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«Touristy destination business activities reinvestment processes modelling problem's solution»

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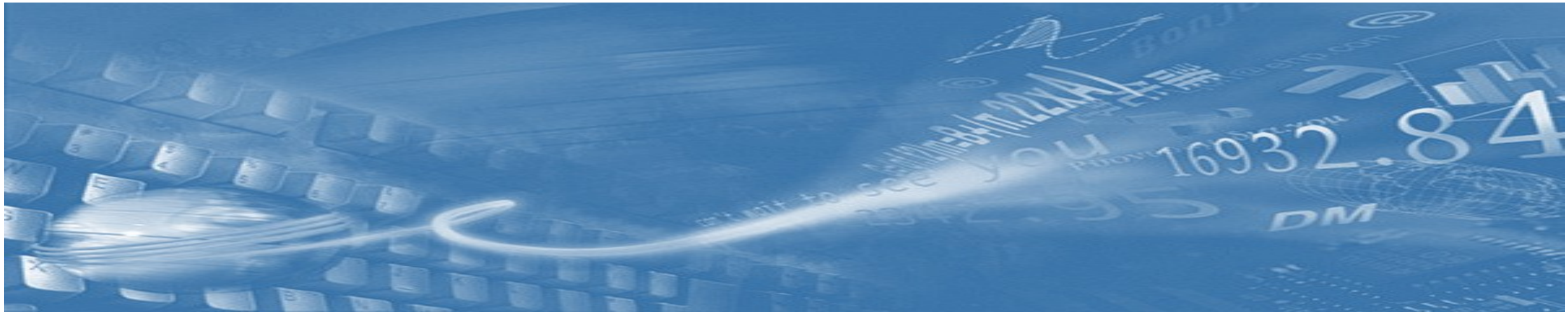
Problem statement

The importance of using information systems in touristy destinations activities modeling is obvious. Upon receipt of reliable information through constructed model, effectiveness of business management increases. In this case, correctly selected mathematical and software tools are needed.

It is need to be mentioned that nowadays resort and spa sphere economic units are budget-forming ones for southern areas of our country. They as profitable business companies attract investments and new projects applying. But their development is under variable factors impact that also need to be taken into account. Economical estimation for these factors influence is very important, and it can be made with multivariate modelling for investment and reinvestment solutions.

Specific of investment and reinvestment business activities modelling for touristy destination is two problems describing: the first one discloses monetary investments (costs, outflows, etc.), the second one is connected to investment activity efficiency analysis (return on investments, input inflows, etc.).



Solution methods

During research that is presented in this article were used several methods and data (materials). The methods were differential equations solutions approach applying, content and economic analyses, mathematical modeling, statistic, techno-economic, system and structural analyses, expert estimation method. Also it was applied research approaches on project management and financing (including investment and reinvestment processes), business improving and different methods of modelling by authors Arora M., Baronokian H. [1], Asmussen S., Glynn P.W. [2], Bala B.K., Arshad F.M., Noh K.M. [3], Basu R. [4], Bible M., Bivins S. [5], Birta L.G., Arbez G. [6], Bodmer E. [7], Bolat H.B., Temur G.T. [8], Dobson M.S. [9], Finnerty J.D. [10], Gatti S. [11], Goodpasture J. [12], Gosavi A. [13], Grimsey D., Lewis M.K. [14], Haas P.J. [15], Harris E. [16], Ireland L.R. [17], Kuehn U. [18], Levin G., Wyzalek J. [19], Lukhaus S. [20], Romano L. [21], Rowe S. [22], Skiadas C.H., Skiados Ch. [23], Sokolowsky J.A., Banks C.M. [24], Spiess-Knafl W., Scheck B. [25], Taylor J. [26], Weber B., Staub-Bisang M., Alfen H.W. [27], Wickham L., Wilcock J. [28], Yescombe E.R. [29].

Conclusions

Results, implementation

The one of investment and reinvestment processes modelling main problems is invested funds useful effect estimation and evaluation of reinvested funds proportion and frequency. It is necessary to determine evaluation period time frames, then divide it into the stages that differ with content, costs and revenues amount and project efficiency qualitative parameters.

It is required to take into account a random parameters set that are impacted by various socio-economical, cultural, political, geographical and other factors. During tourism business activities investment processes mathematical models creation it is very important to define and evaluate certain delay lag. The models disclose supply and demand trends for touristy and spa (recreational) services and business products, also their distribution according to existing and potential touristy destinations, price dynamics, demand elasticity according to the price level for hotel and spa services and other mentioned factors that affect touristy flows intensity. Economic processes regulation specifics, market liberalization, and state participation influence to model choice either.

The our country southern regions touristy economic units investment and reinvestment policy specific objectives are:

1) tourism services market segments diversification requirement;

2) winter, inter-season and year-round tourism development emphasis including event, medical, spa, active ones, etc.;

3) active advertising campaign implementation for touristy services target regions-consumers;

4) bringing customer services level to the EU, UNWTO generally accepted standards and tourists expectations.

The range of tourism industry potential investment solutions is reduced to a set of unified models that can be transformed and adapted to specific situations.

Touristy economic unit's investment and reinvestment processes modelling is difficult task because tourism industry sector is complex system with simultaneous deterministic and random processes with multiple correlations.

Having peculiar data that describe customer flows quantitative characteristics, average level of costs that they spend for their vacation, it is possible to determine demands total capacity for all quality levels. Based on this information it is possible to make forecasts of resort and spa business economic units throughput capacity growth dynamics for serving incoming tourist flows.

Certain investor needs to take into account information on tourist suppliers number, demand and future period profits prospects (also return on investments), tourist services efficiency level, taxes, production factors prices. Touristy services market is characterized by capacity, supply and demand balance level and sale conditions.

Various models can be applied to develop and make decisions on touristy economic units investment processes (for investing to specific program or project). In this paper are suggested models that based on differential equations.

In the model that is suggested below $Q_{(t)}$ is resort and spa sector economic unit's services cost capacity in man-days and it was reached at time t). One man-day average cost is $P_{(t)}$. Sold services cost is multiplication $P_{(t)}Q_{(t)}$, it's peculiar part is invested into production process:

$$I(t) = mP_{(t)}Q(t) \quad (1).$$

In equation (1) I is investment, m: $0<m<1$ is investment rate. Services sales increase is proportional to investments:

$$\frac{dQ}{dt} = \gamma I = \gamma m P(t) Q(t) \quad (2).$$

In equation (2) γ is proportionality coefficient. There is equation (2) solution (3):

$$\int_{Q(0)}^{Q(t)} \frac{dQ}{Q} = \gamma m \int_0^t P(\theta)\, d\theta = \ln Q_{Q(0)}^{Q(t)} \quad (3)$$

or:

$$Q(t) = e^{\gamma m \int_0^t P(\theta)\, d\theta} \quad (4).$$

Provided services total value depends on price dynamics. In market regulation conditions its dynamics is determined by supply and demand balance (L. Walras's equation):

$$\frac{dP}{dt} = \alpha\left(D(p) - S(p)\right) \quad (5).$$

$D_{(p)}$ is demand function, $S_{(p)}$ is supply function, α is proportionality coefficient between price growth and unbalanced demand. Supply and demand interaction forms customers behavior in touristy services market. Touristy services demand is function of client's travel trend. It was approximated supply and demand by functions:

$$D \approx \frac{A}{p}, S \approx BP,$$

in this equation A and B are approximation coefficients. These variables were substituted in equation (5), and it was obtained equation (6):

$$\frac{dp}{dt} = \alpha\left(\frac{A}{p} - Bp\right), \quad (6).$$

By equation (6) left and right sides multiplication it was obtained:

$$P\frac{dp}{dt}=\alpha\left(A-Bp^2\right)=\frac{1}{2}\frac{d}{dt}P^2 \quad (7).$$

Equation (7) was reduced to (8):

$$\frac{dx}{dt}=2\alpha\left(A-Bx\right) \quad (8).$$

The solution of equation (8) is:

$$\int_{x(0)}^{x(t)}\frac{dx}{A-Bx}=2\alpha t, \quad (9)$$

or:

$$\int_{x(0)}^{x(t)}\frac{-Bdx}{A-Bx}=-2\alpha Bt=ln\frac{A-Bx(t)}{A-Bx(0)},$$

that becomes:

$$\left[A - Bx(0)\right]e^{-2\alpha Bt},$$

or:

$$x(t) = \frac{A}{B} - \left[\frac{A}{B} - x(0)\right]e^{-2\alpha Bt} = p^2$$

that is transformed to:

$$P(t) = \sqrt{\frac{A}{B} - \left[\frac{A}{B} - p^2(0)e^{-2\alpha}Bt\right]} \quad (10).$$

Substituting price dynamics equation (10) into provided services total value equation (4) it was obtained:

$$Q(t) = exp\{\gamma m\int_0^t \sqrt{\frac{A}{B} - \left[\frac{A}{B} - p^2(0)\right]e^{-2\alpha B\theta}}\}Q(0) \quad (11)$$

The profit of given economic unit Y over a period of time t is:

$$\begin{aligned} &Y = \int_0^T P(t)Q(t)dt = \\ &\frac{1}{\gamma m}\int_0^T \frac{dQ}{dt}dt = \frac{1}{\gamma m}(Q(t) - Q(0)) = \\ &\frac{Q(0)}{\gamma m}\left[exp\left\{\gamma m\int_0^T d\theta\sqrt{\sqrt{\frac{A}{B} - \left[\frac{A}{B} - p^2(0)\right]e^{-2\alpha B\theta}}\right\} - \right. \\ &\left. -1\right] \end{aligned} \quad (12).$$

4. Conclusion

Resort and spa (recreational) destinations economic unit's investment and reinvestment activity processes modelling analysis is represented the followings. Solving investment problems only with applying of differential equations is important for reflection of tourism industry specifics but for stochastic conditions it should be added by other modelling tools that is going to be presented in author's further researches.

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