Money and Banking
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Lecture - 9

We begin where we left in the previous class, I was talking about a very simple, very simplistic form of a multiplier that may exist in the monitory sector. And I tried to explain that in terms of a reserved change with one bank how, when that is given out as a loan, that is given out as a loan shifts one bank to another bank, through the system, that money and creates what is called was known as credit multiplier.

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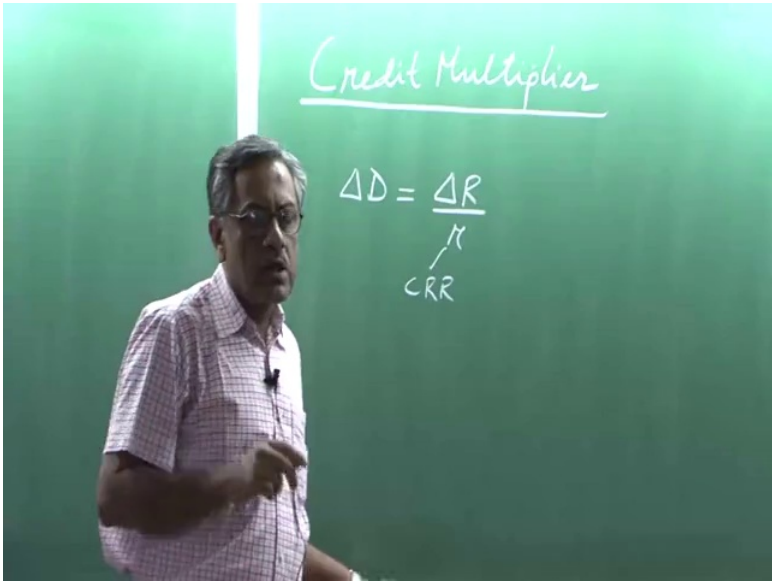

Now, this credit multiplier the algebraic part is simple, the total change in deposits is the initial change in reserves divided by r, where r is CRR. Now, in this formulation that we obtain that day, the multiplier is one over r small r. We are assuming a number of things, when the money leaves first bank as a loan to somebody leaves in the form of a cheque not cash. In case of a cash if the money leaves some cash may remain with the person and some may get deposited to any another bank.

But, here there is an assumption that nothing remains in cash form, it leaves in the form of a cheque, which he goes and deposits in his own bank and if he has an account assuming he has an account and puts the money there again when it leaves in the form of a cheque to somebody who goes and deposits in his bank. And there is no cash the part

cash part of that money, that remains in the economy number one, very simple assumption. Otherwise, it will be only a portion of the loan getting deposited in another bank.

Second, when banks receive deposit money, savings account etcetera, they keep apart as access reserves with them because this is the cash with banks. Banks need, a part of that to be kept as cash primarily, that the person who is deposited the money may come tomorrow or day after tomorrow and say I need some of my money. Now, if the bank gives out the entire money that it received as deposit from you, to some person as a loan where would the bank give the cash to him.

So, this calculation that bank does, how much is this part of the deposits I need to keep as cash with me, which we drew everyday in the bank cash withdrawal form. So, bank have to calculate, banks do calculate the amount of cash they should with hold and then the CRR money which goes to the reserve bank, after deducting all this may be safe zone also another percentage, then whatever remains they think now, how much of that can be given out as loan.

Which even if it is returned 2 years later, 1 year later I do not have any problem in managing my cash with my clients, who are depositing money. So, this is this is where banking, major code area of banking that one does have to have an aptitude to be a banker, there are many other things that banker need to have as a skill or qualification to run a business successfully. There were banks gets banks failure occur, when they give out too many loans and that are bad loans which are not returned, then when depositors come and ask for cash, they do not have cash (( )) that is called a bank failure.

That is why the CRR was created, after the depression, that there is a safe money somewhere a precautionary deposit with the central bank. So, in case I miss manage my funds, for whatever reasons, if tomorrow depositors come I have no problem no panic I can just simply tell RBI and RBI will help me out alright. So, this has a number of simplifying assumptions, this model what I need to tell you.

Now, is all along what I was trying to tell you, that the monitory base of the economy is one which is important to the policy makers, to watch what are the sources from where money is coming into monitory base. It is continuously expanding or contracting, very a live thing and if it does then the super structures which you call money supply or

monitory aggregate, they also keep on expanding and contracting. What is the connection the connection between monitory base and a monitory aggregate like M 1 or M 3 which are commonly found in government documents.

Government documents usually have only M 3 not M 1, but we will do M 1 also what is the connection, the connection is again through a multiplier, which we are familiar with in macro economics. If something happens is multiplied effect on something else, government expenditure increases, there is a multiplied effect on total output or income in the economy. Similarly, monitory base changes there is a multiplied effect on monitoring aggregate, that what we will do, now the connection these are called money multipliers this is very simplistic over simplified.

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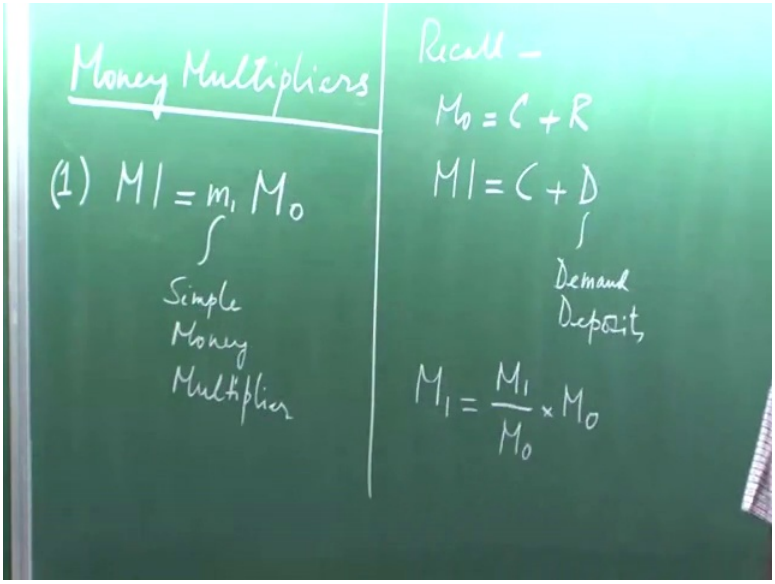

So, we will talk about money multipliers, now. Essentially, I will talk about two money multipliers, 1 the relationship between M 1 and call that small m 1 into M naught, this small m 1 is the simple money multiplier. So, what I am saying, if monitory base changes the effect of M 1 will be via the multiplied effect. It will be multiplied effect, it depends upon M 1 which is the simple multiplier, because I am talking about the narrow money relationship.

One more multiplier I will do the complex money multiplier, which is the relationship between M naught and M 3 I will do that later, let us look at this how it is obtained. It is obtain very mechanically, what we do usually I confined many references, is that lets

recall the definitions, M naught was C plus R, C was currency with the public, was that the definition I used notation. And M 1 is currency with the public plus demand deposits called that D, here D is demand deposits. What is the other thing in M 1 and M naught other deposits I am ignoring them, other deposits I am ignoring them, they are very small amount. Now, you can do a simple manipulation which is M 1 is equal to M 1 over M naught into M naught I can write that.

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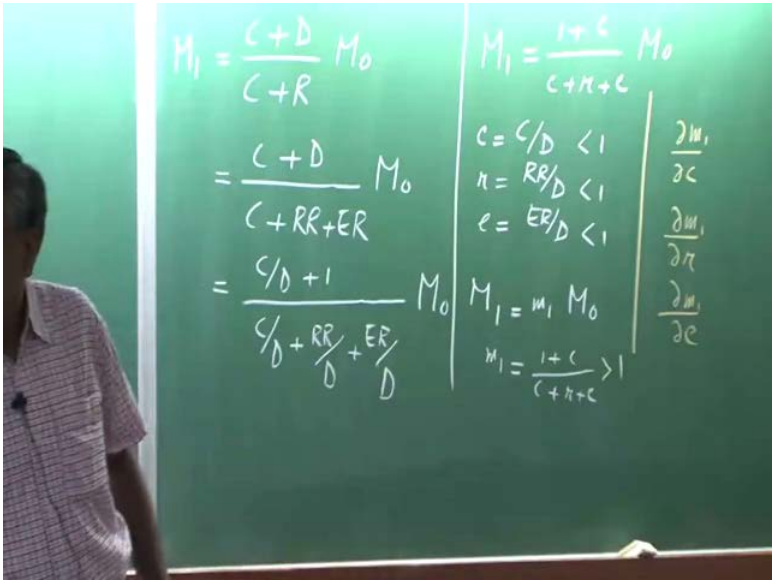

So, this relationship Will therefore, become M 1 is equal to C plus D over C plus R into M naught. Now, R has 2 types R has 2 reserves one is the required reserve the CRR and another one is cash with banks called access reserves. So, this can be rewritten as C plus D divided by C plus R R plus E R M naught alright. Now, divide numerator and denominator by D. So, what you have is C over D plus 1 divided by C over D plus R R over D plus E R over D.

Now, as soon as you do that, you notice one thing, in economics we call behavioral assumption they depend upon the behavior an average behavior, what is the behavioral assumption. I am going to make or behavioral parameters that emerged, economics particularly micro economics is entirely behavioral economics, companies maximize profit, individuals maximize utility all behavioral assumptions alright, there can be an individual who does not maximize. Utility may be maximize disutility, but we do not think that is an average that is normal.

So, we were in behavioral assumptions, the behavioral assumption is very simple what the behavioral characteristics that emerge is very simple C over D is essentially saying, that. When a person receives money how much of that it wants to keep with himself as cash and how much he wants put into the savings account, where if required they can go and these days they can go on ATM machine and get the cash out. So, how much it will be, it will remain as cash with himself and how much his own money he can put it in the bank in a savings account and earn some interest rate and be safe.

So, there can be various reasons why individuals behave in certain way, they behave when they receive money with a banking system around, that they could with held some cash. And the remaining salary can be in the bank and whenever they need money, they can go to the bank and also the advantage is that if it is a checking account, some payments can be made with cheques and you cannot make that. Unless you have the cash in a bank deposit how can you make a cheque, how could you write a cheque if you do not have an account.

So, this is the behavioral characteristic coming out, that it that is emerging from my manipulation here, C over D then R R over D is a typical RBI instruction, how much of D you will have to part and keep with us. The deposits that you get demand deposits to savings account, current accounts etcetera, you will have to keep with us, that is an RBI instruction. So, that is a policy parameter, that is the monitory policy parameter, central banks parameter there alright.

That depends upon central banks, this is essentially the small R I talked about, nothing else required reserve issue CRR, but CRR is a simple CRR, CRR is more complex. I am coming to that and this is a banks behavioral parameter here, E R over D typically, banks when they receive cash through deposits they decide how much they will like to keep in cash form with themselves, in waltz etcetera, lockers. And every day they bring that out or whatever amounts are required when customers come and demand their own money (( )).

Suppose, I have 1 lakh in my account and my typical habit is every 15 days I go there and withdraw 20,000 I am just saying it. So, this is what the banks need to study, what is the behavioral behavior behavioral of the clients, as to how frequently they withdraw money and how much do, they withdraw money some average. So, this is banks

behavioral parameter that may emerge here, E R access reserves the cash banks keep for you and me because our money is with bank, over the total deposits they received as demand deposits clear alright.

Now, what we need to do in this case is very simple, let us give them a name, small alphabets and we can write M 1 is equal to 1 plus called as small c. And let it be small c plus small r plus small e into M naught where, small c is the currency to deposit ratio, small r is the required reserves over demand deposit, small e is equal to excess reserves over demand deposits, alright. And you can see one thing they all these parameters are less than 1, magnitudes are less than 1, all these parameters magnitude are less than 1.

So, this is less than 1, this is less than 1, this is less than 1. Now, we can finally conclude that M 1 is equal to small m 1 into M naught, where small m 1 is equal to 1 plus C over C plus R plus E. Now, question is small m 1 greater than 1 or less than 1, typically this number is very small, this about 7, 8 percent alright. So, it depends upon these 2 numbers are less than 1 and C and C is common and 1 plus C. So, it is definitely greater than 1, here you have the simple money multiplier.

So, just the way human beings are and what banks do to people a multiplier is bond and that exists I am trying to show that to you with the help of some simple notations and algebra, it exists. And that is precisely what happens, when monitory bases changes because an exporter went abroad and sold something, came back to India, with dollars goes to RBI converts the dollar, into Indian rupee. Then he decides to keep a part of the Indian rupee as cash and put that part the other part in deposits, in this case is only demand deposits.

So, this is not a very realistic multiplier I am coming to the other multiplier which is more realistic and banks behave in certain ways, part keep the part of deposits with the RBI on a fort nightly basis or weekly basis and keep excess reserves a multiplier is bond, which we do not realize, unless we go through this process. So, if monitory basis changes by some number, let this number be 2 suppose, the monitory basis changes by 100 corers M 1 changes by 200 corers, this is what RBI keeps track off.

And this is what, your macro text books tell you about M, they do not tell you how M changes, they say suppose M changes l M shifts, but this is the root through M changes alright, (( )). But this did does not make economists happy because here when the deposit

money comes is just not demand deposits in our country, people keep a whole lot of money particularly who earn well in fixed deposits. So, we need to talk about a multiplier where time deposits come and therefore, we need to talk about the complex multiplier which is the relationship between M 3 and M naught. So, that is the next task M 3 and M naught is this part clear.

Student: Why is small c less than 1.

Currency to demand deposits, good point, very good point. Usually people do, but likewise suppose, you receive a salary, but it may not be yes I agree some case it may not be, we need to see imperially what is true for India, you receive salary beginning of month you keep some cash for payments and you have to live through the months. So, that cash you will keep, will it be less than the money that you will keep in the bank usually it is because the rest of the month you have to live on that money.

So, that the fraction you keep as cash is normally less than, the fraction that you keep in your account, these days what happens with IIT etcetera. The salary is not given to me in cash from, salary is deposited in my account and I definitely withdraw a fraction and keep more there less than 50 percent I definitely withdraw because with that salary I have to live, normally that is to, but it may not be yes. So, is the behavioral property, we need to check that empirically.

Not a bad question, why sir are you making it less than 1 some people some people may be crazy, they live on borrowed money may be. So, whatever money they receive, they spend most of it in the first 10 days or 15 days, then the deposit that you keep in bank is definitely less than the currency that you withheld, but normally that should not be the case. So, I am calling it behavioral property or assumption or feature of the model, behavioral means how human beings behave and that you model into your discussion, that you consider in your discussion in economics we do that this kind of a way, this kind of a method we use (( )).

Let us go into complex multiplier, so can you can anybody give before I go to complex multiplier, can anybody tell me how M 1 and C these derivatives would work. I am now, going to make your life a little bit more can anybody tell me di m di c di m di r and di m di e what this multipliers would be partial derivatives. What this partial derivatives

would be, a multiplier how it changes when suppose, as he asked me suppose, the currency to demand deposit ratio increases, how would the multiplier change.

So, this M 1 you call that m 1 may be, how does M 1 changes di m 1 di c what will be the derivative, your numerator denominator both places c. If currency to demand deposit ratio, small c changes, say increases, people decide to keep more cash and keep less money with banks, how would the multiplier get effected, this is an important question this we should answer. Before we go into the complex multiplier, di m 1 di c greater than 0 less than 0 (( )) di m 1 di c the otherwise my notes are I am assuming R and E are less than 1 of course, they are less than 1.

So, will it be greater than 0 or less than 0, less than 0 and what will be the famous policy multiplier which is very important all everybody wants to know, if central bank increases CRR what will happen to the multiplier di m 1 di r what will it be less than 0. Now, you understand monitory policy, why central bank increases CRR when central bank increases CRR that essentially means, central bank is opting for tight money policy. And tight money policy essentially means, that it is going to control the money supply, by shrinking it by shrinking the multiplier.

So, when M naught changes the effect the impact on M 1 will be less, so it can directly hit the multiplier, through CRR number. So, when central bank says from tomorrow, it does announce on TV I have seen, reserve bank governor himself comes often, tomorrow we are going to make CRR to go up by 50 basis point. That means, it is now 7 it will become 7.5 you know what they are trying to do, they are trying to shift the l M curve or control the l M curve, which have been shifting out, so that it does not shift out so much alright.

So, it is trying to also control the outwards shift of the demand curve and therefore, it is trying to control may be something like inflation, because when demand shifts out, supply if it does not change much prices will go up. So, one indirect way of controlling inflation would be a tight money policy, where central bank can announce lets increase CRR is this becoming clear now, to you this is often on TV and this is precise what the reason is, that is why those partial derivatives are very important.

If banks decide to hold more cash as excess reserves because people are withdrawing too much say pooja vacation is coming dasara, when people spend more than the normal. So,

banks at that time keep more cash. So, if E goes up what will happen to the multiplier di m 1 di e again negative it will be, the multiplier shrinks, you see that. So, this is very important, these partial derivatives, this is less than 0, this is less than 0, this is less than 0 (( )).

So, I am just not teaching money and banking I am into monitory policy also in this course, otherwise it does not much make any sense to talk about just money and banking isolated way (( )). Now, I came to the actual multiplier which you open a government document like economy survey you see the numbers and the plots also, I will also give the plots I created my plots, you open economy survey today you will find that it is there it is called a complex multiplier.

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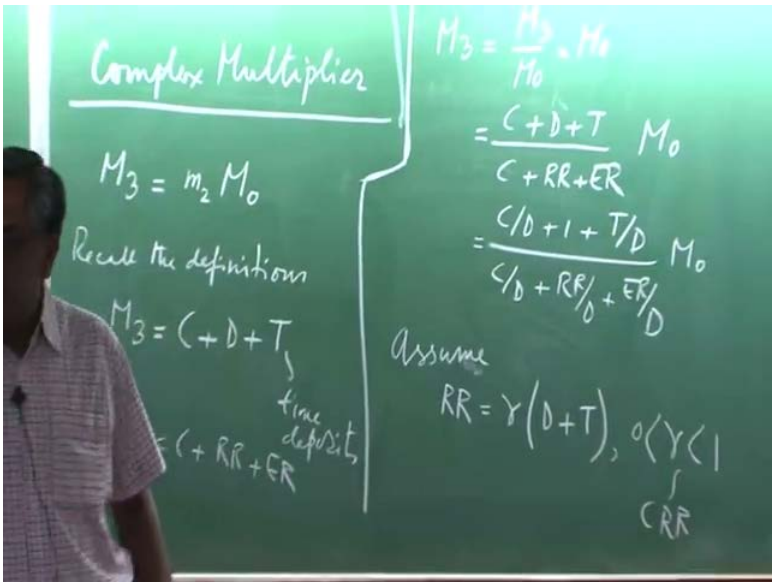

The complex multiplier is essentially the relationship between M 3 and M naught call that M 2, so broad money how it changes, with M naught. So, recall the definitions and ignore other deposits M 3 is currency plus demand deposits plus time deposits alright, demand deposits plus time deposits and M naught is currency plus required reserves plus excess reserves, this is what you have. So, we can write following the same method we can write following the same method we can write M 3 is equal to M 3 over M naught into M naught, which is C plus D plus T divided by C plus R R plus E R. Now, if you divide it by D then you have C over D plus 1 plus T over D then you have C over D plus R R over D plus E R over D into M naught.

Now, we have an extra complication here, we have time deposits now, the store is complete go to bank you can open either of the 2 accounts types, the demand deposit account, which we are saving accounts etcetera. Where you can demand your cash when you want, time deposits your money is stuck there, 2 years fixed deposit, 3 years fixed deposit, 4 years fixed deposit whatever. So, there is a behavioral pattern now, we need another parameter T to D ratio alright.

Let us now, consider the following assume 2 more things, one the required reserves, are the real required reserves that what happens some row is that that is not row that is gamma, gamma which is a proportional factor of D plus T where gamma lies between. And this is the CRR actual CRR, CRR is just not out of savings accounts, that is a simplified CRR this is actual CRR, CRR money is CRR money comes from both demand deposit accounts and time deposit account, both accounts have taken for CRR money.

So, this is the real CRR second let us assume that the time deposits, grow in proportion to time deposits where t is just simply a positive number, time deposit to demand deposit there is a behavioral relationship in the economy. People want to keep this much money in savings account and put this much money in the fixed deposit accounts long term deposits.

Essentially, one short term deposits, one long term deposits some people decide that at home, he often parents sit down father and mother and they decide how much to keep the in fixed deposit and how to keep in savings account. I mean you tell you ask them you will hear that, this is very much human decision a behavioral decision. So, now I can make these, this relationship using these 2 assumptions I can simplify that here.

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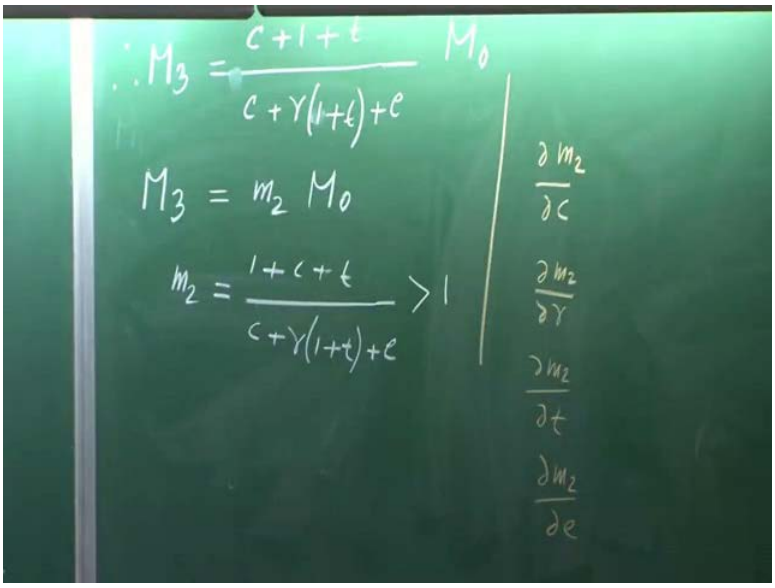

So, this becomes therefore, M 3 is equal to small c plus 1 plus T over D now, if you substitute this D D cancels out it will be small t divided by what you have is again small c plus gamma plus this 1 is going to create some trouble R R over D R R is gamma into D plus T. So, now T is t d. So, it will be gamma D gamma D into 1 plus T. So, it will be gamma and divided by D can cancels out it will be gamma into 1 plus t (( )) R R is now, proportion it is a proportional ratio with D plus T. So, you have to substitute for T first T D factor of D 1 plus small t and then D divided by D D cancels out gamma into 1 plus small t (( )) into M naught.

So, this is the complex multiplier, where M naught is equal to 1 plus c plus t over c plus gamma into 1 plus t plus e. The question is it greater than 1 or less than 1, e is a very small fraction usually 1 plus c plus t. Now, gamma of 1 plus t is a fraction of that 1 plus t here, gamma is 7 percent or something. So, 7 percent of 1 plus t is a small plus c definitely less than that and how much e would you add very little e you have added.

So, it is greater than 1, intuitively you can say it is greater than 1 number, you understand what I am saying, gamma CRR s how much can be maximum CRR is probably 15 percent. So, 15 percent of 1 plus t and it is less than 1 percent usually e will check that number out for India, will check those numbers out actual numbers I have. So, now, 2 3 classes we will have on data, to see actually what numbers are there in India, we need to see that.

So, 1 plus c plus t c plus gamma into 1 plus t plus c is going to be greater than 1 complex multiplier. In India we need to check the complex multiplier and this is RBI checking government given reports, in economic survey ministry of finance if you open you, economic survey you open economic survey for fun in the evening and check M 3 numbers there. A chapter on money supply, monitory developments or monitory sectors something it is called M 3 is plotted there.

So, this is this complex money multiplier which is the relationship between monitory base and broad money is the prime interest to policy makers, like government, like central bank of course, banks, any everybody most people are interested in this whoever is interested with macro economics is interested with this or the macro economy, they are all interested with this. Now, please check the derivatives, the derivatives you need to check now, di m 2 di c di m 2 di the CRR di m 2 di t and di m 2 di e check the derivatives.

This is the most important one from the policy point of view, the other ones are behavioral patterns what do they show, if people are putting more money in fixed deposits, if people are keeping more money in fixed deposits, what will happen to the multiplier, simple questions can be asked. If people want to keep more money in fixed deposits what multiplier will you have, I think what will happen is, we do not really check them out, can you please check the multiplies is derivatives I I tell you my notes are within corrections I mean I made error in the past, simple calculus is required.

But, what I have is di m 3 di policy parameter gamma is less than 0. So, our policy result which we got earlier holds here too di m 3 di e is also less than 0 banks behavior di m 3 di c less than 0 under certain restrictions, which is alright the restriction is 1 minus gamma into 1 plus t should be greater than e. No less, if less than e then it is less otherwise greater than 0. So, check that number di m 3 di c, when you did that differentiate di m 2 not M 3 di m 2 with respect to di c what will it happen, you tell me what algebra do you have, my algebra is incorrect here greater than e to be, so you have E minus.

Student: E minus.

E minus you have E minus 1 minus gamma into 1 plus t is it correct, divided by C plus gamma into 1 plus t plus E square whole square alright. E minus it will be I have written

it incorrectly E minus alright. So, it will be less than 0 if E minus this, where essentially you are saying 1 minus gamma into 1 plus t is greater than E which is reasonable E is a very small number, I will just check 1 minus gamma will be say like 93 percent and 1 plus t, t is usually greater than 1 number t is greater than one number.

So, 1 plus t is greater than 1 of course, and 1 plus. So, has to be rather than E. So, it is less than 0 see if people decide again the same result holds, if people decide to hold more cash, put less money in the bank, even the complex multiplier. Will say that the multiplier strength will weaken, multiplier strength will weaken if central bank decides to increase CRR multiplier strength will weaken, if banks decide to keep more cash.

Now, comes the t if people decide to hold more fixed deposits than demand deposits what will happen to the multiplier, can you find that out di m 3 di t what that algebra will be greater than 0 my result is 1 minus gamma into C plus C, clear divided by a whole square term. Now, 1 minus gamma into C plus C is greater than 0 on ambiguously so 1 minus gamma into C plus C.

So, what you are saying in an economy, when the time deposits increase, compare to demand deposits, which you can check by plotting time deposit values and demand deposit values. Simply two lines and you see the time deposit number goes up like this and the demand deposit number is like this. Suppose, you can close your eyes and you could say that complex multiplier is becoming stronger and stronger (( )) given other things not changing much alright. So, the question is now, multiplier number for any year would be a net result of all these parameter shifts C T gamma E net result. So, we need to see what is happening in India. So, that data will be coming up, Actual numbers for monitory aggregates.