CASH BALANCE MANAGEMENT FOR FIRMS

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THIS THESIS IS MY ORIGINAL

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A B S T R A C T

The main objective of this thesis was to investigate the
following:-

(1) The objectives that underlie cash balance management
decisions made by firms in Kenya;

(2) The degree to which firms in Kenya use decision rules
that can be construed to be some form of decision model;

(3) What variables and/or constraints go into cash balance
decision making process;

and then;

(1) Formulate a hypothesis about cash balance management
practices by Kenyan firms.

(2) Recommend a decision model

(3) Apply the recommended model to a Kenyan firm.

METHODOLOGY

A number of steps were set out in order to achieve the
above mentioned objectives.

The first step was to consider a general introduction to
the field of cash management as necessary. The introduction
was aimed at highlighting the basic management problems. It
also attempted to indicate the reasons why firms hold money
balances, be it on deposit account and other short-term invest-
ments or positive current accounts. Various factors that
influence the demand for cash balances were also considered.

The second step was to lay a sound theoretical foundation.
This was basically a review of existing literature on cash

balance decision models. Basically, cash balance decision models
were classified into two categories:-

    (1) Analytical models;

    (2) Simulation models.

The weaknesses of analytical models as a tool for aiding cash
balance decisions was considered. They work effectively if
the assumptions made by these models hold true. This study of
the strength and weaknesses of the various models later on
helped in the selection of a model for empirical application
in a Kenyan firm. The two steps formed the first section of
the thesis which was labelled "Theoretical Framework".

    Having developed a theoretical framework, the third step
was to empirically investigate the cash balance management
practices by firms in Kenya. The method used in the empirical
investigation was a questionnaire and limited personal inter-
views. In total, thirty one firms were involved in the exercise.
The empirical investigation aided in developing a hypothesis
on the cash balance management practices in Kenya. Before a
model was selected for application to a Kenyan firm, basic
foundations on which such a model would function effectively
was developed. There is no point introducing a model in an
environment that is not yet prepared to receive it. This sec-
tion was therefore included as a warning that unless there
exists efficient management policies at corporate level, the
use of models in the finance department alone would be meaning-
less. Even in the finance department, if a model intended to
provide management with information on how efficiently the cash
balances should be managed is used and on the other hand there are

no such practices for the other functions of the department
would be defeating the ultimate objective of having an efficient
department.

OBSERVATIONS

From the outcome of the empirical survey, it was observed
that:-

(1) The basic objective of cash balance decisions in Kenyan
    firms is geared at ensuring that at least enough bala-
    nces are held to meet transaction demand regardless of
    the costs of holding such cash balances;

(2) Firms in Kenya do not use any decision rules that can
    be construed to constitute some form of a model;

(3) The major decision variable in cash balance decisions
    is working capital requirements;

(4) The majority of firms in Kenya use external financing
    to finance cash balances;

(5) Cash balance is viewed as a means of facilitating
    transactions and not an investment item.

These observations formed the basis for my hypothesis.
The empirical test of the Gibbs buffer stock model brought out
some useful results. It was basically intended to demonstrate
the usefulness of employing a model to guide in decision making.
However, the model tested seemed to show that the level of
cash balance has a relationship with the level of activity, but
statistical tests were carried out and they showed that there
was no significant relationship between the two. In his tests,

Gibbs came out with such a result. This therefore tends to suggest that other factors other than the level of activity influence the level of cash balances. This is subject to further research since the test was carried out in two firms only, one in Britain and one in Kenya. Another observation was that the cash balance pattern of the Kenyan firm was very different from the British firm and this contributed to different required cash balances for the two firms. This tends to be wholly consistent with the general hypothesis that cash balance requirements are a function of the unique cash flow pattern of the individual firm. Generalized decision rules are inappropriate.

A simple comparison of the results obtained from the application of the model with what would have been the results if some of the analytical models was used was also made. It revealed that no useful results would have been obtained from an application of the model in terms of the determination of the amount of finance that should be allocated to cash balance to meet transactions for normal operations. They make generalized decision rules with respect to the mixture of money resources that should be held by business organisations.

SOME BASIC DEFINITIONS.

Buffer Money Balance - Money balances required to finance periodic net cash outflows during the control period. For the purpose of empirical research, the control period was taken to be one calender month.

Capital Gearing- The degree to which long-term debt is used as a source of finance. Normally, it is the ratio of debt to total assets.

Cash Balance- In this thesis, it is taken to mean all cash resources including overdraft facilities, deposit balances and other current account balances, and marketable securities held for trading purposes.

Cash Cycle- Length of time cash balance fluctuations repeat themselves. Say if we have temporary cash surpluses for two weeks and deficit for the next three weeks after which we have another cash balance surplus, then the cash cycle is five weeks.

Cash out- This is a situation where we have no cash balance from internal sources. Overdraft for this matter is not included in the internal finance since it is a debt to the company. Alternatively, it is a situation where a particular amount allocated to finance normal operations for a specified period gets depleted before the end of the period.

Control Period- It is the equivalent of planning period, the length of time for which targets and strategies laid down are supposed to cover.

Critical Minimum- The minimum cash balance below which further payments will lead to deterioration of credit worthness.

Decision Centre- Points within the organisation at which decisions involving deployment of resources are made. For example a production department, a sales department, a stores department and the organisation as a whole.

Decision Rules - Variables or guidelines for making cash balance decisions, for example if deposit interest rate rises to 12%, transfer surplus to deposit account. In this case, interest rate is a decision rule.

Earning Assets - These are invested items for which returns accrue. All assets are supposed to earn returns but money assets are not necessarily so unless they are interest bearing money assets. Money assets include such items as cash and debtors.

Efficient Cash Management Policies - Policies effected by management with an objective of utilising cash balances in a manner that minimizes the costs per unit of cash.

Excess Cash - Cash surpluses over and above requirements for normal day to day transactions, that is, a permanent long lasting increase in cash balances.

External Environment - Elements outside the firm's control but they influence the activities of the firm.

External Financing - Financing that is not generated from the profits of the firm or from resources within the firm. For

example, overdraft, long-term debt, issue of shares for purchase by shareholders and/or potential shareholders.

Financial Control System - Controls that are instituted to monitor and ensure proper utilisation of company resources.

Financing Costs - Costs incurred because of using a particular source of financing. Examples of such costs include interest on overdraft, interest on debentures, dividends are not included since they are payments out of profits to the owners.

Financing Decisions - Decisions that involve consideration of alternative sources of finance.

Financing Mix - The composition of the firm's finances. Proportions taken by financing sources like equity, debentures, trade creditors and bank loans.

Float Period - Interval between time when prepared cheques are posted by the debtor and the time they are credited to the account by the bank.

Internal Environment - Environment within the firm incorporating the operations of various departments, the people who man them and how they influence decision making in the firm.

Internal Financing - Financing by resources generated from profits of the firm.

Investment Base - The amount of long-term finance tied up in the business.

Investment Decisions - Decisions involving the choise of

investment projects on the basis of specified criteria.

Liquid Balances - Money resources from which payments can be
made at short notice or no notice at all. They include such
items as petty cash, current accounts, deposit accounts and
investments in short-term outlets that can be turned to pure
cash within a short time.

Liquidity Stock - The stock of money resources from which the
firm can meet its obligations.

Marketable Securities - Stocks and shares issued by public
or private institutions for purchase by the public, they can
change hands via the stock exchange at short notice.

Monthly Strategy - It is used in this thesis to mean a parti-
cular monthly opening cash balance.

Net Cash Flows - Cash balance obtained by substracting cash
disbursements from cash receipts.

Normal Business Transactions - Transactions made in the cource
of running a business for the purpose of generating profits.
Unusual transactions like payments of fines, donations to
charitable organisations are not included. Interest charges
and repayments of loan or dividends are also not included.
Receipts from sale of an asset or claims from the insurance
firms are also excluded.

Open System - This is a system which takes in inputs from the
external environments. Its behaviours is influenced by elements
in the external environment. Most systems are open systems.

Opportunity Cost - It is what a resource would earn in its next best paid alternative. It is what is foregone in order to use the resource in its present employment.

Optimal Cash Balance - That cash balance at which net benefits are maximized or net costs minimized.

Optimal Mix - That mix of money balance items that minimizes costs of maintaining the cash balance or maximizes returns from cash balances.

Planning Period - The time period covered by cash balance budget or plan.

Positive Cash Balance - Cash balance financed from internal resources.

Programming Approach - A decision making approach where all known constraints are fed into a linear program so that the solution arrived at satisfies all known constraints.

Pure Cash Balance - The notes and coins held in a petty cash and bank current accounts withdrawable by cheque.

Residual Item - An item that is a result or product of others which have been planned for.

Short Costs - Beranek used this term to refer to costs incurred because of holding a cash balance below the critical minimum. An example of this is the imputed costs of delaying to pay bills as they fall due or decline in credit worthness.

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Stock Out - Lack of cash balance to finance transactions for normal business operations.

Temporary Surpluses of Cash - Excess of cash inflows over and above the cash outflows. These excesses are not long lived. They disappear or get used up when outflows catch up at later stages during the planning period.

Weekly Strategy - Used in this thesis to refer to a particular weekly opening cash balance.

INTRODUCTION TO CASH ASSETS MANAGEMENT

INTRODUCTION TO THE FIELD OF CASH BALANCE

SECTION ONE

THEORETICAL FRAMEWORK

C H A P T E R O N E

INTRODUCTION TO CASH BALANCE MANAGEMENT

INTRODUCTION TO THE FIELD OF CASH BALANCE

"..... the administration of cash is of major importance in any business because cash is the means of commanding goods and services"[1]

"..... whatever the reasons for companies allowing cash surpluses to accumulate and proportions of debt capital to decline, they rarely appear to be justifiable against the disadvantages to shareholders or indeed to the management of the company itself when it is recalled that these conditions will often render the company an attractive takeover prospect. If this is the case, the problem for optimal financing is to find some way of minimizing the costs to the shareholders of the firm being a cash surplus"[2]

The above are some pieces of advice to business organisations. They advise against a general tendency by managers to believe that cash, simply being a medium of exchange, does not require proper planning and use of modern techniques that are employed in the management of other business assets.

The complexity of modern businesses has meant that cash balances must be carefully planned for and receive more attention than it has been in the past. The need for proper cash balance planning has become even more important due to the fact that modern businesses are publicly owned. Public

ownership has resulted into management controlling resources
which do not belong to them. The shareholders look upon the
management for effective and efficient management of these
resources, cash balances being no exception. The above view
did not necessarily hold true when businesses were individually
or family owned for they hardly made a distinction between
their own bank accounts and those of the businesses.

The field of cash management has received relatively little
attention even in the academic field. Cash management has a
number of specific areas, for example;[3]
   (a) Cash budgeting and cash planning both for short and long
       term requirements,
   (b) Administration of cash balance,
   (c) Investment of cash in cash like assets,
   (d) Determining when and which financing methods to be used,
   (e) Establishing internal controls over cash.
The division of cash management into these areas is artificial
since one is not independent of the other nor is there any
clear dividing line between them.

While good management of all these subsets of cash is
essential for an efficient cash management policy, not all will
be delt with in this thesis. Particular attention will be paid
to one specific area, that is, the determination of near optimal
cash balance held for normal operations of the business firm.
The purpose of specifying cash balances for normal operations
is that under normal circumstances, the cash balance includes
some cash which is intended to finance capital projects or
redeem debt finance. That balance held for normal operations

consists of commitments like payments to creditors, salaries , and wages on the disbursements side and collection of accounts receivables and cash sales on the receipts side.

For the purpose of analysis, cash for normal operations needs to be distinguished from the cash intended to finance capital projects or redemption of term debt among others. Cash balances for such transactions need separate planning.

Academicians emphasise two aspects of cash management, namely:

(1) Budgeting in order to ensure that we know when we shall have a cash shortage so that we can arrange for alternative financing and make plans to do so in time.

(2) Designing controls to ensure safe custody of money resources.

They often forget another important aspect, that of deciding how much finance will be allocated to money assets within the realm of overall optimal decision making of the business entity. The search for an optimal solution in cash balance management calls for an examination of two factors. The first is the investment problem and the second is the financing problem. The two are interrelated, considering one in isolation of the other will not lead to an optimal solution unless by coincidence,[4] though it is useful for analysis purposes that the two be treated separately.

The purpose of this introduction is to look critically at:-

(1) What the cash balance determination problems are;

(2) Why firms hold cash balances;

(3) What factors influence how much will be held in cash
balances.

DEFINITION OF THE PROBLEM

Cash balance can be an advantage or a disadvantage
depending on how well it is managed. It can be an advantage if
properly managed to yield returns, and a disadvantage if excessive
cash balances are held without being employed in profitable
opportunities. It can yield returns or minimize costs if manage-
ment allocates all the resources available to it including cash
in a manner that will allow efficient utilisation of such
resources. Pure cash in excess of requirements of day to day
normal operations should be invested in alternative productive
assets or be used to redeem some of the debt already incurred
if there are no profitable projects[5]. Many organisations lose
alot of income through holding excess cash. There is a general
misconception that large liquid balances are a reflection of
good financial health and sound management, that it places the
business in a good liquidity position. It is important that
the firm maintains a position of adequate liquidity but usually
it is a trade-off between liquidity and profitability. A balance
must be maintained between the two because they are equally
important to the survival of the business. Lack of liquidity
may mean insolvency and encourage a take-over bid while lack
of profits would reduce the competitive position of the firm
which could drive it out of business in the long run.

Many theories and models have been built around the usual
assumption made in finance that businesses have the objective

of maximizing the long-term cash flows to the shareholders.
This sort of assumption has problems and limitations. These
problems include:-

(1) Choice of time horizon;

(2) Conflict between short-term and long-term objectives.
Short-term objectives, if not fulfilled could hamper the
achievement of long-term goals. On the other hand,
emphasis on short-term goals could make it impossible to
achieve long-term goals.

A redefinition of everall corporate objectives is therefore
necessary to take account of the constraints that the firm
faces. Profit is only one of the obligations that the firm has
to fulfil. A more practical and behavioral view taken by Cyert
and March[6], that firms try to satisfice profits subject to the
constraints imposed by organisational participants, is more
useful and the design of cash balance policies should be on
this everall objective.

As mentioned earlier, it is necessary that the firm main-
tains a balance between liquidity and profitability. In trying
to do so, the firm is faced with two primary problems, (1)
deciding how much finance should be allocated to cash balances
as opposed to other assets and (2) deciding how to hold cash
balances given that the problem of how much finance should be
allocated to them has been solved.

With regard to the first problem, persistently maintaining
a high level of cash balances very often is a reflection of
underutilisation of resources. On the other hand, holding too
low balances carries a risk of cash out and insolvency even if

it meant maximizing profits. Some writers especially on.
liquidity preference theory assert that the choice between
cash balances and other forms of assets lies in the field of
investment and consumption decisions[7]. While this is true, the
Accountant needs to concern himself with such decisions if he
has to contribute profitably to the efficient running of the
business. It is not optimal at all to make cash balance decisions
independent of the investment and consumption decisions because
all are functions of management, and they all need to be co-
ordinated. Should this not be the case, it means that cash is
being considered as an item that does not need separate planning.

The second problem deals with deciding what forms of cash
balance should be held. Should they be held in the form of short-
term securities, savings accounts, current accounts, operate on
overdraft or a mixture of the above?[8] If we hold a mixture of
the above, then in what proportions?

REASONS FOR HOLDING PURE CASH BALANCES

It is generally accepted that long-term assets have a
higher risk associated with them and hence a higher return than
short-term and/or liquid assets. One would wonder why firms
hold pure cash balances when they have negative real return.
The reason does not lie in the fact that there is a lead time
between transfering money from interest bearing assets to pure
cash. We can plan the cash transactions so that lead time is
taken care of. However, for this to be real, the following
conditions must be fulfilled:-

(1) There must prevail certainty;

(2) There must be no costs in financing cash requirements.
The truth is that firms' cash flows are uncertain both in timing
and amounts. This brings about the need to hold pure cash
balances.[9]

The uncertainty of revenue inflows and cost outflows gives
rise to the problem of finding finance to make good money
shortages and the lead time that may be required. If financing
is available with zero lead time, then there would be no need
for money balances (everything remaining the same). Such a
policy would not be necessarily optimal, since the financing
cost to make good shortages may outweigh the opportunity cost
of the additional money balance required to avoid the shortages.
Even if we assume that there is certainty, the need for pure
cash balance will not be eliminated because periodic planning,
lumpiness in cash flows and a lack of synchronisation between
inflows and outflows will give rise to a shortage at times
within the planning period.[10] Figure 1 illustrates this. To
this first problem therefore , the major decision variables are:-

(1) The firm's net cash flows;

(2) The costs of financing money shortages if they arise;

(3) The money holding costs (earnings foregone by holding
    a pure cash balance);

(4) The length of the planning period.[11]

Figure 1 shows that during times A to B, C to D and E to F,
the outlays are in excess of inflows. During these times, we
would require financing of some nature. During the other times,
inflows are greater than outflows. The excess may be held in

the form of pure cash balances or short-term money assets.

Figure 1 : Inflow and outflow of cash over a period of
time.

K£

Daily
Receipts
&
Payments

Inflows

Outflows

A   B   C   D   E   F   Time
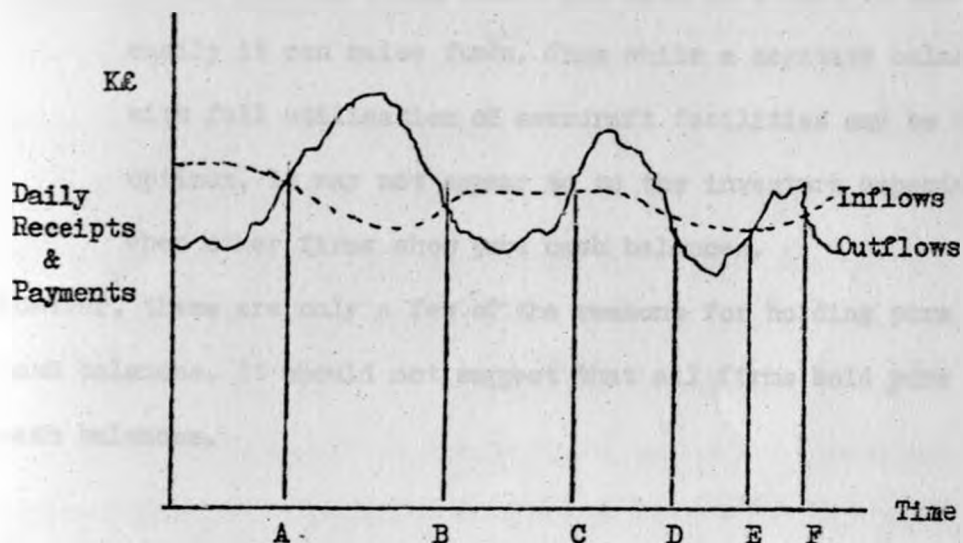
The question is, why should such temporary excesses be held on
current account? Some of the reasons for doing so are:-

(1) The time period between these excess inflows and the
time there will be excess outflows may not be long
enough to realize enough interest to cover transaction
costs;

(2) The excess inflow does not necessarily flow in within
one or two days so that it can all be used in short-term
investments. Thus investing these temporary excesses as
they flow in may not compensate for the costs involved.
On the other hand if we wait until we have accumulated

enough excess inflows so that we can invest, it may

just be the time when we are getting to times of excess

outflows which need financing.

(3) There is the problem of trying to maintain the firm's

position on the stock exchange. How the firm appears

to the creditors and owners has also an effect on how

easily it can raise funds. Thus while a negative balance

with full utilisation of overdraft facilities may be the

optimum, it may not appear so to the investors especially

when other firms show pure cash balances.

However, these are only a few of the reasons for holding pure

cash balances. It should not suggest that all firms hold pure

cash balances.

DEMAND FOR CASH BALANCES

Keynes identified three major motives for holding cash

balances.[12]

(1) The transaction motive:- Which he defined as the need

for cash balances to meet payments arising in ordinary

course of business.

(2) Precautionary motive:- He defined this as the need to

maintain a safety margin or buffer to meet unexpected

contingency, the more predictable the cash flows of the

business, the less precautionary balances that are

needed. It is also reduced when the firm has a ready

borrowing power to meet cash drains.

(3) The third and final motive is the speculative motive.

He defines this as the need to hold cash for the purpose
of taking advantage of expected changes in security
prices. When interest rates are expected to rise and
security prices fall it implies that the firm should
hold cash until the rise in interest rates ceases.
The transaction motive talks about holding cash balances to
meet normal business transactions, for example, payments for
labour or payments for purchases. No economic unit or firm enjoys
perfect synchronisation between the seasonal patterns of its
inflows and outflows. This discrepancy gives rise to balances
which accumulates temporarily and are used up later in the year
when expenditures catch up. The need for transaction balances
is roughly proportional to the aggregate volume of transactions.
It is necessary to point out that though Keynes was talking
from an aggregate macro-economic view, others like Tobin and
Baumol have tried also to suggest that there exists a relation-
ship between cash balances and the level of sales. This remains
to be established.[13] They assert that institutional determinants
of the demand for transaction balances has led to the general
opinion that other determinants including interest rates are
negligible. However, this may be true of the size of transaction
balances but the composition of the transaction balances is
another matter. Many transactors have large enough balances so
that holding part of them in earning assets rather than on
current accounts is a relevant possibility.

Transaction and precautionary balances could be lumped
together in a probability distribution. By incorporating
probabilities in the determination of transaction balances,

the uncertainties for which precautionary balances are intended
to serve are taken care of. How accurate the mean of this
distribution is depends on how accurate our expectations are.
If the probabilities are widely distributed it is a reflection
of the degree of uncertainty. We can provide balances for this
uncertainty by holding an amount equal to the mean and a certain
amount of variance so that cash balance would be $\mu + \sigma$.
Where μ is the mean of the distribution and σ is the standard
deviation of the distribution.

It is most unlikely that non-financial firms hold cash
for speculative purposes. However,   if this were the case,
then such balances would not be treated as   part of the balances
held for transaction for normal operations. Even if non-
financial firms may engage in buying and selling securities and,
making capital gains and interest, it is not convincing enough
from the firm's point of view that they do so as an objective
of earning interest. But rather I view it that they do so
because the pure cash balance held is not needed in the next
few weeks and thus instead of it being left idle it could be
employed in short-term interest earning assets or a savings
account. I doubt whether this is a motive in itself and that
it warrants separate attention. It is simply part of the tra-
nsaction balances held by the firm. On the basis of my
definition of cash it is logical to conclude that the motive for
holding cash is for transactions purpose only. Changes in the
rate of interest on short-term securities may only alter the
optimal mix in which the cash balances are held, while the

effect on how much finance should be allocated to cash balance may be minimal. This suggestion may not hold true if we looked at the economy as a unit, a basis on which Keynes makes the classification. My unit is the individual firm. The economy as a unit would include financial firms, governments and individuals. The behavior of the aggregate is different from a single unit.

Further more, Keynes worked on the assumption that the firm's inflows are lumpy and are experienced at given times while the outflows are spread over the planning period. This is true of individuals who get incomes on a weekly or monthly basis but expenditures are spread over the period. With firms the situation would vary from firm to firm, in some, as mentioned earlier it may be concentrated in certain seasons while expenses are almost evenly distributed. In others revenues are virtually spread over the whole planning period so are the outflows. Different firms would therefore require different analysis of own cash patterns.[14]

In practice firms may hold cash balances for the following reasons:-

(a) Cash balance of a certain level could be held as a matter of some pragmatic decisions not related to the objectives of having an optimal cash balance, for example, a certain level of cash balance is needed because firms in the same industry and of similar size hold a certain percentage or a certain amount in the cash balance.

(b) In some countries, Bankers require their customers to have a certain minimum balances to compensate for their services. They are known as compensating balances. In

Kenya, such a requirement does not exist.

(c) Financing institutions do require that the firm maintains
a certain amount of liquidity so that their investments
are not at stake or so that they can advance a loan at a
future time.

B and C are balances that cannot be classified as those held
for normal operations because compensating balances are not
readily available for spending, so are balances held to satisfy
certain contractual obligations. If a firm is required to hold
a certain level of cash balances by a financial institution,
the balances above those which are economically useful to the
firm should be weighed against lost opportunities of the excess
cash or the interest paid on those excesses as part of the costs
of finance obtained from the financing institution.[15] With res-
pect to A, such a policy would not be regarded as optimal unless
by co-incidence. Firms in the same industry are never exactly
the same and this makes it difficult to make industry comparisons.

CAPITAL STRUCTURE AND THE CASH BALANCE

Some Academicians argue that the capital gearing of a
company influences the level of transactions balances that are
required. One of them is Melbourne, who argues that in a highly
geared company, certain fixed costs must be met.[16] Some of these
costs are , maturing liabilities and interest bills on the
borrowed funds. He then goes on to say that securing funds could
be comparatively more expensive and difficult than if it was
low geared. The two situations could lead to:-

(a) Acute liquidity problems;

(b) Little room for free utilization of funds due to
borrowing potential being used up;

(c) Lenders gaining control of the firm.

In the case of lowly geared firms, the shareholders' funds
form a large part of capital. This has a number of advantages
over borrowed money. These advantages are:-

(a) They do not attract contractual fixed payment;

(b) They do not have to be repaid back on set dates; and

(c) They do not have to be refunded, that is, replacement
funds do not have to be available.

He concludes that cash balances are likely to be higher in a
highly geared company than a lowly geared one.

These conclusions do not follow and especially so if we
continue with our definition of cash balances to include normal
operations payments and receipts. Interest bills and loan re-
payments cannot be classified as payments for normal business
operations, they are financing costs. After excluding them,
then Melbourne's conclusions become irrelevant. The firm, in
deciding its capital structure should choose that level which
maximizes the value of the long-term returns to the shareholders.
If a high gearing fulfils this, then it is the best alternative,
higher cash balances would not be the result of this decision at
all. In fact if they are excessive, they would in the long-run
be shifted to more productive opportunities.

INFLATION AND THE CASH BALANCE

Inflation in the present world is high such that the effects
it has on cash balances could be significant. Cash loses its
purchasing power with inflation. By running large amounts of
cash balances, we run the risk of such losses. Should the rate
of inflation be high, then the pure cash balances would have
to be supported with external finance to make them purchase
goods that they would purchase if there was no inflation. These
costs should be considered as part of the opportunity cost of
holding money assets. On the other hand, during times of high
degree of inflation, uncertainties about prices of commodities
build up which would tend to require higher amounts of transac-
tion balances.[17] Probably because most firms purchase goods on
credit this problem may not be as pressing as stated above but
over a period of time large balances will be required. However,
inflation is only one of the many factors that should be
considered.

CONCLUSIONS

In this introductory chapter I have tried to drive the
point home that firms must reconcile the costs of holding cash
with the costs of financing the cash balance (if they decide
to hold negative balances) when making cash balance decisions.
With the uncertainties in the real world, it is impossible to
determine true optimal balances, however, with the use of
modern techniques, near optimal balances can be determined.

In fact the optimal solution is not static, it keeps changing according to relative changes in the parameters that determine it.

Some firms do not necessarily concern themselves with the problem of getting much out of the cash balance as mentioned earlier. This was somehow confirmed from the answers to the questionnaire that was sent out to about thirty one firms in different industries and of different ownership.

CHAPTER TWO

LITERATURE REVIEW

ANALYTICAL MODELS

A number of personalities have developed cash
balance models of one nature or another. But before
considering the individual models, it is necessary to look
at the different types of models and their characteristics.

Models can be classified into two categories. The first
category is made up of those that take an analytical approach
to problem solving. We call them analytical models and they
search for optimal solutions. The solutions however, are based
on assumptions and parameters that make the groundwork of the
models and inputs that go into them. The validity of the
solutions depend on the reality of the assumptions and
parameters that underlie them. Usually these assumptions and
parameters are generalized such that the solutions are rarely
realistic at a micro or individual units levels. Such models
are good when looking at aggregate situations like modeling
a Country's economy.

The second category are simulation models. These are
models that simulate the actual behaviour of the system for
which we are trying to determine optimal solutions. The
variables that make up the groundwork for the models are
those that actually apply to the system under consideration.
Solutions that are determined using simulation models are

only valid to the particular system in question. They also pro-
vide a range of possibilities and strategies, something that
analytical models do not provide. They cannot be generalized
unless a large sample of other systems show similar results.
This is explained by the fact that simulation is done on
actual situations that face the particular firm. Simulation
models very often if not always,do not provide optimal
solutions because of the probabilistic nature of the inputs
that go into them. They search for optimal solutions .

Analytical models on the other hand do not necessarily
give optimal solutions even though they would purport to
give optimal solutions. The accuracy of such solutions would
depend on how much the parameters have been refined to
represent realistic situation. Where this is true then they
would give optimal solution. However, they would have to be
quite complex if they have to achieve this.

The question therefore arises as to which type of model
is appropriate. The answer is that it depends on what we are
analysing. If it is an Accountant trying to determine how
much to hold on the cash balance then a simulation model is
more appropriate. If it is an Economist trying to determine
how much money supply is required for the Kenyan economy
then a generalized model, say the analytical type may serve
him better.

Cash balance models can be classified into three
categories independent of whether they are analytical or
simulation in nature . They are:-

(1) <u>Optimal Batch Models</u>- They rest on the assumption
that cash comes in the firm in a lumpy manner and is
spent smoothly over the planning period. Another
assumption implicit in it is that there is one
particular level that can be identified as the optimal
level of cash balance. The particular contributors
will be reviewed in a short while. Figure 2 is an
illustration of an optimal batch model.

Figure 2 : Saw toothed diagram of Economic Order Quantity.
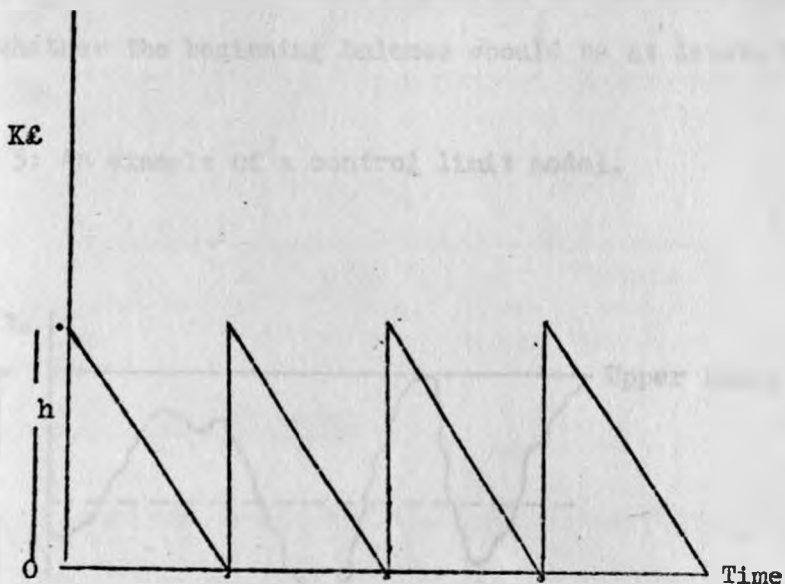
h represents the optimum cash balance.

(2) <u>Control limit models</u> - They rest on the pragmatic notion
that given the stochastic nature of a firm's net cash flows,
the cash balance should be allowed to wander freely between
upper and lower limits. If the limits are reached the
balance is reduced or replenished by transfers to or from
earning assets adjusting the balance to a return point.
The interpretation of this is that a firm can maintain a
near optimal cash balance by holding balances that fluc-
tuates within the upper limit and the return point as
shown in figure 3 below.

(3) <u>Buffer stock models</u> - They endevour to determine the minimum
balance that should be held at the start of a planning
period to avoid cash out during the period. They derive
from making a forecast of the cash balance as shown in figure
4 and then a cost benefit analysis can be made to determine
whether the beginning balance should be at levels 0 or a_1 or a_2.

Figure 3: An example of a control limit model.
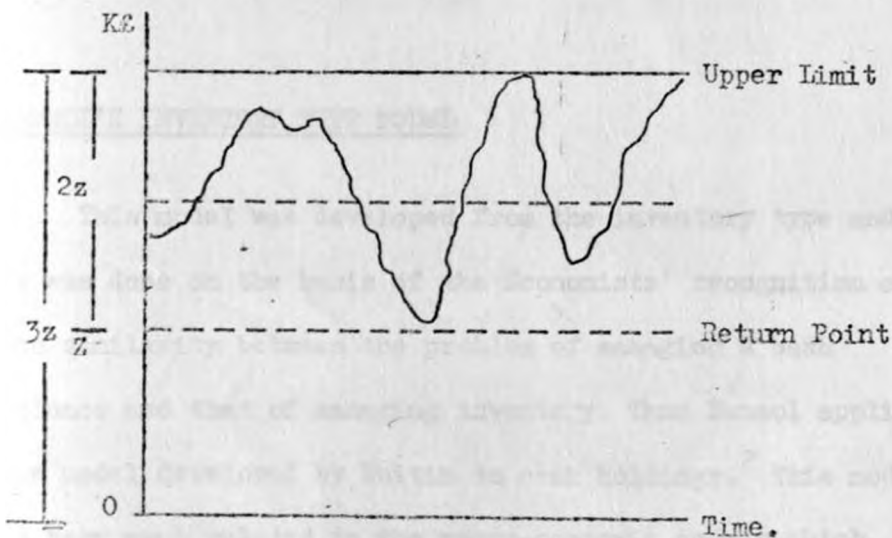
They can be influenced by how readily finances can be obtained and various cost factors. Contributors to this type of model are Patinkin Archer and Mao[1].

Figure 4: An example of a buffer stock model.
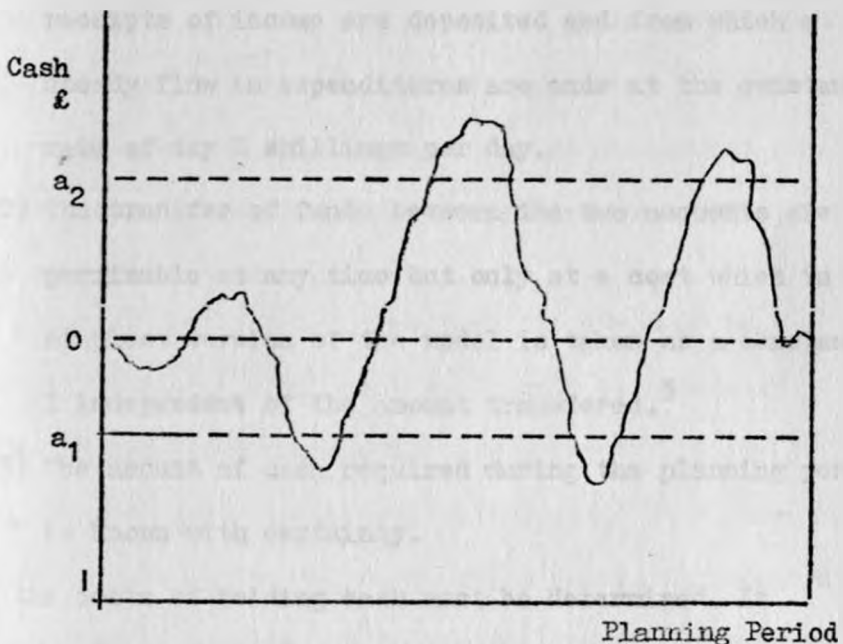
BAUMOL'S INVENTORY TYPE MODEL

This model was developed from the inventory type model. It was done on the basis of the Economists' recognition of the similarity between the problem of managing a cash balance and that of managing inventory. Thus Baumol applied the model developed by Whitin to cash holdings.[2] This model is very much related to the macro-economic models which assume that,inflows are lumpy and expenditures even during

the whole planning period.

Assumptions

(1) That the firm or decision maker is holding two
distinct types of assets (i) an earning asset such
as a saving deposit or bond which bears interest at a
given rate of say V per shilling per day and (ii) a
non-interest bearing cash balance into which periodic
receipts of income are deposited and from which a
steady flow in expenditures are made at the constant
rate of say M shillings per day.

(2) The transfer of funds between the two accounts are
permisable at any time but only at a cost which in the
simplest version of the model is taken as a constant
Y independent of the amount transfered.[3]

(3) The amount of cash required during the planning period
is known with certainty.

Thus the costs of holding cash must be determined. It
depends on the alternative uses to which the cash can be put.
If raised externally the interest charge is the cost. If
raised internally it is the fall in the earnings that results
in keeping the cash idle (opportunity cost). The objective
is to minimize the costs per period. If all these costs are
variable and known only to probability distribution the
problem may be impossible to solve exactly. However the
transaction costs is a known constant. Baumol then derives
the square root model[4]

$$Q = \sqrt{\frac{2YD}{V}}$$

Where Q represents

the economic order quantity and D represents the amount of
cash to be used in the next time period (net disbursements).

This model is deterministic. It does not put into
consideration the fact that cash receipts and expenditures
can be random. The model also assumes that the cash
inflows are lumpy while expenditures are spread evenly over
the whole planning period. This is the basic assumption that
underlie the EOQ in inventory model. In actual practice the
management has more control over expenditures than receipts.
The implication of this situation is that management can decide
that payments be made at particular period assuming lumpiness
while the inflows are stochastic.[5]

Secondly the Baumol's model can operate only in a
stationary state in which cash would only be necessary
because of the fixed transaction costs involved in transferring
cash from securities to account balances and vice versa, an
assumption on which rests the Baumol's model. This being the
case, one would expect that the optimal pure cash balance
and in fact the whole cash balance (by my definition) would
be generally lower than in a dynamic state where risk has to
be traded with profits. And in fact it is really doubtful as
to whether the fixed transaction costs are all that
significant anyway. The fixed costs that he talks about are
extra costs that are incurred on telephone calls, salary of
the relevant Manager dealing with the transactions, brokers
fee and so on. Some of these costs are difficult to quantify
and even so. the Manager is involved in other jobs apart

from such transactions. The broker's fee is frequently fixed
for small amounts but become variable with the value of the
transactions. So far, the transactions costs could turn out
to be variable and negligible. If they are variable as such,
then the Baumol model no longer holds. The costs being neg-
ligible means that transfers would be quite frequent and small
in amount.

Thirdly, the model implies that demand for cash rises less
than in proportion with the volume of transactions so that
there are economies of large scale in the use of cash. The
equation requires that the average transaction velocity of
circulation vary exactly in proportion with the quantity of
cash. For example doubling of the stock of cash will just
double velocity. With regard to the relationship between the
demand for cash and the level of sales, research done by E.
L. Whalen[6] with a purpose of finding out whether this relation-
ship holds, found out that when construction of the demand for
money function allows for changes in the demand to hold cash
as an asset, transactions cash balances appear not to vary
less than in proportion to the volume of sales. In fact, for
certain industries, these cash balances appear to increase more
than in proportion to sales. There existed substancial dis-
economies of scale in cash balances.[7] However, using an
alternative approach which adjusts for differences among
firms in the same industries cash and sales commonly vary less
than in proportion which tends to agree with Baumol's model.

Fourthly, it is an oversimplification of reality because of the rationality assumptions employed in its derivation. It takes the distribution of firms' disbursements over time to be fixed. It also ignores the cash receipts within the relevant period since it assumes that receipts are experienced only at the beginning of the period. Such a model could suit cash holdings by individuals who commonly receive incomes at one time and then spend or invest or a combination of the two until the next cash inflow in the next period.

Fifthly, the model is very limited in that it deals with transactions demand for money and no more. It does not consider the fact that precautionary balances should be held, and especially so if transaction balances are non-deterministic. The neglect of this is a reflection of the model's failure to be adaptive.

Stephen H. Archers points out that in fact Baumol's model deals primarily with the frequency with which a firm should go to the market for cash for transaction purposes and only indirectly on the cash balances problem.[8] The balance would average zero plus an amount C divided by 2 or C/2. It thus becomes operationally cumbersome for the determination of cash balances, and very much so when the net cash flow fluctuates between the positive and the negative.

K.G. LOCKYER MODEL

The basic Baumol model has been developed further by others notably Lockyer who incorporated an overdraft facility

(something that Baumal forgets) which are available to Kenyan firms.[9] It is available only to firms which have a Kenyan on their board of directors. This has a considerable advantage as a means of partially or wholly financing the money demand.[10]

Lockyer looks at the cash management from the point that having determined the type of net cash drain pattern and discovered our overdraft needs, should we have the starting balance as zero or negative (implying an overdraft) or should it be a mixture of the two? In other words apart from determining the optimal opening balance, it also determines the timing of overdraft and other short-term financing. However, as we shall see, this Lockyer's model has the same basic weakness as the Baumol model since the underlying assumptions are almost if not similar.

Three Basic Assumptions

(1) That all receipts are immediately converted into interest earning assets, for example by putting them into deposit accounts.

(2) That disbursements are all appreciably constant and that they are directly controllable by management and could thus be concentrated at regular intervals.[11]

(3) That replenishment of cash either to clear a bank overdraft or to meet a cash balance can be created instantly by for example transfering from one account into another. Cash needs on the other hand can be met by one of the three ways:-

(a) wholly from a cash balance,

(b) wholly from an overdraft,

(c) by a mixture of cash balance and overdraft.

The Model

From the above three assumptions, he goes on to look at which of them has a minimum cost. Baumol's model deals wholly with the first situation and shows in effect that minimum total cost is incurred when the quantity of cash transfered from the portfolio to the cash balance is as shown in appendix II. The equation arrived at is

$$q_0^x = \frac{2DS}{I_H}$$

Where q_0^x is the quantity of cash withdrawal,

D is the total annual requirements for cash,

S is the cost of transfering cash from the portfolio to the balance,

I_H is the cost of holding £1 per year.

The effect of an overdraft on the Baumol model, if it is readily available, is as shown in figure 5 below.
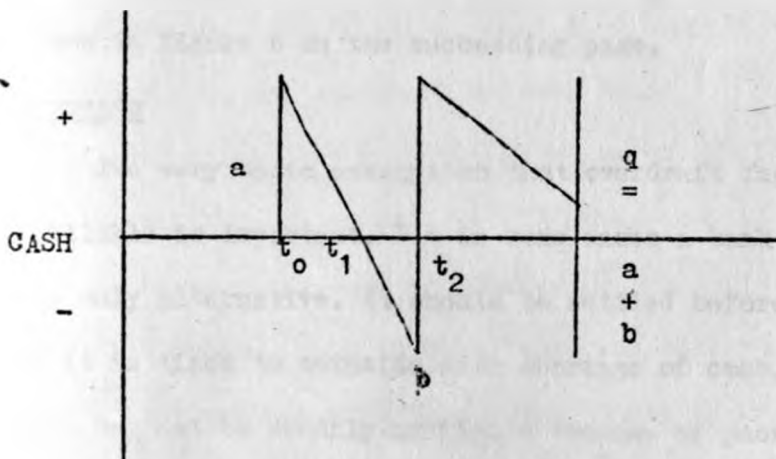
Figure 5: Effects of an overdraft on Baumol model.

Cost attributable to the use of an overdraft is taken to be £1D for each year £1 is borrowed, q is the requirements that need to be replenished and is made up of a cash balance plus b, the overdraft total annual cash transfer cost is = £DS/q, where D/q is the number of replenishments. Thus the total annual cash policy cost A is given by the sum of

(1) total annual cash transfer cost,

(2) total annual overdraft cost, and

(3) total annual holding cost.

The above three give the following, see appendix II.

$$A = DS/q + \frac{a^2 I_H}{2q} + b^2 Ip/2q$$

where I_H is the cost of holding £1 per year.

Thus we must find the value of q^*, a^* and b^* which minimizes A. These values that will bring about minimum costs are likely to be at a level where a mixture of overdraft and internally financed cash balances is used. See appendix II.

He concludes therefore that it is always desirable to swing between a positive and a negative cash balance providing that an overdraft facility and cash are available. The cost involved in using various interest rate, percentages on overdraft are shown in figure 6 on the succeeding page.

Comments

The very basic assumption that overdraft facility will be available is important. But in some cases a bank loan may be the only alternative. It should be settled before hand or else if it is timed to coincide with shortage of cash, the bank loan may not be readily available because of poor credit rating.

Figure 6 : Effects of various interest rates on annual
total costs.
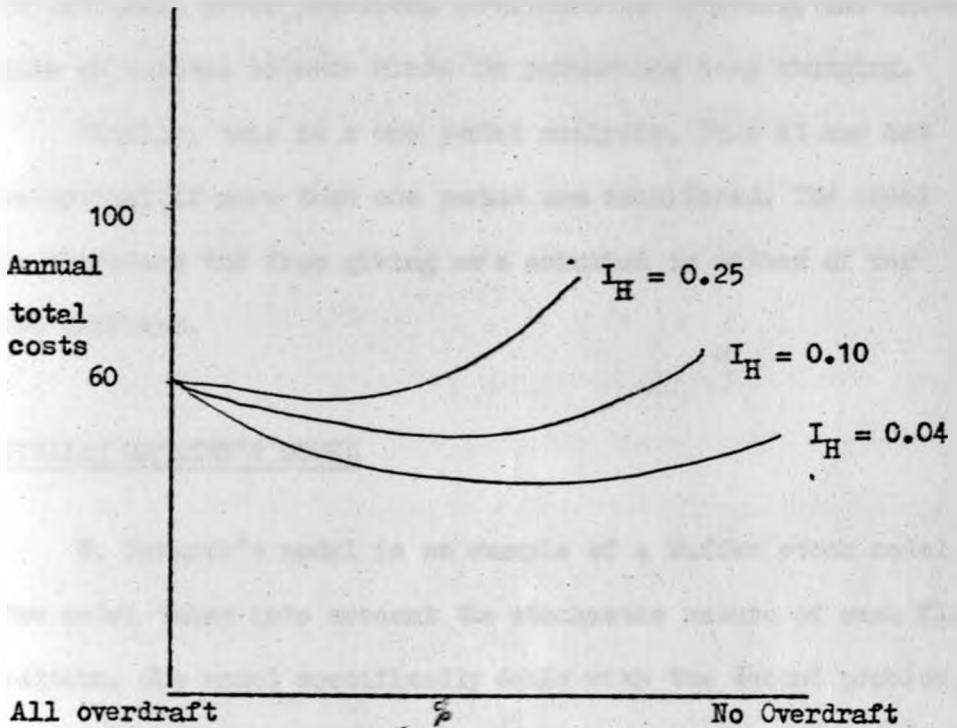
The model if at all it was valid would favour big firms with
generous credit facilities, small firms usually find it
difficult to get overdraft and bank loans.

Secondly, just like the Baumol model, it assumes that
disbursements are spread over the whole control period while
receipts are lumpy and experienced at the beginning of the
control period. This does not hold true with all firms.

Some writers have argued that firms do not usually keep
a particular cash balance which is deemed as an optimal balance.

Many firms have a policy of letting the pure cash balance swing within certain limits above which excess should be invested in other interest bearing securities and below which pure cash should be replenished. This policy is not optimum, however, it is difficult under practical conditions to determine and maintain an optimal balance since the parameters keep changing.

Finally, this is a one period analysis. Thus it may not be optimal if more than one period are considered. The model is therefore far from giving us a solution to either of our two problems.

WILLIAM BERANEK'S MODEL

W. Beranek's model is an example of a buffer stock model.[12] The model takes into account the stochastic nature of cash flow pattern. The model specifically deals with the second problem, that is, deciding the forms in which cash balances should be held and what combination of these forms will yield optimal results.

He starts by dividing the cash balances into two general categories:-

(1) reserves,

(2) transactions.

The cash balance consists of several portions, each portion corresponding to one of a number of different motives. Under reserves, some cash is held for meeting a huge certain cash drain in the near future. However, such a balance for the purpose of this thesis should be neglected. The other bit is

for precautionary purposes. He does not go ahead to determine how much should be held for this purpose but takes it as part of the determination of all the balances required for operational purpose. He therefore agrees with me that division of cash balances for operational purposes into precautionary and transaction motives is very artificial in the light of the realization that cash balances can best be determined stochastically. The transaction category is the set of cash flows associated with the production, distribution and servicing of goods and for services.

For analytical purposes, he classifies transactions into:-

(1) Passive- those which the Treasurer has no control. They consist of decisions made by other sub-optimising decision makers within the firm and customer payments to be made on accounts receivable or cash sales to be made during the cash balance period.

(2) Those under the control of the Treasurer. They include;

a) borrowing short-term money and repaying such obligations.

b) purchasing and sale of marketable securities.

By this method of classification he draws three distinct classes of transactions:-

(1) borrowing or repaying of short-term funds;

(2) purchasing or selling of marketable securities;

(3) all other transactions, mostly the passive ones.

Another classification is whether the transaction is random or nonrandom. However, it is the passive transactions that are likely to be random. Random transactions are considered completely stochastic.

He reckons that the firm should keep some minimum level
of cash balance which he calls critical minimum balance below
which a short cost is incurred. This minimum can be violated
in the following ways:-

(1) It may be violated in the sense that the balance
    actually falls below the critical minimum. Here, the
    penalties incurred may consist of interest and other
    charges on money borrowed or reduces the balance.

(2) It can also be violated by the cost of postponing the
    payment of obligations which fall due during the period.
    The short cost incurred by ignoring demand on the firm's
    cash which if otherwise honoured would result in a cash
    balance below critical minimum is foregone cash discounts
    and other favourable credit terms and by suffering the
    cost of possible deterioration in its credit rating. It
    could have the consequence of no credit at all. Under
    such conditions one is constrained to obtain resources
    on a strictly cash basis. The cost therefore, has a
    strong subjective character. He suggests that any amount
    in excess of the critical minimum is a candidate for
    conversion into marketable securities and a balance less
    than the critical minimum be redressed by manipulating
    the controllable variables like:-

    a) cash borrowing or

    b) sale of marketable securities whichever is cheaper
       if the motive is to choose a course of action which
       maximizes profits.

From here, Beranek makes a mathematical analysis in order

to determine the minimum. On the basis of his argument that
the cash behaviour is both random and : non random, he goes
on to consider probability distribution of the net cash drains
(inflows less outflows during the planning period) so that such
models can provide a more effective compromise between the
conflicting element, short costs and profits from marketable
securities. These are the critical sensitive factors.

Decision Variables

(1) The probability distribution of the net cash drain
which reflects the entire set of "all other" flows

(2) The short cost function and,

(3) A function which characterises the return forth coming
from holding marketable securities over the cash balance
period.

He performs a one period, a two period and a multi-period
analysis. With regard to the first variable, the probability
distribution would be done for the particular firm for which
we are attempting to develop an optimal cash balance. This
probability distribution can be calculated using a computer
program where necessary. It is an end of period cash balance
distribution when the opening cash balance is zero. The begin-
ning of period balance if not zero is substructed from the end
of period balance to give the distribution of the cash drain.

The objective is to have a balance which minimizes total
cost, total cost is the difference between short costs and net
return. This will help us determine the optimal balance. There
are two alternatives:-

(1) If the Treasurer is not allowed to borrow and if he has

£K available, then the net cost function appears as shown in

figure 7 with C_o as the minimum cost achieved at this level of

opening balance.

Figure 7 : Determination of _minimum_ cost when Treasurer
is not allowed to borrow.
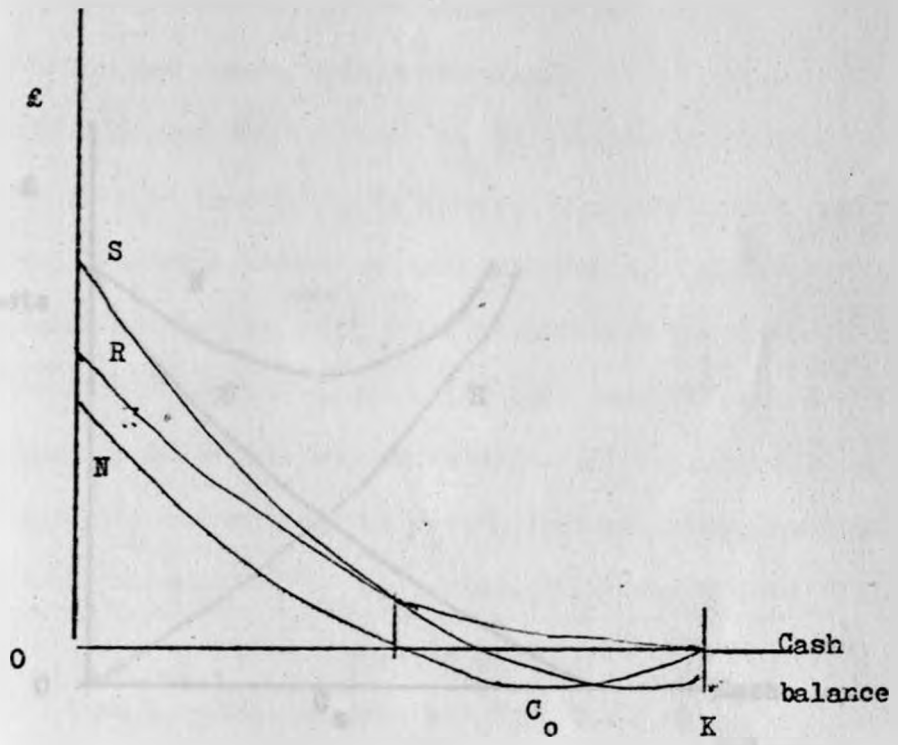
S - short cost function,

R - net return function,

N - net cost function,

C_o - minimum cost achieved at this level of opening balance,

K - C_o should be invested in securities.

(2) On the other hand, if the Treasurer has zero cash and
has no restriction on how much to borrow with an
assumption also that interest on money borrowed is
constant[13] and that the loan may be repaid without
penalty to the borrower, then we have the result shown
in figure 8

Figure 8 : Determination of the level of borrowing.
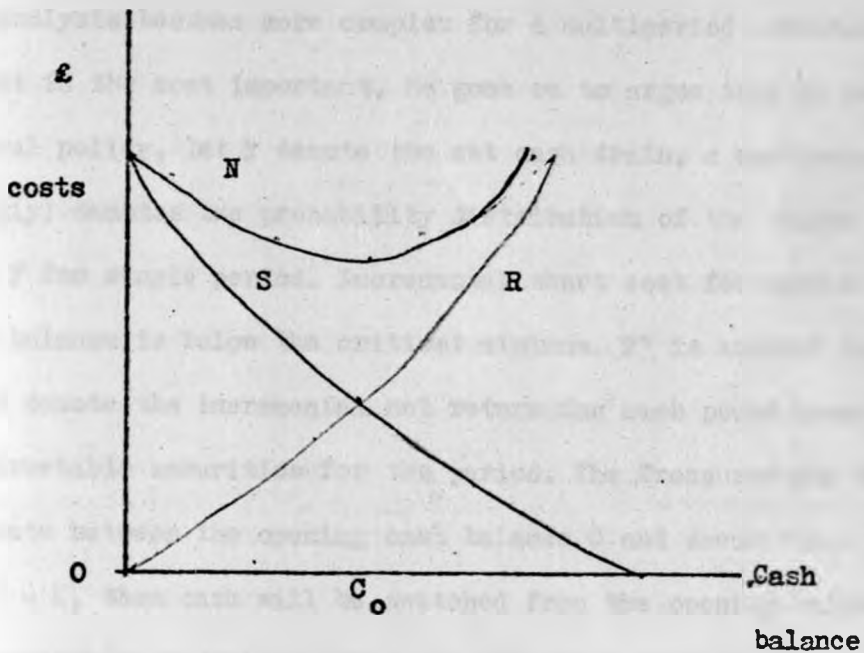
N.B. S, N, R, as defined above.

C_o should be borrowed.

Beranek realized the oversimplification and generalisation
that this model makes. This is a one period analysis. as usual,
a one period analysis is unlikely to give the optimal solution
to the problem. Planning periods are usually interdependent.
He therefore provides a two period analysis. The objective is

to minimize the total two period net costs which he denotes by
E(N). The optimal balance is given by the equation shown below,
see appendix III for derivation of the formula.

$$E(N) = \overline{P}_1 \ (\ \overline{S}_1 + (EP_2 S_2 - R))$$

Where $\overline{S}$ denotes the realized period one short cost,

$\overline{P}$ = the probability of the occurance of $\overline{S}_1$,

S_2 = short costs for period two,

P_2 = the probability of occurance for period two,

R = the net return from securities.

The analysis becomes more complex for a multiperiod continuous case,
but it is the most important. He goes on to argue that to derive the
optimal policy, let y denote the net cash drain, a continuous varia-
ble $g(y)$ denotes the probability distribution of the random varia-
bles y for single period. Incremental short cost for each £ the
cash balance is below the critical minimum. y^* is assumed to be $\underline{a}$.
Let d denote the incremental net return for each pound invested
in marketable securities for the period. The Treasurer has £K to
allocate between the opening cash balance C and securities. If we
set $C = K$, then cash will be switched from the opening balance
to marketable securities until the following condition is
satisfied[14],

$$\int_{-\infty}^{y=y^*-C} g(y)dy = d/a$$

Where y^* is the critical minimum balance, a is the incremental short
cost per pound and d is the incremental net return per pound of
investment.

Some deficiencies of the model

Though Peranek gives an explanation of what a critical
minimum balance is , he does not indicate whether this critical

minimum is the same or identical to the optimum cash balance.

Secondly, he works on the assumption that cash inflows
and outflows are partly stochastic and partly deterministic.
Those transactions that are certain do not pose a problem. The
biggest problem in determining optimal cash balance is the
uncertain transactions. It is not clear in Beranek's final
analysis whether he makes this distinction.

Also important is the fact that most Managers are not
concerned about keeping a particular balance that would actually
be called an optimal cash balance. The dynamism and lack of
certainty in the real world makes reliance on the past data
almost irrelevant. The assumption that expenditures are directly
controlled by management is over ambitious.

Beranek's model could be made more powerful and useful if
it incorporated methods for determining how much cash resources
should be held by the firm rather than take this as given and
simply deal with determination of an optimal mix of cash
resources. In fact the model could be developed further to
become more of simulation than analytical. The latter has
rather too refined and abstract parameters.

MILLER AND ORR

Another analytical model but which is almost completely
different in approach from the Baumol's model is the Miller
and Orr model.[15] It is a control limit model which has more
operational appeal. One snag is that the model tells us what range
we should operate within so that we are not far from the actual

optimum level. It recognises the difficulties of determining
a precise level that would be regarded as optimal.

It rests upon the pragmatic notion that given the stochastic
nature of a firm's cash flows, the cash balance should be allowed
to wander freely between upper and lower limits. If the limits
are reached the balance is reduced or replenished by transfer
to or from earning assets adjusting the balance to a return
point. They have developed a model which enables optimal control
limits and a return to be determined. They hold the suggestions
that cash balances should depend upon:-

(a) The opportunity cost of holding cash;

(b) The cost of making transfers between cash and securities
holding, and

(c) The exogeneously determined and uncontrollable
variability in the firm's cash flows.

The model has four sets of assumptions:-

Set one

(a) The firm has two types of assets, that is, cash and a
separately managed portfolio of liquid assets whose
marginal and average yield is V per pound per day.

(b) Transfer between the two asset accounts can take place
at a marginal cost of I per transfer.

(c) And such a transfer takes place instanteneously, there
is no leadtime.

Set two

The arrangement between a bank and a customer calls for
the maintenance of a minimum cash balance. This is already a
sweeping assumption for in many countries including Kenya there

are no minimum cash balances required.

Set three

This is concerned with the distribution of the possible demand for money. Net cash flows are assumed to be completely stochastic and they behave as if they were generated by a satisfactory random walk.

Set four

It is assumed that the firm wishes to minimise its long-run average cost of managing its cash balance. The cash balance will be allowed to wander freely between an upper and lower limit and no action is done so long as the balance is within these limits.

Now if we let

$E(M)$ = expected average daily cash balance,

$E(N)$ = expected number of portfolio transfer in either direction,

Y = cost per transfer,

V = daily rate of interest earned on a portfolio,

σ^2 = variance of the daily demand for cash,

then the cost per day of managing the firm's cash balance over a finite planning horizon of T is

$$E(C) = Y \frac{E(N)}{T} + VE(M).$$

For optimum results, the objective function above should be minimized. The result is that starred variables represent optimum values. See appendix IV for derivation of formula.

$$z^* = \left(\frac{3y\sigma^{-2}t}{4V} \right)^{1/3}$$

$$h^* = 3z^*$$

Where h* represents the upper limit of the range in which cash balance should be allowed to wander.

The model obtains a relationship between the average cash holding of the form

$$\overline{M} = \frac{4}{3} \left(\frac{3y\sigma^2}{4V} \right)^{1/3}$$

Where $\overline{M}$ is the average cash balance the firm wishes to maintain for transaction purposes ignoring any precautionary balance or minimum cash balance that the bank might require the firm to hold. The illustration in figure 9 gives a clear view.

Figure 9 : Determination of safety levels of cash balances.
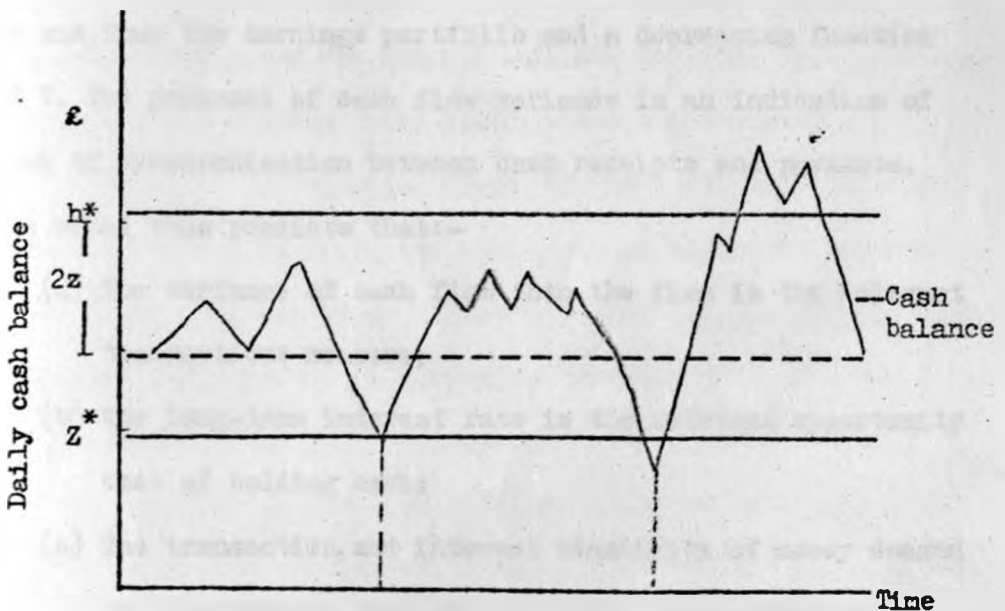
z^* is the return point.

Control action rules:-

(a) When the balance held for transaction purposes falls to the safety level, sell securities of amount z ;

(b) When the balance held for transaction purposes rises to h^* above the safety level, buy securities of amount $2z$.

Observations

The optimal return point is substantially below the mid-point of the range over which cash balance is permitted to wander. The optimal rule Structure implies that sales of portfolio assets will take place with greater average frequency and in smaller bits than purchases. However, this may not hold for all firms since they have different conditions confronting them such that the cost structure assumed in the model may not apply at all.

When compared with the Baumol model, the demand for money is an increasing function of Y, the cost of transferring funds to and from the earnings portfolio and a decreasing function of V. The presence of cash flow variance is an indication of lack of synchronisation between cash receipts and payments. The model thus predicts that:-

(a) The variance of cash flow into the firm is the relevant transactions measure;

(b) The long-term interest rate is the relevant opportunity cost of holding cash;

(c) The transaction and interest elasticity of money demand in a maximizing firm are subject to qualification respectively plus and minus 1/3

Empirical Relevance of the Model

This model lies on two basic assumptions:-

(1) Assumptions that define the basic framework; [16]

(2) Assumptions that are introduced to simplify proofs or
economic interpretation of the results with respect to
the latter assumptions. Many interesting variations with
respect to the cost structure or the distribution of
cash changes can and should be explored. They will cer-
tainly lead to more complicated control rules and change
other matters of detail. Attention has been given also
to the fundamental question of whether the framework
itself constitutes a useful and meaningful way of
describing the demand for money by business firms.

To face reality, businesses hold many different securities,
the model can be extended to incorporate them but the results
would be more complex. Again, firms have a complex of bank
accounts balances and transfers take place not only between
field accounts and the control balances but also among the local
balances and between these balances and the portfolio.

Thirdly, the size and timing of the important individual
transactions comprising the cash flow are under the control of
the management and other transactions are foreseable fulfilments
of past commitments. So they argue this could be true but less
with inflows. For positive application the usefulness of a
sample stochastic model of cash management depends mainly on
how closely its conditional prediction of the average frequency
and size of transfers and of average cash balances correspond
to those actually observed. Some firms may not even make a

transfer to securities even when the balance has gone higher
than h* in anticipation of a turn round in the near future.

If a particular firm's transactions produce a diffusion
rate that is extremely rapid, that is, if the daily balances
fluctuate over a large range during short periods of time,
then the decision rules suggested by the model may not be
relevant. But clearly if a firm does not have an extremely
predictable and uneven cash flow then such a model can be used
as a tool of financial control. It is better to qualify this
by saying that the results of the above model depend in a
critical way on the (h.z) policy form that firms are assumed
to employ. Hence the results are no better than the policy
itself.

We have examined four models which I have termed as analytical
though some could be developed into simulation models. Some of
them are crude but they set in motion the need to give attention
to cash management. The Baumol model trigered the process.
Lockyer's model is only an extension of the Baumol model. Their
weakness lie on the fact that their assumptions are not realistic.
Beranek on the other hand had a more practical appoach to the
cash balance behaviour before embarking on the development of
the model but though it is a powerful model academically, it
is less operational than the Miller and Orr model. As mentioned
earlier, all these models make generalised assumptions which
do not take into account the uniqueness of factors facing in-
dividual firms. These models have had different approaches
and assumptions about the behaviour of cash flows for a firm.

In addition, they have concentrated on dealing with one

problem, that is, the problem of allocation of cash resources
in various forms of liquid assets but they have taken the
primary problem, that is, deciding how much finance should be
allocated to cash balances as mposed to other forms of assets
for example fixed physical assets as given.

For a model to be useful at the firm's level, it should
take into account the unique factors which face the particular
firm. A simulation approach would be more useful in this
respect, though it may not provide us with an optimal balance.

SIMULATION APPROACH

Simulation is a powerful instrument for financial decision
making especially when compared with analytical approaches
considered in part A of this chapter. Some of these advantages
include:-

(1) It permits the Financial Manager to incorporate in
his plan both the most likely value of an activity
and the margin of error associated with this estimate.
By running a series of trials on a model through
simulating the real world conditions under which the
firm is expected to operate, it gives us a pattern of
observations. This pattern of observations which the
model generates indicates a sequence which could occur
if the model were adopted for decision making purposes.
By observing what happens under these simulated
operating conditions, the Financial Manager has the
basis for a more informed evaluation of various variables
to decision making.

(2) Simulation can help him ascertain the effects of changes
in company policies upon cash, for example, the effects
of a change in receivables policy, payables policy
or the timing of purchases that enter the production
processes can be determined.

(3) It can help the Financial Manager to determine the
size of the Buffer Stock of liquidity or bank line
of credit he needs to meet the uncertainties that
surround the company's activities.

(4) He can determine which corporate activities have the
greatest influence upon cash balances. As a consequence
the Financial Manager can sharpen his estimates of
strategic action and ignore those that have only a minor
impact upon cash balances.

Simulation is useful in cases where it is too difficult
to derive the outcomes of a model by analytical means. Where
the structure is complex it may defy an analytical study.[17]

Even though a model's outcome can be expressed analytically,
simulation of the model may be justified in order to support
the analytical results. What this suggests is that even if a
company was using a model like that of Beranek or Miller and
Orr (considered earlier), simulation of the cash balance
behaviour of the firm would add to the reasonableness of the
outcome of such models.

Not many academicians have developed simulation models
for determining required cash balances for the firm. It is a
recent development which has now expanded its use with the advent
of computers. I will consider two simulation models. One of
them is that of Stephen Archers, another is that of Professor
Gibbs. I have selected the latter for empirical application
in a Kenyan firm.

STEPHEN R ARCHERS

Stephen Archers in his paper argues that the Baumol model
(which was reviewed in the proceeding part chapter) is intended to
determine the transactions demand for money but forgets that

the uncertain world requires firms to hold precautionary balances as well.[18] It is this balance that Archers attempts to determine, that is, how much precautionary balances a firm should hold.

The variation in demand for cash transactions purposes causes a need for precautionary cash balances. He does not deal with the amount to be held for speculative purposes on grounds that a firm is ill advised to attempt to profit by speculative activities. Their function is customarily to produce and sell a good or service and not to speculate unless it is a financial institution.[19]

Figure 10 : Distribution of cash outflows and inflows of an imaginary firm.
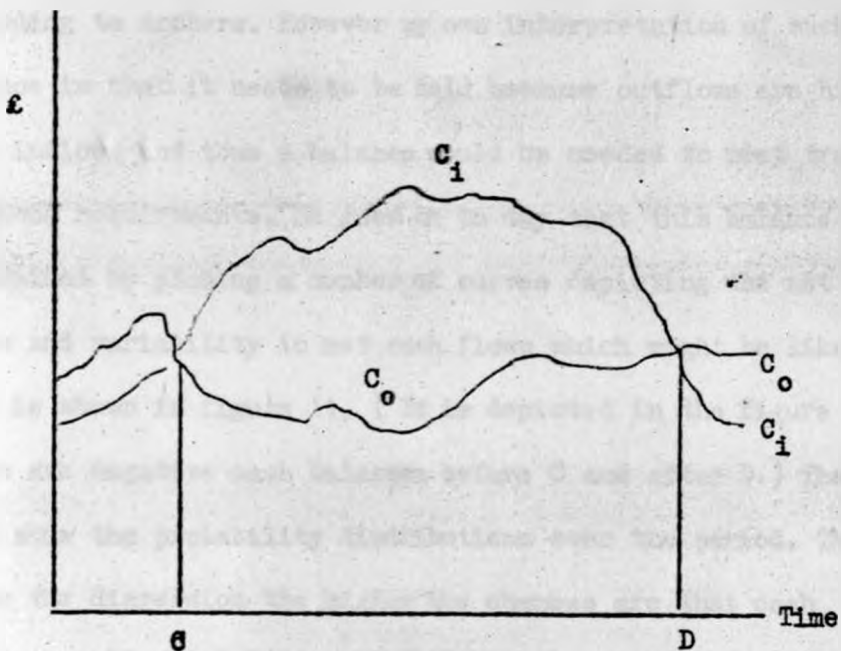
In figure 10, C_i represents cash inflows

$\qquad\quad\ C_o \qquad$ '' $\qquad$ cash outflows

Planning for a liquidity stock at a point in time for
transactions and precautionary purposes involves a study of
cash inflows and outflows and plot them as shown in figure 10.
The figure indicates that there is no need for pure cash balances
between times C and D.

For seasonal activities, separate cash analysis for the
non-normal months would be necessary and for growing firms,
increased balances would have to be projected, but the amount
of cash needed by a firm generally does not grow proportional
to sales.[20]

In figure 10, precautionary balances would have to be carried
before period C and after period D during the one month period
according to Archers. However my own interpretation of such a
balance is that it needs to be held because outflows are higher
than inflows and thus a balance would be needed to meet tran-
sactions requirements. He goes on to say that this balance is
determined by plotting a number of curves depicting the net cash
flows and variability in net cash flows which might be like
what is shown in figure 11. (It is depicted in the figure that
there are negative cash balances before C and after D.) The
dots show the probability distributions over the period. The
wider the dispersion the higher the chances are that cash
balances will not take the trend of the curve shown.

After tabulating, a mean which in this case is the daily
average should be computed for each day. The cash balance for
transactions purposes is then equivalent to the amount of

finance that would be required to finance the biggest gap
between outflows and inflows until we experience excess of
inflows over outflows. A measure of variability of the
transactions cash balances required is computed. The standard
deviation can be considered a good measure of such variability.
However, the mean standard deviation could be considered a
reliable estimate of the true mean and variability of the
population only if the sample is large. Management may consider
the likelihood of running out of cash that it is willing to
assume of a stock out. It can choose to arrange a line of credit

Figure 11 : Distribution of cash balances over a period
of time.
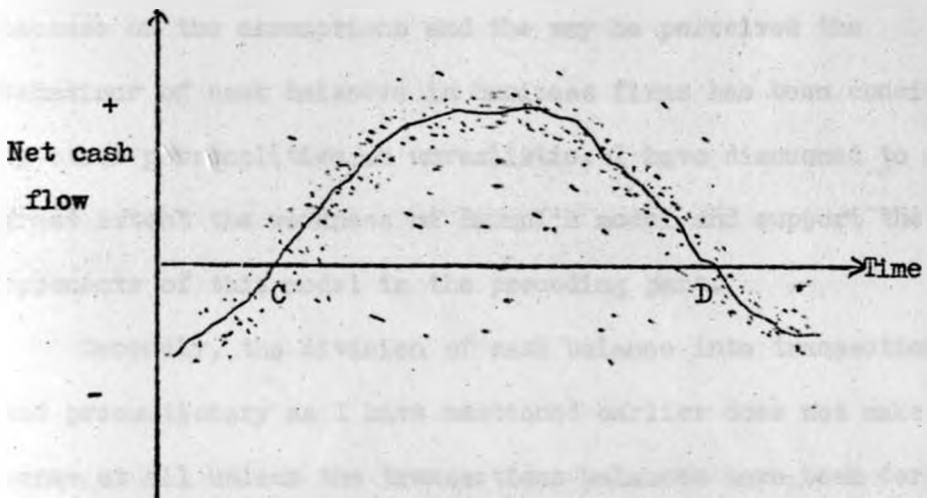
with a commercial bank and then afford a greater risk of stock
out. It becomes thus necessary to compare all costs involved
with the line of credit versus the capital costs of the
precautionary balance saved through the use of the credit to
determine the optimum. However, he suggests that the short
costs function is complex considering the variables involved
and perhaps it is operationally preferable to leave the choice
of risk to be assumed to the subjective choice of management.

OBSERVATIONS

Once again it is quite pertinent that Archers divided the
cash balance into transactions and precautionary balances. The
fact that he recognises Baumol as dealing with transactions
balances reflect that he is convinced that Baumol does develop
a model for determining transactions demand for money which
because of the assumptions and the way he perceives the
behaviour of cash balances in business firms has been considered
by other personalities as unrealistic. I have discussed to a
great extent the weakness of Baumol's model and support the
opponents of this model in the preceding part.

Secondly, the division of cash balance into transactions
and precautionary as I have mentioned earlier does not make
sense at all unless the transactions balances have been derived
using a deterministic approach which of course Baumol adopted
in approaching the problem. After all, precautionary balances
are subjective to how we react to risks. It could probably be
due to this deterministic approach that Archers recognises the
need for precautionary balances. If the transactions balances
have been determined using probabilities, this in itself takes

into account what would be regarded as a precautionary balance.
And indeed the balances Archers is attempting to determine in
his model are transactions balances anyway.

Looking at the other side of the coin is the supperiority
of the approach. Though Archers does not perform any simulation
in his model he gives an approach that could be incorporated
in a simulation model to give fairly realistic results. Risk
is something subjective and as he suggests, it is difficult
to arrive at what balances of cash should be held unless we
are told the amount of risk management would be willing to take.
Some management may wish to hold higher balances because of the
conventional practice. This model is closer to reaching a sol-
ution to the primary problem, that of determining how much
finance should be allocated to money assets.

The added advantage of this type of model is that it lends
itself to an approach which recognises the cyclical nature of
the net cash flows of many firms. Suppliers are usually paid
monthly whilst receipts from credit customers are likely to
follow in a pattern governed by the firm's credit policy.
(this is one finding which I discovered in my research in one
firm. Most and in fact virtually all the volume of transactions
take place in the last week of the month.) The pattern of cash
flows is likely to be unique to the firm suggesting special
cash management decision rules derived after an investigation
of the firm's particular cash flow pattern. The technique of
simulation using a planning period which follows the firm's
cash flow cycle seems to be a promising way of solving the cash
management problem of a particular firm.

H.C.W. GIBBS

A more specific simulation model is that developed by Professor Gibbs.[21] He suggests that the pattern of determination of optimal cash balances should be viewed as an integrated investment and financing decision.[22] The determination of the buffer money balances to hold is properly viewed as an investment decision. Increasing the size of the investment in a money balance will reduce the risk of cash insolvency but at the cost of the additional finance required. The decision must incorporate the cost and availability of finance to provide the desired balance and the management's attitude to the risk of cash shortages. He goes on to point out that in financing decisions, there seems to be a case for using a combination of long and short-term borrowing where the money demand is cyclical in nature as using sufficient long-term finance to cover the peaks will result in an idle balance during periods of low demands.

He made an empirical investigation into the cash management problem of a particular English firm with the aim of studying the particular cash flow patterns of the firm with a view to developing a simulation model linked to a planning period related to the firm's cash cycle. The intention was to develop decision rules regarding:-

(1) The buffer money balances necessary to reduce the probability of cash out to zero or negligible proportions.

(2) The optimal disposition of the money balances any time between cash and a selected interest earning money outlets.

(3) The optimal level of short-term borrowing to be used,

the short-term financing source was assumed to be bank
overdraft in view of its special advantages that pertain
to them.[23]

The criteria used in the investigation was to minimize
the cost of holding the desired balances.[24] The cash pattern
was as that depicted in figure 12.

Figure 12 : Cash flow pattern observed by Gibbs.
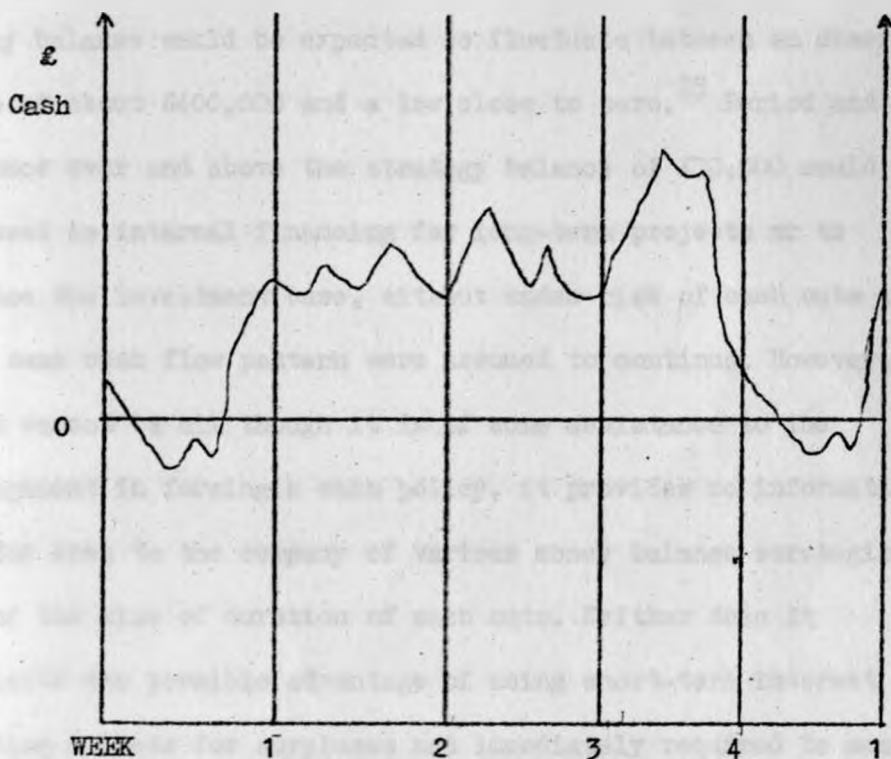
(The planning period was taken as 4 weeks since the cash balance
pattern tends to be a cycle of 4 weeks.)

Cash balances were needed towards the beginning of the
period and a surplus would be available in the latter weeks.

Receipts from equity or debt issues and payments which were
predictable both in timing and amount were excluded. The adjusted
net cash flows were then used to find the size of the opening
balance required to avoid cash outs in each month. The results
provided a probability distribution of required opening
balances and a mean and standard deviation were calculated by
using a computer. He found that the buffer money balance that
would completely avoid a money shortage to be around £70,000
then, because of the cyclical nature of the company's four
weekly cash pattern given a starting balance of £70,000 the
money balance would be expected to fluctuate between an observed
high of about £400,000 and a low close to zero.[25] Period and
balance over and above the strategy balance of £70,000 could
be used as internal financing for long-term projects or to
reduce the investment base, without undue risk of cash outs if
the same cash flow pattern were assumed to continue. However,
this cannot be all though it is of some assistance to the
management in forming a cash policy, it provides no information
of the cost to the company of various money balance strategies
or of the size of duration of cash outs. Neither does it
indicate the possible advantage of using short-term interest
earning outlets for surpluses not immediately required to meet
a cash demand or of using open credit such as bank overdraft.

Thus, he designed a simulation model to test:-

(1) The effects in terms of costs and money shortages of
various opening money balance strategies using a four
weekly planning cycle coinciding with the firm's control
period.

(2) Cost and cash shortages effects of various weekly
strategies within each control period of allocating the
available balance between cash and short-term interest
earning outlet designated deposits in the model.

The calculation of the cost of each strategy depending
upon the parameters set 100 combined monthly/weekly strategies
were simulated using a cash flow chart. The result was that
inspite of the significant higher sales level, an opening balance
strategy of £70,000 again emerged as minimum necessary to
have completely avoided cash outs. (This was a coincidence
as Prof. Gibbs puts it.) This suggests that the particular
pattern of a firm's cash flow is a significant factor in its
money demand. He also observed that:-

(1) as the monthly strategy is progressively reduced the
net holding costs falls but the risk of cash out
increases,

(2) by progressively reducing the amount kept on current
account by transfer to the short-term interest earning
outlet reduces the net cost of holding the balance by
expectedly increasing the period during which overdraft
would occur and the total overdraft limits that would
be required,

(3) the cost difference between various strategies are not
significant relative to the amount involved.

In the model the real cost of holding a balance resulting
from price level increases were ignored.

Secondly, no account was taken of benefits that might accrue

to the company in terms of the market value of its shares if idle balances are released to more remunerative use.

The model was not intended to pick the optimal strategy but to provide the decision maker with information of the cost/risk effects of various strategies so that each cash management decision might have a more rational foundation and a clearer distinction between money balances held for different purposes.

The model is a buffer stock model that unlike the other buffer stock models like the one of Beranek takes a simulation approach and thus takes into account the cash flow pattern of the individual firm.

It also allows for the possibility of using bank overdraft which has a special advantage in that the amount borrowed is automatically adjusted to the precise requirements to meet that part of the demand not financed by long-term finance. It therefore hedges the risk and avoids the cost of finance provided in excess of requirements. The problem is simply to negotiate a limit to cover the estimated total short-term borrowing required at any time.

Thirdly, it provides management with the cost/risk of various strategies for the decision maker to choose in light of other overall decision of the company.

It gives us a near optimal solution to our two related problem, allocation of resources between money balance and other productive assets as well as the mix of money balances held.

More important is the fact that the model also not only
looks at the investment of the resources between liquid money
assets and fixed assets but also shows that this investment
problem is not independent of the financing problem. The latter
is a relevent variable in making strategic cash balance decision
just as is the former. It is important to look at the two if we
are to provide management with the cost/risk involved in having
a particular cash balance policy. It also implies that in making
fairly optimal cash balance decisions, both the investment and
financing decisions should be considered together.

The conclusions that Prof. Gibbs arrives at are however
based on the findings from one firm and it is dangerous to '
generalise unless the same is found to hold true in other firms.
We shall see later whether they hold true in the Kenyan company
in which I did some research on the basis of this model.

CONCLUSIONS TO SECTION ONE

What has become evident in this literature review is that
in a changing world filled with uncertainty and dynamism, it
is not possible to reach a true practical optimum solution to
any problem and very much so in the field of finance, cash
management being no exception. We can only get to a situation
of near optimal.

The various contributors have been engaged in the search for
ways by which firms can determine the appropriate amount of cash
balances to be held. Some, especially the analytical models

attempt to develop generalized parameters for determining the optimum cash balance that the non-financial firms should hold but because of their sweeping assumptions, their models are rendered next to useless.

It has also come out clear that lack of optimal decisions in all other fields of management contributes to the difficulty of arriving at an optimal cash balance level. It is this lack of the models to incorporate other decision making centres that makes them incapable of providing optimal solutions to cash balance problems.

What is required of the Finance Manager is to provide information about the costs and risks of maintaining various cash balance strategies so that these costs are matched with costs and risks of various strategies in other corporate decision areas in a goal programming approach.

Another observation is that what is appropriate for one firm is not necessarily appropriate for another firm even if they are of the same size and in the same industry. Each firm needs particular attention. What this suggests is that analytical models are inappropriate for individual firm's application. A simulation approach is fairly appropriate.

It is not clear yet whether a good model needs to incorporate the growth trends of the firm. Though the money balances required is not necessarily in direct relationship with the sales level of the firm, they could in a way be increasing and also the cost of holding any extra pound in liquid assets could be quite high since it has many productive alternative

opportunities. Thus the two could have a compensating effect. In fact, the question whether cash balances increase in relationship to sales has yet to be resolved.

SECTION TWO

DEVELOPMENT OF HYPOTHESIS
AND SELECTION OF MODEL

C H A P T E R   T H R E E

EMPIRICAL SURVEY

OBJECTIVES OF THE SURVEY

The empirical survey had basically three objectives:-

(1) To find out the objectives that underlie cash balance
management decisions in Kenya.

(2) To investigate and find out whether firms use decision
rules that can be construed to be some form of model.

(3) To find variables and/or constraints that go into cash
balance decisions.

METHODOLOGY

The method employed was by way of mailed questionnaire
and limited personal interviews. The decision to use a question-
naire was because of its time advantage over personal interviews.
A mailed questionnaire has one basic limitation, it can be
misinterpreted.:. It also does not not provide supplimentary
questions which personal interviews would provide as the
interview takes shape. Limited personal interviews were carried
out and the general results (though the number of interviews
was only five) was not very different from the general pattern
of the results of the questionnaire.

A total of thirty one questionnaires were mailed to the
same number of firms picked from various industries of various

sizes excluding financial institutions. Interviews were carried
out in five firms, one of them of which had received a question-
naire and not responded.

DESIGN OF THE QUESTIONNAIRE

The questionnaire had ninenteen questions to it divided
into two major sections. This division was, however, very
artificial in terms of usefulness of the answers received on
each question. The first section of the questionnaire was des-
igned to provide information with respect to cash balance deci-
sion rules if there are any. The purpose was to discover whether
the firms use any decision rules that can in any way be con-
strued as some form of model.

The second section was designed to provide information as
to the objectives that are persued by business organisations
in making cash balance decisions. The section had four questions.
However, some of the desired information was also obtained from
responses to the first section.

There was a small last section consisting of two questions.
They were included for the purpose of finding out which firms
would be willing to allow collection of data so that cash bal-
ance data could be collected for use as raw material for an
application of a selected model in order to demonstrate its
usefulness to Financial Managers.

A copy of the questionnaire in full appears in appendix
V.

NATURE OF RESPONSES

The responses to the questionnaire were not very favourable. Some did not even write back to acknowledge receipt of the questionnaire and why they were not willing to complete them. However, the responses received could cast light in the direction of what the reality is. With respect to request to allow a researcher to collect more data from their records, most firms showed a negative attitude (see table II). As a prior warning, readers are asked to keep in mind that the observations made out of the responses are tentative since the sample was not large enough to make statistically valid conclusions.

As can be seen from table I, 10 out of 31 were completely unwilling to provide even the slightest information about their practices with respect to cash balance. Another 6 of the firms stated that they were unwilling to complete the questionnaire on various reasons which in themselves provide information about the nature of their cash balance management practices and objectives. Some of such reasons are:-

" We cannot complete the questionnaire because we are operating on overdraft, this makes the questions contained in the questionnaire irrelevant to our present situation."

" —— we cannot complete the questionnaire because:-

(a) We do not use this terminology.

(b) Our cash control methods vary according to changing situations and are not rigidly laid down.

(c) Any answers would be the opinion of one employee and
not of the company."

Table I :- Responses to questionnaire

NO	EXPLANATIONS	NO. INVOLVED
1	Completed questionnaires	14
2	Responded but declined to complete questionnaire.	7
3	Did not respond to questionnaire	10
	Total number of questionnaires	31
4	Personal interviews	5
	Less firm that had both questionnaire and personal interview	1
	Number of firms involved	35

"_ _ We are unable to help your survey owing to extreme
pressure of work mainly brought on by staff shortages, we can-
not spare time to give adequate consideration to your question-
naire."

" As we are relatively new and small company we ask to be
excused from completing the questionnaire."

Much can be inferred from these sort of answers. However,
this can be done only subject to the limitations that are
imposed by a mailed questionnaire. Putting aside the limitations,

we can observe that some of the reasons are because of a lack
of understanding of what the questionnaire was intended to
put across and thus giving a different impression from that
which could result from personal contacts and interviews. This
could be true especially with respect to the first answer. The
fact that they are working on an overdraft does not mean that
they do not need cash balance objectives and that practices
concerning cash balance management do not exist.

Table II. : Responses to request for more detailed cash
balance data.

NO.	NATURE OF RESPONSE	NO..INVOLVED
1	Willing to provide more detailed data.	3
2	Unwilling to provide more detailed data or allow collection of data by a researcher	11
	Completed questionnaires	14
3	Willing to allow a researcher but did not complete questionnaire	1
4	Contacted by personal interviews but unwilling to provide more detailed data	4
	Grand Total	19

I conclude there-fore that it is either misinterpretation or that they have no formal policy for managing cash balance or both. Even for the other excuses, it can reasonably be concluded that the firms concerned do not have cash balance policies nor do they use decision rules that can be construed as a form of model. They are most likely to consider cash balance as a residual of other plans. The fact that cash control policies and rules change from time to time does not preclude the use of models and laying down of policies. In fact a model and a good one too has to be adaptive to changing situations. The question of controls changing from time to time does not apply to cash balances alone, it applies to any other investment decision. That is why management has a challenging job of adapting to, and shaping situations. To suggest that the answers would be the opinion of one person and not those of the company is a clear indication that they do not have decision rules or company policies governing cash balance decisions. It is difficult to infer much from one of the reasons given, that they could not complete the questionnaire because of lack of sufficient time. For all other reasons, it is justifiable to conclude that the firms have:-

(1) No cash balance objectives apart from that of maintaining sufficient liquidity;

(2) No form of model for guiding in making cash balance decisions nor do they have decision rules for this purpose.

INTERPRETATION OF RESULTS

Objectives of cash management decisions

    Objectives of any organisation or section of an organisa-
tion can be found not in the statements made by company
officials but by studying the behaviour and practices of such
officials when performing their official company business. The
questions that were asked with an aim of finding whether firms
have objectives and policies for deciding on cash balances were
therefore insufficient. More information was got from other
questions that were asked in connection with procedures. The
division of the questions into sections was artificial. The
responses were as shown in table three.

Table   III : Responses to cash balance objectives

| | | | ANSWER | |
NO.	QUESTIONS		YES	NO
1	Do you think of cash balance policies in terms of trade off between lost opportunity and costs involved in incurring shortages?		8	10
2	Should cash balances be planned or simply a residual of other plans?			
		Planned	11	
		Residual	7·	
	Continued on page 68			

Table III cont....d/

NO.	QUESTIONS	ANSWER	
		YES	NO
3	Is it an objective of your cash strategy never to run out of cash?	6	12
4	Is a large cash balance necessarily better for the firm?		18
5	Do you distinguish between cash balances for normal operations and that earmarked for other predictable purposes?	13	5
6	Do you use a model that can be thought of as optimising?	5	13
7	Do you make cash balance decisions related to:-		
	(1) Maximum	2	
	(2) Minimum	10	
	(3) Both	2	
	or (4) None	4	

(N.B. The statistics in this table include responses from personal interviews.)

Not surprisingly, all the respondents (18) were of the view that larger cash balances do not necessarily mean that the company is better off. They accept it is idle cash. However,

one third indicated that it is their strategy never to run out
of cash. The one third happened to be the ones with limited
or no overdraft facilities. They therefore had a cause to con-
cern themselves with making sure that they do not run out of
pure cash. Again almost a similar number (11/18) were of the
opinion that cash balance should be planned, slightly less than
half (8/18) view cash balance as being a trade off between lost
opportunity and the costs of financing shortages.

The responses seem to suggest that firms hold the views
that:-

(a) Cash being a medium of exchange, large accumulation of
    cash balances is not necessarily beneficial to management.

(b) Cash balance needs to be planned.

(c) Cash balance does not involve a trade off situation
    between lost opportunities and the costs of financing
    shortages.

The last two observation may seem to be contradictory but
this is not the case. Planning is a means to an end whether
firms view cash balances as a residual or an investment would
determine what objectives the planning is geared to. What seems
to be happening is that firms are planning but with the purpose
of forecasting shortages so that precautionary measures can be
taken. This observation is strengthened by answers to two other
questions.

Table III also shows that thirteen out of the eighteen do
not employ a model that could be regarded as optimising. With
regard to the seventh question, (see table III) , only two
indicated that they made cash balance decisions related to both

maximum and minimum while fourteen were either making decisions
related to minimum balances or they were not at all making
decisions with respect to any of these variables. It is there-
fore reasonable to conclude that they are mostly worried about
maintaining a certain minimum.

To summarise on this aspect, most firms have an objective
of ensuring that a certain minimum balance is maintained. Their
planning for cash balance is to facilitate information that
will lead to such decisions, that is, the minimum that should
be maintained.

The reader is again cautioned to bear in mind that these
observations are made on the basis of the limited information
from a small sample. They should be regarded as tentative.

Cash Balance Decision Process

The questions in this section were designed to provide
information as to whether firms use decision rules. Secondly,
to establish whether such decision rules can be construed to
be some form of model. Thirdly, to find out what variable or
constraints do go into cash balance decision making. Specifically ,
the questions that were asked were of the following nature:-

(a) Do firms have any formal policy for making cash balance
decisions?

(b) What variables do they refer to when making such decisions?

(c) Do they distinguish between balances held for daily
operational requirements and those held for other
purposes?

(d) Do they make cash balance decisions with respect to
minimum and/or maximum cash balances to be held?

(e) Are their cash planning periods related to any perceived cash cycle?

(f) How frequently do they make cash balance decisions?

(g) How do they finance shortages and use temporary surpluses?

The exact wording of the questions appears in the appendix V. The statistics of the responses were as depicted in table IV shown below.

Table IV : Responses to cash balance decision process.

NO.	QUESTIONS	ANSWER	
		YES	NO
1	Do you use a formal policy for making cash balance decisions?	16	2
2	What variables do you refer to when making such decisions:-		
	(a) Total sales	1	
	(b) Total assets	←	
	(c) Working Capital	6	
	(d) All of a & b & c	3	
	(e) Both a & b	7	
	(f) Both b & c	1	
3	Do you make a distinction between cash balances for normal operations and balances for other purposes?	13	5
	Continued on next page.		

Table IV cont....d/

| NO. | QUESTIONS | ANSWER | |
		YES	NO.
4	Do you use cash balance decisions with respect to:-		
	(1) Maximum	2	
	(2) Minimum	10	
	(3) Both	2	
	(4) None of the above	4	
5	Is the planning period related to any cash cycle or	4	7
	You don't plan for cash	6	
6	How frequently do you make cash balance decisions? Daily	2	
	Weekly	3	
	Monthly	4	
	Quarterly	1	
	Ad hoc	8	
7	How do you finance cash shortages?		
	(1) Bank overdraft	12	
	(2) Delaying payments to creditors	2	
	(3) Both one and two	2	
	(4) Credit extensions	4	
8	How do you hold cash perceived as temporary surplus?		
	Marketable securities	-	
	Redeem short-term debts	4	
	Bank deposit account	2	
	Others	12	

Do they use any decision rules?

The outcome of the survey indicates that most of these firms do not use decision rules that could be equated to some form of model though when asked a direct question as to whether they had a formal policy, all except two indicated that they did. But answers to other questions showed that this was not true. It is most unlikely that they would have decision rules related to cash balance for normal operations when they did not make a distinction between such balances and that intended to finance predictable transactions. Responses to this question showed that 13 out of the 18 did not make a distinction between the two.

Secondly, if they had a formal policy of making cash balance decisions, then one would expect them to have a regular interval at which they make cash balance decisions. In fact 8 out of the 18 stated that they made ad hoc cash balance decisions. Having concluded that those who gave excuses have no cash balance policies, the number of those who made ad hoc decisions increases from 8 to 14 out of 24.

What seems to be happening is that, decision rules are used only with respect to the minimum cash balance that must be held. But as we shall see later, most of these companies had overdraft facilities beyond their current requirements so a risk of being incapable of paying debts was very low. It is therefore reasonable to assume that they hardly make major cash balance decisions, even if they could be economically useful.

Cash balance decision variables

For the purpose of gathering information regarding variables
that go into cash balance decisions, the respondents were asked
to state what factors they put into account when making such
decisions. A number of possible factors were listed and they
were asked to add some more which they considered relevant when
making cash balance decisions. The distribution of the responses
is given in table III question number two.

It is evident from the answers that working capital was an
important constraint. It probably suggests that optimum working
capital can be determined, implying that working capital items
can be traded off against one another. It is a possible area
for research. Total sales did not seem to be a relevant variable,
only one respondent indicated that it was. Total sales was not cons-
idered a constraint but it was in conjunction with working
capital. It is not clear why sales alone was not considered a con-
straint. It could probably be suggesting that certain level of
working capital is required for a certain level of sales.
Alternatively, the interviewees interpreted both a & b as
either a or b or both.

Surprisingly none of them mentioned such items as interest
charges on bank overdraft, interest on deposit account and
opportunity cost of not using cash in long lived assets.

There could be a number of possibilities to this:-

(1) The question might have been misunderstood or,

(2) it could be that when making cash balance decisions,
emphasis is given to the need to hold cash sufficient
to meet bills but not the form in which to hold the cash

balance in terms of deposits or investment in other
short term assets.

Anyhow, on the basis of the information received, working
capital and sales levels have been indicated as the variables
that go into cash balance decision.

Financing Shortages and Deploying Temporary Surpluses

The firms which contributed to the survey fell into three
groups:-

(1) Subsidiaries of international companies with at least
a Kenyan sitting on the Board of Directors.

(2) Subsidiaries of international companies with no Kenyan
sitting on the Board of Directors.

(3) Companies incorporated in Kenya.

Responses to the question of financing shortages and
deploying surpluses followed closely these groups. Of the
eighteen who responded, four were of group one, ten were of
group two and the remaining four were in group three.
As shown in table IV, the responses were as follows:-

(1) Bank overdraft   12

(2) Delaying payment to creditors   2

(3) Credit extentions (from parent company)   4

(4) Both 1 and 2   2

Nine of these firms using overdraft were multinationals
of group one and they have been on overdraft since they
started business. Those operating on credit extensions from
parent companies were the four that had no Kenya on their
Board of Directors. Kenyan law at moment prohibits overdraft

facilities to a company which has no Kenyan on its Board of Directors. All the companies, that is, those for which overdraft facilities are available and those for which credit extensions from parent companies are available have negotiated for the facilities beyond their immediate requirements. They have hardly exhausted them to concern themselves with alternative sources of finance for temporary shortages.

We can observe from the data that many firms in Kenya, being subsidiaries of multinationals use overdraft financing to finance cash balances (unless they do not have a Kenyan Director and the number of such firms is not high anyhow).

We concluded earlier on that most of the companies tend to be concerned with the minimum cash balance that they must hold but it does not, however, appear to be something that should be of major concern. Especially in view of the fact that there are plenty overdraft facilities. These firms should instead concern themselves with the problem of searching alternatives to which these overdraft facilities can be put. In fact when asked to state what temporary cash surpluses are put to most of them (12/18) stated that they have no surpluses which could be invested in short lived assets. Only four stated that they use temporary surpluses to pay for credit extensions or to reduce the outstanding overdraft. Quite strangely, none of the respondents seem to show interest in marketable securities. Those who do not have enough overdraft facilities and find themselves with temporary surpluses just leave it on the current account.

These observation again are based on the little

information contained in the few responses received with
regard to the questionnaire. The reader is therefore again asked
to consider them as very tentative.

Summary of Observations

I am inclined to draw a number of observations on the
little information available. These observations with respect
to the objectives of the survey are:-

(1) The basic objective of cash balance decisions in firms
    in Kenya is to ensure that at least the minimum balance
    is maintained. It is to ensure that they do not suffer
    a shortage. The idea of minimizing costs of
    maintaining a cash balance does not arise.

(2) Firms in Kenya do not use any decision rules that can
    be construed to constitute some form of a cash balance
    decision model. The reason given is that they use
    overdraft facilities. This makes it meaningless to
    use a decision model because overdraft varies with the
    transaction needs and thus leaves no idle balances.

(3) The major variable that Kenyan firms believe to be a
    determinant of cash balances is the level of working
    capital.

(4) Majority of firms in Kenya finance their cash balance
    needs by the use of external finance, that is,
    overdraft facilities or for foreign firms credit
    extensions from parent companies.

(5) Cash balance is viewed as a means of facilitating
    transactions. It does not matter if it is all held on
    a current account. It is not an item that needs

separate planning with the objective of minimizing
costs or increasing returns.

STATEMENT OF HYPOTHESIS

From the report of the empirical information given on
the preceding pages, I hypothesise that:-

(1) The basic objective of Kenyan firms for holding cash
    balances is to ensure that they don't run out of cash.
    (That is why they emphasise minimum balances to be
    held.) It is not aimed at holding a cash balance that
    will minimise total costs (where total costs is made
    up of holding costs netted against costs of financing
    cash shortages and the risk of deterioration of credit
    standing of the company).

(2) Firms in Kenya do not have formal policies for making
    cash balance decisions nor do they use decision rules
    that can be construed to be some form of model. Two
    possible explanations could be advanced for this,

    (i) Firms in Kenya believe that because they are
        operating on overdraft, it becomes meaningless
        to use a decision model. An overdraft has the
        advantage of adjusting to the level of daily
        transactions so you have no balance lying idle.

    (ii) Cash is viewed by the majority of the firms
        to be a residual which results from other plans.

(3) Firms in Kenya believe that the major variable that
    influence the level of cash balances is the level of
    working capital.

capital.

In other words suggesting that the level of cash
balances is influenced by the level of activity. A
relationship which is under hot debate.

(4) Most of the firms in Kenya finance their cash balance
needs by the use of external short term financing
mainly by overdraft for Kenya firms and credit
extension from parent companies for non Kenyan firms
with no Kenyan director.

(5) Majority of Kenyan firms plan for cash but not for
cash balances to be held for normal operations. They
hardly make a distinction between such balances and
those held for other purposes. The purpose of such
planning is to detect periods of excess outflows
against inflows so that sources of finance can be
negotiated in advance and not with the objective of
minimising costs of maintaining a cash balance.

CHAPTER FOUR

MODEL SELECTION

In the last chapter, tentative hypotheses were made. One of them being that firms in Kenya do not use cash balance decision models in making cash balance decisions. The succeeding pages consist of a look at why it is felt that Kenyan firms should employ some form of cash balance decision model to guide them in making cash balance decisions. A criteria is developed to act as a basis for selecting a model that will be recommended for use by Kenyan firms. Before a model is selected we shall also look at the basic foundations upon which an effective decision model can be based. Finally we shall look at the nature and findings of the particular model selected.

NEED FOR CASH BALANCE MODEL

A cash balance decision model is necessary for the following reasons among many others:-

(1) It encourages both short and long-term planning. The use of a cash balance decision model helps in estimating cash requirements over a period of time;

(2) It enables effective control systems to be established. Such efficient control systems are necessary not only for custodial purposes but also for making it possible for deviations from normal to be detected in time. It thus makes it possible to keep cash balances that enhance returns to owners of the business organisation.

(3) It encourages efficient and effective utilisation of:-

    (a) sources of finance,

    (b) temporary cash balance surpluses which could
        probably have been lying idle.

(4) It makes it possible for planners to be aware of various
decision alternatives available to them and the costs
involved in choosing each alternative and matching them
with the departmental and/or overall company objectives
and strategies. In other words, it reveals a lot of in-
formation with regard to this decision area which could
otherwise not have been easily available.

(5) The use of a model would facilitate the co-ordination
of the cash balance decision area with other decision
centres. This is very essential in today's business
organisations because of their increasing complexity
and size.

However, it should be born in mind that what comes out of
a system is no better than what goes into it. The point is that
for a model to be effective the information fed into it should
be an outcome of other efficient management practices.

FOUNDATIONS OF EFFECTIVE AND EFFICIENT CASH MANAGEMENT

Just as sub-optimisation could result from trying to
optimise the sub-goal independently of the major goal and other
sub-goals through making cash balance decisions independently,
it could also result from using a model that helps determine
optimal cash balances which feeds on inputs that are a result

of inefficient management. The management of cash balances
should be seen in the light of the management of the whole
business. The models that were reviewed in chapter two made
various assumptions. It is the purpose of this section to con-
sider these underlying factors. If the firm does not fulfil
them, then the optimal cash balance so determined by the model
is not a true optimal. Some of the underlying variables include:-

(1) Proper planning and forecasting of cash requirements,
such forecasting will reveal how much is expected to be
generated from various sources and trends of expenditures.

(2) There is a proper planning and execution of company
policies and strategies of the firm as a whole, say,
if a company could benefit by taking discounts but
discounts are instead not taken, then the optimal cash
balances that we may determine will not be the true op-
timal balances. In other words it is assumed that all
assets of the firm are managed efficiently.

(3) Cash collections from all sources are efficient, that
is, there is no much time wasted in the float period.

Effective cash management is even more important today
than in the past for a number of reasons:-

(1) The increased complexity of business organisations.

(2) The relative size of capital investment that has brought
about the need for effective cash policies.

(3) The increased interdependency between firms.

In general, proper cash management requires the development
and application of some practical administrative procedures to
accelerate inflow of cash and to improve the utilization of

excess funds thus generated. The administrative procedures in-
clude:—

    (a) Proper cash planning,

    (b) Effective control of cash flows,

    (c) Productive utilization of excess funds.

A proper cash planning

    There are two tools open to management to this respect. The first
is a long range cash projection which relies on the definition of
goals management intends to accomplish over the period under
consideration. The purpose of long range projections is to show
whether over a period of time, money can be generated through
working capital growth, when and where funds will be needed and if
they will be available, at what time?

    The second tool is the short range forecast. It takes two
forms:—

    (i) A cash receipts and disbursement statement showing the
        beginning balance of cash and short-term investments,
        projected cash receipts for the period estimated cash
        disbursement for the period and the ending balances of
        cash and short-term investments;

    (ii) A cash flow statement showing the projections of revenues,
        expenses and net income on a cash basis. The two statements
        have a purpose of projecting the flow of cash into and out
        of the company over a regular interval of time.

    Michael J Melbourne has suggested a number of action rules
with respect to cash planning[1] They are as follows:—

    (1) Make a realistic estimate of sales receipts. At this
        stage less weight should be given to other forms of

sources like overdraft and other short-term loan money
for they have certain limitations.

(2) A realistic appraisal of debtors should be   based on
company policy on credit terms and collections of debtors.
Too loose a policy increases the risk of illiquidity
while too tight a policy would affect sales levels and
hence profits expectations.

(3) A realistic appraisal of flow of expenditures should be
made and efficient methods instituted. An understanding
of cash flows in and out of the firm is essential.
Diagram 1 is a cash flow model of a typical manufacturing
firm. Each firm may have a different pattern.

(4) After the inflows have been matched against outflows,
arrangements that may be necessary to ensure that standby
funds are readily available should be made.

Diagram 1 shows the cash inflows and outflows of the firm.
It flows in from creditors and collections of receivables and
other inflows not from normal operations. If we consider a time
planning horizon, then the opening balance is another source.
It is used to pay off factory expenses, labour wages and
management and clerical salaries, raw materials and other extra-
ordinary payments. Dividends, taxes, interest payments and loan
repayments also are outflows from the pool of cash resources.
Finished goods are sold on cash and/or on credit basis. The
cycle begins again by collections from accounts receivables.

Diagram 1 : An expenditure and generation of cash model.
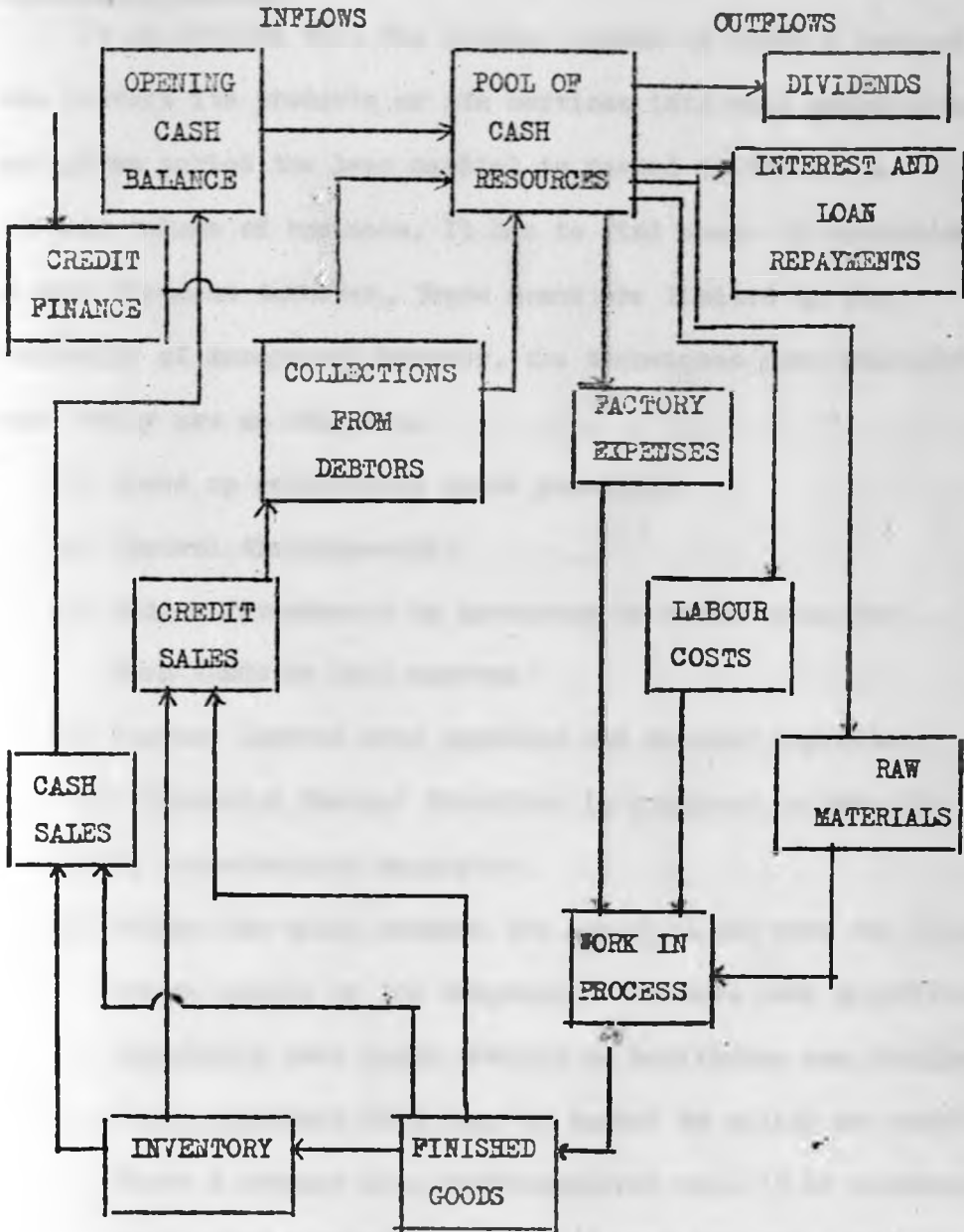
Effective Controls

It is obvious that the greater number of times a company can convert its products or its services into cash proceeds in any given period the less capital is needed to finance a certain volume of business. It has to find means of accomplishing a more frequent turnover. These means are limited by the ingenuity of management, however, the techniques more commonly used today are as follows:-

(1) Speed up collections where possible;

(2) Control disbursements;

(3) Reduce investments in inventory to avoid tying too much funds in such assets;

(4) Improve control over payables and related payments.

The Financial Manager therefore is required to take the following comprehensive measures:-

(i) Reduce the delay between the receipts and when the funds become usable by the company. It becomes more significant especially when large cheques or remittance are involved. It is important that they be banked as quikly as possible. Where a compary is a divisionalised one, it is necessary that tight control be exercised over transfers of cash between divisions of the company. This will reveal excessive funds that usually become temporarily tied up in various divisions of the company and thus unproductive. Further improvements could come about if efforts are made to reduce the delay between sale of the goods and invoicing the customers. Unnecessary pockets of idle funds could arise if bank accounts have large cash balances.

Malbourne suggests that to eliminate this, bank accounts
should be kept to a minimum and the remaining accounts
operated on an imprest basis or on the basis that all
balances above a small operating figure is transferred
automatically by the bank each day to the central account.

(ii) In addition to accelerating collections, effective
control of disbursement can result in a faster turnover
of cash. Whereas the underlying objective of collections
is maximum acceleration the objective of disbursements
is to slow them down as much as possible but not to the
extent of undermining the credit worthness of the company.
It is to arrange terms such that cash disbursements are
not too fast and it does not mean that payments should
not be made on due dates. In fact to ensure that payments
are made on due dates,it is necessary that the operating
procedures are defined. If cash discounts are taken on
accounts payable, the procedure should aim towards
elimination of loss of discounts due to clerical inefficiency.

(iii) Playing the float is another way of increasing the
availability of funds. The float is the difference be-
tween the total money amounts of cheques shown on the
bank statement. It usually happens that a company has
a negative balance in its cash book and a positive bank
balance due to cheques drawn but not yet presented to
the banks.

This can be achieved only with fast accurate reports on
cheques outstanding and the dates they were remitted together
with accurate knowledge of the drawings on or deposits to the

bank account. An accurate estimation of the float should be
able to release surplus funds to be placed on some profitable
location until they are needed not when the cheque is drawn
out but when it is presented at the bank.

In summary the financial Manager can maximize cash avai-
lable to put on profitable use by accelerating collections
effecting payments due to dates, having few main bank accounts
and studying cash flow including the relationship between cash
book and bank balances.

Cash management objectives are important in determining
the cash policies that will be followed. However, it is to the
benefit of the company that such objectives be defined in
relation to overall corporate goals and objectives.

Performance Measurement.

Often Financial Managers are under the impression that
their performance is judged on their ability to procure funds
when needed rather than by how much they pay for the funds.
In fact managements are often tempted to evaluate their fina-
ncial executives on this basis. It is a short sighted criteria
as in the long run they usually realize that the company is
heavily mortgaged. The performance of the financial executive
should be on the basis of how profitably funds are utilized and
maintainance : of a good liquidity position and general fina-
ncial health of the company. He should try to keep the cost
of maintaining such a position to the minimum possible. This
is true especially in such periods when a climate of soaring
interest rates and acute shortage of funds prevail.

The purpose of considering methods of evaluation here is

that the way an executive is evaluated will influence the manner in which he will manage the unit. Evaluation should be in line with the objectives and goals that a particular operation is intended to fulfil.

Controlling and Monitoring

Control of company's liquidity requires fast and accurate information on any variations in actual cash inflows and out-flows from that forecasted. Reasons for these variations from forecasts should be investigated. External factors which have a considerable effect on cash forecast require that such plans be updated. Such factors include strikes, changes in tax rates, shortages of raw materials or dramatic price changes in them. In fact such effects should be tested by methods like sensitivity analysis to see the magnitude of their effects. They would show what the critical factors to the cash flow patterns are. With the increased capability and usage of computers such plans can be programmed and simulated to determine critical cash peaks and provide first-hand information concerning cash balances.

Productive Utilization of Excess Funds

The first two have been dealing with means of increasing availability of funds for use in productive ventures. This last one considers the ways in which excess cash resources can be used. Various alternatives must be considered. If the firm has no profitable opportunities then the excess cash should be used to pay dividends or redeem some liabilities. This recommendation is on the understanding that the excess cash is that beyond cash required for normal day to day transactions. If the excess is temporary then investment in short-term assets or a savings

account may be some of the alternatives available.

Conclusions

The general observation from the preceeding discusion is that efficient cash management is not going to be achieved simply by using a model that determines near optimal cash balances. It is going to be achieved if all facets of the business are well managed and objectives of cash management well understood by those who administer cash balances. Full utilisation of cash will not come-by if cash is considered as a residue of other business decisions.

As a result any cash balance model that purpots to help us determine optimal cash balances is built upon certain underlying factors as shown in diagram 2. The five variables are not independent of one another. They are divided here for analysis purpose.

Diagram 2 shows that while the cash model is built upon the five factors, the cash balance model should be such that it also provides a feedback for the various costs of cash strategies to the five factors in order to help in deciding which is the most optimizing combination of strategies. It is an open system.

Diagram 2 : Factors that go into cash balance management.

```
                    ┌──────────────┐
                    │  CORPORATE   │
                    │  PLANS AND   │
                    │  STRATEGIES  │
                    └──────────────┘
                           ↑
                    ┌──────────────┐
  ┌──────────────┐  │ CASH BALANCE │  ┌──────────────┐
  │     CASH     │  │    MODEL     │  │     CASH     │
  │  MANAGEMENT  │←→│  DETERMINES  │←→│  MANAGEMENT  │
  │ (OBJECTIVES) │  │   OPTIMUM    │  │  (CONTROL    │
  └──────────────┘  │ CASH BALANCE │  │   MEASURES)  │
                    │    LEVEL     │  └──────────────┘
                    └──────────────┘
                      ↑          ↑
  ┌──────────────┐              ┌──────────────┐
  │     CASH     │              │ EFFICIENT AND│
  │     PLANS    │              │  EFFECTIVE   │
  └──────────────┘              │ INFORMATION  │
                                │   SYSTEMS    │
                                └──────────────┘
```
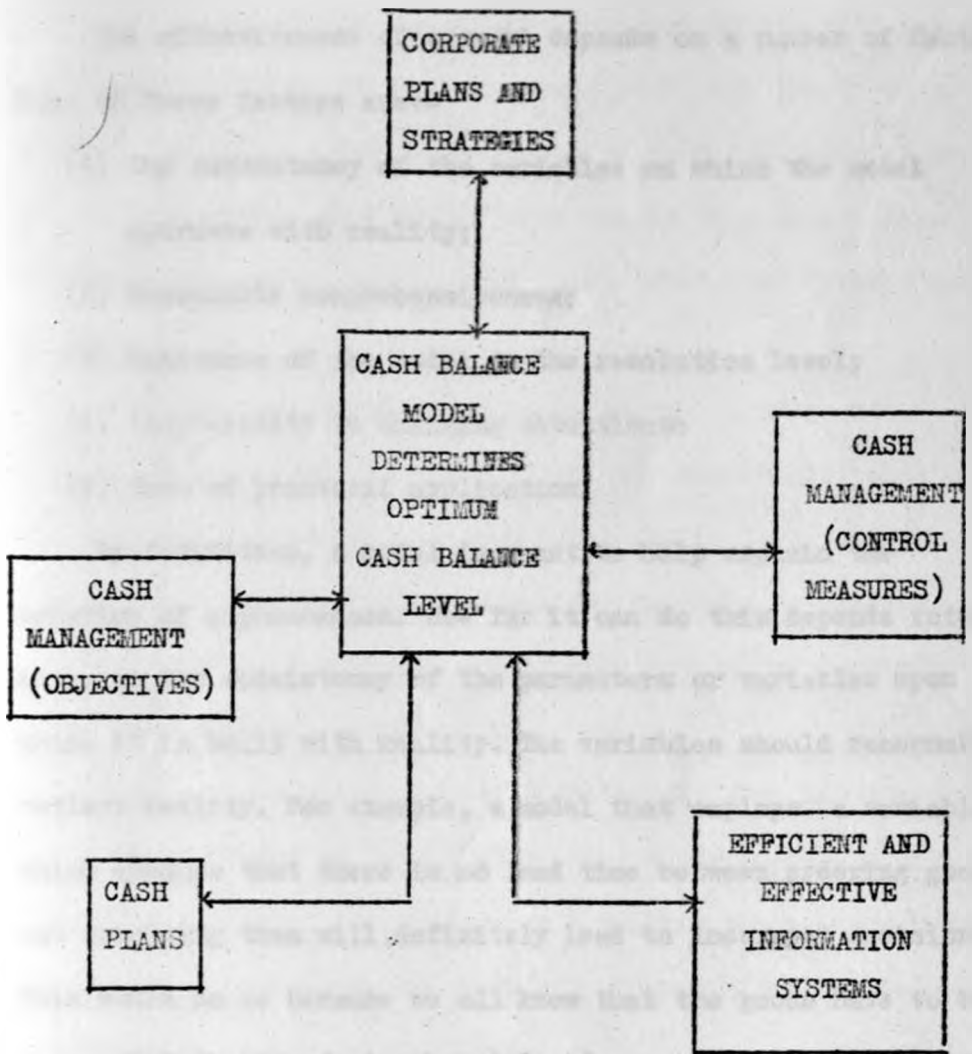
CRITERIA FOR MODEL SELECTION

The effectiveness of a model depends on a number of factors. Some of these factors are:-

(1) The consistency of the variables on which the model operates with reality;

(2) Reasonable comprehensiveness;

(3) Relevance of the model to the resolution level;

(4) Adaptability to changing situations;

(5) Ease of practical application.

By definition, a model is meant to help explain the behavior of a phenomenon. How far it can do this depends inter alia, on the consistency of the parameters or variables upon which it is built with reality. The variables should reasonably reflect reality. For example, a model that employs a variable which assumes that there is no lead time between ordering goods and receiving them will definitely lead to incorrect decisions. This would be so because we all know that the goods have to be appropriated, priced, transported and received by the purchaser. Even if it is a foreman in the factory making a requisition from stores, there is bound to be time lag between the two.

An effective model should be comprehensive and capable of providing information about the critical factors to a situation that requires a decision to be made. A comprehensive model will minimize guesswork and/or misinterpretation. It should be able to lead to same outcomes irrespective of who applies it so long as it is under similar conditions.

Not less important is that the model should be relevant
to the resolution level. Resolution level refers to the point
at which we are seeking solutions, for example it could be at
departmental level, divisional level, corporate level, or at
national level. A model that helps us to find solutions to macro-
economic problems is unlikely to be useful to a single firm
within the economy. This is very often overlooked by many model
users.

Different organisations face different environments.
This is true not only to the external environment but also to
the internal environment. A good model should be capable of
adapting to these differing situations in order to produce
desired results. Analytical models make generalized assumptions
which may not apply to all firms.

Finally, the model must be operational. What is meant here
is that if a model is developed on very abstract and highly
theoretical parameters, it becomes a problem to be interpreted
for practical purposes. It could end up as a piece of academic
exercise.

Requirements for a good cash balance model

The requirements mentioned above apply to any field of
study be it concerning inventory control, cash balance
management or replacement decisions. Specifically, a model for
cash balance decisions should fulfil the following requirements:-

(1) It should help us operate a cash balance that makes
economic sense. It should help minimize the costs of
running a business or maximize the returns to invested
capital subject to the constraints that the firm faces.

(2) It should be adaptive to the behaviour of the cash
balance pattern of the firm for which a search for
solutions is being made. A model of this nature is
called an open system. It is only then that it would
provide information with respect to the costs and risks
involved in maintaining various cash balance strategies.
This cost risk information would be matched with other
strategies in other decision centres in the organisation
in a manner that will lead to the selection of that cash
balance strategy which is in the best interest of the
firm. That is, a strategy which will help achieve
corporate objectives.

(3) The model should be relevant for use at individual
organisational level. A model designed for use at national
level will not suit individual firms. This does not call
for different models for different firms, what is required
is a model which makes it possible to incorporate varying
conditions that individual firms face.

EVALUATION OF THE MODELS

The models to be evaluated in this section are those that
have been discussed in chapter 2. They were basically divided
into two categories namely analytical and simulation. What
follows is the assessment of these models on the basis of the
requirements discussed earlier. They can be perceived to lie
on a continum. The analytical models are at the lower end of
the continum and the simulation models at the upper end of it.

The Baumol model could be considered to be internally consistent. However, the variables and parameters on which the model rests are not realistic in the practical sense. A good example of such assumptions is that there are fixed costs of transfering money resources to and from securities and that these costs are significant enough to make them a critical variable in cash balance management decisions. It is most unlikely that the fixed costs are significant, expenses like the salary paid to the Financial Manager is fixed regardless of whether he makes such decisions or not, they are therefore irrelevant costs. If we recall, in chapter one it was stated that the cash balance problem is double edged. There is the problem of determining how much to hold in money assets on the one hand and how to hold the money assets so determined. The Baumol model does deal with the latter problem while it is the first problem that requires a solution before the second one. This is like 'putting the cart before the horse'. Having adopted rigid assumptions, the model is not adaptive to changing environments.

Lockyer's model is not independent of the Baumol model. It is infact basically the Baumol model with a modification that allows for bank overdraft to be included. . Since most big firms do use some form of overdraft, it is a critical variable which no good model can omit. However, the basic assumptions upon which the model rests are similar to those of the Baumol model. This model is therefore ranked a stage ahead of the Baumol model.

Beranek's model scores more than the previous two but still

does not meet a number of the requirements discussed earlier.
Beranek left his model rather incomplete for he could have
developed it into a simulation model. Its practical importance
is limited by the complications created by the time horizon
and lack of adaptability in order to allow it to incoperate
different conditions under which different organisations operate.
Some of the assumptions made by the model do not lead to near
optimal decision making. For example, the assumption made about
the situations that the Treasurer faces cannot lead to optimal
decisions. Basically, the assumption is that the Treasurer is
faced with two types of cash transactions:-

(1) Passive transactions. He defines these as those tran-
    sactions that the Treasurer has no say in their deter-
    mination. He has to take them as given and provide
    finance.

(2) Those transactions in which he takes an active part for
    example purchasing and selling securities or transferring
    money to and from deposit accounts.

Such an assumption advocates independent decision making
in various decision centres. A policy of this nature points
towards sub-optimization. The only way the Treasurer can
contribute profitably to the organisation is by providing
information about the costs and risks involved in adopting a
particular strategy. The Treasurer is in fact in an advisory
position in this respect. The other limitation with this model
is that it provides information with respect to how to hold
our money assets and does not touch the problem of how much to
hold in the form of money assets. It thus avoids the major
problem.

Miller and Orr's control limit model comes out with a formula for determining how much pure cash (bank current account) should be held, when to purchase securities and sell them. What it implies is that the formula is universal, however, this should not hold true since various firms operate under different conditions. Adaptability is therefore missing in this model. It fails to help solve the problem of determining money balances that would best serve the objectives of the firm. It does not allow an accommodation of unique cash balance behaviour that could be prevailing in different firms. Similar to the Baumol model, it is built upon an understanding that there are fixed costs involved in making money investments and withdrawing them. When this assumption is dropped the model falls to shambles. The survey carried out and reported in chapter three showed that Kenyan firms do not make securities transactions, they hold deposit balances instead. The costs involved in such transfers are negligible.

By now it is probably clear that analytical models are not suitable for use in individual business firms. They are designed to deal with macro-economic problems.

We are then left with two models which adopt a simulation approach. In earlier paragraphs, we have had a look at the advantages that are provided by simulation models, similarly we have had a look at the requirements for a good cash balance decision model. The next few paragraphs deal with what attempts have been made by simulation models to help solve cash balance management problems. It is also an attempt to assess them along with analytical models.

Stephen Archers model does not go far to incorporate
simulation approach though it lays a good groundwork for deve-
loping a simulation model. That Stephen Archers attempts to
do is to show the most likely pattern of cash balance behaviour.
This would provide information that could be fed into a
simulation computer program with various parameters in order
to provide us with the sort of balances that we would need to
hold. He does not go far to tell us how such a program could
be developed and the sort of information we would expect out
of it. Similarly, he does not go far to tell us how balances
so determined should be held in other money assets in order to
minimize the costs of maintaining such balances. The model is
thus not complete.

The last and which I consider more useful is the Gibbs
version of buffer stock simulation model. The model can be used
to test the present practices to find out whether they are
economical. It can also test alternative policies and strategies
so that management can be informed of the costs of selecting
a particular strategy. It also provides information about the
marginal effect of a change in some of the variables that
underlie cash balance decisions. This makes the model flexible
and can be effectively applied to different firms.

The model was applied to a single firm in U.K. Further
experiments in other firms is necessary to confirm the
conclusions arrived at by the use of the model.

Nature of the model selected

On the basis of what has been discussed, it is clear that
the Gibbs buffer stock model is far superior than the others.

It is therefore selected for empirical application for the
purpose of demonstrating how useful the model can be in aiding
management in cash balance decision making.

The model presupposes that decision rules for the follo -
wing aspects can be determined by simulating cash balance
data over a period.

   (1) The buffer money balances necessary to reduce the pro-
       bability of cash out to zero or negligible proportions.

   (2) The optimal disposition of the money balances at any
       time between cash and a selected interest earning
       money outlets.

   (3) The optimal level of short-term borrowing to be used.
       The short-term financing sources could be by overdraft
       or by other means.

The cost parameters used were:-

   (a) Bank overdraft interest charges;

   (b) Interest on deposit balances;

   (c) Opportunity cost in terms of foregone earnings by
       holding resources in money balances.

Findings

(1) He found that the level of opening balance that would
completely avoid a cash out was the same as that which was
the most economical.

(2) Two sets of data were simulated. They were collected from
periods when the difference in the level of sales was significant.
He also found out that the level of opening balance that would
completely avoid a cash out and that was most economical was the
same for the two periods. This suggested that the level of money
balances has no relationship with the level of activity.

SECTION THREE

EMPIRICAL APPLICATION OF
GIBBS MODEL
AND
CONCLUSIONS

CHAPTER FIVE

EMPIRICAL APPLICATION OF GIBBS' MODEL

This chapter is a report on the empirical investigation into the cash management problem of one Kenyan based subsidiary of a multinational company. The investigation was mainly an application of the Gibbs version of a buffer stock model to assist in determining cost/risk effect of various monthly opening cash balance strategies and determining money management decision rules.

OBJECTIVES OF THE INVESTIGATION

The main aim was to study the particular cash flow pattern of the organisation with a view to applying a simulation model of the Gibbs version to a planning period that is related to the firm's cash cycle. This meant determining decision rules with regard to a number of aspects such as:-

(1) The amount of finance that should be allocated to the cash balance as opposed to long-term investment. In other words, the buffer stock money that is required at the beginning of each planning cycle so as to minimize holding costs.

(2) The buffer money balance that is necessary to reduce the probability of cash out to zero or negligible levels.

(3) The optimal allocation of money balances at any one time between pure cash and interest earning money assets.

(4) The optimal short-term borrowing to be used. Bank over-

draft was assumed to be the only short-term financing source.

(5) To investigate the possibility of there being a relationship between cash balances for normal operations and the level of activity.

METHODOLOGY

Minimization of the cost of holding the desired balance was the basic criteria. Cost for this purpose was defined as:-

(1) Explicit financing cost in the accounting sense.

(2) Opportunity cost in terms of returns foregone by the need to hold a cash balance.

These costs were netted out with interest realized on deposit account which was assumed to be the only short-term money outlet. It should be noted that minimum cost may be subject to internal or external constraints imposed by management or the external environment. For example a policy to avoid a cash out at any cost or not wishing to use short-term financing or its non-availability.

The first step was to collect data and study the cash balance pattern.

The subsidiary had a cash cycle of the calender month period. Creditors' accounts were regularly paid for on the last two or three working days of the month. Though cash and trade discounts were available for earlier payment, the company never took the advantage on the grounds that its debtors also never took advantage of earlier payments. Thus if the company took

the advantage, it would require more money early in the month, this would in effect increase their interest bill on bank overdraft. Customers' accounts were also on a calender month cycle, receipts coming on the last two or three working days of the month. This meant that cash was received and alternately paid out to creditors, the balance being used to reduce the overdraft. The company was able to avoid high interest bills in this manner. The rest of the month was characterized by small payments including mid-month advances for the junior staff, payments for casual labour and other general expenses met from the petty cash. It was characterized by small minor receipts from sales of special products which formed about 1% of total sales. The net flows in each period therefore seemed to reach a lowest point a few days preceding the last working days of the month. The general pattern is depicted in figure 13.

Figure 13: Cash balance behaviour pattern observed in a Kenyan firm.
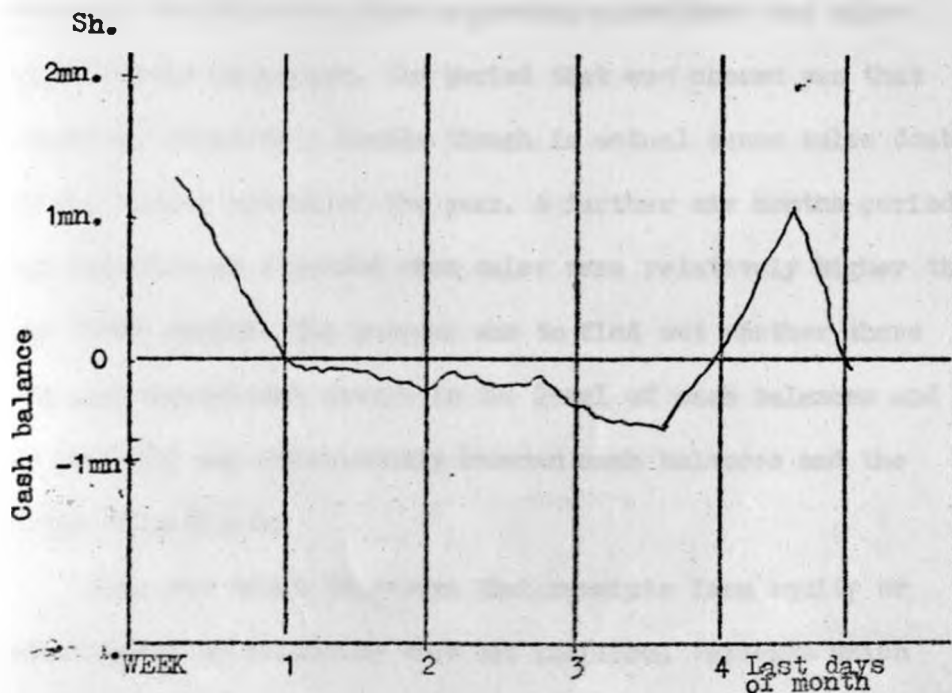
This pattern in general suggests that a balance is needed virtually for the whole month especially a few days before major receipts come in and major payments are made. A surplus was available only in the last days of the month to invest either in short-term money outlets or use it for other purposes like channelling it into further productive long-term investments or redemption of long-term debt finance. Some of the alternatives the company had were:-

(1) To retain the surplus so that it can finance the excess of payments over receipts during the month until higher net inflows come by towards the end of the month.

(2) Leave the pure cash balance at zero so that it is financed solely by overdraft while the surplus at end of month is employed in alternative uses.

A monthly planning period for money seemed appropriate.

The data collected was for a period of twelve months. It was appropriate to select a period when sales were stable. However, the firm is a fast expanding subsidiary and sales could treble in a year. The period that was chosen was that which was relatively stable though in actual sense sales doubled in the latter months of the year. A further six months period was selected at a period when sales were relatively higher than the first period. The purpose was to find out whether there was any significant change in the level of cash balances and to test for any relationship between cash balances and the level of activity.

Care was taken to ensure that receipts from equity or other means of financing were not included. Payments which

were predictable both in timing and amount were also exoluded. The basis for distinction was, however, not whether an item was capital but rather whether they were predictable or not. For this matter dividends, taxation and transfers in between sub-sidiaries and/or the parent company were excluded for this was not the problem at hand.

The cash flows so refined were then to be used in deter-mining the holding costs involved in the various cash balance strategies. The opening balance required to avoid a cash out in each month was also to be determined from this pattern. A statistical analysis was also performed to find out whether such balances had any relationship with the level of activity.

ANALYSIS OF CASH BALANCE BEHAVIOUR

Probability Distribution

Simple statistical analysis involving determination of a mean, a standard deviation and cummulative frequency distribution of required opening balances was performed.

The twelve months period showed an average mean cash balance that is maintained as Sh. 981,668. with a standard deviation around the mean of Sh. 135,022. While the six months period (when the level of activity was significantly higher) recorded a mean of Sh. 1,888,090. with a standard deviation around this mean of Sh. 269,240. The cummulative probability distribution for the cash balances requirements for the twelve months period was as shown in figure 14.

Figure 14: Probability distribution of ending cash balances.
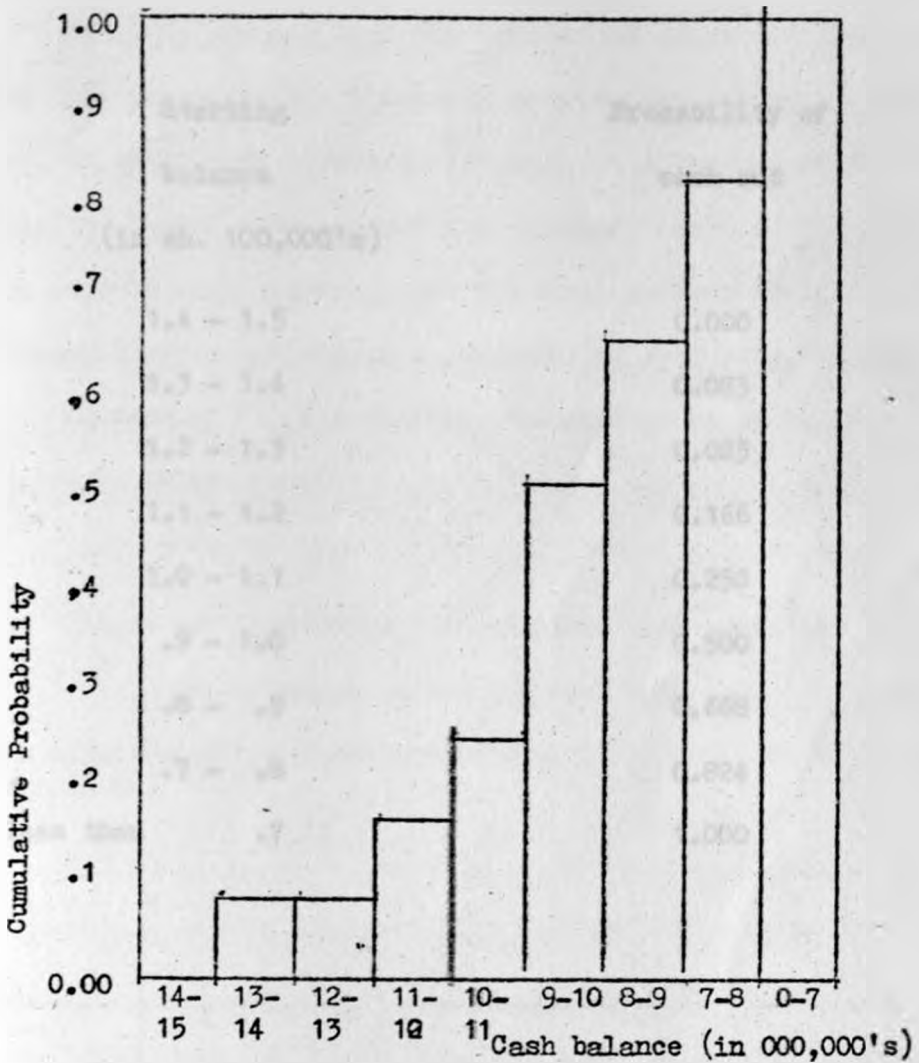
One needs to be cautious about conclusions that can be drawn from this distribution. The number of observations was only twelve. It may therefore not be a true representative of the population. A higher number of observations might give a different pattern.

The nature of the distribution could be seen from another perspective. If the pattern of net cash flows would continue unchanged, the probability of cash out for various opening

balances would be as depicted below.

Starting balance (in sh. 100,000's)	Probability of cash out
1.4 - 1.5	0.000
1.3 - 1.4	0.083
1.2 - 1.3	0.083
1.1 - 1.2	0.166
1.0 - 1.1	0.250
.9 - 1.0	0.500
.8 - .9	0.668
.7 - .8	0.824
less than .7	1.000

The opening balance that would be required to completely avoid money shortages was around 1.5 million shillings. The probability of a cash out increased fast when less than 1.0 million shillings is held as the opening balance. Though the risk of shortage becomes higher at this point, the availability of short-term financing could reduce the cost of such a risk to nil. This is much so in case of the particular firm in which this data was extracted. They have negotiated for overdraft facilities far more in excess of their current transactions balances requirements. For companies with limited or

no overdraft facilities, there is a need to get concerned about
this problem quite seriously.

If it is assumed that the firm has no overdraft facilities
and thus financing its transactions using its own money resour-
ces, it would have to start with an opening balance of Sh. 1.5
million. Taking into account the cyclical nature of the firm's
one monthly cash pattern, then the money balance would vary
between Sh. 1.5 million to a low point of near zero and rise
to a maximum of Sh. 4.1 million. The pattern is shown in
figure 15 below.

Figure 15: Pattern of cash balances that would be
required to avoid a cash out.

(In millions of
 Shillings)
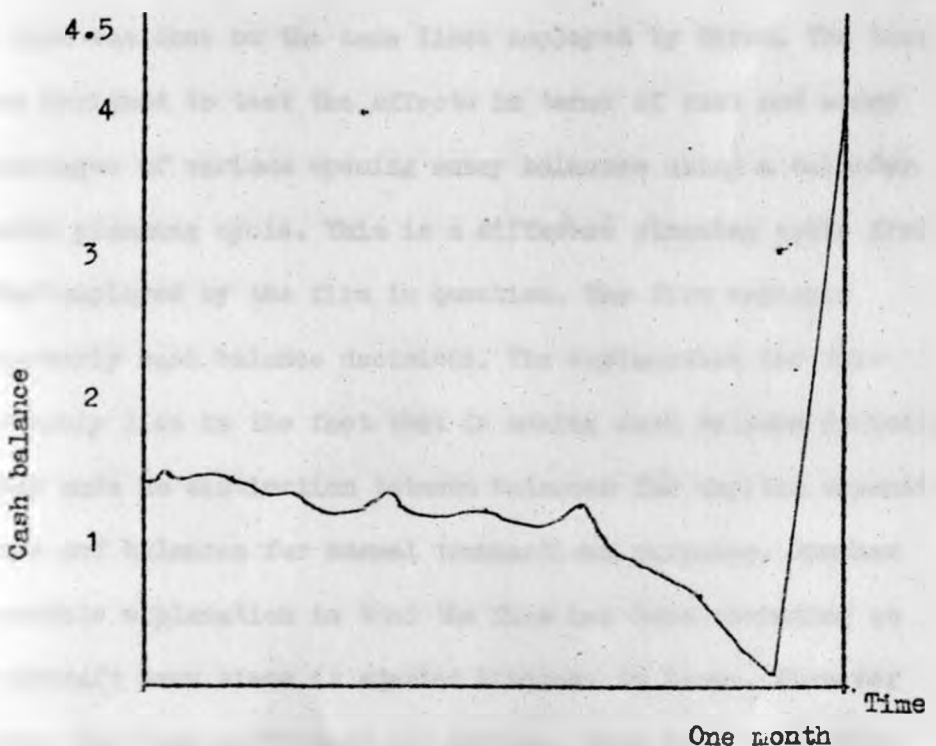
At the end of the month the company would therefore have
at its disposal Sh. 2.6 million (4,100,000 - 1,500,000) to
be used as internal finance for long-term projects or to
reduce the investment base without a risk of cash out. What
is even more important to the firm is the information about
the costs involved in maintaining this balance, both cash out
costs and holding costs. Though the firm's cash flow pattern
is such that for most of the month it is making net payments
and thus the balances dwidle until the last days of the month,
the net payments are not large in amount until towards the end
of the month. This points towards using an overdraft as the
cheapest means since interest expenses are not too high. They
are calculated on daily overdraft outstanding.

The cost/risk information would be available by simulating
a number of possible opening balances and the costs involved.
A test was done on the same lines employed by Gibbs. The test
was designed to test the effects in terms of cost and money
shortages of various opening money balances using a calender
month planning cycle. This is a different planning cycle from
that employed by the firm in question. The firm employed
quarterly cash balance decisions. The explanation for this
probably lies in the fact that in making cash balance decisions
they made no distinction between balances for capital expendi-
ture and balances for normal transactions purposes. Another
possible explanation is that the firm has been operating on
overdraft ever since it started business in Kenya. Whenever
there has been sufficient net inflows, they have been often
diverted to profitable outlets or paid out as dividends.

Within the monthly planning cycle, weekly strategies were also included to test the cost of these weekly strategies within each control period of allocating the available balance between cash and short-term interest earning assets, which in this study was designated deposits. There was one problem arising from breaking the month into weeks. The calender month is two to three days more than four weeks. For the purpose of analysis, it was deemed that the last days of the month which are not equal to six days were treated as a week for the purpose of making transfers between deposits and current accounts but not for the purpose of calculating interest on deposit and bank overdraft interest.

Parameters used

In calculating the cost of each strategy a number of parameters were used. These parameters were employed after discussion with the firm's financial executive, and analysis of financial reports of the firm over a period of three years. Consideration of the projections of capital expenditures and their expected returns were also put into consideration. The parameters were:-

(1) Interest rate on bank overdraft- which varies with time but over the last three years has been fluctuating between 8% and 9% per annum. The current rate of 9% was chosen.

(2) Interest rate on deposit account - it as well varies with time. However, the current rate of 6% was selected for this test.

(3) Opportunity cost - this is the foregone investment opport-

unities by using internal finance to maintain a money
balance, was taken to be 13% per annum.

For each strategy the average number of days per annum
of cash out[1] and overdraft that would result from each combined
strategy were calculated, so were maximum cash out and overdraft.

A similar test was carried out for most recent six months
with an aim of finding out whether there would be a difference
in the optimal cash balance strategies for these two periods.
A number of the strategies that were simulated are shown in
the appendix IX and X.

INTERPRETATION OF RESULTS

Unlike the results obtained by Gibbs, the opening cash
balances required in order to avoid cash out in the two periods
were not the same. For the twelve months period, Sh. 1.5 million
opening balance was required to completely avoid a cash out
while for the six months period an opening balance of Sh. 2.2
million was required. However, one result was obtained which
was in line with that found by Gibbs and that is, in the absence
of risks of cash out, it was optimal for the firm to start with
an opening balance of zero both for the monthly strategy and
for the weekly strategy. In other words the firm would find
it cheaper to allocate no internal finance to cash balances.
This applied to both periods. It could be a further indication
that the opening balance, which in the absence of constraints
from other decision centres, would be the same and un-influenced
by the level of activity.

The fact that the firm should start off with zero balance at the beginning of each month and each week meant that it would have to be on overdraft for all working days in the year. In fact the firm has actually been on overdraft from the time it commenced business in Kenya. How much overdraft would be negotiated for to meet transactions for normal operations differed for the two periods in question. For the twelve months period, a minimum overdraft facility of Sh. 1,400,088 would be required while for the six months period, a minimum overdraft of Sh. 2,119,448 would be required. The firm in question actually negotiated for bank overdraft facilities well above these figures. However, it should be noted that the bank overdraft facilities were used for other transactions in addition to the transactions for normal operations. It was used for payments like interest expenses, dividends, transfer of funds to the headquarters and virtually for all other transactions apart from heavy capital investments which are financed by long-term financing institutions. So it is not clear whether the firm would have negotiated for the above minimums if the overdraft was to be used for the refined transactions or at least made a distinction between balances for normal operations and balances for other purposes.

The results of the simulation also show that the holding costs tended to be less as the weekly strategy within every monthly strategy was reduced despite the high interest rate. A possible explanation for this is that net changes in daily balances were not dramatic for most of the month, thus if large weekly opening balances were maintained, they would lie idle

and earn no interest that they would if they were on deposit account. Interest on bank overdraft as high as it is compared to interest on deposit becomes heavy only towards the end of the month and since it is calculated on a daily balance, the monthly aggregate is not significant. This also explains why operating on overdraft is the cheapest in terms of holding costs. Another explanation for it being the cheapest is that returns on long-term investments is comparatively high 13% per annum as compared to 6 per cent on deposit account. This high rate of return acts against holding money balances.

Another observation was that when the weekly opening balance is reduced below zero the holding costs go up. Here again the explanation lies in the wide difference between bank overdraft interest and deposit interest. A negative opening balance implies that cash has been withdrawn from the current account to a deposit account, a decision which brings a return of 6% per annum and costs interest rate of 9% per annum. It would not be a wise decision at all.

A situation could arise where the firm won't have overdraft facilities or be limited. In such a case management would have to take it as an extra cost and finance money demand. It will do so partly by internal financing and partly by overdraft, if the overdraft is limited. Where there are such limited overdraft facilities, it does not follow that it will be optimal to utilize the full overdraft. For example if the bank imposed an overdraft limit of Sh. 1.3 million in both periods under consideration, then for the twelve months period the company would have to use Sh. 900,088. of this facility and maintain a monthly

opening balance of Sh. 500,000. with a weekly strategy of Sh. 100,000. For the six months period the strategy which utilizes overdraft fully is not the most economical in terms of holding costs. There are two of them:-

    (1) Monthly strategy of Sh. 1.5 million combined with a weekly strategy of Sh. 200,000. at net cost of Sh. 76,685.

    (2) Monthly strategy of Sh 2.2 million combined with a weekly strategy of Sh. 200,00. with a net cost of Sh. 109,711.

A choice of either would utilize Sh. 1,296,444. of overdraft. However, the most economical in terms of holding costs would be a monthly strategy of Sh. 1 million opening balance combined with a weekly strategy of Sh. 100,000 with a cost of Sh. 55,472. This strategy would utilize Sh. 1,191,448 of overdraft.

The reader is asked to take note in interpreting the output from this model, that it was not intended to disclose the optimal strategy but rather to provide the decision maker with information of the cost risk effects of various strategies so that the cash management decisions might have a more rational foundation and secondly, so that a clear distinction can be drawn between money balances held for different purposes. Mention of an optimal strategy has been made in the literature with the assumption that Managers place zero cost on cash out because of the rarity of such a thing when bank overdraft facilities are available. Secondly, the constraints from other decision centres were not taken into account.

SOME LIMITATIONS

Management which is really concerned with striking an

optimal opening balance would have to work out numerous stra-
tegies at closer interval. The ones worked out in this thesis
are very few and the interval is wide (Sh. 500,000) for the
monthly strategy and Sh. 200,000. for the weekly strategy.

Secondly, the costs differences are related to the parti-
cular parameters used. In a world of changes, these parameters
are expected to change, yielding a different array of costs
for the strategies of opening balances.

Thirdly, the real losses on holding a balance resulting
from price level increases were disregarded and no account was
taken of benefits that might accrue to the firm in terms of
the market value of the shares if idle balances are released
to more remunerative use.

Finally, the 13% opportunity cost used in the calculation
is some sort of average rate of return on investment after tax.
It could be that if marginal rate of return was used, it would
yield different results. As the economic environment changes
the marginal rate of return and the average rate of return
would change. These changes must be incorporated in the
strategies.

MONEY BALANCES AND THE LEVEL OF ACTIVITY

As mentioned earlier, Gibbs found that the level of
opening balances that were required to avoid a cash out were
the same for the two periods when sales were differing quite
a lot (60 per cent higher in the later period than the earlier
period). In the present study, different outcomes have been observed.

The level of cash balance that would eliminate a cash out in
the six months period was 51% higher than the opening balance
required in the 12 months earlier period. Sales on the other
hand were 80% higher in the later period of six months. This
tended to suggest that there is some connection between the
level of activity and the level of cash balances. A number of
tests were designed to establish the existence or non exis-
tence of such a relationship.

As observed earlier, the outcome of the simulation showed
that in the two periods the firm would be better off by using
overdraft to finance fully the transactions for normal opera-
tions. The minimum overdraft that would be needed varied.
Having taken money balances to include overdraft it meant that
in the first period the firm would need a balance just over
Sh. 1.4 million and a balance over Sh. 2.1 million in the six
months period. To investigate whether there was any relation-
ship between the level of activity and such cash balances, a
statistical analysis was performed on the basis of the eighteen
months observation. Each observation being the monthly balances
required to finance transactions for normal operations. But
first, a graph was plotted for the two variables to show the
pattern of their behaviour. There were two different graphs
each for each period under analysis. The pattern was as depicted
in figure 16a and 16b.

The pattern as can be seen in the two graphs, (figure 16a
and 16b) they seem to indicate that there is no relationship
between the two variables, that is, cash balances and the
level of activity.

Figure 16a : Cash balance and sales pattern over a twelve

months period.

(in sh. millions)
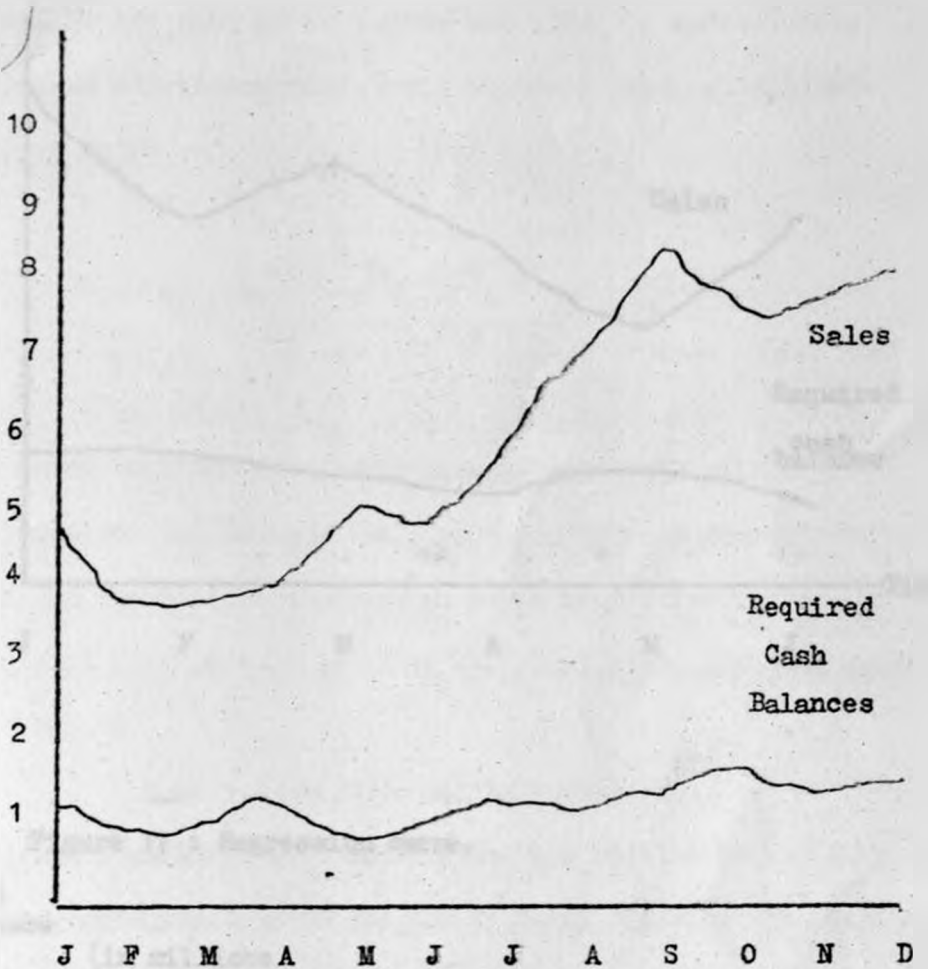
A further step was to plot on a graph the eighteen
observations. The horizontal axis was chosen to represent sales
(since we intend to have it as the independent variable) and
the vertical axis for cash balances. The purpose was to fit a
regresion curve. The regresion curve appeared as shown in
figure 17.

Figure 16b : Cash balance and sales pattern over the six

months period.

(in Sh. millions)
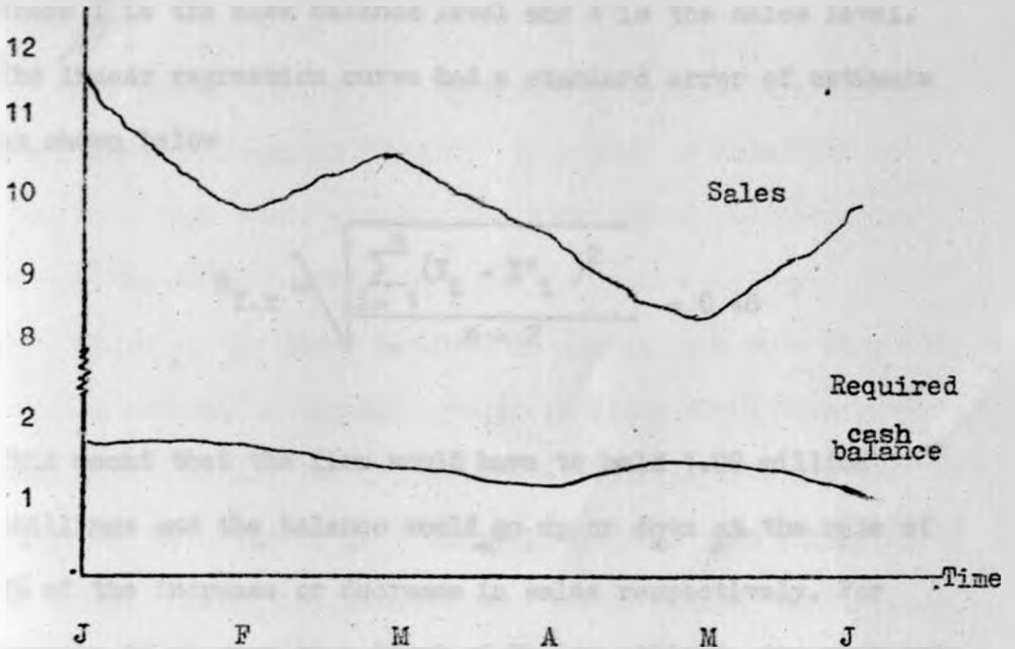
Figure 17 : Regression curve.
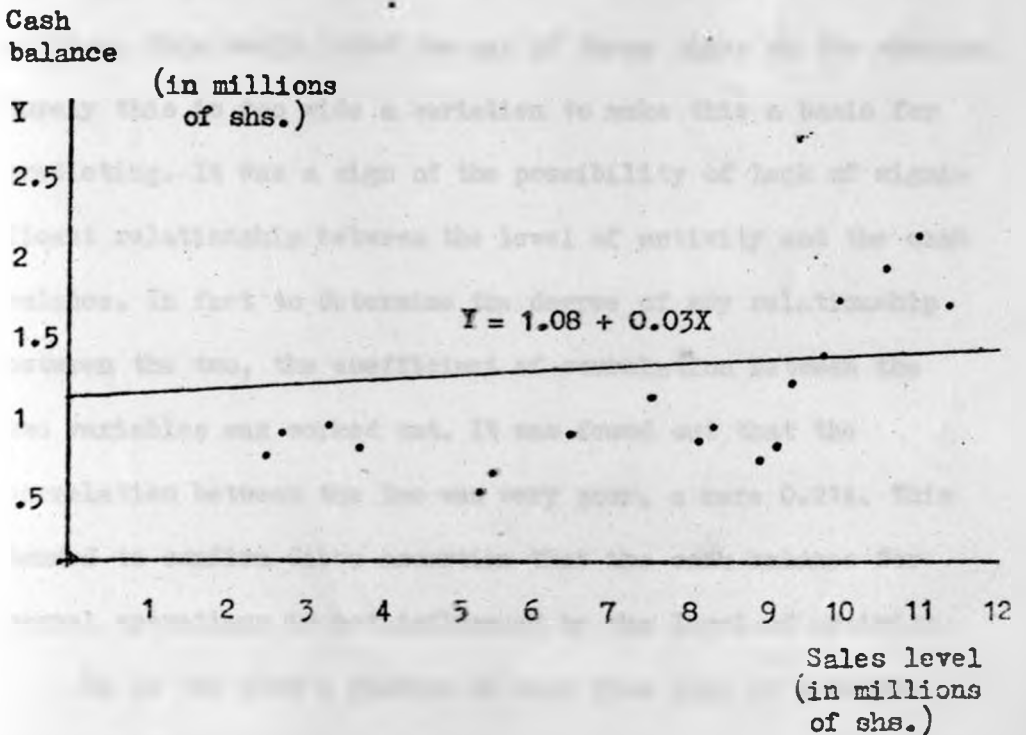
$$Y = 1.08 + 0.03X$$

This curve was fitted using the least square method which gave
out the equation

$$Y = 1.08 + 0.03X$$

Where Y is the cash balance level and X is the sales level.
The linear regression curve had a standard error of estimate
as shown below

$$S_{Y.x} = \sqrt{\frac{\sum_{i=1}^{n} (Y_i - Y'_i)^2}{n-2}} = 0.48$$

This meant that the firm would have to hold 1.08 million
shillings and the balance would go up or down at the rate of
3% of the increase or decrease in sales respectively. For
example if it were at a level of Sh. 10 million, the cash bala-
nce would be

$$1.08 + 0.03(10) = \text{Sh. } 1.38 \text{ million.}$$

This figure would deviate between Sh. 0.9 million to Sh. 1.86
million. This would occur two out of three times on the average.
Surely this is too wide a variation to make this a basis for
predicting. It was a sign of the possibility of lack of signi-
ficant relationship between the level of activity and the cash
balance. In fact to determine the degree of any relationship
between the two, the coefficient of correlation between the
two variables was worked out. It was found out that the
correlation between the two was very poor, a mere 0.214. This
tended to confirm Gibbs assertion that the cash balance for
normal operations is not influenced by the level of activity.

It is the firm's pattern of cash flow that is a signi-

ficant factor in the determination of required cash balances for the firm. On the whole, the findings cast doubt on the notion that the level of activity influences the level of cash balances.

The reader is however, cautioned that these are findings from one organisation. Secondly the number of observations that were made were not many. The findings should therefore be treated as tentative.

Thirdly, the costs involved in making transfers from current account to deposit account or other short-term outlets have been ignored. The approach adopted to investigate the possible relationship is a bit comprehensive than that adopted by Gibbs. Though the findings have led to similar conclusions, it is not clear whether Gibbs would have found it the same if he made such a statistical analysis.

C H A P T E R   S I X

C O N C L U S I O N S

At this final stage, it is important to look back and assess whether the aims of the study have been met or not. I considered a study in this area of business management because the need to employ complex techniques in the management of cash balances has become more imminent. It has become so because of:-

(1) The increased complexity and size of business operations.

(2) The change in the nature of ownership of business organisations, that is, from one or two people owning the business to public enterprises and/or statutory boards.

This has led to the necessity of distinguishing business resources from individual shareholders' resources and accounting to the shareholders how profitable their resources have been put to use.

The main theme of the study was:-

(1) To study the cash balance decision making process in Kenyan firms,

(2) To determine whether firms use rational decision rules with respect to cash balance management.

On the understanding that the firm stands to benefit by the use of a cash balance decision model, a number of models were assessed with the aim of recommending one of them which would provide information to guide in cash balance decision making for the use by Kenyan firms .

In the first chapter, an introduction to the basic mana-

gement problems with respect to cash balances was made. Without
an understanding of the basic problems, it would have been
increasingly difficult to determine the scope and objectives
of the study. The factors that affect or bring about the
demand for cash balances were discussed. Having defined cash
to mean all the notes and coins held for normal business
transactions, the overdraft facilities that are available to
the firm and all other short-term money outlets, it became
necessary to look at the probable factors that could make a
firm want to hold pure cash.

In the second chapter, we looked at the contributions that
have been made by various academicians and how they give or
fail to give a solution to the major cash balance management
problems. The limitations of employing an analytical model were
also highlighted. We concluded that an appropriate model would
be that which is adaptive to changing environments and dif-
ferent factors that different organisations face. We conluded
that a simulation model would be an appropriate tool.

The two chapters aimed at providing a framework for the
empirical study. Theoretically, it was conluded that the use
of a model would yield superior results than a mere rule of
thump.

Chapter three constitutes an empirical survey that was
carried out with respect to cash balance management practices.
More specifically, we dealt with:-

(1) Determining how far Kenyan firms use models in making
cash balance decisions;

(2) Hypothesizing on cash management practices in Kenyan
firms on the basis of the information obtained from

survey;

(3) Recommending a model that practically and theoretically
could be considered most effective.

A sample of thirtyone firms was used. The outcome of the
survey revealed that firms in Kenya rarely use cash balance
decision models when making cash balance decisions. This is
mainly because cash balance for normal operations is considered
as a residual item that does not require separate planning.
Very often, the plans that are made for cash balances are those
where emphasis is placed on the precautionary objective so that
the firm does not run out of cash. These observations are ten-
tative since the sample used was small and responses not very
good. It is therefore a hypothesis which could be tested for
its validity.

In chapter four, an attempt was made to examine and dev-
elop a criteria on which a model would be selected and also
consider in some details the foundations on which a model
would be effectively employed. Efficient management and utili-
sation of resources both at departmental and corporate levels
is necessary so that proper information is used as input for
the cash balance model.

A simulation model "the Gibbs buffer stock simulation
model" was recommended. It was recommended because of the added
information that the model can provide if employed by a
business firm.

In chapter five, an empirical application of the model was
made in a local firm of medium size with the purpose of:-

(1) demonstrating the sort of information that could be

available to management if the model was employed in
business organisations,

(2) to test the observations that were made from the application of the model in Britain. The main one being that the level of cash balances has no relationship with the level of activity. In other words, the level of activity cannot be used as a planning variable to forecast the level of cash balance requirements.

The observations from the application of the model in Kenya were that the use of the model would provide information as to:-

(1) the cost involved in choosing various monthly and weekly opening cash balances,

(2) the maximum pure cash out that each strategy would bring about. (on the assumption that overdraft facilities are not available.)

(3) the minimum overdraft that would have to be negotiated for if a particular strategy is selected,

(4) the number of days in a year that the firm would need an overdraft if a particular strategy is selected,

(5) the number of days a company would be out of cash if opening balance is below the maximum net cash outflow.

With regard to the second purpose, if was observed that though cash balances were higher in the second period when sales were significantly higher, there was no significant relationship between the two. In other words, it suggested that other factors rather than sales influence the level of

cash balances.

In the test, everything was held constant. Only sales was considered a variable. It could be that if other factors were tested, for any relationship with cash balances, we would have a much clearer picture. Interest rates, the opportunity cost were not considered variables for the purpose of the test. Their effect to cash balance is another potential area for research.

Alternatively, the nature of the net cash flows could be a factor that would bring about a relationship between cash balances and the level of activity. However, this alternative is almost ruled out since the cash flow pattern in the two firms (one in Kenya and another in Britain) were considerably different and yet they all showed that there was no relationship between the two variables. Application of the model in many different firms could give us a better insight as to whether the above suggestions are. valid.

As we have seen earlier the use of Gibbs buffer stock model to this Kenyan firm has provided us with the costs involved in selecting and using a particular monthly and weekly strategy. It became clear that overdraft was the best way of financing cash balances. If we employed the Baumol model, there would have been no question of determining how much money resources would be held. The model would have only dealt with the costs involved in transfering various amounts from deposit to current account and vice versa and the interval at which this would be done. It therefore would have assumed a given monthly opening balance. Bank overdraft as one alternative of financing cash balances would not arise.

The Lockyer model would have considered the use of
overdraft but it would have also assumed that the amount to
be held in money balances is given. As shown in figure 6,
Lockyer seems to believe that the cost function would have a
shape roughly the same as those shown at various levels of
overdraft, (see figure 6). However, what seems to come out
of the Gibbs model test in both the British firm and the Kenyan
firm is that the cost function can take completely different
shapes in different firms, especially in view of the differing
cash balance patterns of different firms. And the shape of the
cost function would not depend only on the propotion of overdraft
used and annual interest rate on invested funds but also on the
opening monthly and weekly strategy that the firm adopts. In
fact, with respect to the firm under test, the cost curve would
rise upwards as the propotion of overdraft used falls and
balances financed by internal resources rise. See figure 18

Figure 18 : Possible cost curve for the firm under study.

All overdraft   No overdraft
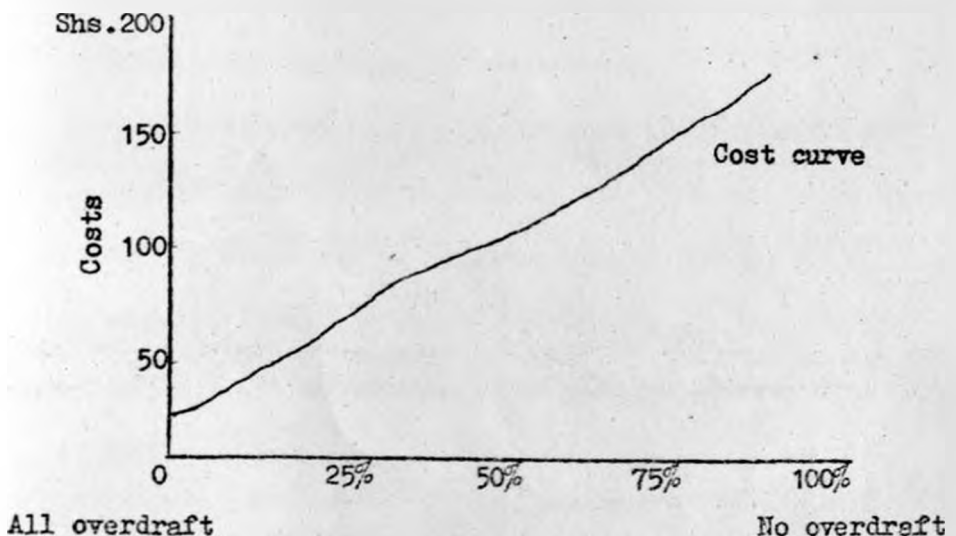
(Notice that the cost curve in figure 18 is based on the assumption that interest on invested funds is at 13%)

These are just a few illustrations of the sort of outcomes we would have got if we used one of the analytical models considered in this thesis. I hope that Financial Managers will find this piece of study quite useful as a guide to cash balance decision making. For the academicians, this is only the beginning.

R E F E R E N C E S :

CHAPTER ONE

1. Intermediate Accounting by Meigs and Johnson, page 140.

2. The Finance and Analysis of Capital Projects by Meret
   and Sykes. Page 415.

3. Cash is used here to mean the same as the definition
   given earlier on , see page XI

4. On the Theory of Optimal Investment Decisions, by
   J. Hirschleifer; Journal of Political Economy Vol. 66
   1958 pages 329 - 372. He looks at how insufficient it
   is to talk of maximizing returns from investments in
   isolation of financing decisions. The level of invest-
   ment made on this basis may not be optimal at all. The
   two, that is, investment and financing should be con-
   sidered together.

5. This could be profitable from the point of view of the
   economy since by redeeming them, the Financiers are
   being given the chance to channel the funds to more
   profitable opportunities elsewhere.

6. They developed an inducement contribution model and
   assert that the objectives of the firm are to be found
   in the behaviour of the individuals and groups in the
   organisation. " A Behavioral Theory of the Firm" by
   Cyert R. M. and March J.G. Englewood Cliffs, Prentice
   Hall, 1963.

7. James Tobin, Liquidity Preference as behaviour towards
   risk; Review of Economic Studies, February 1958,
   Vol. 25 (2) pages 65 - 86.

8. The two problems cannot be completely separated in the
   practical sense because an increase in the yield on
   securities comparative to returns from productive
   physical assets could influence the allocation of re-
   sources between liquidity and capital while it could
   also alter the combination in which cash balances are
   held.

9. Pure cash is defined here as the notes and coins that
   the firm has at hand and positive bank current accounts.

10. As mentioned earlier, even if payments are made in time
    with cash receipts it may not be an optimal policy.

11. Time is a continuous variable, for planning purposes
    an imaginary time horizon has to be assumed. The effect
    of this is that optimal decisions that we make are only
    optimal subject to this time factor.

12. John m. Keynes, The General Theory of Employment
    Interest and Money (New York, 1936).

13. The empirical research to be sighted later attempts
    to investigate whether there is any relationship
    between the two.

14. This is one advantage of using simulation models. It
    is a quality which can not be found with analytical
    models. Much about this is dealt with in chapter four.

15. Idle balances held in order to satisfy such parties
    are foregoing certain returns. These returns in the

economic sense, is a cost to the firm. For example if
a balance of 10% of the borrowed funds must be held, and
we assume that if invested they would bring returns of
20% then the actual cost of the funds so raised is
(assuming a loan interest rate of 12%) .12 x 100/90
or 13.33%.

16. Michael J. Malbourne; Effective cash management; The
Australian Accountant. January / February 1975, pages
6-14.

17. The term transaction balance is used here on the under-
standing that precautionary balances are part of the
transaction balance. The objective for holding cash is
for transaction purposes. See pages 6-9.

CHAPTER TWO

1 .J.C. Mao, Quantitative Analysis for Financial Decisions.
Macmillan, 1969.

2. T.M. Whitin, The Theory of Inventory Management.
Princeton University Press, 1953.

3. This is a rather gross assumption because usually, in
practice the fixed portion tends to be negligible while
the rest tends to be variable.

4. The mathematics involved in arriving at this square
root formula is to be found in appendix 1.

5. Though Managers could influence the disbursements
pattern, there is a limit as to how far they can go
without affecting the credit worthness of the company
which in turn would have an adverse effect on profita-
bility.

6. E.L. Whalen; A cross section study of business demand for money. Journal of Finance, Vol. 20 (september 1965) pages 423-443.

7. Milton Friedman, "The Demand for Money; Some Theoretical and Empirical Results" Journal of Political Economy, August 1959 Vol. 67, pp. 349.

8. S. Archers; A model for the determination of Firm's cash balances. The Journal of Financial and Quantitative Analysis. March 1956.

9. K.G. Lockyer; Cash as an item of stock, Journal of Business Finance Vol. V. No. 1 (1973).

10. It is developed later by Gibbs. A feature in a simulation model which will be considered later.

11. As mentioned earlier, there is a limit to which management can control payments unless at the disadvantage of the business. Outflows like wages for example, have to be paid at certain agreed intervals.

12. William Beranek, Analysis for Financial Decisions. Irwin pp. 345-391.

13. This assumption is to make the analysis possible or easy, for in real sense the interest on money borrowed is bound to change with the level of borrowings.

14. Note that if $d \geq e$ then the entire amount of the Treasurer's resources is devoted to marketable securities. See appendix III for derivation of this.

15. M.H. Miller and D. Orr "a model of the demand for money by firms. Quarterly Journal of Economics LXXX. August 1966.

16. One of the basic assumptions is the fixed transaction costs. These costs are usually negligible and where they are not, they are variable. This also makes and infact renders the model invalid.

17. Eugene M. Lerner; Simulating a cash budget, Califonia Management Review. Winter 1968, Vol. XI No. 2 pp. 79-86.

18. S. Archers. A model for the determination of firm's cash balances. The Journal of Financial and Quantitative Analysis. March 1956.

19. Cash held for speculative purposes can in no way be regarded as part of the balance required for normal operations, unless it is one form in which balances are held and thus speculative purpose loses meaning as an objective in itself.

20. The way Archers puts it implies that he has already established that cash balances increase as a function of sales. This is an assertion yet to be proved.

21. N.C.W. Gibbs, The Demand for money by firms. A review and a buffer stock simulation model. Unpublished at the time of writing. He is former Professor of Accounting at the University of Nairobi.

22. Any asset represent an investment, cash is no exception. In trying to arrive at an optimal investment decision, the financing of the investment should be considered part of the decision.

23. The advantages will be considered at a later stage.

24. Cost for this purpose could mean explicit financing costs in the accounting sense or opportunity cost in

terms of returns foregone by the need to hold a balance,

according to the parameters set up in the programe.

25. The balance that was being held at the time was £200,000.

CHAPTER FIVE

1. Cash out is here defined as money shortages taking
   into account negative balances. We are also taking
   deposit balances and overdraft together. Overdraft was
   taken to be a negative balance on the current account.

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BIBLIOGRAPHY

ARCHERS S, A model for the determination of firm's cash balances. The Journal of Financial and Quantitative Analysis. March 1956.

BERANEK W,Analysis for Financial Decisions. Irwin. Pages 345-391.

CYERT R.M. and MARCH J.G. A Behavioral Theory of the Firm, Englewood Cliffs, Prentice Hall, 1963.

FRIEDMAN M. The Demand for Money; Some Theoretical and Empirical Results, Journal of Political Economy, August 1959 Vol. 67 Pages 349.

GIBBS N.C.W. The Demand for money by firms. A review and a buffer stock simulation model. Unpublished at the time of writing.

HIRSCHLEIFER J. On the Theory of Optimal Investment Decisions Journal of Political Economy Vol. 66 1958 pages 329 - 372.

KEYNES J.M. The General Theory of Employment Interest and Money, New York, 1936.

LERNER M.E. Simulating a cash budget, Califonia Management Review. Winter 1968 Vol. XI No.2 pp 79-86.

LOCKYER K.G. Cash as an item of stock, Journal of Business Finance Vol. V. No. 1, 1973.

LOWE E.A. and MCINNES J.M. Control in socio-economic organisations. Rational for the design of Management Control Systems. The Journal of Management Studies May 1971 pages 213-227.

MALBOURNE M.J. Effective cash management, The Australian
        Accountant. January/February 1975, pages 6-14.

MAO J.C. Quantitative Analysis for Financial Decisions.
        Macmillan, 1969.

MEIGS and JOHNSON, Intermediate Accounting, Second Edition
        Mcgraw-Hill page 140.

MELTZER A.H. The Demand for Money; A cross-section study of
        Business Firms. Quarterly Journal of Economics.
        Pages 405 - 421.

MERET and SYKES, The Finance and Analysis of Capital Projects
        Second Edition, Longman. Page 415.

MILLER and ORR .D. " A model of the demand for money by firms."
        Quarterly Journal of Economics LXXX. August 1966.

TOBIN J. Liquidity Preference as behaviour towards risk; Review
        of Economic Studies, February 1958, Vol.25 (2)
        pages 65-86.

WHALEN E.L. A cross-section study of business demand for money.
        Journal of Finance, Vol.20 (September 1965) pages 423-
        443.

WHITIN T.M. The Theory of Inventory Management; Princeton
        University Press, 1953.

XXXXXXXXXXXX

A P P E N D I C E S

A P P E N D I X   I

As mentioned in the text, let

Y represent fixed costs of financial transactions involved in obtaining cash,

V to represent the interest lost on holding positive cash balances,

D to represent the amount of cash to be used in the next time period (net disbursements),

T to represent net cash.

Average fixed costs per period will be Y/T   which is the fraction of one optimum amount of cash-like assets to be obtained to the cash disbursements. then,

$$Y/T = YD/Q \dots\dots\dots\dots\dots\dots(1)$$

This is shown graphically in figure 19 below

Figure 19 : Average fixed costs
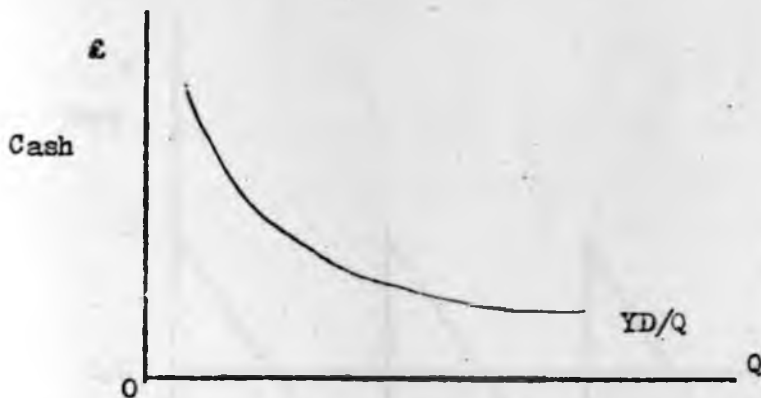
The interest lost on holding cash is a variable factor. It increases with the amount held . The average cash level is $\frac{1}{2}Q$. Thus, the average cost of carrying cash is

$$\frac{1}{2}VQ\dots\dots\dots\dots\dots(2)$$

Total cost is the sum of 1 and 2 i.e

$$C = \frac{1}{2}VQ + YD/Q.$$

Using calculus this equation is differentiated to yield the square root formula

$$Q = \sqrt{\frac{2YD}{V}}$$

Diagramatically ,we get the saw tooth solution type of pattern shown in figure 20 below

Figure 20 : Saw toothed EOQ
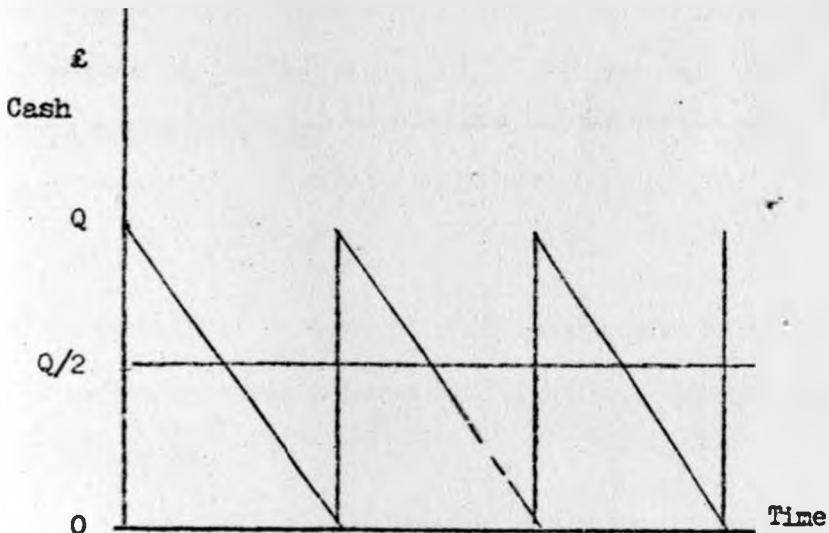
It shows that cash is replenished every Q/D length of time
and Q is the Economic Order Quantity.

APPENDIX II

Let us assume that the total cash requirements during the year is £D. Then, the number of replenishments each year would be D/q, where q is the quantity of cash transfered each time. The total annual transfer cost would be £DS/q. S is the cost of a single transfer.

During the cash balance period t_o to t_2 the average cash held will be $a/2$. If we let the amount required in each period be a, then the average quantity of cash held will be $a/2$ and the proportion of the cycle $t_o - t_2$ during which cash is available is a/q. The total annual holding costs will be

$$\frac{a}{2} \cdot I_H \cdot \frac{a}{q} = \frac{a^2 I_H}{2q}$$

Where I_H is the cost of holding £1 per year.
Hence the total annual cash policy cost £A is given by, total annual transfer cost plus total annual holding cost plus total annual overdraft cost i.e.

$$A = \frac{DS}{q} + \frac{a^2 I_H}{2q} + \frac{b^2 ID}{2q} \qquad \ldots\ldots\ldots\ldots\ldots (1)$$

Minimum costs will be at a point where the values of q, a, and b when inserted into the fundamental equation will give the least value for A.

If R is the ratio of the holding costs to the overdraft cost, the total replenishment quantity q^* is

$$q^* = q_o^* \sqrt{R+1} \qquad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

This gives a maximum cash balance of

$$a^* = q_o^* \frac{1}{\sqrt{R+1}} \quad \dots\dots\dots\dots(3)$$

and a maximum overdraft of

$$b^* = q^* - a^* = q_o^* \frac{R}{\sqrt{R+1}} \qquad \text{with a minimum total}$$

annual cost of

$$A^* = \frac{A_o^*}{\sqrt{R+1}} \quad \dots\dots\dots\dots\dots(4)$$

In the no overdraft case $R = 0$ and

$$q^* = q_o^* = \sqrt{\frac{2DS}{I_H}} \qquad \text{and the minimum total cost}$$

$A^* = A_o^*$ which is the classical "EOQ" .

A P P E N D I X   III

Let $\overline{S}_1$ denote the realized period 1 short costs,
$\overline{P}_1$ the probability of the occurance of $\overline{S}_1$, and let S_2

and P_2 denote the " short costs " and its associated
probability of occurance for period 2. The expected short
cost for a particular sequence of net cash drains E is defined
as

$$E = \overline{P}_1 P_2 \ (\ \overline{S}_1 + S_2 \ ) \ \dots\dots\dots\dots(1)$$

While the total expected short costs for all such possible
sequences given the period 1 net cash drain is

$$\sum E = \sum \overline{P}_1 P_2 \ (\ \overline{S}_1 + S_2 \ ) \quad \text{which in turn implies that}$$

$$\sum E = \overline{P}_1 \overline{S}_1 \sum P_2 + \overline{P}_1 \sum P_2 S_2 \ \dots\dots\dots\dots(2)$$

This summation applies over all possible values of S_2 .
Since $\sum P_2 = 1$, then (2) can be written as

$$\sum E = \overline{P}_1 S_1 + \overline{P}_1 \sum P_2 S_2 \ \dots\dots\dots\dots(3).$$

The first term on the right of (3) is simply the expected
period 1 short cost, a constant while the second term is
the product of the probability of the period 1 net cash
drain, a constant too, and the expected short cost for
period 2.

In determining the optimal period 2 policy for a
given period 1 net cash drain, we must first obtain the
expected net cost of each possible period 2 policy over the
entire month . If we let R denote the net returns from
securities , then the net cost $E \ (\ N \ )$ is defined as (3)
minus the expected returns from securities $\overline{P}_1 R$, or

$$E (N) = \overline{P}_1 \overline{S}_1 + \overline{P}_1 \sum \overline{P}_2 S_2 - \overline{P}_1 R , \ldots \ldots (4)$$

which can be expresed as

$$E (N) = \overline{P}_1 (\overline{S}_1 + (\sum P_2 S_2 - R)) \ldots \ldots \ldots (5)$$

Now with 5 , we can obtain the expected net cost for each possible period 2 policy given the net cash drain for period 1. However if the period 1 net cash drain is given , $\overline{P}_1$ and $\overline{S}_1$ are also given and hence the optimal period 2 policy can be determined. It suffices to compare the quantity in parenthesis in 5 namely $\sum P_2 S_2 - R$ over all possible period 2 policies. The minimum of $(\sum P_2 S_2 - R)$ is linked with the optimal period 2 policy.

A P P E N D I X   III B

To obtain the optimal allocation for the continuous case f for a single period , let

Y = net cash drain ,

$g(y)$ = probability of y

y^* = critical minimum balance

K = Treasure's total resources

a = incremental short cost per pound

d = incremental net return per pound of investment

C = opening cash balance .

Therefore $0 \leq C \leq K$ while the actual balance at the end of the period must be the quantity $y + C$ and the amount short is the quantity $y^* - (y + C)$. Securities transaction costs are assumed to be either zero or increasing by a constant amount , the difference between the increamental gross return and the incremental transaction cost yield d which is the incremental net return.

Now for a given value of C say C_0 , the probability distribution $g(y)$ shifts to the right along the Y axis until we have a new distribution say $f(y + C_0)$ with an expected value greater than the expected value of $g(y)$ by C_0 . Cummulative probability of $f(y + C_0)$ from $-\infty$ to y^* is considered. Since this upper limit is given by $y^* = y + C_0$, the equivalent probability with respect to $g(y)$ must be the area under the curve from $-\infty$ to $y = y^* - C_0$. The expected net cost for any value of C , $h(c)$ must therefore be

$$h(C) = a \int_{-\infty}^{y = y^* - C} g(y) \left[y^* - y - C \right] dy - d (K - C)$$

which can be written as

$$= a \int_{-\infty}^{y = y^* - C} g(y) \left[y^* - C \right] dy - a \int_{-\infty}^{y = y^* - C} y g(y) dy - d(K - C) .$$

Because the upper limit of y is $y^* - c$, the short cost $a \ y^* - y - C$ cannot become negative . Then

$$\frac{d \ h(C)}{dC} = - a \int_{-\infty}^{y = y^* - C} g(y) dy + a g(y^* - C) (y^* - C) (-1) -$$

$$a g(y^* - C) (y^* - C) (-1) + d = - a \int_{-\infty}^{y = y^* - C} g(y) dy + d \qquad \text{which}$$

equals zero if

$$\int_{-\infty}^{y = y^* - C} g(y) dy = d/a$$

This implies that if $d \geq a$ the entire amount K will be invested in marketable securities .

A P P E N D I X   IV

Crucial job in finding optimal values for h and z is to
characterize the steady state occupancy probability distribution
of cash balances then it will be easy to calculate $p(T)$ and
$E(M)$.

Cash balance moves t times a day , m shillings at a
.time. Let the domain of cash balance be 0 , m, 2m ....hm.
When hm is reached a transfer to or from the earning port-
folio returns the balance to the point Zm then

$$p_t + 1 \; (xm) = \tfrac{1}{2} \; (\; p_t \; ((\; x -1 \;)m) + p_t((x + 1)m))$$

$$x \leq 0 \leq z \qquad Z < x < h$$

and

$$p_t + (Z) = \tfrac{1}{2}(p_t(\; (z-1)m) + p_t((Z+1)m) + p_t(m) + p_t$$
$$((h-1)m)).$$

If we replace the cash domain from carrying the size of an
individual cash transaction to m i.e Δm. We invoke the
steady state condition to obtain the difference equation,

$$p_x = \tfrac{1}{2}(p_x-1 + p_x+1) \quad , \; 0 \leq x \leq h \; \; x \neq Z$$

$$p_z = \tfrac{1}{2}(p_{z-1} -1 + p_{z+1}+1 +p_1 + p_{h-1}) \; .$$

With the boundary conditions $p_o = p_h = 0$ and the
probability density condition
$$\sum_{x=0}^{n} p_x = 1$$

They yield the following results
$$E(M) = (h+z)^{1/3} \quad \dots\dots\dots\dots(1)$$

and $p(T) = t/Z(h-z)\dots\dots\dots\dots(.2)$

The rationale is that t transactions take place per day
and should a transaction occur when the cash balance is in t
the state 1 (or state h-1) the probability is $\frac{1}{2}$ that a
transfer cash will occur.

Finally the optimization process is more transparent.
If we substitute $Z = h-z$ in the above ,then the objective
of the firm is

$$Z^{min}\, zE(C) = \frac{yt}{zZ} + V_m \frac{(Z + 2z)}{3}$$

which is obtained by substituting the second equation into

$$E(C) = yp(T) + VE(m) \quad \text{and for minimum}$$

$$\frac{dE(C)}{dz} = \frac{-yt}{z^2 Z} + \frac{2V_m}{3} = 0$$

$$\frac{dE(C)}{dZ} = \frac{-yt}{z^2 z} + \frac{V_m}{3} = 0 \quad . \quad \text{Together they yield}$$

$$z^* = \frac{(3yt)^{1/3}}{(4V_m)} \quad \text{and} \quad Z^* = 2z^* \quad . \text{In terms of the}$$

original policy variables $\quad h^* = 3z^*$
Now returning to the pound denomination in measuring the
cash balance the optimal bounds are given in units of £m.
To obtain the optimal bounds the single pound units are
multiplied by m.

$$z^* = \frac{(3yt)^{1/2}}{(4V_m)} \cdot m$$

and similarly to obtain h^* in pounds units $m^2 t$ is the~~daily~~
daily variance of changes in the cash balance we
can rewrite the above as

$$z^* = \frac{(3y\sigma^2)^{1/3}}{(4V)} \quad .$$

A P P E N D I X   V

CASH MANAGEMENT QUESTIONNAIRE

In this questionnaire cash is to be defined as all monetary assets (excluding debtors) e.g. bank current and deposit balances, cash floats and marketable securities not held as 'trade investments'.

There are nineteen questions to this questionnaire. Please indicate answers by inserting an 'X' in the boxes provided and/or by using the spaces provided.

A   CASH BALANCE DECISION PROCESS

1.   Do you have a formal policy of deciding the level of cash balances to hold?

Yes	
No	

2.   Indicate which of the variables stated you consider cash balance requirements are related to.

Sales value	
Total assets	
Working capital	
None of the above	

If your answer is none, briefly state your view
....
....
....

3.   Do you infact make cash balance decisions by reference to any variable? Please indicate.

Sales value	
Total assets	
Working capital	
None of the above	

4. Do you use a multi-variable decision model? If so please state the variables included.

....
....
....

5. Do you use a decision model that in any sense might be regarded as an optimizing model?

Yes	
No	

If your answer is 'Yes' please indicate the nature of the model below.

....
....
....

6. Do you make a distinction between cash balances held for day to day operational requirements and balance held for other purposes e.g. projected capital expenditure?

Yes	
No	

7. Do you use cash balance decision rules related to minimum or maximum balances to be held? Please indicate.

Minimum	
Maximum	
Both	
None	

If you do, how are these minimum/maximum levels decided?

....
....
....
....

8. Is your cash planning period related to any perceived cash cycle? Please indicate

Yes	
No	
We don't plan for cash	

9. How frequently do you make cash balance decisions?

daily	
weekly	
monthly	
Ad hoc	

10. How do you finance cash shortages?

bank overdraft	
delaying payments to creditors	
Other	

If your answer is 'other' please give a brief answer below ... .
....
....
....

11. How do you 'hold' or use cash perceived as surplus to immediate operating requirements or other earmarked purpose?

marketable securities	
redeeming short term debts	
bank deposit account	
none of above	

If your answer is 'none of above' please give a brief answer below ....
....
....
....

12. How important do you consider cash level decisions to be, compared with inventory level decisions?

more	
less	
same	

13. Who (which official) has the responsibility in your organization for making cash

level decisions? ....
....
....

B   OBJECTIVES OF CASH BALANCE POLICY

1. Do you consider that the cash balance should be planned or simply a residual i.e the results of other plans?

should be planned	
Residual	

2. Is it an objective of your cash strategy never to run out of cash?

Yes	
No	

3. Do you take the view that the larger the cash balance the better it is for the firm?

Yes	
No	

If your answer is 'yes' please state briefly your reasons
....
....
....
....

4. Do you in any way think of
    cash balance policies in terms
    of a trade off between lost
    opportunity for investment of
    cash and the cost involved in
    incurring shortages?

Yes	
No	

C. PROVISION OF DATA

1. Would you be prepared to
    disclose for research purposes
    your total assets, sales and
    average cash balances?

Yes	
No	

2. Would you be prepared to
    allow a research student to
    collect data from your records
    as input for a cash balance
    simulation model, the
    results of which would be
    made available to you?

Yes	
No	

APPENDIX VI

J A N U A R Y 1974

W E E K	D A Y NUMBER	RECEIPTS (+)	PAYMENTS (-)	DIFFERENCE (+OR-)
	1	-	-	-
	2	-	80	80
	3	575	1,023	-488
1	4	-	160,414	-160,414
	5	165	92,298	-29,133
	6	-	3,477	-3,477
	1	-	17,595	-17,595
	2	-	19,749	-19,749
	3	-	12,067	-12,067
2	4	-	71,440	-71,440
	5	-	2,580	- 2,580
	6	-	111,424	-11,424
	1	-	27,693	-27,693
	2	-	33,180	-33,180
	3	-	231	-231
3	4	-	2,524	-2,524
	5	-	5,845	-5,845
	6	-	77,948	-77,948
	1	-	22,525	-22,525
	2	-	17,672	-17,672
	3	-	326,897	-326,897
4	4	-	12,704	-12,704
	5	-	1,324	-1,324
	6	-	55,535	-55,535
	1	-	24,377	-24,377
5	2	484	6,215	-5,731
	3	4418,705	1,776,327	+2,642,378

			FEBRUARY	1974	
W E E K	**D A Y NUMBER**	**RECEIPTS (+)**	**PAYMENTS (−)**	**DIFFERENCE (+ OR −)**
	1	−	692	−692
	2	350	1,860	−1,510
	3	−	31,988	−31,988
1	4	−	11,427	−11,427
	5	−	7,487	−7,487
	6	−	−	−
	1	3,500	67,387	−63887
	2	113	1,342	−1,229
	3	−	5,045	−5,045
2	4	−	6,606	−6,606
	5	−	900	−900
	6	−	4,441	−4,441
	1	4,351	7,400	+3,049
	2	−	−	−
	3	−	3,188	−3,188
3	4	−	−	−
	5	−	374,744	−374,744
	6	1,550	1,791	−241
	1	1,000	1,304	−304
	2	−	683	−683
	3	−	1,036	−1,036
4	4	−	289,983	−289,983
	5	1,100	2,713	−1,613
	6	4,750,971	2,893,778	+1,857,193

		MARCH	1974	
WEEK	DAY NUMBER	RECEIPTS (+)	PAYMENTS (-)	DIFFERENCE (+ OR -)
	1	-	2,572	-2,572
	2	3,950	660	+3,300
	3	-	2,012	-2,012
1	4	393	19,532	-19,139
	5	2,800	-	+2,800
	6	-	4,277	-4,277
	1	-	800	-800
	2	-	3,157	-3,157
	3	-	-	-
2	4	5,054	622	+4,432
	5	-	1,340	-1,340
	6	-	71,000	-71,000
	1	-	6,895	-6,895
	2	200	4,300	-4,000
	3	2,631	118,537	-115,906
3	4	3,500	6,892	-3,392
	5	858	55,853	-49,995
	6	-	2,164	-2,164
	1	-	-	-
	2	-	295,447	-295,447
	3	-	908	-908
4	4	2,003	1,528	+475
	5	3,538	89,245	-85,707
	6	-	225,635	-225,635
5	1	-	6,867	-6,867
	2	3,923,243	2,509,439	+1,413,804

WEEK	DAY NUMBER	RECEIPTS (+)	PAYMENTS (−)	DIFFERENCE (+ OR −)
			APRIL 1974	
	1	−	−	−
	2	3,625	3,200	+425
	3	3,000	33,400	−30,400
1	4	−	86,957	−86,957
	5	−	2,600	−2,600
	6	−	3,391	−3,391
	1	−	−	−
	2	1,612	78,012	−76,400
	3	650	250	+400
2	4	−	76,157	−76,157
	5	−	−	−
	6	−	−	−
	1	−	−	−
	2	−	−	−
	3	−	5,766	−5,766
3	4	−	821	−821
	5	−	4,600	−4,600
	6	−	3,365	−3,365
	1	500	1,165	−665
	2	−	280,000	−280,000
	3	−	−	−
4	4	50,752		−50,752
	5	100	26,700	−26,600
	6	−	1,806	−1,806
	1	−	393,650	−393,650
5	2	3,942,840	2,019,683	+1,923,157

WEEK	DAY NUMBER	RECEIPTS (+)	PAYMENTS (−)	DIFFERENCE (+ CR −)
		M A Y 1974		
1	1	−	−	−
	2	−	1,364	−1,364
	3	−	4,745	−4,745
	4	−	4,554	−4,554
	5	−	4,161	−4,161
	6	−	104,054	−104,054
2	1	−	−	−
	2	−	700	−700
	3	750	1,848	−1,098
	4	−	−	−
	5	−	−	−
	6	−	19,292	−19,292
3	1	−	1,197	−1,197
	2	−	−	−
	3	−	−	−
	4	−	1,382	−1,382
	5	512	949	−437
	6	−	2,235	−2,235
4	1	−	20,622	−20,622
	2	−	1,214	−1,214
	3	−	310,231	−310,231
	4	−	1,522	−1,522
	5	−	−	−
	6	−	1,357	−1,357
5	1	−	−	−
	2	−	263,217	−263,217
	3	4,302,860	3,610,524	+692,336

WEEK	DAY NUMBER	RECEIPTS (+)	PAYMENTS (−)	DIFFERENCE (+ OR −)
			JUNE 1974	
	1	−	9,644	−9,644
	2	−	2,289	−2,289
	3	−	−	−
1	4	−	−	−
	5	−	88,394	−88,394
	6	−	2,120	−2,120
	1	−	146,003	146,003
	2	−	5,100	−5,100
	3	−	81,602	−81,602
2	4	−	545	−545
	5	−	1,586	−1,586
	6	−	1,133	−1,133
	1	4,085	265	+3,820
	2	−	−	−
	3	3,123	716	+2,407
3	4	−	17,131	−17,131
	5	−	416,137	−416,137
	6	−	−	−
	1	−	2,668	−2,668
	2	−	3,078	−3,078
	3	−	1,426	−1,426
4	4	5,812,188	450,335	+5,361,853
	5	−	33,639	−33,639
	6	60,829	2,803,943	−2,743,114

WEEK	DAY NUMBER	RECEIPTS (+)	PAYMENTS (−)	DIFFERENCE (+ OR −)
		J U L Y	1974	
	1	−	−	−
	2	4,300	77,608	−73,308
	3	−	−	−
1	4	−	−	−
	5	−	4,400	−4,400
	6	−	2,090	−2,090
	1	−	20,957	−20,957
	2	−	4,882	−4,882
	3	4,472	720	+3752
2	4	−	8,400	−8,400
	5	−	113,350	−113,350
	6	−	−	−
	1	−	3,141	−3,141
	2	−	16,091	−16,091
	3	−	100	−100
3	4	−	1,580	−1,580
	5	3,000	5,877	−2,877
	6	−	−	−
	1	−	250	−250
	2	620	128,700	−128,080
	3	−	687	−687
4	4	−	397,195	−397,195
	5	−	239,000	−239,000
	6	−	−	−
	1	6,145,187	3,694,000	+2,451,187
5	2	−	−	−
	3	36,309	35,600	+709

		A U G U S T 1974		
W E E K	D A Y NUMBER	RECEIPTS (+)	PAYMENTS (−)	DIFFERENCE (+ OR −)
	1	525	6,385	−5,860
	2	−	1,600	−1,600
	3	−	1,200	−1,200
1	4	−	−	−
	5	−	−	−
	6	−	88,224	−88,224
	1	−	−	−
	2	−	5,400	−5,400
	3	−	−	−
2	4	−		−525
	5	−	35,880	−35,880
	6	−	71,720	−71,720
	1	−	−	−
	2	−	10,336	−10,336
	3	−	−	−
3	4	−	5,459	−5,459
	5	−	30,617	−30,617
	6	6,585	−	+6,585
	1	−	4,740	−4,740
	2	−	2,674	−2,674
	3	−	400	−400
4	4	−	519,287	−519,287
	5	−	12,680	−12,680
	6	−	23,026	−23,026
	1	−	212,650	−212,650
5	2	6,341,282	3,356,483	+2,984,779
	3	78,265	13,992	+64,273

		SEPTEMBER	1974	
WEEK	DAY NUMBER	RECEIPTS (+)	PAYMENTS (-)	DIFFERENCE (+ OR -)
1	1	-	9,772	-9,772
	2	-	9,958	-9,958
	3	-	4,000	-4,000
	4	-	107,436	-107,436
	5	-	3,720	-3,720
	6	-	3,860	-3,860
2	1	-	28,542	-28,542
	2	-	-	-
	3	-	72,300	-72,300
	4	3,657	-	+3,657
	5	-	6,219	-6,219
	6	-	3,300	-3,300
3	1	-	-	-
	2	-	-	-
	3	-	6,000	-6,000
	4	-	400	-400
	5	-	4,733	-4,733
	6	-	3,076	-3,076
4	1	-	653,500	-653,500
	2	-	5,254	-5,254
	3	-	1,734	-1,734
	4	-	-	-
	5	2,806	-	+2,806
	6	6,804,712	3,972,097	+2,832,615
5	1	66,559	63,045	+3,514

O C T O B E R 1974

WEEK	DAY NUMBER	RECEIPTS (+)	PAYMENTS (−)	DIFFERENCE (+ CR−)
	1	−	30,682	−30,682
	2	−	6,835	−6,835
	3	749	417	+332
1	4	6,500	4,061	+2,439
	5	−	1,009	−1,009
	6	7,568	158,988	−151,420
	1	−	770	−770
	2	−	59,900	−59,900
	3	165	296	−131
2	4	−	93,882	−93,882
	5	−	635	−635
	6	−	−	−
	1	−	14,470	−14,470
	2	−	−	−
	3	−	1,984	−1,984
3	4	−	−	−
	5	−	−	−
	6	−	−	−
4	1	−	32,581	−32,581
	2	−	645,815	−645,815
	3	−	−	−
4	4	−	26,291	−26,291
	5	−	59,433	−59,433
	6	−	48,943	−48,943
	1	−	225,978	−225,978
5	2	−	−	−
	3	8,637,127	4,166,095	+4,471,032

NOVEMBER 1974

WEEK	DAY NUMBER	RECEIPTS (+)	PAYMENTS (−)	DIFFERENCE (+ OR −)
	1	7,050	48,226	−41,174
	2	114	2,133	−2,019
	3	1,012	−	+1,012
1	4	−	36,090	−36,090
	5	−	59,374	−59,374
	6	−	126,124	−126,124
	1	−	1,665	−1,665
	2	−	1,572	−1,572
	3	−	4,556	−4,556
2	4	5,117	3,348	+1,769
	5	−	1,188	−1,188
	6	−	78,701	−78,701
	1	−	21,595	−21,595
	2	−	−	−
	3	−	41,081	−41,081
3	4	−	708	−708
	5	−	569,357	−569,357
	6	−	39,322	−39,322
	1	−	23,722	−23,722
	2	−	4,200	−4,200
	3	−	20,897	−20,897
4	4	−	10,783	−10,783
	5	−	−	−
	6	7,971,720	286,989	+7,684,731
5	1	−	16,280	−16,280
	2	53,884	3,888,128	−3,834,244

WEEK	DAY NUMBER	RECEIPTS (+)	PAYMENTS (-)	DIFFERENCE (+ OR -)
		D E C E M B E R 1974		
	1	-	3,765	-3,765
	2	600	10,251	-9,651
	3	1,452	117,031	-115,579
1	4	-	3,088	-3,088
	5	-	13,740	-13,740
	6	-	320	-320
	1	-	-	-
	2	-	90,326	-90,326
	3	2,241	35,821	-33,380
2	4	-	-	-
	5	1,212	870	+342
	6	-	-	-
	1	-	17,212	-17,212
	2	-	32,613	-32613
	3	2,026	677	+1,349
3	4	-	8,632	-8,632
	5	-	599,162	-599,162
	6	-	-	-
	1	-	6,436	-6,436
	2	-	17,953	-17,953
	3	-	42,746	-42,736
4	4	-	-	-
	5	-	1,843	-1,843
	6	-	4,250	-4,250
5	1	-	1,654	-1,654
	2	7,420,790	4,862,469	+2,558,321

WEEK	DAY NUMBER	RECEIPTS (+)	PAYMENTS (−)	DIFFERENCE (+ OR −)
1	1	551	107,661	−107,110
	2	−	12,577	−12,577
	3	−	−	−
	4	−	17,534	−17,534
	5	−	15,515	−15,515
	6	−	244	−244
2	1	−	17,558	−17,558
	2	−	10,297	−10,297
	3	−	−	−
	4	−	129,390	−129,390
	5	1,013	44,715	−43,702
	6	−	10,566	−10,566
3	1	−	1,892	−1,892
	2	−	8,316	−8,316
	3	342	1,291	− 949
	4	858	6,428	−5,570
	5	−	−	−
	6	−	4,025	−4,025
4	1	−	10,499	−10,499
	2	−	12,546	−12,546
	3	−	788,492	−788,492
	4	−	1,531	−1,531
	5	−	−	−
	6	−	147,485	−147,485
5	1	−	362,075	−362,075
	2	9,085,561	5,202,784	+3,872,777

JANUARY 1976

WEEK	DAY NUMBER	RECEIPTS (+)	PAYMENTS (−)	DIFFERENCE (+ OR −)
		FEBRUARY 1976		
1	1	−	2,480	−2,480
	2	−	163,535	−163,535
	3	918	317	+601
	4	−	107,058	−107,058
	5	1,695	5,455	−3,760
	6	−	15,685	−15,685
2	1	−	40	−40
	2	−	1,270	−1,270
	3	−	146,323	−146,323
	4	−	105,621	−105,621
	5	−	−	−
	6	−	22,154	−22,154
3	1	2,157	21,426	−19,269
	2	−	−	−
	3	−	705	−705
	4	−	11,383	−11,383
	5	−	1,372	−1,372
	6	−	1,020	−1,020
4	1	−	9,538	−9,538
	2	−	6,336	−6,336
	3	−	−	−
	4	−	1,061,298	−1,061,298
	5	−	16,490	−16,490
	6	649	330,841	−330,192
5	1	18,804	81,394	−62,590
	2	12,171,408	6,791,815	+5,379,593

WEEK	DAY NUMBER	RECEIPTS (+)	PAYMENTS (-)	DIFFERENCE (+ OR -)
			M A R C H 1976	
	1	-	2,968	-2,968
	2	-	115	-115
	3	858	10,480	-9,622
1	4	-	119,895	-119,895
	5	-	80,283	-80,283
	6	-	8,916	-8,916
	1	1,591	19,216	-17,625
	2	-	120	-120
	3	-	88887	-88,887
2	4	-	167,843	-167,843
	5	-	1,123	-1,123
	6	-	9,909	-9,909
	1	-	682	-682
	2	-	2,361	-2,361
	3	-	146,249	-146,249
3	4	-	1,015	-1,015
	5	-	5,030	-5,030
	6	-	8,979	-8,979
	1	-	2,946	-2,946
	2	-	5,990	-5,990
	3	-	38,836	-38,836
4	4	-	915,650	-915,650
	5	-	456,211	-456,211
	6	-	11,075	-11,075
	1	-	15,728	-15,728
5	2	-	1,370	-1,370
	3	10,498,436	5,962,901	+4,535,535

WEEK	DAY NUMBER	RECEIPTS (+)	PAYMENTS (-)	DIFFERENCE (+ OR -)
		A P R I L 1976		
1	1	385	460	-75
	2	-	3,157	-3,157
	3	-	11,948	-11,948
	4	-	52,041	-52,041
	5	-	108,981	-108,981
	6	-	380	-380
2	1	-	2,000	-2,000
	2	-	206	-206
	3	-	12,773	-12,773
	4	-	12,214	-12,214
	5	-	255,625	-255,625
	6	-	248	-248
3	1	829	16,287	-15,458
	2	-	-	-
	3	-	-	-
	4	-	-	-
	5	-	72,487	-72,487
	6	-	22,612	-22,612
4	1	-	962,776	-962,776
	2	-	3,721	-3,721
	3	-	1,839	-1,839
	4	-	7,715	-7,715
	5	-	85,648	-85,648
	6	229	45,590	-45,361
5	1	-	28,551	-28,551
	2	10,310,262	6,211,494	+4,092,768

		MAY 1976		
W E E K	D A Y NUMBER	RECEIPTS (+)	PAYMENTS (−)	DIFFERENCE (+ OR −)
1	1	−	2,000	−2,000
	2	−	20,301	−20,301
	3	−	18,661	−18,661
	4	−	7,132	−7,132
	5	−	167,533	−167,533
	6	923	3,363	−2,440
2	1	−	12,567	−12,567
	2	−	21,208	−21,208
	3	−	243,077	−243,077
	4	−	860	−860
	5	−	290,447	−290,447
	6	2,000	1,210	+790
3	1	−	12,339	−12,339
	2	−	6,222	−6,222
	3	−	−	−
	4	−	147	−147
	5	−	6,160	−6,160
	6	3,912	1,727	−2,185
4	1	−	4,677	−4,677
	2	−	−	−
	3	−	801,900	−801,900
	4	−	7,332	−7,332
	5	−	334,695	−334,695
	6	5,358	92,368	−87,010
5	1	−	16,557	−16,557
	2	9,779,941	5,175,305	+4,604,636

WEEK	DAY NUMBER	RECEIPTS (+)	PAYMENTS (−)	DIFFERENCE (+ OR −)
		JUNE 1976		
	1	−	2,500	−2,500
	2	−	11,680	−11,680
	3	1,067	28,480	−27,413
1	4	−	23,233	−23,233
	5	−	9,992	−9,992
	6	−	107,959	−107,959
	1	−	89,564	−89,564
	2	−	4,734	−4,734
	3	−	1,560	−1,560
2	4	−	7,672	−7,672
	5	−	19,015	−19,015
	6	−	25,221	−25,221
	1	−	6,334	−6,334
	2	−	−	−
	3	−	15,021	−15,021
3	4	−	555	−555
	5	−	12,763	−12,763
	6	−	5,576	−5,576
	1	−	2,127	−2,127
	2	2,900	−	+2,900
	3	−	733,278	−733,278
4	4	−	316,312	−316,312
	5	−	−	−
	6	9,508,336	5,863,494	+3,644,842
5	1	−	147,624	−147,624

A P P E N D I X   VII

CUMMULATIVE BALANCES   1974

DAY	JANUARY	FEBRUARY	MARCH	APRIL
1	-80	-692	-2,572	-
2	-568	-2,202	+725	-425
3	-160,982	-34,190	-284	-30,825
4	-253,115	-45,617	-19,423	-117,782
5	-256,592	-53,104	-16,623	-120,382
6	-274,187	-53,104	-21,900	-123,773
7	-293,936	-116,991	-22,700	-123,773
8	-365,376	-118,220	-25,857	-200,170
9	-367,956	-123,265	-25,857	-199,770
10	-397,380	-129,871	-21,425	-275,927
11	-407,063	-130,771	-22,765	-275,927
12	-440,243	-135,212	-93,765	-275,927
13	-440,474	-132,163	-100,660	-275,927
14	-442,998	-135,351	-104,660	-275,927
15	-448,843	-135,351	-220,566	-281,093
16	-526,791	-550,095	-223,958	-281,914
17	-549,316	-510,336	-273,953	-286,514
18	-566,988	-510,640	-276,117	-289,879
19	-893,885	-511,323	-276,117	-290,564
20	-906,586	-512,359	-571,564	-570,564
21	-907,913	-802,342	-572,472	-570,564
22	-963,448	-803,955	-571,997	-621,316
23	-987,825	+1,053,238	-657,704	-647,916
24	-993,556		-883,334	-649,722
25	+1,636,745		-890,201	-1,043,372
26			+523,603	+879,785

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	CUMULATIVE BALANCES 1974			
DAY	MAY	JUNE	JULY	AUGUST
1	–	-9,644	–	-5,860
2	-1,364	-11933	-73,308	-7,460
3	-6,109	-11,933	-73,308	-8,660
4	-10,663	-11,933	-73,308	-8,660
5	-14,824	-100,327	-77,708	-8,660
6	-118,878	-102,447	-79,798	-96,884
7	-118,878	-248,450	-100,755	-96,884
8	-119,578	-253,550	-105,637	-102,284
9	-120,676	-335,152	-101,885	-102,284
10	-120,676	-335,697	-110,285	-102,709
11	-120,676	-337,283	-223,635	-138,589
12	-139,968	-338,416	-223,635	-140,309
13	-141,165	-334,596	-226,776	-140,309
14	-141,165	-334,596	-242,867	-150,645
15	-141,165	-332,189	-242,967	-150,645
16	-142,547	-349,320	-244,547	-156,104
17	-142,984	-765,457	-247,424	-186,721
18	-145,219	-765,457	-247,424	-180,136
19	-165,841	-768,125	-247,674	-184,876
20	-167,055	-771,203	-375,754	-187,550
21	-477,286	-772,629	-376,441	-187,950
22	-478,808	+4,589,224	-773,636	-707,237
23	-478,808	+4,555,585	-1,012,636	-719,917
24	-480,165	+1,812,471	-1,012,636	-742,943
25	-480,165		+1,438,551	-955,593
26	-743,382		+1,438,551	+2,029,186
27	-51,046		+1,439,260	+2,093,459

CUMUCATIVE BALANCES 1974

DAY	SEPTEMBER	OCTOEER	NOVEMBER	DECEMBER
1	-9,772	-30,652	-41,276	-3,765
2	-19,730	-37,517	-43,195	-13,416
3	-23,730	-37,185	-42,183	-128,995
4	-131,166	-35,746	-78,373	-232,083
5	-134,896	-36,755	-137,647	-245,820
6	-138,746	-188,175	-263,871	-246,140
7	-167,288	-188,945	-265,536	-246,140
8	-167,288	-248,845	-267,108	-336,466
9	-239,588	-248,976	-272,554	-369,846
10	-102,709	-342,858	-270,785	-369,846
11	-242,150	-343,593	-271,973	-369,504
12	-245,450	-343,593	-350,675	-369,504
13	-245,450	-358,063	-372,269	-386,716
14	-245,450	-358,063	-372,269	-419,329
15	-251,450	-360,047	-413,350	-417,980
16	-251,850	-360,047	-414,058	-426,612
17	-256,583	-360,047	-983,415	-1,025,774
18	-260,659	-360,047	-1,022,737	-1,025,774
19	-914,159	-392,628	-1,046,509	-1,032,210
20	-919,413	-1,038,443	-1,050,709	-1,050,163
21	-921,147	-1,038,443	-1,071,606	-1,092,899
22	-921,147	-1,065,734	-1,082,389	-1,092,899
23	-918,341	-1,125,167	-1,082,389	-1,094,472
24	+1,914,274	-1,174,110	+6,602,342	-1,098,992
25	+1,917,788	-1,400,038	+6,596,062	-1,100,646
26	-	+3,070,944	+2,751,818	+1,457,675

	CUMMULATIVE	BALANCES	1976	
DAY	JANUARY	FEBRUARY	MARCH	APRIL
1	-107,110	-2,450	-2,968	-75
2	-119,687	-166,015	-3,083	-3,232
3	-119,687	-165,414	-12,705	-15,180
4	-137,221	-272,472	-132,600	-67,221
5	-148,736	-276,232	-212,883	-176,202
6	-148,980	-291,917	-221,799	-176,582
7	-166,538	-291,917	-239,424	-178,582
8	-176,835	-293,227	-239,564	-178,788
9	-176,835	-439,550	-328,451	-191,561
10	-306,225	-545,171	-496,294	-203,775
11	-349,927	-545,171	-497,417	-459,402
12	-360,493	-567,325	-507,326	-459,650
13	-362,385	-586,594	-508,008	-475,108
14	-370,701	-586,594	-510,369	-475,108
15	-381,650	-587,299	-656,618	-475,108
16	-387,220	-298,682	-637,633	-475,108
17	-387,220	-600,054	-662,663	-547,597
18	-391,245	-601,074	-671,642	-570,209
19	-401,744	-610,612	-674,588	-1,532,985
20	-414,290	-616,948	-680,578	-1,536,706
21	-1,202,782	-616,948	-719,414	-1,538,545
22	-1,204,313	-1,678,246	-1,635,064	-1,546,260
23	-1,204,313	-1,694,736	-2,091,275	-1,631,908
24	-1,351,398	-2,024,928	-2,102,350	-1,677,269
25	-1,713,473	-2,087,518	-2,118,078	-1,705,820
26	+2,159,304	+3,292,075	-2,119,448	+2,386,948
27			+2,416,087	

DAY	MAY	JUNE
CUMMULATIVE BALANCES CONT...D/ 1976		
1	-2,000	-2,500
2	-22,301	-14,180
3	-40,962	-41,593
4	-48,094	-64,826
5	-215,627	-74,818
6	-218,067	-182,777
7	-230,634	-272,341
8	-251,842	-277,075
9	-494,919	-278,635
10	-495,779	-886,307
11	-786,226	-305,322
12	-785,436	-330,543
13	-797,875	-336,877
14	-804,097	-336,877
15	-804,097	-351,898
16	-804,244	-352,453
17	-810,404	-365,216
18	-808,219	-370,792
19	-812,896	-372,919
20	-812,896	-370,019
21	-1,614,796	-1,103,297
22	-1,622,128	-1,419,609
23	-1,956,823	-1,419,609
24	-2,043,843	+2,225,233
25	-2,060,400	+2,077,609
26	+2,544,236	

A P P E N D I X   VIII

M O N T H L Y   S A L E S   F I G U R E S

M O N T H	1 9 7 4	1 9 7 6
JANUARY	4,725,690	11,685,610
FEBRUARY	3,757,079	9,931,865
MARCH	3,986,665	11,042,059
APRIL	4,301,820	9,463,459
MAY	5,530,512	8,382,479
JUNE	5,502,485	9,922,773
JULY	6,338,437	
AUGUST	7,904,403	
SEPTEMBER	8,217,807	
OCTOBER	7,353,251	
NOVEMBER	7,469,978	
DECEMBER	7,654,599	

APPENDIX IX

1974	MONTHLY STRATEGY	WEEKLY STRATEGY	NET TOTAL COSTS	MINIMUM OVERDRAFT	DAYS ON OVERDRAFT	MAXIMUM CASH OUT	DAYS CASH OUT
STRATEGY 1	0	0	24,922	-1,400,088	286	-1,400,088	286
2	500,000	100,000	61,111	-900,088	66	-900,088	66
3	1,000,000	0	98,724	-814,063	235	-400,088	21
4	"	100,000	97,985	-675,434	107	-400,088	21
5	"	200,000	101,753	-575,434	64	-400,088	21
6	"	400,000	109,662	-414,063	39	-400,088	21
7	1,500,000	-100,000	135,725	-914,063	286	0	0
8	"	0	133,154	-814,063	235	0	0
9	"	+200,000	138,375	-575,434	58	0	0
10	"	400,000	148,063	-414,063	22	0	0
11	2,000,000	0	164,152	-814,063	235	0	0
12	"	400,000	185,814	-414,,63	22	0	0

1 9 7 6	MONTHLY STRATEGY	WEEKLY STRATEGY	NET TOTAL COSTS	MINIMUM OVERDRAFT	DAYS ON OVERDRAFT	MAXIMUM CASH OUT	DAYS CASH OUT
STRATEGY 1	0	0	20,813	-2,119,448	148	-2,119,448	148
2	500,000	100,000	40,119	-1,619,448	97	-1,619,448	63
3	1,000,000	0	58,071	-1,430,708	130	-1,119,448	29
4	''	100,000	57,902	-1,330,708	73	-1,119,448	29
5	''	200,000	59,634	-1,230,708	50	-1,119,448	29
6	''	400,000	62,282	-1,119,448	30	-1,119,448	29
7	1,500,000	-100,000	76,209	-1,530,708	148	-- 719,448	24
8	''	0	74,107	-1,430,708	124	-619,448	22
9	''	200,000	76,596	-1,230,708	48	-619,448	22
10	''	400,000	80,095	-1,030,708	29	-619,448	22
11	2,000,000	0	92,301	-1,430,708	119	-119,448	8
12	0'	400,000	98,153	-1,030,708	29	-119,448	8
13	''	200,000	94,177	-1,230,708	48	-119,448	8
14	''	500,000	100,752	-930,708	28	-119,448	8
15	2,200,000 ˅	0	98,852	-1,430,708	123	0	0
16	''	200,000	101,797	-1,230,708	48	0	0
17	''	400,000	103,311	-1,030,708	29	0	0

1974	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON CURRENT	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORTUNITY COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOT. COST
JANUARY	0	0	-993,556	24	-993,556	24	-	2,945	-	2,945
FEBRUARY	0	0	-803,955	22	-803,955	22	-	1,059	-	1,059
MARCH	0	0	-890,201	24	-890,201	24	-	1,634	-	1,634
APRIL	0	0	-1,043,372	24	-1,043,372	24	-	1,868	-	1,868
MAY	0	0	-743,382	26	-743,382	26	-	1,316	-	1,316
JUNE	0	0	-772,629	21	-772,629	21	-	1,822	-	1,822
JULY	0	0	-1,012,636	23	-1,012,636	23	-	1,674	-	1,674
AUGUST	0	0	-955,593	25	-955,593	25	-	1,367	-	1,367
SEPTEMBER	0	0	-918,341	24	-918,341	24	-	2,016	-	2,016
OCTOBER	0	0	-1,400,088	25	-1,400,088	25	-	2,868	-	2,868
NOVEMBER	0	0	-1,082,389	23	-1,082,389	23	-	2,804	-	2,804
DECEMBER	0	0	-1,100,646	25	-1,100,646	25	-	3,549	-	3,549
TOTAL	0	0	-1,400,088	286	-1,400,088	286	-	24,922	-	24,922

1974	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH CASH OUT	OPPORTUNITY COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOT. COSTS
JANUARY	500,000	100,000	-493,556	9	-493,556	9	5,417	640	906	5,151
FEBRUARY	''	''	-303,955	7	-303,955	7	5,417	354	1,284	4,487
MARCH	''	''	-514,084	6	-390,201	6	5,417	461	1,232	4,646
APRIL	''	''	-543,372	6	-543,372	6	5,417	491	1,052	4,856
MAY	''	''	-243,382	1	-243,382	1	5,417	424	940	4,901
JUNE	''	''	-327,041	5	-272,629	5	5,417	440	855	5,002
JULY	''	''	-665,212	5	-612,636	3	5,417	511	1,205	4,723
AUGUST	''	''	-675,434	4	-455,593	4	5,417	595	1,351	4,661
SEPTEMBER	''	''	-560,488	5	-418,341	5	5,417	712	1,107	5,022
OCTOBER	''	''	-900,088	6	-900,088	6	5,417	1,021	835	5,603
NOVEMBER	''	''	-582,389	7	-582,389	7	5,417	1,049	671	5,795
DECEMBER	''	''	-656,270	9	-600,646	9	5,417	1,517	670	6,264
ANNUAL	500,000	100,000	-900,088	66	-900,088	66	65,004	8,215	12,108	61,111

1974	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COSTS
JANUARY	1,000,000	0	-426,568	19	0	0	10,833	1,040	2,114	9,759
FEBRUARY	''	0	-375,428	18	0	0	10,833	509	3,700	7,642
MARCH	''	''	-614,084	20	0	0	10,833	923	4,158	7,598
APRIL	''	''	-393,650	20	-43,374	1	10,833	837	3,798	7,872
MAY	''	''	-334,946	21	0	0	10,833	540	4,137	7,236
JUNE	''	''	-427,041	17	0	0	10,833	652	3,123	8,362
JULY	''	''	-765,212	19	-12,636	2	10,833	899	3,979	7,753
AUGUST	''	''	-568,807	21	0	0	10,833	652	4,119	7,366
SEPTEMBER	''	''	-657,682	20	0	0	10,833	953	3,832	7,954
OCTOBER	''	''	-814,063	21	-400,088	6	10,833	1,632	3,600	8,865
NOVEMBER	''	''	-672,062	18	-82,389	6	10,833	1,132	2,909	9,056
DECEMBER	''	''	-656,270	21	-100,646	6	10,833	1,187	2,759	9,261
ANNUAL	1,000,000	0	-814,063	235	-400,088	21	129,996	10,956	42,228	98,724

1974	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COST
JANUARY	1,000,000	100,000	-326,168	10	0	0	10,833	313	2,705	8,441
FEBRUARY	''	''	-275,428	5	0	0	10,833	234	2,354	8,713
MARCH	''	''	-514,084	12	0	0	10,833	374	3,691	7,516
APRIL	''	''	-340,157	12	-43,372	1	10,833	350	3,652	7,531
MAY	''	''	-234,946	5	0	0	10,833	310	4,165	6,978
JUNE	''	''	-327,041	9	0	0	10,833	314	2,539	8,608
JULY	''	''	-665,212	5	-12,636	2	10,833	507	3,593	7,747
AUGUST	''	''	-675,434	4	0	0	10,833	483	3,853	7,463
SEPTEMBER	''	''	-560,488	9	0	0	10,833	653	2,948	8,538
OCTOBER	''	''	-500,088	10	-400,088	6	10,833	836	2,963	8,756
NOVEMBER	''	''	-572,062	9	-82,389	6	10,833	393	2,415	8,811
DECEMBER	''	''	-656,270	17	-100,646	6	10,833	459	2,409	8,883
ANNUAL	1,000,000	100,000	-675,434	107	-400,088	21	129,996	5,276	36,287	97,985

1974	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COST
JANUARY	1,500,000	400,000	-26,568	1	0	0	16,250	14	3,690	12,574
FEBRUARY	"	"	+24,574	0	0	0	16,250	0	3,920	12,330
MARCH	"	"	-214,084	1	0	0	16,250	107	4,340	12,017
APRIL	"	"	+6,350	0	0	0	16,250	0	4,085	12,165
MAY	"	"	+65,054	0	0	0	16,250	0	5,060	11,190
JUNE	"	"	-27,041	2	0	0	16,250	28	3,648	12,630
JULY	"	"	-365,212	1	0	0	16,250	201	4,352	12,099
AUGUST	"	"	-162,807	3	0	0	16,250	150	4,527	11,873
SEPTEMBER	"	"	-259,988	5	0	0	16,250	257	4,319	12,188
OCTOBER	"	"	-414,063	5	0	0	16,250	274	4,013	12,511
NOVEMBER	"	"	-272,062	2	0	0	16,250	136	3,168	13,218
DECEMBER	"	"	-256,270	2	0	0	16,250	127	3,138	13,239
ANNUAL	1,500,000	400,000	-414,063	22	0	0	195,000	1,294	48,260	148,034

1974	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COST
JANUARY	1,500,000	200,000	-226,568	6	0	0	16,250	254	4,377	12,127
FEBRUARY	''	''	-175,428	4	0	0	16,250	130	5,217	11,163
MARCH	''	''	-407,117	5	0	0	16,250	301	5,590	10,961
APRIL	''	''	-160,170	6	0	0	16,250	56	5,062	11,244
MAY	''	''	-134,946	5	0	0	16,250	36	5,245	11,041
JUNE	''	''	-227,041	2	0	0	16,250	113	4,400	11,963
JULY	''	''	-565,212	3	0	0	16,250	400	5,228	11,422
AUGUST	''	''	-575,434	3	0	0	16,250	431	6,484	10,197
SEPTEMBER	''	''	-460,488	5	0	0	16,250	458	5,052	11,656
OCTOBER	''	''	-400,088	8	0	0	16,250	410	4,927	11,733
NOVEMBER	''	''	-446,670	3	0	0	16,250	241	4,036	12,455
DECEMBER	''	''	-556,270	8	0	0	16,250	262	4,099	12,413
ANNUAL	1,500,000	200,000	-575,434	58	0	0	195,000	3,092	59,717	138,375

1974	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COST
JANUARY	1,500,000	0	−426,578	19	0	0	16,250	1,040	4,340	11,950
FEBRUARY	''	''	−375,424	18	0	0	16,250	509	6,167	10,592
MARCH	''	''	−607,217	20	0	0	16,250	923	6,461	10,712
APRIL	''	''	−359,158	20	0	0	16,250	708	6,204	10,754
MAY	''	''	−334,946	21	0	0	16,250	540	6,417	10,373
JUNE	''	''	−427,041	17	0	0	16,250	652	6,060	10,842
JULY	''	''	−764,962	19	0	0	16,250	718	6,317	10,651
AUGUST	''	''	−770,717	21	0	0	16,250	652	6,411	10,491
SEPTEMBER	''	''	−660,488	20	0	0	16,250	953	6,162	11,041
OCTOBER	''	''	−814,063	21	0	0	16,250	1,342	5,929	11,663
NOVEMBER	''	''	−672,062	18	0	0	16,250	563	4,998	11,815
DECEMBER	''	''	−658,270	21	0	0	16,250	1,064	5,044	12,270
ANNUAL	1,500,000	0	−814,063	235	0	0	195,000	9,664	71,510	133,154

1974	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COST
JANUARY	1,500,000	-100,000	-526,578	24	0	0	16,250	1,790	5,842	12,198
FEBRUARY	''	''	-475,426	22	0	0	16,250	1,228	6,667	10,811
MARCH	''	''	-707,217	24	0	0	16,250	1,673	6,961	10,962
APRIL	''	''	-459,158	24	0	0	16,250	1,458	6,704	11,004
MAY	''	''	-434,926	26	0	0	16,250	1,290	6,917	10,623
JUNE	''	''	-527,041	21	0	0	16,250	1,402	6,560	11,290
JULY	''	''	-864,962	23	0	0	16,250	1,468	6,817	10,901
AUGUST	''	''	-870,717	25	0	0	16,250	1,402	6,911	10,741
SEPTEMBER	''	''	-770,488	24	0	0	16,250	1,552	6,618	11,184
OCTOBER	''	''	-914,063	25	0	0	16,250	2,092	6,429	11,913
NOVEMBER	''	''	-772,062	23	0	0	16,250	1,313	5,498	12,065
DECEMBER	''	''	-758,270	25	0	0	16,250	1,525	5,544	12,231
ANNUAL	1,500,000	-100,000	-914,063	286	0	0	195,000	18,193	77,468	135,725

1974	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CERRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COST
JANUARY	1,000,000	400,000	-26,568	1	0	0	10,833	14	1,296	9,551
FEBRUARY	''	''	+24,574	0	0	0	10,833	–	1,856	8,977
MARCH	''	''	-214,084	1	0	0	10,833	107	2,311	8,629
APRIL	''	''	-43,372	1	-43,372	1	10,833	11	1,951	8,893
MAY	''	''	+65,054	0	0	0	10,833	–	2,307	8,526
JUNE	''	''	-27,041	2	0	0	10,833	28	1,571	9,290
JULY	''	''	-365,212	3	-12,636	2	10,833	219	2,120	8,932
AUGUST	''	''	-375,434	3	0	0	10,833	198	2,295	8,736
SEPTEMBER	''	''	-259,988	5	0	0	10,833	257	2,030	9,060
OCTOBER	''	''	-414,063	8	-400,088	6	10,833	274	1,487	9,620
NOVEMBER	''	''	-272,062	7	-82,389	6	10,833	239	1,383	9,689
DECEMBER	''	''	-356,270	8	-100,646	6	10,833	304	1,378	9,759
ANNUAL	1,000,000	400,000	-414,063	39	-400,088	21	129,996	1,651	22,185	109,662

1974	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON o/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COST
JANUARY	1,000,000	200,000	-226,168	6	0	0	10,833	254	2,206	8,881
FEBRUARY	''	''	-175,428	4	0	0	10,833	131	2,886	8,078
MARCH	''	''	-414,084	5	0	0	10,833	313	3,232	7,914
APRIL	''	''	-240,157	6	43,372	1	10,833	214	2,862	8,185
MAY	''	''	-134,946	5	0	0	10,833	147	3,251	7,729
JUNE	''	''	-227,041	2	0	0	10,833	257	2,256	8,834
JULY	''	''	-565,212	3	12,636	2	10,833	424	3,258	7,999
AUGUST	''	''	-575,434	3	0	0	10,833	431	3,225	0,039
SEPTEMBER	''	''	-460,488	5	0	0	10,833	458	2,548	8,743
OCTOBER	''	''	-400,088	8	400,088	6	10,833	567	2,390	9,010
NOVEMBER	''	''	-472,062	8	82,389	6	10,833	339	2,061	9,111
DECEMBER	''	''	-556,270	9	100,646	6	10,833	427	2,030	9,230
ANNUAL	1,000,000	200,000	-575,434	64	-400,088	21	129,996	3,962	32,205	101,753

1974	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COST
JANUARY	2,000,000	0	-426,578	19	0	0	21,666	1,040	8,342	14,364
FEBRUARY	"	"	-375,425	18	0	0	21,666	509	9,167	13,008
MARCH	"	"	-607,217	20	0	0	21,666	923	9,461	13,128
APRIL	"	"	-359,158	20	0	0	21,666	708	9,204	13,170
MAY	"	"	-334,946	21	0	0	21,666	540	9,417	12,789
JUNE	"	"	-427,041	17	0	0	21,666	652	9,060	13,258
JULY	"	"	-764,962	19	0	0	21,666	718	9,317	13,067
AUGUST	"	"	-770,717	21	0	0	21,666	652	9,411	12,907
SEPTEMBER	"	"	-660,488	20	0	0	21,666	953	7,162	15,457
OCTOBER	"	"	-814,063	21	0	0	21,666	1,342	8,929	14,079
NOVEMBER	"	"	-672,062	18	0	0	21,666	563	7,998	14,231
DECEMBER	"	"	-658,270	21	0	0	21,666	1,064	8,044	14,636
ANNUAL	2,000,000	0	-814,063	235	0	0	260,000	9,664	105,512	164,152

1974	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COST
JANUARY	2,000,000	400,000	−26568	1	0	0	21,666	14	6,246	15,434
FEBRUARY	''	''	+24,574	0	0	0	21,666	−	6,502	15,164
MARCH	''	''	−214,084	1	0	0	21,666	107	6,764	15,009
APRIL	''	''	+6,350	0	0	0	21,666	−	6,425	15,241
MAY	''	''	+65,054	0	0	0	21,666	−	7,400	14,266
JUNE	''	''	−27,041	2	0	0	21,666	28	5,988	15,706
JULY	''	''	−365,212	1	0	0	21,666	201	6,692	15,175
AUGUST	''	''	−162,807	3	0	0	21,666	150	6,867	14,949
SEPTEMBER	''	''	−259,988	5	0	0	21,666	257	5,319	16,604
OCTOBER	''	''	−414,063	5	0	0	21,666	274	6,353	15,587
NOVEMBER	''	''	−272,062	2	0	0	21,666	136	5,508	16,294
DECEMBER	''	''	−256,270	2	0	0	21,666	127	5,408	16,385
ANNUAL	2,000,000	400,000	−414,063	22	0	0	259,992	1,294	75,472	185,814

1976	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COST
JANUARY	1,000,000	200,000	−760,153	7	−713,473	5	10,833	1,245	2,615	9,463
FEBRUARY	''	''	−1,223,854	10	−1,087,518	4	10,833	1,017	1,806	10,044
MARCH	''	''	−1,230,708	10	−1,119,448	5	10,833	1,491	2,099	10,225
APRIL	''	''	−873,335	9	−705,820	7	10,833	1,174	2,034	9,973
MAY	''	''	−1,060,400	11	−1,060,400	5	10,833	1,536	1,687	10,682
JUNE	''	''	−848,817	3	−419,609	3	10,833	852	2,438	9,247
SEMI-ANNUAL	1,000,000	200,000	−1,230,708	50	−1,119,448	29	64,998	7,315	12,679	59,634
JANUARY	1,000,000	400,000	−713,473	5	−713,473	5	10,833	613	1,505	9,941
FEBRUARY	''	''	−1,087,518	4	−1,087,518	4	10,833	871	1,086	10,618
MARCH	''	''	−1,119,448	5	−1,119,448	5	10,833	1,266	1,266	10,833
APRIL	''	''	−705,820	7	−705,820	7	10,833	1,080	1,576	10,337
MAY	''	''	−1,060,400	5	−1,060,400	5	10,833	1,283	1,137	10,979
JUNE	''	''	−648,817	4	−419,609	3	10,833	236	1,495	9,574
SEMI-ANNUAL	1,000,000	400,000	−1,119,448	30	−1,119,448	29	64,998	5,349	8,065	62,282

1976	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COST
JANUARY	1,500,000	-100,000	-1,060,153	25	-313,473	1	16,250	2,163	6371	12,042
FEBRUARY	''	''	-1,523,854	25	-687,518	4	16,250	2,343	5,735	12,858
MARCH	''	''	-1,530,708	26	-719,448	5	16,250	2,094	5,803	12,541
APRIL	''	''	-1,173,335	24	-305,820	7	16,250	2,519	5,013	13,756
MAY	''	''	-1,335,624	25	-660,400	5	16,250	2,695	5,340	13,605
JUNE	''	''	-1,148,817	23	-19,609	2	16,250	1,508	6,351	11,407
SEMI- ANNUAL	1,500,000	-100,000	-1,530,708	148	-719,448	24	97,500	13,322	34,613	76,209
JANUARY	1,500,000	0	-960,153	21	-213,473	1	16,250	1,285	5,871	11,664
FEBRUARY	''	''	-1,423,854	21	-587,518	4	16,250	1,593	5,235	12,608
MARCH	''	''	-1,430,708	22	-619,448	5	16,250	1,344	5,303	12,291
APRIL	''	''	-1,073,335	20	-205,820	7	16,250	1,982	5,200	13,032
MAY	''	''	-1,235,624	21	-560,400	5	16,250	1,945	4,840	13,355
JUNE	''	''	-1,048,817	19	0	0	16,250	758	5,851	11,157
SEMI- ANNUAL	1,500,000	-100,000	-1,430,708	124	-619,448	22	97,500	8,907	32,300	74,107

1976	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COST
JANUARY	0	0	-1,713,473	25	-1,713,473	25	0	2,923	0	2,923
FEBRUARY	''	''	-2,087,518	25	-2,087,518	25	0	4,187	0	4,187
MARCH	''	''	-2,119,448	26	-2,119,448	26	0	4,660	0	4,660
APRIL	''	''	-1,705,820	24	-1,705,820	24	0	2,995	0	2,995
MAY	''	''	-2,060,400	25	-2,060,400	25	0	4,021	0	4,021
JUNE	''	''	-1,419,609	23	-1,419,609	23	0	2,027	0	2,027
SEMI-ANNUAL	0	0	-2,119,448	148	-2,119,448	148	0	20,813	0	20,813
JANUARY	1,000,000	0	-960,153	22	-713,473	5	10,833	1,621	3,115	9,339
FEBRUARY	''	''	-1,423,854	22	-1,087,518	4	10,833	1,826	1,934	10,725
MARCH	''	''	-1,430,708	23	-1,119,448	5	10,833	1,981	3,011	9,803
APRIL	''	''	-1,073,335	21	-705,820	7	10,833	2,033	2,720	10,146
MAY	''	''	-1,235,624	22	-1,060,400	5	10,833	1,709	2,645	9,897
JUNE	8'	''	-1,048,817	20	-419,609	3	10,833	934	3,606	8,161
SEMI-ANNUAL	1,000,000	0	-1,430,708	130	-1,119,448	29	64,998	10,104	17,031	58,071

1976	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOT COST
JANUARY	2,200,000	200,000	-760,153	5	0	0	23,833	750	7,884	16,699
FEBRUARY	''	''	-1,223,854	10	0	0	23,833	774	7,537	17,070
MARCH	''	''	-1,230,708	10	0	0	23,833	847	7,587	17,093
APRIL	''	''	-873,335	9	0	0	23,833	1,069	7,846	17,056
MAY	''	''	-1,060,400	11	0	0	23,833	1,133	7,108	17,858
JUNE	''	''	-848,817	3	0	0	23,833	304	8,116	16,021
SEMI-ANNUAL	2,200,000	200,000	-1,230,708	48	0	0	142,998	4,877	46,078	101,797

1976	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOT COST
JANUARY	2,200,000	400,000	−560,153	5	0	0	23,833	455	7,257	17,031
FEBRUARY	"	"	−1,023,853	4	0	0	23,833	198	6,601	17,430
MARCH	"	"	−1,030,708	5	0	0	23,833	625	6,697	17,761
APRIL	"	"	−673,335	7	0	0	23,833	257	6,960	17,130
MAY	"	"	−860,400	5	0	0	23,833	607	6,196	18,244
JUNE	"	"	−648,817	3	0	0	23,833	200	7,318	16,715
SEMI-ANNUAL	2,200,000	400,000	−1,030,708	29	0	0	142,998	2,342	41,029	103,311
JANUARY	2,200,000	0	−960,153	21	0	0	23,833	1,212	9,055	15,990
FEBRUARY	"	"	−1,423,854	21	0	0	23,833	1,493	8,479	16,847
MARCH	"	"	−1,430,708	22	0	0	23,833	1,144	8,586	16,391
APRIL	"	"	−1,073,335	20	0	0	23,833	1,883	8,759	19,957
MAY	"	"	−1,235,624	20	0	0	23,833	1,545	8,087	17,291
JUNE	"	"	−1,048,817	19	0	0	23,833	663	9,020	15,476
SEMI-ANNUAL	2,200,000	0	−1,430,708	123	0	0	142,998	7,940	51,986	98,852

1976	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COST
JANUARY	500,000	100,000	-1,231,473	14	-1,213,473	5	5,417	1,481	809	6,089
FEBRUARY	''	''	-1,587,518	25	-1,587,518	16	5,417	1,885	585	6,717
MARCH	''	''	-1,619,448	21	-1,619,448	15	5,417	2,496	667	7,246
APRIL	''	''	-1,205,820	13	-1,205,820	9	5,417	1,943	717	6,643
MAY	''	''	-1,560,400	19	-1,560,400	15	5,417	2,529	669	7,277
JUNE	''	''	-948,817	5	-919,609	3	5,417	1,506	776	6,147
SEMI-ANNUAL	500,000	100,000	-1,619,448	97	-1,619,448	63	32,502	11,040	4,223	40,119
JANUARY	1,000,000	100,000	-860,153	14	-713,473	5	10,833	1,319	3,101	9,051
FEBRUARY	''	''	-1,323,854	13	-1,087,518	4	10,833	1,218	2,475	9,576
MARCH	''	''	-1,330,708	16	-1,119,448	5	10,833	2,103	2,552	10,384
APRIL	''	''	-973,335	12	-705,820	7	10,833	1,194	2,803	9,224
MAY	''	''	-1,135,624	11	-1,060,400	5	10,833	1,805	1,989	10,649
JUNE	''	''	-948,817	7	-419,609	3	10,833	1,305	3,120	9,018
SEMI-ANNUAL	1,000,000	100,000	-1,330,708	73	-1,119,448	29	64,998	8,944	16,040	57,902

1976	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOT. COST
JANUARY	2,000,000	200,000	-760,153	5	0	0	21,666	750	7,343	15,073
FEBRUARY	''	''	-1,223,854	10	-87,518	2	21,666	871	6,604	15,933
MARCH	''	''	-1,230,708	10	-119,448	4	21,666	956	6,712	15,910
APRIL	''	''	-873,335	9	0	0	21,666	1,069	6,909	15,826
MAY	''	''	-1,060,400	11	-60,400	2	21,666	1,282	6,195	16,753
JUNE	''	''	-848,817	3	0	0	21,666	304	7,288	14,682
SEMI-ANNUAL	2,000,000	200,000	-1,230,708	48	-119,448	8	129,996	5,232	41,051	94,177
JANUARY	2,000,000	500,000	-460,153	5	0	0	21,666	275	5,906	16,035
FEBRUARY	''	''	-923,854	4	-87,518	2	21,666	562	5,216	17,012
MARCH	''	''	-930,708	4	-119,448	4	21,666	642	5,343	16,965
APRIL	''	''	-573,335	7	0	0	21,666	777	5,423	17,020
MAY	''	''	-760,400	5	-60,400	2	21,666	721	4,851	17,536
JUNE	''	''	-548,817	3	0	0	21,666	340	5,822	16,184
SEMI-ANNUAL	2,000,000	500,000	-930,708	28	-119,448	8	129,996	3,317	32,561	100,752

1976	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COST
JANUARY	2,000,000	0	-960,153	21	0	0	21,666	1,212	8,112	14,766
FEBRUARY	''	''	-1,423,854	21	-87,518	2	21,666	1,493	7,596	15,563
MARCH	''	''	-1,430,708	22	-119,448	4	21,666	1,185	7,596	15,255
APRIL	''	''	-1,073,335	20	0	0	21,666	1,910	6,737	16,839
MAY	''	''	-1,235,624	20	-60,400	2	21,666	1,618	7,466	15,818
JUNE	''	''	-1,048,817	19	0	0	21,666	663	8,269	14,060
SEMI-ANNUAL	2,000,000	0	-1,430,708	119	-119,448	8	129,996	8,081	45,776	92,301
JANUARY	2,000,000	400,000	-560,153	5	0	0	21,666	455	6,329	15,792
FEBRUARY	''	''	-1,023,853	4	-87,518	2	21,666	220	5,652	16,234
MARCH	''	''	-1,030,708	5	-119,448	4	21,666	647	5,790	16,523
APRIL	''	''	-673,335	7	0	0	21,666	839	5,642	16,913
MAY	''	''	-860,400	5	-60,400	2	21,666	697	5,262	17,101
JUNE	''	''	-648,817	3	0	0	21,666	200	6,276	15,590
SEMI-ANNUAL	2,000,000	400,000	-1,030,708	29	-119,448	8	129,996	3,108	34,951	98,153

1976	MONTHLY STRATEGY	WEEKLY STRATEGY	MINIMUM CURRENT	DAYS ON O/D	MAXIMUM CASH OUT	DAYS CASH OUT	OPPORT. COST	OVERDRAFT INTEREST	DEPOSIT INTEREST	NET TOTAL COST
JANUARY	1,500,000	200,000	-760,153	5	-213,473	1	16,250	1,026	4,960	12,316
FEBRUARY	''	''	-1,223,854	10	-587,518	4	16,250	974	4,311	12,913
MARCH	''	''	-1,230,708	10	-619,448	5	16,250	1,304	4,571	12,983
APRIL	''	''	-873,335	9	-205,820	7	16,250	1,147	4,505	12,892
MAY	''	''	-1,060,400	11	-560,400	5	16,250	1,433	3,845	13,838
JUNE	''	''	-848,817	3	0	0	16,250	304	4,900	11,654
SEMI-ANNUAL	1,500,000	200,000	-1,230,708	48	-619,448	22	97,500	6,188	27,092	76,596
JANUARY	1,500,000	400,000	-560,153	5	-213,473	1	16,250	495	4,064	12,681
FEBRUARY	''	''	-1,023,854	4	-587,518	4	16,250	372	3,400	13,222
MARCH	''	''	-1,030,708	5	-619,448	5	16,250	830	3,488	13,592
APRIL	''	''	-673,335	7	-205,820	7	16,250	962	3,344	13,868
MAY	''	''	-860,400	5	-560,400	5	16,250	930	2,958	14,222
JUNE	''	''	-648,817	3	0	0	16,250	200	3,940	12,510
SEMI-ANNUAL	1,500,000	400,000	-1,030,708	29	-619,448	22	97,500	3,789	21,194	80,095