Cash flow uncertainty and IPO underpricing: Evidence from Thai REITs

by

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This version: 27th May 2020

ABSTRACT

REIT IPOs in Thailand are less underpriced than stock IPOs (2.45% compared to 23.0%), which is a common finding across many international markets (Chan, Chen and Wang, 2013). One of the most common explanations for IPO underpricing is adverse selection arising from information asymmetry. However, research in IPO tends not to investigate this issue directly due to the difficulty in estimating ex-ante uncertainty. REITs provide a unique research setting because some REITs enjoy income guarantee, which can reduce cash flow uncertainty. We find that REITs with income guarantee are much less underpriced on average, corroborating the linkage between cash flow uncertainty and IPO underpricing. We confirm that REITs with income guarantee tend to have lower systematic risk (measured by CAPM beta) and returns, making the nature of some REITs more debt-like than equity-like.

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1. Introduction

One of the most studied aspects of initial public offerings (IPOs) is how price is formed and determined. It is widely documented that IPOs tend to be underpriced,[1] which seems difficult to rationalize at first as it suggests that issuers willingly leave money on the table. To provide the readers with some context, Ritter (2020) find that the 8,610 IPOs in the U.S. between 1980 and 2019 are underpriced on average by 18%, representing more than USD 172 billion left on the table from the aggregate USD 937 billion raised. While there are many potential reasons behind this phenomenon, the leading explanations are centered around information asymmetry, particularly adverse selection in the spirit of Akerlof (1970) and Leland and Pyle (1977). The central idea behind adverse selection is that uncertainty in asset quality can lead to an equilibrium outcome where issuers (sellers) intentionally price their assets below their fundamental value. The two main aspects of uncertainty that affect value are cash flow and discount rate (risk), but this issue remains little-studied because of the difficulty in estimating ex-ante uncertainty.[2]

In this article, we investigate the relationship between cash flow uncertainty and IPO underpricing through IPOs of real estate investment trusts (REITs). Similar to stocks, REITs are publicly traded companies that own or operate real estate-related investment opportunities[3] and also undergo the IPO process. While REIT future cash flows are also uncertain, investment restrictions make their uncertainly lower than stocks. In fact, studies of REIT IPOs find that the degree of underpricing is considerably less. Compared to the double digit average initial returns of stock IPOs, REIT IPOs are always single digit: Buttimer et al. (2005) find 2.47% for U.S. REITs and Chan, Chen and Wong (2013) find 3.24% for international REITs. One aspect of Thai REITs that makes them a unique setting for our research topic is that 60% of REIT issuers offer some form of guarantee (for example, minimum revenue/occupancy guarantee or sale-and-leaseback with guaranteed income over a fixed period), which effectively mitigate concerns over adverse selection. In other words, the income guarantee provides an ex-ante measure to delineate IPOs based on future cash flow uncertainty.

We find that REIT IPOs where issuers offer income guarantee experience substantially less underpricing by as much as 9% lower in our three-stage least square regression that addresses potential endogeneity concerns by estimation of simultaneous equations. We further investigate the risk and return profile of REITs with and without income guarantee and find that REITs with guarantee have significantly lower systematic risk, with some appearing more debt-like than equity-like. To our knowledge, our article is the first to use income guarantee as an ex-ante measure of cash flow uncertainty and explicitly investigates its linkage to IPO underpricing. Our result contributes to the relatively scant literature on IPO underpricing and uncertainty (for example,

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[1] See Ljungquist (2007) for a comprehensive review on IPO underpricing.
[2] Financial research tends to rely on market-based measures such as volatility as estimates of uncertainty (for example, Ang et al., 2006). Variability in accounting ratios such as ROA can also be used to proxy for cash flow uncertainty (for example, Chay and Suh, 2009), but such information tends to be more limited for pre-IPO firms.
[3] Compared to stocks, there are restrictions such as permissible investments, leverage limits and payout policy that make REITs more restrictive, but in return, they enjoy income tax privileges.

Lowry, Officer and Schwert, 2010) and the growing literature on REIT IPOs in Asia (for example, Wong, Ong and Ooi, 2013; Ooi, Mori and Wong, 2019).

The rest of this article is organized as follows. In the next section, we review research related to REIT IPOs and cash flow uncertainty and hypothesize our main prediction. In Section 3, we provide a brief background on Thai REITs to provide the familiarize the readers. Data sources, sample construction strategy, as well as empirical methodology are described in Section 4. We present our main result in Section 5 and further investigate the influence of income guarantee on REIT risk and return in Section 6. Section 7 concludes our article.

2. Literature Review and Research Hypotheses

As IPOs are essentially partial sales of assets, information asymmetry plays an important role in their pricing. The adverse selection problem that arises from uncertainty in asset quality, documented in the influential article by Akerlof (1970) and is the central idea behind many economic transactions such as auction, insurance and financial intermediation, is one of the most popular explanations behind IPO underpricing. In adverse selection-based models (for example, Rock, 1986; Allen and Faulhaber, 1989; Welch, 1989), issuers price IPOs below their fundamental value to increase the success of the transaction, either as compensation for gathering private information or signal firm quality. Issuers can also use ownership retention as a signal of quality independently (Leland and Pyle, 1977) or jointly with underpricing (Grinblatt and Hwang, 1989). The distinction between the informed and uninformed (insiders and outsiders) highlights underwriters' important role in bridging the asymmetry and hence the influence of underwriter's reputation on underpricing (Beatty and Ritter, 1986). In the book-building process, lead underwriters can reward institutional investors for their information production in the form of underpriced allocation (Benveniste and Spindt, 1989; Sherman, 2000; Sherman and Titman, 2002), so institutional investors' participation can be positively related to underpricing.

Empirically, underpricing in REIT IPOs tends to be significantly lower than stock IPOs. For U.S. REIT IPOs, Buttimer et al. (2005) find average initial returns (which is a proxy for underpricing) of only 2.47%. Chan, Chen and Wang (2013) examine 370 REIT IPOs in 14 countries across 4 continents and find average initial returns of 3.24%, and the result is similar for Australia and Asian REITs compared to and North American REITs, while European IPOs tend to be more underpriced. However, compared to stock IPOs, the difference in magnitude is significant: for U.S. IPOs between 1980 and 2019, the average initial return is 18% (Ritter, 2020). Chan, Chen and Wang (2013) conjecture that the finding may be due the fund-like nature of REITs and the redeployability of real estate assets, but their statistical tests rely on REIT characteristics that vary at country level.[4] Subsequent studies of Asian REIT IPOs more closely examine the reasons behind underpricing. Wong, Ong and Ooi (2013) and Ooi, Mori and Wong (2019) find

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[4] Weiss (1989) and Peavy (1990) document that the average initial return of closed-end fund IPOSs is not significantly different for zero, which supports the information symmetry hypothesis as there is little uncertainty in the value of the underlying assets. In stock IPOs, investors must value the firms, but in closed-end fund IPOs, the value of the underlying assets can be observed.

that sponsor ownership is positively related to underpricing, consistent with the prediction of the signaling model by Grinblatt and Hwang (1989).[5]

The key idea behind adverse selection and underpricing is that firms/assets are difficult to value by outsiders, but few studies directly examine the relationship between this uncertainty and underpricing. Because ex-ante uncertainty is difficult to estimate, studies of underpricing tend to address this issue by employing fixed effects, usually technology companies for stock IPOs and property-type fixed effects for REIT IPOs. In an article that more specifically investigates this issue, Lowry, Officer and Schwert (2010) find that volatility of initial returns can proxy for degree of information asymmetry and uncertainty, but the measure is based on ex-post market data and does not relate explicitly to firm characteristic. The two main sources of uncertainty relevant to valuation are cash flow uncertainty and discount rate uncertainty, which are often investigated in the context of asset pricing. In the context of corporate finance, cash flow uncertainty is often investigated as determinants of financial policies, such as capital structure (Keefe and Yaghoubi, 2016), cash holding (Han and Qiu, 2007) and dividend payout (Chay and Suh, 2009). Studies of REITs tend to have similar focus; for example, Bradley, Capozza and Seguin (1998) document the role of expected cash flow volatility on REIT dividend policy.

In this article, we explicitly investigate the relationship between the nature of REIT cash flow on underpricing. The establishment of REITs involve acquisition of real estate assets (often from REIT sponsors) on either leasehold or freehold basis. In many instances, sponsors offer guarantees, for example, minimum revenue/EBITDA, minimum rent and/or occupancy, minimum operating income, sale-and-leaseback with guaranteed income and fixed rental over a specific period. These guarantees (we refer to them collectively as "income guarantee") help mitigate concerns over future cash flow uncertainty, especially for assets with unproven track record and/or riskier exposure from the shorter lease period. We hypothesize that underpricing is negatively associated with income guarantee.

3. Background on Property Funds and REITs in Thailand

In Thailand, fund-based investment in real estate assets first took the form of investment fund named Property Fund for Public Offering Type I (PFPO), also referred to as Property Fund (PF). PFs were introduced in 2003 as a recovery vehicle for distressed properties from the fallout of the 1997 Asian Financial Crisis. However, it was not until 2005 that PFs became a regular part of the Thai capital market with continued issuance. PFs have legal status of juristic person are regulated like mutual funds under the Securities and Exchange Act of 1992 and thus are managed by the same asset management companies that manage mutual funds. Compared to international REITs, PFs in Thailand are more restricted in terms of investment opportunities and use of leverage. Recognizing this limitation, the Securities and Exchange Commission introduced REITs in 2012 to conform to international standards. Thai REIT is established under the Trusts for Transaction in the Capital Market Act of 2007 and largely modeled based on Singapore REIT. Beginning 2014, REITs replace PFs in Thailand; while existing PFs are allowed to trade on the

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[5] Sponsor ownership (retention) can also affect subsequent operating performance, as documented by Tang and Mori (2017).

Stock Exchange of Thailand, they will not be allowed to raise additional capital unless they convert to REITs. As of December 2019, 5 PFs have converted to REITs.

Aside from their different legal forms, REITs enjoy a broadened range of investment opportunities as well as more liberal use of leverage. A REIT can use debt up to 35% of total assets, or 60% if its issuer rating is investment grade, a significant increase from the PF limit of 10%. While the permissible investment universe of PFs is restricted to prespecified types and the property must be 80% constructed when added to the fund, REITs are allowed to invest in any type of real estate assets that yield rental income and permit greenfield developments and international properties, making them more like operating companies. However, in practice, REITs in Thailand act more like investors than developers as they tend acquire completed assets, often from their sponsors, and the main difference between PFs and REITs lies in their use of leverage. Of the 47 PFs in the sample, only uses debt at IPO, while 18 out of 19 REITs are levered with average debt to total assets ratio of 22.9%.

While PFs are managed by asset management companies that predominantly manage mutual funds, REITs are managed by REIT managers, who are formally required by the SEC to have professional real estate management experience. REITs can be externally managed, but in practice, most REIT managers in Thailand are wholly owned subsidiaries of the sponsors, making the majority of REITs in Thailand captive. The REIT structure also allows sponsors to hold up to 50% of trust units, compared to one-third allowed under the PF structure. Both PFs and REITs are required to have trustees, who tend to be also be asset management companies.

4. Data and Methodology

4.1 Data and sample

We obtain data on PFs and REITs IPOs between January 2005 and December 2019 from the Stock Exchange of Thailand (SET). During the period, there are 73 IPOs, but 5 are relisted conversions of existing PFs to REITs, which we exclude from our analysis. We also drop the PF whose underlying asset is an airport due to its uniqueness. We supplement the listing data with stock returns data from Refinitiv Datastream for our analysis of IPO returns. Additional information on sponsors, underwriters, investors and underlying properties are manually gathered from IPO prospectuses and annual reports. After this screening, our final data set contains 66 IPOs, with 47 PFs and 19 REITs. Because of their practical similarities, in this article we collectively refer to both PFs and REITs are REITs for brevity.[6]

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[6] Previous studies that examine Thai "REITs" in comparison with other countries involve periods where REITs technically do not exist yet in Thailand. For example, the sample period of Thai REITs in Chan, Chen and Wang (2013) is 2003 to 2010. Of the 29 IPOs, they find average initial returns of 0.84%. For this reason, we collectively refer to both PFs and REITs as REITs in this study. In studies of stock IPOs, researchers tend to include the percentage price adjustment from the initial filing price range to the final offer price following the finding of Hanley (1993). However, due to their origin as mutual fund-like investments, REITs in Thailand are almost always issued at THB 10 per unit, which is also the standard for mutual fund IPOs.

We obtain the identity of REIT sponsor from the IPO prospectuses,[7] and sponsors who are part of a conglomerate are identified at the group level – that is, if 2 REITs are sponsored by different companies that belong to the same conglomerate, we classify them as having the same sponsor. As REITs trade on SET, ownership information must be periodically disclosed. We collect the information from the SETSMART database which is maintained by SET, and all information is within 6 months from IPO date. Banks, mutual funds, government-sponsored pension funds and insurance companies are defined as institutional shareholders.

Table 1 about here

Table 1 shows the distribution of IPOs and total proceeds during the sample period. We compare the IPOs of stocks listed in SET to REITs. While the proceeds of REITs tend to be larger on average, it is important to note that in REIT IPOs, the proceeds represent the "firm" size, as sponsors will also subscribe to the offering. For stock IPOs, however, proceeds refer to the external capital raised. The average retention ratio for Thai listings is 25%, so firm size is approximately 4 times the proceeds. Similar to international findings, the average initial return of REITs is substantially lower than those of stocks, at 2.45% compared to 23.0%.

4.2 Methodology

In this article, we investigate the influence of income guarantee on underpricing. The literature on IPO underpricing is built on the OLS regression of initial returns (IR) and their determinants. Our main variable of interest, income guarantee (GUARANTEE) is a dummy variable which takes value of 1 for IPO where the underlying assets receive some form of guarantee described in Section 2. Motivated by the findings of Wong, Ong and Ooi (2013) and Ooi, Mori and Wong (2019), we include the following control variables: sponsor retention, measured in natural log (S_RETENTION); sponsor reputation, proxied by whether sponsor is listed (S_REPUTATION); issue size, measured in natural log (IPO_SIZE); underwriter reputation, defined by the share of total IPO proceeds for a given underwriter (U_REPUTATION); stock market volatility from day 2 to day 60 after IPO (STOCK_VOL); first IPO of a given property type in the market (FIRST); cumulative IPOs done by the same sponsor (MARKET_LEARNING); property-type fixed effects (P_INDUSTRIAL, P_RESIDENTIAL, P_COMMERCIAL; omitted category is office); shares held by institutional investors, measured in natural log (INSTITUTIONAL); and 15-day lag market returns prior to IPO (LAG_MKT_RETURN). Descriptive statistics of variables used is reported in Table 2.

Table 2 about here

In our baseline analysis, we regress the standard underpricing equation using OLS with robust standard errors as specified in Equation 1. Based on our hypothesis, we expect the coefficient β_1 to be negative.

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[7] The majority of REITs in Thailand are captive, which is common in Asian REITs as noted by Tang and Mori (2017), and their sponsors can be directly inferred from either the REIT name or the underlying properties. Sponsors are generally previous owners of the assets purchased by REITs. During the sample period, there are only 2 independent REITs.

$$IR = \alpha + \beta_1 GUARANTEE + \beta_2 S\_RETENTION + \beta_3 S\_REPUTATION + \beta_4 IPO\_SIZE \quad (1)$$
$$+ \beta_5 U\_REPUTATION + \beta_6 STOCK\_VOL + \beta_7 FIRST$$
$$+ \beta_8 MARKET\_LEARNING + \beta_9 P\_INDUSTRIAL$$
$$+ \beta_{10} P\_RESIDENTIAL + \beta_{11} P\_COMMERCIAL + \beta_{12} INSTITUTIONAL$$
$$+ \beta_{13} LAG\_MKT\_RETURN + \varepsilon$$

We also employ a more rigorous analysis to examine the influence of income guarantee on underpricing. Grinblatt and Hwang (1989) show that underpricing and sponsor retention can be a joint decision in response to information asymmetry. Following Wong, Ong and Ooi (2013), we use simultaneous equations to jointly estimate IR and S_RETENTION, but we use the three-stage least square (3SLS) method rather than two-stage least square often used in the literature as it can lead to improved efficiency in over-identified equations (Zellner and Theil, 1962). In this simultaneous equation version, the underpricing equation remains the same as Equation 1, and the sponsor retention equation follows the specification of Equation 2.

$$S\_OWNERSHIP \quad (2)$$
$$= \gamma + \gamma_1 IR + \gamma_2 STOCK\_VOL + \gamma_3 P\_INDUSTRIAL$$
$$+ \gamma_4 P\_RESIDENTIAL + \gamma_5 P\_COMMERCIAL + \gamma_6 INSTITUTIONAL$$
$$+ \gamma_7 DEVELOPER + \gamma_8 REIT\_SIZE + \gamma_9 TOBIN\_Q + \varepsilon$$

In Equation 2, additional explanatory variables are introduced. First, we add a dummy variable for whether the sponsor is a sponsor (DEVELOPER), which is motivated by the idea that developer sponsors are more susceptible to agency issues post-IPO and may decide to hold more shares in the REIT to alleviate investors' concerns. Second, we include the natural log of REIT market capitalization at issue (REIT_SIZE), as Wong, Ong and Ooi (2013) find that in Asia, large REITs tend to have large sponsors that take concentrated positions. Third, we add Tobin's q (TOBIN_Q), calculated as the sum of REIT market capitalization and debt divided by book value of total assets, as sponsors may be more likely to retain ownership in assets with high growth opportunities.

5. Cash Flow Uncertainty and IPO Initial Returns

5.1 Univariate Analysis

We first begin this section with a univariate analysis of initial returns. In Panel A of Table 2, the average initial returns is reported by property type. While the overall average initial returns across the 66 IPOs is 2.45% and statistically significant at 5% level, only the average initial returns of commercial properties (mostly shopping malls) is statistically significant at 10% level, and none of the other property types is statistically different from zero. This result indicates that there is significant variation in the degree of underpricing even within property type, so in Panel B we further separate the IPOs by whether they contain income guarantee. We compute the differences in the average initial returns and report the associated p-values. Across all property types, the average initial returns of IPOs with income guarantee is lower and statistically significant at 5% level. The result is most pronounced for offices IPOs at more than 18%. For residential IPOs, we

cannot compute the p-value because there is only 1 IPO with no income guarantee, so we do not report the difference. In fact, IPOs with income guarantee have negative average initial returns. However, while one may be tempted to conclude that these IPOs are overpriced, the average initial returns of -0.92% is statistically insignificant, hence no evidence of overpricing or underpricing.

Table 3 about here

The result suggests that income guarantee may be in part related to the nature of the underlying properties: for example, residential properties (serviced apartments, condominiums, hotels) tend to have shorter income duration (days or weeks rather than years), so their innate cash flow uncertainty tends to be higher, making guarantees more valuable. To see this, we manually examine the IPO prospectuses and compute the average lease length (incorporating all forms of guarantee) of properties held by each REIT. For residential properties, the average lease length is 11.3 years, the highest of the 4 property types. Commercial properties have the second longest average lease length of 8.1 year despite no guarantee, followed by industry properties at 6.1 years and offices at 4.7 years. In other words, the average initial returns by property type seems to be positively related to average lease length, with the exception of commercial properties, most likely due to the more uncertain nature of commercial leases, as failed tenants can terminate leases prior to expiry, so they are still vulnerable to cash flow uncertainty. Consequently, in the multivariate analysis, we include property-type fixed effects to account for this relationship.

5.2 Multivariate Analysis

First, we begin with the OLS underpricing regression commonly used in the IPO literature. Column 1 of Table 4 reports the baseline result without GUARANTEE. In this analysis, the only variable that is statistically significant is U_REPUTATION, which is positive, contrary to the theoretical prediction of Carter and Manaster (1990) that prestigious underwriters have lower risk offerings and hence require lower underpricing, which is also documented in Asian REITs by Wang, Ong and Ooi (2013).[8] In the context of Thailand, this could represent the bargaining power that underwriters have over issuers, as there are only 15 unique underwriters during the sample period, compared to 43 for stock IPOs. Some variables (e.g. STOCK_VOL, INSTITUTIONAL and LAG_MKT_RETURNS) have signs that are inconsistent with previous studies of Asian REITs (e.g. Wang, Ong and Ooi, 2013; Ooi, Mori and Wong, 2019) but are not statistically significant.

In Column 2, we add our main variable of interest, GUARANTEE. The estimated coefficient is 12.5%, much larger than the earlier univariate result of 8.5%, and statistically significant at 1 percent level. The coefficients of other determinants of underpricing remain directionally the same, but U_REPUTATION is lower and less statistically important, while STOCK_VOL is now statistically significant at 10% level. The addition of GUARANTEE

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[8] Loughran and Ritter (2004) find that IPOs with top-tier underwriters during the Internet bubble (1999 to 2000) tend to be more overpriced, which they argue could be caused by issuers paying for analysis coverage indirectly through underpricing and co-opted executives of issuing firms benefitting from allocation of underpriced IPOs. At this stage, we do not draw any conclusion until we examine the 3SLS result which follows.

increases R-squared from 0.253 to 0.430, highlighting its importance to how investors view the IPO.

Table 4 about here

The endogeneity of S_RETENTION is an important issue in how issuers and underwriters respond to potential adverse selection problem, so we confirm our result by jointly estimating the simultaneous equations of IR and S_RETENTION using 3SLS and report the result of the underwriting equation in Column 3 and the sponsor retention equation in Column 4.[9] We first begin with the sponsor retention equation. On average, sponsors of larger REITs tend to retain greater ownership, consistent with other Asian REITs studied by Wang, Ong and Ooi (2013). In addition, REITs issued during periods with high stock market volatility tend to have greater sponsor retention. This finding is consistent with Lowry, Officer and Schwert (2010), who relate volatility with cash flow uncertainty, making retention an important strategic signal to investors. Tobin's q, which can be viewed as a proxy for investment opportunity, is positively related to sponsor retention as we hypothesized. However, unlike the finding of Wang, Ong and Ooi (2013), developers who are sponsors do not behave differently compared to other sponsors with respect to retention.

Column 3 contains our main result: using simultaneous equations estimated by 3SLS, we confirm that the relationship between GUARANTEE and IR is still negative and statistically significant at 1% level; however, the magnitude of the coefficient is reduced from 12.5% to 9.3%. This result highlights the finding of Grinblatt and Hwang (1989) that underpricing and sponsor retention are issuers' joint responses to information asymmetry. In the 3SLS version, the directions of the determinants' coefficients are largely unchanged, but several variables are now statistically significant. S_RETENTION, whose direction is consistent with theoretical prediction and previous findings in Asian REITs, is now statistically significant at 1 percent level. The 3SLS coefficient is significantly increased compared to the OLS coefficient, similar to Ooi, Mori and Wang (2019). The influence of IPO_SIZE is negative and statistically significant, although at 10 percent level, while MARKET_LEARNING is positive. Ooi, Mori and Wang (2019) posit that "experience" discount may represent a compensation for potential agency costs that the newly listed REIT faces, as the more REITs a sponsor owns, the more competition for future property acquisition there is. In our sample, 23 of 66 REIT IPOs are conducted by experienced sponsors, and the maximum number of REITs that a sponsor has issued is 6. One key difference compared to previous studies in our analysis is that STOCK_VOL, which measures the standard deviation of stock market returns on day 2 to 60 after REIT IPO, is negative and statistically significant at 1% level. Wang, Ong and Ooi (2013) find positive relationship between this stock volatility and underpricing and explain this as the risk-return tradeoff. However, our negative relationship may be related to the empirical finding that firms tend to conduct IPOs when stock market valuations are high, which tend to be when market returns and volatility are low. Bouis (2009) find that during those periods, firms tend to go public faster. It is possible that REIT IPOs in Thailand compete with stock IPOs

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[9] We do not report R-squared because the statistic is not meaningful in the context of 3SLS.

for investors' capital, and hence issuers must offer some underpricing when stock IPO activity is high.

In sum, our result highlights the importance of asymmetric information in IPO activities, and how income guarantee that reduce cash flow uncertainty can reduce underpricing. One natural question that arises is that does income guarantee affect the risk of REITs? We explore the implication of income guarantee in the next section.

6. Cash Flow Uncertainty, Income Guarantee and Systematic Risk

First, we begin by examining the systematic risk and return of REITs by property type. We estimate the CAPM beta by regressing REIT total return on the value-weighted total return of all listed stocks (our definition of "market") over 100 days, 1 year and 3 years horizon using stock returns data up to April 2020. IPOs that do not have sufficient data to estimate beta for the whole estimation window are excluded: consequently, we only have 65 REITs for the 1-year and 58 for the 3-year windows. The average of the estimated betas by property type is reported in Panel A of Table 5. Consistent with our discussion in Section 5.1, residential properties have the lowest beta, followed by industrial, office and commercial. The magnitude across property types is similar over time, with the exception of the 100-day beta for residential properties, as they are more popular in early sample period where REITs tend to be more thinly traded, so their inactivity likely leads to low variability. This table demonstrates how cash flow uncertainty for different property types is related to their post-IPO systematic risk.

Table 5 about here

Next, we examine post-IPO returns, measured as the cumulative buy-and-hold return (RET) and the market-adjusted buy-and-hold abnormal return (BHAR) over the 3 holding periods. The results are reported in Panel B and Panel C respectively. The ranking of returns resembles the ranking of beta, with commercial properties delivering the highest cumulative returns on average. BHAR is negative across all horizons and property types, reflecting the innate differences in risk exposure of investing in real estate (as their betas are substantially less than 1) versus general equity used as benchmark in this BHAR analysis.

Table 6 about here

In Panel A of Table 6, we conduct similar analyses of risk and return for all IPOs, separated by REITs with and without income guarantee. REITs with income guarantee tend to have lower systematic risk, which is also reflected in their lower returns. The difference in beta is approximately 50% (0.1 for guaranteed income REITs compared to 0.2 of non-guaranteed) with statistical significance of at least 5% across all horizons. Because variation in GUARANTEE is the most meaningful for industrial and office properties, we report the results for the two property types in Panel B and Panel C respectively. For industrial properties, the difference in beta is not meaningful, but for offices, the difference is substantial: REITs with income guarantee behave almost like fixed income investments with beta close to zero. The result in this section gives us further confidence in the relationship between income guarantee and cash flow uncertainty.

7. Conclusion

This article examines the relationship between cash flow uncertainty and IPO underpricing. Because investment restriction that limits the potential complexity in future cash flow and income guarantees provided by issuers, REITs offer a unique setting to test this relationship. Analysis of 66 REIT IPOs between 2005 and 2019 in Thailand shows that REIT IPOs are substantially less underpriced, at 2.45% compared to 23% for stock IPOs, consistent with international findings (for example, Buttimer, et al., 2005; Chan, Chen and Wong, 2013; Wong, Ong and Ooi, 2013; Ooi, Mori and Wong, 2019). We make two main contributions. First, we find that underpricing is related to the nature of the underlying cash flow, specifically by both property types and whether issuer offers income guarantee. Our finding corroborates the linkage between cash flow uncertainty and IPO underpricing, a direct implication of adverse selection which is not well-studied in the literature. Second, we study the risk-return profiles of REITs by property type and income guarantee and find that they are reflective of nature of the underlying cash flows: some REITs are more debt-like, while others more equity-like. Our result highlights the need for market participants to not generalize REITs by their property-type classification and carefully study the prospectuses for what their real exposures are.

References

Allen, F., & Faulhaber, G. R. (1989). Signaling by underpricing in the IPO market. *Journal of Financial Economics*, 23(2), 303-323.

Ang, A., Hodrick, R. J., Xing, Y., & Zhang, X. (2006). The cross-section of volatility and expected returns. *The Journal of Finance*, 61(1), 259-299.

Beatty, R. P., & Ritter, J. R. (1986). Investment Banking, Reputation, and the Underpricing of Initial Public Offerings. *Journal of Financial Economics*, 15(1-2), 213-232.

Benveniste, L. M., & Spindt, P. A. (1989). How Investment Bankers Determine the Offer Price and Allocation of New Issues. *Journal of Financial Economics*, 24(2), 343-361.

Bouis, R. (2009). The short-term timing of initial public offerings. *Journal of Corporate Finance*, 15(5), 587-601.

Bradley, M., Capozza, D. R., & Seguin, P. J. (1998). Dividend policy and cash-flow uncertainty. *Real Estate Economics*, 26(4), 555-580.

Buttimer, R. J., Hyland, D. C., & Sanders, A. B. (2005). REITs, IPO waves and long-run performance. *Real Estate Economics*, 33(1), 51-87.

Carter, R., & Manaster, S. (1990). Initial public offerings and underwriter reputation. *The Journal of Finance*, 45(4), 1045-1067.

Chan, S. H., Chen, J., & Wang, K. (2013). Are REIT IPOs unique? The global evidence. *The Journal of Real Estate Finance and Economics*, 47(4), 719-759.

Chay, J. B., & Suh, J. (2009). Payout policy and cash-flow uncertainty. *Journal of Financial Economics*, 93(1), 88-107.

Grinblatt, M., & Hwang, C. Y. (1989). Signalling and the pricing of new issues. *The Journal of Finance*, 44(2), 393-420.

Han, S., & Qiu, J. (2007). Corporate precautionary cash holdings. *Journal of Corporate Finance*, 13(1), 43-57.

Hanley, K. W. (1993). The underpricing of initial public offerings and the partial adjustment phenomenon. *Journal of Financial Economics*, 34(2), 231-250.

Keefe, M. O. C., & Yaghoubi, M. (2016). The influence of cash flow volatility on capital structure and the use of debt of different maturities. *Journal of Corporate Finance*, 38, 18-36.

Leland, H. E., & Pyle, D. H. (1977). Informational asymmetries, financial structure, and financial intermediation. *The Journal of Finance*, 32(2), 371-387.

Ljungqvist, A. (2007). IPO underpricing. In Handbook of Empirical Corporate Finance (pp. 375-422). Elsevier.

Loughran, T. & J. Ritter. (2004). Why has IPO underpricing changed over time?. *Financial Management*, 5-37.

Lowry, M., Officer, M. S., & Schwert, G. W. (2010). The variability of IPO initial returns. *The Journal of Finance*, 65(2), 425-465.

Ooi, J. T., Mori, M., & Wong, W. C. (2019). Rationale behind IPO underpricing: evidence from Asian REIT IPOs. *Real Estate Economics*, 47(1), 104-137.

Peavy III, J. W. (1990). Returns on initial public offerings of closed-end funds. *The Review of Financial Studies*, 3(4), 695-708.

Ratcliffe, C., Dimovski, B., Keneley, M., & Salzman, S. (2020). Dividend disclosure and post-performance of REIT IPOs. *Journal of Property Research*, 1-13.

Ritter, J. R. (2020). IPO Statistics for 2019 and Earlier Years. https://site.warrington.ufl.edu/ritter/ipo-data/

Rock, K. (1986). Why New Issues Are Underpriced. *Journal of Financial Economics*, 15(1-2), 187-212.

Sherman, A. E. (2000). IPOs and Long-Term Relationships: An Advantage of Book Building. *Review of Financial Studies*, 13(3), 697-714.

Sherman, A. E., & Titman, S. (2002). Building the IPO Order Book: Underpricing and Participation Limits with Costly Information. *Journal of Financial Economics*, 65(1), 3-29.

Tang, C. K., & Mori, M. (2017). Sponsor Ownership in Asian REITs. *The Journal of Real Estate Finance and Economics*, 55(3), 265-287.

Weiss, Kathleen W. (1989). The post-offering performance of closed-end funds, *Financial Management* 18(3), 57-67

Welch, I. (1989). Seasoned offerings, imitation costs, and the underpricing of initial public offerings. *The Journal of Finance*, 44(2), 421-449.

Wong, W. C., Ong, S. E., & Ooi, J. T. (2013). Sponsor backing in Asian REIT IPOs. *The Journal of Real Estate Finance and Economics*, 46(2), 299-320.

Zellner, A. & H. Theil. (1962) Three-Stage Least Squares: Simultaneous Estimation of Simultaneous Equations. *Econometrica*, 30 (1962), pp. 54-78.

Table 1: IPO Activities in Thailand
This table reports the descriptive statistics for IPOs in Thailand by listing year for Property Funds (PFs) and REITs, and stocks. In Thailand, there are two equity markets: The Stock Exchange of Thailand (SET), which is the main market and Market for Alternative Investment (mai), intended for smaller businesses. PFs and REITs are listed in the main market, so we only report IPO activities in the main market for comparison. IPO data from January 2005 to December 2019 is obtained from the Stock Exchange of Thailand's website. Initial returns are calculated as the percentage change from offer price to the end-of-day price.

Year	Property Funds and REITs			Stocks		
	Initial Returns	Proceeds (USD mn)	Number of IPOs	Initial Returns	Proceeds (USD mn)	Number of IPOs
2005	2.80	387.7	5	10.64	757.2	35
2006	0.75	354.5	2	1.47	967.8	12
2007	-0.33	148.8	3	26.42	312.6	6
2008	-1.20	307.4	5	2.18	563.8	8
2009	-8.00	113.1	3	5.64	143.1	6
2010	8.25	189.3	4	27.60	189.5	4
2011	0.58	444.6	6	8.80	124.0	3
2012	7.47	1,063.3	6	69.38	549.8	8
2013	-2.16	677.9	6	19.67	1,002.9	13
2014	-0.38	1,858.8	9	45.26	1,335.0	16
2015	0.75	429.4	6	44.46	1,040.6	20
2016	24.00	549.5	3	41.21	761.7	10
2017	2.83	306.4	3	22.70	2,469.5	21
2018	7.67	327.4	3	4.11	649.5	7
2019	2.00	234.0	2	5.58	2,259.4	11
All	2.45	7,392.1	66	23.00	13,126.2	180

Table 2: Descriptive Statistics

This table reports the descriptive statistics for the 66 Thai REIT IPOs between January 2005 and December 2019. Information on shares ownership is obtained from the SETSMART database which is maintained by SET, and all information is within 6 months from IPO date. Sponsors are identified from IPO prospectuses and are generally previous owners of the assets purchased by REITs. Banks, mutual funds, government-sponsored pension funds and insurance companies are defined as institutional shareholders. Issue size is originally reported in THB million and is converted to USD using daily THB/USD exchange rated retrieved from the Bank of Thailand's website. Stock market returns and volatility are calculated based on daily, value-weighted average total returns of all stocks listed in the Stock Exchange of Thailand (SET) and the Market for Alternative Investment (mai). Returns data are obtained from Refinitiv Datastream. Many REITs offer some forms of guarantee, for example, minimum revenue/EBITDA, minimum rent and/or occupancy, minimum operating income, sale-and-leaseback with guaranteed income and fixed rental over a specific period. We collectively refer to all guarantees as "income guarantee" in this study.

Variable	Mean	Median	SD	Min	Max	Obs
Initial returns	2.45	0.50	9.45	-30.00	45.00	66
REIT contains income guarantee (0, 1)	0.61	1	0.49	0	1	66
Proportion retained by sponsors (%)	21.49	20.00	14.09	0.00	65.08	66
Sponsor is a listed company (0, 1)	0.62	1	0.49	0	1	66
Issue size (USD million)	112.00	69.21	132.43	12.34	805.80	66
Underwriter market share (%)	14.70	9.41	12.58	0.87	38.37	66
Stock market volatility on day 2 to 60 (%)	1.06	1.01	0.52	0.30	2.98	66
First property type in market (0, 1)	0.12	0	0.33	0	1	66
Cumulative count of REIT IPOs by sponsor	1.70	1	1.19	1	6	66
Industrial property (0, 1)	0.26	0	0.44	0	1	66
Residential property (0, 1)	0.36	0	0.48	0	1	66
Commercial property (0, 1)	0.14	0	0.35	0	1	66
Proportion held by institutional investors (%)	25.95	25.47	19.07	0.00	75.00	66
Cumulative stock market returns 15 days prior to IPO (%)	1.52	2.07	5.24	-25.78	12.39	66

Table 3: Initial Returns and Income Guarantee

This table reports the initial returns of the 66 REIT IPOs. In Panel A, the IPOs are separated by property type. Average initial returns and p-value for the associated t-test of zero mean are reported side-by-side. For each REIT, the lease length is calculated as the value-weighted average lease length of all properties in the REIT. Many REITs offer some forms of guarantee, for example, minimum revenue/EBITDA, minimum rent and/or occupancy, minimum operating income, sale-and-leaseback with guaranteed income and fixed rental over a specific period. We collectively refer to all guarantees as "income guarantee" in this study. The weighted average lease length already incorporates the guarantee. In Panel B, we report the average initial returns by property type and whether the REIT contains some form of income guarantee, their differences, and the associated p-value of the t-test for mean difference. We do not report the mean difference and p-value for residential properties because of sample size limitation. P-values are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Initial Returns by Property Type

Property Type	Initial Returns (%)	p-value	Average Lease Length (Years)	Proceeds (USD mn)	Number of IPOs
Commercial	3.13*	(0.071)	8.10	1,937.0	9
Industrial	1.53	(0.317)	6.06	1,168.6	17
Office	6.99	(0.117)	4.69	2,062.1	16
Residential	-0.19	(0.779)	11.29	2,224.4	24
All	2.45**	(0.038)	7.90	7,392.1	66

Panel B: Initial Returns by Property Type and Income Guarantee

Income Guarantee	No	Yes	Difference
Commercial	3.13		
Number of IPOs	9		
Industrial	7.25	-0.23	-7.48**
Number of IPOs	4	13	(0.027)
Office	11.65	-7.00	-18.65**
Number of IPOs	12	4	(0.050)
Residential	1.00	-0.24	
Number of IPOs	1	23	
All	7.62	-0.92	-8.54***
Number of IPOs	26	40	(0.000)

Table 4: Underpricing Analysis

This table reports regressions of IPO initial returns (IR) on GUARANTEE, which is a dummy variable indicating whether the REIT has income guarantee, and other determinants of underpricing. The variables use are based on those described in Table 2, where S_RETENTION is the natural log of (1 + proportion retained by sponsors), S_REPUTATION is a dummy variable for listed sponsor company, IPO_SIZE is the natural log of issue size, U_REPUTATION is share of total IPO proceeds for a given underwriter, STOCK_VOL is stock market volatility from day 2 to day 60 after IPO computed from daily value-weighted market returns, FIRST is a dummy variable for first IPO of property type in the market, MARKET_LEARNING is cumulative count of REIT IPOs by the same sponsor, INSTITUTIONAL is the natural log of (1 + proportion held by institutional investors), and LAG_MKT_RETURNS is cumulative value-weighted market returns 15 days prior to IPO. Column 1 and 2 are OLS regressions with White robust standard errors, while Column 3 and 4 are respective simultaneous equations of underpricing and sponsor retention estimated using 3SLS. In the sponsor retention equation (Column 4), additional determinants are as follow: DEVELOPER is a dummy variable for developer IPO, REIT_SIZE is the natural log of REIT market capitalization and TOBIN_Q is the sum of REIT market capitalization and debt divided by book value of total assets. Property-type fixed effects, P_INDUSTRIAL, P_RESIDENTIAL and P_COMMERCIAL are included in all regressions, with offices the omitted category. For 3SLS result, the R-squared is not reported because it is not meaningful in this context. Standard errors are used and shown in parentheses, and *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1) OLS	(2) OLS	(3) Underpricing	(4) Retention
INTERCEPT	9.07	13.1	22.6	-0.804**
	(9.90)	(7.96)	(21.5)	(0.383)
GUARANTEE		-12.5***	-9.32***	
		(3.94)	(3.35)	
IR				-0.003
				(0.005)
S_RETENTION	9.53	5.93	116.8***	
	(14.2)	(12.1)	(44.3)	
S_REPUTATION	1.89	1.503	2.07	
	(2.87)	(2.37)	(2.39)	
IPO_SIZE	-0.541	-0.347	-4.49*	
	(1.39)	(1.19)	(2.39)	
U_REPUTATION	0.173**	0.128*	-0.015	
	(0.083)	(0.069)	(0.127)	
STOCK_VOL	-4.18	-4.40*	-10.3***	0.085***
	(2.83)	(2.20)	(3.82)	(0.022)
FIRST	0.362	-0.35	-0.015	
	(4.73)	(4.59)	(3.18)	
MARKET_LEARNING	1.06	1.59	1.91*	
	(1.47)	(1.37)	(0.985)	
INSTITUTIONAL	-5.45	-10.5	30.7	-0.282***
	(12.6)	(10.8)	(19.4)	(0.076)
LAG_MKT_RETURNS	0.087	0.081	-0.027	
	(0.234)	(0.224)	(0.270)	
S_DEVELOPER				-0.023
				(0.019)
REIT_SIZE				0.032**

				(0.015)
TOBIN_Q				0.705*
				(0.390)
Property-type fixed effects	Yes	Yes	Yes	Yes
Number of observations	66	66	66	66
R-squared	0.253	0.430		

Table 5: Risk and Return by Property Type

This table reports the risk and return of REITs under three holding periods: 100 days, 1 year and 3 years. Betas are estimated using the Capital Asset Pricing Model (CAPM) with daily total returns of the REIT on daily, value-weighted average returns of all stocks listed in the Stock Exchange of Thailand (SET) and the Market for Alternative Investment (mai). The last day of our daily stock returns data is April 2020, so some REITs do not exist long enough for the beta to be estimated at all horizons. For returns, we report the average cumulative buy-and-hold returns (RET) and the market-adjusted buy-and-hold abnormal returns (BHAR) for each property type.

Panel A: Beta			
Property Type	100 days	1 year	3 years
Commercial	0.22	0.31	0.26
Industrial	0.12	0.12	0.12
Office	0.13	0.17	0.14
Residential	0.04	0.11	0.13
All	0.11	0.15	0.15

Panel B: RET			
Property Type	100 days	1 year	3 years
Commercial	2.16	15.30	54.38
Industrial	0.75	7.56	21.15
Office	2.32	4.39	28.69
Residential	1.10	3.18	15.85
All	1.45	6.11	25.28

Panel C: BHAR			
Property Type	100 days	1 year	3 years
Commercial	-2.75	1.56	-15.29
Industrial	-7.44	-8.93	-31.35
Office	-6.11	-13.00	-25.65
Residential	-0.81	-11.01	-39.66
All	-4.07	-9.41	-31.11

Table 6: Income Guarantee, Risk and Return by Property Type

This table reports the risk and return of REITs under three holding periods: 100 days, 1 year and 3 years. Betas are estimated using the Capital Asset Pricing Model (CAPM) with daily total returns of the REIT on daily, value-weighted average returns of all stocks listed in the Stock Exchange of Thailand (SET) and the Market for Alternative Investment (mai). The last day of our daily stock returns data is April 2020, so some REITs do not exist long enough for the beta to be estimated at all horizons. For returns, we report the average cumulative buy-and-hold returns (RET) and the market-adjusted buy-and-hold abnormal returns (BHAR). The betas and returns are reported separately for REITs with and without income guarantee. The differences in mean (yes minus no) are reported with p-values in parentheses underneath. Panel A reports the result for all proper types, while Panel B reports the result for industrial properties only, and Panel C for offices only. Because of limited sample size and lack of variation in income guarantee, analyses of commercial and residential properties are not meaningful. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: All Types

Income Guarantee	Beta			RET			BHAR		
	100 days	1 year	3 years	100 days	1 year	3 years	100 days	1 year	3 years
Yes	0.07	0.11	0.11	0.66	4.51	17.07	-4.38	-11.30	-37.71
No	0.17	0.23	0.21	2.66	8.69	39.75	-3.59	-6.38	-19.49
Yes minus No	-0.10**	-0.12**	-0.10***	-2.01	-4.18	-22.68***	-0.79	-4.91	-18.22***
p-value	(0.036)	(0.016)	(0.004)	(0.413)	(0.262)	(0.009)	(0.817)	(0.328)	(0.001)
Number of Obs.	66	65	58	66	65	58	66	65	58

Panel B: Industrial Only

	Beta			RET			BHAR		
	100 days	1 year	3 years	100 days	1 year	3 years	100 days	1 year	3 years
Yes	0.13	0.13	0.11	2.39	9.51	21.55	-5.23	-6.88	-30.61
No	0.10	0.09	0.16	-4.58	1.21	19.95	-14.60	-15.60	-33.58
Yes minus No	0.04	0.04	-0.05	6.97*	8.30	1.60	9.36*	8.72	2.98
p-value	(0.630)	(0.377)	(0.519)	(0.050)	(0.118)	(0.871)	(0.095)	(0.198)	(0.720)
Number of Obs.	17	17	16	17	17	16	17	17	16

Panel C: Office Only

	Beta			RET			BHAR		
	100 days	1 year	3 years	100 days	1 year	3 years	100 days	1 year	3 years
Yes	0.05	0.03	0.02	-5.80	-3.27	13.58	-22.22	-28.51	-44.17
No	0.16	0.22	0.20	5.02	6.95	36.24	-0.74	-7.83	-16.39
Yes minus No	-0.11	-0.19***	-0.18***	-10.82	-10.22	-22.66	-21.48***	-20.69	-27.78
p-value	(0.160)	(0.001)	(0.034)	(0.225)	(0.394)	(0.309)	(0.026)	(0.116)	(0.088)
Number of Obs.	16	16	12	16	16	12	16	16	12