Video 12.2 - Bond Risks part 2: Default Risk

The following is a supplementary transcript for tutorial videos from

https://blogs.ubc.ca/financefundamentals/

Hello and welcome back. Today, we will be continuing our two-part series on the different types of risk affecting bond returns. If you have not watched part 1 on interest rate risk ("Bond Risks part 1: Interest Rate Risk"), please go back and do so before watching this video. Now that we are familiar with interest rate risk, let's talk about default risk. First, we will learn what default risk is and how it is measured. Next, we will learn how default risk affects the return on a bond. We will see that companies with a higher risk of default must pay an additional premium, in the form of a higher interest rate to investors, in order to convince them to invest in their bonds. And lastly, we will learn how both default risk and interest rate risk contribute to the total return on a bond. Let's get started.

Video at 00:54

When a company issues a bond, it makes a promise to pay the periodic coupon payments, as well as the principal payment on the maturity date. However, this doesn't mean investors are guaranteed to receive these payments; the company may go bankrupt or get behind on their coupon payments. That is, there is a risk that the company will *default* on the bond. This level of risk is different for each bond. The degree of default risk varies across companies, and even across industries; some are more stable, and therefore have a lower risk of defaulting.

Video at 01:27

Bond rating agencies help investors evaluate the default risk of government and corporate bonds by assigning them grades (Figure 1). For example, Standard & Poor's rate bonds from AAA to D. High investment grades fall between AAA and BBB. Junk, or speculative bonds, which are considered to be high risk, are rated below BBB. Another commonly used grading scale is Moody's, which rate bonds from Aaa to C. As we discussed, investors expect to be compensated for risk, so the higher the risk of default, the higher the return must be on the bond to incentivize an investor to buy it.

Moody's Analytics	Standard & Poor's	Grade (Rating)	Risk
Aaa	AAA	Investment	**Lowest Risk**
Aa	AA	Investment	Low Risk
A	A	Investment	Low Risk
Baa	BBB	Investment	Medium Risk
Ba, B	BB, B	Junk	High Risk
Caa/Ca/C	CCC/CC/C	Junk	Highest Risk
C	D	Junk	**Default**

Figure 1

Video at 02:05

Let's consider two $1,000 face value bonds; one government treasury bill, and one from a company called Sketch Tech. Government bonds from more economically developed countries are considered to be zero-risk, since the government can always secure financing to repay a bond. For example, the Government of Canada has yet to default on their bonds. However, Sketch Tech is a young company in a volatile industry, and likely has a risk of default.

Video at 02:32

If the $1,000 face value government bonds are trading at $950, and the $1,000 face value Sketch Tech bonds are trading at $800, what is the default risk on these bonds? Assume that investors are risk-neutral, meaning that they are indifferent between investments with the same expected return, regardless of risk. Pause the video and try to solve for the default risk.

Video at 02:57

Well, we already know that the government bonds have zero risk of default. So, we can use these bonds to determine the return that investors expect to earn:

$$return = \frac{\$1{,}000 - \$950}{\$950} = 5.26\%$$

Applying this formula to Sketch Tech bonds gives us

$$return = \frac{\$1{,}000 - \$800}{\$800} = 25\%$$

But we know that the expected return isn't actually 25%; otherwise, who would bother to invest in a government bond that only earned 5%? After all, if investors could earn a higher return on Sketch Tech bonds, everyone would try to buy these bonds and bid up the price, while the price

on the zero-risk government bonds would have to be reduced in order to incentivize people to buy it.

Video at 03:42

The prices will continue to move until the effective return on both investments is equal, at the market rate. In this way, the market will ensure that the expected return on the two bonds is equal. This means that there are no "risk free" profits to be made; that is, investors cannot profit by taking advantage of improperly priced securities through arbitrage. Therefore, it must be that this 25% stated return reflects the probability of default, which has been priced into the bond. This makes intuitive sense because as investors, we know that if Sketch Tech is more likely to default on their bond, we would only take on the risk if Sketch Tech's bond costs less than the government bond ($800 < $950) that can provide the same stream of cash flows (FV=$1,000) at no risk.

Video at 04:28

To solve for the effective return on Sketch Tech bonds, we can set the returns on the two bonds equal:

$$return\ on\ government\ bond\ =\ (1+5.26\%)\times 100\%\ guaranteed\ collection$$

$$=\ return\ on\ Sketch\ Tech\ bond\ =\ (1+25\%)\times probability\ of\ collection$$

we let x% = probability of collection on the Sketch Tech bond, and we solve for x

$$x\ =\ \frac{1.0526\times 100\%}{1.25}=0.84$$

Thus, there is an 84% chance of collecting this bond. This means that the risk of default is (1-0.84), or 16%, assuming that we either collect all or none of the bond.

Video at 05:06

Notice that the risk-free investment ($950) costs more than the risky investment ($800) because of the zero default risk. In reality, investors can earn an even higher return on risk than we just demonstrated, because they are risk-averse rather than risk-neutral. This means that they will require an extra incentive to purchase a risky investment.

Video at 05:25

Recall that we can compute our yield to maturity using this formula:

$$YTM\ on\ treasury\ bond\ =\ real\ rate\ +\ inflation\ risk\ premium\ +\ interest\ rate\ risk\ premium$$

$$YTM\ on\ corporate\ bond\ =\ YTM\ on\ treasury\ bond\ +\ default\ risk\ premium$$

The difference between the yield to maturity on a risky bond and a comparable risk-free bond is called the default premium.

Video at 05:49

Notice that while treasury bills have zero default risk, they still yield a return. This is because investors must still be compensated for their opportunity cost and inflation. They are also exposed to some level of interest rate risk. We can plot the yields of default-free government bonds of different maturities, as shown on this Term Structure Diagram.

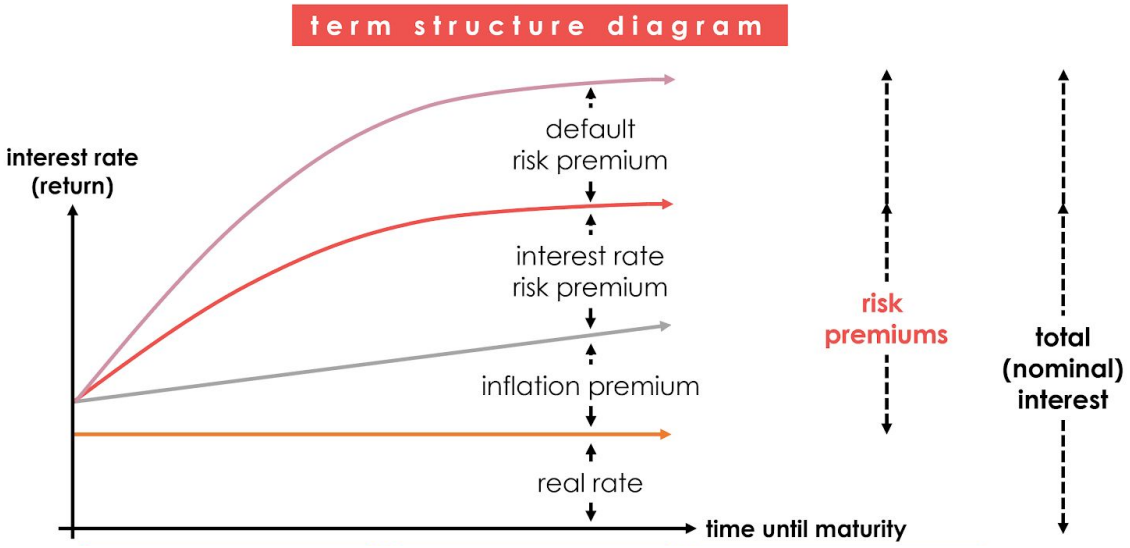

Figure 2

Interest rate risk, and therefore the risk premium, increases as the time to maturity increases. For bonds that involve default risk, we can add an additional return to this graph, in the form of a default risk premium.

Video at 06:26

Today, we went over how bonds are affected by default risk. We learned that default risk is higher for certain bonds. Investors require an additional return, called a default premium, in exchange for holding these riskier investments. We can demonstrate how the return on default-free bonds increases as the time to maturity increases using Term Structure plot. See you next time!