



Integral rating of efficiency of commercial apartment buildings construction

A.D. Avsukevich¹

Saint-Petersburg State Polytechnical University, 29 Polytechnicheskaya st., St.Petersburg, 195251, Russia.

ARTICLE INFO

Article history

Received 9 December 2013
 Received in revised form 28 March 2014
 Accepted 29 March 2014

Key words

investment and constructive project (ICP);
 commercial apartment building;
 integral indicator of efficiency of ICP;
 net present value;
 discount profitability index;
 discount pay-back period;
 internal rate of return;
 indicator of participation;

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.

Contents

1.	Introduction	73
2.	Level of topic readiness	73
3.	Problem statement	74
4.	Research description	74
5.	Conclusion	77

¹

Corresponding author:
 +7 (911) 987 7705, anastasiia.spb@gmail.com (Anastasia Dmitrievna Avsiukevich, Graduate Student)

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 apartment 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], Yurtaeva 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 Dj. [17], Damanpour F., Wishevsky 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.

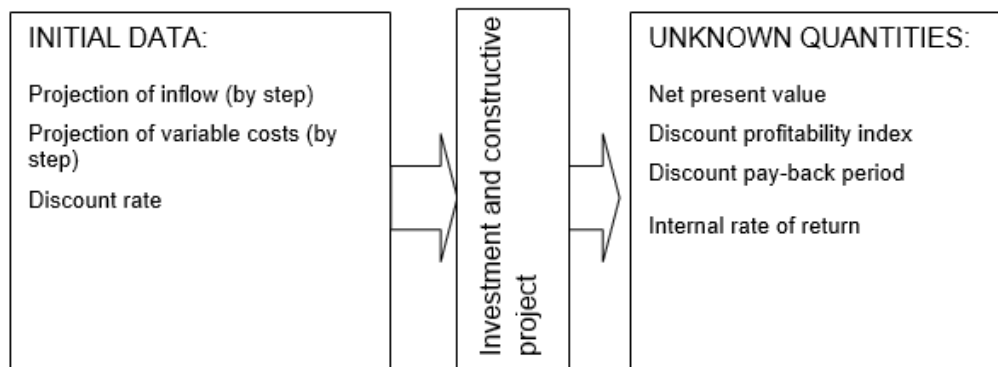


Figure 1. Classical model

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.

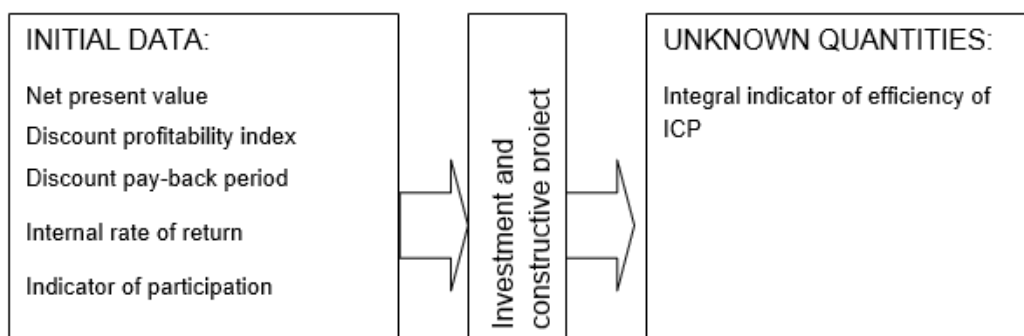


Figure 2. Developed model

The particular economic indicators are calculated according to generally accepted formulas. Net present value is calculated according to formula 1 [23]:

$$NPV = -IC + \sum_{t=0}^N \frac{CF_t}{(1+r)^t}, \quad (1)$$

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]:

$$DPI = \frac{\sum_{t=0}^N \frac{CF_t}{(1+r)^t}}{\sum_{t=0}^N \frac{I_t}{(1+r)^t}}, \quad (2)$$

I_t – investment outlay for t years.

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

$$DPB = \sum_{t=0}^N \frac{CF_t}{(1+r)^t} \geq IC. \quad (3)$$

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

$$-IC = \sum_{t=0}^N \frac{CF_t}{(1+IRR)^t}. \quad (4)$$

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 1. Initial date

Years	Outflow, thousand rubles	Inflow, thousand rubles
0	13 849	0
1	83 855	0
2	95 835	0
3	59 896	0
4 - 24	0	16 380

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):

$$\bar{k} = \frac{k_i}{k_{opt}} \leq 1, \quad (5)$$

$$\bar{k} = \frac{k_{opt}}{k_i} \leq 1, \quad (6)$$

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

Description of inflow, outflow and income

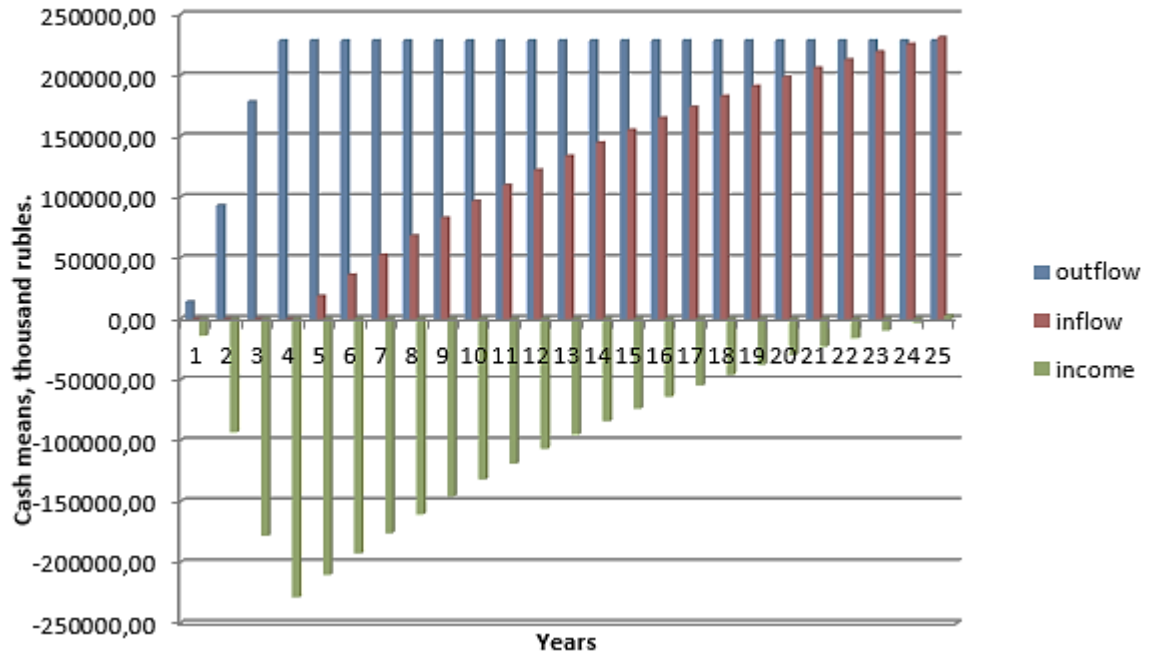


Figure 3. Description of inflow, outflow and income (NPV)

Description of IRR

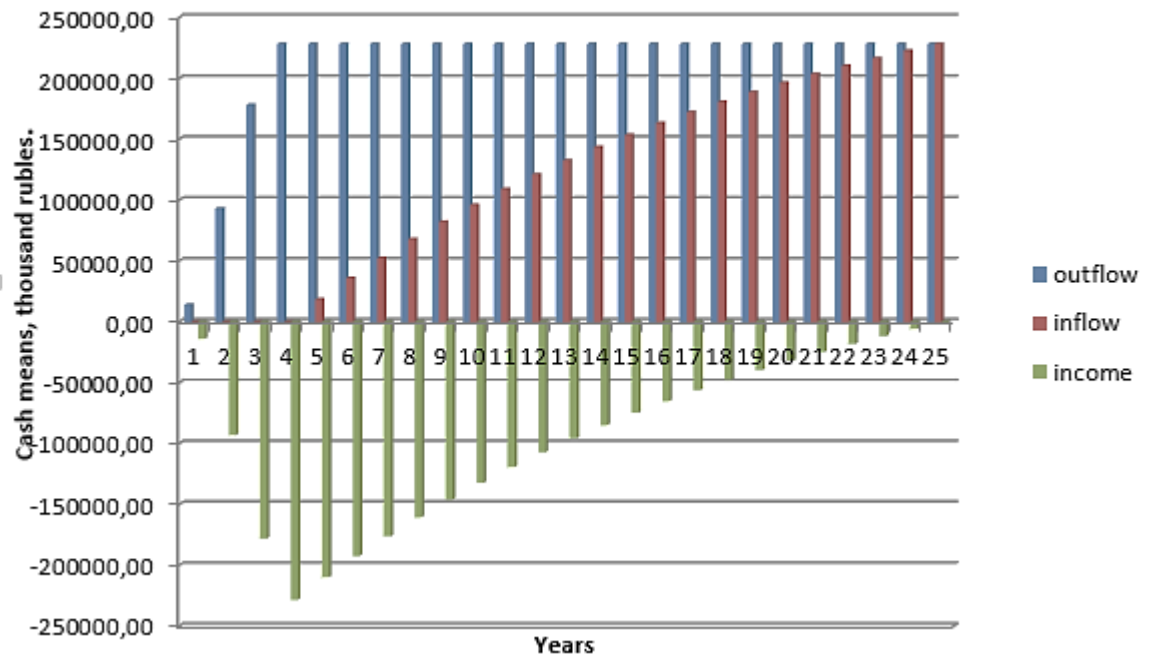


Figure 4. Description of IRR

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:

$$\alpha_i = \frac{\sum_{m=1}^n b_i}{\sum_{m=1}^n b_{NPV} + \sum_{m=1}^n b_{DPI} + \sum_{m=1}^n b_{DPB} + \sum_{m=1}^n b_{IRR} + \sum_{m=1}^n b_{IP}}, \quad (7)$$

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):

$$I_i = \alpha_{NPV} * \left(\frac{NPV_i}{NPV_{opt}} \right) + \alpha_{DPI} * \left(\frac{DPI_i}{DPI_{opt}} \right) + \alpha_{DPB} * \left(\frac{DPB_{opt}}{DPB_i} \right) + \alpha_{IRR} * \left(\frac{IRR_i}{IRR_{opt}} \right) + \alpha_{IPP} * \left(\frac{IP_{opt}}{IP_i} \right). \quad (8)$$

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

1. Gorbachevskaya Ye.Yu. *Formirovaniye metodov privlecheniya investitsiy v stroitelstvo dokhodnykh domov*. [Formation of methods of attracting investments in commercial apartment buildings constructions]. Ph D. Dissertation. Irkutsk: Tipografiya IrGTU, 2011. 24 p. (rus)
2. Golikova A.V. *Mekhanizm investirovaniya finansovykh resursov v dokhodnyye doma*. [Investment vehicle financial resources in commercial apartment buildings]. Dissertation of Ph.D. M: *Tipografiya Akademii truda i sotsialnykh otnosheniy*, 2012. 26 p. (rus)
3. Yurtayeva A.Ye. *Metodicheskiye osnovy opredeleniya ekonomicheskoy effektivnosti investitsiy v «dokhodnyye doma»*. [Methodical basics of economic efficiency determination of investments in commercial apartment buildings]. Ph D. Dissertation. *Tipografiya Ros. ekonom. akad. im. G.V. Plekhanova*, 2008. 26 p. (rus)
4. Vladimirov S.A. *Metodologiya otsenki i analiza ekonomicheskoy effektivnosti investitsionnykh proyektov v stroitelstve*. [Assessment and cost effectiveness analysis methodology of investment projects in construction]. Ph D. Dissertation. *SPb: Tipografiya SPbGIEU*, 2007. 32 p. (rus)
5. Zubareva Ye.A. *Otsenka effektivnosti investitsionnykh proyektov v stroitelstve s uchetom regionalnykh osobennostey pri ikh realizatsii*. [Assessment of investment projects efficiency in construction according with account for regional specific features their realization]. Ph D. Dissertation. *SPb: Tipografiya SPbGIEU*, 2010. 19 p. (rus)
6. Tarasevich Ye.I. *Metodologicheskoye i informatsionnoye obespecheniye otsenki stoimosti nedvizhimosti i analiza tsennosti investitsiy v nedvizhimost*. [Methodological and information support of assessed value of real estate and analysis of real estate investment value]. D.Sc. Dissertation. – *SPb: Tipografiya SPbGPU*, 2003. 34 p. (rus)

7. Ulyanova O.Yu. *Investitsionno-innovatsionnoye razvitiye zhilishchnoy sfery v regionalnoy sotsialnoy infrastrukture*. [Investition-innovation development of housing field in regional social infrastructure]. D.Sc. Dissertation. – Volgograd: *Tipografiya Volgogradskogo gosudarstvennogo universiteta*, 2008. 42 p. (rus)
8. Sutorin I.S. *Razvitiye metodov otsenki effektivnosti zhilishchnykh innovatsionno-investitsionnykh programm*. [Development of efficiency assessment methods of housing innovation-investition programm]. Ph D. Dissertation. – M: *Tipografiya Gosudarstvennoy akademii professionalnoy perepodgotovki i povysheniya kvalifikatsii rukovodyashchikh rabotnikov i spetsialistov investitsionnoy sfery (GASIS)*, 2011. 28 p. (rus)
9. Chegotova E.V. The risks of builders, developers and investors // *Construction of Unique Buildings and Structures*. 2013. № 4 (9). Pp. 133-150. (rus)
10. Kolyev A.A. *Aktivizatsiya protsessa privlecheniya investitsiy v zhilishchnoye stroitelstvo regiona*. [Activation of attracting investments process in residential construction in region]. Ph D. Dissertation. – Vologda: *Tipografiya RAN Vologodskogo nauchno-koordinatsionnogo tsentra Tsentralnogo ekonomiko-matematicheskogo instituta*, 2005. 28 p. (rus)
11. Gattunen N.A. *Investitsionnoye bankovskoye kreditovaniye proyektov zhilishchnogo stroitelstva*. [Investment bank lending of residential construction projects]. Ph D. Dissertation. – SPb: *Tipografiya SPbGUEF*, 2011. 23 p. (rus)
12. Chernov A.V. *Mekhanizm investirovaniya maloetazhnogo zhilishchnogo stroitelstva pri realizatsii proyektov kompleksnogo osvoyeniya territoriy*. [Investment vehicle of low house-building by realization integrated development projects]. Ph D. Dissertation. – Nizhniy Novgorod: *Tipografiya NGASU*, 2012. 25 p. (rus)
13. Alpatskaya I.Ye. *Sovershenstvovaniye investitsionnoy politiki v sfere zhilishchnogo stroitelstva v usloviyakh sotsialno oriyentirovannoy ekonomiki*. [Improvement of investment policy in the field of residential construction in response to socially responsible economy]. Ph D. Dissertation. – M: *Tipografiya MGAKKHiS*, 2012. 25 p. (rus)
14. Ponizov P.V. *Ekonomicheskiye mekhanizmy privlecheniya investitsiy v ekonomiku regiona na osnove gosudarstvenno-chastnogo partnerstva*. [Economic mechanisms of attracting investments in regional economy in terms of state and private partnership]. Ph D. Dissertation. – M: *Tipografiya Instituta ekonomiki i sotsialnykh otnosheniy*. 2011. 14 p. (rus)
15. La Porta R., Lopez-de-Silanes F. Investor protection and corporate governance // *Journal of Financial Economics*. 2000. Vol. 58. Issue 1-2. Pp. 3-27.
16. Payk R., Nil B. *Korporativnyye finansy i investirovaniye*. – 4-oye izd. / per. s angl. [Corporate finance and investment. - 4 edition / translate from Eng.] - Spb: *Piter*, 2006. 784 p. (rus)
17. Sharp U., Aleksander G., Beyli Dzh. *Investitsii: Per. s angl.* [Investment: translate from Eng.] *M.: Infra-M*, 2001. 1028 p. (rus)
18. Damanpour F., Wischnevsky D. Research on innovation in organisations // *Journal of Engineering and Technology Management*. 2006. Vol. 23. Issue 4. Pp. 269-291.
19. Fama E.F., French K.R. Common risk factors in the returns on stocks and bonds // *Journal of Financial Economics*. 1993. Vol. 33. Issue 1. Pp. 3-56.
20. Halawa, W.S., Abdelalim, A.M.K., Elrashed, I.A. Financial evaluation program for construction projects at the pre-investment phase in developing countries: A case study // *International Journal of Project Management*, 2013. Vol. 31. Issue 6. Pp. 912-923.
21. Ke, Y., Liu, X., Wang, S. Equitable Financial Evaluation Method for Public-Private Partnership Projects // *Tsinghua Science and Technology*. 2008. Volume 13. Issue 5. Pp. 702-707.
22. Ferguson, B., Smets, P. Finance for incremental housing; current status and prospects for expansion // *Habitat International*. 2010. Vol. 34. Issue 3. Pp. 288-298.
23. Firer C., Ross S., Westerfield R., Jordan B. *The Fundamentals of Corporate Finance*. University of Cape Town, 2012. 864 p.
24. Machackova J. Final Thesis Report Economic evaluation of a warehouse investment in central Europe. Tampere, 2009. 59 p.
25. Keown A.J., Martin J.D., Petty J.W., Scott JR. D.F. *Financial management: principles and application*. Personal education, 2007. 275 p.
26. Bradley R., Myers S.C., Allen F. *Principles of Corporate Finance*. London Business School, 2003. 976 p.

Интегральная оценка эффективности строительства доходных ДОМОВ

А.Д. Авсюкевич¹

ФГБОУ ВПО Санкт-Петербургский государственный политехнический университет, 195251, Россия,
Санкт-Петербург, Политехническая, 29.

ИНФОРМАЦИЯ О СТАТЬЕ

УДК 69.003.13

История

Подана в редакцию 9 декабря 2013
Оформлена 28 марта 2014
Согласована 29 марта 2014

Ключевые слова

инвестиционно-строительный проект (ИСП);
доходный дом;
интегральный показатель эффективности ИСП;
чистый дисконтированный доход;
индекс доходности
дисконтированных затрат;
дисконтированный срок окупаемости;
внутренняя норма доходности;
показатель участия;

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.

¹

Контактный автор:

+7 (911) 987 7705, anastasiia.spb@gmail.com (Авсюкевич Анастасия Дмитриевна, магистрант)

Литература

1. Горбачевская Е.Ю. Формирование методов привлечения инвестиций в строительство доходных домов: Автореферат диссертации на соиск. учен. степ. к.т.н. – Иркутск: Типография ИрГТУ, 2011. 24 с.
2. Голикова А.В. Механизм инвестирования финансовых ресурсов в доходные дома: Автореферат диссертации на соиск. учен. степ. к.э.н. – М: Типография Академии труда и социальных отношений, 2012. 26 с.
3. Юртаева А.Е. Методические основы определения экономической эффективности инвестиций в «доходные дома»: Автореферат диссертации на соиск. учен. степ. к.э.н. – М: Типография Рос. эконом. акад. им. Г.В. Плеханова, 2008. – 26 с.
4. Владимиров С.А. Методология оценки и анализа экономической эффективности инвестиционных проектов в строительстве: Автореферат диссертации на соиск. учен. степ. д.э.н. – СПб: Типография СПбГИЭУ, 2007. – 32 с.
5. Зубарева Е.А. Оценка эффективности инвестиционных проектов в строительстве с учетом региональных особенностей при их реализации: Автореферат диссертации на соиск. учен. степ. к.э.н. – СПб: Типография СПбГИЭУ, 2010. – 19 с.
6. Тарасевич Е.И. Методологическое и информационное обеспечение оценки стоимости недвижимости и анализа ценности инвестиций в недвижимость: Автореферат диссертации на соиск. учен. степ. д.э.н. – СПб: Типография СПбГПУ, 2003. – 34 с.
7. Ульянова О.Ю. Инвестиционно-инновационное развитие жилищной сферы в региональной социальной инфраструктуре: Автореферат диссертации на соиск. учен. степ. д.э.н. – Волгоград: Типография Волгоградского государственного университета, 2008. – 42 с.
8. Сутурин И.С. Развитие методов оценки эффективности жилищных инновационно-инвестиционных программ: Автореферат диссертации на соиск. учен. степ. к.э.н. – М: Типография Государственной академии профессиональной переподготовки и повышения квалификации руководящих работников и специалистов инвестиционной сферы (ГАСИС), 2011. – 28 с.
9. Чеготова Е.В. Распределение рисков между застройщиком, техническим заказчиком и инвестором // Строительство уникальных зданий и сооружений. 2013. № 4 (9). С. 133-150.
10. Кольев А.А. Активизация процесса привлечения инвестиций в жилищное строительство региона: Автореферат диссертации на соиск. учен. степ. к.э.н. – Вологда: Типография РАН Вологодского научно-координационного центра Центрального экономико-математического института, 2005. – 28 с.
11. Гаттунен Н.А. Инвестиционное банковское кредитование проектов жилищного строительства: Автореферат диссертации на соиск. учен. степ. к.э.н. – СПб: Типография СПбГУЭФ, 2011. – 23 с.
12. Чернов А.В. Механизм инвестирования малоэтажного жилищного строительства при реализации проектов комплексного освоения территорий: Автореферат диссертации на соиск. учен. степ. к.э.н. – Нижний Новгород: Типография НГАСУ, 2012. – 25 с.
13. Алпацкая И.Е. Совершенствование инвестиционной политики в сфере жилищного строительства в условиях социально ориентированной экономики: Автореферат диссертации на соиск. учен. степ. к.э.н. – М: Типография МГАКХиС, 2012. – 25 с.
14. Позизов П.В. Экономические механизмы привлечения инвестиций в экономику региона на основе государственно-частного партнерства: Автореферат диссертации на соиск. учен. степ. к.э.н. – М: Типография Института экономики и социальных отношений 2011. – 14 с.
15. La Porta R., Lopez-de-Silanes F. Investor protection and corporate governance // Journal of Financial Economics. 2000. Vol. 58. Issue 1-2. Pp. 3-27.
16. Пайк Р., Нил Б. Корпоративные финансы и инвестирование. СПб: Питер, 2006. - 784 с.
17. Шарп У., Александер Г., Бейли Дж. Инвестиции. М.: Инфра-М, 2001. 1028 с.
18. Damanpour F., Wischnevsky D. Research on innovation in organisations // Journal of Engineering and Technology Management. 2006. Vol. 23. Issue 4. Pp. 269-291.
19. Fama E.F., French K.R. Common risk factors in the returns on stocks and bonds // Journal of Financial Economics. 1993. Vol. 33. Issue 1. Pp. 3-56.
20. Halawa, W.S., Abdelalim, A.M.K., Elrashed, I.A. Financial evaluation program for construction projects at the pre-investment phase in developing countries: A case study // International Journal of Project Management, 2013. Vol. 31. Issue 6. Pp. 912-923.

21. Ke, Y., Liu, X., Wang, S. Equitable Financial Evaluation Method for Public-Private Partnership Projects // Tsinghua Science and Technology, 2008. Vol. 13. Issue 5. Pp. 702-707.
22. Ferguson, B., Smets, P. Finance for incremental housing; current status and prospects for expansion // Habitat International. 2010. Vol. 34. Issue 3. Pp. 288-298.
23. Firer C., Ross S., Westerfield R., Jordan B. The Fundamentals of Corporate Finance. University of Cape Town, 2012. 864 p.
24. Machackova J. Final Thesis Report Economic evaluation of a warehouse investment in central Europe. Tampere, 2009. 59 p.
25. Keown A.J., Martin J.D., Petty J.W., Scott JR. D.F. Financial management: principles and application. Personal education, 2007. 275 p.
26. Bradley R., Myers S.C., Allen F. Principles of Corporate Finance. London Business School, 2003. 976 p.