Money and Banking
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Lecture - 4

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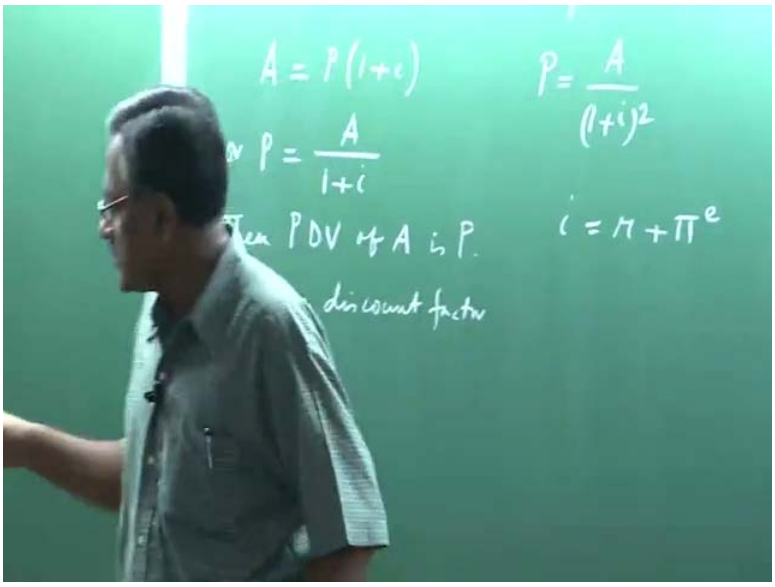

Which can also be written as P is equal to A over 1 plus i then present discounted value of A, which I will get one period later is P. So, something which I will receive tomorrow, for which I will have to wait, if I want to know it is value today is called present discounted value, which is P, which I have with me today alright, will be A over 1 plus i where discount is done by the interest rate. If interest rate is 0, they are equal and i is called the discount factor. Now, this is a one period thing, for two periods in this formulation, where interest rate is paid every period. For two periods it will become, after two period if I get this, the present discounted value will be 1 plus i to the power square, where the interest is paid every period.

So, the present discounted value is often used in the financial market discussion, we will learn a lot about that and many other things in the financial economics course. All I am telling you right now is that, in this simple discussion on interest rate, you see how interest rate plays a very important role, both to calculate what will happen in future and also to get the future values converted into present value. One is going from here to

future, one is trying to calculate the future in terms of the present, which is called present discounted value, interest rate is very important.

Now, I told I also mentioned that, interest rate often bothers people say, sir why you discount only by interest rate in future, values can also be discounted in terms of inflation rate because inflation reduces the value of future. So, the value today of a future thing when there is inflation is even much less, if inflation is added. Then I said well i is a nominal interest rate where, a nominal interest rate according to the fisher definition, which we use in macro economics is i is equal to real interest rate plus inflation rate, an after inflation rate is which did not happen, is the expected inflation rate.

So, you can have an expected inflation rate there, what do you expect so, inflation rate has been considered in this formulation this is what, I was trying to tell you in the previous class. Now, if you go into areas like cost benefit analysis of a project where, you incur costs for 5 years and then the returns will come after 5 years much more complex discounting goes on there and there are concepts of private discount rate, which is this one.

There is a concept of social discount rate because in the context of a project, it has a social relevance. So, what is the social discount rate with environmental economics being alive, you have also environmental issues coming into the picture, as to what will be the discount rate. And you can imagine with environmental costs associated with the project is thermal plant, etcetera the discount rate even becomes heavier, fatter. So, you add i plus some more things so, it is heavily discounted alright, you can get into many discussions, I did not go into it.

My objective here, is to bring out the story about the interest rate so, this is the simple interest rate alright. Now, I go into the other things, there are various kinds of loan bearing instruments, which are called death instruments and various kinds of loan repayment schedules, that are used by the banks. For instance, you must have heard that somebody has taken a loan for car or for a house from a bank pays an EMI, you must have heard of that expression EMI, Equal Monthly Installment.

What happens there is not this kind of a picture where, in case of a two period loan, you either pay the interest at the end. So, interest on interest accumulates, as the cost or you pay interest rate of the every period and then repay the principle at the end of, what you

called the maturity of the loan, the term of the loan alright. Now, EMI when EMI is calculated by banks for you, that this is what you pay towards your 10 lakhs loan, 20 lakhs loan, whatever you have taken then what happens is that, the EMI contains both the periodic interest payment, part of it may be and part of the loan.

So, part of the interest is not paid on which again interest accumulates and the bank gives you a schedule like, this 10 lakhs rupees loan you will have a 10 year period EMI, an each EMI that is equal monthly installment will be this amount or rupees. That amount of rupees you have to pay, bank calculates that alright by which ever means, they have a formula.

This kind of an EMI situation, which is very common with bank loans and mortgages, etcetera which are used in the western world. You buy a house which is mortgaged to the bank and you pay an EMI, once the loan interest have all been paid to the bank then the house becomes yours. Otherwise, the house owner should remains with the bank alright so, loans various kinds of loans and mortgages, EMIs are used.

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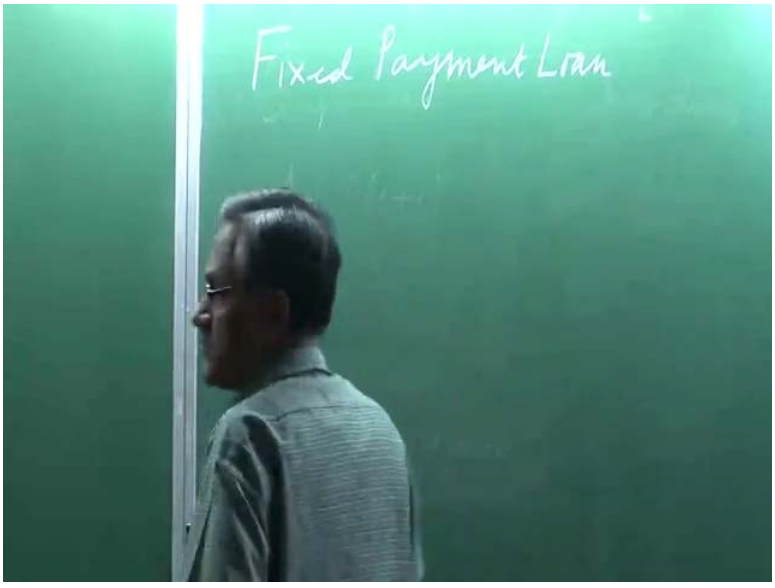

This situation of EMI is known as, in the literature you can refer to mishkin you can refer to mishkin, it is called fixed payment loan. Fixed payment means, fixed repayment schedules EMI's equal month installments, they are also there is an expression is there in the book. I really do not understand entire meaning of it, fully amortized loan, this also loan in which the borrower of a loan must repay a fixed amount, which covers every

period that consist of the part of the principle or the part of the interest for a set number of years alright. Fixed payment loans, that the EMI business which is very common, the example I had initially is a simple example I started out with it, which is taught in middle middle school, secondary school. You know this interest simple interest, compound interest, etcetera the one which also interest us.

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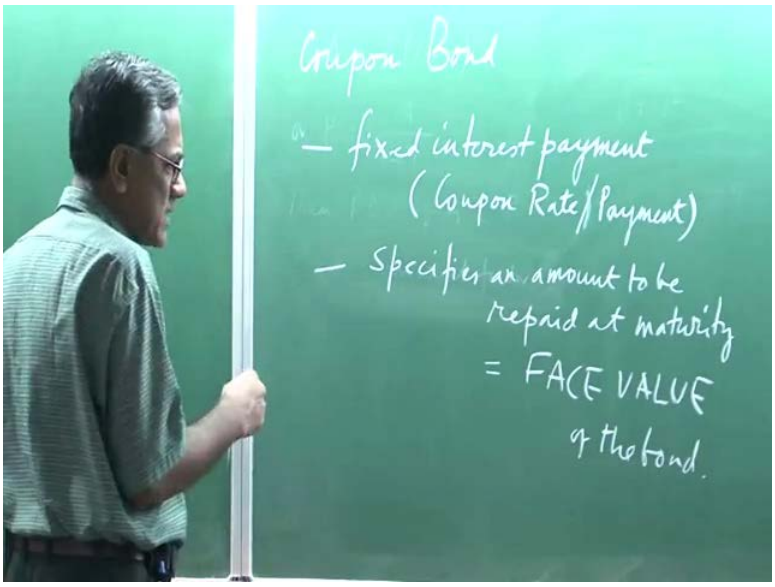

It is a very interesting thing, which is very common you will find in this course and in other areas financial economics, etcetera is known as coupon. Now, what it means essentially a coupon bond, if you buy a coupon bond, there is various kinds of bonds I am coming to that. What is a bond, is a death instrument, somebody borrows money say, the government or a company borrowing money from you, selling coupon bonds which you purchase, what you get.

Every period you get an interest payment which is fixed, which is in fact, written on the bond paper known as the coupon payment. Coupon bond has features like fixed interest payment, fixed interest payment which is also as the coupon rate, fixed interest payment or the coupon rate or the coupon payment alright. Next, a coupon bond also specifies the fixed amount the final amount, which will be paid at maturity, specifies an amount to be paid to be repaid at maturity which is usually repaid at maturity which is usually equal to the, what is known as the face value of the bond, this is then face value.

Every bond paper is has something just not the 10 percent coupon rate mentioned, which is interest payment but it also mentions the face value 10000 rupees, 1000 rupees, 5000 rupees, it is mentioned which you will get back from the seller of the bond. It may be government, it may be a private company, it may be semi government organization like railways, electricity, corporations, various kinds of infrastructure bonds are there coupon bonds, various kinds of bonds are there in India also alright. Another thing which I should have mentioned, fixed interest payment and specifies an amount to be repaid at maturity, there is another thing that is always mentioned is that, it specifies the maturity period.

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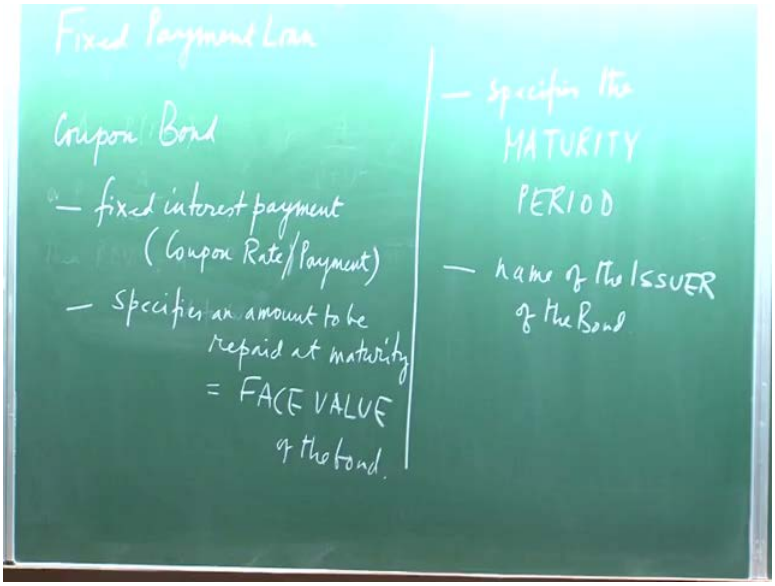

So, it is the 5 year bond it is the 5 year bond or a 10 year bond or 20 year bond, it is on the bond paper, coupon bond alright and most important another important thing if not the most important thing is that, it always mentions the issuer, name of the issuer of the bond. So, issuer of the bond who sold it is mentioned on that. So, if government of India sold this bond to you government of India would be returning, if the UP government has sold UP government will be returning, TATA corporation has sold say, TATA consultancy service so, some bonds it will be return on it.

So, name of the issuer is also very important feature of the this bond papers for coupon bond, it mentions the coupon rate that it promises annually at 10 percent interest to income, from the face value you get a 10 percent interest to income. So, another 1000

rupee bond you will get 100 rupees every year, it mentions the maturity period how long it is and at maturity usually, it is assumed this is not very important. It is understood, that the face value of the bond will be given to you alright, that money will be given to you alright.

Then, coming to very interesting aspects of these coupon bonds before I do that, I come to this they develop a secondary market it is very interesting, they develop secondary market these bonds. And like hoped, I bought the bond in 2010 is the 5 year bond but in 2012, they decided to sell it, I can got to a secondary market and sell it. Question is, what price do you sell it, is the price 1000 rupees we should pay to the government when you bought it face value or is the price more than 1000 you pay or is the price less than 1000.

Three possibilities are there, when you are going to the secondary market there are three possibilities which is there, at which what price. If the bond is very attractive and three more years interest income, interest income is very good, it may be sold in the market at higher than the face value. And if the bond is not very attractive, which is happening on European countries government bonds have become less and less attractive, it may be sold then less than the face value alright.

So, when you sell it, you do not get the 1000 rupees which you would have got at the end of maturity, you would get may be 800, 900, 950 whatever. And all this has implication for another kind of interest rate, I am coming to that which happening in the western world a lot. In India will also we will study this kind of coupon bonds, what the interest rates are so, every kind of death instrument has an interest rate associated with it. Problem with the macro economist is problem of macro economics is which is the interested rate shall reconsider in his study as (( )), so these issues are there.

Let me go into before I go into that secondary market business which is important, the share secondary market capital market which is called, financial market has two broad markets, one is the capital market and one is money market. I will study the money market here, the capital market you have to wait for the financial economics course which is coming in 4 th year, that I would not study here, that is again an area, specialized area alright.

So, together it constitute a nice package for you now, there is a type of coupon bond, which is very interesting and you will be surprised to know the name of it and you would

wondered, sir what this nonsense is all about is called zero coupon bond. Now, this is very popular zero coupon bond now at zero coupon for a zero coupon bond usually, they are short term bonds, zero coupon bond the coupon rate is 0. That means, it promises no interest to you, when you wonder sir why do I buy the bond if it does not pay any interest rate well.

What happens with the zero coupon bond is, they are sold to begin with at a discount so, 1000 zero coupon bond will be sold to you for 950 rupees by the issuer. Now, you wait 1 year a very short term, after 1 year you get back the face value of the bond so, you make a gain of 50 rupees. It does not promise you any interest annual interest income, they are called zero coupon bond, coupon rate is 0, coupon value is 0 amazing stuff.

First when I heard that, I had real trouble understanding it, zero coupon bond does not promise any interest, it is not the regular coupon bond which promise 10 percent, 12 percent, 5 percent, fixed deposit account. Fixed deposit account exactly like this, it promises you an interest payment for 2 years, 3 years, annually you get them alright. The zero coupon bond is very popular short term bond often sold by government, etcetera to collect some money but they sold at the discount and that discount rate at what at what reduced price depends upon the market demand for it. So, it is the demand supply works there, if the demand is very high then the discount rate will become very small, government takes advantage of it. But, if the demand is low and government is of (( )), face value is always the 1000 rupees or 2000 rupees face value is the value of the bond written on the bond paper, which you get at maturity.

(())

Not sold, it is redeemed secondary market yes, secondary market again you have to negotiate a price, what price you will sell it. Face value is the holder of the bond whoever it is, the n th holder of the bond, at maturity what he gets from the issuer of the bond as a principle. In case of a loan, a principle which is repaid to the lender when you take a loan, not only you paying interest throughout, you repay the principle. Here, the principle is the face value which is written on the bond, bond is like a share price, share is very similar share there is a face value of the share 10 rupees, every shares certificate has 10 rupees.

Now, if you keep your eyes open, you hear that somebody had an IPO which is initial public offer of a new share sold at 250 rupees, that 10 rupee share certificate and you wonder 250 rupee, why are they buying it. If share face value, share certificate face value is 10 rupees usually, share value share certificate has always what I have heard, I do not know broad what happens may be, 10 dollars may be, 1 dollar I do not know, here it is 10 rupees but sold at 250 rupees.

So, the company is really riding a horse, it cannot be the horse, space ship towards may be the planet Venus or something and making a huge amount of income on it is way. 10 rupees share certificate initial offer, public offer went in the market because the demand is so high, why is it so. The simple reason, the market value of the company is very high, market value there is a way to calculate that, I am I am not going into capitalize, I am not going to go into capital market discussion here, these are all capital market issues.

But, the face value and the market price can be very different that is why, I am trying to say open mishkin. So, the face value usually happens is that, in case of a bond, not in case of a share in case of a bond, what happens is, at maturity say 10 year period, when 10 year has gone by, you go and surrender that certificate. Somebody else may bought it, 10 hands it has gone through may be in 10 years now, you hold it alright. So, you take it and say, now this is matured, they will immediately return if there is any interest payment to be made, as the last year they would and the face value of the part.

In case of a share it does not happen, when company is recall shares, companies can do that alright winding up say, they have 10 millions shares, they decided to wind up 50 lakhs give the face value necessarily, they give them a market price which is usually have them a face value. So, in case of bond it does not happen, when it matures where a fixed period is there very important, shares have no fixed period by the way. So, bonds have the fixed periods, debenchers another name for bonds, offered by private companies have a face value, have a fixed period the maturity period, definite maturity period.

Shares, you can buy an old shares for your entire life may be, some company alright so, zero coupon bond are this kind of a thing, which was sold at the discounts. I do not know I think this is true, government usually uses something called treasury bills to collect money and I been told, treasury bills are often sold at a discount. And it does not have a

fix interest payment, I can may be correct may not be correct because I never bought a treasury bill. So, they are like zero coupon bond the (()) of coupon bond.

Now, whether it is zero coupon bond or government bond whatever, the thing is you can always calculate at any point say, a bond has a life of 10 year. After holding it for 2 years, buyer A decides to sell it off now, it goes to buyer B and B can calculate the return you will get for the remaining 8 years. And also, use that calculation in deciding, what price you should pay to that seller, which is buyer A originally bought from government. So, at every point, some present discounted value of the return on that coupon can be calculated.

He was talking about tomorrow what happens say, you take treasury bill, I will talk about treasury bill in this course, there are 9o day treasury bill, in one point India government issued 14 day treasury bill, unbelievable. Such a short term instrument 14 day, after 7 days somebody can sell it off, you cannot sell it of in the secondary market for some period. And then you can go for a secondary market, there can be lock in period, in mutual funds there are often lock in periods.

You buy UTI units SBI magnum, they say 3 year as lock in period, is the 10 year kind of a mutual fund certificate 3 years is a lock in periods. So, for 3 years, you cannot do anything, after that you can sell it off and often what happens is that, you sell it to the issuer, back to the issuer. Now so, at every point you can calculate but there is the possible you calculating the present discounted value of all the return that awaits me, I will get it, if I buy today.

Already 2 years has lapsed because it was with somebody else so, a market price develops, this is a secondary market price. Now, an interesting measure appears here suppose, a bond which promises a fix interest rate 10 percent every year so, for 8 years I will get that and at maturity, I will get a principle. Now, for this 10 years return, I can obtain a present discounted value, for the 10 year period 10 for 8 years that I will receive the return, plus on the 10 th year end beginning of 11 th year, I will get back the principle, the face value of the bond alright whose present discounted value I can calculate today.

Some total of that series is something, which is very important to an investor person B initially, investor was person A, who purchased it. B would take that the present

discounted value and compare that with that market price, an notion of equilibrium can established can be established here by saying. Therefore, the market price should match this present discounted value of the series, that awaits me I will get it alright.

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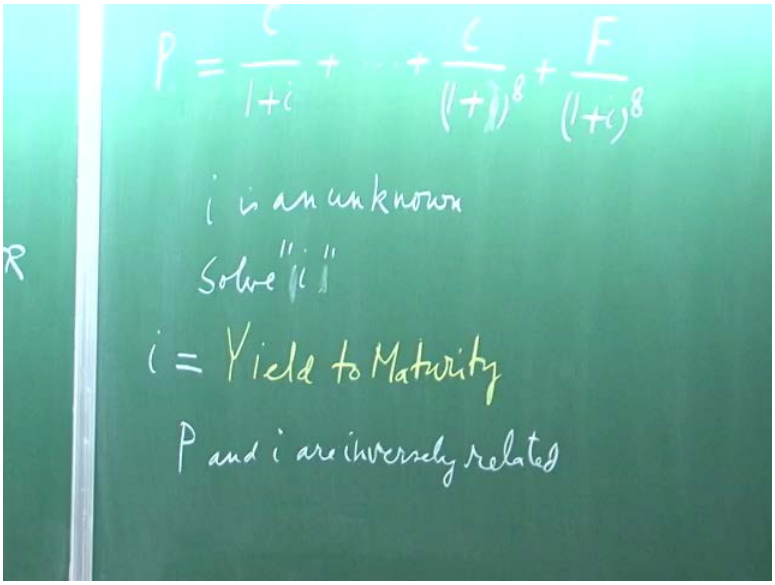

So, what I am trying to say, for a coupon certificate and you are trying to purchase it, where to whether to purchase it or not, there would be a price which is not 1000 rupees, which may be less than 1000 rupees because it is a discount that already sold. You would equate that price to you would you would equate that with all the coupon payments that you will get and their present discounted value for, if it is a 10 year bond then it will be suppose this coupon payment is it is suppose let me rephrase the problem suppose, I buy a coupon bond at a price, it is a competitive price that is developing alright.

Now, I have 10 periods or say 8 periods left, 2 periods have gone by already, somebody is selling it at a price. Now, I want know, whether that price matches all the return that we will get for 8 periods plus the face value of the bond which I will get back after 8 periods, which will be the end of the maturity of the bond which is the 10 period bond. 2 period already have gone with the first investor and the second investor, this equality relationship is very important.

Because, if P is more than the present discount even, I would not buy it, it is too higher price. If P is less, I will jump into it because price is less than the present discounted value of all the return I will get so, making an extra profit alright. Suppose it is equal,

suppose I am talking about an equilibrium relationship, market has reached an equilibrium. This i is an unknown, which given the value of P in the market and the C value which is written on the bond, 10 percent.

So, I can calculate what C is and the face value which is written on the bond, I solve i from this equation, this becomes one equation a polynomial in one unknown, I can solve it. This i you will now, hear a lot on TV is the famous, this interest rate in the secondary market that you hear or even in the primary market, you can calculate that for entire length of the bond is called yield to maturity. Now, this is the very simple cal calculation of the yield to maturity, there can be a more complex calculation of yield to maturity.

Yield means, a return till maturity basically it means, till it matures now, in the European market what is happening, in the financial market these days on government bonds where, governments are running at the deficit. There is a huge recession, very severe recession, they are trying to sell bonds and collect money from the people to run the government. What you hear, if you open the foreign news channel, go and open in the evening, a business channel foreign business channel, you will keep on hearing some story about this yield to maturity alright.

And what is happening to this YTM, it is called YTM, what is happening to the YTM, is going up and up and governments are saying, my goodness this is also called an interest rate is going up and up. Why this called an interest rate, compare this discount factor with the earlier discount factor I had, it is very similar that is why, I use the same notation, except that is asked by a bank to pay. In this case, this is solved form an equation, a variable alright and you can also see, P and i are inversely related P and i are inversely related.

And what you hear on government bonds, yield to maturities are going up and up what does it mean, you take a coupon bond where, C is fixed, F is fixed which government is selling long term bonds and the yield to maturities on these bond are going up and up in the market. And government is saying, my goodness interest rates are going up and up, it is becoming more costly to borrow money this is what, the headache European governments have.

What does it mean yield to maturity going up, if C and F are fixed i going up means, P going down that means, the price at which the government may be selling, is that

instrument is going down and down, lesser and lesser people are interested in it. This is the sign of a typical kind of this is the sign of the typical economy where, the governments are not trusted, the growth fix are negative or zero, unemployment is very high, there is not much savings in the economy and people are not interested even in the government bonds, which are highly risk neutral, zero risk.

Because, government is usually assumed to repay the money, not a private borrower, any company which can go bankrupt tomorrow alright. So, you open a TV channel, this is the usually story you keep on hearing, what has happen to Spain YTM today, what has happen to Italian government bonds YTM, what has happen to Greek Greece YTM, continuously there is a discussion and graph shown.

Now, you would understand what it means, it means it is becoming more and more difficult for government to sell this coupon bonds and collect money to run the show. Because, the government tax (()) was not enough, there is lot of unemployment work work which government has to provide some social security. And they do not know, whether the money is going to come from, economy is down is not generating enough income alright and government also is a catch cash 22 situation on the one hand.

Because of the poor shape of the economy, the revenue coming into governments pocket, is has slowed down or becoming less and less. On the other hand, the demand for government is going up, because of unemployment, etcetera where, people do not have jobs, people do not have health insurance and they are asking government to provide that so, they cannot cut back much on expenses.

On the other hand, revenues are becoming smaller and smaller so, the net present is deficit is becoming larger and to fund the deficit, they are trying go to the market to sell bonds to collect money, which is becoming more and more difficult. And price of anything going down basically means, you can use the demand and suppler model, price of something going down means, demand is less supply is more, very simple. Price going up means, there is more demand than supply, simple demand supply mode.

So, the demands for government bonds are becoming weaker and weaker, poorer and poorer where, a supplier government was becoming larger because government needs money and every now and then it comes up with the fresh supply of these papers. And also you have to realize one thing, which is a very futuristic thing, government may be

trying to cover its expenses by selling bonds today. But, tomorrow it will have to repay, it will have to pay the interest payments, make the interest payments, it will have to repay the F value, the face value when it matures.

So, today's solution is a quick solution, is not have any solution in the long run, government has more debt so, what we see is, in this country is public date is going up. Now, you know what has happened, they have asked China to come in into Europe with its surplus, internally funds European union does not have. European union banks, central bank is in also trouble, how much the central bank can support, all these countries having all sorts of problem, except may be France and Germany.

So, they are asking foreign doners, even Dr. Manmohan Singh when he went to a summit in Mexico, promised via IMF some dollar billion loan to the European union. Because, if they have also called the IMF to help them out, china they are asking the huge surplus, china's trade is doing very well so, china is huge surplus. So, they are asking china to invest in government bills, treasury bills of this European union countries or they are called euro bonds or something, I forgotten.

They are one central bank now, they do not separate countries.

Student: (( ))

Beg your pardon.

Student: (( ))

Government does not have money.

Student: (( ))

This is this is the problem, that is exactly cash 22 situation, there is no money we have to set the source, the demand for money.

Student: (( ))

What has happened if you go back into the history, there are structural falls, there have been fewer tax payments by the rich. So, tax policies all screwed up topsiderily and there is a corruption issue in these countries Greece, Italy, Spain, etcetera where, the rich have

avoided taxes, which they are legally supposed to pay even if they have less in proportion returns. Then their manufacturing set these days economic have become based on service sector.

Service sectors if they go down, they are very competitive they are in trouble, manufacturing sector they have ignored, which used to be their prime occupation where, China is smart, it is manufacturing sector is good. So, there are structural adjustment programs required over hauling required of the entire economy, they survived on a kind of a Utopia Utopian economy, as if everything is alright. But, started becoming shaky, it started affecting the European systems then the European systems similar problems are there, they started shaking and then recover economics they crumbled easily.

A strong foundation will take more time to crumble, earthquake will go like that, one with some strong foundation will last longer. Germany is lasting a longer time, less of a problem, less of a corruption, Germany manufacturing is still very good we all know that. France is doing well, Britain is very smart (( )) kept stayed away from the European union so, did not get effected by it much. Otherwise, all these head ache would have come say, you have a nuclear family, your father runs it, your fathers income if it dwindles, your requirement is in trouble.

But, your neighbor is not part of your family alright and he does not have any obligation to you, expect some charity bond may be (( )) and they are finding more and more only there are two leaders in this whole European union, Germany and France. Have you seen how many times Angela, Michael and that past president of France met in the last 2 years, one could have said, you know may be a girlfriend or boyfriend meeting, so many times but they meeting to solve the European union problem, how many times they meet, I saw at least 20 times on TV, the meeting, continuously meeting going on (( )).

Since the second world war, they thinking about it, any way we need not go into that so, what I saying is that, this i called yield to maturity which is an interest rate, which is now free variable in an equation like this, which you can solve. Not bank saying what i is and in the secondary market context where, P fluctuates i is continuously fluctuating, having a concrete inverse relationship, is an important indicator in an economy in the monitory economy, which you can calculate called illiterate.

So, now, suppose if you have fix payment loan for 25 years, you make a fix payment every year alright and the total loan is this amount that you have got. You can equate that to the fix payment that you get, you have to make every year and you can make a present discounted value of that fixed payment. And you can calculate the yield to i, yield to maturity in that equation also, fix payment divided by 1 plus i after 1 year, fix payment second year then I have divided by 1 plus i square.

10 year period, 25 year period (( )) you calculate your yield to maturity on that loan sitting at home, is the polynomial you have to solve, is not a simple equation but there are algorithms. There are simple things even in calculators I have seen, to solve the polynomial like this where, i can be solved on calculators scientific calculators, I have seen they have, you do not have go to the computer even.

But, what I am trying to say, the concepts are very interesting and important, for your understanding particular for economic students and non economic students, you are also picking up something which you would may require tomorrow when you join work. Somebody your boss asked you to prepare a macro note on the current status affairs in Europe, all this variables will come into your discussion macroeconomics will come, yield to maturity on government bonds there, etcetera will all come alright.

So, anything now, this zero coupon bond another word is often used please remember, it is a discount bond also. Zero coupon bond has another name because it is sold as a discount is called a discount bond so, also called a discount bond. And the yield to maturity is of course, something which you have there, so any financial instrument if you have a return, you may be expected return if you know them and you know the current market price of this instruments may be secondary market price or the primary price.

you can always calculate them into maturity, which is an interest rate and if the interest rate is high, it is bad news for the seller of that instrument because the price is low and he is not getting enough. If interest rate is low then it is a good news for the seller of this institute because the price is high, I can sell it at a high price. I am selling my car, if the yield is low, I am getting a high price for my car. What I am saying, if the yield is high I am getting a low price, that is bad news, for government, yield high yield is a bad news. And what they showing on TV, if you watch now business news foreign channels, the

yield is going higher and higher, every day going up is bad news for these governments alright.

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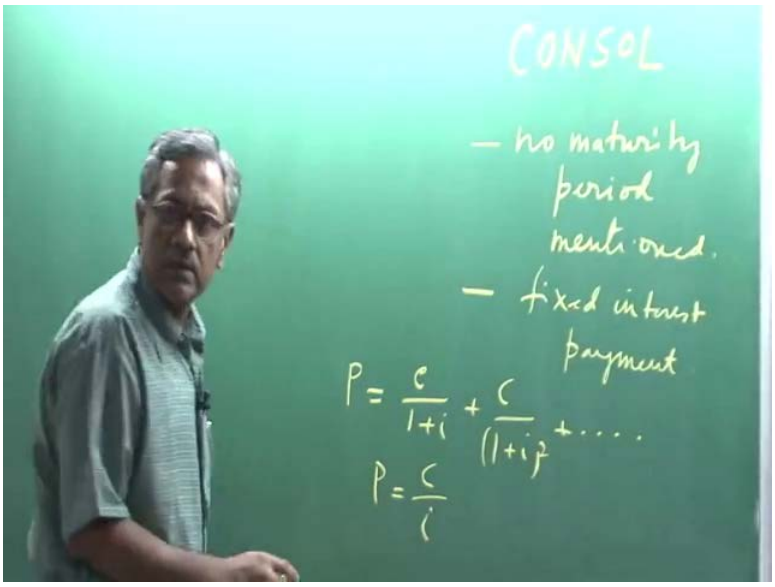

Now, there used to be a very interesting item, last item I will mention while you sign on the attendance sheet is called consol, which used to be sold I do not know it will still exist. In England it was popular at one point, consol is a bond which is sold alright had a price but it does not have it does not have any maturity period, no maturity period mentioned. So, it goes to infinity in some ways and it has a fixed interest rate of course, like a coupon bond, fixed interest payment every year you have.

So, if you do a present discounted value of this equation, it is very interesting P is equal to some coupon payment over 1 plus i plus C is equal to 1 plus i square plus up to infinity it will go. So, if you geometric, if you do a geometric sum, there is a geometric series of this infinite series what will it be, P is equal to C over I so, you will get that alright P is equal to C over i. It is a very simply relationship, which you know from school you will get that, this consols are there which I have read the first time may be, other countries also have it.

In India, some treasury bills which is to be known as adhoc treasury bills have been converted into consols (( )) I have heard and it pays the very funny interest payment, who bought it is scratching the hair off 4.84 percent interest or something. Even inflation is 7 percent, is the negative real return but what government had retire them into a consol, not

paid them back. I do not know whether they have redeem them all of them but they used to be called as adhoc treasury bills, which became such a nuisance for the government, they stopped them issuing new one's, I will talk about that later.

New ones and they converted them into something like a consol where, they will make an interest payment every year till they retire them, which is like a consol. But, a very funny interest rate 4.84 percent, my goodness hardly that is any return, interest income 4.84, 7 percent is inflation, real return negative, nothing. So, console I first read in the context of English economy, they issued some consol government alright.

Now, before I would conclude this part, interest rates, various kinds of interest rates, a yield to maturity, I started up with simple interest rate then you have a consol interest rate you can come alright. Anything can have yield to maturity on consol rate, I conclude this part not in a hurry, I will do it tomorrow alright and then if it is done quickly, I will begin topic 2, topic 1 is over.