Firm Value Variation Illustrated by Income and Real Option Analysis

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The valuation of real estate plays a major role in property market. In the valuation industry there are various models used to estimate the value. The industry has made use of traditional models; however these models do not account for flexibility in property. This article uses income and real options valuations to capture values of South African REITs. The results illustrate that the real option valuation produces a higher value of property than the traditional models. The findings have shown that the traditional models undervalue the REITs. And these findings are consisted with prior studies done in different geographical markets. Finally, one recommends that the industry practitioners should adopt real option valuation in valuing real estate.

Keywords: income approach, real option, REIT

Introduction

The article presents valuation models that can be used to derive the value of vary real properties. The valuation of real properties plays a major role in the real estate asset management for example when the real property is being sold (Reinert, 2019). The traditional models were studied, and it was found that the income capitalization method is the most popularly used formula when appraising the commercial spaces as they generate income—the potential income that the real property will generate in the future is estimated income. It was found that the income capitalization approach has its shortcomings. The capitalization rates that are used in the approach are full of assumptions that are subjective to the appraiser that is making the method biased. The methods also do not also incorporate the flexibility of the real property that the managers make.

Flexibility in the real estate comes from the ability of the management to alter the nature of the real property project as the future unfolds. Real option approach has been introduced as a new method as it is more accurate because it incorporates the flexibility of the use of the property. The usage of real options in real estate, especially on vacant land can be traced back to 1965 (Sebehela, 2012). It seems that most appraisers are not and/or not skilled in using real options.

The article proposes that the real options approach should be the one used when valuing commercial...
properties as it seems more accurate. The industry has made use of traditional methods of valuation; however these methods do not account for flexibility of properties. Academic literature suggests that the real options account for flexibility. So far, it seems that in South African context, especially within the REIT industry, there are no studies that compare valuation based income and real options approaches. The contribution of this article is answering the latter statement.

The results are consistent with prior research studies in this field. The results of this research confirmed our hypothesis that the real options account for flexibility which income method ignores. This study shows the undervaluation of REITs by income. Furthermore, this article shows that South Africa’s REIT market has similar characteristics to more economically developed countries.

The balance of the article is as follows. Section 2 is on literature review. Section 3 is on methodology. Section 4 is data. Section 5 is on analysis and the last section concludes the article.

**Literature Review**

**Traditional Valuation Models**

Property is a heterogeneous asset; this is due to the fact that all properties differ in some way. It may be in physical features such as whether a property has a pool or not, or non-physical features such as the property’s location. From this the information regarding specific properties is not equal. The owner will have more information, and therefore valuations made for the owner will have the information and be more accurate (Bellman & Öhman, 2016). The information in the valuation process is to a large extent historical and may not be accurate in the application of determining present market value (Bellman & Öhman, 2016). A lack of market information may be the cause of the simplicity of traditional valuation methods (Abidoye & Chan, 2016).

It has been shown in the above literature that the free flow of market related data is critical to the valuation process. Once the data is collected it requires the valuer’s interpretation. This interpretation could differ from one valuer to the next, resulting in differing valuations for the same property. Market data is used to determine the capitalization rate. The capitalization rate is used in the income capitalization method of valuation and discounted cash flow (DCF) method. This rate is used to value the income of the property in perpetuity.

In all traditional methods, once the valuer has collected the data from the market he is required to interpret it. Like all interpretations this may lead to biases unknowingly creeping in. It is thus of great importance that both the valuer and the investor are aware of these factors. The valuer’s experience determines what method of valuation is used. More experienced valuers are able to use the more complex methods of valuation as they have the confidence and the experience to do so (Bellman & Öhman, 2016). The factor of selecting the correct method of valuation is critical to produce reliable values. It is often better to use the correct model of valuation that is simplified than to use an incorrect method. The simplified methods although being better, are prone to more valuer bias as the valuer must decide what information to exclude if the simplified version of the valuation is chosen. Valuation methods can also vary slightly from country to country and thus need to be followed when a valuation is taking place in another county (Reinert, 2019). The norms of a country can have further effects on the way in which the valuer makes decisions and the rules of thumb they use (Bellman & Öhman, 2016).

The discounted cash flow (DCF) method is primarily used to value large scale commercial properties, and it is appropriate in the case where the subject property’s future income may be subject to change (Nawrocka, 2018). This method is a cash-based financial model where the various prospective assumptions and specific
timing of contractual events are explicit inputs. The method sums up all the future net cash flows associated with the subject property (Reinert, 2019). Those future cash flows are discounted into present value using the appropriate discount rate. It applies the assumptions that should be consistent with the market changes. Normally, cash flows are based on lease contracts.

The future cash flows include terminal or scarp value realized at the end of analysis lifespan which is usually 10-15 (Reinert, 2018). The cash flows from leases are calculated using DCFs. Other traditional methods used in valuation include (i) income approach, (ii) income capitalization method, and (iii) profit method and cost approach. Income approach is a real estate valuation methodology to appraise properties based on the income that the property will generate over its useful life and indicates value through capitalization process (D’Amato, 2015). Income capitalization method estimates the value of property as the ratio of the property’s annual net operating income to the capitalization rate. It is most suitable method when valuing a property that will generate a stable income in the long run (Nawrocka, 2018). Profit method is an income-based method of valuation that takes into consideration the specialized nature of the property, and is based on the income and expenses relating to the business (Vuuren, 2016).

Since valuation process plays an important role in the real estate market, the value estimated by property appraisers should be as accurate as possible. There are different types of techniques that can be applied by real estate appraisers to derive the value of the property depending on the type of the property, namely; income capitalization method is for income producing properties and cost method is for properties that have limited market and are owner occupied. These appraisal techniques have shortcomings that make the estimated value subjective.

One of the largest problems facing traditional valuation methods is the fact that they are unable to account for flexibility. When one invests in property, they are not required to make further decisions at the time of purchase. The investor has an option when the property is purchased to develop or to hold the land and invest at a later stage. To account for this valuers usually use DCF. Another problem valuers face, is the fact that when development takes place, a property may change its use. Valuers are required to value a property at its highest and best use. The traditional valuation methods do not take the holding of the asset into account. An investor may buy the property with the intention of developing it further or changing the use of the property. The investor may decide to wait and invest at a later point in time. This will incur holding costs; however, the investment after the improvements can be used to justify the increased holding costs.

When a property is valued, it is standard practice to value the property in its highest and best use, as demonstrated above the valuer’s subjective opinion that determines the highest and best use. The highest and best use of a property is an important factor as it determines the approach that will be used when the property is valued. If an inappropriate method is used, the value of the property will be incorrect. A problem arises when a property’s highest and best use is income producing and the actual use is different. In this case if one of the income approaches is used, the property specific expenses used will produce an incorrect value. This is due to the current expenses not being what they would be in the case of an income producing property. A valuer may decide to use the market related expenses; however this is not an accurate representation of value. The basis of valuing a property at the highest and best use is grounded in the theory that a willing buyer will pay an amount higher than the current use of the property because they are able to demolish and improve the property to its highest and best use.
Real Options Approach

Lucius (2001) explored real options in real estate development. According to the author, at that time of writing his paper, real option theory was relatively in investment theory. At the heart of Lucius (2001), uncertainty and managerial flexibility lead to optionality in real options. He states that the fact real estate has adopted the principle “valuation by replication” makes real option suitable for the real estate industry. From Lucius (2001), investment theory defines real estate as triangle comprising of space, money, and time. According to the author, space generates cash flows over specific period. Interestingly, real options have entrepreneurial flexibility—ability to penetrate and exit certain spaces.

Thereafter, Lucius (2001) went further and applied real options in property development. In his case, the project is built over time and it needs to revitalisation some point of the time. The preliminary analysis showed that flexibility and uncertainty contribute significantly to the option value. Moreover, the following traits of real estate, (i) immobility, (ii) heterogeneity, (iii) limited characteristics, (iv) investment volume, (v) transaction costs, and (iv) duration, contribute further to more option value if probably mitigated. On the other hand, the vitality of real estate developments increases option value, i.e., office developments with variety of offices to cater for different clientele. In conclusion, Lucius (2001) illustrated that real options can be used for strategic and valuation reasons.

Yamazaki (2001) tested real options applicability of Japanese land price index. Just like Lucius (2001), Yamazaki (2001) argued that real estate characteristics influence value of options. That according to Yamazaki (2001) includes uncertainty and flexibility. The crux of Yamazaki (2001) is to illustrate that real options perform better neo-classical; models. Yamazaki (2001) uses standard option model driven by (i) risk-free interest rate, (ii) dividend rate, (iii) standard deviation, (iv) covariance of assets, and (v) input costs. The economic variables included in the model are building structure, size, zoning, and distance among other variables. For the economic part, he used a standard logarithmic Hedonic model. Interestingly, the Hedonic model has similar with Samuelson-McKean (1965) model. Note that in the Hedonic model, volatility is from land prices, similar to Samuelson-McKean (1965) model. The real estate data was provided by Mitsubishi.

The results of Yamazaki (2001) show that option model identifies uncertainty and flexibility more than the Hedonic model. Moreover, the sign of uncertainty is positive. Thus, the higher, the uncertainty; the higher the option and non-option values. The uncertainty is more in option space than non-option state. The capital asset pricing model (CAPM) confirmed the similar results as option based calculations. The delaying and irreversibility scenarios were better explained by the option model.

Hui and Ng (2008) applied a risk-based option pricing on a property development in Hong Kong. The authors argued that luxury residential property markets have pushed overall housing prices up. Among the factors that contribute property development complexity are (i) land acquisition, (ii) construction delay, and (iii) environmental contamination. That according to the authors requires proper financial management-option pricing. The property analyzed by Hui and Ng (2008) Chelsea Court located at Tsue Wan in Hong Kong West. That property has residential gross floor area of 1,113,000 square feet. Most properties surrounding the analyzed property are rated A grade. Furthermore, the place is surrounded by different mode of transports. Hui and Ng (2008) used Samuelson-McKean (1965) model for the analysis. Given the uniqueness of the property market, they valued property under different scenarios. Fundamentally, the results reveal that Chelsea Court is highly valuable because the optionality embedded in the project.
Real options are advantageous including the ability to account for multiple effects arising from the interactions of the operating and strategic flexibility during the course of a project, while traditional method of valuation fails to do so (Barbara & Eddie, 2002). According to Barbara and Eddie (2002), when new information arrives, and uncertainty about the market condition is revealed, investor’s may have valuable flexibility to alter its initial operating strategy in order to capture the favourable future opportunities. The real options method of valuation allows for the valuation of the holding period for an investment to be considered. A valuation can take the fact that an investor can make decisions as the investment progresses, and is not bound to make a decision at the start of the investment.

In the context of real options on “real estate”, Samuelson-McKean (1965) model laid the foundation for real estate options. Samuelson-McKean model is used to calculate long call options on vacant land and there were assumed to be American nature (Sebehela, 2012). Long call options are the options that the investors have on the flexibility of the property, and they are associated with vacant land, and arise in the real estate market place which is characterized by uncertainty and changes. Those options can be either option to expand, abandon, or defer. When the Samuelson-McKean (1965) model is used for option-pricing, the money for improvements and total costs on vacant land are added to the land value (Sebehela, 2012). That money for the improvements will be one of the optimal options the land can be utilized for.

**Methodology**

This article adopts both income and real options approaches as valuation methods. Firstly, the income approach is discussed; thereafter, real options method. Table 1 illustrates income method.

**Income Method**

Table 1

| Income Approach | Capital Cash Flow Calculation |
|----------------|--------------------------------|
| **Item**       | **Adjustment**                |
| Profit after tax| 0                              |
| Depreciation and amortization | Add |
| Purchase of fixed assets | Subtract |
| Book value of disposals and sold fixed assets | Add |
| Interest of working capital requirements | Subtract |
| Interest(1-tax rate) | Add |

**Free Cash Flow (FCF)**

- Interest(1-tax rate) | Add
- Interest of short-term financial debt | Add
- Principal payments of long-term financial debt | Subtract

**Equity Cash Flow (ECF)**

- Interest | Add
- Principal payments of long-term financial debt | Add
- Increase of short-term financial debt | Subtract

**Debt Cash Flow (Cfd)**

**Capital Cash Flow (ECF+Cfd)**

*Note.* Table 1 is adopted from Fernandez (2004).
Samuelson-McKean (1965) model to value a perpetual American long-call option is written as follows:

$$\text{Land} = V^* - \frac{V^*}{\text{K}} \left( \frac{V^*}{V^* - \text{K}} \right)^{\eta}$$  \hspace{1cm} (1)

Where $V^*$ is the critical value of the developed property below which the land should be held undeveloped for the time being and above which is optimal to develop the land immediately. K denotes construction cost and $\eta$ denotes option elasticity measure and $\eta = \left[ \frac{y - rf + 0.5s^2 + (\text{rf} - y - 0.5s^2)^2 + 2\text{rf}s^2)^1}{s^2} \right]$, where $rf$ is the risk-free, $y$ is the dividend yield rate (i.e., return on equity in this case), and $s$ is the volatility of revenues.

**Data**

**Description**

The data is on the top-performing REITs on the Johannesburg Stock Exchange (JSE) from February 2006 to December 2018. Typically, most empirical studies use a 10-year period (Lin, Rahman & Yung, 2009). The article uses closing prices of selected REITs on the JSE. The top 10 funds were determined by the market capitalization rate and are listed in the tables in descending order. These funds have invested the majority of their portfolio in South Africa and account for more than 80% of the South African REIT index on the JSE. Some of the funds started as listed property funds and converted to REITs later over time. The companies we looked at are Growth Point, Emira, Fairvest, Hospitality B, Hyprop, Octodec, Redefine, Resilient, SA Corp, and Vukile.

In 2006 Growth point Properties Limited experienced a dramatic upswing in leasing activities particularly in the Western Cape with an overall increase of 45%. The value of leasing deals increased substantially but the total size of space leased has not changed appreciably. The indicators suggest that office leases were particularly achieving strong rentals. During 2006 the company made major transactions; they acquired quality portfolio of 24 properties for R1.4 billion which increased their revenue. In 2006 Emira Property fund dropped its vacancies sharply from 6% in 2005 to 4% in June 2006. The company’s distribution per PI (participatory interest) 74.5 cents saw an annualized growth of 10.3% and the net asset value of the company increased by 38.8% in 2006. The company purchased a portfolio from Momentum Group Limited and RMB properties for R844 million which was aimed at enhancing the performance and quality of the fund and aimed at diversifying the geographical spread of the portfolio.

Fairvest Properties experienced a hard time in 2006 when their turnover decreased to R12.7 million from R15.3 million in 2005. The company’s operating cost rose to R11.4 million from R9.2 million in 2005. Their operating profit dropped drastically to R2.9 million from R8.6 million. In 2006 Hyprop Property Investment increased its investment property by 27% to R6.7 billion. They managed to capitalize on favourable trading conditions that took place for retailers during 2006 and decreased their vacancy spaces. Their basic net income increased by 12.7% and decreased expense-to-revenue from 24% to 22%.

In 2006 Hospitality Property Fund was the only REIT in South Africa focusing on hotels. There is no appetite in the market for investment of hotels because of the major problems within the hotel industry; the lease structure and the income are too risky (Marcato, Sebehela, & Campani, 2019). The income depends on the economic conditions, if the economy is not doing well less people travel. Redefine showed a growth of 41% in the 2006 financial year. This coincided with the REITs increase of corporate activity within the listed property
sector. Redefine made fewer property acquisitions within the 2006 period than in prior periods. The vacancies of the REIT decreased to 2.7% during this time.

Resilient similarly improved its performance. This led to the REIT increasing its distributions by 19.87%. SA Corp changed their financial year end within this 2006 period. As a result of this change, the financial year lasted only five months. Analysts at the time had a positive outlook on the REIT and predicted future growth. In an attempt to increase foreign investment, SA Corp focused on constructing more premium grade buildings. The share price of SA Corp for the 2006 period rose by 19%.

The value of Octodec increased by 15% in the year 2006. The REITs showed significant interest in redeveloping the central business districts of Johannesburg and Pretoria. REITs saw an increase of 11% in their retail portfolio. Vukile implemented a R2 billion plan to partner with ABSA bank in refinancing a portion of their commercial properties in their new commercial mortgage backed securities (CMBS) program. The portfolio saw a 30% increase in their profits and a 3.6% decrease in their vacancies.

**Preliminary Data**

Table 2 illustrates preliminary data.

**Table 2**

| REIT         | Market cap (in ZAR billion) | Sectorial focus | Geographic spread of total portfolio | NAV (in cents) |
|--------------|-----------------------------|-----------------|-------------------------------------|----------------|
|              |                             | Retail | Industrial | Residential | Office | Other | Local spread | International spread |                  |
| Growth Point | 69.2                        | 11%    | 49%        | 0%         | 40%    | 0%    | 0%          | 62.30%            | 37.70% | 2,570 |
| Emira        | 7.5                         | 43%    | 15%        | 1%         | 41%    | 0%    | 0%          | 90%               | 10%    | 1,783 |
| Fairvest     | 2.08                        | 95.40% | 0%         | 0%         | 4.60%  | 0%    | 0%          | 100%              | 0%     | 227.78 |
| Hospitality B| 6.8                         | 0%     | 0%         | 0%         | 0%     | 100%  | 0%          | 100%              | 0%     | 1,921 |
| Hyprop       | 26.2                        | 100%   | 0%         | 0%         | 0%     | 0%    | 0%          | 79%               | 21%    | 10,298 |
| Octodec      | 4.9                         | 34.40% | 7.10%      | 31%        | 16%    | 11.40%| 100%        | 0%                | 2,939  |
| Redefine     | 51.8                        | 39%    | 19%        | 0%         | 37%    | 5%    | 79%         | 21%               | 1,083  |
| Resilient    | 25.7                        | 100%   | 0%         | 0%         | 0%     | 0%    | 0%          | 60.20%            | 39.80% | 6,149 |
| SA Corpo     | 7.5                         | 23%    | 48%        | 23%        | 4%     | 2%    | 98.50%      | 1.50%             | 508.2  |
| Vukile       | 17.1                        | 91%    | 4%         | 2%         | 3%     | 0%    | 74%         | 26%               | 2,010  |
| Mean         | 21.88                       | 54%    | 14%        | 6%         | 15%    | 12%   | 84%         | 16%               | 2,948.898 |
| Median       | 12                          | 41%    | 6%         | 0%         | 4%     | 0%    | 85%         | 16%               | 1,966  |
| STD Dev      | 21.24                       | 0.371  | 0.183      | 0.108      | 0.168  | 0.295 | 0.148       | 0.148              | 2,907.474881 |
| Skewness     | 1.37                        | 0.117  | 1.322      | 1.886      | 0.827  | 3.084 | -0.413      | 0.413              | 1.857  |
| Kurtosis     | 1.03                        | -1.833 | 0.340      | 2.214      | -1.396 | 9.616 | -1.388      | -1.388             | 3.399  |

Table 2 represents publicly available information of the companies’ market capitalisation, sectoral spreading of properties in South Africa, the geographical spread of the companies’ total portfolio, and net asset value for the financial year-end 2018. The mean functions as a benchmark are used to compare the companies with each other. The portfolios of the companies are predominantly retail properties, and they are locally based according to the mean. The sample is positively skewed as a possible result of the diversification of the portfolio to reduce the risk.
Financial Information

Table 3

Financial Information at 2018

| REIT            | Profit after tax (ZAR billion) | Total expenses (ZAR billion) | Owners’ equity (ZAR billion) | Cash (ZAR billion) | Debtors (ZAR billion) |
|----------------|--------------------------------|----------------------------|------------------------------|-------------------|----------------------|
| Growth Point   | 7.905                          | -5.427                     | 47.092                       | 2.320             | 3.645                |
| Emira          | 0.849                          | -1.172                     | 8.969                        | 0.109             | 0.220                |
| Fairvest       | 0.294                          | -0.252                     | 2.364                        | 0.010             | 0.062                |
| Hospitality B  | 0.114                          | -0.754                     | 11.105                       | 0.391             | 0.134                |
| Hyprop         | 2.521                          | -1.564                     | 26.395                       | 0.199             | 0.258                |
| Octodec        | 0.541                          | -1.431                     | 7.824                        | 0.063             | 0.130                |
| Redefine       | 6.617                          | -5.758                     | 58.149                       | 0.422             | 1.076                |
| Resilient      | -3.305                         | -10.156                    | 22.846                       | 0.510             | 0.183                |
| Sa Corp        | 0.830                          | -1.650                     | 12.861                       | 0.207             | 0.451                |
| Vukile         | 2.412                          | -1.247                     | 15.770                       | 1.094             | 0.187                |
| Mean           | 1.878                          | -2.941                     | 21.338                       | 0.532             | 0.635                |
| Median         | 0.839                          | -1.498                     | 14.316                       | 0.299             | 0.203                |
| STD Deviation  | 3.265                          | 3.163                      | 18.103                       | 0.702             | 1.098                |
| Skewness       | 0.689                          | -1.601                     | 1.266                        | 2.206             | 2.795                |
| Kurtosis       | 0.595                          | 2.020                      | 0.701                        | 5.096             | 8.073                |

Similarly, the financial data was obtained from the listed funds publicly audited financial data. This data looks at the profits of the company, expenses, owners’ equity (OE), and amount of cash on hand at year-end, and the debtors receivable. Table 3 shows that the funds are making an average of over R1.5 billion rand in profit with a positive skewness linking to the fact that the funds are profitable. The average cash and debtors accounts show similar figures that indicate an even split of funds. The owners’ equity is seen to have a significant standard deviation.

Analysis

Table 4

Income Approach

| REIT            | Present value @ 2006 (in ZAR billions) |
|----------------|----------------------------------------|
| Growth Point   | 5.62                                   |
| Emira          | 3.18                                   |
| Fairvest       | 30.38                                  |
| Hospitality B  | 0.19                                   |
| Hyprop         | 4.75                                   |
| Octodec        | 1.26                                   |
| Redefine       | 5.46                                   |
| Resilient      | 0.35                                   |
| SA Corp        | -0.94                                  |
| Vukile         | 1.81                                   |
| Mean           | 5.21                                   |
| Median         | 2.50                                   |
| Standard Deviation | 9.14                            |
| Kurtosis       | 8.32                                   |
| Skewness       | 2.80                                   |
Table 4 illustrates the present values of the REITs at year 2006; the values are in billions of South African Rands. On average the companies were valued at R5.2 billion in the year 2006. According to Mueller (1998) the companies that are worth 0 to 500,000 US dollars are classified as small caps; those which are worth 501,000 US dollars to one billion US dollars are classified as mid-caps; and those which are worth above four billion US dollars are mega caps. Based on Mueller’s (1998) classification the companies were small caps in year 2006. In the companies that are classified as small caps, trading volumes are thin, and mergers and acquisitions (M&As) seldomly occur. In terms of skewness, the companies on average are positively skewed. When an asset is positively skewed there is an implication that lot of money can be made from trading (Peiro, 1999). Thus, the results reveal an investment conundrum. Some results illustrate investment while others reveal disinvestment opportunities. There is an investment conundrum in the results since the positive skewness of the companies states the REITs should be traded while they should not be traded since there are no major investment activities happening. As stated in the methodology chapter, the analysis progresses to do a comparison of income and real option approaches.

Table 5

| REIT          | Present value @ 2006 (in ZAR billions) | Option value @2006 (in ZAR billions) | Total value (income plus real option approaches) |
|---------------|----------------------------------------|--------------------------------------|-------------------------------------------------|
| Growth Point  | 5.62                                   | 0.00                                 | 5.62                                            |
| Emira         | 3.18                                   | 0.00                                 | 3.18                                            |
| Fairvest      | 30.38                                  | 0.01                                 | 30.39                                           |
| Hospitality B | 0.19                                   | 0.00                                 | 0.19                                            |
| Hyprop        | 4.75                                   | 0.54                                 | 5.29                                            |
| Octodec       | 1.26                                   | 2.78                                 | 4.04                                            |
| Redefine      | 5.46                                   | 0.36                                 | 5.82                                            |
| Resilient     | 0.35                                   | 0.01                                 | 0.36                                            |
| SA Corp       | -0.94                                  | 1.02                                 | 0.08                                            |
| Vukile        | 1.81                                   | 0.03                                 | 1.85                                            |
| Mean          | 5.21                                   | 0.48                                 | 5.68                                            |
| Median        | 2.50                                   | 0.02                                 | 3.61                                            |
| Standard Deviation | 9.14      | 0.88                                 | 8.97                                            |
| Kurtosis      | 8.32                                   | 6.16                                 | 8.32                                            |
| Skewness      | 2.80                                   | 2.42                                 | 2.79                                            |

The 2006-2007 period was the build-up to the sub-prime mortgage crisis. In this period the property markets were doing well, and consumers were willing to spend their money within the economy. During 2008-2009 period, the sub-prime mortgage crisis took effect, and REIT values dropped. Table 5 shows the amounts that the REITs were undervalued. It should be noted that under-performing REITs tend to be less undervalued than REITs performing at or above market performance. Column 3 illustrates amounts of undervaluation of different REITs. Some REITs were reasonably undervalued while others where highly undervalued. In order to understand the undervaluation, this study provides different market information on those REITs based on what different South African real estate analysts wrote about those REITs.

Conclusion

The findings of this article are as follows. Firstly, real options approach has different values to income
approach in the same setting because of the flexibility embedded in real options. Secondly, interestingly real options reveal negative values of investments. Thirdly, overall income approach under-prices REIT values. Finally, as expected real options illustrate the strategy of the REIT firm.

The implications of this article are as follows. Firstly, for valuation reasons, it is better to use income approach in conjunction with real options valuation. Secondly, REIT investors should know when the values are negative so that they do not overpay for REIT values. Thirdly, given that each valuation method has its own strengths and weaknesses, it is better to use more one valuation technique when valuing REIT firms. Finally, investments injected in REIT firms have strategic implication for REITs.

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