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No Pain, No Gain?
Effecting Market Discipline via "Reverse Convertible Debentures"

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ABSTRACT

The deadweight costs of financial distress limit many firms' incentive to include a lot of (tax-advantaged) debt in their capital structures. It is therefore puzzling that firms do not make advance arrangements to re-capitalize themselves if large losses occur. Financial distress may be particularly important for large banking firms, which national supervisors are reluctant to let fail. The supervisors' inclination to support large financial firms when they become troubled mitigates the *ex ante* incentives of market investors to discipline these firms. This paper proposes a new financial instrument that forestalls financial distress without distorting bank shareholders' risk-taking incentives. "Reverse convertible debentures" (RCD) would automatically convert to common equity if a bank's market capital ratio falls below some stated value. RCD provide a transparent mechanism for un-levering a firm if the need arises. Unlike conventional convertible bonds, RCD convert at the stock's *current* market price, which forces shareholders to bear the full cost of their risk-taking decisions. Surprisingly, RCD investors are exposed to very limited credit risk under plausible conditions.

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The "tradeoff" theory of capital structure (leverage) posits that a firm balances the tax and agency benefits of debt against the costs of potential investment distortions and financial insolvency. Given the apparent tax benefits of debt, Almazan *et al*. [2002] wonder why firms don't routinely operate with high leverage while routinely arranging *in advance* to re-capitalize themselves if large losses occur. This paper explores the potential for a new capital instrument: "reverse convertible debentures" (RCD) convert into common stock if the issuing firm's capital ratio falls below some pre-specified level.[1] RCD conversion would be triggered automatically: neither the issuer nor the investor would have an option regarding this conversion. Moreover, the debentures would convert at the *current* share price, rather than at some absolute price specified in the debenture agreement.[2]

Although any type of firm could incorporate RCD into its capital structure, I evaluate this instrument in the context of large banking firms, which pose difficult supervisory challenges. Many supervisors recognize that the condition of large, international banks can no longer be evaluated in a timely manner using traditional supervisory techniques. For example, the Basel Committee on Bank Supervision proposes three "Pillars" of effective financial oversight. The first two pillars represent traditional supervisory tools: minimum capital requirements and regular review of a bank's risk management procedures. The Third Pillar is qualitatively different: market discipline. The Third Pillar posits that uninsured counterparties will evaluate a bank's default risk when deciding whether to deal with it. Greater perceived default risks cause investors to demand higher rates on debt and/or more secure settlement arrangements for their trading relationships. These cost increases discourage bank shareholders from taking on risky investments that do not offer sufficiently high expected returns.

The fundamental flaw in this view of market discipline is that the issuing institution must fail in order to impose losses on uninsured claimants and to transfer ownership of the bank's assets to former

[1] Paul Kupiec initially suggested this security to me in the context of the U.S. housing GSEs. As noted in the Appendix, others have previously written about similar instruments, although the conversion features proposed here appear to be novel.

[2] Section II.b demonstrates that this feature has the surprising effect of making RCD very low-risk securities.

debt holders. Yet most national supervisors are very reluctant to accept the market uncertainties associated with the failure of a "systemically important" financial firm. They contend that a large banking firm's failure could adversely affect the financial system and, through it, the real economy. Accordingly, rational conjectures about *ex post* support for large financial firms compromise the *ex ante* incentives of private investors to monitor and discipline these institutions.

Requiring each bank to maintain high levels of equity capitalization could substantially reduce the incidence of bank distress. However, bankers assert that binding capital requirements can make regulated firms uncompetitive because equity capital is more expensive than debt. In response to such pressures, supervisors have incorporated certain types of subordinated debentures (including trust-preferred stock) into "regulatory capital." Although such debentures apparently protect the deposit insurance fund, they also expose the bank to more failure states because a smaller loss will render the bank insolvent. Moreover, the level of *equity* capital – not *regulatory* capital – determines whether bank shareholders can gain by increasing their portfolio risk. In short, including SND in regulatory capital increases the likelihood that supervisors will confront the "systemic" costs of a large financial firm's distress.[3]

Legal restrictions also limit the supervisors' ability to take prompt action when trouble first appears. Most banking laws specify a bank's condition in terms of its equity book value. Because book equity measures tend to lag behind market value measures when a bank first encounters distress, supervisors find it difficult to mandate new equity issues when a bank first encounters trouble. Supervisors also overlooked low capital ratios – also known as exercising "forebearance." Pennacchi [1987] shows that permitting a bank to operate with low equity capital for extended periods of time substantially increases the value of safety net guarantees. For a sample of 23 large U.S. banks at the end of 1981, he estimates that the average actuarial value of deposit insurance is $0.47 per thousand

[3] The Shadow Regulatory Committee (Kaufman *et al*. [2000]) would permit banks to operate with any desired combination of equity and debenture "capital" because equity and debentures are both subordinate to depositors and the deposit insurance fund. However, equity capital prevents insolvency while debenture "capital" does not. The two are equivalent only if insolvency is costless.

dollars insured when the banks are *not* required to rectify capital shortages promptly. By contrast, if solvent banks annually restored their capital to a fixed ratio the mean insurance value drops to $0.08 (Pennacchi [1987], Table 3, page 352). Clearly, supervisors' inability or unwillingness to force banks to re-capitalize after losses substantially increases bank liability holders' expected default losses.

The capital ratio that triggers RCD conversion should be measured using concurrent share prices, to avoid the tendency of GAAP equity measures to delay supervisory actions. Issuing RCD as part of a bank's capital structure will then

a) protect depositors and taxpayers via a transparent means of automatic re-capitalization,

b) cause shareholders to internalize the costs of risk,

c) impose no tax penalty on bank shareholders, and

d) reduce the incidence of costly failures.

Conversion of the RCD into equity shares would maintain a minimum equity ratio for the firm under a broad range of asset value declines. The issuing firms would therefore avoid distress in most circumstances, reducing the potential for their uninsured counterparties to "run" from the bank and make a bad situation worse.

This paper is organized as follows. Section I argues that rationally anticipated government interventions blunt private investors' incentives to monitor and influence large banking firms. Section II then describes a new capital instrument -- "reverse convertible debentures" – designed to maintain adequate bank equity by converting into common stock when the firm's capital ratio falls. Combining reverse convertible debentures (RCD) with a short interval between capital ratio evaluations (e.g. one month) causes shareholders to internalize effectively all the costs associated with their risk-taking and reduces the incidence of failure in banking, while their bank operates with less equity capital "on the books." A key feature of RCD is the event(s) that trigger their conversion into common stock. Section III argues that the trigger should be expressed in terms of equity's *market* value, not its book value. It also discusses the importance of (potential) market pricing errors on the firm, and some details

concerning the computation of trigger ratios. Section IV summarizes and points out the potential for applying RCD to nonfinancial firms.

I. What's Wrong with Large Bank Failures?

According to the "textbook" view of bankruptcy, a firm's failure is not a major event. Shareholders simply turn over the firm's assets to erstwhile bondholders, who proceed to operate the firm in the most efficient manner available. In reality, however, the costs of distress and bankruptcy appear to be more substantial, particularly when a firm has multiple claimants, multiple classes of debt obligations, or assets requiring specialized managerial expertise. Re-organization costs may be particularly important for large banking firms, because their credit worthiness plays a major role in some important types of business. A weak credit rating limits a bank's ability to trade foreign exchange or OTC derivatives, or to extend credible lines of credit to borrowing customers. Although market participants have been working to substitute collateral and netting agreements for traditional payment conventions, a large international bank still cannot function without a solid credit rating.

A large banking firms' distress exposes many counterparties to great uncertainty. Large financial firms operate in many countries, under a variety of legal systems. Collateral, rights of offset, netting arrangements, and ring-fencing may each be treated differently in different jurisdictions. The pertinent case law is sketchy at best.[4] The importance of liquidity and credit-worthiness for interbank transactions makes such uncertainties particularly problematic. Once a bank's ability to perform has been questioned, many counterparties will seek alternate suppliers of financial services, and the bank's initial problem may compound rapidly.[5] If the bank were truly solvent, investors could stabilize the

[4] In discussing the mechanisms available to resolve "large complex banking organizations," Bliss [2003] states that "This patchwork of laws governing termination and netting of derivatives contracts provides some protections but remains the source of legal uncertainty." (page 18)

[5] This possibility is often discussed in terms of a "depositor run," but the process is not confined to depositors. In fact, depositor preference laws provide quite a senior claim to even the uninsured depositors of a large financial institution. Merton [1990] differentiates between a firm's customers and its creditors. When a customer must also be a creditor (e.g. in an unsecured derivatives transaction), the firm's condition affects the demand for its services.

situation by adding new capital. However, the required due diligence for a complex international bank takes time. As long as the bank's survival remains in question, counterparties will depart from the institution. These losses diminish the firm's value to an acquirer, reducing the likelihood of successful re-capitalization through traditional routes. Customer flight also forces the firm to unwind its security positions, perhaps at "fire sale prices." Citing the situation of Long Term Capital Management in 1998, the Fed and other central banks fear that a troubled firm's market transactions may cause price movements that destabilize other large institutions.

Problem resolution in the banking sector is therefore caught between two forces. While supervisors would like to rely on market discipline to provide supplementary oversight, they find it extremely difficult to stand by when a large firm stumbles. The *ex ante* incentives of uninsured claimants to monitor and price risk may therefore be substantially compromised, rendering market discipline less effective for the world's most important financial firms. The situation could be salvaged if supervisors effectively disciplined large firms when their condition first began to deteriorate. Yet they are often prevented from interfering with a bank whose book capital exceeds statutory minima – even when the market (and hence the supervisors) clearly know that GAAP overvalues the firm's true equity.[6] A form of regulatory capital that permits supervisors to rely on market assessments of bank condition, while also forcing banks to maintain adequate levels of capital based on market valuations, could substantially improve supervisory oversight of large financial firms

[6] The case of Manufacturers Hanover (MH) in 1990 illustrates the problem. The bank had issued $85 million dollars worth of "mandatory preferred stock," which was scheduled to convert to common shares in 1993. An earlier conversion would be triggered if MH's share price closed below $16 for 12 out of 15 consecutive trading days (Hilder [1990]). Such forced conversion appeared possible in December 1990. In a letter to the Federal Reserve Bank of New York concerning the bank's capital situation, MH's CFO (Peter J. Tobin) expresses the bank's extreme reluctance to permit conversion, or to issue new equity at current prices. At yearend 1990, MH's book ratio of equity capital to total (on-book) assets was 5.57%, while its market equity ratio was 2.53%. The bank was also adamant in announcing that it would *not* omit its quarterly dividend. Despite the low market capital ratio, the Fed appeared unable to force MH to issue new equity. Chemical Bank acquired Manufacturers Hanover at the end of 1991.

II. Reverse Convertible Debentures: Re-capitalization Without Failure

Reverse convertible debentures (RCD) can reduce failure probabilities and improve risk-taking incentives without imposing the immediate tax burden of equity capital.[7] RCD would have the following broad design features:

1. They automatically convert into common equity if the issuer's capital ratio falls below a pre-specified value.

2. Unless converted into shares, RCD receive tax-deductible interest payments and are subordinated to all other debt obligations.

3. The critical capital ratio is measured in terms of outstanding equity's *market* value. (See Section III.)

4. The conversion price is the *current share price*. Unlike traditional convertible bonds, one dollar of debentures (in current market value) would generally convert into one dollar's worth of common stock.

5. RCD incorporate no options for either investors or shareholders: conversion occurs automatically when the trigger is tripped.

6. When debentures convert, the firm must promptly sell new RCD to replace the converted ones.

RCD provide a "programmed unlevering" (Doherty and Harrington [1997, page 28]) when losses reduce a firm's capital ratio. The conversion of RCD short-circuits the usual tendency for bad events to feed upon themselves. If losses depress a firm's equity, counterparties know that RCD will automatically restore the firm's equity ratio if the decline continues.

a) A Simple Example

Table 1 illustrates the basic process of RCD conversion, via bank balance sheets that apply to three points in time. The asset and liability quantities report *market* values, and I assume for the moment that share prices accurately reflect bank value.[8] Suppose "adequate" capital is 8% of assets, and

[7] The Appendix describes some antecedents of this idea.

[8] Equity market "imperfections" are discussed in Section II.c.

that regulatory capital includes only common stock. A new regulation requires that this banking firm maintain RCD liabilities equal to at least 5% of total assets.

Table 1: Mechanics of RCD Conversion

t = 0	
A	L
100	87 Deposits 5 RCD 8 Equity
N=10 ➔ P_S = \$0.80	

t = ½	
A	L
97	87 Deposits 5 RCD 5 Equity
P_S = \$0.50	

t = 1	
A	L
97	87 Deposits 2.24 RCD 7.76 Equity
N=15.52 ➔ P_S = \$0.50	

The bank in Figure 1 starts out at t = 0 with a minimally acceptable 8% capital ratio, backed by RCD equal to an additional 5% of total assets. With ten shares ("N") outstanding, the initial share price ("P_S") is \$0.80. By t = ½, the bank's asset value has fallen to \$97, leaving equity at \$5.00 and the share price at \$0.50. The bank is now under-capitalized (\$5/\$97 = 5.15% < 8%). Required capital is \$7.76 (= 8% of \$97). The balance sheet for t = 1 shows that \$2.76 of RCD converted into equity to restore capital to 8% of assets. Given that P_S = \$0.50 at t = ½, RCD investors receive 5.52 shares in return for their \$2.76 of bond claims. These investors lose no principal value when their debentures convert: they can sell their converted shares at \$0.50 each and use the proceeds to re-purchase \$2.76 worth of bonds. The initial shareholders lose the option to continue operating with low equity, because they must share the firm's future cash flows with converted bondholders.

In this example, only a portion of the outstanding RCD convert. How would the converting debentures be selected? One possibility would be to select debentures at random or pro rata from each investor's holdings. However, it seems better to separate a bank's outstanding RCD into specific

"tranches" which convert in a pre-specified order.[9] (E.g., the longest-outstanding RCD convert first.) A subset of the outstanding RCD would bear most of the conversion uncertainty, and investors who are strongly averse to receiving equity might sell their RCD as the probability of conversion increases. Conversely, it may be easier to sell new RCD if they were less likely to be converted in the near future.

The bank at t=1 is again adequately capitalized, but it has only $2.24 of remaining RCD. Restoring the firm's available RCD to 5% of total assets therefore requires that some deposits be replaced with new RCD. At what rate can new debentures be sold? Since the bank has 8% equity capital in place, the new debentures are just as safe as their predecessors were.[10] The promised return on these bonds need not include a large default risk premium.

b) Generalizing the Example: Continuous Asset Returns

When asset returns follow a continuous distribution, RCD have positive effects on bank investment incentives and failure rates.[11] Moreover, frequent trigger evaluations tend to make the credit risk of newly issued RCD quite low.

Consider a stylized bank with the initial (t = 0) balance sheet presented in Table 1. Recall that the indicated assets and liabilities are presented at their market (not book) values. The minimum required capital ratio is 8% of assets, and the firm starts out with just that ratio.[12] For simplicity, assume that the only change over time is the asset portfolio's market value: no new assets or liabilities are added to the firm, nor do the initial securities mature or change their market value. Realized asset values follow a known, continuous distribution (e.g. normal). If the bank's market equity ratio is below 8% when the trigger is evaluated, just enough RCD are converted to restore the bank to the 8% required minimum ratio.

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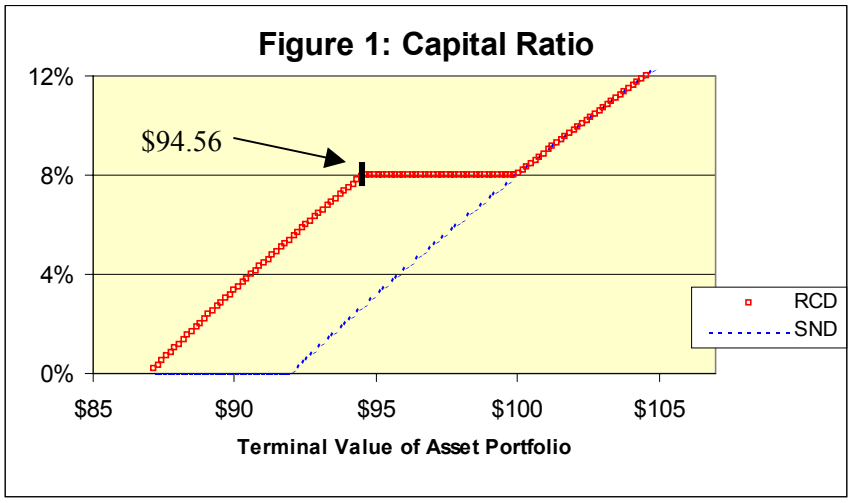
[9] Even with multiple tranches, the marginal tranche will not generally be converted in its entirety, although a covenant could require this.

[10] This statement makes several key assumptions about the potential extent of asset value losses and the timeliness of RCD conversion, discussed below. I return to the question of RCD credit quality in Section II.c below.

[11] A jump component to asset returns complicates the ensuing analysis, but does not affect most of the RCD features derived here. See Section II.c.

[12] Presumably, banks would aim for some cushion above this minimum required equity level.

The equity trigger is examined at some time t > 0. If the asset value ($\tilde{A}_t$) exceeds its initial level ($100), equity value exceeds $8 and the bank remains sufficiently capitalized. The bank could then pay dividends or repurchase shares if it wished to reduce its capital ratio to 8%. However, if the asset value ($\tilde{A}_t$) has fallen, the bank's capital ratio becomes inadequate. RCD convert until the capital ratio is restored to 8%, or until all the initial RCD have converted (whichever comes first). Figure 1 illustrates the bank's time t capital ratio as a function of the asset portfolio's value. With conventional bonds (SND) outstanding, the firm's capital ratio falls with asset value. When $\tilde{A}_t$ < $92 the firm fails, and its fixed-income claimants are left to absorb the costs of re-organization. The narrow line in Figure 1 shows the bank's capital ratio with SND obligations. By contrast, the thicker line traces the bank's capital ratio when it has issued RCD. For relatively small losses, the converting RCD maintain the bank's capital ratio at 8%. Capital becomes "inadequate" only if $\tilde{A}_t$ falls below $94.56, where the $2.56 of remaining initial equity plus the $5 of converted RCD become insufficient to maintain an



8% capital ratio. If $\tilde{A}_t$ falls to \$92, the initial equityholders are wiped out, but the RCD conversion leaves the bank's capital ratio at $\left(\frac{\$5}{\$92}\right)$=5.43%. The firm fails only if $\tilde{A}_t$ < \$87.[13] *Ex ante*, the expected deadweight costs associated with bankruptcy are lower with RCD than with conventional SND, provided that RCD do not induce shareholders to take on additional risk. I argue below that RCD do not encourage risk-taking if the equity trigger is appropriately designed.

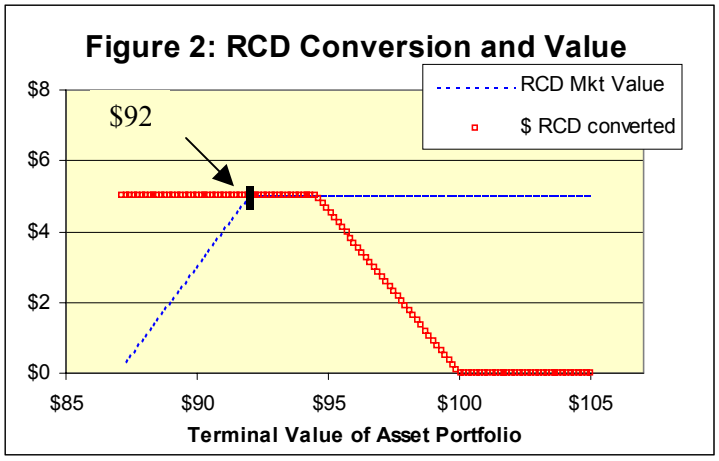


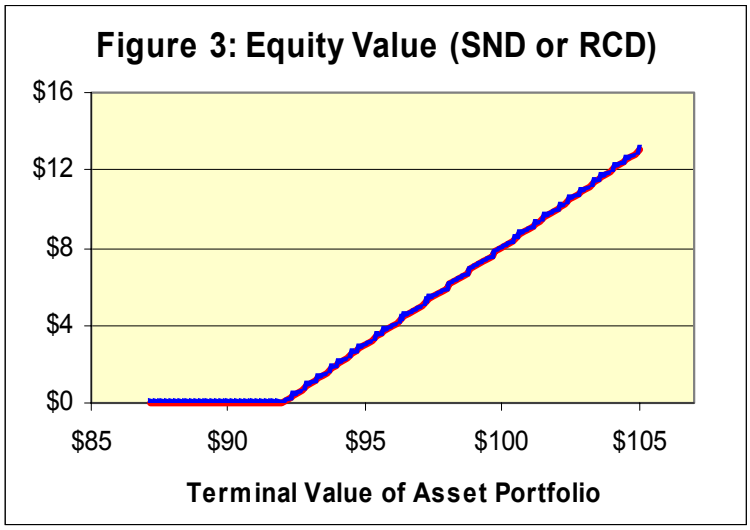
Figure 2 illustrates how RCD conversion provides the firm with this additional equity protection. The thin line in Figure 2 traces the value of outstanding RCD at time t, as a function of the realized asset value. RCD receive the standard type of risk bond payoff. At high asset values ($\tilde{A}_t \geq$ \$100), bonds are fully repaid in cash. For \$92 < $\tilde{A}_t$ < \$100 the bonds are fully repaid with a combination of cash and shares.[14] These shares are sold to converting bondholders at a price that reflects the realized value of bank assets, and hence the RCD investors receive the full amount of their promised repayment over this range of asset values. When $\tilde{A}_t$ < \$92, all RCDs convert, but the resulting equity claims are worth less than the bonds' promised repayment. That is, the bondholders

[13] This statement assumes that RCD convert even if the initial equity has been fully depleted.

[14] Bond investors with no expertise in evaluating bank equities may choose to sell their shares immediately upon conversion, or the RCD most likely to convert might be sold to specialists.

suffer default losses. However, the firm's ownership is passed from shareholders to bondholders *without* an event of default or the costs associated with default.

To summarize, the innovative contribution of RCD to firm capitalization takes two forms. First, bankruptcy is avoided for asset realizations in the range [$87, $92]. RCD therefore provide the risk-absorption of equity without the *ex ante* tax burden. Second, limited conversions maintain the bank's equity capital ratio in the wake of small losses. If the initial equity holders are not wiped out, RCD investors are fully repaid, although the form of that repayment (cash vs. shares) is uncertain. Because the absolute conversion price is not specified *ex ante*, shareholders do not know what proportion of the firm's shares will be transferred to RCD investors upon conversion. The shareholders' uncertainty permits RCD claimants to be free of credit risk over a wide range of asset values.



Surprisingly, Figure 3 indicates that the payoff to the bank's initial equity holders takes the same (familiar) form for *either* RCD or conventional SND. Does this imply that RCD and SND have similar effects on shareholders' risk-bearing incentives? [15] The answer depends on the probability that the loss on initial assets exceeds the value of initial equity. Moral hazard occurs when shareholders do not bear

[15] Green [1984] shows standard convertible bonds eliminate the incentives of equity to undertake excessive risk, under at least some theoretical conditions. Positive outcomes are shared with convertible bondholders, while the expected value of negative outcomes are paid by shareholders in the form of a higher coupon rate (or lower conversion price). However, convertible bonds share the costly feature of regular debentures that the issuer must fail in order for debenture losses to be imposed. These costs can be avoided with RCD.

the full "downside" of their investment decisions. The key to un-distorted investment incentives is therefore to make the initial level of equity capital large, compared to the relevant asset volatility. A market-based conversion trigger can be evaluated very frequently – that is, we can make the time interval "t" quite short, which limits the range of likely asset values at the time conversion can next occur.[16]

This turns out to be a very important design advantage of the proposed RCD. Since the asset value's volatility rises with the square root of the time between evaluations, a shorter interval between evaluations makes large asset declines quite unlikely. For example, consider an annual bank asset volatility (σ_A) of 5.72%, which is the median of large U.S. bank holding companies' asset volatilities in 1998-2000 computed by Flannery and Rangan [2002]. With annual examinations and normally distributed asset values, the probability of an 8% decline in asset value (enough to wipe out initial equity) is about 8.1%. Now suppose that RCD might be converted at the end of every month, based on month-end share prices. The asset return's one-month value has a standard deviation of 1.65% (= $\left(\frac{5.72\%}{\sqrt{12}}\right)$) and the probability that asset value falls enough to wipe out the firm's initial 8% equity is effectively zero (6.34E-07). By shortening the interval between possible RCD conversions, we make the shareholders' payoff in Figure 3 linear over (effectively) the entire range of possible asset values. The beginning-of-month shareholders fully bear any decline in asset values, just as they accrue all of the asset appreciation. In other words, shareholders confront un-distorted risk-bearing incentives.

Figure 3 shows that RCD investors in a bank with 8% initial capital and monthly trigger evaluations, bear effectively no risk of loss. If the bank starts out at its minimum capital level, there is a high probability (something less than 50%) that at least some RCD would convert into common shares, but those investors are still very likely to be paid the full value of their debentures.

[16] Pyle [1986] makes this point: that riskier assets c/should be accompanied by a shorter interval between examinations.

c) Further Design Issues

Effect on Bank Share Prices. Replacing traditional fixed claims with RCD will lower the call option component of bank equity value. RCD could still increase share values if they permit banks to operate with lower equity ratios. Suppose again that the typical annual asset volatility is 5.72%. Initial equity capital of 8% implies an 8.1% probability of a credit loss for RCD with annual trigger dates. By reviewing the triggers monthly instead of annually, the RCD have the same default probability (8.1%) with only 2.3% initial capital. Setting initial capitalization to 5% (for example) would give the monthly-triggered RCDs a default probability of twelve basis points (0.12%). Bankers could therefore reduce their equity capital from (say) 8% to 5%, add another 5% of relatively safe and short-term RCDs, and substantially lower their default probability. The tax treatment of RCD "capital" and a reduction in expected default costs would tend to raise equity value, offsetting at least some of the lost option value.

Equity Market Imperfections. Share prices can fluctuate for reasons other than changes in the firm's underlying asset value. It is therefore comforting to know that the RCDs' low default risk does not require that shares be valued in a perfect market. As the probability of RCD conversion increases, share prices will change to reflect the net effect of additional shares on each outstanding share's value. One might anticipate that the firm's shares would fall in value

a) on account of a downward sloping demand schedule for the bank's equity

b) because each share's voting right becomes less valuable when there are more shares outstanding,

c) because the firm will become less levered.

Suppose the net effect is negative. The market price per share in Table 3 would then be less than $0.50 and RCD investors will get more than 5.52 shares for their $2.76 of converting RCD. The initial shareholders will be left with a smaller proportion of the firm. Market imperfections therefore affect only the initial shareholders, who thereby bear the full effect of poor investment outcomes.

Maturity of the RCD. Conventional subordinated debentures protect senior (deposit) claimants only if they are not redeemed before bankruptcy occurs. Accordingly, SND must have long maturities in order to count as regulatory capital.[17] The situation is very different for RCD, which protect senior bank claimants by adding equity following small losses. RCD serve this function so long as they cannot mature before the next possible conversion date – say the end of each month. Casual introspection suggests that the costs of maintaining a portfolio of RCD would be lower if the debentures' maturity substantially exceeded the conversion interval. (A longer maturity would probably make it easier to replace converted RCD with new ones.) However, the important point is that an initial maturity of 1 – 2 years seems sufficient if trigger evaluations occur monthly. Since high-quality bonds with relatively short maturities have a liquid market, banks could continue borrowing in their traditional maturity habitat. Their issues of RCD will thus benefit from marketing scale economies, and selling new RCD to replace the converted ones should be relatively easy.

Monitoring with Debenture Spreads. If the proposed RCD are generally quite safe, one might wonder whether their interest rates could be used to monitor bank condition or to constrain supervisory discretion. To some extent, the answer is straightforward: if trigger intervals are short and initial equity levels are high, banks are very safe and a low spread on RCD should be the norm. If RCD investors perceive an increase in asset volatility that raises default risk, bond values will fall. The observed yield premia will continue to provide information about the market's view of a bank's capital sufficiency. Consequently, supervisors can continue to infer information from RCD investors, even if that information simply attests to the low probability of a bank's default.

Jumps in Asset Returns. The discussion in this section has assumed a continuous distribution of asset values. Clearly, a jump component to asset returns makes capital problems more likely and thus increases the probability that RCD investors will suffer default losses. However, RCD still prevent failure more effectively than conventional SND. In Table 1, $\tilde{A}_t < \$92$ forces bankruptcy if the firm has

[17] Under current U.S. capital regulations, the proportion of a debenture that counts for regulatory capital declines linearly in the last five years of its scheduled life.

issued SND, while RCD would keep the firm solvent (though perhaps under-capitalized) for asset value realizations down to $87. In addition, RCD continue to maintain bank capitalization better than SND for relatively small losses. Although asset return jumps make it more difficult to maintain bank solvency, RCD retain substantial advantages over current arrangements.

A Means of Issuing Equity. A low equity ratio can occur because losses depress equity value (a bad thing for the firm), or because asset growth is rapid (probably a good thing). In the absence of RCD, a regulated firm's growth is constrained by its retained earnings plus new securities issued. Large, intermittent equity issuance involves a well-known lemons problem and is also relatively costly. RCD might permit managers to finance growth with equity without controlling when that equity is issued. As suggested by Hillion and Vermaelen [2001], therefore, issuing equity through RCDs may improve the price at which new equity is sold.

d) Summary

RCD triggered by a low market capital ratio will maintain the issuing firm's equity ratio over a wide range of asset value losses. Consequently, uninsured counterparties need not run as a bank's equity falls, and losses at a large financial firm need not generate the type of downward spiral that presently elicits supervisory intervention. Frequent trigger evaluations eliminate moral hazard incentives and expose the RCD to surprisingly low default risk. This added protection imposes no immediate tax burden on shareholders, because un-converted debentures are paid tax-deductible interest. With sufficiently high (conservative) trigger points, RCD are very safe and new ones can readily be issued to replace converted debentures. Although RCD would deprive financial firms' shareholders of some option value, they would benefit from lower expected bankruptcy costs and their ability to maintain a given solvency standard with less equity capital "on the books."

III. Does Market Value Provide an Appropriate Trigger?

Supervisory personnel historically formed their own assessments of bank condition, frequently via on-site visits. These assessments influenced capital adequacy judgments. However, supervisors have been increasingly willing to utilize market information in assessing regulated financial firms. The models-based approach to assessing credit risk exposures in Basel II substantially delegates capital adequacy judgments to the regulated firms themselves. Even the "standardized approach" anticipated for smaller banks defines required capital in terms of the borrowers' (privately produced) credit ratings. Still, many supervisors feel that market prices are not always accurate. Market prices can reflect only information that is available to investors, and even then the prices are correct only *on average*. We must therefore consider the implications of security pricing errors. This Section considers whether market prices or book valuations are more accurate, and whether pricing errors would imply large costs for the RCD conversion scheme.

a) Market vs. GAAP Measures of Bank Capitalization

The issuers' equity ratio seems to be a reasonable trigger for a convertible security designed to maintain adequate capitalization. A bank's equity can be valued according to Generally Accepted Accounting Principles (GAAP) or at current market prices, and these two estimates can diverge substantially. Both valuations probably include errors. However, an efficient market's bank stock valuation errors should have zero mean and no serial correlation. By contrast, GAAP provides managers with options to inflate their firm's value and supervisory restrictions on book equity ratios sometimes provide strong incentives to do this.[18] Relying on GAAP capital ratios to trigger RCD

[18] For example, many BHCs sold their headquarters building in the 1980s, booked a capital gain, and then leased it back from the purchaser. A bank can also "cherry-pick" its securities portfolio to enhance its book equity, realizing the gains on appreciated securities while postponing the sale of assets with unrealized losses. Finally, loan provisioning offers a notorious means of inflating equity value for troubled banking firms, because managers have substantial latitude about how much inside information to reflect in their reported loan loss allowance. Note that each of these transactions raises the present value of taxes paid, which lowers equity market value (*ceteris paribus*) even while it boosts book value.

conversion seems problematic if book equity value is biased upwards when the firm is closest to distress. This appears to be the case. [19]

The data in Table 2 suggest that book equity ratios are overstated for the most highly levered U.S. bank holding companies (BHC). These data describe the 100 largest U.S. large bank holding companies with traded common equity, over the period 1986-2000 (Flannery and Rangan [2002]). The reported book equity ratio is the book value of common stock divided by the book value of total (on-book) assets. The market value equity ratio is the market value of common stock divided by the sum of (the book value of total liabilities plus the market value of common stock). The dataset includes 151 BHC with at least one year's data. An individual BHC could appear up to 15 times among the dataset's 1,288 observations. Across the entire sample, 17% of BHC-years report a book equity ratio above the corresponding market ratio, but this is much more likely to occur for BHC with low capital.

The first row of Panel A divides BHC into a group of 84 firm-years with book capital less than 5% of assets and 1,204 firm-years with a book capital ratio exceeding 5%. This result is consistent with the hypothesis that banks subject to regulatory pressure will use accounting options more aggressively to show higher book capital. Similar patterns occur when the sample is divided at higher capital ratios (8% or 10%). Panel B of Table 2 divides the sample's 1,288 BHC-years on the basis of their *market* equity ratios. Now the results are even more dramatic: banks with low market capitalization are more than ten times more likely to report book equity ratios exceeding the market's assessment.

The biases in book equity valuations will lead supervisors to close banks too late or too infrequently. With book valuations most likely to be overstated for the firms attracting supervisory attention, a bank's true (market-based) asset value can easily be lower than liabilities' value while book value remains positive. Such firms have strong incentives to gamble for resurrection. The same bias makes the book equity ratio a poor trigger for RCD conversions, unless the required capital ratio is set very high.

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[19] Peek and Rosengren [1996, page 57] contend, "Reported capital ratios are lagging indicators of bank health, in part because some banks have not fully reflected likely future losses in their loan loss reserve." See also Jones and King [1995].

b) The Effect of Pricing Errors

In an efficient market, current asset prices are the best indicators of future values. Because market valuations incorporate informed expectations about a firm's future cash flows, they seem well suited to the role of RCD trigger proposed here. However, security markets are probably not "strong form" efficient (Fama [1970]). Market investors may lack important information, or may mis-interpret the publicly available data.[20] Nor do efficient prices imply perfect accuracy at all times. Bank regulators often feel that on-site supervisory inspections generate important information that is not available to the public, or that investors do not act rationally when a bank is in financial distress. Given the possibility that market share prices contain valuation errors, few supervisors are prepared to rely on market valuations for important decisions. This view may be quite appropriate for some purposes, but pricing errors have a relatively benign effect on RCD.

Pricing errors can be evaluated in the context of a forecasting problem. Supervisors seek to identify banks that need to be closed, or forced to recapitalize. Investors seek to identify banks whose current share prices do not reflect their true prospects. Supervisors and investors both wish to estimate a banking firm's true (but unobservable) condition and such estimates generally include "forecast errors." Both supervisors and investors must recognize the presence of these errors when deciding how to respond to new information. In some cases, the potential for valuation errors makes it optimal to act slowly. Consider the case of a bank closure. Banks are appropriately closed when their liabilities exceed the value of assets in place plus future growth options. Supervisors perceive (probably quite appropriately) that closing a bank is socially costly even with a safety net. By contrast, the cost of permitting an insolvent bank to continue operating for a while seems less costly. A supervisor should therefore consider the incidence *and cost* of Type I and Type II classification errors when making a closure decision. With asymmetric costs of mis-classification and symmetrical pricing errors, the

[20] Some banking writers contend that banks are unusually difficult for outsiders to value. Flannery, Kwan and Nimalendran [2002] provide some evidence contradicting the hypothesis for "normal" times, although the question remains whether bank valuation errors become unusually large when the bank is in distress.

optimal closure decision will not occur when the estimated bank value is zero, but rather when it is negative.[21]

While mistakenly closing a bank entails deadweight costs, an RCD conversion caused by a share pricing error only re-distributes value between shareholders and RCD investors and the associated risk should be diversifiable. A small share pricing error generates (or avoids) only a small RCD conversion. As asset prices fluctuate or the bank's assets grow, conversions may happen fairly often. With unbiased share prices, bank shareholders expect to sell their shares at a "fair" average price. The cumulative value of these re-distributions should be close to zero and the associated deadweight costs correspondingly small. Contrast this with the present-day situation, where supervisors tolerate capital insufficiency for a while, then pressure the bank to make a large securities issuance. (The large fixed costs of security underwriting also tend to make seasoned equity offerings relatively large.) With infrequent, large security issues, pricing errors affect a bank's expected welfare more than if the bank converted small amounts of RCDs at many points in time. Potential share pricing errors are much less important if RCD are converted gradually on the basis of a market equity ratio, when the firm is not in financial distress.

A second type of valuation error also affects the number of shares conveyed to converting bondholders: the RCD's market value.[22] If a bank's RCDs trade in an active market, those prices provide the obvious estimate of bond value for conversion purposes. However, bonds can also be valued via the type of matrix pricing used to compute a bond mutual fund's daily net asset value. Errors in either share prices or estimated RCD values will affect the number of shares per dollar of converted RCD. Yet the potential for bond mis-valuation adds little to the preceding discussion, which has already treated uncertainty about the exchange ratio when shares may be mispriced. Furthermore, the stock and

[21] Acharya and Dreyfus [1989] derive an optimal closure rule with "early" closure – the bank is closed while asset value still exceeds liabilities.

[22] Recall that Table 1 presents the market values of bank assets and liabilities. An RCD conversion based on book debenture values could generate large value re-distributions, which would affect investors' *ex ante* behaviors.

bond pricing errors are likely to be positively correlated, with (imperfectly) offsetting effects on the number of shares per converted bond.

c) Trigger Design

Several main elements of RCD design depend on how the trigger ratio is computed and how often it is evaluated. Without this information, one cannot compute a required minimum equity capital, a minimum RCD ratio, or the required speed of replacing converted RCD. While the discussion to this point has assumed "a" relevant market equity ratio, the mechanism for computing this ratio warrants further consideration.

First, how should this ratio be computed? Initially, one might think to use the last trading day's closing price for the issuer's equity. However, noisy market prices may imply that share prices should be averaged over some interval. Likewise, the potential for price manipulation by an interested party seems to support the use of an average. (Recall how option cash values were initially based on closing prices, but subsequently changed to an average over some time period.) On the other hand, averaging share prices over too long an interval diminishes the speed with which a firm can be re-capitalized. Because the intended RCD issuers are large, important financial firms, their share prices seem difficult to manipulate for very long.

Second, how often should the market equity ratio be evaluated for large banks? A market equity ratio trigger could be evaluated weekly: equity prices are available daily, and many large banks already report their total liabilities on a weekly basis. For example, in the U.S. all banks with more that $17 billion in total assets are asked to complete the "Weekly Report of Assets and Liabilities for Large Banks" (form FR 2416). Although participation in this survey is voluntary and the individual banks' data are presently confidential, it seems reasonable to require a weekly statement of total liabilities from large holding companies, so that their market equity ratios could be computed. Although I have not analyzed this issue in detail, further discussion may be aided by a specific suggestion. Therefore,

> I propose that the closing market value of equity be averaged over the last five business days of each month.[23] Issuing BHC would report their closing liability balances over the same five days, and the trigger ratio would be the simple ratio of average equity value to (average liabilities plus average equity value). If the trigger were tripped, shares would convert on the first trading day of the (immediately ensuing) month.[24] Supervisors could require that converted RCDs be replaced within a week.

In an efficient stock market, it is quite possible that a bank's market value will rise again shortly after some RCDs are converted, making its capital more than adequate at the subsequent trigger evaluation. The bank could choose to hold this equity as a cushion, or (if the price reversal were large) it could pay out some excess equity via dividends or share repurchases, subject to the minimum permissible level of equity's market capitalization.

d) Costly Strategic Behaviors

The process of converting some debt to equity when the borrowing firm becomes poorly capitalized provides several benefits to firm claimants. It also raises some corporate control issues. Such conversions would expose both shareholders and RCD investors to new types of expropriation.

#1 Encourage Short Sellers? Hillion and Vermaelen [2001] study a set of 487 "death spiral convertibles" issued in the U.S. before August 1998. These bonds or preferred stock could be converted to equity at the investor's option, generally at a conversion price *below* the shares' market value on the conversion date. Many issues also included a look-back option in the form of a conversion price based on a trailing average market value. Hillion and Vermaelen give the example of a gold mining company that issued convertible preferred stock in 1997. The preferred shares were convertible (at their face value) into common shares. The conversion price was between 8.5% and 39% of the common shares' recent average (past 15 – 60 days) market value. They find that 85% of the firms that issued such convertible bonds had negative abnormal returns in the subsequent year, and a great many failed. They

[23] This average should probably be weighted by shares traded, to help alleviate the potential for low-volume price manipulations.

[24] Inserting a few days between the trigger evaluation and the conversion date would permit bond investors to sell their bonds to traders with lower costs of liquidating the converted shares.

conclude that this poor *ex post* performance was largely due to contract design flaws that encouraged short-selling by the convertible investors. Since the investor could obtain shares through conversion, she could increase her expected returns by selling short the underlying common (Hillion and Vermaelen [2001], page 3). The selling pressure might drive down share prices. Anticipating such a decline, professional short sellers sought out companies with convertible bonds or preferred shares.

The RCD proposed here differ from Hillion and Vermaelen's death spiral convertibles in several important ways. First, RCD investors have no riskless arbitrage opportunity because they have no option to convert, or even to time a conversion mandated by a low capital ratio. Second, conversion occurs *at* the current market price, not at a discount. Short sellers cannot lock in a riskless profit based on their option to convert at a discount to market value (Shleifer and Vishny [1997]). Third, many of Hillion and Vermaelen's sample securities were converted at their *par* value. My proposed RCD convert at their (actual or estimated) market value, which eliminates the loss to existing shareholders when conversion occurs. Unlike the death spiral convertibles, RCD conversion causes no systematic transfer from shareholders to bond investors. Despite the fact that RCD *appear* less likely to encourage shorting the issuer's equity, it is worth evaluating the impact of RCD issuance on stock price dynamics, particularly as the firm's assets fall in value.

#2 Aid Corporate Raiders? Could RCD become a vehicle for gaining control of a firm cheaply? Perhaps a corporate raider could accumulate a firm's outstanding RCDs, then short-sell the stock to force conversion at an artificially low price. One obvious response to the fear of market manipulation is to make the trigger apply to an average share price, as opposed to any one day's price. Another response is to observe that RCD are designed for large, systemically important financial firms, whose shares trade in broad and deep markets.

#3 Entrench Management? Management is often replaced when a firm fails or is taken over. By avoiding financial distress, RCD would also circumvent this mechanism for replacing weak management. This constitutes a deadweight cost of RCDs, which is more important in industries for

which managerial talent more strongly affects firm value. Still, shareholders (including the newly converted ones) could vote management out. If RCDs increased managerial entrenchment, it would constitute a deadweight cost of including them in a firm's capital structure.

#4. Timing the Conversion of Shares. It is often alleged that managers offer new shares to the market when they feel their shares are overvalued (Myers and Majluf [1984], Ritter [1991]) If management felt its shares were overvalued when the firm was close to its equity ratio trigger, they could pay a large dividend or repurchase shares in order to drive the ratio below the trigger. The value of such behavior is limited, however, by the fact that new shares are issued to RCD investors only in proportion to the equity shortfall. It seems that large share issues through this channel are unlikely at any one trigger date.

On the other side, managers might take extraordinary (and costly) steps to *avoid* triggering conversion if they wished to protect their current shareholders from the attendant dilution. Impending conversion might cause managers to continue paying normal dividends despite falling sales, to under-report expected future loan losses, etc. Although these possibilities deserve serious consideration, the fact that falling a little below the trigger level only causes a little conversion (and hence a little dilution) seems likely to limit the deadweight costs that shareholders would bear in order to avoid conversion.[25]

Both of these possible share manipulation strategies deserve further consideration.

Unresolved Issues. I have not fully analyzed all of the important features of a capital policy based on RCD. Omitted issues include:

- Mandated Ratios. What level of equity capital should be required, and how is it determined? How should the volume of outstanding RCD affect the required amount of equity?

- Replenishment. How quickly should a bank be required to replace converted RCD?

[25] When Manufacturers' Hanover confronted a possible conversion of preferred stock in late 1990 (see footnote 6), they considered redeeming the issue using cash on hand. Such a "plan" only works if a supervisor will accept it. Under a market value trigger, such redemption would have to be financed by issuing equity; otherwise, the redemption would further lower the capital ratio. Another important feature of the MH convertible preferred issue was that the entire issue converted if common share prices were even $.01 too low over the specified time interval.

- Maturity. Should supervisors care about the maturity of RCD?

- Pricing Errors. For what set of large financial firms might actual pricing errors (for the shares or for the RCDs) cause serious problems?

- Tax Treatment. I have assumed that RCD interest will be tax deductible, and that conversion is not a taxable event. Is this correct?

- Market. Is there likely to be a deep market for RCD?

- Scope. How large a banking firm should be required to maintain outstanding RCD? Is it possible to implement an RCD scheme for a bank without traded equity? With only thinly traded equity?

- Ownership Restrictions. At least in the U.S., supervisors must approve the identity of anyone who controls a banking firm. Similarly, a controlling firm becomes subject to regulation as a BHC or Financial Services Company (FSC). Finally, the SEC requires investors to report when they control 5% of a traded firm's shares. Would such ownership restrictions limit the market for RCD? Is there a sufficient grace period within which an RCD owner can dispose of his shares in order to avoid such regulations?

If reverse convertible debentures become a serious candidate for regulatory capital, these questions will need more extensive consideration.

IV. Summary and Conclusions

Bankruptcy costs tend to discourage many firms from operating with high leverage. This must reflect some deadweight cost of raising new equity in the wake of substantial losses. A security that reduces the deadweight costs of financial distress could therefore permit firms to operate with more debt, and hence (perhaps) a lower cost of capital. Reverse convertible debentures (RCD) expand shareholders' financing opportunities by automatically reducing leverage when it becomes too high. RCD provide a transparent and time-consistent means of "programmed unlevering" that require no new securities be sold to the public when a firm has been suffering losses. Many types of firms might be able to use RCD in place of conventional debt to increase their financial leverage quite substantially.

RCD have special benefits for the supervisors of large financial institutions. The Basel Committee's intention to make "Market Discipline" an important component of supervisory oversight is commendable (Basel Committee on Banking Supervision [2000a, 2001]). However, relying on market

discipline for systemically important institutions is probably not a time consistent policy, given supervisors' and central bankers' concerns about the social costs of a large financial firm's failure. Exhortations from academics and others to "let the market work" in these situations are doomed to fail, because the people in charge believe that the market works poorly when a large firm becomes distressed. If large bank failures are believed to be socially costly, *ex post* incentives to bail out the creditors of a large bank will interfere with market incentives to monitor and discipline such firms. Yet these are precisely the firms for which market disciplinary forces have the greatest value, because traditional supervisory practices are least efficacious.

It may be preferable to design a security that keeps banking firms adequately capitalized in most situations. A firm whose outstanding debt includes reverse convertible debentures (RCD) has established a transparent means by which relatively large capital losses can be absorbed without involving depositors, counterparties, or taxpayers. RCD circumvent the human or legalistic tendencies to forebear when a firm experiences minor difficulties: they automatically "make the decision" to increase the firm's equity capital whenever it becomes inadequate. Triggered by a frequently-evaluated ratio of equity's market value to assets, RCD could be nearly riskless to the initial investors, while transmitting the full effect of poor investment outcomes to the shareholders who control the firm. In short, some features of RCD appear to be extremely attractive to issuing banks, market investors, and supervisors.

Appendix

Some Precedents for Reverse Convertible Debentures

The RCD instrument proposed here reflects earlier proposals regarding SNDs and closure rules.

Horvitz [1983] observed that deposit insurance would be unnecessary if banks could be closed as soon as their asset values fall below their promised liability payments. This argument is correct provided that asset values follow a continuous statistical process (no jumps), that deadweight closure costs are zero, that supervisors can observe bank asset values continuously, and that supervisors can close insolvent firms promptly even if they have positive book value. Horvitz' intuition clearly indicates that efficient bank closures should involve frequent inspections and rapid supervisory action.

Wall [1989] proposed that banks issue subordinate debentures with an embedded put option: investors could demand repayment (at par) at any time for any reason. The put option substitutes for traditional restrictive covenants, and hence avoids the need to specify untoward events *ex ante*. Puttable debt also addresses some of the problems of book value supervisory intervention. A solvent bank should be able to replace the redeemed debentures. If a bank cannot do so promptly, it would have to close. This feature would give market investors a lot of power over whether and when to terminate a distressed banking firm. Some would count the resulting constraints on supervisors' options as a benefit. It may also have discouraged official support for the idea.

Bankruptcy studies note that distressed firms have three avenues for improving their situation. First, they can go through statutory bankruptcy (or the financial-firm equivalent), which entails substantial deadweight costs that seem to be particularly large for banking firms (James [1991]). Second, they can try to unlever the firm by exchanging debt for shares. This is a relatively low-cost transaction, but it is difficult to implement with many, atomistic bondholders. Finally, the firm can negotiate a "pre-packaged" bankruptcy restructuring, and then use the bankruptcy law's cram down feature to impose the deal on minority (Betker [1997], McConnell and Servaes [1991], Tashjian *et al*. [1996]). RCD resemble a state-dependent pre-pack: if equity falls, some bonds will be converted to

shares to unlever the firm. Programmed unlevering not only reduces expected bankruptcy costs but also changes the incentive structure for new project selection by reducing debt overhang. Importantly, the firm needs to raise no new money at a time when managers frequently believe that their securities are undervalued.

Almazan *et al*. [2002] try to explain why firms do not counteract the potential distress costs of high leverage by committing to sell new equity if leverage gets too high. Their model includes a negative expected effect on firm value when information is revealed through the due diligence process. (These costs reflect an assumed asymmetry in workers' wage demands to the information revealed.) Early in the paper (fn. 2) Almazan *et al.* acknowledge that some forms of convertible debt may circumvent these negative information effects while reducing the uncertainties associated with the bankruptcy process.

Doherty and Harrington's (DH) [1997] "reverse convertible debenture" is the most direct antecedent of the security I propose here. Starting from a risk-management perspective, DH define an RCD as subordinated debt that can be repaid with either cash or common shares at a *pre-specified price* at the *option of the issuing firm*. They derive the impact of such a debt instrument on risk-taking incentives, and conclude that these securities can be valuable for any sort of firm. (See also Doherty [2000a], chapter 13.) The RCD I analyze here differs from DH's security in two important features. First, my RCDs convert at *current* market prices rather than at a *predetermined* price. Second, the DH security provides shareholders with an option to repay debenture holders with shares only at maturity, while my RCDs convert automatically whenever the trigger is tripped. These two features make my RCDs relatively safe and provide shareholders with extremely good incentives for making new investments.

A few capital market instruments already exist to re-capitalize a firm following specified events. Some insurance companies have issued "catastrophe bonds" that are canceled following a large loss (Doherty [2000a], pp. 609-613). "Contingent capital" contracts give an insured firm the right to sell equity instruments (usually preferred stock) to an insurance company under pre-specified conditions

(Shimpi [2001], chapter 9 and Culp [2002], chapter 21). The investment trade press describes a limited number of bonds that can be repaid with either cash or shares, at the issuer's option. These bonds generally offer maturities of one to three years, are sold to retail investors, and offer a high coupon rate to compensate for the embedded put. Doherty [2000b] points out that these instruments serve a risk-management function: when the firm's share price is depressed, part of the outstanding debt is (effectively) forgiven.

A similar-looking, but puzzling, instrument provides the issuer with an option to repay principal with *another* company's stock. For example, ABN-Amro has outstanding a number of "Reverse Exchangeable Securities": medium term notes repayable either in cash or a fixed number of shares of another company's stock, at the option of ABN-Amro. Outstanding Reverse Exchangeable Securities permit payment with the stock of Walt Disney Co., Citigroup, General Electric, and Home Depot, among others. Perhaps these securities constitute a means of selling under-priced put options to retail investors.

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Table 2: Relation Between Book and Market Capital Ratios
100 large U.S. Bank Holding Companies, 1986-2000

Annual data describe BHC capital ratios during 1986-2000. (1,288 BHC-year observations).

- **Book Equity Ratio** = the book value of common stock divided by the book value of total (on-book) assets.
- **Market Equity Ratio** = the market value of common stock divided by the sum of (the book value of total liabilities plus the market value of common stock).

Panel A: BHC sorted on Book Equity Ratio

	Percentage of BHC with Book Ratio Above Market Ratio when …		
Critical Capital Ratio	**Book Ratio Below Critical Value**	**Book Ratio Above Critical Value**	**# below Critical Capital Ratio**
< 5%	63.10%	13.79%	84
< 8%	23.20%	3.25%	888
< 10%	17.63%	4.76%	1225

Panel B: BHC sorted on Market Equity Ratio

	Percentage of BHC with Book Ratio Above Market Ratio when …		
Critical Capital Ratio	**Market Ratio Below Critical Value**	**Market Ratio Above Critical Value**	**# below Critical Capital Ratio**
< 5%	92.96%	7.59%	142
< 8%	57.07%	0.55%	375
< 10%	37.85%	0.14%	576