

MORE ON THE PRICING OF CORPORATE BONDS

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Last time I was talking about the fact that the option formula can be used to value risky corporate bonds, at least in principle. And I was talking about some of the work that was being done to take into account the fact that corporate bonds have dividends and call features and other complications that the simple formula doesn't take into account.

Today, I want to talk about some other elements of the pricing of corporate bonds that come out of looking at corporate bonds in the context of options, but that really do not require knowledge of any specific formula. And for most of the time, I want to assume that bankruptcy of a firm does not involve any real costs. A lot of the actual things that happen in the world in connection with bonds and bond default, I think, has to do with the fact that when there is a bankruptcy, an additional claimant is introduced for the resources of the firm--namely the lawyers who are involved in the bankruptcy proceedings. That has a major effect on the actions of the creditor in the situation where a default may occur.

That isn't the only type of thing that bankruptcy involves. There is also, a disruption of the firm's business because people don't like to do business with bankrupt firms in some cases. Those kinds of things I want to ignore. I want to see what would be true if there were no such costs to bankruptcy.

Now, the formula tells us, in general, that the value of a risky corporate bond will depend on such things as the value of the firm. We can think of the value of the firm as the market value of all of the liabilities taken together--the stock, the bonds and so forth. The value of the risky bond will depend on the value of the firm, on the total risk of the firm--not the beta, but--the standard deviation of the return on the value of the

firm. And it will depend on other things: if the firm pays out dividends to stockholders, or if the firm merges with another firm, that will affect the position of the bondholders.

The value of the bond will also depend on possible changes in the total risk of the firm. If the firm shifts its asset mix or its liability mix in such a way as to change the risk of the assets available to the bondholder, then that will tend to change the market value of the bond.

One of the reasons for bond indentures, which these days tend to be long, legal documents, is to limit the number of things that the stockholders of the firm, acting through the managers of the firm, can do to hurt the bondholders--that is, changes that they can make to reduce the value of the bonds.

The reason they would want to make such changes is, if you think of the value of the firm as a given, fixed quantity and the stockholders do something to hurt the bondholders, then they will be doing something to help themselves, because any dollars taken away from the bondholders will be added to the value of the stock.

That is the context of our discussion. Now let's begin by looking at the first question that I said I am going to talk about and that is the difference between a conventional bond and an income bond. And let me again simplify the definitions of these bonds. In fact, they tend to be very complicated, but let me assume that in a conventional bond, there isn't any interest-rate risk. We are going to ignore interest-rate risk. The risk of the bonds is the risk that the payments will not be made by the firm.

Let's assume that in the conventional bond, if there is a payment missed, then the principal of the bond becomes due immediately and one of

two things happens. If the value of the whole firm is greater than the principal of the bond, then the bondholders are paid off. The firm is sold as a whole, or recapitalized, and the bondholders are paid off in full. If the value of the firm is less than the principal value of the bond, then the bondholders get the whole value of the firm and the stockholders get nothing.

Let us assume that the distinguishing characteristic of an income bond is that, if a payment is missed, no default will be assumed to occur. The missed payment will be added to the principal, or maybe it will just be forgotten about, but there won't be any default until the principal of the bond is due. So it seems on the surface as if the lender might be better off with an income bond than with a conventional bond, because lenders don't like defaults, and you think of a default as something to be avoided. You try to make your loans in such a way that the borrower will not default.

But I would claim that the opposite is true, that, given that something bad has happened to the firm, the lenders want a default to occur. The lender is best off if a default does occur.

Think again of the value of the firm and think of it as being divided between the stockholders and the bondholders. In the case where the firm is worth less than the face value of the bond, the most that the bonds can be worth is the value of the firm. If the equity is worth anything, then the bonds will be worth less than the value of the firm.

And in the case where the firm is worth more than the face value of the bonds, where we have assumed away interest-rate risk, the most that the bonds can be worth is the face value of the bonds. If the bonds are absolutely riskless, then they will be worth their face value.

So, where the corporation is in financial difficulties, if the terms of the loan are such that a default is made to occur at a particular point in time, then the bondholders get the maximum that they can possibly get from their bonds, either the face value of the bond or the whole value of the firm, whichever is greater. They can't get more than that. The bonds can't be worth more than that.

If the terms of the bonds are such that the default does not occur when a corporation is in financial difficulty, then the stockholders are going to have a claim on the firm and it is going to be worth less than the maximum of those two and that is worse for the lender. That is why it is better to have a default occur.

I have a comment here on bankruptcy costs. Bankruptcy costs are serious and you want to take them into account when deciding whether to make a default occur or not. However, bankruptcy costs are not totally out of the control of the firm and its lenders, or the firm and its creditors. There are things that can be done in the way that the financing of the firm is managed to reduce the size of the bankruptcy costs if a default should occur.

In writing the various contracts with creditors, you can try to write them so there is a minimum of negotiation that has to go on between the different creditors, if there is financial difficulty. An extreme example of this is to note that really the function of bankruptcy proceedings in many cases is to allocate the value of the firm that remains between different creditors. Now the expense of that process is going to depend on how many different creditors there are. If you can arrange things so that there are fewer different creditors, then presumably the cost of bankruptcy, if it occurs, will be smaller.

One way for a lender to arrange for there to be fewer creditors is to insist on being the only creditor or close to the only creditor. A lender, or a consortium of lenders acting as a group, can say it is willing to provide the credit that the firm is going to need for various purposes in the future if the corporation will not default on the loan and if it will not use any other significant sources of credit. Then, if the bankruptcy occurs and this one consortium of lenders is the major creditor, there should be a minimum of negotiation. In fact, the main creditor should be able to pay off the other creditors in full and thereby get the whole process out of the bankruptcy courts and take over the firm.

Taking over the firm does not mean, necessarily, that the lender takes over the management of the firm; it simply means that it takes over ownership of the firm and the former owners cease to have a significant ownership interest. The lender may wish to leave some sort of interest with the previous owners of the firm, if the lenders wish to retain the management and if that is an appropriate compensation for the management.

You will note that I am talking about taking over the firm as a going business and continuing to operate it or selling it.

Now let's talk a bit about the difference between a bond that allows sale of assets of the firm to make bond payments and a bond that doesn't allow that. Frequently there is a provision in the bond indenture that the firm should not be allowed to sell any significant block of its assets without the permission of the creditors. That would presumably include sale of assets in order to make payments on the bond itself.

If the firm cannot sell assets to make payments on the bond, that doesn't mean that payments can't be made--even substantial payments, because in general it is possible for a firm, if it is not in difficulty that is too

severe, to issue securities to get money to make bond payments. So, if the firm is doing fairly well, that provision of a loan agreement would not be a constraint. It would simply sell common stock or other securities to get the money to make these payments.

However, there are circumstances under which the value of the firm might be greater than a particular payment that is due to the bondholders and yet the firm would not be able to issue common stock to get the money to make that particular payment.

Let me try to give an example of that.

Suppose the company is worth \$100 million. You can think of that as being the value of the assets of the business as a going concern, or as the sum of the values of the liabilities.

There is a payment due of \$50 million. And let's suppose that, if that payment were made, the value of the equity after the payment was made would be \$40 million. We are thinking about a case in which the firm is going to try to issue equity to get the money to make this \$50 million payment. The value of the assets of the firm will be undisturbed by making this payment.

After the payment is made, if the payment can be made, there will be remaining payments due on the debt. I am supposing that the value of those remaining payments is \$60 million. The firm is worth \$100 million. That means that the equity is going to be worth \$40 million after the payment is made. Well, it should be clear that the firm cannot possibly issue common stock to make this payment because it has got to issue \$50 million worth of common stock and the most that all of the common stock can be worth--both the common stock outstanding before the payment and the greater amount outstanding after the payment--is \$40 million.

So there is no way that common stock can be issued and have the stockholder have something after he buys it that is worth the same as he paid for it.

Since there is a \$50 million payment, and since I have tried to demonstrate that the payment cannot be made by issuing equity as the firm is required to do, there is going to be a default. There is going to be a default and, with the kinds of numbers we are working with here, the face value of the debt is going to be greater than the value of the firm--which means that the bondholders are going to take over the whole firm.

So, given that this payment exists and that the stockholders cannot possibly make that payment by issuing stock, the value of the bonds is going to be \$100 million and the value of the stock is going to be zero. If the provisions of the debt agreement are that the company has to issue equity to get the money to make these payments, then at this point in time, a default will occur and the debtholders will get the whole company.

If the provision of the debt agreement is that the company is allowed to sell off a portion of itself to get the money to make the payment, then it will be able to do that. It will indeed be able to sell off half of itself in one way or another and make the \$50 million payment. Then the total assets of the company will only be \$50 million because it will have paid out \$50 million to the bondholders. The bondholders will have a claim on that \$50 million, but the equity holders will have a claim, too, and it will be worth a positive amount.

So the current value of the debt will be the \$50 million, plus the claim on the additional \$50 million, which will add up to less than \$100 million.

The debt is going to be worth more if the company is prevented from selling assets to make the payment than if the company is allowed to sell assets to make the payment. It is going to be worth more if a default occurs, or is forced to occur, than if it isn't forced to occur.

And it turns out that that is not just true at the time the payments are due. It is true all the time. The terms of the loan agreement that make defaults more likely, generally will make the bond worth more than terms that make default less likely.

To put it another way, if the terms of the loan agreement are more stringent and therefore (everything else being equal) would make a default more likely, the lender can offer a lower interest rate initially. Again, continuing to assume away costs of bankruptcy.

Now, what about junior debt. The usual statement is that junior debt will not have any effect on the senior debtholder and loan agreements frequently specifically allow the firm to take on junior debt.

In the light of the current discussion, it turns out that junior debt helps the senior debtholders. It helps the senior debtholders because it makes default more likely and default is good (in this world) for the senior debtholder.

Junior debt makes default more likely where the firm is not allowed to sell assets to make payments on senior debts. It is required to issue securities. If a payment is due, the more junior debt is outstanding, the less the value of the equity is going to be if we ignore the payment that is due, and therefore the less likely it is that the firm is going to be able to issue equity to make that payment.

So the more junior debt is outstanding, the more likely a default is going to be when a debt payment is due. Therefore, the more junior debt is outstanding, the higher the value of the senior debt is going to be. And when the stockholders are considering putting on junior debt, they should take into account the fact that if they put it on, they are actually going to help the senior debtholders, which means they will be hurting themselves.

Senior debtholders won't object to putting on junior debt, but in this kind of a world, the stockholders should object. You shouldn't expect to find it too often because it will actually hurt the stockholders.

I keep seeing newspaper reports that a bank has waived the interest on its loans to a real estate investment trust. I am always astounded when I see that people have done that.

Sometimes you see a bank has found a default in a loan agreement and has taken the occasion to increase the interest rate on its loan to a much higher level. That is the rational reaction to a default, because you can always essentially get the value of the firm by increasing your interest rate high enough. If you increase your interest rate to 20 percentage points above the prime or something like that, then you essentially have the firm. That would seem to me to be the logical reaction.

Reducing the interest rate! Actually saying that the borrower doesn't have to make interest payments! If there is any significant value of the firm in the hands of junior creditors or equity holders, that makes no sense! Because the borrower has an opportunity in effect to take over the whole value of the firm and is not using that opportunity.