng (1983), the settlement amount is assumed exogenous while Reinganum and Wilde (1986) endogenized it. Bebchuk (1984) adopted a screening setting where the uninformed party makes a settlement offer to the informed. Spier (1992) extended Bebchuk (1984) framework by allowing multiple periods of bargaining to explain the "U-shaped" time pattern of settlement. Schweizer (1989) and Spier (1994) explored litigation games with two-sided asymmetric information.

Given how pervasive loss aversion is, it is important to understand how litigants’ behavior is affected by it. In this paper, we try to answer this question from a theoretical perspective. Specifically, we are interested in how loss aversion affect litigants’ decisions such as filing a lawsuit and choosing a settlement offer. We show that loss aversion significantly affects plaintiff’s decisions. In particular, contrary to what first intuition suggests, loss-averse plaintiff’s are not uniformly likely to litigate less than loss-neutral litigants.

We build our model based on Bebchuk (1984): an uninformed plaintiff makes a settlement offer to an informed defendant. If the offer is rejected, the plaintiff can drop the suit and save litigation costs. Therefore, the plaintiff’s offer is only valid if she can maintain her threat to proceed to trial following rejection. Although it is intuitive that loss aversion makes for weaker plaintiffs who settle for less, it only happens when the stake is high enough. The need to remain credible induces loss-averse plaintiffs to ask for more when stakes are low.

Section 2 introduces our baseline model and the main results. Section 3 discusses comparative statics regarding litigation costs and distribution of the defendant’s type. Section 4 discusses fee-shifting rules and an in-court settlement system. Section 5 concludes.

2 Baseline Model

2.1 Setup

In this section, we introduce the baseline litigation model featuring asymmetric information and a loss-averse plaintiff. We assume that there are two players, the plaintiff (P) and the defendant (D). For convenience, we take to the plaintiff to be female and the defendant male. The plaintiff sues the defendant for compensation W, which is assumed to be fixed and publicly known to both sides at the beginning of the game. If they proceed to the trial stage, the plaintiff pays fixed litigation
costs $C_p$ and the defendant pays $C_d$. Those represent the direct and opportunity costs associated with introducing and supporting a formal lawsuit. If parties manage to work out a settlement before trial, then they save those litigation costs. If the plaintiff does not drop the suit after settlement fails, then trial follows. A more detailed description of the timing comes later in this section. For the time being, we introduce the key assumptions of the model.

Asymmetric information The defendant is assumed to have private information about the strength of his case. To be specific, he knows his probability of losing in trial, which is randomly and privately drawn at the beginning of the game and is denoted by $p \in [0, 1]$. The plaintiff, on the other hand, only knows the distribution of $p$, represented by a p.d.f. $f(\cdot)$ and a corresponding c.d.f. $F(\cdot)$. Based on this limited information, she makes a unique settlement offer to the defendant.\footnote{One could of course consider the theoretical case where the plaintiff attempts to screen defendants by offering them to choose their preferred option among a menu of settlements and continuation probabilities, so that they truthfully reveal their type. It is however hard to think of a situation where the plaintiff could commit herself to proceed to trial with a given probability. On the contrary, we believe that the plaintiff can always choose to drop the lawsuit after her offer has been rejected and that is what we choose to model the process as we do.}

Loss-averse plaintiff The plaintiff is assumed to have reference-dependent utility function with loss aversion. We use Kahneman and Tversky’s value function of income $w$ with respect to a fixed reference point:

$$u(w|r) = \begin{cases} w - r & \text{if } w \geq r \\ \mu(w - r) & \text{if } w < r \end{cases} \quad (1)$$

In the gain domain, the utility is the difference between actual income $w$ and reference income $r$. In the loss domain, the difference is multiplied by loss aversion coefficient $\mu$. We assume that $\mu \geq 1$. This coefficient describes the importance of loss aversion in the plaintiff’s preferences: for $\mu = 1$, the plaintiff is a standard expected utility maximizer; for $\mu > 1$, losses loom larger in her assessment of uncertain prospects, and the more so, the higher $\mu$. In what follows, we assume $r$ to be equal zero. That is, we assume that the reference point is the status quo prior to starting litigation. The use of such a reference point is supported by experimental studies (Zamir and Ritov 2012).

We assume that utility is linear in $w$. That is, we assume that the plaintiff is risk-neutral in the gain and loss domains, respectively, and isolate the effects of loss aversion. In practice, individuals are likely to exhibit both risk and loss aversion. For simplicity, we circumvent the differences in risk attitudes and focus exclusively on the fact that losses loom larger than gains. In the conclusion, we elaborate on the changes which risk aversion would bring to our analysis.

Whether the defendant also exhibits loss aversion (which may be an empirical issue if, for instance, it is a corporation in an individual tort case) is immaterial to our analysis. Winning, losing or accepting the settlement offer, the defendant always finds himself in the loss domain. Every payment he makes is multiplied by coefficient $-\mu$ in his utility function, so that the exact level of $\mu$ does not matter for his decisions.
Timing and choices The timing of the game is in the following table:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 0</strong></td>
<td>Nature</td>
</tr>
<tr>
<td><strong>Stage 1</strong></td>
<td><em>D</em>’s private information <em>p</em> is drawn from <em>F</em></td>
</tr>
<tr>
<td><strong>Stage 2</strong></td>
<td><em>P</em> decides whether to bring a lawsuit against <em>D</em></td>
</tr>
<tr>
<td><strong>Stage 3</strong></td>
<td><em>D</em> chooses whether to accept the offer or not</td>
</tr>
<tr>
<td><strong>Stage 4</strong></td>
<td><em>P</em> decides whether to drop the case</td>
</tr>
<tr>
<td></td>
<td><em>D</em> pays nothing</td>
</tr>
<tr>
<td></td>
<td><em>P</em> pays <em>C</em>&lt;sub&gt;p&lt;/sub&gt;, <em>D</em> pays <em>C</em>&lt;sub&gt;d&lt;/sub&gt;</td>
</tr>
<tr>
<td></td>
<td><em>D</em> pays <em>W</em> (with probability <em>p</em>)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Offer Rejected</th>
<th>Offer Accepted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case dropped</td>
<td>Case pursued</td>
</tr>
</tbody>
</table>

Table 1. Timing of the litigation game

Compared to Bebchuk (1984), one noticeable feature of our game is as follows: if the settlement offer is rejected, then the plaintiff has the chance to drop the suit. In that case, she does not pay litigation costs *C*<sub>p</sub> but receives nothing from the defendant. This means that in the pre-trial settlement phase of the game, players have to look at the credibility of the implicit threat by the plaintiff to actually proceed with trial in case her settlement offer is rejected, a point made by Nalebuff (1987).

We solve the game for perfect Bayesian equilibria. Before going into the actual analysis, we survey the key decisions to be made by players, following backward induction.

Dropping the suit? In stage 4, the plaintiff decides whether to drop the suit or not in case her offer is rejected. Depending on the amount of the rejected offer, the plaintiff updates her belief about the defendant’s type *p*. Then, she makes her decision by comparing the expected utility of trial (formally defined later) and that of dropping the suit, which is assumed to be zero. For convenience, we assume that the plaintiff pursues the lawsuit if she is indifferent between dropping it and pursuing it.

Accepting the offer? In stage 3, the defendant decides whether to accept the offer he received or not. The decision will depend on whether a trial is likely to follow or not and, in case it is, on the expected trial costs, compared to those of accepting the settlement.

Making an offer. In stage 2, anticipating the defendant’s behavior and her own decisions regarding pursuing the lawsuit in case her offer is rejected, the plaintiff chooses a settlement amount that maximizes her expected utility. At this stage, she faces a credibility constraint: an offer that is too generous might be rejected by many defendant types, which would prevent her from rationally continuing with the litigation.
Bringing the lawsuit? If the plaintiff always gets negative utility from trial, she will drop the suit in stage 4. She thus gets zero utility from bringing the lawsuit and is indifferent between bringing the lawsuit and not bringing it. For convenience, we assume that she will not bring the lawsuit in the first place.

2.2 Formal Solution

In an equilibrium \( \{ L, S^*, r(S, p), b'(S), d'(S) \} \), \( L \in \{0, 1\} \) is the plaintiff’s decision about whether to bring the lawsuit or not. \( S^* \) is the equilibrium offer made by the plaintiff. \( r(S, p) \) is the probability that a type \( p \) defendant rejects offer \( S \), where \( r \in [0, 1] \). \( b'(S) \) and \( d'(S) \in [0, 1] \) characterize the plaintiff’s belief about the distribution of the defendant’s type at trial and choice of dropping the suit, respectively, if offer \( S \) is rejected. We start by showing that an offer with \( d'(S) = 1 \) (the plaintiff drops the suit after rejection with probability 1) is always rejected in an equilibrium.

Lemma 1. In a perfect Bayesian equilibrium, if the plaintiff drops the suit after rejection of offer \( S(d'(S) = 1) \), \( S \) will be rejected with probability 1 by all types of defendants.

Proof. In the proper sub-game after the plaintiff makes offer \( S \), if a defendant with type \( p \) chooses \( r(S, p) < 1 \), then his expected payment is positive: \( (1 - r) S \). If he switches to rejecting for sure, his expected payment is 0 since the plaintiff drops the suit following rejection. Hence, all types should reject offer \( S \).

An immediate consequence is that, if an equilibrium involves such an offer on the equilibrium path \( (d'(S^*) = 1) \), the plaintiff’s payoff from bringing the lawsuit is zero. By our assumption, the plaintiff then does not bring it. Next, we show that the defendant’s equilibrium choice exhibits a cut-off property.

Lemma 2. In a perfect Bayesian equilibrium, for an offer \( S \) with \( d'(S) \in [0, 1] \), if a type \( \tilde{p} \) defendant weakly prefers rejecting to accepting, then a defendant with \( p < \tilde{p} \) strongly prefers rejecting to accepting.

Proof. For the proper sub-game after the plaintiff makes offer \( S \), the defendant expects the plaintiff to pursue the case with some probability if he rejects the offer \((d'(S) \in [0, 1]) \) by assumption. The defendant will compare the outcome of accepting the offer and that of rejecting it. For a defendant with type \( p \), the expected utility from rejecting the offer is (subscript \( d \) stands for defendant):

\[
U_{d}^{trial}(p) = -(1 - d'(S)) \left( p W + C_d \right)
\]
The expected utility from accepting the offer is $-S$. As $U_d^{\text{trial}}(p)$ is decreasing in $p$, $U_d^{\text{trial}}(\tilde{p}) > -S$ implies that $U_d^{\text{trial}}(p) > -S$ for $p < \tilde{p}$.

Notice that sequential rationality requires that Lemma 1 and Lemma 2 hold for equilibrium offer $S^*$ as well as any other offer $S$ off the equilibrium path. Furthermore, as we assumed that the plaintiff pursues the trial when she’s indifferent, we have either $d^*(S) = 1$ or $d^*(S) = 0$ for a proper sub-game after the plaintiff makes offer $S$.

For the equilibrium offer $S^*$, it is safe to restrict its range to $[C_d, W + C_d]$ without loss of generality. $S^* = C_d$ is the highest offer that is accepted with probability 1 by all defendants. In equilibrium any choice $S^* < C_d$ is dominated by $S^* = C_d$ because the latter brings the plaintiff a higher settlement amount and is accepted for sure. $S^* = W + C_d$ is the lowest offer that is rejected with probability 1 by all defendants. Any choice $S^* > W + C_d$ leads to the same outcome as $S^* = W + C_d$ because the defendant rejects and trial follows with probability 1.

Furthermore, directly from Lemma 2, for an offer within the range $[C_d, W + C_d]$ with $d^*(S) = 0$, the defendant’s equilibrium choice is characterized by a cut-off type $p(S)$:

$$p(S) = \frac{S - C_d}{W} \quad (2)$$

If $p < p(S)$ for the defendant, he will reject $S$ for sure; if $p > p(S)$, he will accept $S$ for sure.

From the plaintiff’s perspective, the probability of trial is therefore $F(p(S))$ and her expected utility is (with subscript $p$ standing for plaintiff):

$$U_p(S) = [1 - F(p(S))] S + \int_0^{p(S)} [p W - C_p - (\mu - 1) (1 - p) C_p] f(p) dp \quad (3)$$

Loss aversion introduces an asymmetry between settlement and trial to the plaintiff’s choice: settlement is a sure gain while trial might lead to a loss (given the existence of trial costs). If she indeed loses in trial, the loss will be multiplied by $\mu$. The solution to the first-order condition, $S^{\text{foc}}$, is characterized by:

$$1 - F(p(S^{\text{foc}})) = f(p(S^{\text{foc}})) p'(S^{\text{foc}}) (C_p + C_d) + (\mu - 1) f(p(S^{\text{foc}})) p'(S^{\text{foc}}) (1 - p(S^{\text{foc}})) C_p \quad (4)$$

For the first-order condition to uniquely pin down an interior solution $p(S^{\text{foc}})$ and thus $S^{\text{foc}}$, we need the following assumptions on the distribution of $p$.

Assumptions: For the p.d.f. $f(\cdot)$ and the corresponding c.d.f. $F(\cdot)$, we assume that:

1. $\frac{1}{f(0)} > \frac{\mu C_p + C_d}{W}$
2. $\frac{f(p)}{1-F(p)}$ is increasing in $p$

3. The concavity of $\frac{f(p)}{1-F(p)}$ does not change in $[0,1]$: $\text{sign}(\frac{\partial^2 f(p)}{\partial p^2}) \geq 0$ or $\leq 0$ for $p \in [0,1]$.

The first assumption guarantees that the marginal benefit of settlement is high enough at $p(S) = 0$. Along with the second assumption, which is the standard increasing hazard rate property, it guarantees that an interior solution exists. The third assumption guarantees the uniqueness.

In the first-order condition (4), the left-hand side of the above equation is the marginal benefit of further increasing $S$. Such an offer is accepted with probability $1 - F(p(S))$. If accepted, the plaintiff’s payoff is marginally increased by 1. The right-hand side denotes the marginal cost of increasing $S$. For a higher $S$, the marginal defendant, whose type is $p(S)$, will shift from accepting to rejecting. The plaintiff bears the full costs of this shift, which are the litigation costs $C_p + C_d$ multiplied by the intensity of the marginal shift. The second term results from loss aversion: against the marginal type $p(S)$, the plaintiff’s losing probability is $(1-p(S))$, which costs her $(\mu - 1)C_p$ in addition.

The above only applies to offers with $d'\geq(S)=0$. For this condition to hold, the trial stage utility must be non-negative. With the cut-off property of defendant’s rejection choice, the expected trial stage utility is properly defined as below:

$$U_{p�试}(S) = \mathbb{E}[p|p < p(S)]W - C_p - (\mu - 1) \left(1 - \mathbb{E}[p|p < p(S)]\right)C_p$$

Thus, the plaintiff’s objective becomes:

$$\max_S U_p(S) \quad s.t. \quad U_{p测试}(S) \geq 0$$

$U_{p测试}(S)$ is the expected utility in the trial stage. It is increasing in $S \in [C_d, W + C_d]$: when the plaintiff makes a higher settlement offer, the expected winning probability $\mathbb{E}[p|p < p(S)]$ becomes higher as the marginal type $p(S)$ becomes higher. Demanding more in the settlement, the plaintiff pushes weaker defendants to trial, which means that she faces a more favorable pool of defendants. Therefore, the credibility constraint puts a lower bound on the settlement offer. We use $S$ to denote the lower bound. It is the solution to the following:

$$U_{p测试}(S) = E[p|p < p(S)]W - C_p - (\mu - 1) \left(1 - E[p|p < p(S)]\right)C_p = 0 \quad (5)$$

the optimal settlement offer $S^*$ is therefore given by:

$$S^* = \max (S^{foс}, S) \quad (6)$$

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2. It means that in calculating plaintiff’s utility of bringing the lawsuit, we assume that $W$ is high enough such that trial is profitable for the plaintiff against the average defendant. If $U_{p测试}(S) < 0$ for any $S$, the plaintiff does not bring the lawsuit as we assumed.
2.3 Comparison with a traditional plaintiff

We now compare a loss-averse plaintiff's choices ($S^*$ and $d^*(S)$) with those of a loss-neutral plaintiff ($\mu = 1$). We use subscript $tp$ to denote such a 'traditional plaintiff'. Her objective is (assuming that bringing the lawsuit is profitable):

$$\max_S U_{tp}(S) = \int_0^{p(S)} (pW - C_p) f(p) dp + (1 - F(p(S))) S$$

s.t. $U_{tp_{trial}}(S) = \int_0^{p(S)} (pW - C_p) \frac{f(p)}{F(p(S))} dp \geq 0$

This is also a constrained maximization problem: the plaintiff chooses a settlement offer that maximizes her expected utility given that her trial stage utility is non-negative if this offer is rejected. Similar to (4) and (5), we can solve for $S_{tp_{foc}}$ by (4') and $S_{tp}$ by (5'):

$$1 - F(p(S_{tp_{foc}})) = f(p(S_{tp_{foc}})) p'(S_{tp_{foc}}) (C_p + C_d)$$

$$U_{tp_{trial}}(S_{tp}) = 0 \Rightarrow E[p | p < p(S_{tp})] W - C_p = 0$$

The solution is:

$$S_{tp} = \max(S_{tp_{foc}}, S_{tp})$$

Comparing the settlement offers ($S^*$ and $S_{tp}$) and the probabilities of trial ($F(p(S^*))$ and $F(p(S_{tp}))$), we find that the result depends on compensation $W$. We have the following proposition:

**Proposition 1.** Compared with a traditional plaintiff, there exist unique $W_{tp}$, $W$ and $\tilde{W}$ ($W_{tp} < W < \tilde{W}$) such that:

1. For very small claims ($W_{tp} \leq W < W$), a loss-averse plaintiff does not file a lawsuit while a traditional plaintiff does.

2. For big claims ($W \geq \tilde{W}$) 1) a loss-averse plaintiff demands a smaller settlement; 2) the probability of trial is lower; 3) total expected litigation costs are lower.

3. For medium claims ($W \leq W < \tilde{W}$), 1) a loss-averse plaintiff demands a higher settlement offer to make her threat to litigate credible; 2) the probability of trial is higher; 3) total expected litigation costs are higher.

The three critical values for $W$ are defined as follows:

$$W_{tp} = \frac{C_p}{E[p]}$$
\(W_{tp}\) is the minimum of compensation level which incentivizes the traditional plaintiff to introduce the lawsuit. \(W\) is the minimum of compensation level which incentivizes the loss-averse plaintiff to introduce the lawsuit:

\[
W = (1 + (\mu - 1) (1 - \mathbb{E}[p])) \frac{C_p}{\mathbb{E}[p]}. 
\]

\(\hat{W}\) is implicitly defined as:

\[
S(\hat{W}) = S_{tp}^{loc}(\hat{W})
\]

It is the compensation level at which the loss-averse plaintiff and the traditional plaintiff choose the same settlement offer. The existence and uniqueness of \(\hat{W}\) will be shown in the proof.

**Proof of Proposition 1:**

The loss-averse plaintiff’s trial stage utility is:

\[
U_p^{trial}(S) = \mathbb{E}[p|p < p(S)] W - C_p - (\mu - 1) (1 - \mathbb{E}[p|p < p(S)]) C_p
\]

We have \(d U_p^{trial} / d p(S) > 0\). And since \(d p(S) / d S \geq 0\), we have \(d U_p^{trial} / d S \geq 0\). This means the maximum of \(U_p^{trial}\) is achieved at \(p(S) = 1\) and \(S \geq W + C_d\) for any given \(W\). We use \(\overline{U}_p^{trial}\) to denote this maximum:

\[
\overline{U}_p^{trial} = E[p] W - C_p - (\mu - 1) (1 - E[p]) C_p 
\]

We also have that \(d U_p^{trial} / d W > 0\). By definition of \(W\), \(\overline{U}_p^{trial} = E[p] W - C_p - (\mu - 1) (1 - E[p]) C_p = 0\). So, for \(W < W_{tp}\), \(U_p^{trial}(S) < 0\) for any \(S\). Hence, the credibility constraint cannot be met and the plaintiff will drop the suit for sure if a settlement offer is rejected. By Lemma 1, all types of defendants reject the offer. Therefore, the loss-averse plaintiff will not bring the lawsuit. A similar proof goes for the traditional plaintiff for \(W < W_{tp}\). As \(W_{tp} = \frac{C_p}{E[p]} < W\), a loss-averse plaintiff does not file a lawsuit while a traditional plaintiff does for \(W \in [W_{tp}, W)\). This proves part 1 of Proposition 1.

To prove part 2 and 3 of Proposition 1, we state the following two lemmas.

**Lemma 3.** \(S > S_{tp}; S_{foc}^{loc} < S_{tp}^{loc}\).

**Proof.** The proof of this lemma directly follows the definition of the relevant settlement offers. For \(S\) and \(S_{tp}\), we have:

\[
E[p|p < p(S)] W - C_p = (\mu - 1) (1 - E[p|p < p(S)]) C_p
\]

(5)

\[
E[p|p < p(S_{tp})] W - C_p = 0
\]

(5')

As \(\mu > 1\) and \(\mathbb{E}[p|p < x]\) is weakly increasing in \(x \in [0, 1]\), we have \(S > S_{tp}\). Moreover, \(S(W)\) and \(S_{tp}(W)\) are implicitly defined from the above equations. By the implicit functions theorem, they are continuous functions.
For $S_{tp}^{foc}$ and $S_{tp}^{foc}$, using $p'(S) = 1/W$, we have

$$1 - F(p(S_{tp}^{foc})) = f(p(S_{tp}^{foc})) (C_p + C_d) / W$$

$$+ (\mu - 1) f(p(S_{tp}^{foc})) (1 - p(S_{tp}^{foc})) C_p / W$$

(4)

$$1 - F(p(S_{tp}^{foc})) = f(p(S_{tp}^{foc})) (C_p + C_d) / W$$

(4')

Similarly, $S_{tp}^{foc}(W)$ and $S_{tp}^{foc}(W)$ are implicitly defined from the above first-order conditions (4) and (4') and they are thus continuous functions of $W$. To see that $S_{tp}^{foc}$ is smaller, we check what happens on the margin if the loss-averse plaintiff chooses $S_{tp}^{foc}$ instead. The first-order derivative becomes:

$$U''(S_{tp}^{foc}) = - (\mu - 1) f(p(S_{tp}^{foc})) (1 - p(S_{tp}^{foc})) C_p / W < 0$$

Therefore, $S_{tp}^{foc} < S_{tp}^{foc}$.

To continue with the proof, we define two more critical values of $W$. For the loss-averse plaintiff, $W_p$ is defined as in $S_{tp}^{foc}(W_p) = S(W_p)$; for the traditional plaintiff, $W_{tp}$ is defined in $S_{tp}^{foc}(W_{tp}) = S_{tp}(W_{tp})$. $W_p$ ($W_{tp}$) is the lowest compensation at which the constraint $U_{tp}^{trial}(S) \geq 0$ ($U_{tp}^{trial}(S) \geq 0$) is slack for the loss-averse (traditional) plaintiff.

To see that $W_p$ is uniquely defined, we use the fact that for $W \geq W_p$, we have:

$$dp(S_{tp}^{foc}) / dW > 0, \quad dp(S) / dW < 0$$

At $W = W_p$, an equilibrium offer cannot be lower than $W + C_d$ due to the credibility constraint: we have $p(S) = 1 > p(S_{tp}^{foc})$.\(^3\) For $W \to \infty$, $p(S) \to 0$ and $p(S_{tp}^{foc}) \to 1$.

From the intermediate value theorem, we can find $W_p$ such that $p(S_{tp}^{foc}) = p(S)$ and $S_{tp}^{foc}(W_p) = S(W_p)$. Similar proof goes for the traditional plaintiff. At $W = W_{tp}$, we have $S_{tp}^{foc}(W_{tp}) = S_{tp}(W_{tp})$.

Lemma 4. At $W = W_{tp}$, $p(S^*) > p(S_{tp}^{*})$ and $S^* > S_{tp}^{*}$; for $W > W_{tp}$, $S_{tp}^* = S_{tp}^{foc}$. For $W \in [W_{tp}, \tilde{W}_{tp}]$, $U_{tp}^{trial}(S) \geq 0$ constraint is binding for the traditional plaintiff.

At $W = W_{tp}$, $p(S^*) < p(S_{tp}^{*})$ and $S^* < S_{tp}^{*}$; for $W > W_{tp}$, $S^* = S_{tp}^{foc}$. For $W \in [W, \tilde{W}_{tp}]$, $U_{tp}^{trial}(S) \geq 0$ constraint is binding for the loss-averse plaintiff. $\tilde{W}_{tp} < W_{tp}$.

Proof. At $W = W_{tp}$, $S_{tp}^* = S_{tp} = S_{tp}^{foc}$ (definition of $W_{tp}$). By Lemma 3, we have $S > S_{tp} = S_{tp}^{foc} > S_{tp}$. Therefore, $S^* > S_{tp}$ and $p(S^*) > p(S_{tp}^*)$.

At $W = W_{tp}$, $S^* = S = S_{tp}^{foc}$ (definition of $W_{tp}$). By Lemma 3, we have $S_{tp} < S = S_{tp}^{foc} < S_{tp}$. Therefore, $S^* < S_{tp}^*$ and $p(S^*) > p(S_{tp}^*)$.

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3. For $W = W_p$, the plaintiff’s expected utility from bringing the lawsuit and making a credible offer is zero. She is indifferent between bringing it and not. For simplicity, we assume that she brings the lawsuit, makes a credible offer and pursue the case to trial. We assume the same thing for traditional plaintiff for $W = W_{tp}$.
Since $S_{tp}^{foc} > S_{tp}$ at $\tilde{W}_p$ and $S_{tp}^{foc} = S_{tp}$ at $\hat{W}_p$, it means the credibility constraint is binding at $\hat{W}_p$ but not binding at $\tilde{W}_p$. We have $\hat{W}_p < \tilde{W}_p$.

Directly from Lemma 3 and Lemma 4, for $W < W < \tilde{W}_p$, the credibility constraint is binding for both kinds of原告. We have $S^* = S$, $S_{tp} = S_{tf}$, $S > S_{tp} \implies S^* > S_{tp}^*$ for $W > \tilde{W}_p$, neither is binding and we have $S^* = S_{tp}^{foc}$, $S_{tp} = S_{tf}^{foc}$, $S_{tf}^{foc} < S_{tp}^{foc} \implies S^* < S_{tp}^{foc}$.

Now we show that in interval $[\tilde{W}_p, \tilde{W}_p]$, there exist $W$ such that two plaintiffs make the same settlement offer. By Lemma 4, for $W \in [\tilde{W}_p, \tilde{W}_p]$, we have $S_{tp} = S_{tp}^{foc}$, $S^* = S$ and thus $p(S^*) = p(S)$ and $p(S_{tp}^*) = p(S_{tp}^{foc})$.

At $W = \tilde{W}_p$, $p(S_{tp}^*) < p(S^*)$; at $\tilde{W}_p$, $p(S_{tp}^*) > p(S^*)$. By the implicit function theorem, $p(S_{tp}^*)$ and $p(S^*)$ are continuous in $W \in [\tilde{W}_p, \tilde{W}_p]$ and we have the following monotonicity results from (4') and (5):

$$\frac{d p(S_{tp}^{foc})}{dW} > 0$$
$$\frac{d p(S)}{dW} < 0$$

From the intermediate value theorem, $p(S^*)$ and $p(S_{tp}^*)$ intersect at a unique point in $(\tilde{W}_p, \tilde{W}_p)$. We use $\hat{W}$ to denote this intersection. At $\hat{W}$, we have $S = S^* = S_{tp} = S_{tp}^{foc}$. The loss-averse plaintiff’s credibility constraint is binding while the traditional plaintiff’s is not. In sum, for $W \leq W < \hat{W}$, we have:

$$S^* > S_{tp}^*, p(S^*) > p(S_{tp}^*) \quad \text{if} \quad W \leq W < \hat{W}$$

Total expected litigation costs are higher if the plaintiff is loss-averse because the probability of trial is higher. For $W > \hat{W}$, we have:

$$S^* < S_{tp}^*, p(S^*) < p(S_{tp}^*) \quad \text{if} \quad W > \hat{W}$$

Total litigation costs are smaller if the plaintiff is loss-averse.

**End of proof Proposition 1.**

One might have thought that loss aversion makes for weaker plaintiffs who always settle for less. We show in Proposition 1 that the need to remain credible induces loss-averse plaintiffs to ask for more when stakes are low. So, under loss aversion it is harder to settle intermediate claims than big claims. Loss aversion helps to explain why we observe less settlement than the conventional model predicts.

### 2.4 A numerical example

The following figures give a numerical example of probabilities of trial $F(p(S^*))$ $(F(p(S_{tp}^*)))$, and settlement offers $S^* (S_{tp}^*)$ under different $W$ when $p$ follows a truncated normal distribution on $[0, 1]$. 

The results from Proposition 1 are clear from the figures. $\tilde{W}_p$ ($\tilde{W}_{tp}$) features a kink in the $S^*(W)$ ($S_{tp}^*(W)$) curve. For smaller $W$, the optimal settlement offer is determined by the credibility constraint; for larger $W$, the optimal offer is determined by the first-order condition. For $W \leq \tilde{W} < \hat{W}$, the loss-averse plaintiff demands a higher settlement to make sure that she will not drop the case if her offer
is rejected. For $W \geq \tilde{W}$, the loss-averse plaintiff demands a lower settlement offer to increase the probability of settlement. Both results come from the fact that the loss-averse plaintiff suffers additional utility loss when she loses in trial.

For $W < \tilde{W}_p$, neither a traditional plaintiff nor a loss-averse plaintiff finds it profitable to bring a lawsuit. For $\tilde{W}_p \leq W < W$, a traditional plaintiff brings a lawsuit but a loss-averse plaintiff does not. The intuition is that it is harder for a loss-averse plaintiff to profitably go to trial: she endures additional utility loss if she loses in trial compared to a traditional plaintiff. Thus, compensation $W$ has to be higher for the loss-averse plaintiff to bring a lawsuit.

3 Comparative statics

3.1 litigation costs

3.1.1 Plaintiff’s litigation costs $C_p$

The increase of the plaintiff’s litigation costs $C_p$ has the opposite effect of increase in $W$. If the credibility constraint is not binding, the increase of $C_p$ leads to lower probability of trial because the plaintiff prefers higher probability of settlement to avoid larger losses. The effect on total litigation cost is ambiguous. If the credibility constraint is binding, the increase of $C_p$ leads to higher probability of trial because the plaintiff has to increase the settlement offer to keep her threat to trial credible. The increase of litigation costs has a larger effect on the loss-averse plaintiff. If $C_p$ becomes too high for the plaintiff to profit from litigation, the probability of trial drops to zero. The following figure gives an illustration:

![Figure 3. the effect of $C_p$ on trial probabilities and on litigation costs](image)

3.1.2 Defendant’s litigation costs $C_d$

Assuming that $W$ is high enough such that the credibility constraint is not binding when $C_d = 0$. Increase in $C_d$ first leads to lower $p(S^*)$ as the marginal benefit of settlement becomes higher from the first-order condition (4). It means lower probability of trial. But when trial happens, litigation costs are higher due to increase in $C_d$. The effect on $S^*$ as well as the effect on total litigation costs is ambiguous.

Increase of $C_d$ cannot reduce $p(S^*)$ to zero due to the credibility constraint. The lower bound of $p(S^*)$ is determined by equation (5) and $C_d$ plays no part in it. Once the credibility constraint is binding, $S^*$ increases as $C_d$ does to keep $p(S^*)$ unchanged and thus to keep (5) satisfied. The following figures give an illustration:
Figure 4. the effects of $C_d$ on settlement offers and trial probabilities

Figure 5. the effects of $C_d$ on litigation costs

### 3.2 Distribution of $p$

In this subsection, we relax the assumption that the support of $p$ is $[0, 1]$. Instead, we assume the support is $[\bar{p}, \tilde{p}]$ with $\bar{p} > 0$ and $\tilde{p} < 1$. We consider two distributional changes regarding $p$.

First, we consider a shift to distribution $G(\cdot)$ in support $[a + \varepsilon, b + \varepsilon]$ with $g(x + \varepsilon) = f(x)$ for $x \in [\bar{p}, \tilde{p}]$. The new distribution $G(\cdot)$ first-order stochastically dominates distribution $F(\cdot)$. 
Under the new distribution $G(-)$, the plaintiff’s credibility constraint is less restrictive as the over all winning probability is higher. When the credibility constraint is not binding, the traditional plaintiff asks for a higher settlement offer but the probability of trial stays the same (first-order condition (4')). For the loss-averse plaintiff, the probability of trial will increase under distribution $G(-)$. Intuitively, as the the plaintiff’s overall probability of losing is lower under $G(-)$, the effect of loss aversion becomes smaller. The following figure illustrates this difference:

![Figure 6. FOSD shift of distribution $F(-)$](image1)

Second, we consider a mean-preserving contraction of $F(-)$. The new distribution second-order stochastically dominates $F(-)$. The result is similar to Bebchuk (1984): the effect on $S^*$ is ambiguous but the probability of trial is lower. A mean-preserving contraction of the distribution of $p$ means the plaintiff has more precise information about the defendant’s type. Mutually beneficial settlement is more likely as the degree of asymmetric information declines. The following figure gives an illustration:

![Figure 7. SOSD shift of distribution $F(-)$](image2)

### 4 Extensions: fostering settlements

#### 4.1 Fee-shifting rules

In the baseline model, we assumed that the court adopts the so-called American rule in the allocation of litigation costs: each party pays for their own legal expenses regardless of the trial outcome. Now we consider the English rule, which provides that the loser in court pays for both parties’ litigation costs. It is equivalent to moving to $W^{EN} = W + C_p + C_d$, $C_p^{EN} = C_p + C_d$ and $C_d^{EN} = 0$ under the American rule.
For intermediate claims where the credibility constraint is binding, shifting to English rule has ambiguous effects. In the American rule, $W$, the lowest compensation that incentivizes the plaintiff to sue is:
\[
W = [1 + (\mu - 1)(1 - \mathbb{E}[p])] \frac{C_p}{\mathbb{E}[p]}
\]
Under the English rule, we have:
\[
W^{\text{EN}} = \frac{\mu(1 - \mathbb{E}[p])}{\mathbb{E}[p]}(C_p + C_d)
\]
The relative size of $W$ and $W^{\text{EN}}$ depends on $\mu$, $C_p$, $C_d$ as well as the expectation of $p$.

If the credibility constraint is not binding, the likelihood of settlement is lower under the English rule if the plaintiff is not loss-averse (Bebchuk 1984). With loss aversion, the rule shifting may have ambiguous effects: if the level of loss-averse is high for the plaintiff, the English rule may encourage settlement. From the first-order condition (4), we have the following comparison:
\[
\begin{align*}
1 - F(p(S_{\text{loc}}^{\text{foc}})) & = \frac{C_p + C_d}{W} + (\mu - 1) (1 - p(S_{\text{loc}}^{\text{foc}})) \frac{C_p}{W} \\
1 - F(p(S_{\text{EN}}^{\text{loc}})) & = \frac{C_p + C_d}{W + C_p + C_d} + (\mu - 1) (1 - p(S_{\text{EN}}^{\text{loc}})) \frac{C_p + C_d}{W + C_p + C_d}
\end{align*}
\]
For $\mu = 1$, rule shifting unambiguously decrease the right side of equation (4). From the increase hazard rate property, $p(S_{\text{loc}}^{\text{foc}})$ increases as a result. For equation (4EN), the right side might becomes smaller if $\mu$ and $C_d$ is large. Intuitively, if the heavy cost is shifted to the plaintiff and the effect of loss aversion is large, the plaintiff might prefer higher probability of settlement. The following figure illustrates such a possibility:

![Figure 8. probabilities of trial under different rules](image-url)
4.2 An in-court settlement regime

From Proposition 1, we can see that the plaintiff’s binding credibility constraint leads to higher settlement offer and thus higher probability of trial for medium range $W$. The constraint results from the plaintiff’s lack of commitment power. If the plaintiff could credibly commit to trial if her offer were rejected, then she as well as the defendant would benefit: she would be able to make a lower settlement offer that suits herself better ($S^*$), which the defendant also prefers. This could be achieved by moving from the out-of-court settlement regime which we have studied to an in-court settlement regime.

Suppose indeed that the legal system does not allow a plaintiff to drop a suit outside court. Then, even a settlement necessitates to pay for trial. In an (extreme) in-court settlement regime, the plaintiff pays $C_p$ at the time she introduces the lawsuit: she will use the court’s service even if she settles with the defendant. This will remove the credibility constraint as well as the loss-aversion add-on. As a result, she will not drop the case if her offer is rejected because trial comes with no additional costs. She is thus no longer affected by her credibility constraint. Even if she is loss averse, trial will not lead to losses if $C_p$ is paid up-front. A loss-averse plaintiff thus chooses the same settlement offer as a traditional plaintiff does.

After a lawsuit is filed and $C_p$ is paid, the optimal settlement offer ($S^*_{in}$) is characterized by the following first-order condition:

$$1 - F(p(S^*_{in})) = f(p(S^*_{in})) C_d / W$$

Our assumptions of $F(\cdot)$ guarantees that we have a unique interior solution $S^*_{in} \in [C_d, W + C_d]$. $S^*_{in}$ applies to the loss-averse plaintiff and the traditional plaintiff. It is straightforward to show that $S^*_{in} > S^*_{tp} > S^*_{tp,oc}$: $C_p$ has been paid up-front so saving $C_p$ is no longer the marginal advantage of settlement over trial. But for medium $W$ at which credibility constraint is binding in the out-of-court settlement regime, we may have $S^*_{in} < S^*$ ($S^*_{in} < S^*_{tp}$) for the loss-averse (traditional) plaintiff.

The lowest $W$ that incentivizes a loss-averse plaintiff to sue ($W_{in}$) is hard to characterize for a loss averse plaintiff: whether settling is gain or loss depends on whether we have $S^*_{in} \geq C_p$ or the opposite. However, two special cases come handy. First for $W = W$, the loss-averse plaintiff could bring the lawsuit and ask for $S \geq W + C_d$. This brings her the same utility as in the out-of-court settlement regime. She can do better than this because credibility constraint is no longer binding. Second, if $C_d \geq C_p$, the plaintiff can bring the lawsuit, pay $C_p$ and ask for $S = C_d$ as long as $W \geq 0$. The defendant will accept the offer whatever his type. Therefore, we have $W_{in} < W$ in general and $W_{in} \leq 0$ if $C_d \geq C_p$. For the traditional plaintiff, we have similar results: $W_{in, tp} < W_{tp}$ in general and $W_{in} \leq 0$ if $C_d \geq C_p$. Notice that it means cases with negative expected value become profitable in the in-court settlement regime. It’s consistent with Bebchuk (1996) results. The following figure gives an illustration for $C_d \geq C_p$ cases.
Thus, the effect of requiring plaintiffs to settle in-court (at a cost) would have an ambiguous effect on the volume of litigation: the total effect will depend on the distribution of claims ($W$’s).

5 Concluding Remarks

Our goal of this paper is to theoretically show how loss aversion affects people’s behavior. We have shown how loss aversion might lead to higher litigation probability for medium claims and lower probability for large claims. Due to loss aversion’s effect on the plaintiff’s credibility constraint, policies to reduce the number of costly trial and to foster settlement may have different effects for different size of claims.

In our analysis, we assumed that both litigants are risk-neutral. If we include the prospect theory insights that people are risk-averse in the gain domain and risk-loving in the loss domain, the credibility constraint will make it even more difficult for the litigants to reach a settlement. Risk-aversion makes it harder for the plaintiff to commit to trial. In the loss domain, risk-loving makes the defendant less willing to accept a settlement. A more realistic specification of preferences can help explain why we observe less settlement than the conventional model predicts.

Bibliography


