The Impact of Misvaluation in the REIT Sector

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Abstract: By using the decomposing market-to-book model and the residual income model to estimate misvaluation, we find empirical evidence supporting the proposition that misvaluation has an impact on the financing decisions and liquidity management of REITs. Regarding the financing decisions, REITs experiencing a high increase in their stock prices will tend to increase their equity to exploit the low cost of capital relative to other financing forms. In addition, REITs are also more likely to increase debt issuances when their misvaluation is higher because overvalued REITs generally have easier access to debt. Finally, REITs use more cash than bank credit lines in liquidity management when they experience a misvaluation.

Keywords: financial decision, liquidity management, misvaluation, real estate investment trust (REIT)

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1. Introduction

Misvaluation is defined as the act of misspecifying the current value of an asset or a company. Shiller (2008) proposes that misvaluation is able to contribute to the emergence of a financial crisis because it warps investment. In a survey involving 392 chief financial officers (CFOs), Graham & Harvey (2001) report that misvaluation is one of the most important factors impacting on the decision of when and how to issue common stocks. Also, Rhodes-Kropf et al. (2005) document that misvaluation strongly affects merger activities. Therefore, misvaluation is a significant problem due to its macro and micro effects.

Within the REIT (real estate investment trust) sector, investors as outsiders have difficulty to accurately determine the market value of REITs because information asymmetries in the real estate market are high (Garmaise & Moskowitz, 2004). Moreover, REITs rely mainly on external financings for their investment or expansion activities because REITs have to distribute at least 90% of taxable income as dividends to shareholders (Feng et al., 2007; Ooi et al., 2010), and they always issue securities to cover a shortage of internal sources of capital (Boudry et al., 2010). Hence, misvaluation is more likely to be a significant problem for REITs. However, up to now, the effect of misvaluation on the REIT capital structure decisions has not been analyzed.

Using two different methods to measure misvaluation quantitatively, the present study conducts a comprehensive investigation of its impact in the REIT sector. First, we examine the impact of misvaluation on REITs’ financing decisions because the capital structure of REITs is entirely different from non-REIT firms due to their tax-exempt status. Second, we analyze how misvaluation can influence cash holdings and the use of bank credit lines. These could be severe problems in the REIT sector because the mandatory payout is high (Feng et al., 2007; Ooi et al., 2010), and the ratio of cash to total assets of REITs is 12 times lower than that of non-REIT firms (Damodaran, 2005). Altogether our paper makes several contributions to the literature about the effect of misvaluation on the financing decisions and liquidity management policies of REITs.

To these ends, our sample consists of 2,163 firm-year observations and spans a 17-year period from 1999 to 2015. The necessary data is obtained from Thomson Reuters Eikon. By using the decomposing market-to-book model (DMM) of Rhodes-Kropf et al. (2005) and the residual income model (RIM) of Ohlson (1995) to estimate misvaluation, we find empirical evidence proving that misvaluation influences the financing decisions and liquidity management of REITs.

The main results can be summarized as follows: First, REITs experiencing a high appreciation of stock price would have a greater propensity to increase the likelihood of an equity issue, whose purpose could be to exploit the low cost of equity capital relative to other forms of capital. Second, REITs are more likely to increase debt issuances and have greater credit line availability when their stock is overvalued. These findings are contrary to the results of non-REIT firms that tend to issue debt when their stocks are undervalued (Elliott et al., 2008). The reason for this result appears to be that overvalued REITs generally have easier access to debt. Third, regarding the liquidity management policies, we find empirical evidence supporting that overvalued REITs use more cash than bank lines of credit for liquidity management because they can accumulate larger amounts of cash relative to other firms.
The remainder of this paper is organized as follows. Section 2 reviews the relevant theoretical background and makes hypotheses. Section 3 presents the models of measuring misvaluation. Section 4 shows the research design and data description. Section 5 discusses the empirical results, while Section 6 concludes.

2. Theoretical background and hypotheses

One may contend that information considerations are not important in real estate markets because there is “limited investment in human capital and growth options” (Feng et al., 2007). Therefore, tangible real estate assets are relatively easier to value than those of industrial or manufacturing firms. However, Garmaise & Moskowitz (2004) argue that the real estate market is highly illiquid, and real estate assets are idiosyncratic, so it is hard for outsiders to accurately value these assets. Han (2006) also posits that accurate valuation of real estate assets is complicated and requires special skills because there is the presence of illiquidity and heterogeneity that make the predictability of cash flow to be less precise. Hence, the problem of informational asymmetry is significant in real estate transactions. In addition, previous empirical research reports that REITs depend primarily on external financings for their activities always issue securities to cover a shortage of internal sources of capital.

The combination of high informational asymmetry and high dependence on external financings is likely to be a significant driver for misvaluation within the REIT industry. To the best of our knowledge, the effects of misvaluation have not been analyzed in the REIT literature yet. Accordingly, we conduct a comprehensive investigation of the impact of misvaluation in the REIT sector to make some contributions to the REIT literature. In particular, we analyze effects of misvaluation on the financing decisions and liquidity management policies of REITs.

The first subsection discusses the impact of misvaluation which is reported in the general financial literature. The second subsection reviews empirical studies on the financing decisions of REITs. The final one addresses research on liquidity management of REITs.

2.1 Empirical research on the effects of misvaluation

Misvaluation is an important problem because it has substantial impacts on particular firms as well as on the economy (Shiller, 2008). Using the method of decomposing the market-to-book ratio into components that capture misvaluation at the firm level and the industry level as well as a component that captures long-run growth opportunities, Rhodes-Kropf et al. (2005) report that misvaluation strongly affects merger activities, and this finding is consistent with the conclusion of Ben-David et al. (2015).

In a survey of Graham & Harvey (2001) involving 392 CFOs, the magnitude of equity undervaluation or overvaluation is one of the most important factors having an impact on the decision of when and how to issue common stocks, and more than 60% of CFOs admit that they would issue stocks when their firm’s stock price has risen. Using an earnings-based valuation model to estimate the intrinsic value, D'Mello & Shroff (2000) show that firms repurchase shares when their stocks are undervalued. Using the market-to-book ratio as a proxy of market timing opportunities perceived by managers, Baker & Wurgler (2002) find that the effect of a higher market-to-book ratio is to increase net equity issues and to lower leverage. They explain that
managers could time and raise equity when misvaluation happens and makes the cost of equity cheap relative to the cost of other capital. Therefore, misvaluation influences not only the capital structure of firms but also the merger activities and the whole economy.

2.2 Empirical studies on the financing decisions of REITs

There are several studies which research the financing decisions of REITs. What we can find so far is: Boudry et al. (2010) use a multinomial logistic model with four categories, namely common equity, preferred equity, public debt and private debt, to examine the determinants of REIT security issuance decisions. They find that market timing behavior has a strong influence on security choices of REITs. In particular, REITs would be more likely to issue stock after they experience high returns or high price-to-net asset value ratio. Using a similar model, Ooi et al. (2010) classify the financing events into eight categories, specifically equity issues, equity repurchases, debt issues, debt retirements, dual issues, debt issues accompanied by equity repurchases, equity issues accompanied by debt retirements, and no action. They document that REITs time the financing decisions according to the market conditions and adjust their capital structure towards the long run target leverage ratio.

Focusing on the equity repurchase decisions to provide an explanation why REITs repurchase their stocks, although there is not an apparently theoretical motive, Ghosh et al. (2008) provide empirical evidence supporting the notion that managers decide to repurchase their stock when they believe that their stocks are undervalued. This finding is consistent with that of Brau & Holmes (2006).

Because misvaluation is not the primary focus of these papers, the impact of misvaluation on the financing decisions is not investigated. Our article, thus, wants to shed light on this issue in the REIT sector by examining extensively how the act of misspecifying the current value of equity affects the REIT’s financing decisions which are classified into nine categories, as discussed in Section 4.

Empirical evidence revealing that REITs exhibit market timing behavior is found. Therefore, we hypothesize that misvaluation has an effect on REIT capital structure. In particular, we expect that when the market value of equity is greater than the intrinsic value of equity, managers have the motivation to issue stocks and retire debt. In contrast, when the intrinsic value is higher the market value, managers will repurchase shares and issue debt, if necessary. We have the first hypothesis:

(H1) Misvaluation is positively related to equity issuance, debt retirement, and negatively related to equity repurchase and debt issuance.

2.3 The liquidity management of REITs

As discussed above, liquidity management could be a major issue in the REIT sector. To meet short-term liquidity requirements, REITs use net cash provided by operations, existing cash balances and bank credit lines. Accordingly, empirical research usually analyzes cash holdings and lines of credit when it investigates the liquidity management policies.

Hardin et al. (2009) investigate what determinants have effects on REIT cash holdings. They document that cash flow, growth opportunities, leverage, capital market access and lines of credit can influence cash
holdings of REITs. Ghosh et al. (2012) examine the relationship between excess cash holdings and activities of merger and acquisition. They report that REITs that have a higher level of excess cash are probably to become bidders when their insider ownership is small. Because the focus of both papers is not on misvaluation, the effect of misvaluation on REIT cash holdings has not been captured. Hence, our paper provides a new contribution to the REIT cash holding literature.

When conditions in the capital market are favorable, firms could time the capital market and issue equity to exploit short-term variations in the cost of equity relative to the cost of other forms of capital, even when they have no immediate need for external funds (Bolton et al., 2013). Kasbi (2009) posits that past successful market timers tended to accumulate larger amounts of cash relative to other firms. Because market timing behavior is reported to exist in the REITs sector, we expect that the relation between misvaluation and REIT cash holdings is positive. We have the second hypothesis:

\[ \text{(H2) Misvaluation is positively related to REIT cash holdings.} \]

The papers studying the management of corporate liquidity have mainly focused on cash holdings because the access to data of bank credit lines is often limited. In the REIT sector, lines of credit are important because they permit REITs to make fast decisions in property acquisitions and add "strategic value" to REITs (An et al., 2012). Therefore, it is insufficient if we do not analyze lines of credit when we study the liquidity management of REITs. Fortunately, in the REIT sector, information on bank credit lines is available.

Hardin & Wu (2010) examine how banking relationships affect the REIT capital structure. They document that REITs with bank relationships, specifically the bank lines of credit, effectively manage their debt ratio while keeping adequate liquidity level. Hardin & Hill (2011) try to determine the use pattern for bank credit lines and the determinants of the utilization of bank credit facilities of REITs over time. However, misvaluation is not the focus of both studies.

A closely related paper is An et al. (2012) which examines the effect of information asymmetry on the choice between the use of cash and of a line of credit to meet the liquidity requirements. They use the analyst forecast error and dispersion to capture the extent of the information asymmetry. They conclude that bank credit line use of REITs for liquidity management decreases when information asymmetry increases because banks ration to provide loans to the customers with higher information asymmetry.

The difference between the market value of equity and the intrinsic value of equity implies the fact that existing share prices do not reflect all relevant information. In other words, misvaluation may be a measure of information asymmetry. Therefore, we expect that overvalued REITs will use more cash holdings compared to a bank credit line in liquidity management because they keep more cash, as the second Hypothesis assumes, and have difficulty in obtaining a line of credit, as An et al. (2012) predict. Consequently, we postulate the third hypothesis:

\[ \text{(H3) Misvaluation is negatively related to the bank credit line component in liquidity management.} \]

3. The models of measuring misvaluation
To measure misvaluation, we firstly determine the intrinsic value of a firm, then the ratio of the market value to the intrinsic value will directly capture misvaluation. We use two models which are widely used in the finance literature to measure the intrinsic value, specifically the decomposing market-to-book model (DMM) of Rhodes-Kropf et al. (2005) and the residual income model (RIM) of Ohlson (1995).

3.1 The decomposing market-to-book model

The market-to-book ratio has a dual role in empirical studies: It is both a proxy of misvaluation and a proxy of growth opportunities (Rhodes-Kropf et al., 2005; Mahajan & Tartaroglu, 2008). Recognizing this issue, Rhodes-Kropf et al. (2005) develop a method to decompose the market-to-book ratio (called the decomposing market-to-book model – DMM) to empirically examine the effect of misvaluation on merger activities (for more details, see Rhodes-Kropf et al., 2005).

The DMM decomposes the market-to-book ratio into three parts: firm misvaluation, sector misvaluation, and growth opportunities as:

\[
\text{Market-to-book} = \text{Market-to-intrinsic} \times \text{Intrinsic-to-long run intrinsic} \times \text{Long run intrinsic-to-book}. \tag{1}
\]

Rhodes-Kropf et al. (2005) hypothesize that a perfect measure of value exists, so the first part (Market-to-intrinsic), called “firm-specific error”, expresses the discrepancy between the market value and the intrinsic value of a company at time \(t\). This component reflects a firm’s misvaluation at time \(t\). The second part (Intrinsic-to-long run intrinsic), called “time-series sector error”, expresses the discrepancy between a firm’s intrinsic value at time \(t\) and its long-run intrinsic value. This part reflects whether a sector is overvalued. A sector can sometimes be overcooled or overheated, so companies in the same industry could share a mutual misvaluation component. The final part (Long run intrinsic-to-book) reflects the difference between the long-run intrinsic value of the company and its book value which captures growth opportunities.

To estimate the intrinsic value of equity, Rhodes-Kropf et al. (2005) follow a two-step procedure. They first run a regression model with the market value of equity as the dependent variable to obtain the estimated coefficients. They then use firm-specific accounting information and these estimated coefficients to determine the intrinsic value. The long-run intrinsic value is computed by firm-specific accounting information and the average of the estimated coefficients.

In particular, in the first step, Rhodes-Kropf et al. (2005) regress the time \(t\) market value of equity of firm \(i\) on its corresponding book value per share, its net income, and its leverage ratio as the following equation:

\[
m_t = \alpha_0 + \alpha_1 b_t + \alpha_2 \ln(NI)_t + \alpha_3 I_{<0} \ln(NI)_t + \alpha_4 LEV_t + \varepsilon_i, \tag{2}
\]

where \(m\) and \(b\) denote the firm’s market value and its book value in natural logarithms, respectively; \(\ln(NI)_t\) stands for the natural logarithm of the absolute value of net income; \(I_{<0}\) is a dummy variable taking on the value of 1 if \(NI < 0\), and 0, otherwise; \(LEV\) is the leverage ratio which is defined as total debt scaled by total assets.

In the second step, they use the estimated coefficients, \(\hat{\alpha}_{k,t}, k = 0, 1, 2, 3, 4\), from Eq. (2) and annual firm-specific accounting information to calculate the intrinsic value.
Intrinsic value_{it} = \bar{\alpha}_{0t} + \bar{\alpha}_1b_{it} + \bar{\alpha}_2\ln(NI)_{it}^t + \bar{\alpha}_3l_{(<0)}\ln(NI)_{it}^t + \bar{\alpha}_4\text{LEV}_{it}, \quad (3)

To estimate the long-run intrinsic value, they use the average of estimated coefficients, \bar{\alpha}_k = 1/T \sum_k \hat{\alpha}_{kt} k = 0, 1, 2, 3, 4 from Eq. (2) and annual firm-specific accounting information.

Long run intrinsic value_{i} = \bar{\alpha}_0 + \bar{\alpha}_1b_{it} + \bar{\alpha}_2\ln(NI)_{it}^t + \bar{\alpha}_3l_{(<0)}\ln(NI)_{it}^t + \bar{\alpha}_4\text{LEV}_{it}, \quad (4)

The long-run intrinsic value captures the fundamental value of a firm which is implied by long-run industry averages.

**The residual income model**

The theoretical research of Ohlson (Feltham & Ohlson, 1995; Ohlson, 1995) makes the residual income model (RIM) popular as a fundamental valuation model (for more details, see D’Mello & Shroff, 2000). There are substantive empirical studies using the RIM to estimate the misvaluation of a firm, such as D’Mello & Shroff (2000), Dong et al. (2006), and Elliott et al. (2007 & 2008).

Following the RIM, the intrinsic value of a firm is estimated as:

\[
IV_0 = BV_0 + \sum_{t=1}^{T} \frac{E_0[X_t - \tau BT_{t-1}]}{(1+r)^t} + \frac{TV}{(1+r)^T},
\]

\[
TV = \frac{E_0[(X_T - \tau BT_{T-1} + (X_{T+1} - \tau BT_T)]}{2},
\]

where IV_0 is the intrinsic value of a firm’s equity at time zero, BV_0 is the book value of equity at time zero, \( r \) is the cost of equity, \( E_0(X_t) \) are the expected earnings for period \( t \), as seen at time zero, \( T \) is the number of periods, and TV is a firm’s terminal value.

D’Mello & Shroff (2000) and Elliott et al. (2007 & 2008) use the CAPM to calculate the cost of equity as follows:

\[
r = r_f + \beta [E(r_m) - r_f],
\]

The risk-free rate of interest, \( r_f \) is defined as the short-term T-Bill, and the return of S&P 500 is the proxy for the expected market return, \( r_m \). Beta, \( \beta \), is the estimate of the firm’s systematic risk, and \( [E(r_m) - r_f] \) is the market risk premium.

We use the perfect foresight version of the RIM (D’Mello & Shroff, 2000; Elliott et al., 2007, 2008). Therefore, BV_0 is the book value per share at time zero, and X_t is defined as the earnings before interest, taxes, depreciation and amortization at time \( t \), and \( T \) equals two years as in Elliott et al. (2007 & 2008).

Misvaluation is calculated as the market price of a stock at time zero, MV_0, scaled by the intrinsic value of a firm’s equity at time zero.

\[
\text{Misvaluation}_0 = \frac{MV_0}{IV_0}, \quad (8)
\]

Misvaluation_0 should equal one if there is no mispricing. This variable should be less than one when a firm’s equity is undervalued, and greater than one, otherwise.

**4. Data and variables definition**
Sample construction starts by determining firms against the National Association of Real Estate Investment Trusts database from 1999 to 2015. To reduce potential problems with a survivorship bias, we include all observations from REITs that are delisted, taken private or merged until changes of their status. Mortgage REITs are excluded from the sample because their capital structure is likely significantly different from other firms in the sample.

To empirically employ the models of Section 3, we obtain all necessary data from Thomson Reuters Eikon, except information on bank lines of credit (discussed below in detail). We drop observations which miss accounting data and stock prices. We further exclude firms with fewer than two consecutive years of data when running DMM, and firms with less than four consecutive years of data when running RIM.

When we examine the financing decisions of REITs, we remove observations with the financing events being less than US $1 million and less than 5% of total assets.

Data of bank lines of credit

The annual 10-K SEC filings provide complete information on bank credit lines, specifically the total borrowing capacity, the outstanding borrowings and the available amount or unused amount of credit lines. For instance, Kilroy Realty Corporation details its bank lines of credit in the FY 2015 10-K filing as follows:

<table>
<thead>
<tr>
<th>December 31, 2015</th>
<th>December 31, 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>(in thousands)</td>
<td></td>
</tr>
<tr>
<td>Outstanding borrowings</td>
<td>$ 0</td>
</tr>
<tr>
<td>Remaining borrowing capacity</td>
<td>$ 600,000</td>
</tr>
<tr>
<td><strong>Total borrowing capacity</strong></td>
<td><strong>$ 600,000</strong></td>
</tr>
</tbody>
</table>

Although information on bank lines of credit is available in 10-K filings, the existing empirical studies considering the use of credit lines of REITs obtain this information from other data sources. For example, Hardin & Wu (2010) use the Loan Pricing Corporation's (LPC's) DealScan database and the SNL REIT database. Hardin & Hill (2011) and An et al. (2012) use the SNL REIT database. It is noted that there is no search software or application which supports us to automatically extract information on a credit line from annual 10-K SEC filings. Therefore, following Sufi (2009), we manually collect the data of bank credit lines from annual 10-K SEC filings.

Table 1 presents the summary statistics of firm characteristics. The columns 2, 3, and 4 report the summary statistics of the sample which is used to analyze the financing decisions of REITs. The columns 5, 6, and 7 show summary statistics of the sample used to examine the cash holdings of REITs. The columns 8, 9, and 10 inform about the data that is used to investigate the effect of misvaluation on the probability of a REIT having a credit line. The last three columns show the summary statistics of the sample which is utilized to investigate the liquidity management of REITs.

<< Insert Table 1 here >>
*Financial decisions* is an indicator variable that captures the financing activities of REITs. This variable takes the value of 1 when a REIT issues equity, 2 when it repurchases equity, 3 when it issues debt, 4 when a REIT retires debt, 5 when it issues both equity and debt, 6 when the company issues debt and repurchases equity, 7 when it issues equity and retires debt, 8 when it repurchases both equity and debt, and 0 when a REIT does nothing. Figure 1 presents the percentage of each financing activities of REITs in the sample. It is noted that net debt issues are the activity having the largest portion (22.8%), while pure equity issues take the second largest percentage, 14.4%. In general, debt issues take 35.7%, while equity issues entail 31.5%. This evidence shows that REITs use more debt financing than equity financing to meet capital requirements.

<< Insert Figure 1 here >>

*Line of credit* is the total amount of bank credit lines. In our sample, 93% of observations have bank credit lines. This number shows that the use of bank lines of credit is extensively popular in the REIT sector. Sufi (2009) reports that this portion for non-financial firms is 74.8%. *Total* is the total amount of bank credit lines scaled by the sum of total bank credit lines and cash and cash equivalent.

*Firm misvaluation* which is obtained from the DMM expresses the discrepancy between the market value and the intrinsic value of a REIT at time $t$. This variable reflects the misvaluation of a firm’s equity at time $t$. *Sector misvaluation* takes the value from the DMM and reveals the discrepancy between the intrinsic value at time $t$ and the long-run intrinsic value. This variable will be larger than one if contemporaneous multiples are higher than average, and, accordingly, reflects that this sector could be overvalued at a point in time. *Misvaluation* expresses the natural logarithm of the discrepancy between the market value and the intrinsic value of a REIT’s equity at time $t$ which is obtained from the RIM.

*Cash* is defined as the cash and cash equivalent scaled by total assets. *PPE/A* is the amount of property, plant, and equipment scaled by total assets. *EBITDA/A* is earnings before interest, taxes, depreciation, and amortization scaled by total assets. *Size* is the natural logarithm of total assets. *10-year T-Bill* is the yield of a 10-year government bond. *Term structure* is the difference between the yield of a 10-year government bond and a 3-month T-Bill. *Net Income* is the net income before extraordinary items scaled by total assets.

5. **Models and empirical results**

5.1 **Misvaluation and financing decisions**

To investigate the impact of misvaluation on the probability of a REIT choosing a certain financing activity, we use a multinomial logistic model (MNL).

$$Pr(\text{Financing decision}_{i,t} = \{1, 2, ..., 8\} | X) = \beta_0 + \beta_1 \text{Mis}_{i,t-1} + \beta_2 \text{Inde}_{i,t-1} + \varepsilon_{i,t},$$

where $Pr$ is the probability of a certain financing decision, Mis denotes *Firm Misvaluation* and *Sector Misvaluation* in the DMM or *Misvaluation* in the RIM. Inde contains a set of independent variables, specifically *PPE/A, EBITDA/A, Size, 10-year T-Bill*, and *Term structure* that are also used in Ooi et al. (2010).

We categorize financing events into nine groups. Firms that did not experience any changes in their capital structure are taken as the base option (0), while firms that made changes in their capital structure are classified into group (1) to group (8), as discussed above. We then perform eight different regression models
to identifies how independent variables change the probability of a REIT choosing a financing event $z$ which takes the values of $\{1, 2, \ldots, 8\}$ against the base option (0). It should be noted that a significantly positive coefficient in the MNL would imply that a higher value of the explanatory variable increases the likelihood of each of the potential financing decisions against a no change transaction, and vice versa.

<< Insert Table 2 here >>

Table 2 presents the results from the MNL. Regarding events involving equity, the estimated coefficients of Firm Misvaluation and Misvaluation are positive and statistically significant in the financing events 1 and 5. These findings imply that REITs experiencing a high appreciation of stock price would have a higher propensity to increase the likelihood of an equity issue against the no transaction alternative, which is consistent with the prediction of the market timing theory. The purpose of these decisions could be to exploit the low cost of equity capital relative to other forms of capital. The estimated coefficient of Sector Misvaluation is also positive and statistically significant in the financing event 5 which is consistent with that of Firm Misvaluation and Misvaluation. However, in the financing event 7, this coefficient is negative and contrary to our expectation.

Regarding events involving debt, the estimated coefficients of Firm Misvaluation and Sector Misvaluation are significantly positive in the financing event 3 and significantly negative in the financing event 4. These coefficients imply that REITs with higher misvaluation are more likely to increase their leverage ratio by increasing debt issues and decreasing debt retirements. These results are similar to that of Ooi et al. (2010). They find the empirical evidence supporting that a REIT has a higher propensity to issue debt when its stock price increases, but they give no explanation. In an investigation of the probability of the net debt issues against the pure equity issues which is not presented here, we also find the significant evidence indicating that REITs that have higher Sector Misvaluation (the intrinsic value is higher than the long-run intrinsic value), are more likely to issue debt.

These findings are quite strange and contrary to our expectation. Theoretically, a REIT has no motive to issue debt and is more advisable not to issue debt when its stock is overvalued. However, in the real world, REITs have debt issues and their leverage ratio is even greater than that of non-REIT firms (Alcock et al., 2014). The rationale for this action is still a question that needs to be settled by future research. We argue that one of the answers that appear to be reasonable is the mandatory high payout for REITs. With high payouts, REITs rely on external capital to finance their activities (Ooi et al., 2010), so they always issue securities to cover a shortage of internal sources of capital (Boudry et al., 2010). Because companies can raise debt more quickly than raise equity (Rapp et al., 2014), REITs should prioritize the choice of debt issues, and our finding appears to imply that overvalued REITs generally have easier access to debt.

When REIT profitability increases, the dependence on external sources of financing decreases due to the increase in retained earnings. This proposition is supported by the significantly estimated coefficients of EBITDA/A. In particular, when EBITDA/A increases, the likelihood of equity issuance, debt issuance, and dual issues against a no-change transaction decreases, and the probability of equity repurchases increases.
The estimated coefficients of Size are negative where they are statistically significant, suggesting that smaller REITs are more active in conducting financing activities. Small REITs could not be able to have enough cash flow, which is derived from sales of real property or from rents from real assets, to finance their activities and investments, so they have to be more active in raising external sources of financing to meet their capital requirements. This finding is inconsistent with Ooi et al. (2010).

Regarding the impact of the market interest rate on the choice of issuing debt, we find empirical evidence supporting the proposition that the increase in the interest rate or the risk premium for long-term debt would reduce events of debt issues because the cost of debt financing is relatively high. In particular, the estimated coefficient of 10-year T-Bill is negative and significant for the financing event 5 (Dual issues), and Term structure is negatively related to the event 6 (Debt issues accompanied by equity repurchases).

However, Table 2 also shows that REITs have inconsistent actions to respond to fluctuations in the relative cost of debt regarding the choice of debt retirement. Specifically, in the group 7, the probability of debt retirement accompanied by equity issue vis-à-vis doing nothing decreases if the market interest rate increases, while this chance will increase if the risk premium for long-term debt increases.

Overall, we find the significantly positive relationship between misvaluation and equity issue which is consistent with Hypothesis 1. Nevertheless, we also find the empirical evidence contradicting Hypothesis 1 with respect to the relation between misvaluation and debt issue and retirement, and there is no evidence supporting the negative relationship between misvaluation and equity repurchase.

5.2 Misvaluation and cash holdings

When conditions in the capital market are favorable, firms could time the market and issue equity to exploit short-term variations in the cost of equity relative to the cost of other forms of capital, even when they have no immediate need for external funds (Bolton et al., 2013). Kasbi (2009) posits that past successful market timers, who successfully predicted stock price movements and performed a seasoned equity offering, tend to accumulate larger amounts of cash relative to other firms.

The existing REIT finance literature provides evidence supporting that REITs exhibit market timing behavior. As discussed above, we also find this empirical evidence; therefore, a positive relationship between cash holdings and misvaluation is expected. To test this expectation, we perform two OLS regressions for two valuation models (the DMM and the RIM) as follows:

\[ \text{Cash}_i = \beta_0 + \beta_1 \text{Mis}_i + \beta_2 \text{Inde}_i + \epsilon_i, \]

The dependent variable is Cash which denotes cash and cash equivalent scaled by total assets. Mis denotes Firm Misvaluation and Sector Misvaluation in the DMM or Misvaluation in the RIM. Inde contains a set of independent variables, specifically PPE/A, EBITDA/A, and Size.

Table 3 reports the regression results from two OLS regression models. The estimated coefficients of Firm Misvaluation and Sector Misvaluation are positive and statistically significant at the 1% level. The result
implies that REITs with higher misvaluation keep more cash than lower-misvaluation REITs, which could be explained by the proposition of Bolton et al. (2013) and Kasbi (2009). Moreover, these coefficients are also economically significant. For example, when Firm Misvaluation increases from 1 to 1.1, representing 10% overvaluation, cash and cash equivalent scaled by total assets will be expected, everything else being equal, to increase by 0.1%. Standardization is usually used to measure how much a dependent variable changes if an independent variable changes one standard deviation. However, in our study, the standard deviation of Firm Misvaluation is quite small, so we investigate the dependent variable for a 10% shift in Firm Misvaluation. The coefficient of Misvaluation has the expected sign but is statistically insignificant.

Hardin et al. (2009) assumed that the market-to-book ratio is a proxy for the degree of information asymmetry, and argue that REITs with a higher degree of information asymmetry could hoard more cash to prevent costly external sources. By using the DMM and the RIM to estimate the intrinsic value of equity, we find a positive relationship between misvaluation and cash holdings, which explains more clearly the result found by Hardin et al. (2009), because information asymmetry causes, in part, misvaluation.

The estimated coefficient for tangible assets is negative which supports the notion that REITs with higher tangible assets have more possibilities to access loans, so they do not need to accumulate cash. Similarly, REITs with higher profitability keep lower cash because they can generate positive cash flow and higher retained earnings.

Finally, the coefficient on the size variable is negative and significant, indicating that as REITs become larger, they keep less cash. This finding is consistent with the one of Hardin et al. (2009) which implies that large firms need less precautionary cash holdings due to diversification effects or capital market access.

Overall, we find empirical evidence that supports the Hypothesis 2: Misvaluation is positively related to REIT’s cash holdings.

5.3 Misvaluation and bank lines of credit

We use an OLS regression to analyze the effect of misvaluation on the total amount of bank credit lines of REITs.

\[
\text{Line of credit}_{it} = \beta_0 + \beta_1 \text{Mis}_{it} + \beta_2 \text{Inde}_{it} + \epsilon_{it}
\]

where Line of credit is the total amount of bank credit lines. Mis denotes Firm Misvaluation and Sector Misvaluation in the DMM or Misvaluation in the RIM, Inde contains a set of independent variables, specifically cash flow and Size. Following An et al. (2012), we use EBITDA/A and Net Income as two alternative measures of cash flow. Net Income is used for models 1 and 3, EBITDA/A is used for models 2 and 4.

Table 4 presents the estimation results from this OLS regression. The estimated coefficients of Firm Misvaluation and Sector Misvaluation are positive and statistically significant. These coefficients indicate that a REIT experiencing an overvaluation will obtain larger amounts of credit lines. This result is consistent with our above finding implying that overvalued REITs generally have easier access to debt.
If we consider misvaluation as a measure of information asymmetry, this finding is opposite to the result of An et al. (2012), which predicts that REITs with lower information asymmetry have a higher probability of access to bank credit lines. However, in an investigation of the impact of misvaluation on the likelihood of a REIT to obtain a bank credit line which is not reported here, we find the evidence supporting that overvalued REITs have a higher chance of access to bank credit. These finding can be explained as follows: Overvalued REITs may not need bank credit lines because they can meet their liquidity requirement by accumulating large amounts of cash, as discussed in Section 5.2, so the probability of an overvalued REIT having a credit line is lower. However, when an overvalued REIT has bank lines of credit, its total amount of bank credit lines will be larger than undervalued REITs, because overvalued REITs generally have easier access to debt. This finding may be due to the special regulatory environment of REITs and need to be settled by future research.

Borrowers having better cash flow have a higher possibility of receiving loans because financial institutions typically apply measures of cash flow to examine the repayment capacity of their customers. We find the positive relationship between the cash flow variables and Line of credit, which supports this proposition; however, these coefficients are not significant, except the coefficients of EBITDA/A in model 4. In addition, we also find the evidence supporting that larger REITs have greater total amount of credit lines.

5.4 Misvaluation and liquidity management

To meet short-term liquidity requirements, REITs use net cash provided by operations, existing cash balances, and bank credit lines. We investigate how misvaluation affects liquidity management, specifically the proportion of bank liquidity to total liquidity, by using the following model:

\[ \text{Total}_{it} = \beta_0 + \beta_1 \text{Mis}_{i,t} + \beta_2 \text{Inde}_{i,t} + \varepsilon_{i,t} \]

Here, the dependent variable, Total, is defined as the total amount of bank credit lines scaled by the sum of this amount and the amount of cash and cash equivalents. Firm Misvaluation and Sector Misvaluation in the DMM or Misvaluation in the RIM is used as the proxy of misvaluation which is denoted by Mis. Inde includes the other independent variables, specifically cash flow (EBITDA/A, Net Income) and Size.

The regression results are reported in Table 5. The estimated coefficients of Firm Misvaluation are negative and statistically significant at the 10% and 1% in models 1 and 2, respectively. This finding indicates that REITs with higher misvaluation will have lower bank credit line component in liquidity management than REITs with lower misvaluation. For instance, in model 1, the estimated coefficient of Firm Misvaluation, -0.01, indicates that if the market price of a REIT’s stock is higher 10% than the intrinsic value and all else equal, the total amount of credit lines scaled by the sum of total bank credit lines and cash and cash equivalent will decrease 0.1%.

The signs of the other independent variables are as expected and consistent with the results in previous sections. In particular, REITs having higher cash flow or larger size will hold less cash and have higher levels of credit lines capacity; therefore, their bank liquidity is greater than that of REITs with lower cash flow or smaller size.
In summary, we find the empirical evidence supporting that REITs with higher misvaluation will have lower bank credit line components in liquidity management than REITs with lower misvaluation.

6. Conclusion

This paper provides a comprehensive investigation of the effect of misvaluation in the REIT sector. In particular, we investigate whether misvaluation affects financing decisions and liquidity management policies of REITs. By using the decomposing market-to-book model and the residual income model to estimate misvaluation for 2,163 firm-year observations in the REIT sector from 1999 to 2015, we find empirical evidence proving that misvaluation has the effects on the financing decisions and liquidity management of REITs.

Regarding the financing decisions in the equity market, we find evidence supporting market timing behavior. Specifically, REITs experiencing a high appreciation of stock prices have a higher propensity to rely on equity issues, whose purpose could be to exploit the low cost of equity capital relative to other forms of capital. In the debt market, REITs are more likely to increase debt issuances or decrease debt retirements when their misvaluation is higher. Also, overvalued REITs have greater credit line availability. A potential explanation for this result is that overvalued REITs generally have easier access to debt. However, the questions of why REITs issue debt and why debt issues become more relevant for overvalued REITs need to be correctly settled by future research.

Finally, regarding the liquidity management policies, we find empirical evidence supporting that overvalued REITs use more cash than bank lines of credit for liquidity management because they can accumulate larger amounts of cash relative to undervalued firms.

References


D'Mello, R., & Shroff, P. K. (2000). Equity Undervaluation and Decisions Related to Repurchase Tender


Table 1: Summary statistics

<table>
<thead>
<tr>
<th></th>
<th>Model of financial decision</th>
<th>Model of cash holdings</th>
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<td>21.43</td>
<td>1.14</td>
<td>2,163</td>
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The table presents summary statistics for the sample from 1999 to 2015. Financial decisions is an indicator variable that captures the financing activities of REITs. This variable takes the value of 1 when a REIT issues equity, 2 when it repurchases equity, 3 when it issues debt, 4 when a REIT retires debt, 5 when it issues both equity and debt, 6 when the company issues debt and repurchases equity, 7 when it issues equity and repurchases debt, 8 when it repurchases both equity and debt, and 0 when a REIT does nothing. Cash is the cash and cash equivalent scaled by total assets. Line of credit is the total amount of bank credit lines. Total is the total bank credit lines scaled by the sum of total bank credit lines and cash and cash equivalent. Firm misvaluation which is obtained from the DMM expresses the discrepancy between the market value and the intrinsic value of a REIT at time t. Sector misvaluation takes the value from the DMM and reveals the discrepancy between the intrinsic value at time t and the long-run intrinsic value. Misvaluation expresses the natural logarithm of the discrepancy between the market value and the intrinsic value of a REIT’s equity at time t which is obtained from the RIM. PPE/A is property, plant and equipment scaled by total assets. EBITDA/A is earnings before interest, taxes, depreciation, and amortization scaled by total assets. Size is natural logarithm of total assets. 10-year T-Bill is the yields of 10-year government bond. Risk Premium is the difference between yields of 10-year and 1-year government bond. Net Income is the net income before extraordinary items scaled by total assets.
Figure 1: Financial decisions of REITs. This figure presents the percentage of nine financing activities of REITs.
Table 2: The financing decisions of REITs

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Panel B: Residual income model

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The table reports the result of the multinomial logistic model. The dependent variable is the financing events of a REIT. This variable takes the value 1 if a REIT issues equity, 2 if repurchases equity, 3 if issues debt, 4 if retires debt, 5 if issue both equity and debt, 6 if issues debt and repurchases equity, 7 if issues equity and retire debt, 8 if repurchases both equity and debt, and 0 if does nothing. The base option is 0. The definitions of variables are presented in Table 1.

*p<0.1; **p<0.05; ***p<0.01
Table 3: The cash holdings of REITs

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<th>Variables</th>
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<th>Residual income model</th>
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The table shows OLS regressions predicting REIT cash holdings. The first regression is for the decomposing market-to-book model (DMM) and the second is for the residual income model (RIM). The definitions of variables are presented in Table 1.

*p=0.1; **p=0.05; ***p=0.01
Table 4: The bank credit line access

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<th>Decomposing market-to-book</th>
<th>Residual income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td>Firm Misvaluation</td>
<td>70.10***</td>
<td>69.02***</td>
</tr>
<tr>
<td></td>
<td>(8.49)</td>
<td>(8.31)</td>
</tr>
<tr>
<td>Sector Misvaluation</td>
<td>42.30**</td>
<td>44.02**</td>
</tr>
<tr>
<td></td>
<td>(2.15)</td>
<td>(2.24)</td>
</tr>
<tr>
<td>Misvaluation</td>
<td>-0.01</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>(-0.05)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>Net Income</td>
<td>131.43</td>
<td>495.3</td>
</tr>
<tr>
<td></td>
<td>(0.42)</td>
<td>(1.47)</td>
</tr>
<tr>
<td>EBITDA/A</td>
<td>297.86</td>
<td>974.3***</td>
</tr>
<tr>
<td></td>
<td>(0.95)</td>
<td>(2.82)</td>
</tr>
<tr>
<td>Size</td>
<td>299.11***</td>
<td>298.95***</td>
</tr>
<tr>
<td></td>
<td>(35.68)</td>
<td>(35.79)</td>
</tr>
<tr>
<td>Constant</td>
<td>-6101.76***</td>
<td>-6117.66***</td>
</tr>
<tr>
<td></td>
<td>(-34.21)</td>
<td>(-34.13)</td>
</tr>
<tr>
<td>N</td>
<td>1973</td>
<td>1973</td>
</tr>
<tr>
<td>R²</td>
<td>43.66%</td>
<td>43.68%</td>
</tr>
</tbody>
</table>

The table reports OLS regressions. The dependent variable is Line of credit. The independent variables are misvaluation (Firm Misvaluation, Sector Misvaluation or Misvaluation), cash flow (EBITDA/A for model 1,3; Net Income for model 2, 4), and Size. The definitions of variables are presented in Table 1. *p=0.1; **p=0.05; ***p=0.01
Table 5: The liquidity management of REITs

<table>
<thead>
<tr>
<th></th>
<th>Decomposing market-to-book</th>
<th>Residual income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td>Firm Misvaluation</td>
<td>-0.01*</td>
<td>-0.02***</td>
</tr>
<tr>
<td></td>
<td>(-1.97)</td>
<td>(-4.30)</td>
</tr>
<tr>
<td>Sector Misvaluation</td>
<td>-0.01</td>
<td>-0.00</td>
</tr>
<tr>
<td></td>
<td>(-1.22)</td>
<td>(-0.15)</td>
</tr>
<tr>
<td>Misvaluation</td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.36)</td>
</tr>
<tr>
<td>Net Income</td>
<td>0.70***</td>
<td>0.68***</td>
</tr>
<tr>
<td></td>
<td>(3.65)</td>
<td>(2.88)</td>
</tr>
<tr>
<td>EBITDA/A</td>
<td>2.71***</td>
<td>2.52***</td>
</tr>
<tr>
<td></td>
<td>(14.08)</td>
<td>(10.51)</td>
</tr>
<tr>
<td>Size</td>
<td>0.03***</td>
<td>0.03***</td>
</tr>
<tr>
<td></td>
<td>(5.59)</td>
<td>(5.70)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.21*</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>(1.92)</td>
<td>(0.36)</td>
</tr>
<tr>
<td>N</td>
<td>1,888</td>
<td>1,888</td>
</tr>
<tr>
<td></td>
<td>1,188</td>
<td>1,188</td>
</tr>
<tr>
<td>$R^2$</td>
<td>2.16%</td>
<td>10.67%</td>
</tr>
<tr>
<td></td>
<td>0.49%</td>
<td>8.57%</td>
</tr>
</tbody>
</table>

The table reports OLS regressions that examine how a REIT uses lines of credit and cash for liquidity management. The dependent variable is Total. The independent variables are misvaluation (Firm Misvaluation, Sector Misvaluation or Misvaluation), cash flow (EBITDA/A for model 1, 3; Net Income for model 2, 4), and Size. The definitions of variables are presented in Table 1.

*p=0.1; **p=0.05; ***p=0.01