3.1 Introduction:

In this Chapter we have discussed the concept of cash, motives of holding cash, cash management, objectives of cash management and models of cash management. At first we discussed the concept of cash and motives of holding cash. It also explains the effect of holding cash on firm’s liquidity and profitability. After that it explains the cash management, its objectives and significance in the present scenario. It also states different models of cash management along with its major problems.

3.2 Cash:

Cash is the most liquid form of asset for incurring day to day expenditures. It is a special form of money. It is considered as the most common purchasing power or medium of exchange. In order to start business cash is the basic input to be required. In a financial sense, it refers to all money items and sources that are immediately available to help pay a firm’s bills (Hampton, J.J., Financial Decision Making: Concept, Problems & Cases, Prentice-Hall of India Pvt. Ltd. second Ed., 1980, New Delhi, P.176). It is also known as ready money or term which implies activity (Clarkson, G.P.E and Elliot, B.J, Managing Money and Finance, London, 1969, P.19). Initially cash is invested in fixed assets like plant and machinery, tools, furniture etc. which help the firm to prepare products and generate cash by selling such products.

Cash is also considered as the important part of working capital. Storing of certain quantity of raw materials and finished goods and provide credit terms to customers require investments in working capital. Generally, cash is invested in raw materials at the beginning of operating cycle passes through different stages like work-in-progress, finished goods and sundry debtors to get released at the end of the cycle and at that time fresh funds are needed for raw materials. Apart from that fresh capital is also required for purchasing more fixed assets, extension of the operational level and extending the credit periods to the customers. Sometimes some extra –ordinary factors also affect the requirement of cash.
Broadly, the term cash means state or bank money which is used for business purposes. It includes bank deposits. Sometimes cash is used to describe all assets that form the ‘cash fund’. The ‘cash fund’ consists of capital in the form of cash or equivalent assets available at management’s discretion for meeting obligations as they mature or for investment in operating assets. Included in the cash fund are cash in hand, bank deposits, gold bullion and temporary investments made as a means for holding cash until it will be needed. Such investments can be converted to cash without material delay or loss to meet obligations for payments. While some income may be derived from assets in the cash fund, capital is ordinarily not held in this form for its earnings because the rate of return is substantially lower than the realized from capital invested in most other business assets.\(^1\)

Another important feature of cash is ‘intrinsic liquidity’ which differentiates it from other assets. It is such an ability by which it can meet the claim of the fixed quantities of money. Such quality gives us at the optimum level in cash than other assets. Such feature makes it riskless and appropriate medium of payment and store value. Therefore, due to such intrinsic liquidity it is easier to manage and control than other assets.\(^2\)

Now a day’s business uses credit instead of cash in its routine work. The use of cheques, bills, draft, credit cards, debit cards, ECS, fund transfer through internet etc replaces the use of coin and paper currency. Large portion of cash of the most of the businesses are in the form of bank accounts which paid claims to money rather than tangible property.\(^3\)

Sometimes, the term ‘cash’ refers to the currency plus bank A/C balances held at different commercial banks. On the other hand, it includes near cash assets such as marketable securities or bank term deposits.\(^4\)

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3.3 Importance of Cash:

We have idea of business or venture. When such business (Venture) started need large amount of liquid cash. With it the businessman purchases the necessary items for business. Apart from it he kept records all of his receipts and payments. At the ending of the venture all the cash returned to his hand. Excess cash over the balance at the beginning treated as profit. It cannot be denied. But the introduction of accrual basis of accounting with periodicity concept, the main focused on assets other than cash and liabilities which had necessarily to be maintained. But still now cash plays the dominate role altogether. Today also business started with cash and end results of the business i.e. dividend can also be received in the form of cash.

Generally certain amount of cash invested at the starting of the business converted into fixed assets in the form of land, building, plant and machineries, furniture etc. Other portion of cash invested in the business for purchasing raw materials payment wages to the worker and payment of expenses. Such expenses result in production and also sales in case of manufacturing concern and in other cases only sales. Therefore, investment of cash in the production process continued until the revenue comes in the form of sales. Then the business gets its momentum. No further cash is needed if the business changes its level of activities or adopted a new project or profit distributed among the shareholders in the form of dividend or suffered a huge loss. After that cash should be generated in its regular basis to mitigate the expenses. Periodical surplus in the process distributed as dividend. Such occurrence may arise in a certain moment in the initial life of the business but it is expected at a regular basis onwards. It can be said that in the gestation period i.e. in the formation time cash may be introduced from outside for its future so that it can earn sales revenue. Therefore, from overall point of view cash is important because a continuing business starts with the investment of certain amount of cash. In the next stage i.e. the stage where sales revenue is stable and dependable, no further amount of cash invested from the outside. Such cash is left as fixed assets and as working capital consisting of inventories, debtors and cash.
But, the more important is the amount of cash which is obtained as a component of working capital. A certain amount of working capital is always to be kept for future purposes whatever may be the revenue flow in future. New elements of working capital should be generated in order to cope with the old ones and also for maintaining a certain level of stock for its own after meeting expenses so that the normal operation of the business does not suffered.

For regular operation of the business a minimum portion of cash as a component of working capital required after the completion of the developmental stage. Such cash balance is utilized by paying off creditors for its supply of materials, workers for wages and other overhead expenses up to the generation of new revenue. This process continues like a cycle in the business. It should be remembered that the period of credit allowed would directly affect the amount of cash needed after the developmental period or stage. Because period of credit allowed to customers cannot be equal to the period of credit by suppliers. Therefore, such periods directly or indirectly influence the cash cycle or the working capital cycle.

Working Capital Cycle, earlier discussed, a period starts with purchase of raw-materials, payment of wages and expenses, and ends with collection from debtors for sale of goods. It is also known as production or sales cycle. In working capital cycle raw-materials are purchased and held in stock for some period till such are used for production then raw-materials are used a work-in-progress until completion of the product and as finished goods held in stock for some for sold. These processes stop the inflow of cash. This money lock period continues till the amount received form debtors. If credit receives from creditors, then such money lock period reduced.

A certain amount of cash holding is necessary for smooth production and sales cycle. But, when debtors fail to meet obligations then it is necessary to change the policy of the management and held some cash so that the production and sales are continued without any interruption. Holding of excess cash is necessary if period of credit allowed to debtors is too long and this is so because similar credit facilities are not offered by suppliers. If such period is extended by two to three months then it will effect on the requirement of cash holdings.
In addition to this if production, sales and period of credit extended then cash position decreases quickly. Now, if there is any increase in sales then the expenses relating to raw-materials and labour and other expenses also increases. Extra income require extra period of time. This situation is commonly known as over trading. It endangers the short-term liquidity unless extra cash supplied from the outside by withdrawing of profit as loss suffered by the organization. The situation can be opposite and produce ‘surpluses or ‘idle’ cash if the proper investment plan is not adopted at the right time.

The arrangement of required cash does not end with the end of the developmental period. It continues for ever. But, the credit and other management policies help us for determining the cash holding of a business firm during a particular period of time. Therefore, other functions of management directly and indirectly affect the cash management. Suppose, due to the change of production function, functions like debtors realization policies, creditors repayment policies, sales promotion and more specifically cash holding for other working capital components may also be adjusted on the given cash balance, like our day-to-day cash management. It is inter-dependent function. In this way cash is converted into other types of assets and again this reconversion into cash.

Generally, cash is being converted in different types of assets and such assets then converted into cash. Period of conversion may be shorter of longer. Current assets are frequently changing their forms. For example, when inventory is sold off through accounts receivable or debtors then it converted into cash. Contrary, fixed assets change their forms very slowly and each year converted into cash through amortization, depreciation or depletion charges etc. “In a typical business situation, a number of capital conversion cycles are in process simultaneously. Completion of a cycle may in some cases be accomplished in a relatively shorter time; while in others, years may elapse before cash outlays are completely reconverted into cash. Since most business firms make immediately payment for only a small portion of their purchases and collect immediately only a portion of their sales, the normal pattern will be further complicated by secondary payment and collection cycles”.

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This process is common in every business. Generally, at any given time firm collecting cash from debtors and other sources, cash sales and purchasing raw materials and services and meeting other cash expenses. Sometimes, the inflow and outflow of cash is faster and sometimes it is slow. So, cash play a key role in every business organization through the process of conversion. And such conversion can be easily realized with the help of working capital cycle where cash play a vital role. Such can be discussed in the following diagram.

(a) In case of purely financial organization

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Cash ➔ Debtors ➔ Cash
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(b) In case of purely trading organization

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Cash ➔ Merchandise ➔ Cash
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(c) In case of manufacturing organization

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Cash ➔ Material, Labour and Expenses ➔ W.I.P ➔ Finished Goods ➔ Sales ➔ Debtor ➔ Cash
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Manufacturing organization is different from other forms of organization. Therefore, the inflow and outflow of cash of manufacturing organization is also different from other organisation. Such can be discussed in the following diagram.

From the above discussion and diagram it is clear that a minimum cash balance should always be maintained so that the production process continues and repetitive. So the adequate amount of cash and its sound controlling determines the fate of the organization. From it we can say cash is very important for its existence and viability. Cash is needed for starting of a business continuation of business, for payment of dividends. Therefore, cash position should be maintained in such a way that helps the normal operation of the business and also for the future operation.
3.4 Cash Management:

Cash Management is the management of corporate funds. More specifically cash management is the planning, organizing and controlling of inflow and outflow of funds for transaction purposes, precautionary purposes and speculative purposes. With this definition we can say cash management covers all the motives of holding cash. Cohen and Robbins defined cash management ‘as the art of keeping the amount at hand to minimum while holding sufficient access to it to avoid financial difficulties and to permit the acquisitions of other assets whenever needed’. Shuckett and Mock opined that cash management involves the weighing of two priorities, the firm’s need for cash balances. Soloman and Pringle are of different opinion regarding cash management. According to them cash management involved two questions. They are (1) how the working cash balances be stored, collected and disbursed? And (2) how the exact working cash balance be determined and how the temporarily unused fund be invested in interest earning assets in a given fund?

Generally Cash Management can be seen from two perspectives. One is treasury management and other is advance cash management. Treasury management actually controls the cash management of the companies and their main role is to fix an optimum cash level so that payment can be made easily. Advance cash management includes the functions of treasury management as well as treasury forecasting, negotiation and fixing the relationship with financial institutions and financial risk management. Treasury Management is also known a basic Cash Management. It establishes the relationship with administrative techniques to optimizing the cash level of a company (Myers & Majluf, 1984, Chastain, 1986; Harford, 1999). If there is any gap in the trading cycle for insufficient cash then the manager must calculate the amount needed for that particular activity, plan the timing of payments and collections and finally draw up a policy of investment in highly liquid assets so that it can easily converted it into cash at a very low transactional cost in order to support treasury fund of the company (Kamath, et al., 1985, Srinivasan & Kim, 1986).
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So, appropriate level of cash is to be needed for short term investment in business organization. Wrong holding of cash or near cash item may affect the normal flow of business activities. Holding of less cash may affect the business firm for payment of its debt within time and also losing the opportunities of investing in an interesting project.

On the other hand, holding excess cash is not desirable at all. But, surplus cash is advantageous to the business firm in normal operation as well as unexpected needs. But, if we think about the opportunity cost then holding of surplus cash is disadvantageous as it is not profitable at all (Awan, 2001). Surplus liquid assets have an opportunity cost because the return on such assets is much lower than the investment in productive assets and must consider the transaction cost for sale or purchase of such assets and also the taxation. Therefore, it should be the responsibility of the treasurer to manage the disposable from collection, cash and payment point of view (Palom & Prat, 1984). At last, it is desirable that to shorten the collection periods, lengthen the payment periods and minimize unused cash balances which have no returns (Masson, et.al., 1995).

The idea generated by Palom and Prat (1984) is defended by Casanovas & Fernandez (2001) that treasury management is known as “administration of the treasury circuit”, emphasizing the analysis, study and review of the three circuits indicated (Payments, collections and holding of cash). Treasury management is therefore a mixture of complex techniques, instruments and functions. They argued for advanced cash management for short-term investments, short-term financing and bank relationships.

3.5 Advance Cash Management:

According to Torre (1997), treasury management is known as a set of techniques which give emphasis on the liquidity of a company by affecting factors and processes which convert immediately into cash with the objective of increasing the profitability and improving the working capital management. So, Cash Management is an overall and integrated service of which the customer takes the appropriate decision in appropriate time. But, treasury management is regarded as theory for few decades. Now the business scenario is different. Here we consider the economic environment, risk reduction and efficiencies of cash management in corporate success (Platt, 2003).
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Other functions like interest-exchange rate, risk management and contractual relationships with financial institution should be added to a new concept of cash management for improving the profitability with minimum risk and other conditions (Welch, 1999, Mulligan, 2001). From this point of view Cash management or Treasury Management is a broad concept which includes availability, profitability, planning and financial risk with liquidity management, as argued by Von Eije & Westerman, 2002, Bort, 2004 and others. More specifically cash management is a set of strategic and organizational measures which concerned with working capital, risk management, banking relationships and planning to give effect to the cash flows and different financial results of the firms.

In brief treasury management is concerned with collection and payment, liquidity management and banking management and now in broader concept it includes planning of unused treasury assets with its proper controlling, strategy for investing surplus assets for maximum profitability and finance deficits with minimum cost, interest rate and exchange rate management risk, banking management (Charro & Ortiz, 1996, Lopez, 2003). Now cash management accumulates all the factors like management of liquidity (Driscoll, 1983, Palom & Prat, 19847, Masson, et. al, 1995; Torre, 1997; Casanovas & Fernandez, 2001), forecasts of treasury (Pindado, 2001), management of banking (Torre, 1997, Lopez, 2003), investment of treasury surpluses and deficit and financing management functions(Masson et. al, 1995; Torre, 1997; Pindado, 2001) and financial risk management (Masson et. al., 1995, Buckley, 2004).

All these factors are to be considered at all to generate a Cash Management model which may give more profit with minimum cost. Treasury management from larger point of view or advanced cash management is not only financial tools and techniques for measuring and managing liquidity but also tells us the corporate culture of the organization. According to Leal (1991), “Corporate Culture” is “the set of beliefs, expectations and basic principles shared by the members of an organization. These beliefs give rise to rules of conduct (norms) that powerfully shape the conduct of individuals and groups in the organization and thus distinguish it from other organizations”.

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The main objective of Cash Management is to reduce the financial risks in order to meeting contractual obligation i.e. the liquidity and maintaining desired level of profitability. We know that business started with cash and the end result of business is cash. If we see the cycle it is clear to us.

![Cash Management Cycle]

It is also known as working capital cycle. It is the heart of Cash Management. This cycle is continuous, self-operating and it varies from organization to organization depending upon its scope and nature. Therefore, the objective of Cash Management is to minimize, rather shorten the period of such cycle as much as possible. In other words increase the speed of inflow and outflow of cash in business operation. A well planned Cash management has the following objectives,

(a) maximize the usefulness of cash by making payment faster,
(b) to improve the collection process of cash from outside, and
(c) to accelerate cash flows.

3.6 Modern Cash Management has the following objectives:

(1) To ensure that the adequate cash balance is available or not for payment of expenditures when they are due. Allocation of revenues can facilitate this.
(2) To borrow the funds when they are needed. Unnecessary allocation of funds creates pressure on cash outflow of the funds.
(3) To maximize the return on idle cash. It means to avoid the accumulation of unremunerated or low yielding government deposits in the commercial bank.
(4) To manage both risk i.e. business risk and financial risk in such a way that it increases the surpluses productivity as against the adequate collateral.
Hence effective Cash Management is meant for smooth cash procurement and disbursement without endangering the operating capability and productivity of the firm. The main reason behind it is opportunity cost which we discussed earlier.

3.7 Significance of Cash Management:

Management of Cash is a significant area of Working Capital Management. Management of circulating capital or current assets requires great efficiency of financial managers and also time. Due to shorter turnover it is continuously absorbing and releasing cash. It is not new. It gradually generating its significance from world wars when the demand for social goods increases, profit centre concept came into act, cost of funds increases, cash is recognized as scare resource, short-term interest rates increase, increase in the competition between business firms and most specifically development of technologies.

But, if the management techniques are improved them the organization can carry out its business with less amount of cash. So the following well equipped management programmed can help the finance manager for his/her operation.

1. A desired level of liquidity should be effectively maintained by managing the liquidity resources.
2. The idle funds (temporarily) which are not used for a certain period of time should be managed in such a way that gives greater return.
3. The important short run decisions which have long run implications like credit standing, bankruptcy, and availability of future funds on reasonable terms, earnings capability, dividend policies, cost of capital and earnings per share.
4. A strong relationship among the firm with customers, vendors and bank should be maintained for better credit risk and increase the growth of the firm.
5. Give as much as information to the top management so that they can take decision regarding the cash flow projection which is very important at the time of cash flow crisis.
Generally, it is observed that there has been a gap between the cash management department and other corporate departments due to insufficient data from Cash Management regarding what to do and what not to do. So a system should be adopted where such gaps are not present here for better cash management.

Fund transfer is another important suggestion of Cash Management. It not only benefited the firm as well but also the customer.

Bargain with the vendors and negotiation for payment is also a significant factor of modern cash management.

Normally, a cash manager suppress his inability to control liquid resources behind a policy of large amount of excess cash on deposit and invested in safe govt. securities with fixed term maturing. It ensures that there is no risk of defaulting or loss arising from fluctuating of interest rates. It bypasses the policies of controls which indicate the inefficiency of Cash management. There should have no problem of bankers or the creditors if the security gives less return or less cash from the purchase price at the time of sale. In this situation they are not thinking about the opportunities.

In management of cash or near cash item there are opportunities for taking risk for efficient and for improving the profitability of the firm. Because, Cash Management is directly related with the profitability of the organization and sufficient cash needed for day to day requirements. We can say that long run planning can be successful if cash management is proper i.e. the management of uses and sources of funds. It indirectly implies the control over resources.

### 3.8 Cash Management: Past and Present Scenario

The simple use of cash is the medium of exchange. We always want to keep as much cash as possible in hand for several reasons. Similarly, business organization also needs sufficient money to pay debts as they become due or payable in time and for speculative purposes. Cash Management, now, is more sophisticated than previous years. Now our objective is to reduce the level of cash as minimum as possible and invested the unused funds to some earning assets. It is also recognized as an important profit center.
Now, our technology is much more advanced and we are getting more information regarding collection, disbursement, accounting, forecasting, budgeting etc. Most of the firm maintains good relations with their suppliers for disbursing funds in timely basis with low operating costs. For these reasons different modern methods like Zero Balance Account (ZBA), Remote Disbursing (RD), Electronic Funds Transfer (EFT), Automatic Wire Transfer (AWK) etc. are used like float management.

But, in other developed countries the role of cash manager is more information manager rather than a ‘float managers’. With the development of computers, software and specially technologies communication become easier and the cash manager or finance manager can easily joining with the bank managers and share their opinions in order to optimize the uses of cash resources. But, in certain cases the bank managers are also sharing their interest in cash management and exchange the information with the help of technologies to the finance manager of the companies.

Today the effectiveness and greatness of cash management is largely depends on the computer and computer associated programmed to reduce the cross border payments and subsequent foreign exchange expenses. Retail customers’ uses microcomputers to a large extent in order to integrate the whole financial system with the help of computers, Automated Balance Reporting system and Electronic Funds Transfer facilities. They use the computers in order to routinise the tasks and analyzing the information and cash flow planning.

It requires high speed transmission. Systems like Lock-boxes, Remote zero balance account are used to pool the working balances to a centralized master control account and use for decentralized collection and disbursement as the funds are transferred in and out each day to achieve a zero balance at the day’s end.

Technologies used for better Cash Management is costlier but give more benefits to the organization. Therefore, the important factors of efficient Cash Management are the information, the people and the system to manage cash with the help of modern electronic and software technology.
3.9 Models of Cash Management:

In Cash Management the ultimate objective of Cash Management is to determine the actual level of cash or safety level of cash or optimum quantity of cash. Hampton suggested the easiest method of determine the safety level of cash. He has given two different formulas for normal and peak periods separately.

For normal periods:
Safety level of Cash to be required = Desired days of Cash* Average daily outflow.

For Peak Periods:
Safety level of cash to be required = Desired days of cash at business period*Daily cash outflows.

Optimum cash balance can be found with help of inventory type models invented by William J. Boumol, Merton Miller and Daniel Orr, William Beranek and James C.T. Mao. The details discussions of these models are as under.

3.9.1 Boumol Model: William J. Boumol applies the EOQ models in his article on cash management for identifying the problem of cash management. His article is also helpful for macro economic implications of monetary theory and business finance for further research work. According to Boumol there must have some fundamental similarities of inventories and cash from financial aspect. In case of inventories ‘ordering’ and ‘stock-out’ costs play an important role. Such cost may be expensive if the inventory level come down to zero and for placing orders for immediate requirements. Holding inventories also implies some costs.

Similar situation can be also being occurred with cash and securities. There are also ordering costs. It may be in the form of clerical work and brokerage fees at the time of transfers between cash account and an investment portfolio. On the other hand, holding costs of interest forgone may also crop up when large amount of funds remain unutilized. The costs related with running out of cash also very important and similar to stock out costs of inventories. Optimum cash balance can minimizes such costs.
In this model Boumol assumes that the firm’s cash balances behave over time like a saw tooth manner. Receipts are collected in periodical manner whereas expenditures occur at regular basis during the periods.

This model is based on certainty aspect and some fixed amount is invested in a short-term investment portfolio at the beginning of the period. After that some amount is placing in a cash account in a regular basis for daily expenditures during the period. This model considers both the costs of investment transactions and the costs of holding cash balances.

In this model cash and securities is similar. It includes both ordering costs and holding costs. Cost of clerical work and brokerage fees for transferring funds from investment portfolio to cash account comes under ordering costs. On the other hand, interest foregone for holding large cash balance instead of making transfer is comes under holding cost. In case of inventories there are also costs associated with running of cash. But holding optimal cash balance minimizes these costs.

In this model it is assume that firm adopted an optimal policy under which the firm invested a fixed amount in a short-term investment portfolio at the starting of every period after that withdrawing some part of it and transfer it to the cash account at regular intervals during the period. This model considers both the cost of investment transactions and costs of holding cash balances.
The behavior of cash inflows and outflows according to Boumol model is applicable to an individual’s situation rather than a business firm. In case of firm, inflows are likely to be less lumpy and outflows are likely to be less smooth. The daily cash balances may vary from one day to another day. Sometimes it is up and sometimes it is down. When it is upward for a certain period of time the finance manager orders a transfer of cash to the investment portfolio and cash balance reduced to a certain level. But, when disbursement exceeds receipts for certain period, investments are sold and the amounts transferred to the cash account which increases the cash balance.

**Realistic Pattern of Receipts and Expenditures of a firm**

### 3.9.2 Miller-Orr Model:
Merton Miller and Daniel Orr extended the Boumol model by adopting a stochastic generating process for periodic changes in cash balances so that cash pattern should show the resembling pattern. Miller-Orr assumes that the cash flows behave as if they were generated by a ‘stationary random walk’. This indicates that changes in the cash balance over a given period are random in both size and direction and form a normal distribution as the number of period increases.
Miller-Orr model is designed in order find out the time and size of transfers between an investment account and the cash account depending upon the decision process.

According to Miller-Orr model cash balances are increasing until it reach at level $h$ at time $t_1$, it then decreased to level $z$, the ‘return point’ i.e. $(h-z)$ invested in investment portfolio. Then the cash balance reaches at lower point, $r$ at $t_2$, at this time earning assets are sold to return the cash balance to its return point $z$. This model is based on cost function and it is similar to Boumol’s model. This model includes the cost of making transfers from cash to investment portfolio and opportunity cost of holding cash. Under this model upper limit, $h$, which cash balances should not be allowed to cross the return point, $z$, to which the balance is returned after every transfer to or from cash account which minimizes the cost function. The lower limit is assumed to be given and it should be the minimum balance maintained by the bank in which cash is deposited.

Miller and Orr prepared the model with the help of data relating to the daily cash balances, purchases and sales of sales of short-term securities of a large industrial company for a period of nine months. The average daily cash balance predicted under this model is 40 percent lower than that of the actual cash balances computed by the treasurer of the company.
Like other inventory control models its efficiency not only depends on the conditional predictions like expected number of transfer and the expected average cash balance but also on the estimated parameters. Here it is difficult to estimate the transfer cost. According to Miller and Orr ordering cost include the following components,

1. making two or more long distance phone calls plus fifteen minutes to half-hour of the assistant treasurer’s time.
2. typing and carefully checking an authorization letter with four copies,
3. carrying the original of the letter to be signed by the treasurer, and
4. carrying the copies to the controller’s office where special accounts are opened, the entries are posted and further checks of the arithmetic are made.

In this model Miller and Orr does not rely on the order costs and they used the same number transactions as computed by the treasurer. They opine that the order costs implied by the treasurer’s own action. It then evaluate the treasurer’s performances in managing the cash balances and provide valuable information to the treasurer.

3.9.3 Beranek Model: William Beranek in his text ‘Analysis for financial Decisions’ discussed the problems of determining the optimal allocation of available funds between the cash balance and marketable securities. Beranek used a probability distribution for expected cash flows and the cost function for the loss of cash discounts and deterioration of credit rating when the firm is caught short of cash. In this model Beranek give emphasis on the allocation of funds between cash and investments at the beginning of the period. He also assumes that withdrawals from investments are possible at the end of each planning period.

As per Beranek it is more beneficial in cash management problems because cash disbursement can directly be controlled by the management. In certainty cases the cash balance behaviour pattern would be opposite of Boumol’s saw tooth pattern. Institutional customs and managements are the causes of concentration of cash outflows for a specific period. Salaries and wages are paid on weekly or monthly basis. Payment to creditors is done on the tenth or final days of the month but other significant payments such as tax and dividend are paid on regular intervals.
As the cash requirements are predictable and controllable, therefore, financial manager can easily find out the needs of funds during the planning period and after that unused portion of funds are invested in some profitable projects.

According to Beranek’s model the financial manager is expected that the total resources be $M$ at the beginning of the planning period. He also expected that the net cash payments i.e. amount receipts minus disbursements, at the end of the period be $P$ (it may be positive or negative) having probability distribution $f(P)$. Here the objective of the finance manager is to maximize the return on investment in securities considering the transaction costs and cost related with the shortages of cash when it is needed for expenditures. Beranek defined ‘shortage of costs’ as cost of cash discounts foregone and the deterioration of the firm’s credit rating when it is unable to meet payments in time.

In net cash flows the cost of running short of cash and the opportunity cost of holding cash balances have probability distribution. With this probability distribution Beranek develops a cost function and by differentiating it to obtain the optimal initial cash balance that should be in hand at the beginning of the period.

He set the cash balance at such a level that, if such critical level is set, the cumulative probability of running short of cash is then equal to the ratio of $d/a$, where, $d = \text{net return on the investment portfolio, and } a = \text{incremental cost of being short Re.1 of cash.}$ In other words, the financial manager continuously investing the fund until it reaches to the critical minimum level and which is equal to the above mentioned ratio i.e. $d/a$. 

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3.9.4 Mao Model: Mao Model developed by James C.T. Mao. The model is more complex but adopted convincing approach than Boumol’s model. Mao developed this model with the help of one of the techniques of Operation Research. Such technique is popularly known as ‘Dynamic Programming’. Dynamic Programming is such a technique or recursive process or procedure for selecting the sequence of decisions that maximizes the overall profitability of a firm. In this model it is assumed that the time is divided into periods so that all funds raising activities occur at the beginning of each period. This restriction means that if a firm expects a net cash outflow during certain period and it does not wish to run out of cash it must start the period with a cash balance equal in size to the net cash outflow. Simply, the cash management problem can be wiping out by using two steps systematic search procedure. They are (a) all transfers from cash to government securities should be made at the starting of the planning period, (b) all transfers from government securities to cash should be made after the firms cash balance has been reduced to zero.

If we plot the above discussion in diagram then it should be easy to understand. We plot the firm’s cash and securities balance against time and denote its holdings of govt. securities by a shaded rectangle in the diagram. The necessary conditions of the optimality are (1) the shaded rectangle must be bounded on the left by the vertical axise and (2) the north-east corner of the rectangle must touch the form B(t)[i.e. the cash & securities of the firm as a function of time]. First diagram clearly violates both the conditions optimality.

![Mao Model – A firm’s Cash & Securities against Times](image_url)
In second diagram there is only one withdrawal during the planning period T. But this policy satisfies both the conditions for optimality. It is also important to mention that these are not the only reasons for its optimality. Because, it is not proved that $q(T-t_3)$ is the optimal initial amount of govt. securities that the firm should had. On the other hand, it is also not proved that a policy calling for one withdrawal is superior to different number of withdrawal.

Suppose there is zero withdrawal and the policy associated with the net gain we assigned a value of 0. A policy of zero withdrawal insists the firm to invest its cash in any govt. securities. Assignment of zero in this policy signifies a point of reference on which all other policies can be compared.

Let us now consider one withdrawal during $t$ time units. At the policy of only one withdrawal, the firm first of all invests its initial cash balance in govt. securities and disinvests holdings all at once at some time before the end of the planning period. Here the two important variables are optimal amount to invest and optimal time to disinvest. These two variables are interrelated. The amount of optimal cash balance and the time of disinvestment is directly related with the size of the initial cash balance which the firm prefer to retain. Such cash balance is nothing but the complement of initial cash holdings of govt. securities. This model also helps us to derive or analyze such withdrawals two or more such withdrawals.

Hence, we discussed few important models of cash management with some specific problems relating to inventory controls, where different mathematical tools can be used. These models have some specific assumptions and errors. Despite such assumptions and errors, if we put the essential elements in the decision problem then the models perform well. Such models proved to be very useful in determining the optimal balance of cash in hand but the application such models in practice is very complex. These models are using by the financial manager in the developed countries like U.S.A, U.K etc. but in India it takes some time to make it useful when the financial manager understand the importance of these models. It is not desirable to apply the models blindly because there are some parameters and probabilities and even some information available to the financial managers, which are not incorporated directly in the model.
Therefore, we can say that these models are not final conclusion of particular decision problem, rather, these are some tools which guide the financial manager at the time of making intelligent decision. In practice, the determination of the adequate level of cash balance depends largely upon a trade-off between risk and return.

3.10 Risk and Return: A Trade Off

Generally, it is seen that the huge cash balance maintained by the firm signifies sound liquidity but for that they have to forgo some opportunities to earn interest. But if the firm maintains small cash balance then it decreases the liquidity position although it increases the profitability, if they invest the fund to some profitable projects, other things remaining same. But for making for making payments it may have to sell some short-term securities which involve transactions costs. Therefore, we have to match the transaction costs and the risk of too small cash balance with the opportunity costs having large cash balance.

The transaction costs and the opportunity costs are discussed below in graphical format.

![Graph](image)

Here, \( A^{I} \) = Total Costs, \( B^{I} \) = Opportunity Costs and \( C^{I} \) = Transaction Costs

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At point E addition of two costs will be the minimum. Therefore, E is the point of minimum or optimum cash balance which every firm should try to achieve.

Therefore, obtaining adequate cash balance can be achieved if we conglomerate cash management models and the risk-and-return trade-off analysis. However, costs play a great role here, because collection of information for the purpose of the development of the models is a matter of question. The savings in cost may not be possible due to such factors which is our main objective. Some basic accounting techniques help us in determining adequate cash balance.

3.11 Problems of Cash Management:

The main problem of cash management is the lack of accurate synchronization of cash receipts and cash payments, which insist the firm to hold extra cash. Sometimes cash receipt exceeds cash payments and vice-versa. Therefore adequate cash balance should be maintained neither more nor less. Maintaining excess cash is not permissible because excess cash produce nothing towards the firm’s profitability. On the other hand shortage of cash will affect the firm’s daily operation. Therefore, the management should maintain or regulate the cash balances in such a way that neither too much not too low at any time. At the time of inflation idle cash loses its purchasing power and therefore decreases the real value. Hence, the firm should not maintain excess cash balances. Contrary, a firm should not find itself sort of cash that it is unable to meet its obligations as they become due or not taking the advantages of cash discounts. Mary C. Driscoll has identified certain key systems of a week cash management.

1. High short-term borrowings and consistent bank overdrafts.
2. High deposit floats time and failure to consolidate cash balances.
3. Holding accounts payable cheques.
5. Poor collection performance and
6. Large cash balances in demand deposit account.

Therefore, effective and efficient cash management programme should not allow the above symptoms to occur and continue for long-time and minimize or cleaned it with the help of various tools of cash management.
3.12 Conclusion:

Normally, cash needed for purchasing of raw-materials to sale of finished goods and it is a continuous process. It consist liquid cash, bank balance, gold bullion, temporary investments etc. Cash has intrinsic liquidity. So working capital cycle largely depends on cash level of organization. Such cycle may be shorter or longer depending upon the nature of the business.

Cash management is the planning, organizing and controlling of inflow and outflow of funds for transaction purposes, precautionary purposes and speculative purposes. Treasury management give emphasis on the liquidity of a company by affecting factors and processes which convert immediately into cash with the objective of increasing the profitability and improving the working capital management. The main objective of cash management is to reduce the financial risk and increase the profitability of the organization.

Cash is the medium of exchange. Earlier we used to keep cash in hand as much as possible due to several reasons. But, now our objective is to hold less cash as minimum as possible and invested it in some earning assets. Now, with the development of computers, software and technology cash manager or finance manager can easily contact with the bank managers and share their opinion in order to optimize the use of cash. In this regards different models are described in this chapter.

It is seen that for maintain huge cash balance due to sound liquidity, organizations might have to forgo some opportunities to earn interest in some profitable projects. In this chapter we have shown how the transaction cost and risk of too small cash balance with the opportunity costs having large cash balance are matched with the help of diagram.

Cash management is not free from limitations. Due to high short-term borrowings and large bank overdrafts, deposit floats time, holding account payable cheques, and high volume of intra-company cheque, poor collection performances sometime affect the cash management.