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Organizaton Process Optimization on a Haulage Company

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Abstract: Optimisation of organizational cooperation between the sides of a lease bargain is examined in this study and the corespondent math model is presented. The problem of long-time investment attraction for creation of expansion production, acquiring modern equipment and implementation of modern technologies (that can be really pricy) can be solved with the help of debt capital use, specifically the tool of leasing capital investment projects funding.

Key words: Optimization, organizational process, mathematic model, lessor, lessee

INTRODUCTION

Today companies, establishing a long-term business in passenger traffic sector are hanging behind in new generation vehicles equipment in comparison with worldwide practice (Panasyuk *et al*., 2013). Wastage of machinery assets in motor transport sector is exceeding 50%. Out of date equipment fleet maintenance is unprofitable to haulage companies, competitive vehicle scarcity grows every year and asset's retirement rate is several times more than its renewal which leads to lack of new economic vehicles. Yet, very few companies are able to renew the whole equipment fleet at once. Lack of funds reduces ability of motor manufacturers to produce required transport and capability (Malik *et al*., 2012) of haulage companies to obtain it so both supply and demand for home-produced cars decreases not only in Russia (Ehrgott *et al*., 2014).

MATERIALS AND METHODS

Theory: Currently, there are lots of publications about leasing, giving coverage to economic and institutional issues, those of tax liability, etc. Presented research considers the investment tool based on 3-side dealing: leasing subject producer, lessor and lessee. This layout of leasing business tool helps to analyze it generally from the position of lessor-lessee relationship. Predominantly each of the researchers who offered mathematical models connected with the issues of practical leasing, lays emphasis on the interests of only one side of the lease bargain bank, lessor, lessee. However, obviously whole system's operational effect is defined by organization

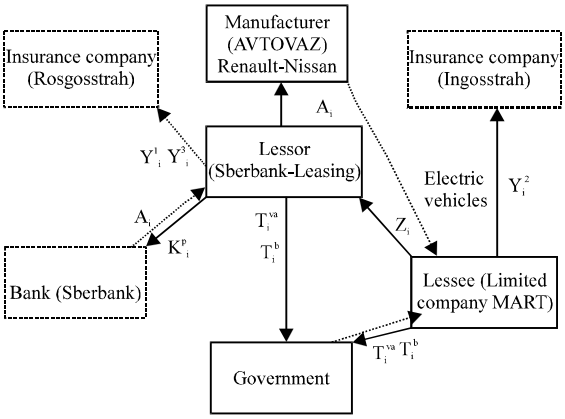

Fig. 1: Scheme of organizational interaction of leasing system participants

methods of building cooperation between all its participants. Leasing can be determined as a kind of investment activity as acquiring some property and passing it to an individual or a corporate body for fixed payment, on a fixed period and with fixed terms, conditioned by the lease contract.

Organizational interaction between the participants of leasing relations system, cash and material flows connecting them are shown in Fig. 1 (Ajupov, 2014). The scheme can help to trace lessor's responsibility to fix lessee up with the property of certain list, containing N positions, each position's amount is y_i, price p_i per one. Total amount of gear A_i, bought from the vendor and passed on lease, for which the lessor can take out a loan and liquidate it with K^p_i payment transactions with the contract duration T and determined periodicity t. According to it lessor acquires a fixed reward B_i from the

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lessee for services provided. After that the property and financial risks are being insured in an insurance company for the whole lease period with the annual amount of insurance bonus Y_i, that can partially be included into lease payments z_i, paid by the lessee.

Lessee gets revenue from leasing property maintenance (Paiva *et al*., 2008). It consists of the revenue from providing services with the use of this property and from advertisement positioning on it. At the same time the lessee bears the costs of permanent contributions to the lessor (lease payments) and other expenses (maintenance, technical and organizational gear handling, personnel teaching and retraining, property maintenance upkeep, gas, oil and lubricants expenditure, etc). In the lessor's point of view, commission rate is a parameter which directly defines his profit while for the lessee, on the contrary, it's the costs' indicator (Liu *et al*., 2014). Thus, the aim of this publication is to choose such a parameter of the lease contract, that on the one hand would consider lessee's financial possibilities and on the other would provide required profitability for the lessor, i.e., optimization of their cooperation process. Issues of this publication are, firstly, lease companies activity essence and special aspects investigation as well as procedures of interaction with the acceptor of an innovative leasing subject (Chen and Jiao, 2014; Ajupov, 2014). Secondly, examination of current mechanisms of B2B cooperation (Gao *et al*., 2014). Thirdly, application of optimization methods as exemplified by some haulage company.

RESULTS AND DISCUSSION

For covering of lessee's expenses provided service's efficiency has to be more than lessor's auctioneer's commission percent, also commission rate can't be less than the average rate established by the lessor and should concern dependence of the auctioneer's commission rate from the dynamics (Chen *et al*., 2013) of the concluded contracts amount. This is represented by delimitations in the model. Lessee's optimization model was developed Eq. 1:

$$\prod_2(T)=\sum_{i=1}^{N}\sum_{t=1}^{T}\left(\frac{(y_i\cdot(\gamma_i(t)\cdot P_i\left[Q_i,(t_0-t),\varphi_i\right]-z_i(t))+p_i^d(y)-c_i^d}{(1+r)^t}\right)\rightarrow\max_{y_i}$$

$$i=\overline{1,N},t=\overline{1,T}$$

$$1.28\cdot(y_i\cdot z_i(t))^{-0.1172}\le n_b<\frac{\overline{\Pi_2(t)}}{b} \quad (1)$$

Where:

b = Net value of the lease contract subject, (mln.rub.)

n_b = Auctioneer's commission rate, fractional from property net value

y_i = Amount of property of certain type

$\Pi_2(T)$ = Lessee's profit

$\Pi_2(T)$ = Average annual return from property maintenance

$\gamma_i(t)$ = Amount of services provided on certain period of time with the use of property type i, acquired on lease by lessee j this variable is a temporal function, by the way, in this case index j is fixed, as performance function of a certain lessee is explored

$P_i\left[Q_i,(t_0-t),\varphi_i\right]$ = Tariff of a service, provided with the use of property type i, depending on the usage factor of providing this service, time t of the job in relation to accepted in a standard time and service's prime cost, provided with the use of property type i

$p_i^d(y)$ = Revenue from diversified types of activity

$z_i(t)$ = Lease payment for a unit of property type i

c_i^d = Other lessee's expenditure concerned with property type i maintenance

Lease company gets revenue as a payment from the lessee including liquidation of the bank loan, motor vehicle liability insurance and affording of additional services (risk insurance for some lease bargain participants, vehicle registration, support manning, personnel training, etc.) and tax liabilities too. Thus, lessor's net profit will consist of auctioneer's commission for services provided and amortization expenses. According to this, lessor's model for profit calculation during period T (Eq. 2):

$$\prod_1(T)=R_1(T)-C_1(T)=\sum_{i=1}^{N}\sum_{t=1}^{T}\left(\frac{y_i\cdot z_i(t)}{(1+r)^t}\right)-\sum_{i=1}^{N}\sum_{t=1}^{T}\left(\frac{y_i\cdot(T_i^{va}+K_i^p+Y_i^3)+D_i}{(1+r)^t}\right)=\sum_{i=1}^{N}\sum_{t=1}^{T}\frac{y_j\cdot(z_i(t)-(T_i^{va}+K_i^p+Y_i^3))-D_i}{(1+r)^t} \quad (2)$$

Taking delimitations, essential for the model establishment. To cover the expenses of the leasing company, auctioneer's bonus percent, determined by it, has to be more than bank's interest rate, that can be written as:

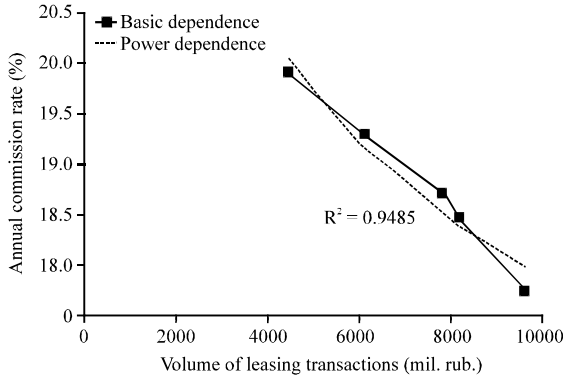

Fig. 2: Dependence of auctioneer's bonus rate from the amount of the concluded contracts of CJSC "Sberbank Leasing" with dynamic approximation

$$n_c < n_b \prod p \prod n_c,\ n_b > 0 \tag{3}$$

Figure 2 shows the dependence of lessor's auctioneer's bonus rate from the dynamics of the concluded contracts amount upon condition of the lease contract duration permanence (3 years) which provides another delimitation in the model Eq. 2. Then, optimization model of a leasing company for a period is shown in Eq. 4:

$$\prod_1(T) = \sum_{i=1}^{N}\sum_{t=1}^{T} \frac{y_i \cdot (z_i(t) - (T_i^{va} + K_i^p + Y_i^3)) - D_i}{(1+r)^t} \to \max_{z_i}$$
$$i = \overline{1,N}, t = \overline{1,T},\ n_b \le 1.28 \cdot (y_i \cdot z_i(t))^{-0.1172},\ n_c < n_b \tag{4}$$

Where:

$\Pi_i(T)$ = Lessor's profit
K_i^p = Annual lessor's payment for serving credit resources
n_c = Credit's rate (in fraction)
T_i^{va} = Size of the value added tax which is discharged in rated year (mln.rub.)
Y_i^3 = Amount for compulsory civil liability motor vehicle insurance and hull insurance
D_i = Annual payment for extended services under the treaty
r = Discount rate

Pay for extended ervices (haul and storage of leasing's, updating and others), if they are in rated year, are accounted for using equation:

$$D_i = \sum_{i=1}^{n} d_i$$

where, d_1, d_2, ..., d_i is the annual lessor's cost for each service under the treaty.

Relying on foresaid, the general interaction model between lessor and lessee is looked like Eq. 5:

$$\prod_1(t) = \sum_{i=1}^{N}\sum_{t=1}^{T} \frac{y_i \cdot (z_i(t) - (T_i^{va} + K_i^p + Y_i^3)) - D_i}{(1+r)^t} \to \max_{z_{ij}}$$
$$\prod_2 \sum_{i=1}^{N}\sum_{t=1}^{T} \left(\frac{y_i \cdot (\gamma_i(t) \cdot P_i[Q_i, (t_0 - t), \varphi_i] - z_i(t)) + p_i^d(y) - c_i^d}{(1+r)} \right) \to \max_{y_i},\ i = \overline{1,N}, t = \overline{1,T} \tag{5}$$
$$n_c < n_b \le 1.28.(y_i.z_i(t))^{-0.1172},\ 1.28.(y_i.z_i(t))^{-0.1172} < n_b \le \frac{\overline{\prod_2(t)}}{b}$$

Formula to calculate total annual payment for leasing (Eq. 6) using specific condition is written:

$$z_i(t) = A_i + B_i + D_i + K_i^p + Y_i^3 = b \cdot (N_A + n_b + 1 + n_c) + Y_i^3 + \sum d_i \tag{6}$$

Where:

B_i = Specific payment for given services from lessee to lessor
A_i = Overall total of goods
N_a = Annual rate of depreciation reserves (in fractions)

Substitute Eq. 6 in model Eq. 5 and get following system Eq. 7:

$$\prod_1(t) = \sum_{i=1}^{N}\sum_{t=1}^{T} \frac{y_i \cdot [(b \cdot (N_A + n_b + 1 + n_c) + Y_i^3) - (b \cdot (1 + n_c + n_t) + Y_i^3)]}{(1+r)^t} \to \max_{z_i}$$

$$\prod_2(t)=\sum_{i=1}^{N}\sum_{t=1}^{T}\left(\frac{y_i\cdot(\gamma_i(t)\cdot P_i\left[Q_i,(t_0-t),\phi_i\right]-(b\cdot(N_A+n_b+1+n_c)+Y_i^3+D_i))+p_i^d(y)-c_i^d}{(1+r)^t}\right)\rightarrow\max_{y_i}$$

$$\begin{aligned}&i=\overline{1,N},\ t=\overline{1,T},\ n_c<n_b\le 1{,}28\cdot[y_i\cdot(b\cdot(N_A+n_b+1+n_c)+Y_i^3+D_i)]^{-0.1172}\\&1.28\cdot\left[y_i\cdot\left(b\left(N_a+n_b+1+n_c\right)+Y_i^3+D_i\right)\right]^{-0.1172}<n_b\le\frac{\overline{\prod_2(t)}}{b}\end{aligned}\qquad(7)$$

CONCLUSION

So, the math interaction model between lessee and lessor is formed. Using certain numbers, it's possible to get optimal range of auctioneer's rate parameter which helps to figure each bargain participant's profit and the principles of its functioning. Further investigations of this topic can help to answer the question of best satisfaction of each participant's interest and compromise reaching. That, certainly will redefine the development of economy.

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