Should Banks Trade Equity Derivatives to Manage Credit Risk?

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Banks incur a variety of risks and utilise different techniques to manage the exposures so created. Some of those techniques are internal to the bank. For example, the law of large numbers enables banks to diversify away liquidity risk or default risk from a portfolio of retail loans. Alternatively, matching of asset and liability characteristics such as interest rate reset dates removes interest rate risk. Other techniques involve use of markets. For example, banks can take positions in markets in interest rate options and futures to manage interest rate risk.

Unfortunately, one type of exposure does not appear amenable to either of these risk management techniques. This is the credit risk arising from loans extended to large corporate customers. While a portfolio of corporate loans can provide some protection by diversification, most banks face significant residual exposure to large corporate customers. Nor does it seem generally possible to trade away such an exposure into the market.

That has certainly been the case in recent banking experience in Australia. Two State government owned banks have suffered major losses, primarily on corporate lending, which wiped out their capital reserves. In one case, the State Bank of Victoria, the losses were primarily incurred through the actions of its merchant banking arm Tricontinental, and led to the ultimate sale of the bank to the Commonwealth Bank. In the other case, the State Bank of South Australia, the losses were incurred within the bank itself, and an equity injection from the government owner was required. Royal Commissions have been established in both cases.

Other major Australian banks have not escaped unscathed from the rash of corporate failures in Australia. Latest sets of accounts have involved significant increases in provisions for bad and doubtful debts and loan write offs. Bank profit figures fell dramatically in 1990 -91 and, more significantly, bank equities underperfomed the market on a large scale.

The objective of this paper is to point out that a hedging strategy, albeit imperfect, does exist. Once a bank has extended credit to a large corporate customer, it faces the possibility that a decline in the asset value of the customer below the contractual repayment can occur and lead to default on the loan. A hedging strategy thus requires finding some asset whose value increases as the corporate's asset value falls. Such an asset can be readily found in the form of either a short sale of the corporate's equity (perhaps constructed using put and call options) or as a bought put option on the company's shares. While the share price will not move in direct relation to the underlying asset value of the company, the correlation can be sufficient to provide a potential hedging mechanism. Moreover, adverse movements in the share price itself may sometimes be sufficient to trigger default clauses in loan agreements, and thus an event warranting insurance against.

With the deregulation of banking which is occurring world wide, in particular the removal of barriers between commercial and investment banking, the chance for commercial banks to utilize equity markets for hedging purposes becomes possible. While such a move appears radical, it involves nothing more than recognizing that the exposures involved in corporate banking may be closely linked to share market performance of the customer and thus most suitably hedged using equity market instruments.

In the following section, a simple model is outlined which demonstrates the relationship between share prices and asset values for a corporate with a bank loan outstanding. This is then utilised to demonstrate how the lending bank can achieve a measure of hedging protection by transactions in the equity of the company.

The subsequent section examines some of the difficulties involved in implementing such a hedging strategy. These include the problem of basis risk, arising from the less than perfect correlation between firm asset values and share prices, as well as problems arising from less than complete markets in securities needed for hedging purposes.

Next, the question is addressed of whether bank trading in equity instruments of their corporate customers is appropriate. The banker-customer relationship is one which means that banks have access to differential information about the customer vis a vis the rest of the market. Moreover, their monitoring activities mean they are typically in a situation whereby they can influence management policies - and thus share prices. Where such asymmetric information exists, it is not immediately apparent that allowing banks to trade in equities is in social interests. While this may cause information to be more quickly released into the market, the monitoring incentives and production of information may be retarded.

In the last section, equity trading is compared to several other possible techniques for managing credit risk. These include securitization, increasing seniority of bank loans, and alternative mechanisms for monitoring the behaviour of borrowers. The case for equity trading is considered relative to available alternatives.

A Simple Model

The corporate borrower is assumed to have assets with a resale (market) value of A, a random variable. The corporate has outstanding a bank loan involving a once-only repayment of amount L at date T, and no other debts. It is assumed that there are no costs of bankruptcy or financial distress. Then, the gross payoff

to the lending bank is

$$R = \max [L, A_T]$$
[1]

where if the firm's assets are insufficient to meet the contractual repayment (A < L), the bank takes over the company and sells the company's assets at their resale value. The payoff can be rewritten as

$$R = L - max [0, L - A_T]$$
 [2]

$$= L - P [A_T, L]$$
 [3]

where P [A_T , L] = max [0, L - A_T] is the payoff at expiry T to a bought put option on A with exercise price L. Equation 3 thus indicates that the loan payoff is equivalent to that from a portfolio consisting of a risk free loan plus a sold put option on the firm's assets with exercise price L and expiry date T.

As is well known in the corporate finance literature, the value of that put option at the date the loan is created provides an indication of the default premium which should be incorporated into the interest rate charged on the loan.

Equation 3 illustrates the nature of the credit exposure which the bank has to its corporate customer, and the question which needs addressing is how that exposure might be hedged. Under a number of simplifying assumptions that question is easily answered. Assume that the firm has N shares on issue, the market value of each being S. Assume also that the Tobin's q ratio for the firm is constant at unity, so that the market value of the firm's liabilities (including equity) equal the resale value of its assets. Thus at each date t

$$NS_t + R_t = A_t$$
 [4]

where R_t is the value of the (risky) loan at date t. Then,

$$S_t = [A_t - R_t]/N$$
 [5]

Consider, specifically, the value of S at date T. Using equation 2,

$$S_{T} = [A_{T} - L + max [0, L - A_{T}]]/N$$
 [6]

$$= \max [0, A_T - L]/N$$
 [7]

Equation 7 simply indicates that the share price is zero if the firm's assets are insufficient to repay the loan, and otherwise equal the residual value of the assets less the loan, divided by the number of shares.

Now consider the payoff from purchasing a put option (with value denoted by p) on the company's shares with exercise price of X. At date T this is given by

$$p = max [0, X - S_T]$$
 [8]

Substituting from [7] we have

 $p = max [0, X - max [0, A_T - L]/N]$ [9]

If M such options are purchased and the strike price X is set at

$$X = L/N$$
 [10]

the payoff to the bank is given by

$$Mp = M\{max [0, L/N - max [0, A_T - L]/N]\}$$
[11]

 $= M\{ \max [0, \max [0, L/N - A_T/N]] \}$ [12]

$$= M \{ \max [0, L/N - A_T/N] \}$$
[13]

If the number of options purchased is set equal to N, i.e. M = N, the payoff to the bank is

$$Np = N \{max [0, L/N - A_T/N \}$$
 [14]

$$= \max [0, L - A_T]$$
 [15]

Comparing this with equation [2] which shows the loan payoff, it is apparent that under the assumptions made, the purchase of put options provides a perfect hedge to the credit risk associated with the loan. This is seen by noting that the payoff from the loan plus purchase of put options is given by summing [2] and [15] to obtain

$$R + Np = L - max [0, L - A_T] + max [0, L - A_T] [16]$$

= L

In this simple model, then, a perfect hedge is available to the bank to remove its credit exposure to its corporate customer. Of course, that protection comes at a price. To obtain the payoff of L with certainty, the bank has to purchase N put options on the company's equity. Each option will have a price at the date the loan is granted (date 0) of p(0) which can be expressed as

$$p(0) = p(S_0, L/N, T, r, \sigma_s)$$
 [17]

Equation 17, is a standard option pricing relationship, which indicates that the cost of the protection afforded by the put option will depend upon the current share price, the option strike price, the time to expiry, the risk free interest rate, and the volatility of the share price. In the context of the simple model employed here, these factors can be seen to be closely related to the loan size relative to company assets, and the volatility of asset prices.

Extensions to the model

As outlined above, the model assumes very simple contractual arrangements between the bank and company, and makes strong simplifying assumptions about the determination of share prices. Among the latter, the assumption that the q ratio is always unity is a strong assumption. However, in the event of default, the q ratio will be one, so that the expiry date calculations are not affected. What will be affected will be the cost of constructing the hedge, since deviations of q from unity will affect the share option price vis a vis the value of the implied option granted by the bank. Also, the model assumed implicitly that the options were of the European style.

The issue also arises of whether there is an options market in the company's shares and if so whether contracts with strike prices as assumed in the model are available. If contracts with the required strike prices are not available, it becomes necessary to examine the hedging performance of options with different strike prices. If no options market exists, the possibility of the bank conducting an over the counter market in such options can be considered. Of course, finding counterparties willing to sell such options to the bank and ensuring their ability to meet their obligations if required introduces further problems.

Approaches to controlling credit risk

Consequently, traditional approaches to the management of corporate credit exposure take a number of simple forms. Most commonly, banks place an upper limit on the exposure to а particular customer which will be tolerated. To compensate for the risk taken, banks will endeavour to obtain adequate compensation through the credit risk premium in the interest rate charged. But since that premium reflects the compensation required by a risk averse lender with a less than fully diversified portfolio, it may that required through other financing sources. exceed One consequence has been the growth of syndicated lending, whereby lender diversification is increased by participating in a smaller scale in a larger number of corporate loans. This can be thought of as a market response equivalent to co-insurance whereby the risk is distributed in a number of smaller parcels. Another alternative lies in securitization, whereby loans are repackaged and sold off to investors. While this has grown apace in certain areas, such a technique has yet to emerge as a means of trading out credit risk associated with corporate customers. Several reasons can be suggested. First, most securitization has to date involved creation of low credit risk securities involving claims on a diversified portfolio of loans. Second, the objectives of institutions in securitizing assets have typically been things other than credit risk concerns. Third, securitization works best when the assets being securitized are 'well defined'. Loan arrangements with large corporate customers will often involve significant intangible commitments and arrangements, and many

facilities, as part of an ongoing banker customer relationship. This means that the default probability on any particular loan contract will not be independent of the actions of the bank.

It can also be considered whether this approach to hedging throws any light onto mechanisms used by banks for passing on credit risk to other parties such as syndication, obtaining guarantees etc..

References

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