Economics of Banking and Finance Markets
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Lecture - 08
Risk structure of Interest Rate

Welcome to this session.

(Refer Slide Time: 00:22)

Objective

- To examine the sources and causes of fluctuations in interest rates relative to one another (that is, across different types of debt instruments)

The objective of this session is to examine the sources and causes of fluctuations in interest rates relative to one another, that is, across different types of debt instruments.

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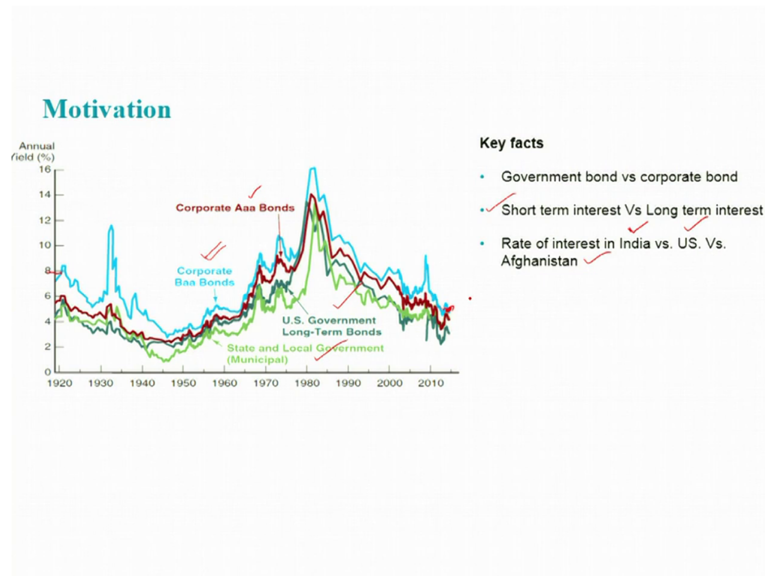

Look at this figure. You can see here that on the y-axis we denote annual yield; that means, the rate of interest, and on the x-axis, this is the time. So, some of the key facts you can see here is the variation in the rate of interest across different types of debt instruments.

You can see here that corporate bonds that is corporate Aaa bonds, corporate Baa bonds, the US government long-term bonds, the State and local government bonds (municipal bonds), etcetera. Some of the difference that you can see here is that, for example, government bond and corporate bond, and you can see that the corporate bond for example, looking at this figure, you can see that the rate of interest for corporate bond is greater than the government bond.

That is one. And within corporate bonds, you can see that the corporate Aaa bonds interest rate is less than corporate Baa bonds. And, similarly, look at the short-term and long-term interest rate, we have seen in the previous diagram, the difference between US government long-term bonds and short-term bonds. Even within government bonds, short-term interest rate is less than the long-term interest rate.

And some of other things that you might have observed that the rate of interest across the globe; that means, between countries, for example, when you compare rate of interest between India and US, you can see that the rate of interest is very low in the US as compared to India. For example, for the government bonds, the rate of interest much lower in the US as compared to India.

And, similarly when you compare, for example, Afghanistan you know that the rate of interest in Afghanistan, even issued for bonds by the Afghanistan government, is greater than the rate of interest of India. It means that there are differences in the rate of interest for different instruments debt instruments.

What is the reason for that? What explains these differences, and over time, you can see that it fluctuates. For example, you can see here is that the corporate Baa bonds, how much it was, for example, in 1920 it was nearly 8 percentage, but in 2010 you can see that, it is going to be nearly 6 percentage.

What are the factors that explain this kind of differences and fluctuations, that is the main focus of this session and subsequent few sessions.

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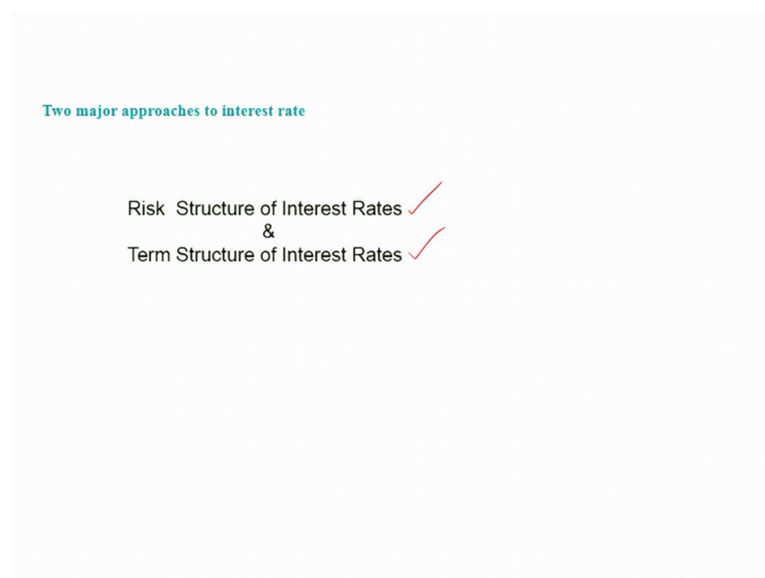

To understand what the reasons for the differences in the rate of interest for different types of debt instrument are, there are mainly two major approaches to this. One is called risk structure of interest rate, and the other one is called term structure of interest rates. Let us now focus on the first one in detail: the risk structure of interest rate, and thereafter we will move to the term structure of interest rate.

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Why Bonds Are Risky?

- 1. *Interest-rate risk: Interest rates may rise between the time a bond is purchased and the time it is sold reducing the bond's price (capital loss).*
- 2. *Inflation risk:* Inflation may turn out to be higher than expected, reducing the real return on holding the bond.
- 3. *Default risk:* The issuer may not make the promised payments on time.

About the risk structure of interest rate: let us start with a very basic question- why are bonds risky? Normally, bonds are considered as safe investment as compared to stocks, however, bonds are still risky because of some factors that are going to discuss here. One is interest-rate risk: the interest-rate risk is that interest rate may rise between the time a bond is purchased and time it is sold, thus, reducing the bond price.

Suppose the rate of interest is going to increase in the future. When someone brought a bond today, and after one year when the rate of interest increases, then obviously, you know that the bond price will decline, when he/she sell it, he/she will incur a capital loss. This is happening due to the interest rate risk, the fluctuation uncertainty in the interest rate.

The second one is called inflation risk; that means, inflation may turn out to be higher than expected, thus, reducing the real return on holding the bond.

The third one is the default risk. This is the key issue, an important risk associated with bonds; this is the default risk. Default risk means issuer may not make the promised payment on time. It may be because the supplier of bonds, for instance, got into financial trouble, and became bankrupt, or maybe deliberately he or she does not want to pay back.

The main point here is that default risk is the one of the important aspects that makes bonds riskier.

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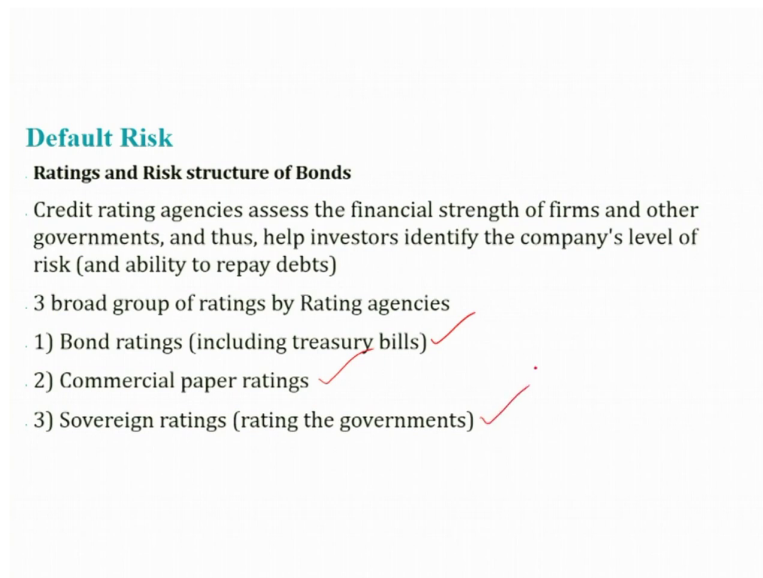

Our discussion today is going to be more on this default risk. To measure the default risk, that the probability that the issuer of the bond supplier of the bond will pay back the borrowed amount and the associated interest payments. The default risk assessment is done by the rating agencies.

Rating agencies assess the financial strength of firms and governments, and, thus, help investors identify the company's level of risk and their ability to repay debts.

There are mainly three broad group of ratings by rating agencies relevant to our context – one is called bond ratings, the second one is commercial paper ratings and the third one is sovereign ratings, that is, rating the governments.

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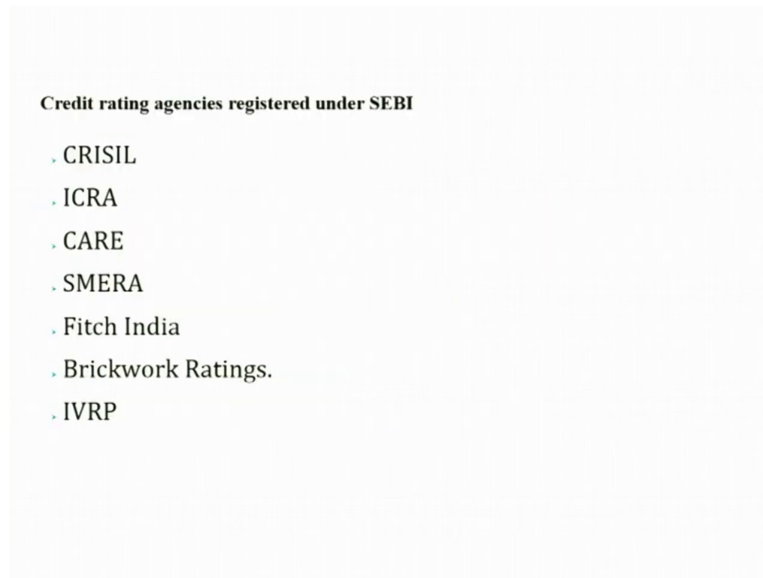

You may know that there are registered credit rating agencies in every country. In India, there are several rating agencies. These are the top credit rating agencies registered under SEBI – Security and Exchange Board of India. These agencies assess and rate the risk default risk of the firms. They will assess the credit risk and will give a rating of debt instruments. Whenever a firm issue a bond in the market, first it will undergo a credit rating assessment and accordingly they will get a score rate rating they will be getting.

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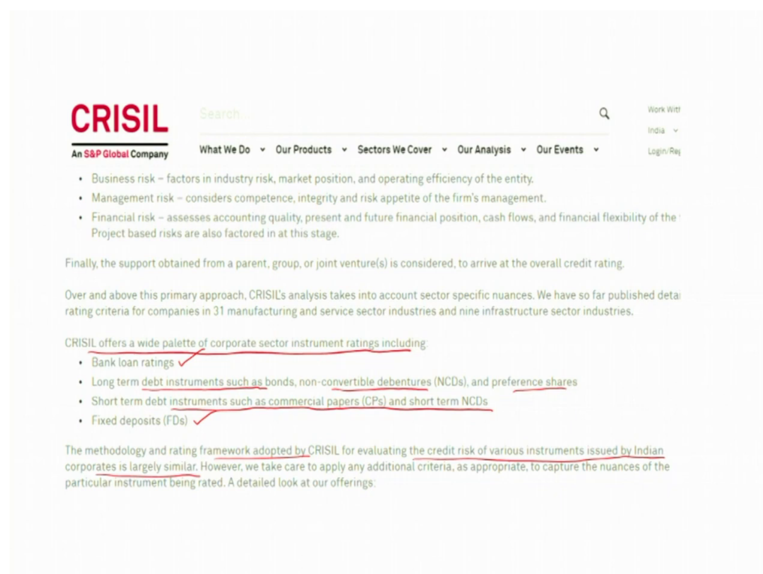

I would suggest you visit their website to get more idea what is meant by ratings, and how do they do, and what kind of methodology they use. And overall, there is a similarity about the methodology they use. However, still when you go to their website you can see there are lots of differences as well.

Overall, the idea is that they are going to measure the financial soundness of the firm, the financial health of their firm and the debt instrument (the bond) they are issuing. The rating agencies will assess the economic and financial feasibility of the project for which they are going to issue the bonds.

For example, CRISIL you can see here that they do the rating for bank loan, and they also rate long term debt instruments such as bonds, non-convertible debentures and preference shares. And they also do the rating for short term debt instruments such as commercial papers and short term NCDs they also rate fixed deposits as well.

You can read it from their website that the methodology and rating framework adopted by this agency for evaluating the credit risk of various instruments issued by Indian corporate is largely similar. However, they also say that, based on the context, they will slightly change the methodology, the criteria used for the rating of each of their credit instruments.

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You can also go through another credit rating agencies for example, India Rating and Research, you will get more idea about what are the methodology they use, what kind of rating they do etcetera.

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Internationally, there are three major agencies international credit rating agencies – Moody's, Standard and Poor and Fitch. And, these agencies, mostly they do sovereign rating, they rate the governments.

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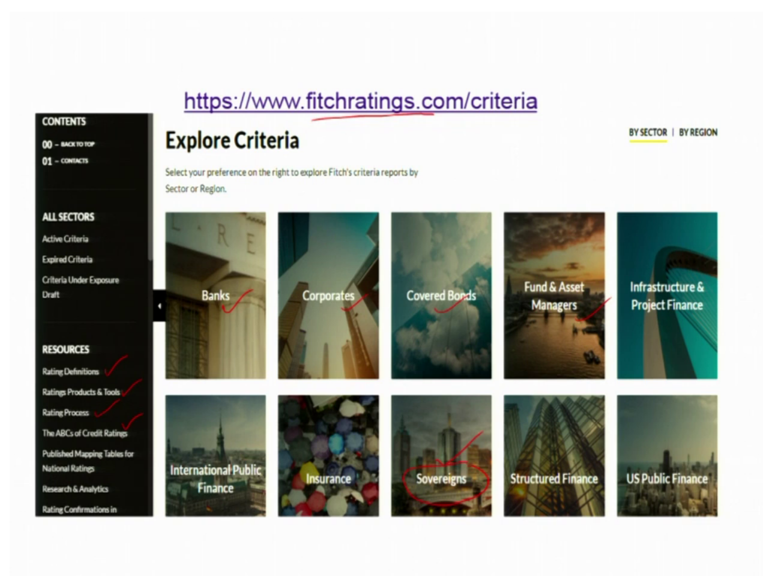

Again, I would suggest visit their website to get the criteria they use. We can see that Fitch ratings.com and where you can browse for the criteria what they use. From there itself you can see that the rating definition, rating products, rating process etc.

They rate it by institutions, by sectors, they rate corporates, they also rate sovereigns; that means, sovereign means governments. They rate national governments, they do rate India, they do rate Afghanistan, they do rate US as well.

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You can also visit the web of another rating agencies: Standards and Poor, S&P for short, where again you can see their criteria. You can see that corporates, financial institution, insurance, and they are infrastructure, and governments, and structured finance, and these are all the sectors they do the ratings.

(Refer Slide Time: 11:25)

And again you can see here that the Moody's, and for example, you can see that the global long term rating, you can see that they are using some terminology, that notations that the triple A, double A, B double A etcetera. So, let us discuss these in appropriate context.

(Refer Slide Time: 11:57)

Moody's: Global Long-Term Rating Scale

Aaa: Obligations rated Aaa are judged to be of the highest quality, subject to the lowest level of credit risk.

Aa: Obligations rated Aa are judged to be of high quality and are subject to very low credit risk.

A: Obligations rated A are judged to be upper-medium grade and are subject to low credit risk.

Baa: Obligations rated Baa are judged to be medium-grade and subject to moderate credit risk and as such may possess certain speculative characteristics.

Ba: Obligations rated Ba are judged to be speculative and are subject to substantial credit risk.

B: Obligations rated B are considered speculative and are subject to high credit risk.

Caa: Obligations rated Caa are judged to be speculative of poor standing and are subject to very high credit risk.

Ca: Obligations rated Ca are highly speculative and are likely in, or very near, default, with some prospect of recovery of principal and interest.

C: Obligations rated C are the lowest rated and are typically in default, with little prospect for recovery of principal or interest.

So, for example, the Moody's global long term rating scale where you can see that they do Aaa; Aaa means the obligation the debt obligation rate is to be the highest quality subject to the lowest level of credit risk. The default risk is very low, means nearly zero. This is called prime quality debt instruments.

Then, for the next category, this is another just below, this rating is called Aa that you can say that they are judged to be high quality and subject to very low credit risk, but obviously, less than a triple. And Aa is judged to be upper-medium grade and subject to lower risk.

These are called highly investment grade debt instruments or bonds, then comes below that you can see that Baa, you can say the medium grade and subject to moderate credit risk and may possess certain speculative characteristics. Then comes Ba and B. So, for example, here you can see that B they are denoted as high credit risk.

And, by applying their criteria if they find out that default risk is very high, then they will be giving Ca and further they will give you C, Ca, C triple a, Ca and C. So, C means these are all called mainly junk bonds; that means, the credit risk is very high that the default risk is very high.

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Similarly, they also do the global short-term rating scale. This is mainly for the short the term. They use is notation P-1 that is prime–1 reflect superior ability to repay short-term obligations, then P-2 and then P-3. And finally, they give the ratings of NP; that means, 'not prime' they do not fall within any of the prime rating categories. That means they see that the default risk is very high.

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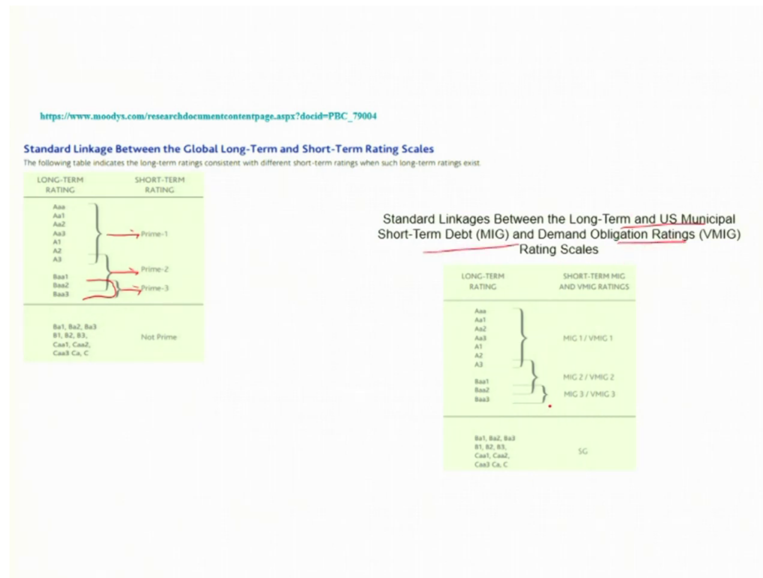

We can relate it with the long term where we can find some comparisons. You can see that the Aaa, this one is almost like prime–1, the long term the relationship between long term and short term and here A3 till Ba it can be one more similar to prime–2 or this one is equal to denoting prime–3.

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Bond Ratings
by Moody's, Standard and Poor's, and Fitch

Moody's	S&P	Fitch	Definitions
Aaa	AAA	AAA	Prime Maximum Safety
Aa1	AA+	AA+	High Grade High Quality
Aa2	AA	AA	
Aa3	AA−	AA−	
A1	A+	A+	Upper Medium Grade
A2	A	A	
A3	A−	A−	
Baa1	BBB+	BBB+	Lower Medium Grade
Baa2	BBB	BBB	
Baa3	BBB−	BBB−	
Ba1	BB+	BB+	Noninvestment Grade
Ba2	BB	BB	Speculative

Junk bonds and Fallen angels

- A fallen angel is a bond that has been reduced to junk status because its issuer has fallen into financial trouble.
- Its bonds pay higher returns than investment-quality bonds but are riskier.

By now, you know that there are different rating agencies. These are the different rating agencies rating same government, may be rating same bonds, they will be rating same debt

instrument. They are comparable. You can see that when it comes to the maximum prime safety, all of them give the same notation that triple A.

Then comes slightly difference that Aa1 by Moody's AA plus by S&P, double A plus by Fitch, these are high grade quality. So, similarly when you look further down you can see that, may be this one, this is called speculative that the Ba2, BB and BB, these are speculative bond, also called as junk bonds. These are non-investment grade bonds.

When the ratings are very high, these are called prime maximum safety; that means, their risk is very low. when they get lower ratings, it means the probability of their default risk increases. When the default risk is high, they will get low rating.

We can see that when the default risk is very high, they get lower ratings, when the rating is very low, for example, junk bond rating, then the issuer of the bonds would find it difficult to get the demand for their bonds, thus, they must pay high rate of interest. That means, the rate of interest for a prime maximum safety kind of bonds or debt instruments is going to be low.

So, from this what we can see that some firms get a high rating, this is called the prime the maximum safety or high-quality debt instruments. However, sometimes the high-quality bonds with high ratings may fall may overtime and will be downgraded to junk bonds, and they can be become a kind of fallen angel. Fallen angel is a bond that has been reduced to junk status from prime quality rating because issuer has fallen into a financial trouble.

May be at the time of getting the ratings, they may be either in all this category, but later you can see that, some of them will become fallen angel. This exactly happened during 2007–8 financial crisis. Many top-rated companies who got the top ratings for their debt instruments became fallen angel during the 2007–8 financial crisis.

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This is just to give you some idea about the different types of grading, for example, an investment grade; who are all getting investment grade and the description; and for example, issues with bonds outstanding in 2012. For example, these companies- Microsoft, and the country- sovereign Canada. So, they got that triple A and similarly this company is a corporate, and the government getting double A etc.

Look at, for example, highly speculative grade. You can see here, for example, countries like Greece, Pakistan, Cuba, Venezuela are having a low rating. This is just for your information. So, you please go through this description to get a better understanding of this credit rating.

(Refer Slide Time: 19:11)

Table 7.2 Commercial Paper Ratings

	Moody's	Standard & Poor's	Description	Examples of Issuers with Commercial Paper Outstanding in 2012
Investment or Prime Grade	P-1	A-1+, A-1	Strong likelihood of timely repayment.	Coca-Cola General Electric Procter & Gamble
	P-2	A-2	Satisfactory degree of safety for timely repayment.	General Mills Time Warner
	P-3	A-3	Adequate degree of safety for timely repayment.	Alcoa
Speculative, below Prime Grade		B, C	Capacity for repayment is small relative to higher-rated issuers.	
Defaulted		D		

This table shows the commercial paper ratings. The companies like Coca Cola, General Electric, and Procter and Gamble get the P–1, that the prime grade.

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Sovereign ratings:
Ratings the governments by rating agencies

https://countryeconomy.com/ratings

https://en.wikipedia.org/wiki/List_of_countries_by_credit_rating

In addition to the ratings of the corporate, they also rate the government. This is called sovereign ratings, rating the governments by rating agencies. To get more idea please visit some of this website; the ratings rating for different countries; there are lots of information in the websites, you can see that even in Wikipedia.

You can get the list of countries by credit ratings. For instance, we can see that nearly 10–11 countries- they are having the triple A ratings (prime ratings) and many countries have received junk status grading.

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Sovereign Ratings List

	Moody's ratings [+]	S&P ratings [+]	Fitch ratings [+]
United States [+]	Aaa	AA+	AAA
United Kingdom [+]	Aa3	AA	AA-
Germany [+]	Aaa	AAA	AAA
France [+]	Aa2	AA	AA
Japan [+]	A1	A+	A
Spain [+]	Baa1	A	A-
Italy [+]	Baa3	BBB	BBB
Portugal [+]	Baa2	BBB	BBB
Greece [+]	Ba3	BB+	BB
Ireland [+]	A1	AA-	AA-
Andorra [+]		BBB	BBB+
United Arab Emirates [+]	Aa2	AA	AA-
Albania [+]	B1	B+	
Armenia [+]	Ba3	B+	B+
Angola [+]	B3	B-	B-
Argentina [+]	Ca	CCC+	CCC
Austria [+]	Aa1	AA+	AA+
Australia [+]	Aaa	AAA	AAA

Look at this table, I had taken it from countryeconomy.com website. This is a screenshot where you can see that, the US for example, is having triple A ratings by Moody, and prime quality rating by Moody’s, and Fitch. But only double A plus rating was given by S & P, but Moody’s and Fitch they have given triple A ratings. You can see Australia, for example, having same rating by all the three agencies triple A, triple A and triple A.

From this, you can see that the ratings differ across the countries. In many countries, you can see here that they are having low ratings. Even there is rating difference between agencies, but slight differences and overall, you can see that there is a high correlation between the ratings.

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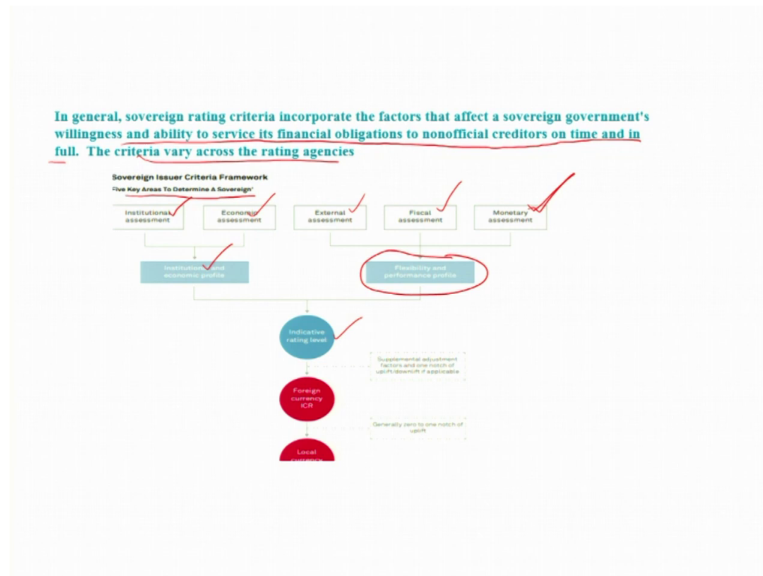

What are the factors that determines the sovereign ratings. The sovereign rating criteria incorporate the factors that affect sovereign government’s willingness and ability to service its financial obligation to non-official creditors on time and in full. The criteria vary across rating agencies, but however, overall, there is some commonalities.

Here are the five key areas determining a sovereign rating.

One is called the institutional assessment; the institutional assessment reflects how strong the socio-economic and legal institutions of the country is. The second one is the economic profile of the country

Next is the external assessment, and then the fiscal assessment, followed by the monetary assessment.

About the fiscal assessment: whether the country is having fiscal deficit or fiscal surplus. If there is fiscal deficit, what is the magnitude of the fiscal deficit and what are likely fiscal deficit in the future, that is, whether it is increasing over time or declining over time, whether government is making deliberate effort to reduce the fiscal deficit systematically, all these would come under the fiscal assessment. Then about the monetary assessment that reflects the inflation, forex reserve and forex rate etc. It also include the the monetary policy, the monetary institution, how independent is the central ban,k and how robust are there with their economic policy making and the interference in the economy. Both fiscal and monetary

assessment are also called the flexibility and performance profile. This will be also will be included or considered in this rating criteria. Overall, these are the key factors used to develop a rating index.

(Refer Slide Time: 23:45)

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India - Credit Rating

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Agency	Rating	Outlook	Date
Fitch	BBB-	stable	Jun 10 2022
Moody's	Baa3	stable	Oct 05 2021
DBRS	BBB (low)	stable	May 19 2021
Fitch	BBB-	negative	Jun 18 2020
Moody's	Baa3	negative	Jun 01 2020
DBRS	BBB	negative	May 21 2020
Moody's	Baa2	negative	Nov 07 2019
Moody's	Baa2	stable	Nov 16 2017
DBRS	BBB	stable	Nov 05 2015
Moody's	Baa3	positive	Apr 09 2015
DBRS	BBB (low)	positive	Nov 05 2014

Rating Outlooks/Watches for the agencies are the following:

- Positive means that a rating may be raised
- Negative means that a rating may be lowered
- Stable means a rating is not likely to change

I just posted here some of the credit rating for India for the last couple of years, and you can see that our ratings are called, for example, features given triple B minus, that is in June, 10 2022. Obviously, this is not a good sign, that is, not a high rating; that means, they rated somewhere below the medium investment quality.

Fitch, Moody's and the DBRS, they have given this one; these are all they have given during this period. Here also you can also see that they also give an 'outlook' or 'watches' for the agencies. For example, positive somewhere here, but here we had positive in 2015.

The 'positive' outlook means that a rating may be raised in the future; if we had Baa 3, then in the future if we continue our economy is performing the way it has been doing, then the rating is going to be increased. The rating will be raised from Ba to the next higher level.

The outlook 'Negative' means the economy is going through some tough situation according to this rating agencies. So, they may downgrade our ratings in the future. Stable outlook means rating is not likely to change in the future. So, that currently for example, Fitch in June, 2022, had given India a 'stable' outlook.

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What are the reasons and consequence of poor sovereign ratings? One of the reasons is the fiscal deficit. High fiscal deficit will lead to low sovereign ratings, which would lead to high rate of interest. When we are getting low ratings, that when our sovereign ratings declines, it also means that the country must pay high rate of interest when they borrow from the finance market, that is, government must pay high interest rate for its bonds because of the low sovereign ratings.

Low rating means high risk; high risk means high rate of interest. When the rating is very low, many foreign governments would not allow their companies especially pension funds and insurance companies to invest in those countries with a low sovereign rating.

And, it has implication for economic growth as well because when the sovereign rating is very low, the foreign direct investment will come down because they see that the country has high risk, that is, the default risk is very high.

Poor political and economic profile also adversely affect the rating. If there is instability in political context and the economic institutions are weak, then it will adversely affect the ratings of the country.

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The Impact of Ratings on Yields

Benchmark bonds : Low default risk (High rating)

Benchmark bonds : US treasury bills

The yields on other bonds are measured in terms of the **spread over Treasuries**

Bond yield = US. Treasury yield + Default risk premium

8% = 2% + 6%

0

Let us see the impact of rating on yields. We have seen that when higher the ratings the rate of interest will be low. They need to pay only low rate of interest for their bonds. In other words, they can borrow, that is, they can supply bonds at a low rate of interest. When the rating is very high, it implies that they are having low default risk, and their bonds will be considered as a benchmark bonds.

In the global scenario, the US treasury bills are considered as the benchmark bonds. They are the benchmark bonds, and the yields on other bonds (issued by other countries, for example) are measured in terms of the spread over the US treasury bills.

A bond yield for example, the bond yield in India it will be measured or expressed in this way. For example, US treasury yield that is the benchmark bond plus suppose the bond yield for example, in India for example, 8 percentage. suppose the US treasury yield is 2 percentage and remaining 6 is the risk premium default risk premium. So, in this way we express a country's bond yield equal to US treasury yield and plus default risk premium. These 6 percentages (in our example here about India) is the default risk premium; that means, when our ratings improve when it is become equal to the benchmark bond of the US treasury bill, the risk premium will become 0.

In the next session we will continue this discussion.

Thank you.

Key words: Rating, default risk, bond rating, commercial paper rating, sovereign rating, risk premium, risk spread