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Absolute Priority Rule Violations, Credit Rationing, and Efficiency

by Stanley D. Longhofer

FEDERAL RESERVE BANK OF CLEVELAND

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Stanley D. Longhofer is an economist at the Federal Reserve Bank of Cleveland. The author is grateful to Charles Calomiris, Charles Carlstrom, Joseph Haubrich, Charles Kahn, Stephen Peters, João Santos, Bruce Smith, Anjan Thakor, James Thomson, Anne Villamil, seminar participants at the University of Connecticut, and several anonymous referees for helpful comments.

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Abstract

Violations of the absolute priority rule (APR) are commonplace in private workouts, formal business reorganizations, and personal bankruptcies. While some theorists suggest they may arise endogenously, they are clearly magnified by the institutional structure of the bankruptcy code. This paper shows that APR violations exacerbate credit rationing problems by reducing the payment lenders receive in default states. Furthermore, APR violations make default more likely to occur, thereby making debt financing more costly. Together, these results support the view that APR violations create an impediment to efficient financial contracting.

ABSOLUTE PRIORITY RULE VIOLATIONS, CREDIT RATIONING, AND EFFICIENCY*

Stanley D. Longhofer

Research Department
Federal Reserve Bank of Cleveland
P.O. Box 6387
Cleveland, OH 44101-1387
stan.longhofer@clev.frb.org
Phone: 216-579-3062
Fax: 216-579-3050

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List of Symbols

ã	Lower case English a with a tilde over it.
B	Upper case English bee.
c	Lower case English cee.
d	Lower case English dee.
f	Lower case English ef.
F	Upper case English ef.
i	Lower case English i.
I	Upper case English i.
$\overline{I}$	Upper case English i with an overbar.
K	Upper case English kay.
l	Lower case English ell.
L	Upper case English ell.
O	Upper case English oh.
R	Upper case English ar.
$\overline{R}$	Upper case English ar with an overbar.
W	Upper case English double-u.
$\overline{W}$	Upper case English double-u with an overbar.
x	Lower case English ex.
$\underline{x}$	Lower case English ex with an underbar.
$\overline{x}$	Lower case English ex with an overbar.
$\hat{x}$	Lower case English ex with a carat above it.

γ	Lower case Greek gamma.
δ	Lower case Greek delta.
ε	Lower case Greek epsilon.
θ	Lower case Geek theta.
$\forall$	Mathematical symbol “for all.”
$\in$	Mathematical symbol “element of.”
arg max	Mathematical function “argument maximum.”
$\int$	Mathematical integral notation.
$'$	Mathematical “prime” notation.
0	Number zero.
1	Number one.

1. Introduction

The absolute priority rule (APR) is the theoretical standard by which financial contracts are resolved when a debtor is insolvent. Simply stated, this rule requires that the debtor receive no value from his assets until all of his creditors have been repaid in full.[1] While this rule would seem quite simple to implement, it is routinely circumvented in practice.

Violations of the APR in Chapter 11 reorganizations are well documented. Studies by Betker (1995), Franks and Torous (1991), and LoPucki and Whitford (1990) have shown that stockholders of publicly traded companies that go through reorganizations receive value about 75 percent of the time, even though their creditors are not paid the full value of their claims. The magnitude of these deviations is not small. Eberhart, Moore, and Roenfeldt (1990) find that the firm's original equity holders retain 7.6 percent of the firm's value on average.[2,3]

These violations may be even larger in small business bankruptcies. LoPucki and Whitford (1990) argue that for small businesses with a single owner/manager, "equity frequently dominates the bargain to such an extent that the absolute priority rule is virtually stood on its head."[4] Because

[1] The APR also states that senior creditors should be paid before junior creditors. In this paper, Iconsider only APR violations between the borrower and a (single) lender.

[2] Betker (1995) and Franks and Torous (1994) find these deviations to be somewhat smaller—2.86 percent and 2.3 percent, respectively.

[3] Beranek, Boehmer, and Smith (1996) point out that violations of the "laymen's" APR cited here do not constitute violations of the "legal" APR as defined by current statute and case law. Hence, the implication that bankruptcy courts fail to perform their statutory duty is incorrect. Nonetheless, these APR violations do represent wealth transfers from creditors to debtors in violation of their original contractual agreements. As a result, their prevalence can have a substantial effect on the efficiency of financial contracts, whether or not they are mandated or encouraged by current law.

[4] LoPucki and Whitford (1990), p. 149.

such entrepreneurs may have specialized skills in running their businesses that are not easily replaced, they gain added leverage in the renegotiation process that can exacerbate APR violations.

APR violations are not limited solely to corporate bankruptcies. Chapter 5 of the Bankruptcy Code allows individual debtors generous exemptions to protect personal property from their creditors.[5] In addition, bankruptcy eliminates most claims on a debtor's future wage income, thereby limiting creditors' access to what is typically his most valuable asset: his human capital.

Clearly, the Bankruptcy Code provides implicit support for these violations in some cases and explicit statutory authority for them in others. But whether they are beneficial remains an open question. A growing body of research suggests that these deviations do, in fact, have negative consequences. Indeed, many recent proposals for amending current bankruptcy law are motivated by the belief that the frequent APR violations inherent in the current system are undesirable.[6] But this view that the APR should be sacrosanct is by no means universal. The question is then: Are APR violations an impediment to efficient financial contracting?

In addressing this question, I point out two additional problems associated with APR violations. First, they make default more likely, increasing the interest rate borrowers must pay when raising funds. Second, APR violations make credit rationing problems more severe, since they make lenders less willing to offer loans to borrowers. My results thus support the view that APR violations impede efficient financial contracting.

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[5] 11 U.S.C. §522.

[6] See Roe (1983), Bebchuk (1988), and Aghion, et al. (1992).

The traditional model of credit rationing was developed by Stiglitz and Weiss (1981) and focused on borrowers' adverse selection and moral hazard problems.[7] Williamson (1986, 1987) showed that credit rationing could exist even without these problems, relying instead on the costly state verification (CSV) framework used in this article.[8] Each of these credit rationing models focuses on a market made up of many borrowers, and rationed agents are denied loans even though they are willing to offer a higher rate of interest than that paid by those who do receive credit.

Since I use a CSV environment, my model most closely resembles that of Williamson (1987). Credit rationing occurs in Williamson's model because lenders have different reservation returns, giving rise to an upward sloping supply function for loans. In my model, however, lenders all have the same reservation return, differing instead in their access to internal funds. As a result, costly state verification and APR violations limit the amount of financing any investor is willing to provide a firm. Hence, firms with little access to internal funds are rationed out of the market while those who require smaller loans are able to finance their projects.[9]

An alternative interpretation of credit rationing in my model is that it limits the size of project the borrower is able to undertake. One advantage to this approach is that it shows the essential similarity between a borrower who is credit rationed and one who is "credit constrained." A credit constrained borrower is one who cannot obtain as large a loan as he might in a perfect capital market with no informational asymmetries. For example, a consumer might be forced to buy a smaller

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[7] See also Jaffee and Russell (1976), Smith, (1983), Besanko and Thakor (1987a, 1987b), Smith and Stutzer (1989), Gale (1990), and Ferguson and Peters (1996).

[8] Also see Boyd and Smith (1993a).

[9] In this respect, my results are similar to those of Calomiris and Hubbard (1990), who argue that external finance will be differentially available to firms based on their ability to raise internal finance.

house or a less expensive car, or a business owner might be unable to finance as much inventory as he would like (and be able to if APR violations did not occur).

An additional contribution of my paper is to show that simple debt contracts are optimal even when APR violations occur. Consistent with the spirit of CSV models, I assume that APR violations always occur in verification states. This assumption translates into a constraint on the size of the transfer that can be made from the entrepreneur to the investor in verification states, raising the possibility that debt may no longer be the optimal contract. Nevertheless, I demonstrate that simple debt contracts still provide optimal state-contingent payoffs, despite the fact that APR violations occur in default.

The next section briefly reviews recent research on the impact of APR violations on financial contracts. Then, in Section 3, I analyze APR violations in a simple CSV model. I show that, despite the presence of these violations, debt remains the optimal contract. Nevertheless, APR violations cause the borrower to have a lower expected return ex ante because they increase the probability of default. In Section 4, I show that APR violations exacerbate credit rationing problems; that is, a greater fraction of borrowers are rationed out of the market when APR violations are large. Section 5 discusses alternate interpretations of the nature of APR violations and their impact on the form of the optimal contract in my model. Section 6 considers the empirical and policy implications of the model, while Section 7 concludes; proofs of propositions are found in the appendix.

2. Other Views on the APR

Bulow and Shoven (1978) and White (1980, 1983) were among the first to question the efficiency of strict adherence to the APR.[10] They show that when a firm is in financial distress, the APR generally leads to inefficient investment and liquidation/continuation decisions. In particular, the APR leads to an underinvestment problem, because they assume that equityholders can renegotiate their bank debt but not their public bonds. Since the benefits of some positive net present value projects will accrue only to bondholders, the firm has no incentive to undertake them. Berkovitch and Israel (1991) examine these over and underinvestment problems in more detail and show that APR violations allow the firm to efficiently renegotiate its debt, thereby eliminating perverse ex post investment incentives.

APR violations can also have a significant effect on ex ante moral hazard problems. Eberhart and Senbet (1993) argue that APR violations reduce the risk-shifting incentives that arise as the firm approaches financial distress. Since shareholders receive a portion of the firm's revenues even in default, they have less incentive to take risky actions that might reduce this value. In contrast, Bebchuk (1991) and Longhofer and Carlstrom (1995) conclude that this moral hazard problem is worsened by APR violations, since they reduce the pain of bankruptcy for the entrepreneur.[11]

Although these papers come to opposite conclusions, their results are entirely compatible, given their differing assumptions about *when* the firm can affect its return distribution. Generally, risk-shifting has two opposing effects on the firm's value. First, the firm's return in nonbankruptcy states is higher, raising expected profit. Second, the probability of bankruptcy is increased, reducing

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[10] See also the later extensions by Gertner and Scharfstein (1991).

[11] See also Innes (1990).

expected profit. Immediately after contracting, when Bebchuk and Longhofer and Carlstrom assume risk shifting occurs, the latter effect generally dominates, since lenders will insist on being compensated for this possibility. In contrast, Eberhart and Senbet assume that risk shifting takes place only after new information about the firm's prospects is revealed. At this time, the first effect may overwhelm the second: If the firm's prospects are sufficiently bad and bankruptcy is likely to occur regardless of the action taken by the firm, increasing this probability provides little deterrence.

APR violations have been examined in other contexts as well. Harris and Raviv (1993) contend that court-imposed APR violations can be an important part of state-dependent financial contracts, which are desirable whenever the firm's assets are difficult to verify but more valuable in the hands of the entrepreneur. Bebchuk and Picker (1993) propose that APR violations reduce the incentive of an owner/manager to select inefficient "insider" projects whose values are highly dependent on the manager's personal skills, and also encourage the owner/manager to invest in his own human capital. Both of these papers provide reasons APR violations may be desirable. On the other hand, Eberhart and Sweeney (1996) find that between 30 and 85 percent of the noise in the market for bankrupt firms' bonds may be attributable to APR violations, and thus conclude that APR violations are detrimental because they add uncertainty to the security valuation process.

In what follows, I show that APR violations make credit rationing more likely. The more the debtor receives in default states, the lower the threshold at which increases in the interest rate *reduce* the lender's expected return. Furthermore, I demonstrate that APR violations reduce social welfare by making default, which is costly, more likely to occur. Together, my results support the view that APR violations are undesirable.

3. A Model with Debt and APR Violations

Consider a two-period world with a large number of risk-neutral economic actors. We may think of these actors as individual consumers or, alternatively, as firms. In the first case, I assume that individuals have some random income in period two, but wish to consume a good that costs K in the first period; this good might be education, a house, a car, or some other consumer good. In the second case, we can think of firms as having some project in which they can invest K in the first period to obtain a random return in period two. In either case, agents die at the end of period two, and the good/investment chosen in period one has no residual value. In what follows, I will use the "firm" terminology, but it should be clear that either interpretation would work equally well.

Each firm is identical except for its private access to internal funds; to distinguish among firms, I will index them by i. Denote firm i's internal resources as $W_i < K$. Since firms' initial endowments are insufficient to finance the project, they must raise funds from outside investors. Let $I_i = K - W_i$ denote the outside investment required by firm i. Assume that the market of potential investors is perfectly competitive, that all investors are risk neutral, and that the riskless rate of interest is one, so that any investors advancing funds to firm i have a reservation return of I_i.

Although firms differ in their access to internal funds, their project returns are all independent and identically distributed. Thus, there is no loss of generality in restricting attention to the problem of an individual firm and its investor. Let x denote the project's return in period two, $F(x)$ the distribution function for x, and $f(x)$ its density function, which is strictly positive on its support $[\underline{x}, \overline{x}]$. Although the firm can costlessly observe the realized x, the investor can only do so by incurring state verification costs of c. Thus, I adopt the CSV environment of Townsend (1979) and

Gale and Hellwig (1985). Let $R(x)$ denote the (state-contingent) payment made by the firm to the investor.

To focus on the impact of APR violations, let $\delta(x,\gamma)$ denote the minimum value the firm receives in verification states as a function of x; in other words, $\delta(x,\gamma)$ is an exogenous constraint on $R(x)$, with γ being a shift parameter. Such a specification facilitates comparative statics on δ. For example, an increase in γ shows the impact of changes in the magnitude of the APR violation. Hereafter, I assume $\delta_\gamma > 0$, meaning that an increase in the shift parameter leads to a weak increase in $\delta(x)$ for all x, with a strictly positive change for some x.

Obviously, $\delta(x,\gamma) \leq x$ for all x and γ. I also assume that $\delta_x \in (0,1)$ for all x and γ, consistent with two stylized facts. First, the size of the APR violation is increasing in the level of the firm's assets.[12] Second, as the firm has an additional dollar to distribute in verification states, some of it will be given to the investor. Finally, to make the problem interesting (i.e., to have some risk involved), assume $I_i > \underline{x},\ \forall\ i$, and, to avoid unlimited liability problems for the investor, assume $\underline{x} > c + \delta(\underline{x},\gamma)$.

This definition of δ assumes that APR violations are unavoidable when verification occurs. Hence, the state contingent payment $R(x)$ represents the actual amount received by the investor, net of the APR "transfer" in verification states.[13] Thus, the incorporation of APR violations into the

[12] Franks and Torous (1994) and White (1992) provide evidence suggesting that the percentage of the firm's assets given to equity is larger the closer the firm is to solvency, i.e., that $\delta(x,\gamma)/x$ is an increasing function of x. This would imply $\delta_x > \delta(x,\gamma)/x$, a more restrictive assumption than is necessary for my results; the assumption $\delta_x > 0$ ensures that my results are true for an even wider range of functional forms of δ.

[13] This assumption is crucial to the optimality of debt in my model. Alternatively, I could assume that APR violations arise only in "bankruptcy" and, as such, are a consequence only of contracts labeled as "debt"; I discuss this possibility in Section 5.

CSV environment adds a new, exogenous constraint not considered by Townsend (1979) and Gale and Hellwig (1985), making the optimality of debt nontrivial.[14] Nevertheless, we have:

PROPOSITION 1: *In a CSV environment with APR violations, the optimal financial contract entails the following three characteristics:*

1) $R(x) = R$, *a fixed payment in the nonverification region;*
2) $R(x) = x - \delta(x,\gamma)$ *in the verification region (i.e., maximum recovery for the investor in bankruptcy); and*
3) *The verification region is a lower interval.*

In other words, the optimal financial contract is a (modified) simple debt contract.

In this model, I have assumed APR violations happen whenever state verification occurs. This places an additional constraint on the contracting problem, limiting the size of the transfer to the investor in verification states. As I will show below, this added constraint has important implications for the efficiency of debt. Nevertheless, it does not alter the fact that debt is the optimal contract.[15]

Let R denote the gross payment (principal and interest) due the investor (henceforth called the lender) in period 2; for ease of exposition, I will often refer to R as "the interest rate." Let $\hat{x}$ represent the critical value of x below which the firm (borrower) defaults; since the lender will

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[14] This new constraint is a feasibility constraint: $R(x) \leq x - \delta(x,\gamma)$ for all x in the verification region.

[15] Strictly speaking, I have assumed that state verification is perfect and that it occurs in a deterministic manner. If stochastic verification is allowed, the simple debt contract will not, in general, be optimal (see Townsend, 1979; Mookherjee and Png, 1989; and Border and Sobel, 1987). It is worth noting, however, that Boyd and Smith (1994) show that the gains from stochastic monitoring are likely to be small.

default whenever the payment he must make by doing so is less than R, $\hat{x}$ is defined by the equation $\hat{x} = R + \delta(\hat{x},\gamma)$.[16]

It is worth noting that this definition of $\hat{x}$ assumes the firm will default opportunistically. That is, the firm will default in some states even though it has sufficient revenue to pay its debt in full. The intuition here is straightforward. If $x = R + \varepsilon < \hat{x}$, APR violations cause the firm to earn more by defaulting than it does by repaying its debt (i.e., $\delta(R+\varepsilon,\gamma) > \varepsilon$). Of course, one could imagine a world in which bankruptcy judges allow no APR violations when $x \geq R$, in which case $\hat{x} = R$, and firms would no longer default opportunistically. My specification of $\hat{x}$ is fully consistent with either assumption, and all of my results remain true in either case.[17]

The borrower's expected return is then

$$B(R,\delta(x,\gamma)) = \int_{\underline{x}}^{\hat{x}} \delta(x,\gamma)\, dF(x) + \int_{\hat{x}}^{\bar{x}} (x-R)\, dF(x) \,. \tag{1}$$

The lender's expected return is

$$L(R,I,\delta(x,\gamma)) = \int_{\underline{x}}^{\hat{x}} [x-c-\delta(x,\gamma)]\, dF(x) + \int_{\hat{x}}^{\bar{x}} R\, dF(x) - I \,. \tag{2}$$

DEFINITION: *A competitive equilibrium in this market is defined by an interest rate R^* that maximizes the borrower's expected return subject to the constraint that the lender earns zero expected profits,*

$$L(R^*,I,\delta(x,\gamma)) = 0 \,, \tag{3}$$

and subject to the borrower's expected return being non-negative.

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[16] Such an $\hat{x}$ must exist if lending is to take place.

[17] Some of the specific calculations that follow, however, differ when $\hat{x} = R$.

Technically speaking, an autarkic equilibrium in which no lending occurs is always possible. In this equilibrium, R may take any value, since it is never offered to the borrower.

Equilibrium is characterized by the following proposition:

PROPOSITION 2: *In any competitive equilibrium in which lending takes place, the lender's expected return is nondecreasing in the face value of the debt (i.e.,* $L_R(R^*,I,\delta(x,\gamma)) \geq 0$*) and the borrower's expected return is decreasing in the face value of the debt (i.e.,* $B_R(R^*,\delta(x,\gamma)) < 0$*).*

This proposition implies that if multiple choices of R satisfy $L(R,I,\delta(x,\gamma)) = 0$, the smallest such R will be the equilibrium.

Of course, when a lending equilibrium exists, the APR violations that occur in default will be anticipated, forcing the borrower to pay a higher interest rate ex ante. One might suspect that the borrower's expected return in bankruptcy states would exactly cancel his added expected interest costs. In the appendix, however, I show that this is not the case (that is, $dB(R^*,\delta(x,\gamma))/d\gamma < 0$).

This fact is an immediate consequence of the optimality of simple debt, and its intuition is straightforward. Violations of the APR reduce the lender's expected return in default states.[18] As a result, the lender must receive a larger payment in nondefault states, i.e., the face value of the debt must be larger to maintain the zero-profit constraint. This means that default will occur more often, implying its deadweight costs will be incurred more often as well. It is worth noting that if c, the deadweight cost of state verification, were zero, the size of $\delta(x,\gamma)$ would have no impact on the

[18] Equivalently, they make the feasibility constraint more stringent.

borrower's expected return. But, of course, if this were the case, simple debt would no longer necessarily be the optimal financial contract.

Because ex post state verification is costly in my model, Proposition 1 assures us that debt is, in fact, the best way for the investor to advance funds to the firm. As a consequence, when lending occurs in equilibrium, the existence of APR violations, while beneficial ex post for a borrower in default, actually reduces the borrower's ex ante expected return. The next logical question, then, is: How do APR violations affect the lender's willingness to make loans in equilibrium? In particular, do they change the likelihood of credit rationing? It is this question to which I turn in the next section.

4. APR Violations and Credit Rationing

Analyze this issue requires first defining what is meant by "credit rationing." Simply stated, credit rationing occurs whenever excess demand for credit persists in equilibrium. Since the market is in equilibrium, by definition there is no pressure for the interest rate to increase to clear the market, as is the case in the classical Walrasian model. In my model, credit rationing means that some firms are unable to finance their investment projects because the interest rate cannot rise enough to ensure that a lender's zero profit constraint (3) is satisfied.

Why does this credit rationing occur? Both the deadweight cost of state verification and the APR violation reduce lenders' expected return in default states. Eventually, increases in the interest rate make default so likely that these costs outweigh the higher return lenders expect to receive in nondefault states. Figure 1 shows L graphed as a function of R, holding I and $\delta(x,\gamma)$ constant. As R gets larger, L eventually slopes downward.[19]

[Insert Figure 1 about here]

Define $\bar{R}$ as the interest rate that maximizes the lender's expected return given the magnitude of the APR violation, $\delta(x,\gamma)$:[20]

$$\bar{R}(\delta(x,\gamma)) = \arg\max_{R} \; L(R,I,\delta(x,\gamma)) \,. \tag{4}$$

Since increases in I cause $L(R, I, \delta(x,\gamma))$ to shift down vertically, we can define $\bar{I}(\delta(x,\gamma))$ as the largest investment the lender can feasibly finance:

$$\bar{I}(\delta(x,\gamma)) = \int_{\underline{x}}^{\hat{x}} [x - c - \delta(x,\gamma)] \, dF(x) + \int_{\hat{x}}^{\bar{x}} \bar{R} \, dF(x) \,, \tag{5}$$

where $\hat{x}$ here is defined with $R = \bar{R}$.

Credit rationing occurs in this model because lenders are unwilling to provide financing greater than $\bar{I}$; firms that need larger loans (because they have insufficient internal funds) will be unable to finance their projects, despite the fact that they would be willing to pay a higher interest rate if it were offered to them. In other words, letting $\bar{W} = K - \bar{I}$, firms with $W_i \geq \bar{W}$ are able to finance their projects while those with smaller W_i cannot.

[19] Note that L is not necessarily a concave function of R. All of my results, however, hold true regardless of the shape of L.

[20] Notice that $\bar{R}$ is not a function of I, because changes in I are merely vertical shifts of $L(R,I,\delta(x,\gamma))$; such shifts do not change the location of the extremum, $\bar{R}$, only the value of the function at the extremum.

I now derive the primary result of the paper:

PROPOSITION 3: *Larger APR violations increase the magnitude of credit rationing by reducing the maximum investment that will allow lenders to earn non-negative expected profits; i.e.,*

$$\frac{d\bar{I}(\delta(x,\gamma))}{d\gamma} < 0 . \tag{6}$$

Figure 1 illustrates the effects summarized in Proposition 3. Holding I constant, an increase in γ shifts L down and to the left.[21] As a result, loans that will be made when the APR violation is $\delta(x,\gamma_1)$ will not be made when the APR violation is increased to $\delta(x,\gamma_2)$—the resulting decrease in the lender's expected return makes loans of I_1 infeasible. The largest loan a lender is willing to make is, instead, $I_2 < I_1$.

Thus, we see that a larger fraction of firms are rationed when APR violations are greater. Although firms with limited access to internal funds would be willing to pay a higher interest rate to obtain a loan, and despite the fact that their projects have a positive net present value, large APR violations make lenders unwilling to provide funding to these borrowers at any rate of interest.

5. Interpreting APR Violations in CSV Models

The model above assumed that APR violations were the inevitable consequence of state verification. That is, regardless of the label affixed to the optimal contract, APR violations limited

[21] In the appendix, I argue that $d\bar{R}/d\gamma$ is typically negative. For some peculiar functional forms for δ, however, it is possible that $\bar{R}$ increases with γ; in either case, my results still hold.

the size of the transfer that could be made to the investor in verification states. As shown in Proposition 1, this added constraint does not change the optimality of simple debt.

Of course, it is well understood that the optimality of debt in CSV models without APR violations arises solely because this contract provides for the right state-contingent payoffs, and other contractual forms are optimal as well. For example, a contract in which the investor receives all the stock of the firm but the entrepreneur receives a call option on this stock with a strike price of *R* provides exactly the same payoffs as a simple debt contract with face value *R*, and is thus also an optimal contract.[22]

Under my assumption that APR violations always arise in verification states, these two contracts remain isomorphic. If I were to assume, however, that APR violations occurred only in contracts labeled as "debt," an important wedge would be driven between levered equity and a call option on the firm's total assets, and the equity/call option contract just described might "dominate" a simple debt contract, despite the fact that the two contracts are theoretically equivalent. In other words, although these two contracts provide the same state-contingent payoffs, if the courts don't take this functional equivalence seriously, an equity/call option contract could avoid the undesirable APR violations that occur in bankruptcy. If this were the case, one would need to explain why debt contracts would be used when APR violations are present.

One answer is that firms typically have multiple creditors, and it would be difficult to coordinate a sequence of options that could account for the needs of all the firm's investors. Second, it is likely that if firms and their creditors were to change the *name* of their contracts without changing any of their relevant terms, courts would still consider them to be debt contracts and

[22] In this contract, state verification occurs only when the option is not exercised.

subject them to the bankruptcy process. In this case, the two contracts would again be essentially identical, and simple debt would remain the optimal contract.

If I were to interpret APR violations as a consequence of bankruptcy, I would be assuming that different contracts with identical state contingent payoffs have different implementation costs, effectively predetermining the optimal contract. Although I have argued that debt may still be desirable in this environment, its optimality would arise out of characteristics exogenous to the state verification at the heart of the CSV model. All told, I believe that the assumption that APR violations arise whenever state verification occurs is more consistent with the spirit of CSV models in which the form of the optimal financial contract is derived rather than assumed.

6. Empirical and Policy Implications of the Model

Recently, researchers have focused increased attention on the differences in bankruptcy laws across countries.[23] One important characteristic of bankruptcy institutions that varies dramatically is the relative bargaining power given to debtors. This fact may provide a means of empirically testing the predictions of this paper. Since an important source of APR violations in bankruptcy is the ability of debtors to extract surplus in the renegotiation process, my results suggest that, ceteris paribus, businesses in countries with strong, "pro-debtor" bankruptcy laws will have less access to credit and the cost of that credit will be higher.

My results are also germane to concerns about the cost and availability of consumer credit. As noted before, individual debtors may violate the APR unilaterally by "exempting" some of their assets from the property of the estate. Although the Code allows states to opt out of this provision,

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[23] See, for example, Franks and Torous (1992), Packer (1996), and White (1993).

individuals may exempt property listed in §522(d) of the Code or, if their state allows more generous exemptions, they may follow the state's rules instead. Assets that are typically exempt under both state and federal law include interest in a house, automobile, jewelry, clothing, and other personal possessions. The total value of such assets generally varies from state to state with some states exempting an unlimited amount of unsecured assets.[24]

This variation in the level of allowed exemptions makes it possible to empirically test my conclusions with respect to consumer loans as well. In particular, the results above suggest that consumers in states that allow more generous exemptions will pay higher interest rates and be offered less consumer credit than borrowers who live in states with smaller exemptions. Independent research by Gropp, et al. (1997) provides just such a test. Using the 1983 Survey of Consumer Finances, they find that households in states with "unlimited" exemptions are 5.5 percentage points more likely to be turned down for credit or discouraged from borrowing than households living in states in the bottom quartile of the exemption distribution. They also find that households in high exemption states pay substantially higher interest rates on automobile loans (up to 230 basis points more) than households in low exemption states. Thus, their results support my predictions that APR violations can affect the cost of and access to credit, and show that the magnitudes of these effects are nontrivial.

Finally, my theory also has direct relevance to the debate over proposed revisions to the bankruptcy code. As a part of the Bankruptcy Reform Act of 1994, Congress established the Bankruptcy Review Commission to analyze the current U.S. Bankruptcy Code and develop a list of

[24] One notable state is Texas, whose homestead law exempts a rural family home of up to 200 acres regardless of worth. See Weintraub and Resnick (1992), ¶ 4.07. Gropp, et al. (1997) provide a table listing the value of allowed exemptions on a state-by-state basis.

proposals for possible amendments to the Code. Many had hoped that this Commission's proposals would serve to reduce the strong "pro-debtor" stance in the current code, making it harder for bankrupts to extract value from their creditors. Instead, most of the proposals adopted by the Commission would make the U.S. bankruptcy code even more favorable to bankrupt individuals and businesses than it currently is.[25] In other words, it is likely that these revisions would worsen the APR violations that occur in both personal and business bankruptcies. Accordingly, my results suggest that, if adopted, these proposals would exacerbate credit rationing problems and make credit more costly when it is available.

7. Conclusion

I have demonstrated that APR violations can exacerbate credit rationing problems. By lowering the lender's expected return, deviations from the APR make fewer loans profitable for lenders. To the extent that existing bankruptcy law makes APR violations more likely, my results imply that it makes credit rationing problems more severe.[26] Even when lending does take place, however, the fact that APR violations make default occur more often reduces the borrower's ex ante expected profit. Both of these effects suggest that APR violations are to be avoided.

These results may be particularly relevant with respect to small business financing. Small businesses are typically more likely to default on their loans than large corporations. In addition,

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[25] See Jaret Seiberg, "Bankruptcy Panel Votes for Plan To Make Debt Collection Harder," *American Banker*, vol. 162, no. 119, June 23, 1997, pg. 1; and Jaret Seiberg, "Lenders Coalition Urges Congress To Deep-Six Bankruptcy Proposals," *American Banker*, vol. 162, no. 134, July 15, 1997, pg. 1.

[26] See Bebchuk and Chang (1992) and Brown (1989) for theoretical models suggesting that the structure of Chapter 11 does, in fact, encourage APR violations.

since they are often managed by the entrepreneurs who own them, equity's bargaining power is enhanced in reorganization negotiations, thereby increasing the expected magnitude of the APR violation. Finally, many small businesses are sole proprietorships. As such, their owners can take advantage of personal bankruptcy exemptions that are allowed under applicable state law, further increasing the expected APR violation in default. Taken together, these facts suggest that APR violations may constrain small businesses' access to credit.

Although most analyses of APR violations have focused exclusively on corporate bankruptcies, the concern about credit rationing is also applicable to the market for consumer loans. Indeed, this problem may be particularly severe in this market given the generous exemptions of personal assets provided by Federal and state bankruptcy laws. As noted in the previous section, Gropp, et al. (1997) suggest that the magnitude of these exemptions can substantially affect the availability and cost of consumer credit.

I conclude by noting that my analysis must be considered with certain caveats. Boyd and Smith (1993b) note that adherence to the APR can be thought of as nonstochastic monitoring in a CSV environment.[27] When stochastic monitoring is allowed, the optimal contract typically involves some element of debt forgiveness—i.e., a violation of the APR, similar to that proposed by Harris and Raviv (1993). Since I have selected a CSV framework for my model, at least one of the theoretical benefits of APR violations is present. Similarly, my model has abstracted from several important informational frictions that, as discussed in Section 2, can affect the desirability of APR

[27] Boyd and Smith point out that the APR and nonstochastic monitoring are not strictly synonymous. Rather, they "associate an absolute priority rule with nonstochastic monitoring because—if stochastic monitoring were easy to implement—there would be no reason to have an interest in absolute priority rules in this environment" (Boyd and Smith, 1993b, footnote 4). This paper was later revised in Boyd and Smith (1994).

violations. A more complete analysis would incorporate all of these factors to determine the full impact of these violations. Nevertheless, my primary conclusion that APR violations engender credit rationing should remain robust to the introduction of these further complications.

8. Appendix

Proof of PROPOSITION 1: The proof is standard and is omitted for brevity. Interested readers may obtain a copy from the author.

Proof of PROPOSITION 2: This proof is also familiar and is omitted for brevity. Once again, interested readers may obtain a copy from the author.

Proof that *B* is decreasing in γ: Noting that R^* depends on γ, I differentiate (1) with respect to γ to get:

$$\frac{dB(R^*,\delta(x,\gamma))}{d\gamma} = \int_{\underline{x}}^{\hat{x}} \delta_\gamma(x,\gamma)\, dF(x) - [1-F(\hat{x})]\frac{dR^*}{d\gamma}. \tag{7}$$

To calculate the change in the equilibrium debt payment due to an increase in the APR violation, totally differentiate (3):

$$\frac{dR^*}{d\gamma} = \frac{\int_{\underline{x}}^{\hat{x}} \delta_\gamma(x,\gamma)\, dF(x) + cf(\hat{x})\frac{d\hat{x}}{d\gamma}}{[1-F(\hat{x})] - cf(\hat{x})\frac{d\hat{x}}{dR^*}}. \tag{8}$$

Totally differentiating the definition of $\hat{x}$, we see that

$$\frac{d\hat{x}}{dR^*} = \frac{1}{1-\delta_x(\hat{x},\gamma)} \qquad \text{and} \qquad \frac{d\hat{x}}{d\gamma} = \frac{\delta_\gamma(\hat{x},\gamma)}{1-\delta_x(\hat{x},\gamma)}. \tag{9}$$

Using these values, substitute (8) into (7) and simplify to get

$$\frac{dB(R^*,\delta(x,\gamma))}{d\gamma} = \frac{-c\, f(\hat{x})\frac{d\hat{x}}{dR^*}\left[\int_{\underline{x}}^{\hat{x}} \delta_\gamma(x,\gamma)\, dF(x) + \delta_\gamma(\hat{x},\gamma)[1-F(\hat{x})]\right]}{[1-F(\hat{x})] - cf(\hat{x})\frac{d\hat{x}}{dR^*}} . \tag{10}$$

The denominator of this expression is the change in the lender's expected return due to an increase in the face value of the debt, and is positive by Proposition 1.[28] The numerator is clearly negative, showing that the borrower's expected return is decreasing in γ (i.e., in the magnitude of the APR violation). ♠

<u>Proof of PROPOSITION 3</u>: Define $\bar{R}$ by setting the first-order condition dL/dR equal to zero:

$$\frac{dL(R,I,\delta(x,\gamma))}{dR} = [1-F(\hat{x})] - cf(\hat{x})\frac{d\hat{x}}{dR} = 0 . \tag{11}$$

Totally differentiating this expression allows us to calculate the change in $\bar{R}$ due to a change in γ:

$$\frac{d\bar{R}}{d\gamma} = -\frac{f(\hat{x})\frac{d\hat{x}}{d\gamma} + cf'(\hat{x})\frac{d\hat{x}}{dR}\frac{d\hat{x}}{d\gamma} + cf(\hat{x})\frac{d^2\hat{x}}{dR\, d\gamma}}{f(\hat{x})\frac{d\hat{x}}{dR} + cf'(\hat{x})\left(\frac{d\hat{x}}{dR}\right)^2 + cf(\hat{x})\frac{d^2\hat{x}}{dR^2}} . \tag{12}$$

Substituting in (9) above and rearranging allows us to write

$$\frac{d\bar{R}}{d\gamma} = -\theta \frac{d\hat{x}}{d\gamma} \Big/ \frac{d\hat{x}}{dR} = -\theta\, \delta_\gamma(\hat{x},\gamma) , \tag{13}$$

where

[28] Strictly speaking, this can also equal zero. In this case, increases in γ engender credit rationing, which I discuss in Section 4.

$$\theta = \frac{f(\hat{x}) + cf'(\hat{x})\dfrac{d\hat{x}}{dR} + cf(\hat{x})\dfrac{\delta_{xx}(\hat{x},\gamma)+\delta_{x\gamma}(\hat{x},\gamma)/(d\hat{x}/d\gamma)}{[1-\delta_x(\hat{x},\gamma)]^2}}{f(\hat{x}) + cf'(\hat{x})\dfrac{d\hat{x}}{dR} + cf(\hat{x})\dfrac{\delta_{xx}(\hat{x},\gamma)}{[1-\delta_x(\hat{x},\gamma)]^2}}. \tag{14}$$

Careful examination of this expression shows that θ will typically be positive (the denominator is positive because *L* must be concave in *R* for $\bar{R}$ to be a maximum), although for some choices of $\delta(x,\gamma)$ it may be negative. Whether it is greater than, less than, or equal to one depends on the sign and magnitude of $\delta_{x\gamma}$.

Setting $R = \bar{R}(\gamma)$ we can recalculate

$$\frac{d\hat{x}}{d\gamma} = \frac{\frac{d\bar{R}}{d\gamma}+\delta_\gamma(\hat{x},\gamma)}{1-\delta_x(\hat{x},\gamma)} = \frac{(1-\theta)\delta_\gamma(\hat{x},\gamma)}{1-\delta_x(\hat{x},\gamma)}, \tag{15}$$

which may be positive, zero, or negative, depending on θ.

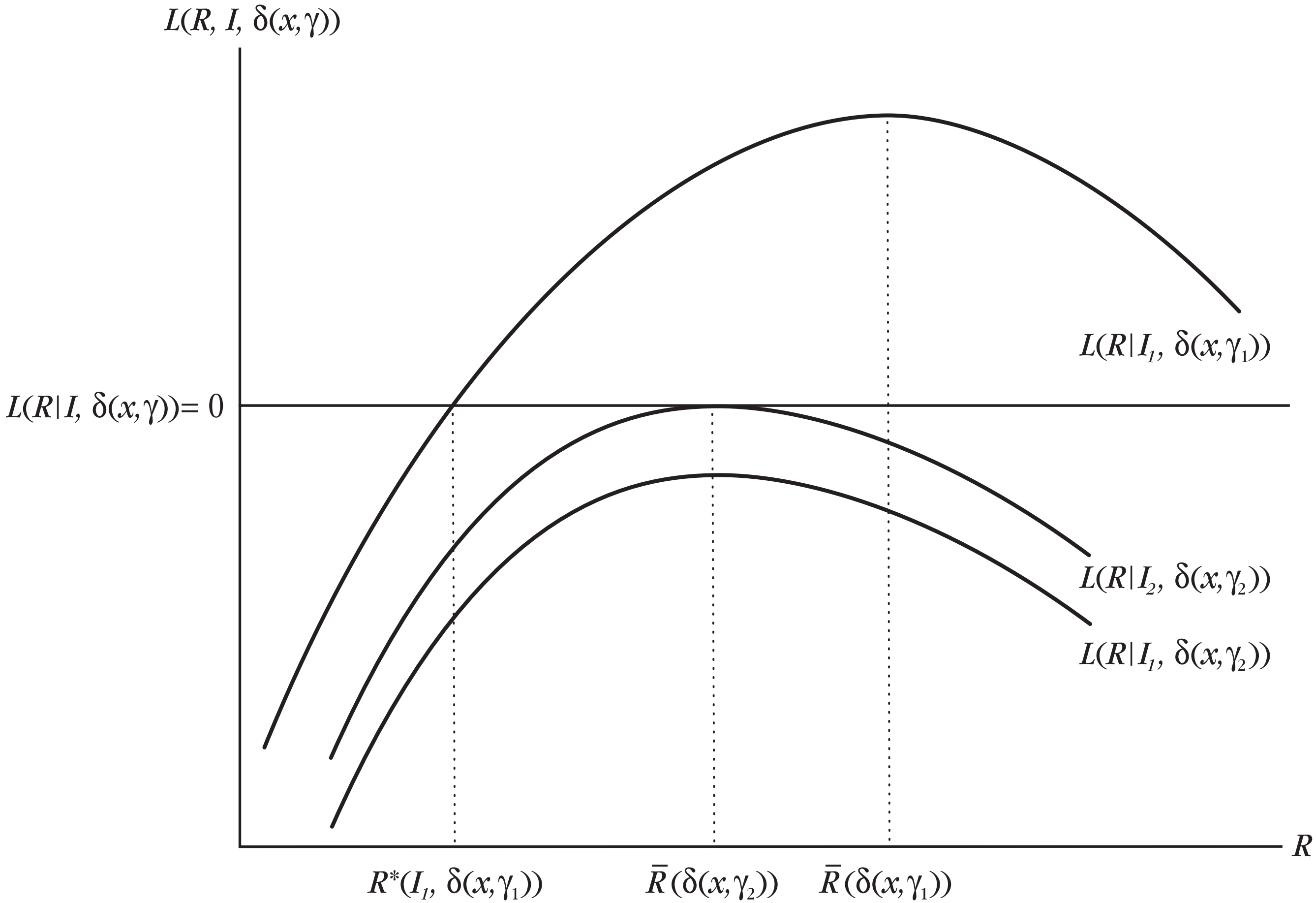
We now calculate

$$\begin{aligned}\frac{d\bar{I}}{d\gamma} &= [1-F(\hat{x})]\frac{d\bar{R}}{d\gamma} - cf(\hat{x})\frac{d\hat{x}}{d\gamma} - \int_{\underline{x}}^{\hat{x}} \delta_\gamma(x,\gamma)\, dF(x) \\ &= -\theta\delta_\gamma(\hat{x},\gamma)[1-F(\hat{x})] - (1-\theta)\delta_\gamma(\hat{x},\gamma)\frac{c\, f(\hat{x})}{1-\delta_x(x,\gamma)} - \int_{\underline{x}}^{\hat{x}} \delta_\gamma(x,\gamma)\, dF(x).\end{aligned} \tag{16}$$

By expression (11), the definition of $\bar{R}$, $[1-F(\hat{x})] = c\, f(\hat{x})/(1-\delta_x(\hat{x},\gamma))$, so

$$\frac{d\bar{I}}{d\gamma} = -\int_{\underline{x}}^{\hat{x}} \delta_\gamma(x,\gamma)\, dF(x) - \delta_\gamma(\hat{x},\gamma)[1-F(\hat{x})], \tag{17}$$

which is clearly negative. ♠


L(R, I, δ(x,γ))
L(R|I, δ(x,γ))= 0
L(R|I1, δ(x,γ1))
L(R|I2, δ(x,γ2))
L(R|I1, δ(x,γ2))
R
R*(I1, δ(x,γ1))
R̄(δ(x,γ2))
R̄(δ(x,γ1))

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