Working Capital Management
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Lecture-48
Models of Cash Management-Certainty Model by Baumol

Welcome students, so we were discussing the cash flow statement and in the previous lecture we discussed that how to prepare the latest cash flow statement which is to be divided over the 3 activities that cash flow from operations cash flow from investments and cash flow from the financing activities. So, these 3 activities are there to be clearly say to be identified.

And then to be say we have to highlight in the cash flow statement that how much cash is flowing from operations and then from the investing activities and from the financing activities. So, that it can be clearly found out that, so that we can clearly find out that how much cash is coming from operations, how much is coming from the other 2 activities. Because in any manufacturing concern operations are the major source of the cash should be the major source of the cash and not the investing as well as the financing activities.

So, we have to verify that and it will help us to find out also that how much of the total profit debited by the income statement of the profit and loss account is in cash how much is the cash profit right. After that we talked about something we call it as that is the liquidity management.
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And then I discuss with you that liquidity when we talk about the liquidity of a firm liquidity those border concept but if you talk about the pure liquidity or maybe the backup-liquidity. So, it has 2 components that is the cash and then is the marketable securities, part of the cash you can keep as cash and remaining cash can be invested into marketable securities. So, that if any amount of the cash is kept idle it will cause a cost to so to avoid that cost.

We will have to keep cash some amount of the cash as cash which is called as the pure liquidity and the remaining has to be kept as the backup liquidity right. So, while we talk about the backup liquidity we have to be careful that how much is the expected return from the securities and we have to construct a portfolio. So, part of the cash you can invest into the risky securities and part of the cash can be kept in the less risky securities or maybe very low risk securities.

So, that income from this investment is also say managed and risk is also within control, so we have not only to invest into those securities which are totally risk free. For example if you talk about the risk free securities that treasury bills, so you invest into the treasury bills because they are owned by the government, they are issued by the government in the market. So, those securities are totally tax free.

Because governments securities there that is why there called as the gilt edged securities also. So, partly we can invest the cash into the treasury bills and partly we should invest into the other

revenues also. So, we have to create a portfolio where we have both the securities risky and less risky securities. So, that the risky securities are giving the higher return and less risky securities are giving you the lower return.

And ultimately desired amount of the return or the percentage of the return can be found out right. So, it means cash+marketable security should be say managed to manage the liquidity in the firm right. Now as I told you in the previous class that we will be moving further and will be talking in today's class. In this class about the cash management models right we will talk about the cash management models.

So, cash management models as we see here, we have the 2 broad cash management models one is the certainty model which is given to us by one professor called as W.J. Baumol.

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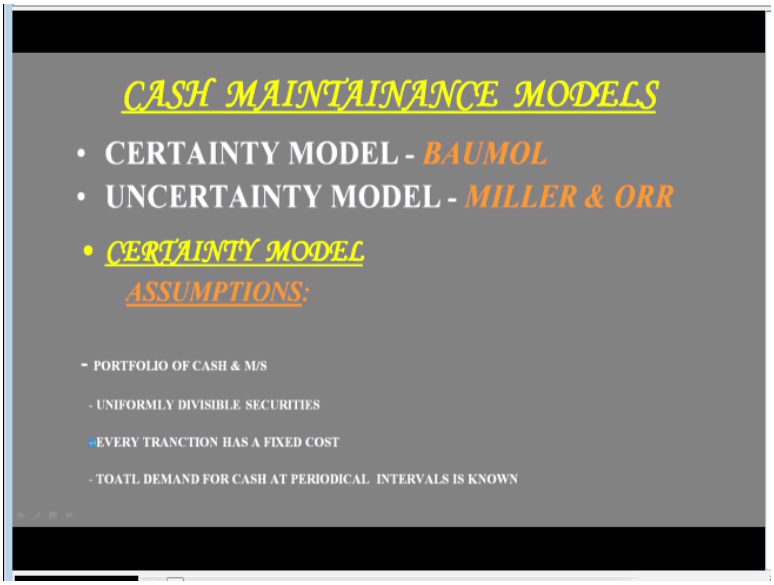

This professor is called as the W.J. Baumol and there is another model which is given to us by the other 2 professors and they are it is called as the Miller and Orr model. So, if you talk about the W.J. Baumol one, say this is the called as the first model in the cash management which is called as the certainty model.

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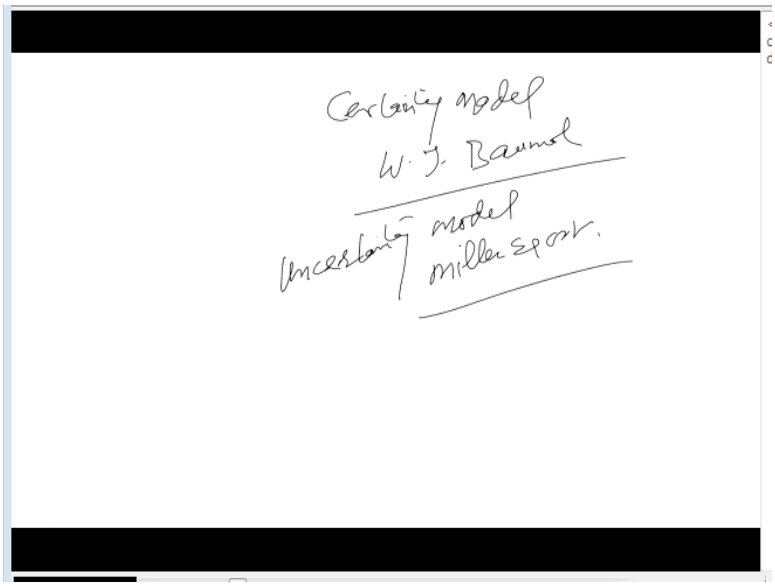

This model is given to us by W.J. Baumol this model we called as the certainty model and there is another model which is called as uncertainty model. Another model is that if you look at this model this is the uncertainty model and give it to us by 2 people that is Miller and Orr. So, now we will discuss these 2 models and we will learn how the cash management can be led or can be had or we can have an idea about managing the cash with the help of the 2 models.

So, first model is the certainty model which is given to as by W J Baumol and when W.J. Baumol gave us the certainty model of cash management. He applied the concept of inventory management and in the inventory management if you remember we use 1 technique to manage the inventory that is the economic order quantity EOQ model of the inventory management. He simply replicated the model, same model EOQ model of inventory management into the cash managements.

So, he assumed that now we do not have the inventory of the finished or the raw material finish goods or the raw material now the inventory for us here is the cash right. Now the inventory for here for as is the cash, so as we are managing the inventory with the help of EOQ why cannot we mange cash again with the help of EOQ right. So, we will have to we should apply the model of this EOQ model and Baumol had that idea in his mind.

And then he applied this model which is called as a certainty model, so because of this certainty concept which he has introduced in this model. This model has lot of limitations but still you cannot say it is absolute model or it is not usable or it is not important at all it has many other properties, it has many other qualities. And we can use the model if some of the assumptions of the model or held true in any concern or in any firm or in any business organization.

So, let us move forward and try to understand what this model is which is called as the certainty model given by professor W.J. Baumol. Now while applying the concept of EOQ from the inventory to cash. Here he has taken some assumptions right and these are some of the assumptions say taken by professor Baumol and first assumption he has taken here is that portfolio of the cash and marketable securities.

He says that firms always they do not keep the cash always cash as the cash if you are talking about the true business maybe a private sector organization. We are not talking about the public sector companies because there it might be possible that entire amount of the cash is being kept as cash nothing is being invested in the market. So, there is nothing called as the marketable security.

But in the truly nicely managed effectively managed business concern maybe in the public or private organizations we expect that the cash is being managed, this way the assumptions Baumol has taken. So, he says first assumption is portfolio of the cash and marketable securities, he says that firms keep part of the cash as cash and then remaining is invested in the market in the form of the marketable securities.

And there is a 2 way to manage the cash keeping the cash as cash and then partly the cash is invested into marketable securities. So, firms manage cash in both the ways keeping the cash as cash and then partly investing the cash into marketable securities generally this I think reasonable assumption. Because normally the firm should do like this, so he has assumed that firms are doing like this.

Second assumption he has taken is uniformly divisible securities, he says that when the firm is investing into the securities in the market they are uniformly divisible securities. For example 1 security of 100 rupees, so he if we want to have to invest 10000 rupees in the market. It means we have to buy say 1 securities of the 100 rupees. So, it means if we want to invest 10000 rupees in the market, we have to buy the 100 securities.

So, 100*100 will be 10,000 rupees for example, similarly the 1 security for 10 rupees then same way you have to buy 1000 securities from the market. So, that is the second assumption which sometimes may not be true that when you want to invest in the market the prices of the security maybe not uniformly divisible that maybe for the different prices and we are talking about building up of the portfolio.

Then certainly you will not have the securities which are always uniformly divisible right, so but still he has taken the assumption. Third assumption is every transaction has a fixed cost, so this is the assumption he has taken here and that is true also that when you convert the cash into marketable securities and marketable securities into cash certainly we have to pay some cost.

Because there is a cost of the people who are working in the firm and handling the cash and they are investing into the securities. So, there is a cost for that because we have to place the order we have to say find out the broker and broker has to find out the security or maybe sometime when you have to sell the security in the market you have to find out the buyers in the market. So, it means broker's commission is also there the people who are working in the cash department their salaries are also involved.

So, there is some minimum cost is there which remains fixed that this is the broker's commission on transaction or conversion of 1 security into cash and cash into security, this much is an approximate time of the cash management department people being used. So, that is **is** somehow is to be there and that is there. So, we assume that yes there is a fixed transaction cost when you convert the cash into marketable securities and marketable security into cash.

Because if you have surplus cash keeping part of the cash is cash remaining you will invest in the market in the marketable securities right. So, we bought the securities from the market and when you have when you required that cash and we are running sort of the cash means sufficient cash is not available in the bank account or with the office shares then we have to sell the marketable security.

So, then in that case you have convert the security into cash, so that is again very very say important component of the total cash management it also has a cost. So, conversion of cash into security and security into cash it has the cost and that is called as the transaction and every transaction has the fixed cost. So, this is the another important assumption he has taken and I think it is true it is not a unbelievable or the unrealistic assumption, this assumption is true.

Then is total demand for cash as the periodical at the periodical in turbo is known, total demand for the cash at the periodical in turbo is known. This is some but not fully acceptable because your, you demand for the cash keep on fluctuating. So, every time you require the same amount of cash for the business transactions I think that is also not reasonable.

But still means if it is not same if it is debating little bit even then you can have a broad idea rough idea by using this model that how much cash we will be keeping as cash and how much should be converted into the marketable securities. So, not means the totally (()) (12:32) say you cannot say it is totally a redundant idea and it cannot be used or it say redundant model it cannot be used that you cannot say right.

So, it means this assumptions, so assumption out of the 4 assumptions, so far we have discuss. We first one correct that is the portfolio of the cash on marketable securities. And third one is also acceptable that every transaction has a fixed cost because it has but the second and fourth that is the uniformly divisible securities and total demand for the cash at the periodical in turbo is known, there is something some doubt about that.

But you see that if we assume the yes, there is a study requirement of cash and the cash requirement at the different in turbo is known not 100% maybe correct but it is it cannot be

denied that it is impossible it may be possible also. So, let us accept this model and try to use it and learn how to calculate the cash balance with the help of this model.

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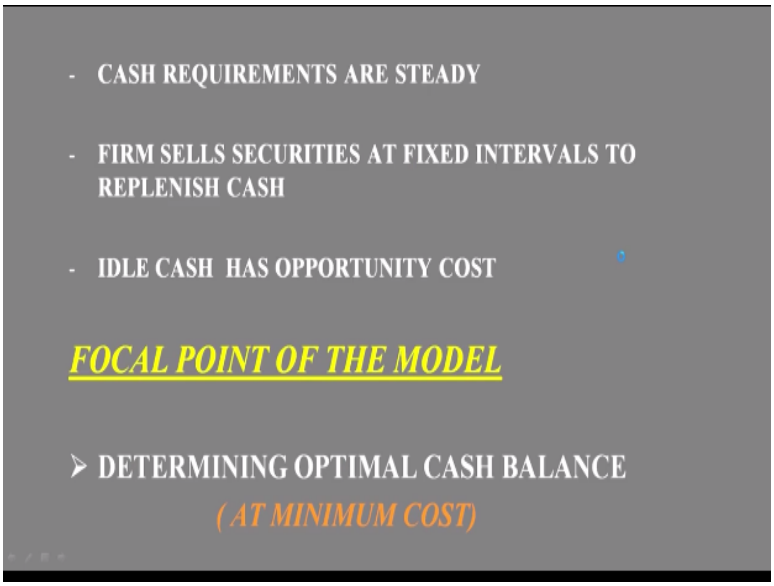

Other 2 assumptions he has taken is cash requirements are steady means over the different in turbo period of time maybe the firms say time and turbo is say 1 week or 15 days or 1 month you call it as weekly requirements or fortnightly requirements or monthly requirements cash requirements of the firm are same. This is also some but not 100% true because your requirements keep on fluctuating.

Sometime you require maybe 50 lakh rupees, sometime you require 40 lakh rupees, sometime you require 60 lakh rupees, it may be more or less not 100% same not exactly same. So, but still is to some extend if you assume it that yes cash requirements are steady then yes we can use this model. And this last assumption or the maybe not last I would say it is a second last assumption that firms sells security at fixed turbo is to replenish cash.

He says that your cash requirements are steady total requirements of the cash maybe over a period of time you see 1 year is also known. So, it means if the weekly requirement is fixed or fortnightly requirement is fixed or at least monthly requirement is fixed. So, it means you know that monthly*12, so your annual requirement is fixed. And how much cash you have to convert

into securities and securities into cash over the months looking at the 1 months requirement we because the requirement is steady.

So, we can physically convert the securities or convert the cash into physical securities at the regular intervals it means that everything is certain that everything is known which is still means not 100% acceptable but cannot be totally rejected also. Then this is again a very valid assumption ideal cash has opportunity cost yes if we keep the cash as cash it has the opportunity cost.

Because had this cash when invested in the market it would have earned something for us, something good for us, some good returns for us. So, it means it has the opportunity cost no doubt about that, if you keep the cash as cash is not earning anything for you. But if you invest part of that cash which is not required in the firm into the business then certainly the opportunity cost can be avoided and we can have some returns from the market.

Because we have invested their cash into the marketable securities, so it is much better than keeping the cash is ideal. So, yes ideal cash is the opportunity cost yes that is very much acceptable. Next thing is that what is the focal point of the Baumol's model, focal point of the Baumol's model is determining the optimum balance of the cash that what should be the optimum balance of cash.

As we have been discussing in this subject all through maybe from the beginning of discussion that working capital management requires that level of current assets which cannot be brought down to 0 but should not be very high also. So, it has to be maintained all the current assets whether it is inventory, receivables, cash or any other current asset that has to be managed at the say appropriate level or at the optimum level that has to be managed at the optimum level or the appropriate level.

So, it means we have to see here that yes the optimum level of the cash should be there all the times. So, that neither it is too high nor it is too low and the cost of excessive cash or managing

or maintaining excessive cash can be avoided. So, Baumol's model also highlights that particular fact that how to find out the optimum balance of cash which is neither too high nor it is too low.

So, the firm is maintaining it is liquidity also and firm is not technically insolvent also it means neither they are keeping high amount of cash. So, they are not subject to pay the high amount of the cost and they are also not say expected to be technically in solvent. Because they have sufficiently say the keeping the cash is the sufficient that is why we have to learn from this model how to maintain a optimum balance of cash which is neither high nor very low.

And this is how the Baumol's model can be applied and to find out say optimum amount of the cash. So, after this once we learn this model we will then talk about certain limitations of the model also. But I think we will see that how this model will work before we move into the limitations first let us understand the model how this model will work and how the Baumol has tried to implement this model.

And in this case when you think of a applying this model you have here the say structure. Now let us prepare a structure that what structure the Baumol has prepared and how that is similar to the EOQ model. Because as I told you in the beginning that Baumol has applied the concept of EOQ economic order quantity model of the inventory management. So, here same thing will be applied same structure is used by the Baumol.

So, we will also be learning how to use their structure in working out the optimum balance of the cash or the amount of the cash. So, just recall what was the EOQ model of the inventory management, it is something like this.

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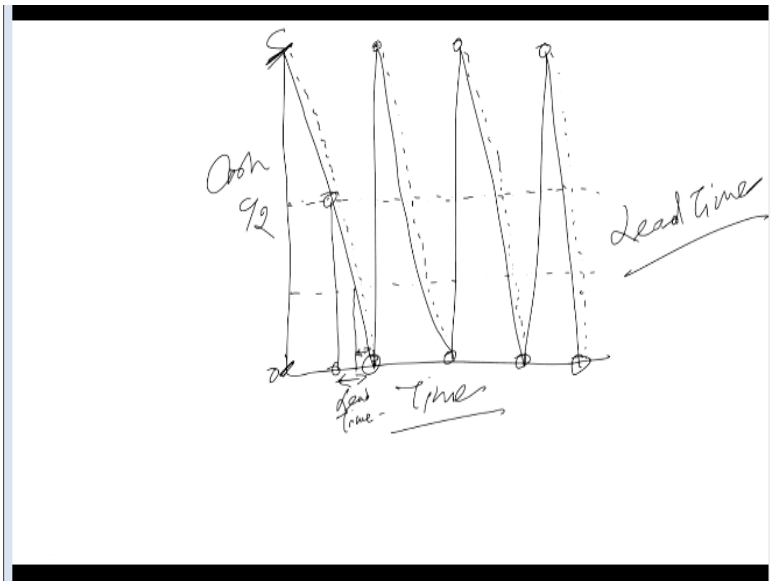

This model is something like this here you keep cash and here you keep the time, cash and time are the 2 important things. And here it is the model works like this it creates a saw tooth picture. And this picture is something like this it is a saw tooth picture and if you try to find it out here. Here it is you call it as this is 0, this is C and this you can call it as the average cash balance which you can say that it is the C/2.

And normally if you do not do anything else we will find that certain things are here that normally we keep the C amount of cash 0 to C this much amount of the cash we keep that is from here, here to here or here to here. This much of the amount of the cash we keep at 1 point of time and we start using the cash.

So, it is start coming down this (()) (20:03) starts coming down and when it comes down it when it reaches here 0. Then immediately then and we do not have the cash means whatever the cash is available with us, we have used it once it is comes down here then we will sell the marketable securities whatever the investment we have made in the market, we will sell that securities in the market and we will convert those securities into cash.

So, it means it will be c/2 or the average sorry this will be the total amount of the cash we are using that is 0 to C. And we start we keep the cash when we start the business on the first day maybe of any month or any year. Then we have the c amount of the cash and then we start using

the cash here you have the receipt and payments both. But finally sometime what happens your payments are exceeding the recedes.

And we our cash balance is coming down and finally it will come down to this point once it comes down to this point again now you have to arrange the cash. And we will convert the marketable securities we will sell the marketable securities and again will bring the cash to this level. And again we will start using the cash and it will come down to this point once it touches this point.

Then again we will replenish and bring it to here this level then we will use this cash this weight is coming down now because of the payments are more than the hour recedes. So, again it will come here and then we will again convert the marketable securities which investment we have made in the market will convert into cash. And we will again take the cash balance to this level and then will be again we start using the cash.

And it is the amount we will be then the cash balance will come down to 0 this is the simpler model but sometime what happens that and all the times for example this much amount of the cash is assume to be there all the times which is called as the average cash balance. So, what happens that sometimes what happens that we want to have some lead time.

Because there is a concept of lead time, lead time means that time to be taken that when you place the order of converting any security into cash. It takes some time is not that easy that you any time you want to sell the securities into market. You can find the buyers in the market at the appropriate price and you will be able to sell those security in the market it is not possible. So, what we with there that broker also needs sometime our cash department also needs sometime.

So, it means they there is a concept of the lead time, so what will happen there we use the average cash balance concept here that is C/2, C/2 means half of this is the average cash balance is all the times maintained in the firm. So, when the cash balance reaches at this level then means it is we are here over the period of time after some period of time we when the cash balance is

reaching here it is coming down and when it is reaching here then what will be there. We will place the order for conversion of the cash marketable securities into cash.

And this much of the time is available with us that we have place the order here at this point of time and when the cash balance will become 0. We have already started the process at this point of time and when will the cash balance will come down to this level then we will be able to have means again the cash balance by selling the securities in the market and converting that into cash.

And here again we will be able to replenish the cash with the sale of security, so means this is called as the lead time. Same thing means nothing new same thing is done in the say EOQ inventory model that is economic order inventory model, sometimes what happen that means re-ordering level is not the average cash balance level. We keep it low, say for example this at this level we place the order we see that we will place the order at this level.

So, it means in this case your lead time will come down, so your lead time will be how much, it will be this much only. So, this much period will be your lead time, so depending upon that how quickly we are able to convert the securities into cash and cash into securities we have to keep the lead time with us. And for example he does not require anytime then there is no point to keep any this no point of keeping any say lead time when it is C, you keep the average amount of the cash we keep on using it.

And when it comes here 0, immediately for example today evening if it becomes 0 and tomorrow morning we are sure that in the night or maybe in the after 5'o clock we will be able to convert the securities into cash. Then next day morning we will have the cash available with us maybe in the bank account or in the office (()) (24:49). So, then there is no need of any lead time what it seldom happens, it does not happen like that.

We need some minimum time to convert the marketable securities into cash right, to convert the marketable securities into cash you need the minimum time. So, it means finally with the help of this model we are able to find out something which is called as C, C is the optimum balance of

the cash we want to have all the times. C is the optimum balance of the cash we want to have at one point of time or all the times.

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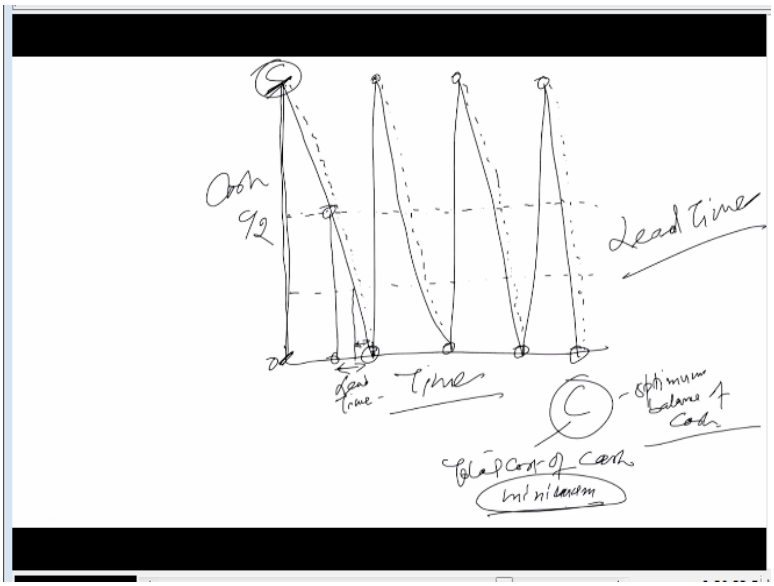

So, it means why C it is, why it is C, C means when you are calling it as is optimum balance of cash. So, this is the optimum balance of cash and how you can say that it is optimum balance of the cash because here at C total cost is minimum, total cost of maintaining cash is total cost of cash is minimum, it cannot be lesser than this. So, it is the minimum cost at C level of the cash the total cost of maintaining the cash or this balance of the cash is minimum.

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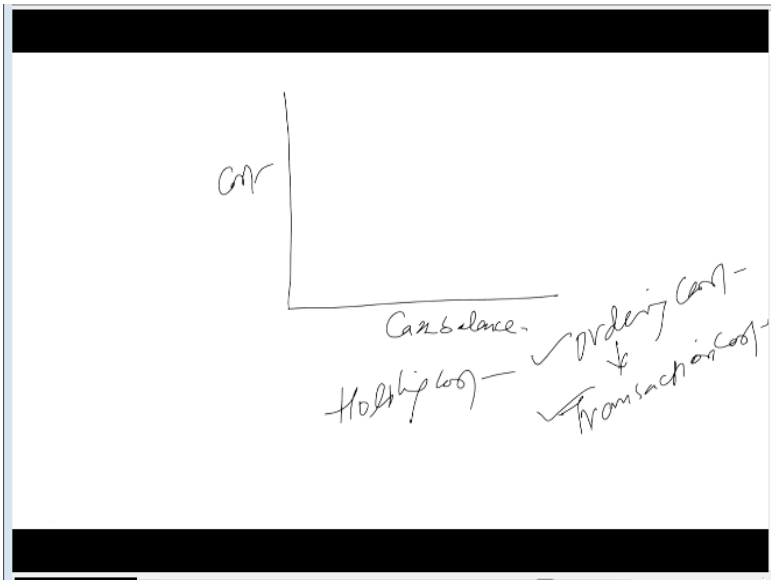

So, it means what is now how can you find out that it is optimum balance of the cash on the total cost is minimum I will tell you here let see we have a structure here. Again the second structure if we see this second structure here put the cost here and put the cash balance here. It is the cash balance right in the EQ model also you have to type of the cost 1 cost is the holding cost and another cost is the say transaction cost.

So, means there is a ordering cost, holding cost and the ordering cost there also because when we place the order for inventory we pay the cost. Because there is a some fixed cost of because the proper order and then you have to dispatch the order and then make sure that the reaches you. So, we assume that there is a fixed cost of placing the order which is called as the ordering cost and second cost is the say holding cost where you have to say pay the interest of the cash invested into the inventory then the warehouse expenses.

Then the human resources maybe say watchman or maybe the other people who are keeping taking care of that warehouse or the store of the inventory all these things will have to pay the cost. So, higher the amount of inventory you are keeping your holding cost is high but reverse is happening that. If the lower the amount of the inventory you are keeping, so what you have to do is you have to frequently order the inventory.

Because some side if you are keeping 100 units of inventory and on the other side you are keeping 1000 unit of inventory. If you are keeping 100 units of inventory then what will happen, it will be very quickly over and you have to again place the order. So, what will happen many orders will be placed in a year or in a month and our ordering cost will increase. On the other side if you are holding high amount of inventory then your holding cost will increase your interest cost will increase your say a human resource cost will increase, your storage cost will increase.

So, it means these cost will increase, same is the case with this model when the Baumol has applied that he has considered that at the place of the ordering cost there is a ordering cost in inventory and here he called it as that it is the transaction cost.

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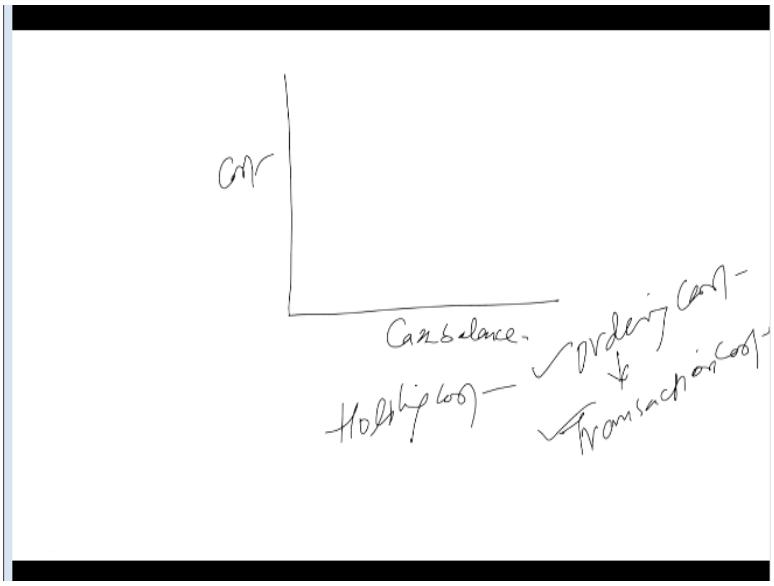

That when there you can place the order and here we convert the again here also we place the order of converting the securities into cash and cash into securities. So, it is a order for the cash and there is the order for inventory, so this is the same cost. So, he says both the cost are same whether you manage inventory or whether you manage the transactions. Second cost he says is the say that is of you call it as the holding cost.

So, holding cost is same in both the cases, holding cost in the inventory also you have the holding cost, cost of the cash invested as I told you invested into the inventory. So, we have to pay the interest for that warehouse cost, human resources cost taking care of that inventory and in this cash management also we have the holding cost because if you are keeping the high amount of cash then their opportunity cost is very high.

Because you are not investing that cash in the market just say with the fear off that if there is a shortage of the cash from where the cash will come or maybe we do not know how to manage the cash and where to invest in the market. So, you are holding high amount of cash, so in that case your opportunity cost is high. So, there it is a holding cost here it is the opportunity cost, so that is if you are keeping the high amount of the balance of cash or inventory or inventory of cash your holding cost will increase.

But if you keep small amount of the cash your transaction cost will increase, so it means we have to find out a point where we have the total cost are lowest or the total cost is minimum. So, you say this is the holding cost this moves.

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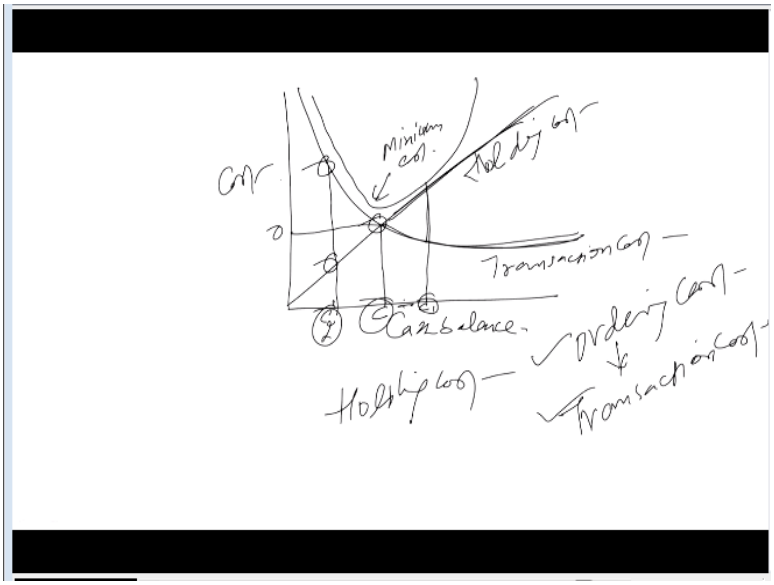

And this is your transaction cost. So, you call it as this is the holding cost and this is the transaction cost I would say this is the transaction cost. And here if you draw a curve here you will find 1 cost which is the minimum cost, this cost is called as minimum cost. So it means what is this, this is called as C, C amount of cash, C that is why I told you in the previous discussion that why C is the optimum amount of the cash or the balance of the cash.

Because the total cost of C is the minimum, how it is minimum that when you take on the 1 side the holding cost and the other side you take the transaction cost, if I draw a curve here it is the minimum point of the minimum cost, this is the minimum cost and this is the cash balance we are taking here. It means if you keep this much level of the cash, so what will be your cost will be this much.

But if you increase the level of cash for example firm C to this point C1 if you make it C1. So, what will happen this will be the new line. So, in this case your say transaction cost will come down your transaction cost is coming down but is your holding cost is going high and if you

bring it to this point that is the C2. If you take this point here say for example it is C2, so what will happen the curve will be something like this.

So, in this case your holding cost will come down but your transaction cost will be very high, so ultimately this is the point C which is called as the optimum balance of the cash or where we can maintain the balance of the cash which is called as the optimum where both the cost are minimum. And that is the point where the holding cost intersects with the transaction cost, so this is called as the C amount of the cash.

And this is what we have try to find out that is the C amount of the cash Baumol is saying that this is the C amount of the cash which we normally keep with us. Because the cost of this cash balance is optimum and when we start using it, it is allowed to come down to this level or sometime this level or sometime this level. And then we again sell the marketable securities convert them into cash and again replenish the cash by selling the marketable securities.

So, I think you must have understood by now how to apply the concept of economic order quantity which is applicable in the inventory management in the management of cash or managing the cash balances. So, this is the basic model we discuss now but how to apply this model. I will discuss with you in the next class, thank you very much.