CHAPTER - 11

SUGGESTIONS FOR FUTURE RESEARCH
11. CHAPTER 11: SUGGESTIONS FOR FUTURE RESEARCH

Knowledge has no boundaries and research is a never ending process. Hence, no research work appears complete without discussing future scope of the thesis. Following are some problems in which ITOR approach is applicable:

1. **Inventory Turnover Ratio with known but varying demand:**

   In general, the demand rate is considered as constant over an infinite time horizon. In some business problems constant demand rate is rare. e.g. commercial warehouses problems. Similar situation arise with manufacturing inventories where purchased parts are kept in stock to be used as components in serial production. Let us take demand as known but varying demand. Therefore $D_i = \text{Demand during periods } i = 1, 2, 3 \ldots n$. Demands is, therefore, known up to period $n$.

   There are two possibilities for this model:

   (i) Either one knows how the problem behaves in future means one can, at least, give probabilities for future demands.

   (ii) Or one consider it as an infinite horizon problem.

   Let us take holding cost as $C_1$ ordering / setup cost as $C_3$ and time period for which ITOR is maximised as $T$. ITOR is define as,

   $$ I(T) = \frac{Dp}{C(T)} $$

   where $D = D_1 + D_2 + D_3 + \ldots + D_n$

   $p = \text{Unit price of the item.}$

   and $C(T) = \frac{C_2}{T} + \frac{C_1}{T} \left[ TD_T + (T-1)D_{T-1} + \ldots + D_1 \right]$
The quantity $D_i$ is stored for $i$ periods, maximization occurs in the discrete variable $T$.

Above problem is also defined for the continuous time and one can maximise the inventory turnover ratio.

2. **Inventory Turnover Ratio with fixed delivery period and stochastic delivery time:**

   If the delivery period is positive, constant and known, then the time of ordering and the periods of maximum stock levels should be differentiated. The order must be placed $t$ time periods before the stock becomes empty. The stock level is at its optimal order point when $q = Dt$. If the delivery period $t$ is longer than the duration of a cycle $T$ then orders occur in each time period and in certain periods, more than once. If it is not allowed, one must always order the quantity $q$ at the moment when the last order has been delivered. Because of this, Costs is increased compared to the case in which frequent orders are made. In general, firms seek to avoid early deliveries in the same way they attempt to avoid late deliveries by imposing contract penalties and other reasons. Therefore, optimal delivery period must give some advantage to the firm in the competitive situations.

   Suppose the delivery time be a random variable with some expected value. If one specifies the demand during the expected delivery time then, in the case of a symmetrical delivery time distribution, one would have as many as shortages immediately before an order arrives. This is only optimal if the inventory cost rate is equally as large as the shortage cost rate. By increasing the order point the risk of shortage is reduced. Its purpose is to cover many deviations in expected delivery times.
One can solve above two situations with respect to ITOR approach.

3. **Inventory Turnover Ratio with Forecasting:**

The basic model of inventory with periodic monitoring was formulated by Arrow, Harris and Marschak (1951) is named AHM-Model. The introduction of the AHM inventory model can sometime fail in models which imply a stationary demand process. However, information about the future course of demand usually exists from which short-term forecasts can be made. These forecasts must be considered in the model. One finds such situations, for example, if supply agreements are settled with a major client.

In practice, one proceeds in such a way that a demand forecast is made in the first step, a safety stock level is determined in the second step, the forecast as deterministic demand is determined in the third step and, using a deterministic model, ITOR is maximised. This stepwise procedure, however, leads to solutions which are, as a rule, sub-optimal.

Optimal solutions are obtained if the forecast are integrated in the dynamic programming method which requires a reformulation of the optimality principle.

There are two types of forecasts: the exogenous and the endogenous forecasts. In the endogenous forecast, the forecast values are solely derived from previously observed demand whereas in the exogenous forecast, the source of information lies outside of the model.

4. **Inventory Turnover Ratio with Dynamic Problems under risk:**

Dynamic inventory problems under risk are characterized by two features: there is the possibility of a number of orders and there is
a known probability distribution of demand. Since time is implicit in
dynamic problems, the probability distribution of demand must be
specifying in terms of some interval of time. Dynamic inventory
problems under risk or under uncertainty include the great majority of
practical inventory problems. All items which are regularly used over
a reasonable length of time would fall in to this category unless the
demand is known with certainty, which is relatively infrequent. Even
items with a short demand life time will fall in to this category if more
than one order is possible. Most departmental store and supermarket
inventories are of this general type as are the inventory problems of
the manufacturers who supply them. One can solved this type of
problems with the help of ITOR approach.

We have discussed some problems on a broad canvas. Many such
problems can be solved using ITOR concept which can broader the
boundaries of financial inventory management.