Department of Real Estate, Planning and Geoinformatics

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A preliminary investigation of the real estate investment executive perspective

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Aalto University | SCIENCE + TECHNOLOGY | RESEARCH REPORT

Aalto University publication series
SCIENCE + **TECHNOLOGY** 3/2015

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ISBN 978-952-60-6206-8 (pdf)
ISSN-L 1799-4896
ISSN 1799-4896 (printed)
ISSN 1799-490X (pdf)
http://urn.fi/URN:ISBN:978-952-60-6206-8

Unigrafia Oy
Helsinki 2015

Finland

Author
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Name of the publication
Real options analysis as a decision-making tool: a preliminary investigation of the real estate investment executive perspective

Publisher School of Engineering

Unit Department of Real Estate, Planning and Geoinformatics

Series Aalto University publication series SCIENCE + TECHNOLOGY 3/2015

Field of research Real Estate Economics

Abstract

This paper attempts to identify literature where real options analysis (ROA) has enhanced real estate investment analysis and decision-making as well as to conduct a preliminary investigation of how ROA is known and perceived by senior real estate investment executives.

The research is carried out as an exploratory study where the data for the research is gathered via semi-structured interviews with senior executives in real estate investment companies.

All of the interviewees expressed that they would welcome ROA into their investment decision process and into the industry as a general method. The results indicate that the findings from earlier often theoretical ROA research do have practical interest, which hopefully encourages researchers to study the topic further together with practitioners. The perceived complexity of real options valuation could be overcome by communicating the benefits of ROA with results where the option values are transparent approximations.

The interviews focusing on the role of ROA in investment decision making process with real estate investment executives are the first of its kind and provide new understanding regarding both the overall potential of ROA for real estate investments as well as where the next research questions should focus, especially concerning the practical viability of the method.

Keywords real options, real estate investment, decision-making, investment analysis

ISBN (printed)	**ISBN (pdf)** 978-952-60-6206-8	
ISSN-L 1799-4896	**ISSN (printed)** 1799-4896	**ISSN (pdf)** 1799-490X
Location of publisher Helsinki	**Location of printing**	**Year** 2015
Pages 18	**urn** http://urn.fi/URN:ISBN:978-952-60-6206-8	

1. Introduction

Megatrends, such as sustainable development, digitalization and technological innovations are profoundly changing many industries across the globe. Growing uncertainty intensifies the division between successful and unsuccessful businesses. In the real estate investment business, this uncertainty has concretized in less predictable cash flows, e.g. the average lease length for office buildings in the UK has declined from 6.7 years to 4.5 years between 1999 and 2011 (BPF-IPD, 2012). The decline has been even steeper in retail and logistical real estate. In addition to greater competition in letting activities, this phenomenon will result into higher requirements from the buildings, which need to have flexibility for adapting into fast changing requirements of the 21st century. Even thought everybody can agree that flexibility is valuable, it is not systematically accounted for in real estate investment analysis. This could be due to the fact that pricing of flexibility is difficult because its value is a contingent claim into an event in the future. Researchers, such as Myers (1984), Trigeorgis and Mason (1987) and Dixit and Pindyck (1995) have argued long ago that the discounted cash flow (DCF) valuation alone cannot properly value contingent claims, or as better known, options.

In the financial industry, options are valued and actively used for hedging risks because daily continuously updated historical data is available for determining the probability of an event. In the real estate industry, similar data is not available due to the special characteristics of the sector (i.e. uniqueness, illiquidity, location bound, high transaction costs, etc.). This is a likely reason why options in real assets, i.e. real options, do not have an active role in decision-making. Nevertheless, many top experts in the academia have praised the potential of real options in sustainable decision-making. Professors Copeland (2010), Geltner and de Neufville (2012) have stated that real options may be the solution for encouraging investors to ask for a more sustainable design in long-term capital-intensive systems. In theory, real options have proven to enhance lifecycle performance of many assets across different industries, yet adoption of the method as a standard approach in investment evaluation practices has been very slow.

This paper attempts to identify literature where real options analysis (ROA) has enhanced real estate investment analysis and decision-making as well as to conduct a preliminary investigation of how ROA is known and perceived by senior real estate investment executives.

The paper is organized as follows. The next section organizes real options research in the real estate industry and formulates the actual interview form based on the research questions and findings from the literature. In the following section, the results of the semi-structured interviews are presented. Finally, discussion is presented and conclusions drawn.

2. Literature summary and formulated themes for interviews

The literature summary starts with an overview of real options literature in general and then moves into real estate industry specific literature, where the research was categorized into five topics: real estate market, land valuation, building flexibility, lease contracts and technology investments.

Myers (1977) introduced real options as *"opportunities to purchase real assets on possibly favourable terms."* Myers (1984), Kester (1984), McDonald and Siegel (1986) and Pindyck (1991) highlighted the

importance of options in capital investment decision-making. Trigeorgis and Mason (1987) and Trigeorgis (1988, 1993) researched the added value of managerial and financial flexibility in real assets. Dixit (1992) and Dixit and Pindyck (1995) emphasized how options can improve the upside potential while at the same time limit downside losses. Lander and Pinches (1998) and Oppenheimer (2002) both recognized the potential of real options but indicated criticism, especially in the complexity of the valuation. Amram and Kulatilaka (1999) compiled a profound review of real options in managing strategic investments. Bowman and Moskowitz (2001) concluded that options approach encourages managers to *"experimentation and the proactive exploration of uncertainty."* Miller and Park (2002) and de Neufville (2003) explored how real options can link market information with strategic engineering economic decisions. Adner and Levinthal (2004) added to the criticism of real options that understanding the boundaries of the approach is essential in all path-dependent activity. Borison (2005) concluded a great review of applicability, assumptions and mechanics of different real options valuation methods. Copeland (2010) discussed cases of real option applications and challenges that have to be overcome for a breakthrough of ROA as a practical method. Finally, Geltner and de Neufville (2012) have recently emphasized how compiling real options theory and 21st century digital data sources can result in more efficient urban development with greater flexibility.

Real option research in real estate industry is used to explain real estate market phenomena, such as market behaviour, development cycles and role of competition. Grenadier (1996) used a game-theoretic option exercise strategies to explain why some markets have bursts of development activities and others smooth development activities. Lai et al. (2004, 2007) analyzed the price uncertainty of new developments for modeling presale strategy of developers and to explain developers' behavior with rents and occupancy levels in different market types. Bulan et al. (2009) suggested that increases in both idiosyncratic and systematic risk lead developers to development exercise. Fu and Jennen (2009) argued that real options are capable of predicting new office construction. Ott et al. (2012) used real options to explain the rationale of phasing and building for inventory in a large-scale residential development. Clapp et al. (2012, 2013) explained how option to redevelop residential real estate explains value changes in different housing markets and cycles. Furthermore, Clapp et al. (2014) analyzed what drives the exercise timing of an expansion option in shopping centers. Chau and Wong (2014) identified a negative impact that urban renewal has on nearby properties redevelopment option values.

Land valuation is one of the original applications of real options in the real estate industry. Titman (1985) argued that the option to select the type and size of building raises the value of the vacant land and has important role in decision-making. Williams (1991) followed by arguing that the stochastic evolution of operating revenues and construction cost should be acknowledged in development decisions. Quigg (1993) argued that the current land valuation models should account for the option to wait because it has a value in decision-making. Capozza and Sick (1994) explained the value and risk structure of land markets where urban land is priced using CAPM and agricultural land with real options because it can be converted into urban land. Chiang et al. (2006) identified similar embedded options inside vacant land, arguing that the NPV cannot capture the value of options available within project developments. Cunningham (2006) identified the presence of real options in vacant land prices and suggested that real options should be included in capital investment analysis. Rocha et al. (2007) demonstrated how real options could improve investment analysis in a real estate development cases

by identifying optimal strategy and timing for sequential investing. Grissom et al. (2010) used option-pricing theory together with portfolio analytics to assess single and mixed-use of the same land.

Building flexibility can be identified as one of the key themes in the real estate industry. Greden and Glicksman (2005) used binomial real options model for calculating how much flexible space is justified economically. De Neufville (2006) used ROA for planning a staged parking garage investment in uncertain demand. Guma et al. (2009) studied vertical phasing, option to raise, as a corporate real estate strategy. Fawcett et al. (2012) discussed the importance of real options in designing buildings by proposing that options-based decision-making is a continuum for LCC and LCA calculation methods. Dortland et al. (2012, 2014) used qualitative methods to discuss flexibility in healthcare investments; scenario planning and ROA were found as effective tools for increasing the management of understanding the importance of flexibility. Cardin et al. (2013) developed an options framework for optimizing the phasing and flexibility of a development project. Vimpari et al. (2014) used real options valuation to point out that flexibility is not valuable in all parts of the building and decisions should be made accordingly. Furthermore, Vimpari and Junnila (2014) demonstrated that option pricing could be used for valuing green building certificates because the certificate provides the flexibility to adapt into future market conditions.

Several studies have identified ROA as a method for valuing options within commercial lease contracts. Grenadier (1995, 2005) produced a model for valuing equilibrium lease term structures for different kind of contracts, such as leases with options to renew or cancel and with insurances. Hendershott and Ward (2000) incorporated option-like features, such as overage rent and expense stops into valuation of shopping centre leases. Ambrose et al. (2002) presented a stochastic pricing model that is used to explain why initial rents should be significantly lower in upward-only leases compared to fully adjustable leases. Sing and Tang (2004) addressed investor's leasing risk with a binomial option model; the model increases the investor's understanding in embedded cancellation and default options in lease contracts. Cho and Shilling (2007) also used ROA for valuing shopping centre leases by delivering further evidence why the user-cost of capital does not hold in uncertain environments by claiming that it does not include the risk premium related to tenant risks. Finally, Ashuri (2010) used ROA to valuate flexibility in a corporate lease.

ROA has been proposed as a method for controlling technology investment risks, mostly related to energy. Greden et al. (2005) used option-based design to justify the costs of a switch option between natural and mechanical ventilation. Van der Maaten (2010) used binomial option pricing to value the timing of a solar power investment in residential real estate. Verbruggen et al. (2011) argued that irrevocability and dynamic sequential analysis of future events have to be accounted when making correct decisions about energy investments in buildings. Menassa (2011) developed a framework for guiding sustainable retrofit investments. Kumbaroglu and Madlener (2012) studied energy retrofit investments by using traditional static decision-making (NPV) and dynamic decision-making (ROA) in an office building case. It is found that energy price uncertainty significantly affects profitability of retrofit investments and that option to wait in envelope retrofits is not valuable if energy price increases remain moderate and smooth.

The examined research on real options identifies several key themes where ROA can contribute to the investment analysis and decision-making in the real estate and construction industry. There is already well-defined real estate market phenomena that can be explained through real options, and thus provide valuable insight into strategic decision-making in the industry. Similarly, real options in land valuation and building flexibility are important to understand when making long-term decisions in fast-changing markets. Understanding option values embedded in lease contracts have a growing importance when average leases are becoming shorter. Finally, the option value of renewable and conserved energy may be one of the major applications of the method in climate conscious future.

One interesting observation was that most of the literature applications have been tested so far in hypothetical settings. Accordingly, many studies have concluded that more real life cases are needed. Even though the opportunities that ROA provides for the real estate industry is claimed to be extremely valuable, it seems that adoption of ROA as an investment analysis and decision-making tool in practice has been very slow. The next section tries to shed light to this problem by interviewing senior executives of real estate investment companies. The following key questions are formulated:

- What investment material is used in investment decision-making process?
    - How is uncertainty addressed in the material?
- What is the knowledge of senior executives of real options analysis?
    - Could it enhance decision-making process?
    - Could it be used for identifying new profitable investments?
- What is needed for a wider practical adoption of real options analysis in the real estate industry?

3. Research methodology and data

The research is carried out as an exploratory study where the data for the research is gathered via semi-structured interviews with senior executives in real estate investment companies. The interviewees for the study were chosen from the largest (based on asset value) commercial real estate investment companies based in Finland. An invitation to participate in a 90-minute interview was sent to 20 executives with a final acceptation rate of 60 % (12). The twelve participating companies have approximately 19 billion € of real estate investments in the Finnish property market. This represents approximately 40 % of the size of the professional property investment market (KTI, 2014).

The organization types and interviewees' positions within the organisations are as follows: three publicly listed real estate investment companies (a Chief Commercial Officer, a Senior Vice President and a Group Treasury Officer), four institutional investors (four Head of Real Estate) and five real estate investment funds (three Chief Executive Officers and two Head of Finland). A more detailed description of the interviewees is not disclosed due to confidentiality. The interviews were conducted in Summer 2014.

The interviews started by discussing investment decision-making process, current decision-making material and uncertainty assessment. Then, ROA was introduced to the interviewee with a short presentation. After that ROA as a decision-making tool and its role in the industry were discussed. The interview form is presented in Table 1.

Interviewee:

Place and date:

CURRENT DECISION-MAKING MATERIAL AND UNCERTAINTY ASSESSMENT

1. What are typical investment opportunities that you analyse?
   1.1. How many significant investments opportunities are analysed yearly?
2. What is your investment decision-making process, what is your role in the process and who produces decision-making material?
3. What kind of material is used for decision-making?
   3.1. Does DCF valuation have a key role?
   3.2. Does the investment analysis contain enough information regarding physical asset characteristics, such as technical attributes, environmental qualities and future rental opportunities?
4. What part of the decision-making material is quantitative (KPIs) and what part is qualitative (expert opinions)?
   4.1. Is all knowledge incorporated into the calculations?
   4.2. Have you noticed any essential shortcomings in the decision-making material?
   4.3. Is the discount rate a good method for measuring the risk of an investment?
   4.4. Are future scenarios examined carefully or does the decision-making focus more on the current situation?
5. Is uncertainty examined systematically in the decision-making material?
   5.1. Do you seek actively flexibility to prepare for the uncertainty?
   5.2. How have shorter average lease lengths influenced uncertainty examination?
6. In hindsight, what risks have realized in investments: those which where/where not examined during the decision-making process?

- INTRODUCTION OF REAL OPTIONS ANALYSIS TO THE INTERVIEWEE -

REAL OPTIONS AS A DECISION-MAKING TOOL

7. Have you heard about the method earlier? (in what context, have you used it?)
8. What are your first impressions of the method?
9. Do you systematically try to identify real options within investments in your organisation? (with what method, have you calculated the real options values?)
10. Could systematic identification and valuation of real options produce added value in your investment process?
    10.1. Could it be a part of the formal decision-making process?
    10.2. Could it help justifying strategic investments which values realize later or risk management investments?
    10.3. Could real options analysis enhance uncertainty management compared to the current methods that you use?
    10.4. Would it be of value that the producer of decision-making material analyses real options?
11. How transparent the real option value would have to be that it would be acknowledged in decision-making?

11.1. Would an approximation of the value be enough for decision-making?
12. Do you think that the knowledge and intuition is enough for identifying real options, or would a systematic method bring added value for identifying real options?
12.1. Could you find new valuable investments with real options analysis?
12.2. Could you enhance your competitiveness with real options analysis?
ROLE OF REAL OPTIONS IN THE REAL ESTATE INDUSTRY
13. Would you welcome a wide introduction of the method in the real estate industry?
13.1. Could the method increase attractiveness of real estate investments?
14. Could the method guide investors to demand more from buildings?
14.1. Could it support sustainable development?
14.2. Could it promote implementation of new technologies?
15. How could the method be implemented into practice in the industry?
15.1. What are the obstacles in implementation?
15.2. Would the implementation require more knowledge from decision-making material producers?

Table 1 Interview form

4. Interview results

4.1 Current decision-making material and uncertainty assessment

Introductory questions were planned to motivate the interviewees by discussing what kind of investment opportunities are analysed and who bears the responsibility in the decision-making process. The responsibilities of the interviewees in the decision-making process had variation depending on the type of the investment organisation. All of the decision-makers relied their information on material produced by in-house analysts, which were supported (depending on the organisation) by other in-house staff, such as letting negotiators, construction managers, and legal counsels. Outside experts were used when necessary.

The main instrument for producing decision-making material was identified as DCF valuation. However, the information included in the DCF varied among respondents. Some were satisfied with narrower inputs, i.e. market rents and vacancy rates, determining correct discount rates as well as approximating maintenance and renovation costs. Some mentioned a more detailed analysis, such as demographic factors, development potential of the neighbouring areas, competitiveness in the area, building flexibility and a very detailed analysis of macro-economical factors. The role of DCF in the material was further analysed by asking, *"Does the investment analysis contain enough information regarding physical asset characteristics, such as technical attributes, environmental qualities and future rental opportunities?"* Only four of the respondents clearly stated that enough was included, three felt that it has a growing role and is almost in satisfactory level but five answered that it definitely needs to be developed further.

The next question was *"What part of the decision-making material is quantitative (KPIs) and what part is qualitative (expert opinions)?"* Quantitative was identified as the main source but many felt that experience plays an essential part in the decision-making which is often hard to incorporate in to the quantitative part. This question was broken down in to sub-questions *"Is all knowledge incorporated into the calculations?"* Interestingly, all of the respondents felt that all necessary knowledge is incorporated in the analysis. However, many pointed out that there are areas where improvement is needed but not very specifically where. The next question, *"Have you noticed any essential shortcomings in the decision-making material?"* tried to elaborate this. Nine responded that development of the investment analysis methods has already removed these shortcomings, two recognized problems with exit value modelling and one stated that positive opportunities are not aggressively sought after. Then the interviewees were asked, *"Is the discount rate a good method for measuring the risk of an investment?"* The answers had a negative tone because almost all responded that there is not a better way for measuring the risk. However, some pointed out better methods for this, such as IRR and Equity Multiple. The last sub-question asked, *"Are future scenarios examined carefully or does the decision-making focus more on the current situation?"* Three responded that only the current situation is used for decision-making and nine responded that actually the future scenarios of the investment are the most important part of the analysis.

The following question asked, *"Are uncertainty sources examined systematically in the decision-making material?"* Six clearly questioned their systematic processes, four avoided the question by rather mentioning something about their methods, such as SWOT and sensitivity analysis, and only two clearly said that they have a systematic process. The first sub-question asked *"Do you seek actively flexibility to prepare for the uncertainty?"* All responded that they seek for flexibility; others mentioned that flexibility in buildings is necessary and others used lease agreements for finding flexibility. The final sub-question asked, *"How have shorter average lease lengths influenced uncertainty examination?"* Three responded that it did not have an effect because most of the leases are until further notice leases or that possibility to develop tenant mix is important. Rest responded that it clearly has influence due to various reasons, such as risk levels are increased, property valuation effect and capital is more expensive.

The final question, before introducing ROA to the interviewees, asked *"In hindsight, what risks have realized in investments: those which where/where not examined during the decision-making process?"* Tenant risk was identified as the largest risk source that have resulted in situations where the premises could not be rented as efficiently or with the rental levels as planned. Other realized risks were technical conditions were worse than analysed, head offices had become multi-tenant buildings with lower rentable areas and investments were made with too low yields.

4.2 Real options as a decision-making tool

ROA was introduced to the interviewees using the major topics identified from literature. First, general literature from ROA was used to describe the method, shortly its history and its importance in the real estate industry. Then it was explained how real options are identified and how the value of an option is determined. Finally, real option applications from four different topics (land value, building flexibility, lease contracts and technology investment) were presented as examples to the interviewees. All of the

interviewees wanted to know more detailed data from the actual examples by mentioning that a particular topic is very important or that they have had some experience in a similar project.

After presenting the examples the interview moved to discuss real options as decision-making tool in the real estate industry, starting with a question *"Have you heard about the method earlier? (in what context, have you used it?)"* Four out of twelve respondents had heard about the method before, and of those, only one had used it but in a different industrial context. The following question asked, *"What are your first impressions of the method?"* All of the respondents had a very positive feeling about the method, few with some caution regarding the complexity of the valuation:

> *"Supports gut feeling or brings a new perspective for gut feeling… decision-making is more formal"*
>
> *"To start, it would be very smart if the options could be modelled… sceptical whether the option values can be cost-efficiently calculated"*
>
> *"I don't see this as a method for a closed-end fund… Institutional investors and real estate companies should absolutely think of these kinds of options"*
>
> *"It is obvious that this would have a great benefit if the method works and is easy to use"*

The next question asked, *"Do you systematically try to identify real options within investments in your organisation? (with what method, have you calculated the real options values?)"* The answers had some variation because none used the term real options, but they had some kind of informal methods for identifying options and flexibility. The following quotes elaborate:

> *"We think what happens if a major tenant leaves... expert opinions are calculated for renovation costs and architects calculates what is the leftover rentable area… we don't really look for positive things, only negative"*
>
> *"We try to identify flexibility and options informally, it is based on experience… we mainly focus on lease agreements… I don't know whether the focus on the technical building attributes is enough"*
>
> *"We don't have a systematic process but we try to identify them… for example, if a shopping centre has expansion potential, it influences the required yield"*

Then the interviewees were asked, *"Could systematic identification and valuation of real options produce added value in your investment process?"* Eleven responded yes where the lone no stated that their methods, such as scenario planning and sensitivity analysis are so developed that ROA might be an unnecessary addition. The question was then opened up with four sub-questions starting by asking, *"Could it be a part of the formal decision-making process?"* Again eleven out of twelve responded yes. The second sub-question asked, *"Could it help justifying strategic investments which values realize later or risk management investments?"* Everybody saw that it could help justifying these kinds of investments. The third sub-question asked, *"Could real options analysis enhance uncertainty management compared to the current methods that you use?"* All responded yes, especially for

increasing systematic processes. The final sub-question asked, *"Would it be of value that the producer of decision-making material analyses real options?"* Again, all responded yes.

The following question asked, *"How transparent the real option value would have to be that it would be acknowledged in decision-making?"* Everybody highlighted that transparency is very important; the following quotes elaborate the importance of the issue:

> *"Reliability over that the option can be exercised…the risks should not be regulations or political, rather based on markets"*
>
> *"Very transparent… I am afraid that only few people in our organisation can academically understand how the value comprises"*
>
> *"It is enough if our organisation understands where the value comes from"*

A following sub-question asked, *"Would an approximation of the value be enough for decision-making?"* Everybody answered clearly yes, with several responses highlighting that too much detail is actually a bad thing in appraising options like these. Additionally, the following quotes elaborate the issue:

> *"Approximation is enough if we can identify the value drivers and can agree with the used parameters"*
>
> *"In a transaction if a seller can communicate an option value, the buyer can then examine itself whether they are realistic and exercisable"*
>
> *"All valuations are approximations"*

The final question in this section asked *"Do you think that knowledge and intuition is enough for identifying real options, or would a systematic method bring added value for identifying real options?"* All had positive answers that a systematic process for identifying options would be beneficial. Two sub-questions were asked, *"Could you find new valuable investments with real options analysis?"* Eight responded yes, three no and one could not respond. The second sub-question asked, *"Could you enhance your competitiveness with real options analysis?"* Eight responded yes and four no.

4.3 Role of real options in the real estate industry

The final section of the interview focused on the role of real options in the real estate industry. The first question asked, *"Would you welcome a wide introduction of the method in the real estate industry?"* All twelve had positive responses:

> *"Competition wise it would be nice to be a pioneer but overall it clearly would increase professionalism in the industry"*

"The construction companies, as a strong developers, have done projects where there are no options, rather only negative surprises… maybe we would not now have one million square meters of empty offices in the Helsinki Metropolitan Area"

"The investors, especially institutional, should require these; then the construction companies would start to offer them… it is just like environmental certificates"

One sub-question asked, *"Could the method increase attractiveness of real estate investments?"* This divided the interviewees, six yes and six no. The following quotes elaborate:

"The method could help properly justify decision rather than just say that this is good and we should go after it"

"The industry has already developed so much that the method probably would not make any difference"

The next question asked, *"Could the method guide investors to demand more from buildings?"* Ten of the responses answered clearly yes and two yes with some reservation regarding the object of interest. Two sub-questions were also asked, *"Could it support sustainable development?"* and *"Could it promote implementation of new technologies?"* Both questions were answered yes by all interviewees. The following quotes elaborate:

"During the design and construction phase, we would actually do something about changing future conditions rather than just talking about them"

"It depends on the decision-maker's background; my background is technical, so I view flexibility as a natural thing… If you only want to look at the cash flows, maybe you don't want to use this kind of tool"

"We always talk about flexibility but when actually more money needs to be invested, it is hard to justify… I don't know whether this method would help, maybe if it can clearly show the added value"

(It would support sustainable development because)

"Lifecycle would have more weight and buildings without future use would not be constructed"

"Environmental investments, such as energy efficient buildings, would be easier to support"

(It would promote new technologies because)

"It would focus on finding best cost-efficient technologies for dividing spaces… additionally it could be used for valuing environmental certificates"

"BIM (Building Information Modelling) could be used for seeing opportunities for expanding and raising buildings, and how they are done"

"Added value comes from new technology, e.g., doors in logistics and thermal heat systems"

The following question asked, *"How could the method be implemented into practice in the industry?"* This provided many wide-ranging answers, but the main reasoning seemed to be ease of use and transparent communication of results. Additionally, pioneer investors just have to start using it and point out the benefits to different stakeholders, i.e. tenants, banks, property valuers, developers and other investors. The following quotes elaborate:

"Investors have a great role in this, they must demand more from the construction companies… with lease agreements, the tenants should get used for paying for the options"

"The mathematics must be simple enough so that it is not the threshold issue… however, only thinking in terms of real options is valuable, to think about the opportunities and negative aspects, and the distribution"

"Ease of use, applicability and communicating to the decision-makers, these are three important issues"

"Very standardized, probably requires a simple framework that is also taught at university"

"Proving the economical value is of essence… maybe investors should start to require that options are examined as a part of the investment process… it is very important that during a design phase of building these are required and the designers are guided accordingly"

"People just have to start using it and eventually when others see how valuable it is, it will spread in the industry. This of course takes time."

"It just needs to be simple to use and showed as a simple decision-making tool… the decision-maker has to understand where the value comes from"

"I think RICS has a role in this, it should be have a status of a standardized tool in the industry"

The first sub-question asked, *"What are the obstacles in implementation?"* Again, a wide range of answers were given, but sticking into old practices and complexity of the method were identified as key topics:

"Prejudices and willingness to use old standard operating procedures… organisation resistance can be high"

"Old standard cash flow valuations could be hard to replace, people are used to specified results which could be hard to compare to new ones… the method needs to be a supplement to old methods"

"No proper tool available for implementing, which is the largest obstacle at the moment"

"The problem is that there are not enough knowledge, people feels it is too complex – the method should not be mystified… real option might be a hard term for somebody to understand"

The second sub-question asked*, "Would the implementation require more knowledge from decision-making material producers?"* Seven mentioned that physical asset characteristics knowledge should be increased; three mentioned numerical and financial knowledge should be increased and two said that enough knowledge is already there:

"The knowledge probably is in the market but it just needs to be tied together… the analyst requires knowledge from different sources… BIM could be one of the tools for this kind of work"

"First, the thinking process must be updated which brings added value; the numerical calculations is the second step… we should look more outside the box: what can happen to the investments… divestments would also be very interesting to analyse with this"

"Understanding of the property is something that needs to be increased, to understand the technical conditions and how the affect future choices"

"A greater understanding of financing is needed"

"Requires more knowledge of technical issues, you cannot read from simple documents what are possible technically… probably needs a group of people for inputs"

4.4 Key observations from the interviews

Two points are highlighted from the first part of the interview, which discussed current (DCF based) decision-making processes. Firstly, only four out of twelve respondents clearly felt that enough physical asset characteristics knowledge is included in investment analysis, yet controversially all of the respondents felt that all necessary knowledge is incorporated in the analysis, and further again that that improvement is needed but not specifically where. Secondly, question regarding systematic uncertainty assessment provided answers where six questioned their systematic processes, four avoided the question and only two clearly said that they have a systematic process.

In the second part, real options as a decision-making tool, received an interested welcome from all the interviewees. Only four out of twelve had heard about the method before, but the response was very positive since eleven thought that ROA could directly add value to their investment process and decision-making. In addition, all answered yes to questions whether ROA would help justifying strategic and risk management investments or enhance uncertainty management. Regarding real options valuation, all felt that transparency is very important and that an approximation (no need for high statistical probability) of the option value would clearly be enough for decision-making. Furthermore, eight out of twelve responded that they could find new valuable investments and increase competitiveness with real options.

The role and future of real options in the real estate industry was discussed in the final section of the interview. All of the twelve respondents stated that the method would be welcomed in the industry, but only six felt that it would increase the attractiveness of real estate investments (as an asset class). However, ten thought that the method would guide investors to demand more from buildings and all respondents felt that it would support sustainable development and promote new technologies. The main requisites for a wide implementation of the method in the industry were stated to be the ease of use and transparent communication of results. The potential obstacles for implementation were identified to be the tendency of the conservative industry to stick into old practices and the complexity of the method. Finally, regarding the knowledge required for implementing the method, seven mentioned that physical asset characteristics knowledge should be increased and three that numerical and financial understanding should be increased.

5. Discussion and conclusion

The paper attempts to organize previous real options literature in the real estate industry into major application domains, and to shed light to the role and future of real options in the current decision making processes of the industry by interviewing senior real estate executives in Finland.

The literature revealed that ROA could provide valuable insight into strategic decision-making, enhance understanding for example in land valuation and building flexibility analysis, highlight the importance of embedded options in lease contracts and help justifying investments in renewable energy solutions. However, most of the studies were conducted in hypothetical settings and many pointed out that real life cases are needed for validating the findings.

The interviews was planned to discuss uncertainty assessment, ROA as a decision-making tool and its role in the real estate industry. It was found that only four out of twelve respondents clearly felt that enough physical asset characteristics knowledge is included in investment analysis, yet controversially all of the respondents felt that all necessary knowledge is incorporated in the analysis, and further again that that improvement is needed but not specifically where. Additionally, only two out of twelve clearly responded that they have a systematic process for uncertainty assessment. The answers seem a bit contradictory because one could though that uncertainty assessment is an essential part of an investment analysis, or then systematicity is not found that important in the analysis.

The participants welcomed ROA with interest: eleven out of twelve responded that it could add value to their investment analysis and decision-making. All felt that it would help justifying investments and enhance uncertainty management. Concerns were raised about complexity of the method and transparency of results. However, all answered that an approximation of the value would clearly be enough for decision-making. This is not surprising since often decision-making is based on approximations rather than exact figures. Nevertheless, this is an important observation because a fair share of real options research relies on very complex mathematical methods, which is the main source of criticism for the method in the first place (e.g. Lander and Pinches, 1998; Oppenheimer, 2002).

All of the participants would welcome ROA into wide adoption in the real estate industry; ten thought that the method would guide investors to demand more from buildings and all respondents felt that it would support sustainable development and promote new technologies. Ease of use and transparent

communication of results were found to be the key reasoning for a successful adoption as a practical tool in the industry.

Reliable cross comparison of the interview results was ensured because a single researcher conducted the semi-structured interviews using the same interview form. The risk that the interviewees may have understood certain concepts differently was minimized by using common definitions in the industry, and by communicating ROA to interviewees with the same presentation. The analysis of the results is subjected to the interviewer's interpretation of the answers. Recording the interviews and effectively making notes during the interviews aimed to minimize the effect of this. As this was a preliminary investigation, increasing the sample size and adding more real estate markets to the study would improve the generalization of the results. The sample size of this study is a good representation of the Finnish market as it covers 40 % of the professional property investment market.

Finally, all the interviewees expressed that they would welcome ROA into their investment decision process. The results indicate that the findings from earlier often theoretical ROA research do have practical interest, which hopefully encourages researchers to study the topic further together with practitioners. The obstacles of sticking into old practices and the perceived complexity of real options valuation could be overcome by communicating the benefits of ROA with results where the option values are transparent approximations. An important step in this is, as one of the interviewees pointed out that the knowledge of the method must be increased with practitioners because people feel it is too complex and therefore will not break through. Since ROA is a method that connects financial and engineering analysis (e.g. Miller and Park, 2002; de Neufville, 2003), it is necessary to think whether the current decision-making material producers, which seem to be mainly (financial) analysts using DCF, incorporate enough physical asset characteristics information in the analysis. This is something that should be studied further together with practitioners and real estate education.

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Aalto-ST 3/2015

ISBN 978-952-60-6206-8 (pdf)
ISSN-L 1799-4896
ISSN 1799-4896 (printed)
ISSN 1799-490X (pdf)

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