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Real Options Analysis in Residential Property Development Decision-Making in Australia: Perspective of Executives

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Studies have demonstrated the potential of real options analysis (ROA) in property development decision-making. However, practitioners have yet to accept, adopt and integrate ROA in property development decision-making in Australia. This paper therefore investigates how Australian residential property developers manage uncertainties and risks, examines flexibility as a risk management tool, and evaluates the receptiveness and acceptance of ROA for decision making. Data are collected through face-to-face semi-structured interviews with twelve participants, and analysed by using thematic analysis. The results indicate that a discount rate is insufficient for managing uncertainties and risks; rather, contingency is used. Receptiveness and acceptance of the RO theory are mixed due to lack of unanimity among responses. Some participants are positive about flexibility, while others are dismissive. Beyond quantitative ROA models, the findings suggest that practitioners are receptive to ROA, but concerns remain over adoption. Flexibility cases executed by some participants in practice indicate that practitioners are subconsciously using ROA. Therefore, it is possible that acceptance and adoption could be achieved in the future. Evidence of the use of contingency as a risk management tool challenges the long-held notions of risk-return relationships in property development and investment. This is initial evidence of qualitative research on ROA in practice within Australian property developments.

Keywords

Real Options Analysis, Flexibility, Property Development, Receptiveness and Acceptance

1. Background

Property development actors agree that the development process is infinitely flexible and cannot be static or prescribed; circumstances alter cases due to uncertainties (Fisher and Collins, 1999). Managing uncertainties in Australian residential property developments require active decision making in the form of inherent strategic alternative decisions (flexibility) that can serve as both a hedge against future unfavourable outcomes for developments and at the same time, enable property developers to capitalise on emerging opportunities when market conditions are favourable. The value of such strategic flexibilities (real options (RO)) embedded in residential property developments are generally tied to uncertainty and the ability of developers to flexibly respond to changes in economic conditions during the execution of property development projects. These strategic flexibilities have become generally known as building flexibility or RO.

Uncertainties emanate from different sources and impacts on the profitability of property development projects. Loizou and French (2012) suggest key sources of uncertainty, which include cost of land and financing, construction, timing of development, sales and rents, and other socioeconomic factors. Newell and Steglick (2006) support this position based on the results of a survey, which ranks property development risk factors in order of impact and indicate that land cost is the third most important risk factor considered during property development. When land values are disproportionately higher than the prevailing property prices, developers face the risk of over payment which can affect the viability of projects. Similarly, land for development is affected by planning restrictions and other regulations that can be lengthy and time consuming. As a result, uncertainties that emanate from the duration of obtaining planning permits can delay projects, thus resulting in economic viability issues (Loizou and French, 2012). For example, the average time for securing a planning permit for complex projects in Melbourne, Australia could be 12 months and possibly more, should objections end up at the Victoria Civil and Administrative Tribunal (VCAT) (Keen Planning, 2018).

Developers are pervasively exposed to the risk of changes in the cost of capital (interest rate on borrowed funds). This is profound in the Australian property development market due to the high level of leverage ratios taken by property developers. As a result, any delays in the estimated time for the completion of a project have effects on profitability due to the potential rising cost of borrowed capital. Loizou and French (2012) suggest that increases in time and interest rate reduce the profit margins of developers and affect the viability of developments. Liang and Cao (2007) argue that commercial banks have become more and more deeply involved in the residential property financing market, which is mainly encouraged by the lower interest rates that have prevailed in Australia. As a result, any change in interest rate has serious financial consequences for profit margins. Similarly, residential property

investors and owner-occupiers face similar issues related to hiking interest rates which has the potential to affect mortgage affordability. The situation is compounded by the high leverage ratios, variable mortgage rates and negative gearing by housing investors in Australia as increases in interest rate directly cause reductions in demand, thus affecting the property development business.

Newell and Steglick (2006) argue that time delay is an important risk for developers. Timing is tied to cash outflow in terms of construction costs and cash inflow denoted as revenue in the form of deposits (during presales) and settlement upon completion and hand over of projects. As a result, any delays in the estimated construction time have enormous implications on financing costs and profitability (Loizou and French, 2012). Moreover, delays can have legal and contractual implications especially when a project is timed to meet a specific market demand. Furthermore, the construction stage of property development is risky because it typically attracts the largest cash outflow. Due to uncertainties of land characteristics and their ability to support development, it is important to analyse and perform soil testing to ensure that there is no contamination to avoid extra costs in land preparation which can affect profitability. Gehner (2008) suggests that construction costs can also exceed budget during tendering or construction.

Property developers grapple with the uncertainty and risk of settlement after completing property development projects. They normally sell or lease a portion of a project before commencing construction, which is typically a requirement of most lenders before funding is provided for property development projects. The pre-sale/lease requirement for debt funding is to mitigate the risks of the lender and lower the costs of financing. As profitability is evaluated at the inception of projects, any variation in projected revenue (sale price of houses) can have significant impact on profitability. This may not be ascertained until completion of development due to uncertainties. For example, Kirsten Craze, who writes for www.news.com.au, reports on a study conducted by Greville Pabst, chairperson of a valuation and advisory firm called the WBP Property Group in Melbourne. Pabst said that their study “showed that in 50 per cent of all cases in which we were involved in the valuation of the property at settlement there was a shortfall between the contract price and the valuation. That shortfall was in the range, in some cases between 10 to 15 per cent” (Craze, 2016). The resultant action of the buyers in such instances is to walk away and lose the deposit rather than moving forward with the settlement based on the knowledge that the price that they are paying is lower than the current value. This has negative effects on both cash flow and debt repayment for residential property developers.

Despite the negative impacts of uncertainties and risks on residential property developments, property developers can proactively exploit uncertainties and risks through strategic initiatives such as exercising the flexibility to defer a project, optioning to expand or switch use, implementing a temporary shut down and then restarting the development process, and abandoning a project.

For example, de Neufville et al. (2006) evaluate the flexibility of expanding a parking garage to address the uncertainty of future demand and argue that flexibility expands the value of the project by about 5%. That is, at a certain point in time in the future when demand increases for car parks, built-in flexibility would allow the developers to expand the size of the project to capture upturn opportunities. Similarly, Baldi (2013) assesses the value of flexibility to defer a greenfield property development project in Italy. The results of the study suggest that a deferral option at the early stages of developing a property accounts for 16% of the expanded land value of the project, with 8% of such value based on the expansion option. Vimpari and Junnila (2014a) study the flexibility to wait, which is found in the active management of a residential real estate fund divestment project. They argue that staggering the sales of individual units in apartment buildings in a portfolio has the potential of adding an extra value of about 6.6% as opposed to offering all of the units to the market at the same time. These strategic flexibilities could be adopted by Australian residential property developers to mitigate their risks while at the same time, opening upturn opportunities for capitalisation in the future. For example, a series of staggered investments in master plan community developments would invariably protect residential developers from huge losses should demand decrease at any time during the execution of a project. Similarly, delaying the start of a project until uncertainties are resolved would also protect a developer from potential losses, whereas a temporarily shut down of unviable investments would reduce estimated losses should an entire project face a lack of demand.

Despite the potential of building flexibility to enhance uncertainty and risk assessment, Australian residential property developers are still struggling with risks and uncertainties. The situation is compounded by the use of traditional valuation methods for financial feasibility analyses because they are incapable of incorporating flexibility and a broad range of future values to deal with uncertainties. This is especially the case with the discounted cash flow (DCF) techniques which have been criticised on several grounds including their inability to analyse and incorporate values attached to strategic flexibilities (RO) (Hayes and Abernathy, 1980, Hodder and Riggs, 1985) and failure to account for time-series linked investments (e.g. strategic investments) which are often growth opportunities (RO/flexibilities) (Myers, 1984). Sirmans (1997) argues that the DCF model is not only incomplete, but its use may lead to costly errors.

Financial feasibility evaluation is vital for any property development activity, because without an appropriate numerical measure of the potential future payoff from a proposed residential development, it is assumed that rational developers and investors would not commit to property development projects. Due to these uncertainties and the inability of the DCF model to incorporate the value of flexibilities into financial feasibility evaluations of property development projects, Luehrman (1998) suggests that a better valuation approach should incorporate both uncertainty and the decision-making required for a property project to succeed. Flexibility of buildings (both in construction and physical

structure) that serves as a strategic right for mitigating risk and capitalising on emerging opportunities can be termed as real options (RO). Myers (1977) refers to RO to adapt and apply options pricing techniques (OPTs) in finance to value investments in non-financial or “real” physical assets where much of the value of an asset is attributable to flexibility (managerial flexibility in decision making). Copeland and Antikarov (2001) suggest that when a property developer has the right but not the obligation to exercise such a right to defer, expand, switch use, abandon the project, and temporarily shut down until the expiration date, there is an embedded value in the option/flexibility. Sirmans (1997) states that “investors must decide when to invest, how to modify operating plans during the life of the project, and when to sell the investment. Existing research shows that the conventional DCF techniques can be poorly suited for investment valuation in the presence of “real options”.

The development of the RO theory is still in the early stages and attention has generally been dedicated to quantitative models and applications. As a result, the qualitative part where the views of practitioners or potential users of RO models in practical applications in the residential property and construction sector in Australia is missing. Consequently, after the development of RO models and some applications, the receptiveness to flexibility and RO models and acceptance of them from the perspective of practitioners have not been explored.

This paper has four main objectives:

- a) To determine the primary means of property development valuation that is used by Australian residential property developers in decision making;
- b) To examine the appropriateness of the current way(s) of handling uncertainties and risks in residential property development via the use of the specified means in (a);
- c) To find out how Australian residential property developers address emerging opportunities in the development process; and
- d) To evaluate the receptiveness and acceptance of the RO theory for practical decision making in the Australian residential property development market.

Since informal discussions with practitioners have revealed that most practitioners are not using the RO theory for decision making, (d) is not carried out by measuring the number of users, but gleaning the possible receptiveness and acceptance or rejection based on positive statements or negative sentiments expressed by the participants about the RO theory. This paper is part of a broader study that enquires into the practical application of real option valuation (ROV) models and potential integration into mainstream Australian property development and investment decision-making. A version of this paper was submitted and accepted for presentation at the 23rd Asian Real Estate Conference held in Incheon, South Korea.

2. Literature Review

The application of flexibility and the use of RO models for valuation in property development and investment have been grouped into different areas. Vimpari (2014) suggests the groupings of vacant land valuation, general application to property markets, building flexibility, lease contracts and technology investments in the property sector. In terms of vacant land valuation, Titman (1985) studies the application of flexibility to land use decisions and uses the ROV model to value land development as an option. Williams (1991) derives a partial differential equation for determining the optimal density and time at which a developer may develop a vacant land. Quigg (1993) extends the model of Williams (1991) by adding fixed cost to the total cost of construction and empirically tests the ROV model in practice. Capozza and Li (1994) apply the ROV model to determine the intensity and timing of land development. Sing and Patel (2001) develop a one factor contingent claim valuation model of land development. Chiang et al. (2006) study the embedded options in Hong Kong auctioned land prices by applying both hedonic pricing and ROV models. Leung and Hui (2002) examine embedded options in property projects in Hong Kong. Yu et al. (2002) develop an ROV model which they use to empirically evaluate option premiums associated with five selected “white sites” in Singapore. Rocha et al. (2007) develop a model that determines the optimal strategy whether sequential or simultaneous to the development of a residential housing project in Rio de Janeiro. Grissom et al. (2010) integrate option pricing approaches with land use decision in a case study of single and mixed use developments on the same land. Geltner and de Neufville (2012) demonstrate the value of the horizontal phasing of a large scale urban property development project by using the certainty equivalence approach of the binomial option pricing method (BOPM) combined with a Monte Carlo simulation analysis. Shen and Pretorius (2013) construct an ROV model for property development by considering and incorporating institutional arrangements, direct interactions and financial constraints. Yao and Pretorius (2014) develop and test the long withstanding American call option pricing model for valuing development land under leasehold.

In terms of the flexibility embedded in real estate lease contracts, ‘an upward only review’ in UK leases has been evaluated through an RO framework by first considering a case study in the UK and analysing the case study from an international perspective (Ward and French, 1997, Ward et al., 1998). Grenadier (1995) develops a framework for valuing flexibility in lease contracts, as well as another generalized ROV model for valuing a wide variety of leasing contracts, including the option to cancel, forward leases and lease insurance contracts. Buetow and Albert (1998) analyse a partial differential equation (PDE) that models flexibility to renew or purchase a property at the end of a lease. Ashuri (2010) develops an ROV model for valuing flexible leases with the option to expand, contract or cancel by using possible changes in rent and firm required space as sources of uncertainty. On the other hand, Sing and Tang

(2004) use a multi-period BOPM to examine the default risk options in office leases, and Sing (2012) evaluates the embedded flexibility in percentage lease agreements in the retail sector.

Another area of application of the RO theory is the design of flexible spaces in property development. In terms of the flexibility to switch use, Trigeorgis (1993b) apply ROV to a construction project and concludes that the value of flexibility to switch is almost 7% of the gross value of a project. Gann and Barlow (1996) argue that there is the need to incorporate more flexibility in buildings to meet unforeseen changes in their future use. Patel and Paxson (1998) evaluate switching flexibility for a leisure centre development in a restricted sequential time context and find positive results. Leung and Hui (2002) evaluate several option types including the value of the option to switch a part of the hotel of a Hong Kong project. Paxson (2005) also finds similar results in applying switching flexibility in property investments. Greden and Glicksman (2005) develop a model capable of justifying the expenses of the flexible design of a property that could be renovated into an office block at a future specified cost.

Guma et al. (2009) use four case studies in the US, and demonstrate the value of flexibility of vertically phasing a corporate real estate building. Fawcett (2011) indicates that a more systematic understanding of flexibility is offered by lifecycle options. Dortland et al. (2012) study different kinds of flexibility and use a qualitative analysis to argue that RO and scenario planning can help to manage uncertainties. Throupe et al. (2012) use a switch option valuation analysis to compare the return on investment (ROI) for buildings as planned or switch to a different property mix that conforms to permitted zoning codes. Throupe et al. (2012) also suggest the use of ROV to determine the exact timing of the commencement of a development project. Cardin et al. (2013a) demonstrate that design flexibility has practical implications on the property industry with emphasis on development projects. Cardin et al. (2013b) also suggest ways to achieve design flexibility and argue that such simple, intuitive and efficient procedures through flexibility can enhance the life cycle performance of buildings. Vimpari et al. (2014) explore how real options analysis (ROA) can be used to value flexibility in a real retrofit investment case. Recently, Vimpari and Junnila (2016) argue that the physical adaptability of buildings is important but current investment analyses that use DCF do not incorporate enough information on the characteristics of the physical assets, which leads to the long term loss of competitiveness and imprudent use of built environment resources.

Greden et al. (2005) evaluate the flexibility of converting a naturally ventilated building into a mechanically ventilated building. Fleten et al. (2007) present a method for evaluating investment strategies in decentralized renewable power generation under the conditions of price uncertainty. van der Maaten (2010) evaluates whether policy incentives to invest now, rather than tomorrow, can be designed to compensate for any option value to defer. Ashuri and Kashani (2011)

use ROA/ROV to evaluate “solar ready buildings” that can easily adopt photovoltaic (PV) panels later in the future at an optimal time by incurring initial investments and waiting until the right time. Hillebrand et al. (2014) apply ROA/ROV to a university building retrofit and find that an energy, ecological and economic efficiency evaluation shows that a generally preferred retrofit option cannot always be identified. Vimpari and Junnila (2014b) also apply an ROA to evaluate green building certificates as RO and argue that ROV methods are appropriate for assessing the monetary value attached to green building certificates.

General applications to real estate market dynamics are also found in the literature. Lai et al. (2004) use ROV to examine the risk-return relationship of the presale system of residential property developments. Wang and Zhou (2006) also derive a closed-form solution for an equilibrium RO exercise model with stochastic revenue and costs for several property markets. Lai et al. (2007) show that the exercise strategies of developers can be affected by the size and the type of property markets by using an ROV model. Bulan et al. (2009) examine the extent to which uncertainty delays property investment and the effect of competition on this relationship. Ott et al. (2012) present an ROV model that estimates the optimal phasing and inventory decisions for large-scale residential development projects. Clapp et al. (2012) examine the value of flexibility in the option to redevelop and find a positive association between option value and drift in house prices. Clapp et al. (2013) analyse the relationship between house price dynamics and option to rebuild or enlarge established dwellings. Clapp et al. (2014) similarly analyse the determinants of the expansion and contraction of shopping centres and show that the expansion and contraction of gross leasable areas are less likely for large shopping centres. In a more recent study, Geltner et al. (2017) empirically estimate the development asset value index (DAVI) for commercial property and compare the index with a corresponding traditional transaction based hedonic property asset price index (PAPI) which has been corrected for depreciation. Geltner et al. (2017) argue that the difference between DAVI and PAPI reflects the realized value of timing flexibility embedded in land development.

It is evident from the extant literature that the focus of the development of the RO theory has largely been on quantitative models to evaluate the value of flexibility. To the best of the knowledge of the author, Vimpari and Seppo (2015) is the only paper that has until recently sought to determine the perspectives of practitioners on the practical use of ROV through a qualitative approach in Finland. They suggest that the RO theory receives a positive response and that based on certain conditions, ROV could be adopted for decision making. The current study extends the literature on the qualitative aspects of the RO theory by investigating whether discount rates can deal with uncertainties and risks in Australian residential property developments and if not, how are Australian residential developers dealing with uncertainties and risks in property development? The paper further examines the receptiveness and acceptance of RO/ROV in the Australian residential property development sector. This is a

preliminary work that focuses on eliciting information from practitioners on their acceptance of the RO theory and potential adoption for decision making in practice in Australian residential property developments.

3. Method

This paper uses face-to-face semi structured interviews to elicit information from key participants/stakeholders in the Australian residential property industry. In face-to-face semi structured interviews, there is generally a prepared interview guide, but the researcher is not bound to follow the questions in an orderly manner. The flexibility of the interview process is important to ensure that the respondents feel that they are informants and freely give information. In view of this, Yin (2003) posits that it is important for a researcher to maintain the main line of enquiry during a research interview process and at the same time, ask actual conversational questions in an unbiased manner to obtain the required information. In order to stay focused on the topic under discussion, an interview guide is used in the interview process with the participants as supported by Easton (1995). The interview guide is provided in Appendix 2.

In face-to-face semi structured interviews, the researcher has the opportunity to ask further probing questions that emanate from answers provided by the participants. Runeson and Höst (2009) suggest that the development of a conversation dictates the order of questions that are asked. This method allows for extensive and in-depth exploration of issues relevant to the focus of the paper on flexibility in the Australian residential property development market. In view of the use of face-to-face semi structured interviews, the researcher has the opportunity to ask further probing questions and obtain rich in-depth information for analysis. This paper therefore uses purposive sampling to select the participants for the interviews. According to Teddlie and Yu (2007) "purposive sampling techniques are primarily used in qualitative (QUAL) studies and may be defined as selecting units (e.g., individuals, groups of individuals, institutions) based on specific purposes associated with answering a research study's questions". Similarly, Maxwell (2008) further defines purposive sampling as a type of sampling in which "particular settings, persons, or events are deliberately selected for the important information they can provide that cannot be gotten as well from other choices". Thus, relevant information from participants can be obtained from the few who have experience in addressing such issues around flexibility in practice.

A major inference from these definitions is that in qualitative studies, participants are normally chosen deliberately due to the relevance of the information that is being sought, rather than randomly selected to represent a population as it pertains in statistical analysis. This mode of selecting participants is well suited for qualitative research because in qualitative

research, studies tend to delve deeper into specific issues which is unlike quantitative studies that rely heavily on broad generalisations to validate the results. Experts who understand flexibility in property development and its integration in practical decision making in the Australian residential property development market are deliberately chosen for this study. The selected participants are well experienced and conversant with the use of property valuation models and decision making in property development. Moreover, most of the participants are at the forefront of decision making in property development. As a result, their views are paramount in evaluating the acceptance of the RO theory for decision making in practice. They are mostly at the senior management level, hence, their views are highly relevant to this study.

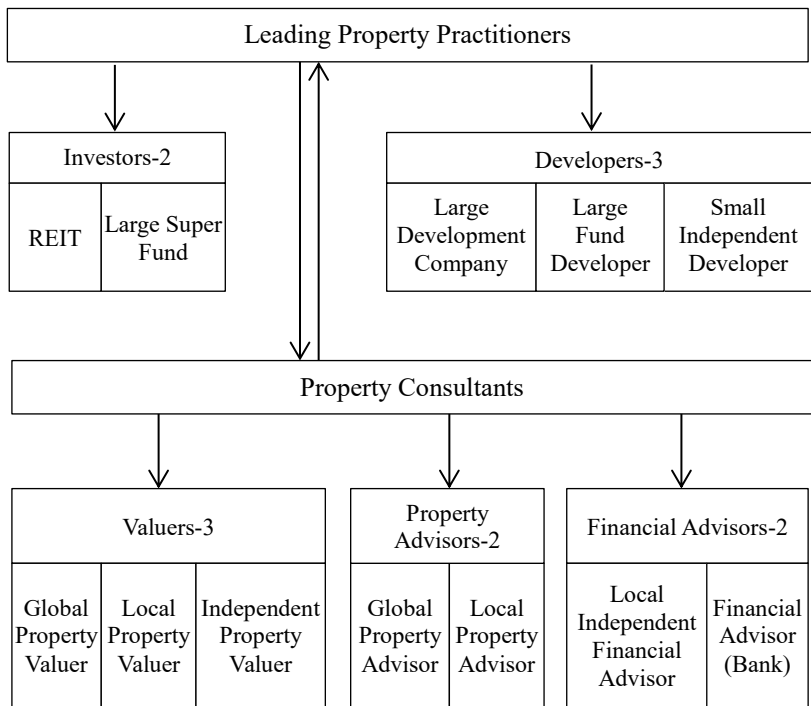
Figure 1 shows the relationship between the participants in this study. Broadly, they are grouped into two categories; leading property practitioners and property consultants. The former comprise investors and developers who are at the forefront of initiating property projects. Most property development projects are initiated by either developers or investors. As a result, they are the leading property practitioners in decision making on property developments in practice. Their response on the practical use of the RO theory for decision making is very significant for shaping the potential adoption of the RO theory in practice. The property consultants on the other hand include property and financial advisors and property valuers. The role of this group is mainly to provide advisory services to the leading practitioners.

The double-head arrow between the leading property practitioners and property consultants indicates a mutual relationship in which the former depend on the services of the latter in performing their functions. Similarly, the latter have the former as their clients, hence, they generally take instructions from the leading property practitioners. As a result, there is close collaboration between these stakeholders and their responses as experts are relevant in this study. Besides, these are the stakeholders who are involved in property decision making. The acceptability of RO for decision making is largely dependent on these stakeholders. All of them are relevant in this study to the extent that the property consultants would have to accept and use the RO theory to arrive at results and provide the same as advisory services to the leading practitioners. The leading practitioners on the other hand must also understand and accept the RO theory for decision making before accepting the results from the consultants. Thus, there is a need to examine the views of all of these relevant stakeholders before arriving at a conclusion on the acceptance of the RO theory in making practical decisions on property.

To ensure a balanced representation of views, the participants are drawn from groups of valuers, long term property investors, property advisors (financial and property) and property developers (investor-developers and trader-developers). There are three (3) participants each from the groups of developers and valuers, and two (2) participants each from the groups of large investors, and property

and financial advisors. This provides twelve (12) key participants whose views are sourced and used in this study (see Figure 1 and Appendix 1 for details on the participants). In qualitative research, selection bias is not relevant because of the in-depth nature of studies that adopt this approach and focus on specific issues that requires the contribution of specific types of participants. In some cases, such small groups are the only experts on a subject matter under investigation. Qualitative studies also generally examine issues from the perspective of those with extensive and relevant knowledge (experts) on a specific topic without seeking to generalise the findings to a population, hence, the selection bias that would occur in quantitative studies is irrelevant. Therefore, qualitative studies generally select participants deliberately and not randomly, to collect relevant data on a specific topic of interest. This is supported by O'Leary (2014) who argues that as opposed to quantitative research, qualitative research tends to use a very limited number of participants because of the in-depth nature of the data.

Figure 1 Composition of Semi-Structured Interview Participants



Source: Author, 2018

In the case of this study, the participants selected are based in Melbourne, Australia, but have offices nationwide. Thus, even though the property market

in Australia is not concentrated, the major players with a national presence are selected to participate in the interviews, hence, capturing the views of the relevant stakeholders, nationally. When the responses from participants of the same group are very similar, these are deemed as repeatability of information. The interviews are considered completed at the saturation point, (Small, 2009). Unlike quantitative studies which are dependent on broad generalisations and use sample size to represent the population of a study, the number of participants in qualitative studies is irrelevant because analytical and theoretical generalisations are used for knowledge contribution. Therefore, the twelve (12) participants in this study are considered to be adequate in qualitative terms and can deliver valid results for analytical and theoretical generalisations. This is similar to the study by Higgins and Moore (2015) and Moore and Higgins (2016) who use 14 key building stakeholders to identify key elements of contemporary governance, design and construction in apartment buildings in Australia.

In collecting the qualitative data, the researcher used an audio recorder and the recordings were transcribed into text format for analysis. To de-identify the participants and protect their anonymity, the researcher assigned codes to the various participants who were interviewed. Transcripts obtained from the audio transcription were analysed based on themes with a qualitative software, NVivo version 11. NVivo is a software for organising qualitative data into themes for further analysis. The software is capable of organising data into major themes and sub-themes based on the responses of all of the participants. In this study, NVivo software is used to organise the data into themes based on the responses of all of the participants. Before using the auto-coding function in NVivo, the participants were assigned a code such as large fund investor, global property advisor, global property valuer, large property developer, etc. for ease of analysis, data de-identification and protection of their anonymity.

In this study, thematic analysis, which is one of the most common types of analysis in qualitative research for examining and recording patterns in qualitative data, is used to analyse the responses provided by the participants. Thematic analysis is a method for identifying, analysing and reporting patterns (themes) within data and described as the foundational method for qualitative data analysis (Braun and Clarke, 2006). Thus, similarities in the response of the participants are grouped and meanings are developed based on the patterns that evolve from the data. Grounded on responses from the participants and the auto-coding process of NVivo software for the data analysis, themes and sub-themes that emerged from the data were further developed. This was augmented by both individual group analysis as well as cross case and overall participant analyses. For example, a theme such as acceptance of RO in practice was analysed from the individual group perspective such as valuers, developers, investors, and financial and property advisors. This was further examined in depth by analysing the consolidated responses of all groups of participants. The data presentation and results of the study are supported by quotes from the interviews. Furthermore, major inferences are drawn from the results and the quotes augment the interpretations and arguments of the author.

4. Data Presentation and Discussion of Results

4.1 Managing Uncertainties and Risks in Australian Residential Property Developments

4.1.1 Frequently Used Development Valuation Approach for Decision Making

The execution of residential property development projects is based on a numerical analysis of the profitability associated with a proposed project. Without such a numerical analysis to support the economic viability of proposed projects, rational investors tend to refrain from committing to developments. Several property valuation models are used for this exercise and different firms and analysts adopt different methods to evaluate the profitability of proposed projects depending on the type of project. One of the aims of this paper is to identify the main method adopted by stakeholders in evaluating the viability of Australian residential developments.

Among the developers, it is interesting to note that they adopt different methods that include residual valuation and DCF techniques. The majority of the developers are using the DCF method for evaluating the viability of development projects. Actually, the interviewees revealed that DCF is used by smaller developers only when a project has a longer life span of above 2 years. Thus, any project that is less than 2 years (which is the case for most smaller developers-18 months is the maximum), they adopt the land residual valuation method. However, all large corporate organisations in Australia including Metricon, Lendlease, etc. are using DCF for decision making. This is surprising because the impact of the time value of money is not captured by the land residual valuation method and uncertainties due to sale prices, costs and delays in completion can have enormous implications on such projects. In the Australian residential development market, most developers use the residual valuation method to determine the viability of proposed projects.

“The method we use at our company is a residual value method” (Large Development Company Representative).

“A company like us will never make a decision without having a DCF in the events; they will say what are the financial metrics” (Large Fund Developer).

“If you are large corporate organization, they will have hurdle discount rates. In large corporate organizations, some of them will use profit and risk factor rather than a discount rate, generally a discount rate is used if a project is over a period of 2 years as a rule of thumb. But in small organisations, just cash or the dollar value of the profit” (Small Independent Developer).

The views of all of the property and financial advisors who serve as consultants to residential property developers have been sought as the main method for the financial viability analysis. Their responses indicate that all of the advisors use DCF to evaluate the financial viability of proposed projects. This is in addition to other methods such as income capitalization and simple profitability analysis of cost against value. Others suggested that they use an industry accepted software (Estate Master) to evaluate the economic viability of projects. The main method that underpins this software is the DCF, so in effect, they use a DCF for decision making.

“So, yeah. Movement in price, movement in cost, movement in return, not return necessarily because you generally have a single discount rate. It’s certainly factored in what if and scenario testing. So, assuming you can do this, is it valuable to build. Yes, the people building the standard practice, they do, do it in a linear fashion as in there are certain variables that will go up and down” (Independent Financial Advisor).

“I think you will actually find when you talk to most developers, most will not use IRR, they will not use a discount rate. Lend lease might, Metricon, larger corporates might, if you talk to the numerous developers, all they care about is cash. Just cash so it’s a million dollars or not a million dollars. They don’t go and factor in time value for money” (Financial Advisor-Bank).

“We will use feasibility modelling, so Estate Master is the model we use, basically DCF” (Local Property Advisor).

“I would be using the capitalization approach and the DCF approach” (Global Property Advisor).

Investors are capital providers for most of these projects initiated by developers and also involved in the economic viability analysis of projects in order to determine which projects would provide them with the required rate of return. An analysis of the views and responses provided by the investors indicate that they predominantly use DCF techniques for evaluating the financial feasibility of Australian residential property development projects. This is because the capital provided by investors is for an entire investment horizon which is normally between 3-5 years for short term developments. To a certain extent, this supports the suggestion by the small independent developer that DCF is used to evaluate projects with an investment horizon that is more than 2 years.

“We use a model called Estate Master. Estate Master is an industry accepted model which is also used by our financiers. It is a development feasibility model, so basically, we use that as our template in establishing feasibility of projects. In that model, we put all the construction costs and delivery costs you would expect for a particular project, as well as revenue expected at completion as well. And that model also models the time value

of money, so it gives you both the project's internal rate of return (IRR) as well as equity IRR as well as obviously what the expected profit will be at the end of the project for a particular development. So, we use that as basis for our assessments on all development feasibility across the whole business" (Large Superannuation Fund Representative).

"Erm we do that on Estate Master software package and then we provide erm, we've worked out our own capital overlay if you like" (REIT Investor).

Property valuers also provide consultancy services to developers and investors on the feasibility of residential property development projects. The responses from the property valuers are similar because both suggest the use of DCF as a secondary method for the financial feasibility evaluation of Australian residential projects. Despite the use of other traditional methods as the primary approach, the use of DCF is an indication of managing risks and uncertainties with discount rates.

"Capitalization of the income primarily and that a specific net market income of stated capitalization rate and then I will have regard to sales comparison method and the discounted cash flow as secondary and tertiary approach because I find that there is a lot more rigor around the information that I have available to undertake a capitalization approach" (Global Property Valuer).

"Typically, we will do a residual analysis but in a residential investment portfolio we have a much-extended discounted cash flow (DCF) because of the long-term horizon" (Independent Property Valuer).

In a cross-case analysis, all of the participants suggested that they use DCF in the financial feasibility evaluation of Australian residential property development projects. However, the size of the organisation determines whether DCF is used as a primary or secondary method. Similarly, DCF is used for projects with an investment horizon that is more than 2 years and in large organisations. In summary, DCF is the main method used for evaluating the financial feasibility of Australian residential projects, particularly in large corporate organisations because most of their projects are long term community master plan developments. A further probing question after establishing that the DCF is the main method for financial feasibility evaluation is how uncertainties and risks are captured in the evaluation process. As a result, the next section discusses the appropriateness of the use of a discount rate for managing risks and uncertainties in Australian residential property developments.

4.1.2 Accounting for Risks (Changes in Demand, Supply, Interest Rates and Property Values) in Property Development: Is Discount Rate the Solution?

The question of risk management in property projects is essential to all property developers. Since the main tool used for evaluating the profitability of residential property development projects is the DCF, it could be argued that the discount rate is the main factor for capturing the impact of risks in feasibility analysis. As postulated by several researchers in the finance discipline and adopted by property researchers, the discount rate has a component for risk premium. As a result, the follow-up question (on discount rate from the DCF) is whether the use of a discount rate (sometimes referred to as all risks yield) suffices for the risk management of residential property development projects as theorised by researchers. Is a discount rate capable of capturing all risks in Australian residential property development projects? As this study uses face-to-face semi structured interviews, the conversational style of this approach enables the researcher to ask further probing questions into how uncertainties and risks are managed in the process of residential property development. Similarly, other issues including risks as opportunities have emerged from the interviews with the participants and are all discussed in this section.

The financial feasibility evaluation of Australian residential property developments and investments has an inextricable link to the choice of a discount rate (which is normally the required rate of return or opportunity cost of capital) because it is an important consideration in the decision making of developers and investors in accepting or rejecting a development proposal. Similarly, risks and uncertainties associated with specific Australian residential property developments determine the accepted required rate of return that developers would expect to achieve from a project. Simply detailed as the risk-return relationship, the classic statement that the higher the risk, the higher the required rate of return and vice versa in finance theory holds in the Australian residential property development/investment sector. The required rate of return (expected return) is normally used as the discount rate for development financial feasibility evaluation (Geltner et al., 2014).

The widely accepted method of financial feasibility evaluation in practice is the DCF which incorporates a required rate of return that denotes a discount rate. The required rate of return which is adopted as the discount rate incorporates a risk premium and hence, the direct relationship between risks and required rate of return. Theoretically, this is the proposition by numerous researchers in the property sector. Since there is a direct relationship between risks and the choice of a specific rate of return, the participants were required to examine whether the choice of a required rate of return is enough to capture all potential risks and uncertainties in Australian residential property development. The participants suggested that it is not able to capture all the risks and as a result, there are other means of representing risks and uncertainties in residential property development.

Inferring from the information gathered from the participants, there is indication that investors and property developers believe that the required rate of return is somewhat important in capturing risks in the Australian residential property development but ultimately not the main factor that drives their investment /advisory decisions. As stated by the representative from a large superannuation firm,

“Well the discount rate can capture our risks in determining what is the appropriate IRR; look, it sounds very simple but in terms of profit and risks, we will look at other risks such as the planning risk if you like, the construction risk and the realisation risk” (Large Superannuation Fund Representative).

“The discount rate doesn’t really capture all risks. We do but, mainly in Estate Master; we identify key risks and we will apply a key number to that from the contingency to it instead of tweaking a discount rate” (Large Fund Developer).

The response from the representative of a large superannuation fund sheds light on how risks are also categorised in terms of property development over the different phases of a project. Thus, key risks are identified and categorised based on where such risks occur in the development process. Rather than tweaking a discount rate in tandem with risks, an amount of money is included in the contingency budget as a proactive way of preparing for uncertainties and risks.

Among the valuers, there seems to be a split in responses. One of the valuers argued that the use of a discount rate is the only means of capturing risks. It is quite interesting that the valuer believes a discount rate is the only means of accounting for risks in property development. This might be because the participant represents a global property valuation company that focuses on international best practices. In addition, this valuer might be involved in valuing existing or completed projects, hence, no consideration is given to contingency. Under such circumstances, the possibility of accounting for risks in the valuation is tweaking discount rates to reflect the potential risks associated with a specific project as an investment opportunity.

“I think that the discount rate is really the only way of capturing all the risks; there is no other way. I mean because at the end of the day, you are making a call on where these are going to be in the future” (Global Property Valuer).

The two other property valuers suggested that a discount rate used in valuation can capture risks to some degree but not entirely. Thus, the discount rate is not a only measure for risks; there are other ways of making provisions for risks in the process of determining the financial feasibility of Australian residential property developments/investments in the residential sector. In assessing the

value of potential residential developments and advising clients in making decisions on acceptance and execution of projects, other factors play a key role.

“Well it is not the only one you will use. So, it is significant, and it is one of the drivers we have got, and we can use to change the outcomes (final valuation figure), but it is not the only one” (Independent Property Valuer).

“No, I think you, you try and build in all those different risks so you're obviously making an analysis on various components, and yes you have to make a single number, but you will analyse various factors within that. So, you are determining one number, but you are making a whole range of assumptions looking at a whole range of variables” (Local Property Valuer).

Even though there is a split in the responses of the valuers, the majority agreed that a discount rate cannot capture all of the risks associated with Australian residential property developments. This indicates that property stakeholders would need to reconsider the long-held position on risk-return relationships.

The property advisors and more importantly, the developers who are the main players in initiating and executing projects indicated that a discount rate cannot capture all risks and as such, they do not use a discount rate by itself to deal with risks. In some cases, it is not even considered in the decision-making process.

“The discount rate can't capture all risks, no, not at all. At the end of the day, valuation is not just a number. So, it is not just about the number. It is about the amount of supply of property that is in the market in that particular area and is that going to compete against your development and the environmental risks associated with the site and yes, they will play a part in that number. But it is certainly not the measure of all risks and uncertainties” (Global Property Advisor).

“So, but to understand how to appropriately price future risk into investment return, there is a difference between how it is done and theoretically how it should be done. I think you will actually find when you talk to most developers, most will not use IRR, they will not use a discount rate” (Local Independent Financial Advisor).

“I actually doubt that we do put any financial value on the risk. It's not to say we may pump the cap rate by a couple of points to say listen, we think if this risk comes into fruition, it will have this impact” (Large Fund Developer).

“No, no it can't, because at the end of the day, that metric is only a measure of a cash flow. If that does not occur, your cash flow changes, your metric

shifts. The thing with development is it is dynamic. You aren't able to lock away all your risks" (Large Development Company Representative).

This finding is contrary to the theoretical suggestion that expected risk premium (risk component of a discount rate) is proportional to the amount of risk (development risks) developers perceive to be involved in residential property developments (Geltner et al., 2014). The developers suggested that they do not even adjust the discount rate to reflect changing perceived risks during the process of development because they make provisions through contingency. Probably, the most important of all is the revelation from the financial advisor that most developers might not even use a discount rate to represent risks and profitability. Furthermore, the financial advisor stated that there is a mismatch between theory and practice. All of the valuers, except for one, suggested that a discount rate cannot capture all risks in property development. The result is that the majority of the participants agreed that a discount rate is not an appropriate means of dealing with risks and uncertainties in property development. In some cases, it is not the only means of capturing risks and uncertainties even though it is used in financial feasibility analyses.

The dynamic nature of residential development makes it imperative for contemporary property development projects to be designed in such a way that projects can respond to the emerging changes in the market. Thus, the use of a discount rate to determine the financial feasibility of property development projects is untenable and could lead to abandonment of viable projects. There is therefore a knowledge gap or possibly practitioners have found a better way to represent risks in financial models as opposed to theoretical suggestions. In summary, the responses suggest that the required rate of return (used as discount rate) cannot capture all of the risks in Australian residential property development. It can be safely argued that risks in property development are managed differently in the Australian residential property development sector as compared to general theoretical suggestions.

4.1.3 Contingency as Risk Management Tool

If in practice, developers do not use the required rate of return (discount rate), which is a known measure of risks in property investment and development, then a probing question ensues which asks how are all of the risks in residential property development captured or managed? This elicits important information in the form of how different developers tackle uncertainties and risks by using contingency. Indeed, property development is dynamic and very risky. Developers are normally aware of the risks such as movement in property values during construction (knowing that they have pre-sold some of the development) and hence capture them in risk analysis through financial feasibility modelling.

“So, all developers understand risks and how we price them is by looking in the model and setting appropriate contingencies for the key areas in the model which is subject to movement” (Small Independent Developer).

“So, we spelled it out to the board, here's what we know about the risks, here's what we don't know about them and how we've allocated an interest contingency on that project to deal with them. And we then get that built into the financial model” (Large Fund Developer).

Others are unforeseen and occur only after execution has begun. It was determined that developers, for the purpose of risk analysis, divide the process of development into three stages of risks: planning risks (before construction starts), construction risks (during construction) and realisation risks (potential risks of default at settlement). Within these three stages are different activities that have risk implications on the project.

“Look, it sounds very simple but in terms of profit and risks, we will look at the planning risk if you like, the construction risk and the realisation risk” (Large Fund Developer).

Therefore, several line items (project areas where risks occur in the three stages) with their associated risks are priced into the total contingency budget for the project. As a result, contingency serves as a way of absorbing the potential effect of unforeseen and known risks on expected profits.

“The only relationship between the risks and the value is the amount of contingency that we will put in the project to cover those risks” (Large Fund Developer).

“We price risks into our model in terms of contingencies. That is contingency against key risk that we carry through construction” (Large Development Company Representative Representative).

“And then you've got to price it, price the uncertainties and risk. You can price that generally into like a contingency. If they price it in (contingency), and you make your hurdle return, and you use that contingency then you keep your return, if you don't factor it in, you have to use your money and your return goes down” (Local Independent Financial Advisor).

“And then you've got to price it, price the uncertainties and risk. You can price that generally into like a contingency” (Financial Advisor-Bank).

“You either price risk into your return hurdles or you price risk into your line items which is contingency in the feasibility” (Global Property Advisor).

The views of the participants are unanimous in the use of contingency as a way of dealing with potential uncertainties and risks. The responses suggest that this approach is pervasive in the Australian residential property development sector and all stakeholders and practitioners are aware of the use of contingency to manage uncertainties and risks. Therefore, contingency provides a safe way for dealing with known and unknown risks within the Australian residential property development sector.

An important finding is that the contingency budget is prepared in such a way that each foreseeable risk is analysed, and a specific amount is allocated to the specific line item associated with the uncertainty or risk as contingency and built into the project costs. As a result, as far as investor-developers in the Australian residential property development market are concerned, it is contingency that is adopted contrary to the view that the required rate of return (discount rate) captures risks in Australian residential property developments. Therefore, in dealing with risks in Australian residential property development, a specific amount is allocated to address specific foreseeable and unforeseeable risks as line items in the budget, which forms part of the financial feasibility modelling. Again, contingency is neither set as a percentage of the construction/development cost nor as a percentage of various parts of the development cost (Tseng et al., 2009). Rather, it is based on how an analyst would subjectively view the negative impact of specific risks on a residential development project, which is set as a dollar value allocated to specific potential occurrences in the development cost.

4.1.4 Emerging Opportunities and Risks After Project Commencement

Since RO are about capturing the latent value of assets, contingent on changes in the Australian residential property development market, one aspect considered is the examination of emerging opportunities during the execution of a residential development project. Particularly, prices tend to change regularly due to relatively high liquidity (frequency of transactions) in the Australian residential property market. Since most residential developers who hold assets normally lease them before and during construction, pre-leasing serves as a tool for risk mitigation. As a result, developers normally miss opportunities associated with favourable changes in the residential development market. In times when the Australian residential property development market is experiencing growth with increasing prices, investor-developers have the potential to hold onto stock for a reasonable period of time and capitalise on rising rents. Similarly, during the pre-sales of residential development sites, developers can deliberately hold onto some of the stock and wait for the opportunity to benefit from a favourable upturn in the market. In practice, however, developers prefer a 100% sold off or leased development compared to holding stock in anticipation of favourable changes in the market because of the impact of unforeseen uncertainties and risks. For example, a response by a large investor-developer on risk mitigation is as follows,

“If for example you’ve got a 100% pre-commitment on a project you’ve wiped out that risk, haven’t you?” (Large Superannuation Fund Representative).

Despite planning and settlement risks, the participant suggested that pre-sales can completely address risks. However, some of the other participants admitted that there is still settlement risk that can affect the total realisation from a residential development at the time of leasing or settling because there can be defaults with preleased/pre-sold contracts. The suggestion that pre-sales are the panacea for risk mitigation is not entirely accurate due to the presence of operational and settlement risks during the process of development as suggested by a developer. Therefore, even though pre-sales and pre-leasing serve as risk mitigation, they are not a panacea for settlement, construction or planning risks. Even though they mitigate downturn risks and serve as a requirement for debt funding, they lead to the loss of potential upturn benefits in the process because strategic options are lost.

“We have been in situations where the market has been rising right? So those contracts that we signed up today, we should have held back 50% of the stock of homes because the prices were taking off through the course of construction” (REIT Investor).

This implies that flexibility can potentially change the profitability dynamics of a residential development project. More importantly, for the penetration of the ROA and ROV theory into the Australian residential property development industry, the views of practitioners on risks and uncertainties as opportunities in the residential development market could be crucial. The response of the investor from a REIT company supports the argument that flexibility is valuable because if the company had exercised the option to delay, this would have considerably increased the market value of the homes.

Some of the practitioners, especially the advisory group of local and global property advisors argued that lost opportunities after the start of a project is generally part of their business in property development. For example, the property advisors argued that

“Yeah, so the market has gone up. But as a developer, you don’t have control over that. Yeah, that’s just the risk in doing development” (Local Property Advisor).

“Quickly go and buy another block of land then quickly start developing another one so you can get more money” (Global Property Advisor).

This corroborates the literature in terms of accepting movements in key variables as risks and not opportunities (Peiser and Frej, 2003, Loizou and French, 2012). Despite knowing the value embedded in flexibility, they do not consider the ability of practitioners to proactively exploit uncertainties and risks,

and craft strategies to capitalise on possible emerging opportunities. Buying another block of land and starting a new project do not ensure that a developer will maximise potential profit from a single development. It is economically sensible for a developer to spend less and capitalise on emerging opportunities in a market on the same project than initiate an entirely new development to take advantage of a favourable market. As a result, both property advisors do not see flexibility as a way of proactively capitalising on emerging opportunities.

The developers explained that the challenge is the ability to respond to these favourable changes in the market in time to capture the benefits and incorporate such opportunities in property development feasibility analyses. This suggests that even though developers are aware of potential opportunities that emanate from value changes in the property market after a project has commenced, they generally accept that it is difficult to take advantage of the opportunities rather than proactively exploiting risks as opportunities.

“We started selling the apartments and were selling an even mix of one and two-bedrooms. In the first building of 30, the one-bedrooms moved quickly. All right, we will put more one-bedrooms in building two. Guess what? They did not move quickly in building two. Two-bedrooms moved quickly in building two. You’ve already predefined the design, so unfortunately the difficulty in those matters is that before you go to market to start selling and start construction, you have to define the outcome” (Large Development Company Representative).

“But to be honest, we would pin our heels back and try and get that 50% sold. It is better to have the contractual commitments rather than holding onto the units” (Large Superannuation Fund Representative).

Evidently, flexibility is valuable because rigid designs are not adaptable to easily fit changing trends. Should flexibility be embedded in projects, developers can respond to market dynamics with respect to changing market conditions faster than changing designs during construction. Moreover, even if it is possible to delay present decisions in expectation of better opportunities, the developers believed that capitalising on opportunities today makes a huge difference as compared to waiting due to future uncertainties.

This implies that property development decisions can be delayed when losses are imminent. However, to delay pre-sales/pre-leasing in expectation of rising property values might pose risks which Australian residential property developers and investors are not willing to accept. In effect, if there is the chance to secure contractual agreements, the general view is that it is much better than holding onto stock in expectation of future rising property values and capitalizing on the upturn benefits. This might be due to the use of pre-sales/pre-leasing as a risk management tool in the Australian residential property development sector and for securing funding.

4.1.5 Market Dynamics (Risks) as Potential Opportunities Through Flexibility

It also emerged from the interviews that some risks could be perceived as opportunities during the process of residential property development depending on the ability of the developer to flexibly respond to market dynamics. Risks as potential opportunities were gleaned from the responses based on the probing questions and the conversational style of the interviews. This was not part of the pre-planned questions, but the researcher deems it fitting to include risks as part of risk management strategies of residential developers because some of the participants alluded to this strategy.

Risks such as changes in key variables (interest rates, property values, costs, rental levels, sale prices, etc.) that affect financial modelling in Australian residential property developments are expected and as such, property development/investment analysts who are operating in the Australian residential property development sector always make provision for those factors in financial models due to their negative impacts. As already identified from the interviews, the contingency budget is used to deal with all known and unknown risks in Australian residential property developments.

However, these analysts hardly make provision for potential positive gains from changes in these key variables via active management of projects by foreseeing potential future opportunities to eventually capitalise. For example, a delay in the presales of a residential development project may be deemed as negative occurrence and hence a risk. On the contrary, delaying the sale of some units in a residential development project over a period of time could generate extra revenue above forecasted values and profits due to rising property values. Even though such a positive outcome could occur, delay is a risk and not an opportunity in most financial models. This raises the issue of whether all occurrences in the property market are risks or opportunities. As a result, the stakeholders were asked through probing questions to provide answers to these questions that emerged during the interviews.

The views provided by the practitioners suggest that value appreciation opportunities may occur but due to debt funding requirements, it may not be entirely possible to engage in opportunistic options as they carry risks which financiers may not be willing to fund. As a result, such analysis cannot be quantified and incorporated into financial modelling as potential opportunities to capture. In some cases, trader-developers even prefer a 100% presale of residential projects before commencement due to the dynamic nature of the Australian residential property development market. The indication was that if investor-developers want to incorporate flexibility, then they would have to fund it. Besides, funding is secured for a specific project. As a result, future alterations might be unsupported by the funding entity. On the contrary, it was realised that some of the participants have embedded flexibility in some projects in the past. This suggests that risk management or possible future

opportunities have been identified by practitioners. These issues are explored in detail in the quotes and discussion below. Among the developers,

“You will typically find in the market place most developers require a certain level of presales for a residential building before they commence construction as well as before they apply for debt finance. A lot of financiers will want you to have a certain level of pre-commitment either in presales in residential before they actually lend money against it” (Small Independent Developer).

“Building technologically future-proofed as much as possible so things like communication system in building, we will make sure it's 5G enabled from when 5G is the norm. No one can predict the future accurately but as best as we can, it's both for our benefit as well for the occupants but we want to have a building that we can compare ourselves with our competitors” (Large Fund Developer).

“We always would go into a situation where we have a prescribed outcome we're expecting. It'll be on a case-by-case request, and we'll have a look at what that means from a potential cost point of view and therefore say, well, if you want that change, it's an additional cost and therefore will cost you this for that change” (Large Development Company Representative).

On the issue of embedding certain features in a project as a way of proactively exploiting risks and turning them into opportunities, some Australian residential property investor-developers consider it as a way of being competitive in the market to be able to attract more occupants to their projects and retain them. Depending on the specific situation in the property market, shortened lease lengths or delaying sales as usually experienced in land sub-division could be opportunities. Again, future proofing a building by spending extra today only ensures that a building does not become functionally obsolete after a few years of construction when there is disruption from the digital revolution, for example. Participants answered questions with their views on these non-traditional risks in property development (perspective of owners) and how future flexibility could be used to exploit such risks as opportunities. Technical variations during the process of development may be possible depending on the stage of development and the willingness of the client to pay for the additional cost of the variation. This is an accepted practice in the industry in that whoever asks for variations in design bears the cost of the changes. As far as long-term investor-developers are concerned, the final product of a building design is obvious from the beginning as this is a requirement from the council for the planning permit. As a result, technical variations as opportunities are time bound and based on the specific dynamics of Australian residential property developments.

On the other hand, some of the participants, particularly, the valuers, viewed these non-traditional risks as opportunities depending on the analysis conducted

by the practitioners and their view of the market at that point in time during valuation. This is dependent on the views, observations and experience of the practitioner who is interpreting whether a specific issue poses a risk or an opportunity to the owner of a specific asset under consideration. It was evident that property valuers with exposure to other international property markets where the ROA theory is gradually being accepted as a decision-making tool are thinking in terms of flexibility.

“So, my view is that those items can only be balanced against what the valuer thinks, that the opportunity in the asset is balanced against its risks. Does it have more downside risks or more upside risks or more upside opportunities I suppose” (Global Property Valuer).

“So, I think in addition to these you kind of got to know where you are in the market at any one time and that’s really how you balance that out. You’ve got to come up with an independent view of what that might be and how people are interpreting that issue in the market” (Independent Property Valuer).

The global property valuer expressed the view that non-traditional risks such as shortened lease lengths might be opportunities, which is the main proposition of the ROA theory where favourable changes in the property market can have upside benefits. However, flexibility must exist before such opportunities could be capitalised for profitability. Thus, valuers may be examining flexibility qualitatively but without the use of appropriate tools and techniques for the valuation of such potential future opportunities, because the dominant method of valuation (DCF) is incapable of capturing the stochastic process attached to the changes in property asset values.

“Yeah, I think it is two things. It’s about the practitioner’s view about how that building is made in future needs and if it’s obvious; for example, you’ve got a small floor plates and the trend is towards larger floor plates” (Local Property Valuer).

In essence, this local property valuer indicated that depending on prevailing trends, which is also a point in time in the market, flexibility could be valuable if embedded in a building. Thus, embedded flexibility would allow the owner of a building/development to switch to capitalising on an emerging opportunity. The valuer who would analyse embedded flexibility during the process of valuation by using a subjective opinion would largely determine the value associated with flexibility. As a result, the practical adoption of the RO theory by the Australian property industry is greatly dependent on the opinion of the valuers on flexibility.

4.2 Receptiveness of RO Theory (Flexibility) in Australian Property Developments

To put the RO and ROV models into practice, practitioners would have to view them as better models compared to conventional valuation models. The focus of this objective, which is to evaluate the receptiveness and acceptance of the RO theory for practical decision making in the Australian residential property development market, is to determine the initial reaction of practitioners to the RO theory by comparing the mechanisms and presentation of the theory to those of traditional valuation models. As a result, the practitioners answered questions on their receptiveness towards RO/ROV models in decision making on Australian residential property development. This was intended to elicit their views on RO analysis as a strategic way of developing property assets for risk mitigation and ROV models for the valuation of flexibility. In general, the key participants interviewed indicated that they could envisage the benefits associated with the use of the RO and ROV models in practice. Particularly, the views around the decision-making process and the weight given to the potential future value of property assets over their entire life cycle.

Among the valuers, there is unanimous response in the benefits of using ROV models compared to conventional valuation methods. This represents a 100% positive reception to the ROV model for valuation of flexibility and decision making. Despite this positive reception, the valuers have certain requirements before deciding to use them for decision making. This is also evident in the suggestion of the global property valuer who indicated that it is important to develop a solid understanding of the RO/ROA models before accepting them for decision-making. This requires further exploration in order to promote the adoption of the RO theory for practical decision making. Secondly, the suggestion by one of the valuers that the ROV model could certainly be useful suggests some level of uncertainty around the response, yet, a positive reception. This is potentially attributable to the novelty of the RO/ROV models in the Australian residential property development sector.

“I think this is very interesting in some form of study and I can see the benefits in this, but I would need some solid underlying basis for making decisions around the probability of the outcome” (Global Property Valuer).

“It sounds like it could be certainly worthwhile, and, yeah it gives you more options to look at different risk factors throughout the period that you're analysing” (Local Valuer).

“So really, the benefit that I can see is that you give some weighting towards an outcome” (Independent Property Valuer).

However, the property advisors, including both the global property and independent financial advisors, view the RO theory favourably. The use of probability and consideration of all possible outcomes are deemed to produce

very precise and accurate outcomes as compared to conventional valuation models that are replete with subjectivity. The independent financial advisor suggested that this is done in practice but in a different way. This suggestion is accurate to some extent in terms of the scenario testing which has some resemblance to the RO theory. However, the two methods are different in their approach. The concern, however, of the global property advisor is how to generate probability estimates for residential property development valuation by using ROV and the respondent reiterated a well-known parlance in investment analysis— “garbage-in-garbage-out” to support the argument. Therefore, property advisors also identified the benefits in the use of ROV for decision-making, but the advisors were generally sceptical about its use due to various reasons.

“I think in theory it really sounds very good and very accurate; I do wonder a little bit about I mean your output is only ever as good as your input in anything right, so working out the probability for some of these factors, how credible some of those probabilities are and what they are based on. Because your end result is going to be as good as what's going on into it. But I think in theory the model sounds very good” (Global Property Advisor).

“I think people do incorporate these methods in practice, but not in the way you were talking about. So, scenario testing, options analysis we do that all the time” (Independent Financial Advisor).

The response that scenario analysis is used by some of the participants coupled with a positive reception towards the RO theory for property development valuation are indications that in the future, the method might be accepted and adopted in the Australian residential property development sector for decision making, on the condition that practitioners develop a better understanding of the RO theory and sources of input variables in the model.

The views of the property developers are similar to those of the property valuers. One of the benefits pointed out is the ability of the RO theory to combine information from the worst, best and maximum case scenarios together in determining the payoff from a project for decision making. This benefit is important because current models are capable of modelling scenarios separately, without combining all scenarios to determine a single outcome for decision-making. As a result, all possible outcomes are factored into the decision making in the RO theory as opposed to conventional property development valuation models. Sentiments about the RO theory from the property developers include the cost associated with flexibility and the accuracy associated with the probability computations. Supporting the discussion above are quotes below:

“I like it because it actually gives you your boundaries. What is my worst, what is my best, it is sort of defining it all for you. That is a good thing.

Then it's probably coming up with the ability to say, well, what's my probability of being..." (Large Development Company Representative).

"So, it is good for academics to understand that theoretically it is fantastic to build these flexibilities, but it has to be considered in terms of cost impulse. If you are building something in today, I would struggle to see the value in building a flexibility into it" (Large Fund Developer Representative).

"Yeah, I just don't know the actual input going into it, like how you could accurately...;how you could come out with some of those probabilities specifically you know" (Small Independent Developer).

An investor who manages a listed fund that invests in property development projects pointed out that giving more weight towards an outcome is important as it is similar to the way practical decision making is approached. Combining the other scenarios in the RO approach is quite new, as a result, the investor argued that it would be worthwhile to know all of the possible outcomes to determine the certainty and accuracy of the outcomes. This will inform the decision as to whether a project should be executed or abandoned because a higher weight given to less positive outcomes as opposed to many negative outcomes could result in some form of biasness.

"You give more weight to the best guess outcome than the other scenarios and so to combine it all, I would want to know how many observations are down in there, within the positive part versus the negative part and if there is a bias, where is the bias?" (REIT Investor).

This section focuses on the views and initial reactions of practitioners towards the RO theory for decision making in Australian residential property development. All of the participants identified some positive aspects of the RO theory and ROV models which alluded to the fact that the use of ROV models for valuation and flexibility has some benefits that are superior to conventional valuation models for decision making. As a result, it can be concluded that all of the participants gave positive responses to the use of ROV as a decision-making tool. However, these positive reactions about using ROV as a decision making tool was accompanied by a plethora of issues that need to be resolved and clarified in order to secure the support of the industry. Thus, despite the criticisms and scepticism among practitioners towards the RO theory, it is viewed favourably as a potential decision-making tool in Australian residential property developments.

4.3 Acceptance and Adoption of Real Options Theory in Practice

The adoption of RO in decision-making in Australian residential property development is dependent on the acceptance of the method by practitioners. This is in the form of a tacit acceptance of the method as compared to the DCF, which was determined by analysing the responses provided by participants through probing questions. The potential of RO, which allow a decision maker to prepare against the impact of uncertainty at a certain time in the future by strategizing to address such risks and uncertainties at the inception of a development project was impressive to the financiers. This is possible due to the magnitude of capital committed to projects by financiers and the potential ramifications of failed development projects on their businesses. As a result, their major concern is to mitigate risks as much as possible. Under that circumstance, it is important to highlight the risk enhancement potential of RO and ROV in feasibility analyses vis-a-vis the cost of achieving such an objective of mitigating risks. Since RO allow a decision maker to re-evaluate project feasibility mid-way through execution via active management, potentially unviable projects can be abandoned, thereby enhancing risk management of residential property developments. Moreover, RO also enable project developers to capitalise on emerging upturn opportunities through already embedded flexibility in property development projects.

The developers favoured the RO/ROV models for two main reasons; range of values and probability/possibility analysis. One of the large fund developers argued that ROV models improve decision making related to risk analysis in project execution as compared to DCF. This is attributable to the range of figures adopted by ROV models in the computation of the profitability of property development projects which captures all possibilities as far as profitability is concerned. Thus, the use of probability/possibility analysis to represent uncertainties from which potential numeric outcomes (profits) of developments are calculated by using ROV is better than a single point estimate with the use of DCF, because ROV weighs the probability of achieving a specific target return or profitability level.

“Oh certainly! No doubt about it; you are much better off assessing them (options) than just looking at one DCF model” (Large Fund Representative/Developer).

“I think the DCF is better as a straight line from a point of view of simplicity. It comes down to who we are communicating this message to and how close I understand this philosophy. I think it is worth seeing. I think it's worth looking at closely and seeing how it might work and discussing with others within my business, what they think of this” (Large Development Company Representative).

“You start realizing any profit or decent profit till 10 and 15 years later at the end, when the infrastructure has been absorbed. So, I feel like this is already in practice” (Small Independent Developer).

On the contrary, one of the large developers argued that the DCF is better because it is simple to use as opposed to ROV models, which use probability analysis. Therefore, it can be argued that property developers would be inclined towards the use of simpler ROV models. A similar finding is found in Vimpari (2014) who argues that property valuation models generally begin from simple models and are later improved. For example, direct capitalisation which is improved and developed into a DCF technique. Similarly, the knowledge that profits of developers would be sunk into infrastructure for over a period of 10-15 years is a major concern for another developer. Thus, among the developers, there is general acceptance of ROV models and they see the worth of adopting them in decision-making. However, they would only do so based on a deeper understanding of ROV models and knowing the assumptions behind them, and the input parameters into ROV models. In addition, the simplicity or complexity of ROV models would also determine their acceptance for decision making.

There were some strong views from the investors on the approach of the RO theory in evaluating property development projects. The investors who instigate property developments and hold them over a defined investment horizon had mixed responses because one of them favoured the idea of flexibility due to future opportunities, but such an investment would be justified based on the cost. The other investor argued that flexibility investments are case or project specific because there are no identical projects. Accordingly, the main determinant for flexibility investment would be the cost. As a result, it can be concluded that flexibility investments would only be accepted based on the cost to the investor at the initial stages of a project. The quotes below support the argument of the author on the responses of the investors.

“It is very much horses for courses but if you are asking a developer, he is building a brand-new premium asset to consider this at a cost impulse, I would say he won't give it much airtime” (REIT Investor).

“Having said all of that, we are a long-term investor and what we want to do is invest today for the future. So, if we can invest flexibility or the opportunity for flexibility in buildings, we will do it. It depends what the cost is” (Large Super Fund Representative).

An evaluation of the responses from the property valuers on the adoption of ROV models in practice also shows divided views. A local property valuer suggested that it is good to have such a model that can dynamically evaluate the value of flexibility because frequent changes in the property market necessitate flexibility. The participant indicated that having such a flexibility from the inception of a project affords a developer the opportunity to alter decisions based on future circumstances. On the contrary, the independent

property valuer indicated that the DCF is better under current valuation practices because of client requirements. The indication is that the valuation of investment in flexibility must be executed in a manner consistent with how clients are evaluating similar opportunities in the property market. Since there is no demand from clients to adopt or change the current method (DCF), then DCF is considered as a better option over ROV models.

“But it certainly sounds like a good option. I mean the property market is always changing so it is good to have a model that allows for flexibility” (Global Property Valuer).

“I actually think that, in the current environment, the DCF will probably be better, because I think that is the way our clients are looking at things” (Independent Property Valuer).

“I think people are so used to doing what they're doing, it would be difficult to implement and bring it rolled out, and I guess industry wide” (Local Valuer).

Both valuers did not clearly state that they are willing to accept the RO theory, but it is obvious that one is willing, and the other is concerned about the acceptance of clients of the use of ROV models and scepticisms about the possibility of rolling them industry wide.

The suggestion that the sales comparison and income methods are very important in valuation is an indication that practitioners would want to see these methods reflected in ROV models as indicated by the local property advisor. The reasons are that they are familiar with the sales comparison and income approaches of property valuation, and these two methods underpin the theory of valuation. Furthermore, highlighting similarities between ROV and traditional valuation models (sales comparison and income approach) could contribute to acceptance and adoption. This is also an indication of the preference for traditional valuation methods as compared to newly introduced methods such as ROV for practical decision making. It would be important to highlight that ROV models are also based on the income approach as they use the projection of sales revenue and rents to determine the values of development projects.

The financial advisor who represents a bank suggested that the potential for re-evaluating and pricing risks at some point in the future during project execution, which is a characteristic of ROV, is valuable.

“I think that first of all, you've got sales comparison method and income approach which is so important” (Local Property Advisor-Bank).

“So, you've got money out of the door as sunk cost, you won't get bank funding for it, unless you structure it somehow that your equity becomes

the sunk cost, but even then you need to have presales to pay down the debt” (Local Property Advisor-Bank).

“So, under your method, you are saying I get the chance to reprice my risk depending on the future circumstances? I think it’s better to be able to do it” (Financial Advisor).

“This is all good but the thing that will bring it all on stack is money” (Financial Advisor).

Despite the scepticism about ROV models and the possibility of failure to obtain funding for flexibility investments, the financial advisor indicated that it is generally better to have an in-built strategy to deal with risks at some point in time in the life of a development project as compared to being helpless in the face of unfavourable market conditions. Thus, the financial advisor favours the use of a flexibility approach to deal with risks and uncertainties in residential property development because of the opportunity to deal with risks better, albeit problems with funding. In summary, most of the participants indicated the positive aspects of ROV models as compared to traditional property valuation models. However, the possible acceptance level is quite low due to scepticism and lack of market demand for such a tool for decision making. It would be interesting to gain a sense of the requirements of practitioners that would propel acceptance and adoption of the RO theory in practice.

4.4 Practical Cases of Flexibility

In terms of the RO theory, it is vital to note that the participants are mostly in favour of flexibility as an important concept in Australian residential property developments. Particularly, they consider it essential to have the managerial flexibility to respond to changes that take place in the property market in the future. Some of the participants suggested that they are familiar with several property development projects that have embedded flexibility in practice. This is an important finding because although flexibility has enormous cost implications for developers and investors as disclosed in the interviews, it is surprising to know that there are embedded flexibilities in some of the projects that they have executed in the past. This was determined through the interviews and the researcher deems it fitting to include the information as a sign of receptiveness and acceptance of RO in practice.

“Yeah we can say an example of this, say I was valuing a big development in another state in South Australia and it was a three stage development, it wasn't one tower like this, it was three individual towers but a hell of a lot of infrastructure that was to be used for all three towers was to be built in the first stage, and so the cost to build the first stage was significantly higher than building the other two stages” (Global Property Advisor).

“Lots of properties that are traditionally retail strips are doing residential above them as well. So, having that flexibility to diversify use is certainly valuable” (Local Valuer).

“However, we have just finished this development right here, that project was developed over a car park because the car park has been built such that you could use the existing structure to some extent to build on top of it” (Large Fund Representative/Developer).

It is interesting, revealing and surprising to find out that through flexibility, office space has been developed on top of an existing car park. It would be important to know how the decision to invest in flexibility was justified before the commencement of the project or embedding of flexibility. Apart from this, local authorities who approve planning permits for property development projects are also advocating for flexibility in the commercial property market space according to one of the participants. This is a significant breakthrough since planning approval was raised as a major barrier to the execution of flexibility in residential property development.

“The Australian town planning regime is pretty firm like you know Australia is a tough place to develop, it has a lot of regulations around it, it’s a hard place, is much harder than Europe, much harder than other countries to developing because we have some strict planning regimes and there are a lot of rigors around protecting purchasers” (Financial Advisor).

This indicates that the legal barriers to the adoption of flexibility could be overcome if local councils are becoming advocates of embedding flexibility in residential development projects. A large investor-developer who deals with several councils for planning permits suggested that,

“For example, Melbourne City Council at the moment encourages developers to build car park that in the future can be converted into an office space. As Melbourne City Council achieves its goal of keeping cars out of the city, they are suggesting to developers if you have floor to floor heights that are appropriate in your car park, then you can convert one day back into an office space” (Large Investor Fund Representative).

Significant among the findings is also the revelation by a global property advisor that another valuation team in their company uses an ROV model for the valuation of mines and mining rights and had held a discussion on the possibility of adopting the model for property valuation.

“Yeah, so I know our bigger business valuation team for example uses these techniques and I know it is used in the valuation of mines and mining rights and that sort of things, so we have discussed kind of this methodology, but I do not apply for property valuations. I know others in the firm who do” (Global Property Valuer).

This is an important step towards the acceptance of ROV models in practice in the Australian property development sector. Since international practices generally trickle down to affect local practitioners, it can be argued that in the long term, ROV models might be introduced to the Australian property industry by some of these international valuation firms and affect the practice of valuation in Australia.

4.5 Practical Implications of Study

The findings of this paper are similar to those in Vimpari and Seppo (2015) in respect of the receptiveness to ROV which received a positive response. However, the results on acceptance of ROV models differ because in the context of Australian residential property developments, practitioners still favor the DCF for decision making as opposed to the ROV even though they observed the explicit benefits of the ROV over the DCF. Acceptance of ROV models is dependent on researchers and other stakeholders who can provide evidence to address the skepticism of the industry.

Practical empirical cases suggest the subconscious use of the RO theory for decision making but practitioners have yet to adopt ROV models for the valuation of flexibility embedded in development projects in practice. It is accepted that there is more work to do to achieve the acceptance of RO/ROV for decision making in the Australian property industry. The acceptance of RO and ROV is not unanimous because some of the practitioners have reservations on how some inputs in the ROV models are derived for computation. Moreover, the computation of probabilities is also deemed to add a level of complexity to financial feasibility evaluation of property development projects. As a result, practitioners who have reservations indicated that the DCF technique is good enough for its simplicity in the current decision-making environment. Therefore, it can be inferred that simpler ROV models might be preferred to those deemed complex.

Since some of the practitioners consider that the DCF is better due to its simplicity, ROV models that are simple in application must be used to demonstrate practical applications of flexibility valuation to achieve adoption of RO in practice. This is similar to the suggestion given in Vimpari (2014) who argues that simplified ROV methods could encourage adoption. In this sense, the simple, yet novel fuzzy payoff method (FPOM) must be emphasised because of its use of triangular distribution and embedded income approach, which practitioners and stakeholders are already using in practice in scenario and sensitivity analyses in property valuations. It is possible that their familiarity with the triangular distribution and income approach would generate interest in, and acceptance of, ROA and ROV in practice. Besides, the FPOM does not require knowledge of the probability theory to calibrate and construct the value changes in property assets during development feasibility analysis

with the use of ROV computation. As a result, the FPOM could be simple enough for practitioners to use for decision making.

This study is the first to examine the receptiveness and potential acceptance of the RO theory for decision making in the Australian residential property market by using a qualitative approach. Besides, it also contributes to the limited literature on the qualitative approach to the study of the RO theory. Literature on the RO theory has focused on quantitative applications but neglected a qualitative approach which captures the views of the potential users of the RO theory for decision making in practice. This paper fills this gap by adopting a qualitative approach to examine the RO theory as a decision-making tool to evaluate the feasibility of its use in Australian residential property developments.

Findings such as risk pricing by using contingency and allocating an amount for risky line items in the development budget are new to the literature on risk management in Australian residential property development. Similarly, determining that discount rates are incapable of accounting for risks in Australian residential property developments also challenges the long-held notions of risk-return relationships in property development and investment. The practitioners have indicated that discount and capitalisation rates are not adjusted in tandem with the level of perceived risks associated with a project. Furthermore, the highlighted benefits associated with the RO theory and ROV models for valuation of flexibility are new contributions because these could be emphasized to inform practitioners about the superiority of the RO theory over traditional property development valuation models.

In practical settings, Australian residential property developers are losing and missing out on opportunities associated with flexibility embedded in projects because several upturn opportunities that could have been capitalised for maximising profitability are not analysed. In most cases, these opportunities which could be strategic decisions before the commencement of a project, may emerge either during or after project completion. Without the requisite in-built flexibility in a project, capitalising on emerging opportunities is impossible. If flexibility is embedded in projects, the accurate means of evaluating flexibility is via the use of ROV models. Any attempt to use traditional methods of valuation leads to serious errors. The Australian housing market is highly liquid due to the frequency of transactions. As a result, price fluctuation is a recurring phenomenon. It is through the RO theory and ROV modelling that such values can be captured for profit maximisation by investing in strategic flexibilities.

Currently, the evidence available from the Australian residential property market suggests that residential property developers have lost several opportunities. For example, Mintah et al. (2017) evaluate a deferral option embedded in an Australian high-rise residential project. They argue that the developer of the project lost about 1.3% (calculated as dollar value of undiscounted cost of the project) profit due to the use of conventional models

of residential development valuation which do not consider the value of managerial flexibility. Similarly, Mintah et al. (2018a) evaluate the staging flexibility embedded in a large scale residential urban development in Australia and find positive results associated with embedded flexibility. The value of flexibility embedded in this project was also not captured because of the use of traditional valuation methods for evaluating the viability of the development. As a result, about 3% of the value of the project was missed. If ROV modelling had been used to evaluate such a project, the value associated with flexibility would have been captured in the profitability analysis. Mintah et al. (2018b) also evaluate a switching output flexibility in a high-rise residential project in Australia and conclude that flexibility is valuable because of the long-term nature of investments in the built environment sector. The results of that study seek to justify the upfront costs associated with flexibility investments in anticipation of potential upturn opportunities. The study finds out that upfront investments in flexibility could yield about \$4 million dollars in extra profits for the developer. With the evidence available, Australian property developers are missing the value attached to flexibility in residential property developments.

5. Conclusion

This study has aimed to investigate the appropriateness of risk management approaches in residential property development, receptiveness and acceptance of the RO/ROV theory in the Australian residential property development sector for uncertainty and risk mitigation. Using a face-to-face semi-structured interview approach, the study has received a positive response from practitioners on their receptiveness towards RO/ROV for practical decision making in residential property developments. This is largely due to the positive attributes of RO/ROV as revealed by the participants in their responses. For example, a participant observed the benefits associated with the RO/ROV models compared to the DCF, which suggests that highlighting these benefits over currently existing valuation models of financial feasibility evaluation could contribute to the acceptance of RO/ROV in practical decision making. It is found that the discount rate is not a panacea for uncertainty and risk management in Australian residential property developments but line items in the development budget have allowances for contingency, which are used to deal with uncertainties and risks that emerge during the process of development.

The acceptance of RO/ROV has received a mixed response from the participants because there is no indication of unanimous acceptance. Even though most of the participants observed the benefits of an ROA/ROV, they are sceptical about accepting the ROV method. This is partly due to the fear of the unknown which characterises the introduction of new feasibility methods to a very conservative industry. Besides, there is indication that clients have a vital role to play in the acceptance of RO/ROV for decision making because valuers

are required to adhere to the instructions of these clients who may not have knowledge of ROA/ROV models. The participants also require a better understanding of the RO/ROV models in order to accept and use them in practical decision making.

The finding that the participants or practitioners have dealt with similar cases in the past is positive, because it shows that with plausible reasons, the industry could be convinced to accept and adopt the ROA and ROV for the valuation of flexibility in practice. The reason is that the use of current valuation models could lead to serious errors as posited (Trigeorgis, 1993a). Besides, Mintah et al. (2018a; 2018b) have provided evidence to suggest that Australian residential property developers are missing the value of flexibility. As a result, it is important to push for the acceptance and adoption of RO/ROV for the valuation of flexibility to derive accurate numerical results for decision making.

This study has focused on the qualitative aspect of the ROV which is rarely examined because researchers of the RO theory have mainly focused on the quantitative techniques. It has been revealed that discount rates are incapable of capturing all risks in residential property developments, as a result, contingency is the main tool for dealing with uncertainties and risks in Australian residential property developments. The study has also revealed the receptiveness and potential of the acceptance of the ROV for flexibility valuation in practice. Further research is recommended in examining the valuation of flexibility from the perspective of practitioners. During the interviews, one of the participants provided a practical case where an office has been developed on top of an existing car park. It would be interesting to find out how the valuation of the flexibility was executed. Another qualitative approach could focus on examining the requirements for integrating an ROA/ROV in practical property development decision making. Several concerns have been shared by the practitioners on the mechanisms of the ROV models: the use of probability and the various inputs into the models. These findings are important for improving ROV models towards the possible acceptance and adoption by practitioners. Further research could also focus on the barriers and means of achieving practical adoption.

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Appendices

Appendix 1 Participant's Matrix-Interviewed Property Professionals

Role in organization	Type of organization	Location/Coverage	Code for data analysis
Director/ Owner	Small private financial advisory services	Melbourne and inner suburbs	Local independent financial advisor
Senior advisor	Large projects financing company	Melbourne and nationally	Financial advisor
Managing partner	Large private property advisory services company	Nationally and globally	Global property advisor
Senior property advisor	Large property advisory services firm	Melbourne and nationally	Local property advisor
Senior investment analyst	Real estate investment trust-residential developments	Melbourne and nationally- Medium to high rise residential apartments	REIT Investor
Investment director	Large listed property investment company	Melbourne and nationally-High rise residential apartments	Large superannuation fund representative
Development director	Global property development company with offices in Melbourne	Melbourne and nationally- Land banking, mid- and high-rise apartments	Large development company representative
Investment director	Large private company-invests pension funds- Melbourne and nationally	Melbourne and nationally	Large fund developer
Director/Owner	Private independent company-Small residential developments	Melbourne and inner suburbs	Small independent developer
Senior valuer	Large property valuation company	Melbourne and nationally	Local property valuer
Director	Small valuation company	Focus on Melbourne market	Independent property valuer
Managing partner	Large valuation company that specialises in valuing different assets including property, businesses, and machinery	Globally with offices in Melbourne	Global property valuer

Appendix 2 Interview Question Guide for Face-to-Face Semi Structured Interviews



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Title: Is there Value in Waiting? An Empirical Study of Real Options Valuation (ROV) Application to Property Developments

A: Interview Questions for the Semi-Structured Interviews

Information about participant

- 1) Can you briefly introduce yourself?
- 2) What is your role within your organisation and how long have you been in this role?
- 3) What type of development/investment project do you frequently analyse in your organisation?
- 4) Do you carry out the analysis alone or with other professionals? If not alone, what is your role in the team?

Current financial evaluation methods for property development and investment

- 5) What method(s) of valuation is/are frequently employed in your evaluation analysis within the specific market your organisation operates (retail, apartments, office)?
- 6) How are uncertainties and variability related to rents, demand, supply, interest rates, property values, and costs of development treated during feasibility evaluation of projects?
- 7) How about changing lease lengths, technological changes, flexibility and adaptability of buildings, long term performance of assets, value appreciation opportunities, technical variations etc.?
- 8) Is the discount rate a suitable measure of all risks and uncertainties?

Real options analysis/methods and potential integration into mainstream valuation techniques

- 9) Does your organisation consciously seek flexibility and adaptability of use of floor plans in real estate projects to better prepare for future uncertainties? If yes, how? If no, why not?

- 10) Do you make a conscious effort to determine embedded real options (flexibility and future opportunities) in your projects? If yes, how? If no, please explain?
- 11) Real option values are realized later in the life of a project/investment. However, they need to be considered at early stages of developments/investments. Do you think this approach to risk management is feasible and persuasive in practice within your specific market?
- 12) Have you encountered any risks/opportunities that were not examined at the inception of a project but occurred later during the implementation phase due to uncertainties?
- 13) Can you mention some of the opportunities and risks encountered and how were you able to deal with them?
- 14) How can new and emerging opportunities be justified to management for investments in flexibility, for example expanding a building later when uncertainties are resolved by investing into it initially?
- 15) Do you think ROA and ROV provide enough justification for strategic property investments that can be profitable in the future but may be deemed unprofitable today? Please explain?
- 16) Do you think uncertainties are resolved by the ROA/ ROV methods better, as compared to standard evaluation methods (DCF)?
- 17) Would it be valuable to incorporate real options models into standard evaluation models in practice? If yes, why? How can it be done and what could be the likely barriers? If no, please explain?
- 18) Which of the ROV method(s) do you think has the potential to be adopted by practitioners and why?

Thank you

B: Criteria for Selecting Participants

- 1) Must be a developer, investor, financier or a valuer involved in property developments/investments or performing financial feasibility evaluation of property developments
- 2) Must be involved in the development / investment decision making process
- 3) Must have considerable experience in the field of real estate development and investments (would be desirable to have participants with between 5-15 years of experience in order to have a blend of knowledge from old and new generation)
- 4) Selected from major players (companies) in the industry