A Research Oriented Conceptual Opinion of Fact – The External Analysis of Strategic Market Management can be Realized in the Light of Statistics and Artificial Neural Networks

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ABSTRACT
The paper entails the statistical based investigations on the sales and profit analysis of a business. By virtue of the forecasting in strategic market management, certain unique claims have been proposed. The paper also deals with Artificial Neural Network based discovered facts of business forecasting. The discovered facts have been justified in the light of statistical and neural modeling based approaches.

Keywords—Strategic market management, Artificial neural network, Business forecasting

I. INTRODUCTION

Strategic development or review [1] deals with an analysis of the factors external to a business that affect strategy. Marketing Myopia [2] also indicates the essence of investigation of sales and profit in case of strategic uncertainty. In certain cases due to some external stochastic events [3], statistical analysis has to be carried out based upon prediction and forecasting. Recurrence relations, point estimation [4] and Artificial Neural Network [5] also facilitate towards accurate modeling in business forecasting.

II. FORECASTING IN STRATEGIC MARKET MANAGEMENT

The work proposes few unique claims towards statistical based realization of business forecasting. Claim 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.

Illustration of Claim 1 –
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

$\epsilon_1, \epsilon_2$ = units of time

Now, $T_{DE(i)} = T_{E(i)} + \epsilon_1$
and $T_{RE(i)} = T_{DE(i)} + \epsilon_2 = T_{E(i)} + (\epsilon_1 + \epsilon_2)$
For equidistant time-spans between initial observed profit and subsequent loss, and subsequent loss and profit as per initial measure, each of $\epsilon_1$ and $\epsilon_2$ is a constant. Let us investigate for 3 iterations.

$T_{DE(1)} = T_{E(1)} + \epsilon_1$
$T_{RE(1)} = T_{DE(1)} + \epsilon_2 = T_{E(1)} + (\epsilon_1 + \epsilon_2)$
$T_{DE(2)} = T_{E(2)} + \epsilon_1$
$T_{RE(2)} = T_{DE(2)} + \epsilon_2 = T_{E(2)} + (\epsilon_1 + \epsilon_2) = (T_{E(1)} + \epsilon_3) + (\epsilon_1 + \epsilon_2) = (T_{E(1)} + \epsilon_3)
$T_{DE(3)} = T_{E(3)} + \epsilon_1$
$T_{RE(3)} = T_{DE(3)} + \epsilon_2 = T_{E(3)} + (\epsilon_1 + \epsilon_2) = (T_{E(2)} + \epsilon_4) + (\epsilon_1 + \epsilon_2) = T_{RE(2)} + \epsilon_4$

Therefore, the generalized equation represents that of a recurrence relation as $T_{RE(i)} = T_{RE(i-1)} + b_i$, with initial condition(seed) $T_{RE(i)} = T_{E(i)} + (\epsilon_1 + \epsilon_2)$ 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”.

Claim 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.
\section*{III. ARTIFICIAL NEURAL NETWORK BASED BUSINESS FORECASTING}

The research work points out some claims based upon the neuro-associator and radial interpolation \cite{5} concepts of artificial neural networks that play a pivotal role towards accurate modeling in business forecasting.

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

Illustration of Claim 4 –

Let $PF(E_i)$ be the priority factor of event $E_i$ ($i=0,1,\ldots,n$) 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 $PF(E_i)$ varies with time. As per a monotonically decreasing function for each priority factor, the impact factor on quantitative predictive business estimate has a central tendency towards $\beta$ and a small dispersion. Hence 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

$E_{X,t} = Ye^\alpha$ 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, $E_{X,t1} = Ye^{\alpha t1}$ and $E_{X,t2} = Ye^{\alpha t2}$. The mid-interval time is $(t1+t2)/2$.

\begin{equation}
(E_{X,t1} \cdot E_{X,t2})^{1/2} = [(Ye^{\alpha t1})(Ye^{\alpha t2})]^{1/2} = [Y^{2e^{\alpha(t1-t2)/2}}]^{1/2} = Ye^{\alpha(t1-t2)/2} = E_{X,(t1+t2)/2} \text{ .........................................(9)}
\end{equation}

Therefore, from Eq(9) 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”.

\section*{III. ARTIFICIAL NEURAL NETWORK BASED BUSINESS FORECASTING}

Let the probability of validity of a frequent event $E$ (either profit or loss) be $V$ such that $0 \leq V \leq 1$. Prediction distribution function $f_1(V,\beta)$ of the event involves certain unknown parameter $\beta$ which result in the actual occurrence of profit or loss in case of business uncertainty.

Let $\alpha$ be a statistic \cite{4} such that $\alpha = f_2(V1,V2,\ldots,Vx)$ where $Vi$ ($i=1$ to $x$) is actual accuracy of predicted estimate on the basis of historical information of the incidence of the event for $x$ times.

Future prediction accuracy estimate $\beta$ for the frequent event is to be a satisfactory estimate of $\alpha$ such that $|\alpha - \beta| = 0$. This can be achieved if sample distribution of $\alpha$ has a central tendency towards $\beta$ and a small dispersion.

Hence 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

$E_{X,t} = Ye^\alpha$, 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, $E_{X,t1} = Ye^{\alpha t1}$ and $E_{X,t2} = Ye^{\alpha t2}$. The mid-interval time is $(t1+t2)/2$.

\begin{equation}
(E_{X,t1} \cdot E_{X,t2})^{1/2} = [(Ye^{\alpha t1})(Ye^{\alpha t2})]^{1/2} = [Y^{2e^{\alpha(t1-t2)/2}}]^{1/2} = Ye^{\alpha(t1-t2)/2} = E_{X,(t1+t2)/2} \text{ .........................................(9)}
\end{equation}

Therefore, from Eq(9) 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”.

The research work points out some claims based upon the neuro-associator and radial interpolation \cite{5} concepts of artificial neural networks that play a pivotal role towards accurate modeling in business forecasting.

Let $PF(E_i)$ be the priority factor of event $E_i$ ($i=0,1,\ldots,n$) 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 $PF(E_i)$ varies with time. As per a monotonically decreasing function for each priority factor, $PF(E_i)$ varies with time.

\begin{equation}
PF(E_i) (t) = \max (0, PF(E_i) (t-1) - \beta) \text{ .........................................(10)}
\end{equation}

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

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

\begin{equation}
T = \{ (RC_{E_i} , RUC_{E_i}) : i = 0,1,\ldots,n \} \text{ .........................................(11)}
\end{equation}

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\textsubscript{Ei} being impact estimate in boolean form of event E\textsubscript{i} in present state and
RUC\textsubscript{Ei} impact estimate in boolean form of event E\textsubscript{i} in future state. The priority weight is computed as \[ W_{x,y}\textsubscript{Ei} = \frac{1}{3} [ RCE\textsubscript{Ei,x} * RUC\textsubscript{Ei,y} * PF(Ei) ]; i = 0,1,....., n \]
where \( x,y \) denotes mapping of xth sequence of actual event E\textsubscript{i} with jth sequence of hypothetical event E\textsubscript{i}; \( x=0,1,.....m \) and \( y=0,1,.....n \) (m not necessarily equal to n).

Now as per normal decay in business stability , \[ W_{x,y}\textsubscript{Ei} = \frac{1}{3} [ RCE\textsubscript{Ei,x} * RUC\textsubscript{Ei,y} * PF(Ei) ]; i = 0,1,....., n \]
where \( x,y \) denotes mapping of xth sequence of actual event E\textsubscript{i} with jth sequence of hypothetical event E\textsubscript{i}; \( x=0,1,.....m \) and \( y=0,1,.....n \) (m not necessarily equal to n).

Therefore with respect to time ,\[ W_{x,y}\textsubscript{Ei} = \frac{1}{3} [ RCE\textsubscript{Ei,x} * RUC\textsubscript{Ei,y} * PF(Ei) ]; i = 0,1,....., n \]
where \( x,y \) denotes mapping of xth sequence of actual event E\textsubscript{i} with jth sequence of hypothetical event E\textsubscript{i}; \( x=0,1,.....m \) and \( y=0,1,.....n \) (m not necessarily equal to n).

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’.

Claim 5 - Approximate computation of predictive timing instant of occurrence of an event (either profit or loss) can be realized on the basis of radial interpolation of contribution factor and arrival time of related past sequences in present state as well as that of related sequences in future state.

Illustration of Claim 5 –
Let E be the predictive future event (either profit or loss),
T1 be the timing instant of transition of event from past state to present state
T2 be the timing instant of transition of event from present state to future state ,
(T1+x) be the timing instant of occurrence of the event E in future ,
S = \{S1,S2,S3,...,Sn\} be the set of past sequences related to E in present state ,
F = \{ F1,F2,F3,...,Fm\} be the set of sequences related to E featured in future.

We assign a contribution factor value in each of the sequences featured in future such that summation of the values of both past and future equals to 1 (in probabilistic form).

Let \( CF\textsubscript{S1}, CF\textsubscript{S2}, ...., CF\textsubscript{Sn} \) be the contribution factors of past sequences,
\( CF\textsubscript{F1}, CF\textsubscript{F2}, ..., CF\textsubscript{Fm} \) be the contribution factors of future sequences,
\( CF\textsubscript{E} \) be the contribution factor of event E in future (which is obviously equal to 1),
\( TS1, TS2, ..., TSn \) be the timing instants of occurrence of \( S1,S2, ...,Sn \) respectively
\( TF1, TF2, ..., TFm \) be the predicted timing instants of occurrence of \( F1,F2, ...,Fm \) respectively.

We apply radial based interpolation technique to get ,
\( \frac{CF\textsubscript{S1}}{(T1+x - TS1)} + \frac{CF\textsubscript{S2}}{(T1+x - TS2)} + ... + \frac{CF\textsubscript{Sn}}{(T1+x - TSn)} + \frac{CF\textsubscript{F1}}{(TF1- (T1+x))} + \frac{CF\textsubscript{F2}}{(TF2- (T1+x))} + ... + \frac{CF\textsubscript{Fm}}{(TFm- (T1+x))} \)
\[ = CF\textsubscript{E} \]

IV. CONCLUSION

The paper points out the following discovered facts –

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. 
2. The quantitative percentage of profit in successive times phases including initial seed are linearly dependent in case of any stochastic business fluctuation. 
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.
4. The priority of arrival of past event (either profit or loss) in business forecasting can be computed on the basis of neuro-associator.
5. Approximate computation of predictive timing instant of occurrence of an event (either profit or loss) can be realized on the basis of radial interpolation of contribution factor and arrival time of related past sequences in present state as well as that of related sequences in future state.

REFERENCES