Integral rating of efficiency of commercial apartment buildings construction

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ABSTRACT

The issue of development of integral indicator of efficiency of ICP is discussed in the research. The issue is discussed in term of construction of commercial apartment building in the form of state and private partnership.

The analysis of theoretical works was carried out. The advantages and disadvantages of classic model are shown. The economic indicators and the indicator of participation are suggested to be introduced into classic model. The main dependences for particular indicators and integral indicator of efficiency of ICP are shown.

The conclusion about necessity of carrying out the integral indicator of efficiency of ICP, in case of commercial apartment buildings and state and private partnership was done.

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1. Introduction

At present, solution of housing problem is one of the most critical social and economic problems in Russian Federation and in Saint-Petersburg specifically. According to statistical data, about 40% of population of Russian Federation lives in apartments which do not meet the minimal requirements of improvement. The results of public opinion poll showed that more than 60% of families are not satisfied with their living conditions. According to data of Federal State Statistics Service in Saint-Petersburg and Leningrad region on 2012, the provision with total area of accommodation in Saint-Petersburg is 23.8 sq.m per person. The value is almost in two times lower than mean European value of 40 sq.m. The mean value in Finland is 37 sq.m., in Germany and Sweden – 44 sq.m., in Austria – more than 50 sq.m., in USA – more than 70 sq.m. per person. According to expert opinion, the chance of Saint-Petersburg to catch up Europe shortly is not big. The planning putting into operation of accommodation in volume of 2.7 mil sq.m. per year and level of population in 5 mil. allow to catch up countries of East Europe in 25 years.

The great problem of modern Saint-Petersburg is not even in quantity of accommodation per person, but in its quality. At present main demand for accommodation is concentrated in segment of small-sized cheap accommodation – economy-class. In first place, there are studio apartments and one-roomed flat with area of 25-40 sq.m. and with cost value 2.6-3.5 million rubles. Part of such apartments (supplies of developers) is enough significant, about 35-50%. Besides, there are a lot of not settled communal apartments in central districts of the city.

At this conjuncture, stimulation of construction of inexpensive commercial apartment buildings is one of possible solution of the problem. Such buildings are broadly spread in European countries, Japan and North America.

The most important task in realization measures of citizen support in building is the maximum involvement financial resources, mainly with use of non-budget sources.

Current schemes of investment of commercial apartment buildings are not enough efficient and attractive for investors. Investors and business affirm that pay-back period is too large, and costs are too high. Investments in commercial apartment buildings are “slow” money. It is much easier to build and sell a domestic house, than an commercial apartment building. Regional apartment programs are limited with deficit of budgetary funds. At this conjuncture, it is necessary to improve current methods and develop other methods of attraction of investments in apartment construction. Investment on terms of state and private partnership is one of the long-term ways of improvement of investment policy in the area of social apartment construction.

2. Level of topic readiness

The topic under consideration is one of the most important parts of commonly encountered problems of development of apartment construction.

Research of the methods and mechanisms of attraction of investments in construction of commercial apartment buildings, detection of their economic efficiency are conducted in works of Gorbachevskaya E.Y. [1], Golikova A.V.[2], Yurtseva A.E.[3].

The tasks of rating and analysis of investment and constructive projects economic efficiency are solved in works of Vladimirov S.A. [4], Zubareva E.A. [5], Tarasevich E.I. [6], Ul’yanova O.Y. [7], Suturin I.S. [8]. The issue of the risks allocation of builders, developers and investors is considered in work of Chegotova E.V. [9].

The issues of activation of investments attraction process in apartment construction were considered in works of Kol’ev A.A. [10], Gattunen N.A. [11], Chernov A.V. [12].

Recommendations and economic mechanisms of improvement of investment policy in area of social apartment construction and region economics on terms of state and private partnership are considered in works of Alpatskaya I.E.[13], Ponizov P.V.[14], La Porta R., Lopez-de-Silanes F.[15].

Paik R., Nil B.[16], Sharp U., Alexander G., Beily D.[17], Damanpour F., Wischevsky D.[18], Fama E.F., French K.R.[19], Halawa, W.S., Abdelalim, A.M.K., Elrashed, I.A. [20], Ke, Y., Liu, X., Wang, S. [21] can be singled out among foreign authors worked in the field of investment, rating of their efficiency. The issues of investments attraction were also considered in works of Ferguson, B., Smets, P. [22].

However, at present the integral rating of efficiency of commercial apartment buildings construction, taking into accounts not only economic particular indicators, but indicator of participation, is absent.
3. Problem statement

The aim of the article is formation of present the integral rating of efficiency of construction of commercial apartment buildings with a glance of long pay-back period. To this effect it is necessary to solve next tasks:

- to choose classical and develop new research models;
- to detect particular indicators of rating of efficiency of construction of commercial apartment buildings;
- to implement normalization of particular indicators of efficiency of construction of commercial apartment buildings in general form;
- to implement ranging of efficiency of construction of commercial apartment buildings in general form.

Solution of the tasks allow not only improve objectivity of rating of efficiency of construction of commercial apartment buildings, but give opportunity to particular investors and bodies of state power to find the ways of investment in construction of commercial apartment buildings. Thus it will promote solution of social problem of provision citizen with available comfort apartment.

4. Research description

The object of the research is investment and constructive project of construction of commercial apartment building on terms of state and private partnership.

The subject of the research is methods of rating of integral efficiency of project on terms of risks.

Classical research model include economic indicators. The model is shown in figure 1. The advantage of the model is the opportunity of rating of economic efficiency. The disadvantage of the model is absence of recording of indicators of social efficiency. The particular economic indicators of efficiency of commercial apartment building construction are defined with use of classical model and given initial data.

![Figure 1. Classical model](image1)

Developed research model include as indicator of participation (% particular investor). The model is shown in figure 2. In this case, unknown quantities of classical model are the initial data. The indicator of participation is also included in initial data.

![Figure 2. Developed model](image2)
The particular economic indicators are calculated according to generally accepted formulas. Net present value is calculated according to formula 1 [23]:

\[ NPV = -IC + \sum_{t=0}^{N} \frac{CF_t}{(1+r)^t} \]  

(1)

\( CF_t \) – flow payment in t years; \( IC \) – initial investment, \( IC = -CF_0 \); \( r \) – discount rate.

Discount profitability index is calculated according to formula 2 [24]:

\[ DPI = \frac{\sum_{t=0}^{N} \frac{CF_t}{(1+r)^t}}{\sum_{t=0}^{N} \frac{IC}{(1+r)^t}} \]  

(2)

It – investment outlay for t years.

Discount pay-back period is calculated according to formula 3 [25]:

\[ DPB = \sum_{t=0}^{N} \frac{CF_t}{(1+r)^t} \geq IC. \]  

(3)

Internal rate of return is calculated according to formula 4 [26]:

\[ -IC = \sum_{t=0}^{N} \frac{CF_t}{(1+IRR)^t} \]  

(4)

In the capacity of example, make the calculation of the particular indicators for the project. The project is construction of 10 storied commercial apartment building including 39 2-roomed apartments. The discount rate \( r=6\% \) for commercial apartment building. Rent is 35 thousand rubles. Initial date for the calculation is shown in the table 1.

<table>
<thead>
<tr>
<th>Years</th>
<th>Outflow, thousand rubles</th>
<th>Inflow, thousand rubles</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>13 849</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>83 855</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>95 835</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>59 896</td>
<td>0</td>
</tr>
<tr>
<td>4 - 24</td>
<td>0</td>
<td>16 380</td>
</tr>
</tbody>
</table>

As the result of calculation: \( NPV=2 588 \) thousand rubles. \( DPB=24 \) years, \( DPI=1,01 \), \( IRR=6,1\% \). This result demonstrates low supply of investments. The diagrams show existent problem of long pay-back period for investors. So investors want to reduce inflow of their investments. It can be gotten with use of scheme of state and private partnership. The diagrams are shown in the figure 3 and 4.

Similarity of the diagrams 3 and 4 is explained with similar values of discount rate \( r=6\% \), which was used while calculating efficiency of construction, and calculated value of internal rate of return \( IRR=6,1\% \).

It is necessary for formation integral indicator of efficiency to carry out the experts’ survey. The integral indicator of efficiency is defined by means with composition of particular indicators. Experts’ method allows carrying out normalization and ranging of particular indicators.

Normalization of particular indicators are calculated according to next formulas. Formula 5, where increase of indicator is considered positive, is used for normalization of \( NPV, DPI, IRR \). Formula 6, where decrease of indicator is considered positive, is used for ranging of \( DPB, IP \) (% particular investor):

\[ \tilde{k}_i = \frac{k_i}{k_{opt}} \leq 1, \]  

(5)

where \( k_i \) – value of appropriate indicator in i-project; \( k_{opt} \) – optimal value of appropriate indicator.

Аксюкевич А. Д. Интегральная оценка эффективности строительства доходных домов. / Avsukevich A. D. Integral rating of efficiency of commercial apartment buildings construction. ©
Description of inflow, outflow and income

Figure 3. Description of inflow, outflow and income (NPV)

Description of IRR

Figure 4. Description of IRR
Ranging of particular indicators are carried out with definition of weight ratio for each indicator. The weight ratio for each indicator is calculated according to formula 7:

\[
\alpha_i = \frac{\sum_{m=1}^{n} b_i}{\sum_{m=1}^{n} b_{NPV} + \sum_{m=1}^{n} b_{DPI} + \sum_{m=1}^{n} b_{DPB} + \sum_{m=1}^{n} b_{IRR} + \sum_{m=1}^{n} b_{IP}}
\]  

(7)

where \(\sum_{m=1}^{n} b_i\) – sum of numerical score for each particular indicator; \(\sum_{m=1}^{n} b_{NPV}\) – sum of numerical score for NPV; \(\sum_{m=1}^{n} b_{DPI}\) – sum of numerical score for DPI; \(\sum_{m=1}^{n} b_{DPB}\) – sum of numerical score for DPB; \(\sum_{m=1}^{n} b_{IRR}\) – sum of numerical score for IRR; \(\sum_{m=1}^{n} b_{IP}\) – sum of numerical score for IP.

Therefore, integral indicator of efficiency of construction of commercial apartment building include particular economic indicators (NPV, DPI, DPB, IRR) and indicator of participation (state and private partnership IP) in general form (8):

\[
I_i = \alpha_{NPV} \ast \left( \frac{NPV}{NPV_{opt}} \right) + \alpha_{DPI} \ast \left( \frac{DPI}{DPI_{opt}} \right) + \alpha_{DBV} \ast \left( \frac{DPB}{DPB_{opt}} \right) + \alpha_{IRR} \ast \left( \frac{IRR}{IRR_{opt}} \right) + \alpha_{IPP} \ast \left( \frac{IP_{opt}}{IP_i} \right)
\]  

(8)

5. Conclusion

1. Classical research model was chosen as initial research model. Unknown quantities are particular indicators of efficiency. Research model was developed for definition integral indicator. Initial data in developed research model are economic indicators and indicator of participation.

2. Particular indicators of rating efficiency were detected for construction of 10 storied commercial apartment building.

3. Normalization of particular indicators of efficiency of commercial apartment buildings construction was implemented in general form.

4. Ranging of efficiency of commercial apartment buildings construction was implemented in general form.

5. Formula for definition integral indicator of efficiency of commercial apartment building construction including particular economic indicators (NPV, DPI, DPB, IRR) and indicator of participation (IP) was introduced.

Use of the integral indicator of efficiency allow to improve objectivity of rating of efficiency of construction of commercial apartment buildings, but give opportunity to particular investors and bodies of state power to find the ways of investment in construction of commercial apartment buildings. Thus it will promote of social problem of provision citizen with available comfort apartment.

References


Интегральная оценка эффективности строительства доходных домов

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АННОТАЦИЯ

В статье рассмотрены вопросы разработки интегрального показателя эффективности инвестиционных проектов при строительстве доходных домов в форме государственно-частного партнерства.

Проанализированы основные положения теоретических работ по данной тематике. Приведены достоинства и недостатки классической модели исследования. Предложено ввести в модель исследования, как экономические показатели, так и показатель участия. Приведены основные зависимости для частных показателей и общий вид интегрального показателя эффективности инвестиционных проектов.

Сделан вывод о целесообразности использования интегрального показателя эффективности инвестиционных проектов при сравнении различных вариантов строительства доходных домов в форме государственно-частного партнерства.

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