Turkish Online Journal of Qualitative Inquiry (TOJQI)
Volume 11, Issue 4, December 2020: 1528-1536

Strategic Market Management – A Mathematical Perspective on Profit-Loss Forecasting

Prasun Chakrabarti[1] , Biswajit Satpathy[2], Meghana Ramchandra Tribuwan[3] , Jonathan Andrew Ware[4], Ananda Shankar Hati[5], Pradeep Chhawchharia[6]

Abstract

The paper points out a mathematical based perspective of strategic management. Fixed term loss can be governed mathematically by the principle of recurrence relations for equidistant time-spans between initial observed profit and subsequent loss, and subsequent loss and regaining profit as per initial measure. The quantitative percentage of profit in successive times phases including initial seed are linearly dependent in case of any stochastic business fluctuation resulting in marginal gain.Statistical analysis of business forecasting in case of a frequent event (profit or loss) can be governed by the point estimation method and furthermore, if there bears an exponential relation between quantitative measure of an estimate (profit or loss) and the corresponding timing instant of incidence, then the same relation is valid, if the estimate is observed in the mid-timing interval. The priority of arrival of past event (either profit or loss) in business forecasting can be computed on the basis of neuro-associator

Keywords:strategic management, recurrence relations, business forecasting, point estimation, neuro-associator

[1]Post-doctoral (D.Litt) scholar, Sambalpur University,Odisha 768019,India
[2]Department of Business Administration, Sambalpur University, Odisha 768019,India
[3] ITM(SLS) Baroda University,Vadodara 391510,Gujarat,India
[4]Faculty of Computing,Engineering and Science, University of South Wales, UK
[5]Department of Mining Machinery Engineering, Indian Institute of Technology (Indian School of Mines) Dhanbad, Jharkhand 826004,India
[6]Techno India NJR Institute of Technology, Udaipur 313003, Rajasthan,India
Corresponding author – drprasun.cse@gmail.com

Introduction

Strategic development or review (Aaker *et.al.* ,2015) deals with an analysis of the factors external to a business that affect strategy. In strategic market management, estimation of sales and profit plays a significant role . Sometimes a separate statistical analyst team is solely recruited in certain business companies. A running business can be investigated on the basis of apriori events and statistical trend analysis ((Cobb*et.al.* ,1925), (Giri*et.al.*, 1999)). However in certain cases due to some external stochastic events, statistical analysis has to be carried out based upon prediction and forecasting and in this perspective of strategic uncertainty , the business estimate varies from individual to individual

depending on his nature viz. normal , optimistic , pessimistic and fickle-minded. Certain discovered facts can be pointed out pertaining to the variation of external analysis of strategic market management depending on the human nature. We propose certain mathematically established axioms in this context. An opportunity or a threat results in a significant change in pattern of the sales and profit of a business. Marketing Myopia (Levitt, 1960) also indicates the essence of investigation of sales and profit in case of strategic uncertainty.Furthermore, profit and loss are two mutually exclusive events at any specific timing instant of the observation period. Therefore, R , the Bernoulli random variable (Olofsson,2005) for the external analysis of business strategy in this situation , is applicable. Strategic uncertainties focus on specific unknown parameters that will affect the outcome of strategic decisions. In this claim we have proposed that the principle of hypothesis rule plays a pivotal role in strategic decisions. A statistical hypothesis(Samuelson,1976) is an assertion about the distribution of one or more random variables which we want to verify on the basis of a sample. Fuzzy set theory was proposed in 1965 by Lotfi A. Zadeh. A fuzzy set (Zadeh,1965) can be defined mathematically by assigning to each possible individual in the universe of discourse, a value representing its grade of membership in the fuzzy set. Fuzzy based profit-loss forecasting also can be analyzed. If prediction of occurrence of gain in a strategic market management by a normal individual is based upon estimation of weight of single associated parameter and hypothesis of fairness by pessimistic individual is rejected , then for unit negative bias, the estimate of weight of the single parameter by either historical or predictive means by a normal person is represented as a complex variable.Accuracy estimate of future prediction of occurrence of an uncertain event (gain or loss) is governed by the principle of hypothesis of fairness rule in case of both optimistic and pessimistic individuals. In case of sales and profit estimation of strategic market management done by a fickle-minded person , the predicted value (Tv) clearly acts as a reference parameter for identifying the output (To) trends towards both rare and frequent fuzzy domains. The null hypothesis of validity of an unknown event (gain or loss) for a biased individual is identical to alternate hypothesis of the same for a normal person.In this study (Alden *et.al.*,1999), the authors examine the emergence of product appellation positioning customs in advertising that parallel the development of the wide-reaching marketplace. an auxiliary construct, global consumer culture positioning (GCCP), is proposed, operationalized, and tested. As per (Ataman *et.al.,* 2010), marketing managers spend billions of dollars on their marketing programs each year, but few studies systematically assess the long-term impact of these programs across many brands and categories. In addition, existing research focuses mainly on advertising and promotions, but not on product or distribution. This study attempts to consider both the data and the modeling requirements. This study (Atuahene-Gima*et. al*., 2004) attempts to contribute to a better understanding of marketing strategy by examining the antecedents and outcomes at the project level. The integrity of the marketing strategy (MSC). Drawing on institutional and contingency theories, the authors develop and test the effects of production and process rewards, task conflict, and intra-industry and non-industry relationships of project members in MSCs. Relationships outside the industry are positively related to SCD, task conflicts (combined with conflict avoidance) impede their expansion. In addition, the results indicate that MSC has a more positive effect on performance when implementation speed is faster. Finally, the authors find that technology and market uncertainties moderate the relationship

between MSC and performance differently; The former has a positive effect and the latter has a negative effect. The authors also discuss the theoretical and practical implications of their results. In this paper (Balducci*et.al*.,2018) the rise of unstructured information (UD), propelled by novel technologies, is reshaping markets and therefore the management of promoting activities. nevertheless these multiplied data stayprincipally untapped by several firms, suggesting the potential for additionalanalysis developments. Market analysts and marketing strategists (Dickson *et. al*. ,2001) emphasize understanding the fundamental dynamics of a market, but how deeply do they think about the interplay of these fundamentals and what frameworks do they use for such reasoning? How do business schools teach managers this way of thinking? The premise of this article is that senior marketing executives, board members, consultants, and financial analysts should approach the market and the company's integration into a market as a moving video rather than a static snapshot in their strategy. The authors propose that what drives video are fundamental feedback effects that create the evolutionary paths that a market and a company can take. A taxonomy of systemic feedback regularities is presented with applications showing how the proposed taxonomy and soft-mapping techniques can be used to create dynamic mental models that improve their dynamic strategic thinking and strategic foresight by consultants.

Strategic Market Management And Essence Of Analysis

The strategists need new and improved evaluations techniques, the tools, and the concepts. Exactly, they will need to develop skills around the given five management tasks that is strategic analysis, innovation, getting control of the multiple business units, then creating the sustainable competitive advantages (SCAs), and finally creating the growth platforms.The need for information about its customers, its competitors, and the ongoing trends which is affecting the market is now higher than ever. Addition to that, the information needs to be in continuous manner, and is not tied to a planning cycle, because a timely detection of the major threats, the opportunities, the strategic problems, or rising weaknesses can be very crucial to getting the response right. There is also an increased premium on the ability to foresee the trends, project their impact to the business, and differentiate them from simple fads. That means the resources need to be capitalized in right manner and capabilities that is created in terms of getting the right information, then filtering it, and finally converting it into an actionable evaluation.The ability to innovate is one of the important key to successfully be the best in the dynamic markets as numerous empirical studies have already shown. Innovation, though, turns out to have a multitude of dimensions in them. There is also an organizational challenge of creating a context that supports innovation. There is also the brand selection challenge to make sure that the innovation s are owned and not to be a short-lived market glitch. There is also the strategic task of developing the right mix of improvements that is ranges from incremental to the transformational phase. Hence lies the execution challenge which is important to turn the innovations into the contributions in the market.It is the rare business now that does not carry out multiple business units which is defined by the channels and the countries in addition to the given product categories and subcategories in it. Decentralization is an era old organizational form which is going to provide the accountability, a deep understanding of the

product or service, and it will be close to the customer‟s need and fast response, all are good things needed. Though, in its ultimate form, the independent business units can lead to the miss allocation of the resources, redundancies, a failure to capture the cross-business potential synergies, and the confused brands. The challenge need to adjust the decentralization model so that it is no longer able to prevents the strategy adaptation in the on-going dynamic markets.

Mathematical Representation of Strategy

In case of a significant downward change in sales and profit, quantification of threat estimation is a measure of how likely failure is at a timing instant t of a brand-new product that is already t time units old. Hence it is basically a conditional measure of failure. This is a probabilistic event. Critical estimation with error bounds suffices an idea of the reasons behind the occurrence of the event. This needs an investigation of business gain in certain time-intervals so that the actual failure rate can be observed and sensed accurately. It is preferable to keep the confidence interval as short as possible in order to get high accuracy in the gain estimate. This is a very significant step in case of external analysis of business strategy. The main objective is to find out the unknown parameters that contribute significantly towards the occurrence of downward change in sales and profit. Succession , Hypothesis testing , Fuzzy Logic , Neuro-associator and Radial Interpolation can be applied in case of artificial intelligence based strategic marketing. In certain cases , due to unknown reason , any unexpected event related to sales and profit may appear stochastically. The chi-square distribution based trend investigation plays a pivotal role in case of external analysis of strategic market management. An external analysis can contribute to strategy indirectly by observing the trend of gain estimate. In any business scenario , estimation of the sales and profit is essential for analyzing the current status with respect to the present market need. The customer and competitor analysis can be performed in the light of concept learning and artificial neural modeling of customer based approach of identifying competitors. Statistical based investigations can be carried out based upon two significant factors of image and positioning strategy viz. market impact and profitability. Understanding competitors based upon profitability can be governed by exponential growth model. Reduction in tolerance limit in level of growth of sales and market share is a function of level of degrade in vitality of business strategy, measure of threshold tolerance limit and probabilistic measure of profit. Increase in profitability on timing basis leads to increase in level to access capital in investment. The investigation related to risk associated with super competitor late entry in a market can be governed by the basic principle of geometric distribution. The investigation related to risk associated with price instability resulting from overcapacity, can be governed by the basic principle of geometric distribution. Another unique contribution of the work may be related to the statistical correlation of the investigations carried out for the sales and profit prediction and analysis by persons of different mindsets in case of strategic uncertainty. The normal , optimistic , pessimistic and fickle-minded based individual mindsets significantly contribute to varying external analysis of business statistics. The emerging submarket deals with observation towards launching a novel product. The expansion of features in an existing product based upon supervised learning strategy leads to fuzzy logic based computation and the support factor for each parameter. It can represented

as x.€ = 1 – y.£ , where € and £ are fuzzy estimates of new product and common product respectively , x be support factor of € towards optimum expansion while y be the probabilistic support factor of £ reflecting the necessity of augmentation. If € = 0, then £ = 1/y. Now, if y is in lower fuzzy range in that case as per the proposed mathematical relation , £ has to be in frequent fuzzy range. This indicates that the product is highly acceptable in the market and at the moment there is no significant change is needed. Also, y ≠ 0 as in that case £ will be undefined which is absurd. Hence, augmentation is a necessary and mandatory pre-requisite for product validation. Similarly the more x.€ tends towards 1, it indicates that the augmentation leads to evolution of a new product with a predictive acceptable market response. In case of extreme strategic uncertainty towards prediction of market size, the predicted quantified estimate of submarket growth lacks proper co-ordination between present estimate with past one and present estimate with future event. Let us assume T_E (€_t) be the time-stamp of observing the present quantified estimate of submarket growth ,T_E (€_(t-1)) be the measure of lagging time with respect to quantified estimate of submarket growth and T_E (€_(t+1)) be the measure of leading time with respect to quantified estimate of submarket growthThe entire time-stamps of realizing the past ,present and future quantified estimate of submarket growth can be represented by Abelian Group (G,+) where T_E (⟦€_(t-1),€⟧ _(t),€_(t+))={0,±1,±2,… ,±∞},the identity element „0" being T_E (€_t).The sets representing correlation of past and future quantified estimate of submarket growth with respect to present are T_E (€_(t-1) ,€_t)={(-1,0),(-2,0),… ,(-∞,0) and T_E (€_t ,€_(t+1))={(1,0),(2,0),… ,(∞,0). In case of extreme strategic uncertainty, analyzing of event of timestamp TE(€t) leads to false belief. Hence, realization of the quantified estimate of submarket growth representing correlation of both present with past as well as present with future has to be distorted. The dimensions of Environmental analysis involves the technology, forecasting technology , disruptive and sustaining technologies , government , economics and culture. This needs a focus on the fuzzy logic based analysis and neural modeling of the aforesaid dimensions. This will be a unique contribution. Internal analysis can be analyzed based on probabilistic models related to sales and profitability. Stochastic processes and Hidden Markov model based quantification of performance measurement has also to be examined. The learning rules of neural networks also play a pivotal role in this context. Prediction in the light of supervised learning rule in context to gain analysis is based upon irregular incidence of bivalent states [0→ loss ; 1→ profit]. Any state is a stochastic process and based on unsupervised learning rule, both states are aperiodic. The transition graph includes feed-forward path, feedback path and self –loop which can be represented as follows-

(i) Marginal gain with respect to previous data is a feed-forward path ,

(ii) Consecutive state change is a done a feedback path and

(iii) Consistent profit or loss for a short term time span is a self-loop.

All the aforesaid facts (i – iii) are positive recurrent which signifies the validity of ergodic property .Hence, the business gain analysis can be governed by the principle of discrete time ergodic Markov chain.

Findings and Discovered Facts

Fact 1 - Fixed term loss can be governed mathematically by the principle of recurrence relations for equidistant time-spans between initial observed profit and subsequent loss , and subsequent loss and regaining profit as per initial measure.

Justification –

Let $T_{E(i)}$ = timestamp of occurrence of initial observed profit

$T_{DE(i)}$ = timestamp of subsequent loss

$T_{RE(i)}$ = timestamp of regaining profit as per initial measure

€1, €2 = units of time

Now, $T_{DE(i)} = T_{E(i)} + €1$

and $T_{RE(i)} = T_{DE(i)} + €2 = T_{E(i)} + (€1 + €2)$

For equidistant time-spans between initial observed profit and subsequent loss , and subsequent loss and profit as per initial measure, each of €1 and €2 is a constant. Let us investigate for 3 iterations.

$T_{DE(1)} = T_{E(1)} + €1$

$T_{RE(1)} = T_{DE(1)} + €2 = T_{E(1)} + (€1 + €2)$ .....(1)

$T_{DE(2)} = T_{E(2)} + €1$

$T_{RE(2)} = T_{DE(2)} + €2 = T_{E(2)} + (€1 + €2) = (T_{E(1)} + €3) + (€1 + €2) = T_{RE(1)} + €3$ .....(2)

$T_{DE(3)} = T_{E(3)} + €1$

$T_{RE(3)} = T_{DE(3)} + €2 = T_{E(3)} + (€1 + €2) = (T_{E(2)} + €4) + (€1 + €2) = T_{RE(2)} + €4$.....(3)

Therefore, the generalized equation represents that of a recurrence relation as $T_{RE(i)} = T_{RE(i-1)} + b_i$, with initial condition(seed) $T_{RE(1)} = T_{E(1)} + (€1 + €2)$ and b_i being the constant towards event E(i) ,i.e., regaining profit as per initial measure.

Hence it is justified to state that "Fixed term loss can be governed mathematically by the principle of recurrence relations for equidistant time-spans between initial observed profit and subsequent loss , and subsequent loss and regaining profit as per initial measure".

Fact 2– The quantitative percentage of profit in successive times phases including initial seed are linearly dependent in case of any stochastic business fluctuation resulting in marginal gain.

Justification –

Let QE(T1) be the initial seed in probabilistic form representing quantitative percentage of the event E ,i.e., profit at timing instant T1 ,QE(Ti) be the probabilistic value representing quantitative percentage of the event E ,i.e., profit at timing instant Tiand ai be the probabilistic value representing stochastic business fluctuation ,i.e., relative loss in QE(Ti).

Investigation for four successive iterations yield -

QE(T2) = QE(T1) - a1. QE(T1) ..... (4)

QE(T3) = QE(T2) - a2. QE(T2) ..... (5)

QE(T4) = QE(T3) - a3. QE(T3) ..... (6)

QE(T5) = QE(T4) - a4. QE(T4) ..... (7)

In case of marginal gain or loss,

$QE(T5) = QE(T4) - a4. QE(T4) \approx 0$

or, QE(T4) = a4. QE(T4) .....(8)

Putting result of Eq(8) in Eq(6) ,
a4. QE(T4) = QE(T3) - a3. QE(T3)
or, QE(T3) = a3. QE(T3) + a4.QE(T4)..... (9)
Putting result of Eq(9) in Eq(5) ,
a3. QE(T3) + a4.QE(T4) = QE(T2) - a2. QE(T2)
or, QE(T2) = a2. QE(T2) + a3. QE(T3) + a4.QE(T4) .....(10)
Putting result of Eq(10) in Eq(4),
a2. QE(T2) + a3. QE(T3) + a4.QE(T4) = QE(T1) - a1. QE(T1)
or, QE(T1) = a1. QE(T1)+ a2. QE(T2)+ a3. QE(T3)+ a4.QE(T4)
or, QE(T1) - a1. QE(T1) = a2. QE(T2)+ a3. QE(T3)+ a4.QE(T4)
or, QE(T1) = (a2/(1-a1))QE(T2)+ (a3/(1-a1))QE(T3)+ (a4/(1-a1))QE(T4)..... (11)
Hence, from Eq(11) it is evident that "The quantitative percentage of profit in successive times phases including initial seed are linearly dependent in case of any stochastic business fluctuation".

Fact 3 - Statistical analysis of business forecasting in case of a frequent event (profit or loss) can be governed by the point estimation method and furthermore, if there bears an exponential relation between quantitative measure of an estimate (profit or loss) and the corresponding timing instant of incidence, then the same relation is valid, if the estimate is observed in the mid-timing interval.

Justification –
Statistical analysis of business forecasting in case of a frequent event (profit or loss) can be governed by the point estimation method.Furthermore, as per the hypothesis, there bears an exponential relation between quantitative measure of an estimate (profit or loss) and the corresponding timing instant of incidence.Hence the mathematical equation for quantification of profit or loss be
$E_{X,t} = Ye^{at}$where $E_{X,t}$
is a quantitative measure of profit or loss at a time instant „t" ; „Y" and „a" are constants.
Let the confidence interval be [t1,t2] as investigation has to be carried out at mid-timing interval.
Therefore, $E_{X,t1} = Ye^{at1}$ and $E_{X,t2} = Ye^{at2}$. The mid- interval time is $(t_1+t_2)/2$.
$(E_{X,t1}.E_{X,t2})^{1/2} = [(Ye^{at1}).(Ye^{at2})]^{1/2} = [Y^2e^{a(t1+t2)}]^{1/2} = Ye^{a(t1+t2)/2} = E_{X,(t1+t2)/2}$.....(12)

Therefore, from Eq(12) we can claim that "if there bears an exponential relation between quantitative measure of an estimate (profit or loss) and the corresponding timing instant of incidence, then the same relation is valid, if the estimate is observed in the mid-timing interval".

Fact 4 – The priority of arrival of past event (either profit or loss) in business forecasting can be computed on the basis of neuro-associator.

Justification –

Let $PF_{(Ei)}$ be the priority factor of event Ei (i=0,1,…n) that may be either gain or loss. Based on optimum priority factor , probability of event arrival in future timing instant increases considerably. Business stability normally exhibits a decay effect and therefore $PF_{(Ei)}$ varies with time. As per a

monotonically decreasing function for each priority factor,

$$PF_{(Ei)}(t) = \max(0, PF_{(Ei)}(t-1) - \beta) \ldots\ldots (13)$$

where a small positive constant $\beta < 1$ signifies the rate of minor deviation in future business stability relative to the past event Ei.

The training set in this future forecasting perspective may be viewed as follows-

$T = \{ (RC_{Ei}, RUC_{Ei}) : i = 0,1,\ldots n \} \ldots$ .....(14)

where each pattern being bivalent {0,1} ; 0 signifies impact factor on quantitative predictive business estimate less than bias ,

1 signifies that exceeding or equal to bias value £ ,

RC_{Ei}being impact estimate in boolean form of event Ei in present state and

RUC_{Ei}impact estimate in boolean form of eventEi in future state.

The priority weight is computed as $W_{x,y}Ei = 1/3 [RC_{Ei,x} * RUC_{Ei,y} * PF_{(Ei)}]$; $i = 0,1\ldots, n$

where x,y denotes mapping of xth sequence of actual event E(i) with jth sequence of hypothetical event E(i); x=0,1,…m and y=0,1,….n (m not necessarily equal to n).

Now as per normal decay in business stability ,$W_{x,y}Ei$ also changes accordingly from time to time.

Therefore with respect to time ,$W_{x,y}Ei(t) = (1-\beta) W_{x,y}Ei(t-1) + RC_{Ei,x} * RUC_{Ei,y} * PF_{(Ei)}(t-1)$,where $(1-\beta)$ denotes the attenuation factor.

Hence it is justified to state that "The priority of arrival of past event (either profit or loss) in business forecasting can be computed on the basis of neuro-associator" .

Fact 5 - Fuzzy estimate of augmentation or expansion of a product or service towards achieving new dimension and bias estimate for a common product can be related mathematically as x.€ = 1 – y.£ , where € and £ are fuzzy estimates of new product and common product respectively , x be support factor of € towards optimum expansion while y be the probabilistic support factor of £ reflecting the necessity of augmentation . Furthermore , augmentation is a necessary and mandatory pre-requisite for product validation.

Justification –

The emerging submarket deals with observation towards launching a novel product. The expansion of features in an existing product based upon supervised learning strategy leads to fuzzy logic based computation and the support factor for each parameter.

We propose x.€ = 1 – y.£ **,**where € and £ are fuzzy estimates of new product and common product respectively , x be support factor of €towardsoptimum expansion while ybe the probabilistic support factor of£reflecting the necessity of augmentation

If € = 0, then £ = 1/y. Now, if y is in lower fuzzy range in that case as per the proposed mathematical relation , £ has to be in frequent fuzzy range. This indicates that the product is highly acceptable in the market and at the moment there is no significant change is needed. Also, $y \neq 0$ as in that case £ will be undefined which is absurd. Hence, augmentation is a necessary and mandatory pre-requisite for product validation. Similarly the more x.€ tends towards 1, it indicates that the augmentation leads to evolution of a new product with a predictive acceptable market response.

Conclusions

The paper points out mathematical representation of strategy. The discovered facts proposed in this study include recurrence relation, linear dependency , point estimation and neuro-associator based profit-loss forecasting. A significant finding in this study states that fuzzy estimate of augmentation or expansion of a product or service towards achieving new dimension and bias estimate for a common product can be related mathematically as x.€ = 1 – y.£ , where € and £ are fuzzy estimates of new product and common product respectively , x be support factor of € towards optimum expansion while y be the probabilistic support factor of £ reflecting the necessity of augmentation . In this context it is relevant that augmentation is a necessary and mandatory pre-requisite for product validation.

References

1. Aaker, D. A. (2005). *Strategic Market Management.* John Wiley & Sons ,Inc.
2. Alden, D. L., Steenkamp, J. B. E., & Batra, R. (1999). Brand positioning through advertising in Asia, NorthAmerica, and Europe: The role of global consumer culture. Journal of Marketing,63(1), 75-87.
3. Dr. AarushiKataria, Dr. Naveen Nandal and Dr. Ritika Malik, Shahnaz Husain -A Successful Indian Woman Entrepreneur, International Journal of Disaster Recovery and Business ContinuityVol.11,No. 2, (2020), pp. 88–93
4. Aarushi, Naveen Nandal, Parul Agrawal. AN EXPLORATORY RESEARCH IN PRODUCT INNOVATION IN AUTOMOBILE SECTOR. JCR. 2020; 7(2): 522-529. doi:10.31838/jcr.07.02.98
5. Kumar, S. (2022). Effective hedging strategy for us treasury bond portfolio using principal component analysis. Academy of Accounting and Financial Studies Journal, Vol. 26, no.2, pp. 1-17
6. Almahirah, M. S., S, V. N., Jahan, M., Sharma, S., & Kumar, S. (2021). Role of Market Microstructure in Maintaining Economic Development. Empirical Economics Letters, Vol.20, no.2, pp. 01-14
7. Ataman, M. B., Van Heerde, H. J., & Mela, C. F. (2010). The long-term effect of marketing strategy on brand sales. Journal of Marketing Research, 47(5), 866-882.
8. Atuahene-Gima, K., & Murray, J. Y. (2004). Antecedents and outcomes of marketing strategy comprehensiveness. Journal of Marketing, 68(4), 33-46.
9. Balducci and Marinova, E. (2018). Unstructured data in marketing management. Journal of the Academy of Marketing Science, forthcoming.
10. Cobb ,CharlesW.,and Paul H. Douglas (1925) , "A Theory of Production", *Amer. Econ. Rev., Supplement* ,pp.139-165
11. Dickson, P. R., Farris, P. W., & Verbeke, W. J. (2001). Dynamic strategic thinking. Journal ofthe Academy of Marketing Science, 29(3), 216-237.
12. Giri, P. K. & Banerjee, J. (1999). *Introduction to Statistics.* Academic Publishers
13. Levitt, T. (1960) "Marketing Myopia" *Harvard Business Review.* July-August ,pp. 45-56
14. Olofsson, P. (2005). *Probability, Statistics, and StochasticProcesses.* John Wiley & Sons ,Inc.
15. Samuelson , Paul A. , *Economics* , (10^{th} edition),chap.20.,New York : McGraw-Hill Book Company,1976
16. Zadeh , L.A. (1965), *Fuzzy Sets* , *Information and Control,* Vol.8, pp. 338-353