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Iwona Dittmann
Wrocław University of Economics

FORECASTING IN CONSTRUCTING SCENARIOS FOR ASSESSING PROFITABILITY AND RISK OF INVESTING IN REAL PROPERTY[1]

Summary: The paper presents scenario analysis – one of the methods of calculating effectiveness of investing in real property. It is suggested to use forecast methods in constructing scenarios. In addition, the issue of the number of generated scenarios is presented and the creation thereof is suggested based on scenarios for individual explanatory variables.

Key words: scenario analysis, investment in real property.

1. Introduction

Two main streams may be indicated in the development of the investment profitability and risk assessment methods. The first one ("mathematical") focuses on developing increasingly more complicated algorithms and formulas for the effectiveness of assessment of investment undertakings, including the methods of assessing their profitability. The second ("improving") one aims at indicating the advantages and disadvantages of the currently used methods, indicating the possibilities to use them in economic practice and suggesting their modifications (cf. [Rogowski 2008, p. 63]). What is regarded as the reasons for the appearance and popularity of this stream, is not the considerable quality improvement of results obtained with use of increasingly complicated, in terms of mathematics, effectiveness assessment methods, high cost (e.g. connected with obtaining necessary data) and relatively high difficulty (for practitioners) in making calculations. In economic practice,

[1] According to IAS 40 "Investment property", investment real property is "property (land or a building or part of a building or both) held (by the owner or by the lessee under a finance lease) to earn rentals or for capital appreciation or both, with such property not being held for use in the production or supply of goods or services or for administrative purposes, nor held for sale in the ordinary course of business." This definition is similar to the definition of investment as per law on accounting. An investment real property differs from other real property particularly in that cash flows from rent or sales are to a large extent independent from other assets of an entity. The examples of investment real property are apartments, holiday apartments, office space, commercial space, warehouse space for lease.

there is a great demand for methods which bring good results, at the same time being relatively simple in terms of calculations. This is due to the fact that the condition necessary for succeeding is to understand the employed method, its advantages and limitations and to correctly adopt its assumptions. Fulfilling those conditions is easier for practitioners in the case of simpler methods rather than very complicated methods.

2. Scenario analysis

One of the methods of calculating effectiveness is the scenario analysis. This belongs to determinist simulation methods, i.e. the ones consisting in multiple repetitions of the procedure of calculating the value of the investment profitability measure (e.g. net present value – NPV), with assuming different explanatory variables affecting the value of the investment profitability measure in individual scenarios. The simulation indicates the risk related to the project, hence simulation methods are regarded as investment risk analysis tools (cf. [Minasowicz 2009, p. 79]). The possibility to examine the simultaneous influence of multiple variables on the project effectiveness is regarded as the primary advantage of simulation methods (including the scenario analysis). This makes answers to such questions (also formulated in the sensitivity analysis) as "what if…?" more realistic[2].

The main disadvantage associated with the scenario analysis is the fragmentary nature of the risk assessment and the problems related to the structure of scenarios [Rogowski 2008, p. 270; Minasowicz 2009, p. 79]. The fragmentary nature results from considering a limited number of scenarios which might occur in the future[3]. The need to limit the number results, in turn, from the fact that the risk of experiencing "analysis paralysis" grows with increasingly greater numbers of generated potential scenarios [Ross et al. 1999, p. 358]. The problem in constructing scenarios is also the assumptions concerning the behaviour of explanatory variables in future periods. The scenario analysis should take into account the most probable values of explanatory variables[4] (cf. [Ross et al. 1999, p. 356; Rogowski 2008, p. 266; Nogalski, Piwecki 1999, p. 103]). Therefore, this reveals the need to build scenarios based on credible forecasts of explanatory variables.

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[2] Sensitivity analysis takes into account the simultaneous change of only one variable and its application is essentially different.

[3] It is emphasised that this disadvantage is absent in simulation methods based on stochastic models, i.e. those employing probability distributions of explanatory variables, where variable values in individual simulations are generated randomly. In the case of multi-period projections (characterising usually investment in real property), the author notices a difficulty in employing stochastic analysis.

[4] Contrary to sensitivity analysis, where parameter values other than in the base scenario are assumed mechanically, e.g. +/–10% [Marcinek 2009, p. 144, 149; Nogalski, Piwecki 1999, p. 103, Rogowski 2008, p. 256].

3. Forecast-based structure of scenarios for the assessment of profitability and risk of investing in real property

It seems that the scenario analysis as a method of investment risk and profitability analysis can be improved with the use of explanatory variable forecasts. It is assumed here that a forecast is the outcome of a forecasting process, that is "rational, scientific foreseeing of future events" [*Prognozowanie gospodarcze*... 2005, p. 20]. Therefore, a forecast is a judgement concerning the future of the forecast phenomenon, formulated based on regularities characterising the forecast phenomenon or occurring between it and other phenomena. Forecasting allows determining a scope of the most probable values of explanatory variables and facilitates creating extreme scenarios.

In creating scenarios, both point and interval forecasts may be useful. Designated by the application of the greatest credibility rule and the anticipated value rule, point forecasts may be used for building the most probable scenarios. Lower and upper boundaries of interval forecasts may constitute bases for the creation of extreme scenarios (optimistic and pessimistic). In addition, variant forecasts of explanatory variables may be a useful tool for creating scenarios. Individual variants thereof may constitute bases for the creation of various scenarios for assessing profitability and risk of investing in real property.

The built forecasts may be quantitative or qualitative forecasts. Quantitative forecasts may concern the initial values of explanatory variables (in period "0" and "1" year of operation) and the pace (dynamics) of their changes, while qualitative forecasts – the direction of their changes in subsequent years.

It seems that in the case of real property market, forecasts may be built based on formal and informal models. Formal models are built based on data concerning the behaviour of the value of the forecast variable and explanatory variables in the past. These include in particular:

– time series models,
– econometric models,
– analogue models.

Informal models (thought) are judgments of individual experts or groups of experts. Their opinions (judgements) may but need not be formulated, based on data on the behaviour of the value of the forecast variable so far and of explanatory variables in the past. It is believed that advantages of informal models include allowing taking into account changes occurring in existing regularities quicker and to a larger extent, e.g. as a result of the change in environment, and the possibility to employ them with a low availability of data.

4. Building scenarios

In literature, the most often described approach consists in creating 3 scenarios: the most probable, optimistic (assuming the most optimistic level of all considered variables) and pessimistic (taking into account the worst level of all considered

variables). It seems advisable, however, that this method of building scenarios should be abandoned since it may lead to the overestimation of extreme (boundary) values of the effectiveness measure, e.g. NPV. The net present value of the investment for an optimistic scenario is often too high or too low for the pessimistic scenario (above all [Minasowicz 2009, p. 46; Rogowski 2008, p. 270]). Another (less extreme) 3-scenario version provides for scenarios: consistent with expectations, more favourable than the expected one, less favourable than the expected one [Marcinek 2009, p. 149-150]. The relevant literature suggests other solutions as to the number of scenarios:

– extended – e.g. 5 scenarios: optimistic, moderately optimistic, most probable, moderately pessimistic and pessimistic; intermediate scenarios (moderate) are characterised by both pessimistic (prevailing in moderately pessimistic scenario) and optimistic (prevailing in moderately optimistic scenario) [Ross et al. 1999, p. 357];
– 5 scenarios by 5-stage scale of assessment of economic cycle: very good tendencies of economic growth, good macroeconomic and mesoeconomic tendencies, average growth, difficulties in economic growth, poor economic growth[5] [Ostrowska 2002, p. 107];
– asymmetrical – puts emphasis on risk in the negative sense – e.g. 4 scenarios: optimistic, realistic, pessimistic and worst possible [Nogalski, Piwecki 1999, p. 103][6];
– extremely asymmetrical – apart from the base scenario, a pessimistic scenario is suggested as the only additional one [Marcinek 2000, p. 116];
– several scenarios defined by different environment conditions set by e.g. economic cycle and competition (cf. Greer after: [Marcinek 2009, p. 154] (Table 1):

Table 1. Scenarios constructed based on economic cycle and competition

Competition	Economic cycle	Scenarios
Activity in conditions of competition	poor	1
	average	2
	good	3
Activity in conditions of no competition	poor	4
	average	5
	good	6

Source: own work based on [Marcinek 2009, p. 154].

[5] It is believed that a significant drawback of set scenarios based on the economic cycle is taking into account only systematic risk. There is no differentiation of scenarios by risk specific to the given project (cf. [Rogowski 2009, p. 268]).

[6] If the same number of optimistic and pessimistic scenarios is created, then in the case of calculating the expected NPV it can be assumed that the pessimistic scenario is more probable (in order to put more importance to the negative risk). If already at the stage of creating scenarios more pessimistic than optimistic ones are assumed, the probabilities of individual scenarios should be distributed evenly.

It seems that scenarios for individual explanatory variables can be constructed first and then overall scenarios by combinations thereof. Due to the possibility to use the Excel spreadsheet while combining scenarios of individual explanatory variables into overall scenarios, and to make automatic calculations, the author suggests extending the number of overall scenarios to a dozen or so or even several dozen. Intermediate scenarios of explanatory variables may differ from one to another e.g. in variable initial values, tendency (decreasing, increasing) or dynamics (quicker or slower growth, quicker growth in initial years of investment or in later years). A pessimistic scenario should reflect situations which are unlikely yet possible on the real property market. An example distribution of probabilities for individual overall scenarios could look (compared with the classical division into 3 scenarios) as follows (Table 2):

Table 2. Probabilities assigned to individual combined scenarios – classical 3-scenario case and the suggestion of the author

Author's suggestion				Classical 3 scenarios	
Combined scenarios		Probabilities of completion		Scenarios	Probabilities of completion
Base		0.2	0.2	optimistic	0.2
Moderately optimistic	1	0.05	0.35		
	2	0.1			
	3	0.1		most probable (base)	0.6
	4	0.1			
Moderately pessimistic	1	0.1	0.4		
	2	0.1		pessimistic	0.2
	3	0.1			
	4	0.1			
Pessimistic		0.05	0.05		

Source: own work.

One can notice three possible methods of forming overall (combined) scenarios as comprising individual explanatory variable scenarios.

Method one consists in generating all possible combinations, that is, combining explanatory variable scenarios on "each with each"[7] principle. A significant disadvantage of this solution is constructing, apart from overall scenarios which are correct in terms of correlations of variables, also overall scenarios which are incorrect (erroneous) in terms of substance. For example, correlating a high increase in real property value with a decrease in occupancy rate (i.e. holiday apartments) and in potential income in longer term is an error. A less significant (due to the possibility to make calculations in the Excel spreadsheet) drawback of this solution is the potentially relatively large number of combined scenarios. It should be remembered

[7] This approach goes in the direction of stochastic analysis.

that their number is the product of, firstly, the number of explanatory variables for which more than one (base) scenario will be created; secondly, the number of scenarios for each explanatory variable.

The greater is the number of explanatory variables for which more than one (base) scenario will be created, the more combinations are possible. It is suggested, thus, to restrict the number of explanatory variables for which more than one (base) scenario will be created to:

a) variables having the greatest influence on the investment profitability (which may be determined based on sensitivity analysis), since in this case a small percentage change of the explanatory variable value will significantly influence the investment profitability (an example may be potential gross revenue);

b) variables in the case of which the point forecast is more erroneous e.g. due to the absence of data on the value assumed by that variable in the past or to the strong dependence of the variable on external factors which are independent from the investor (an example may be occupancy rate in holiday apartments dependent in particular on the business cycle, weather or percentage rent amount applied in the case of commercial and entertainment space dependent on tenant income).

The more scenarios there are for each explanatory variable, the more combinations thereof are present. If a point forecast of the value of the given explanatory variable is slightly erroneous, the author suggests reducing the number of scenarios to one primary – base scenario (an example may be management costs). In the case of interval or variant forecasts, it is suggested to increase the number of scenarios (e.g. for occupancy rate in the case of holiday apartments, financial costs). The number of potential combined scenarios depend on a number of variables and a number of scenarios for each explanatory variable. For example in the case of 2 variables and 2 scenarios for each it makes 4 combined scenarios. If we apply 3 variables each with 2 scenarios we will have 8 combined scenarios. If we raise a number of scenarios for each of 3 variables to 3, we obtain 8 combined scenarios.

Method two consists in selecting collations. Collations which are incorrect in terms of correlation of explanatory variables are rejected. This approach is worth applying in practice. It should be emphasised that the knowledge and experience of an analyst regarding economic issues, economics of the real property market (basics of valuation) etc. are necessary in the scenario elimination process. In particular the possibility of diversified behaviour of the "price − demand" correlation is noteworthy in different environment states: the phase of development of local market and the associated competition and economic cycle[8]. While selecting collations it is worth

[8] Essentially, the space lease price is negatively correlated with occupancy rate (it is a "price – demand" correlation described in the theory of microeconomics). Such a correlation characterises mature, stable markets. However, in the case of a large surplus of space demand over its supply, which characterises emerging markets, a scenario providing an increase in values of both variables is realistic. Conversely, in the case of a poor market condition, an "overheated" or "fading" market, in which supply exceeds demand, a scenario providing a decrease in both variables may prove realistic.

drawing attention to values in extreme scenarios and possibly not considering "double-extremely pessimistic" and "double-extremely optimistic" variants created as a result of accumulation of extremely pessimistic or extremely optimistic assumptions of variable value behaviour.

Method three is creating scenarios based on non-controlled variables, controlling variables and controlled variables[9]. Overall scenarios are created stepwise. First, scenarios for a non-controlled variable are constructed. If there is a correlation between it and the other variables, it is taken into account while creating scenarios for a controlling variable. Then, separate scenarios of a controlled variable are constructed for each scenario of a controlling variable. This method requires determining non-controlled, controlling and controlled variables. It seems that this approach best reflects the idea of the scenario analysis, in which scenarios being a holistic vision of an investment against its environment are constructed (cf. [Marcinek 2009, p. 149]).

Example:

A controlling variable is the lease price and *controlled variables* are occupancy rate and real property value increase. For the controlling variable – lease price – 3 scenarios designated with the letters: A, B, C were created.

For occupancy rate scenarios designated with Arabic numbers were created: 1, 2, 3 (for scenario A of lease rate); 4, 5, 6 (for scenario B of lease rate); 7, 8, 9 (for scenario C of lease rate). Such situations may also be considered where the generated scenarios will be partially the same e.g. for A: 1, 2, 3; for B: 2, 3, 4; for C: 3, 4, 5.

For real property value increase scenarios designated with Roman numbers were created: I, II (for scenario A); III, IV (for scenario B); V, VI (for scenario C). Similarly as in occupancy rate scenarios, such situations may also be considered where the generated scenarios will be partially the same e.g. for A: I, II; for B: II, III; for C: III, IV.

It is also possible to take into account a given controlled variable of both the specific scenario of controlling variable and the specific scenario of another controlled variable while creating scenarios. For example, a scenario of real property value increase may be based simultaneously on the lease price and occupancy rate scenario[10]. Then the following real property value increase scenarios would be created: I (for scenarios: A, 1); II (for scenarios A and 2); III (for A and 3), etc.

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[9] Non-controlled variables are defined as variables which are independent from the decision maker; their level is independent from the decisions made by the latter. Controlling variables are those whose level depends on the decisions made by the decision maker. By making decisions on controlling variables, the decision maker may shape the level of controlled variables [Szpulak 2010, p. 219-220; Szpulak 2003, p. 204].

[10] Treating real property value as a dependent on lease price and occupancy rate is justified substantively, cf. real property valuation in the income approach based on NOI (net operating income).

The advantage of the approach based on the controlling variable and controlled variables is the possibility to take into account the correlations between explanatory variables ("If price is A, what might the occupancy rate be?", "If price is B, what occupancy rate might be?", "If price is C, what might the occupancy rate be?"). The disadvantage is the excessive simplification of correlations and problems with the classification of certain variables. For example, a real property value increase may be treated as a controlled variable since it depends e.g. on investment and management decisions of an owner. On the other hand, it is justified to regard a real property value increase as a non-controlled variable since it depends on external factors to a large extent, e.g. development of the local real property market, changes in real property surroundings, etc.

5. Conclusion

The suggestions proposed in the paper constitute specific hints for creating scenarios of the assessment of profitability and risk of investing in real property[11]. At the same time they retain the primary advantages of the scenario analysis, i.e. flexibility and comprehensibility. The use of the Excel spreadsheet streamlines the construction of overall scenarios and permits creating more scenarios with automatic calculations as to the investment profitability. Basing scenarios on forecasts (created with the use of methods based on both formal and informal models) aims at improving the analysis quality. What is important is that the restricted availability of data does not exclude constructing scenarios based on the forecast; it only requires employing the appropriate forecasting methods.

It should be emphasised that the actual value of the suggested improvements will depend on the knowledge and experience of a real property market expert involved in the scenario designing process and of a forecast specialist. Their significant acquaintance with the operation of the real property market (factors determining the demand and supply, correlation of variables, trends, phenomena) will have a great impact on the scenario analysis quality.

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PROGNOZOWANIE W KONSTRUKCJI SCENARIUSZY DO OCENY OPŁACALNOŚCI I RYZYKA INWESTOWANIA W NIERUCHOMOŚCI

Streszczenie: W artykule przedstawiono analizę scenariuszy – jedną z metod rachunku efektywności inwestowania w nieruchomości. Zaproponowano wykorzystanie metod prognostycznych w konstrukcji scenariuszy. Przedstawiono także zagadnienie liczby generowanych scenariuszy oraz zaproponowano ich tworzenie na podstawie scenariuszy dla poszczególnych zmiennych objaśniających.