Do Thai Property Fund and REIT Investors Herd?

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พฤติกรรมการซื้อขายตามๆกันของนักลงทุนในตลาดกองทุนรวมและทรัสต์เพื่อการลงทุนในอสังหาริมทรัพย์แห่งประเทศไทย

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This paper is the first to examine herding behavior in Thai Property Fund and Real Estate Investment Trusts or REIT market for the period of 2015-2019. The empirical results suggest that those market is exhibit herding behavior significantly. The herding is present in both up and down market and also present in medium to high volume days. Besides, the herding is motivated by cross-sectional premium to NAV, however, on high dividend yield days as well. Herding on high dividend yield days also robust when controlled the dividend yield by the Government bond yield. These results are sensational as herding might not occurred purely from noise trading, however to some extent fundamental based decision. In term of relationship between herding behavior and Thai Property Fund and REIT characteristics, this paper found evidences of herding in medium and small market capitalization portfolio. Notwithstanding, the conclusion cannot be reached when taking into account percent free float.

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1. Introduction

Since its origin in 1980, field of behavioral finance has challenged the efficient market hypothesis and attempted to explain inefficiencies presented in financial markets. Herding behavior, a type of behavioral bias, is the phenomena where investors ignored their own analysis, and follow others actions either buying or selling. Investigating herding behavior, is considerable as herding could shift the financial instruments' market price far away from their true value without rationale justification. Herding, in global context, by far have been confirmed in various asset classes, especially in equities.

Property Funds (PF, hereafter) and Real Estate Investment Trusts (REIT, hereafter) have been widely known as alternative investments. PF and REIT, to some extents, also have been considered hedging instrument for many portfolios. Since PF and REIT are close-ended fund, which listed in the Stock Exchange of Thailand (SET, hereafter), they could be traded in authorized secondary market, the similar fashion with common equities. As equities have been confirmed of herding behavior with tons of evidence globally, PF and REIT which share many similar characteristics in nature, on the other hand, has very limited studies to explore herding in this asset class.

Philippas et al., 2013 investigated herding in U.S. REIT market during 2004-2011 period, and confirmed existence of herding behavior at that time. They also explained further that herding was stronger in period of bear market. In Thailand context, to the best of my knowledge, PF are REIT still be an asset class which not yet to be explore regarding herd behavior.

Refers to global financial crisis between 2007-2008, which widely known the origin stemmed from real estate, together with current real estate market environment in Thailand, this paper, therefore, aims to investigate herding behavior in Thai PF and REIT market at market level during 2015-2019 period. Addition, this paper also investigates deeper if herding appears symmetry in various market conditions, for example, when the market trading volume is high or market return is high. As dividend yield has been one of the key indicators when considered buying or selling PF and REIT, this paper will examine if herding has relationship with dividend yield

or yield gap when comparing with 10-year Thai Government Bond. This paper continues examine further if herding is relevant with PF and REIT's Net Asset Value (NAV, hereafter). In term of robustness test, this paper also investigates if herding has relationship with market capitalization or percent free float. Thanks to Chang et al., 2000, their herding measurement model will be implemented throughout this paper to achieve the research objectives.

This paper contributes to the behavioral finance in several ways. First, this paper contributes to limited existing evidences of herding examination by being the first to investigate herding behavior in Thai PF and REIT market. Second, this paper provides the insight relationship between herding behavior and PF and REIT market characteristics. Finally, this paper, hopefully, would be ground for someone examine further if this paper results might have relationship with potential Thailand real estate bubble in the future.

2. Literature Review

2.1 Herding

"Herding behavior refers to how individual decisions are influenced by group behavior" (Pettinger, 2018). "Herd instinct in finance is the phenomenon where investors follow what they perceive other investors are doing, rather than their own analysis" (Chen, 2019). Addition, "herding can be construed as being either a rational or irrational form of investor behavior" (Chang et al., 2000).

2.2 Property Fund and REIT

PF is a type of close-ended mutual fund with the main purpose of investing in real estate, residential projects, or other property-linked securities allowed by law. PF focuses on investments in property that return a regular income, and that income would be distributed among investors in the form of dividends.

REIT is a type of trust with the similar purpose of investing and investment style as PF. Notwithstanding, REIT could be deemed as new generation of PF since REIT has been relaxed some of PF constraints such as, type of investable real estate or leverage limit.

Both PF and REIT have been required to be listed in SET. Investors in those financial instruments shall receive returns in the form of dividends from income generated by the properties and capital gains from the sale of the unit trusts on the stock exchange.

2.3 Herding in Asset Class

Herding behavior has been investigated in many contexts over past decades. In an international perspective, many researches have confirmed herding behavior in equity, bond, derivative, crypto-currency and REIT.

Oehler et al., 2000 confirmed existing herding behavior of institutional investor in German bond market between period of 1993-1995, while Cai, Han and Yi Li, 2019 also confirmed institution herding in U.S. corporate bond between period of 1998-2014, particularly in lower-rated bonds. Ajaz and Kumar, 2018 found herding in Crypto-currency between period of 2015-2018 while Weiner, 2004 found herding in derivative market. Chang et al., 2000, confirmed herding behavior in emerging equity market such as South Korea and Taiwan between period of 1963-1997. In REIT context, Philippas et al., 2013 found evidences of presence herding in U.S. REIT for the study period 2004-2011.

In Thailand context, on the other hand, there are quite few researches, which examine herding behavior in Thailand financial market. Vairungroj, 2018 found an existing evidence of institution herding in Thailand bond market between 2005-2015. Rattanasri and Vichitthamaros, 2018 found herding behavior in SET index between 2010-2015, further they found that herding was stronger during bear market situation. Notwithstanding, in Thai PF and REIT market, to the best of my knowledge, has not yet to be explored.

2.4 Evolution of Herding Measurement Model at Market Level

Refers to different variety of researches' testing methodologies, the well-known ones are to testing herding at market level by investigating the relationship between asset return dispersion and market return.

The origin of this testing methodology stemmed from Christie and Huang, 1995. They proposed the Cross-Sectional Standard Deviation of return model attempting to explain the linear relationship between asset return dispersion and

market return following rational asset price model. They also found evidence against the presence of herding in U.S. equity market between period of 1962-1988 at both market and industry levels. Chang et al., 2000 then propose the Cross-Sectional Absolute Deviation of return, the modified version of Christie and Huang, 1995 model. This model suggested that if investors tend to follow aggregate market behavior and ignore their own priors during periods of large average price movements, then the linear relationship between asset dispersion and market return will no longer hold i.e., the relationship could become non-linearity. For the results, Chang et al., 2000, confirmed herding behavior between period of 1963-1977 in emerging equity market such as South Korea and Taiwan, however not in developed equity market such as U.S., Hong Kong and Japan.

The Chang et al., 2000 model has been widely accepted, and become notably intuitive approach for testing herding behavior at market level. Philippas et al., 2013 extended the Chang et al., 2000 model using dummy variables technics to discover the evidence of herding behavior in U.S. REIT market on days of extreme movements in the REIT market in both extremely bull and bear market. Ajaz and Kumar, 2018 using Quantile Regression method instead of Ordinary Least Square as samples of their return series were skewness and fat-tails. They found the evidences of herding behavior in six major crypto-currencies between 2015-2018 in all quantiles. Recently, Cui, Y. et al., 2019 also extended the Chang et al., 2000 model by employing the similar technique of dummy variables and found the evidence of herding behavior of institution in U.S. Closed-end fund market between 1992-2016. They also found that herding will be stronger on days when trading volume are high and when closed-end funds were trading at discount to NAV on average. Notwithstanding, they found no significant asymmetries when the performance of the closed-end funds' industry is taken into account i.e., herding was presented in both up and down market without significant difference in herding between up and down markets.

In summary, many literatures which following Chang et al., 2000 model provided the mixed results and interpretations. First, herding might be present according to specific asset class within the same country as there were evidences of herding behavior in U.S. REIT, however not in U.S. equity. Second, herding might be present according to the location where the same asset class was located as there were

evidences of herding in emerging equity market, on the other hand, not in developed equity market. This conflict result might be partly explained by incomplete information disclosure in the emerging markets. Therefore, this is very interesting to investigate if there is herding behavior in Thai PF and REIT market as in Thai equity and bond has already been confirmed.

3. Hypothesis

This paper investigates herding in the context of Thai PF and REIT for the period between 2015-2019 by testing a number of hypothesis. According to Rattanasri and Vichitthamaros, 2018, there were herding behavior occurred in Thai stock market i.e., SET. Since Thai PF and REIT were one of SET's component, it is interesting to investigate further if this behavior occur consistency in Thai PF and REIT market. Due to the fact that both PF and REIT are close-ended fund which listed in SET, they can be traded in the same fashion as common stock. Therefore, it is worth to verify if there is also herding behavior in Thai PF and REIT.

Hypothesis 1: Thai PF and REIT market is characterized by significant herding.

If the hypothesis 1 is true, then herding should be investigated further whether herding appear likewise in various market condition. As herding is behavior that investors follow what they perceive other investors are doing and noise trading tends to increase the volume of trading (Black, 1986), it is most likely that whenever market trading volume is high, there might be latent herding. Since most of analyst paper usually recommend "**BUY**" rather than "**SELL**" (Womack, 1996), it is most likely that herding will be prominent when market is positive.

Hypothesis 2A: Herding in Thai PF and REIT market will be stronger on days when market volume is high.

Hypothesis 2B: Herding in Thai PF and REIT market will be stronger on days when market return is positive.

As price momentum is evident in that portfolios with high returns (winners) in the prior six months are also winners in the following six months and the year after portfolio formation (Chan, Jegadeesh, and Lakonishok, 1996). Addition, according to

Demirer, Lien and Zhang, 2015, herding had some relations with momentum strategies as they found that the profitability momentum strategies depends on the level of herding. Since dividend yield (dividend amount divided by market price) has been one of the notable factors when considered buying or selling PF and REIT, it seems reasonable to assume that whenever the PF or REIT dividend yield on average is trading at low level comparing to their past, those trading are suspected of herding behavior. This could be explained further by agency problem of money management (Lakonishok, Shleifer and Vishny, 1991) as some money managers might follow short-term strategies based not on fundamentals, but on technical analysis and other types of feedback trading.

Hypothesis 3A: Herding will be stronger when PF/REIT dividend yield on average is low.

As PF and REIT dividend yield is usually compared with Government bond yield in order to justify whether PF and REIT at that particular time is attractive. To confirm if Hypothesis 3A is still consistent after controlling for Government bond yield, it is also reasonable to assume that whenever the yield gap (PF or REIT dividend yield minus Government bond yield) is low, it might be because of herding behavior.

Hypothesis 3B: Herding will be stronger when there is small yield gap between PF/REIT dividend yield and 10-year Thai Government bond yield.

The fact that PF and REIT's NAV are easily to access as those data are available publicly as required by laws. As the similar rationales in Hypothesis 3A and 3B, it is justified enough to assume that whenever any PF or REIT is trading at Premium i.e. market price per NAV is more than one, that trading is suspected of herding behavior.

Hypothesis 4: Herding will be stronger when market on average trading at Premium to NAV

Empirical research in the financial literature indicates that small firms earn higher average rates of return than large firms. One of the many explanations is partly

due to the higher the information asymmetry in small firms. Furthermore, Buzby, 1975 found evidences in U.S. indicating that the disclosure in annual reports is positively associated with the size of a company's assets and not affected by listing status. Therefore, it is reasonable to assume that PF/REIT characterized by low market capitalization will be subjected to stronger herding behavior.

Hypothesis 5: Herding will be stronger if PF/REIT's market capitalization is lower.

As noise trading tends to increase the volume of trading (Black, 1986) and stocks with higher percent free float have a higher level of liquidity (Ding, Ni and Zhong, 2016). It is reasonable to assume that the higher the percent free float of PF and REIT, the stronger the herding behavior.

Hypothesis 6: Herding will be stronger if PF/REIT's percent free float is higher.

4. Data

This paper collected the daily data on closing price, trading volume, market capitalization, dividend payment, 10-year Thai government bond yield, NAV and percent free float during the 2015-2019 period from Bloomberg. In total, there are 75 funds/trusts as samples in this paper including active and terminated ones, hence mitigating survivorship bias.

The reasons for the data obtaining from 2015 onwards are due to the fact that PF and REIT has been quite brand-new asset class in Thailand, which first established in 2003 for PF and 2014 for REIT. Therefore, if the study period started too early, the samples might not be enough to provide accurate result. Note that at the beginning of year 2015, there were 55 funds/trusts out of 61 funds/trusts at the end of 2019.

5. Methodology

This paper shall examine herding behavior following the Chang et al.,2000 herding model. This model aims to measure herding behavior at market level. His formula for testing will be as follows:

$$CSAD_{m,t} = \beta_0 + \beta_1 |R_{m,t}| + \beta_2 R_{m,t}^2 + e_t \quad (1)$$

According to Chang et al.,2000, $R_{m,t}$ mentions to average return of all actively traded stocks on day t, while $CSAD$ is stand for Cross-Sectional Absolute Deviation of return and calculated as follows:

$$CSAD_{m,t} = \frac{\sum_{i=1}^{n} |R_{i,t} - R_{m,t}|}{n} \quad (2)$$

In this equation, n is the numbers of actively traded stocks on day t, and $R_{i,t}$ is the price return of stock i on day t, which can be calculated as follows:

$$R_{i,t} = \ln\left(\frac{P_t}{P_{t-1}}\right) \quad (3)$$

where, P_t and P_{t-1} are closing price of stock i on day t and $t-1$ respectively.

In this paper, however, $R_{m,t}$ will be referred to average return of all actively traded PF/REIT on day t and $R_{i,t}$ become price return of PF/REIT i on day t.

In equation (1), Chang et al.,2000 argued that in the case of no herding behavior, $CSAD_{m,t}$ is expected to be increase in the linear fashion with absolute market return following rational asset pricing setting. Therefore, β_1 is expected to positive and statistically significant. On the contrary, in the case of herding behavior presented, the relationship between $CSAD_{m,t}$ and market return will no longer be linear. Hence, β_2 is expected to be statically significant and negative instead. This is due to the fact that herding will cause $CSAD_{m,t}$ to be lower comparing to no herding behavior case.

In order to test Hypothesis 1, equation (1) is used to investigate if there is significant herding in PF/REIT market.

To test Hypothesis 2A and 2B, this paper run the following empirical specification to capture differences in investor behavior in different market conditions as follows:

$$CSAD_{m,t}^{HV} = \beta_0 + \beta_1 \left|R_{m,t}^{HV}\right| + \beta_2 \left(R_{m,t}^{HV}\right)^2 + e_t \quad (4)$$

$$CSAD_{m,t}^{MV} = \beta_0 + \beta_1 \left|R_{m,t}^{MV}\right| + \beta_2 \left(R_{m,t}^{MV}\right)^2 + e_t \quad (5)$$

$$CSAD_{m,t}^{LV} = \beta_0 + \beta_1 \left|R_{m,t}^{LV}\right| + \beta_2 \left(R_{m,t}^{LV}\right)^2 + e_t \quad (6)$$

Equation (4) – (6) are employed to test Hypothesis 2A, where the superscript HV, MV and LV are stand for high volume days, medium volume days and low volume days respectively. Note that according to Brooks, et al., 2005, the estimated beta could be vary depended on the trading volume. Therefore, it would be more reasonable to separately regress Chang et al., 2000 herding model by grouping of trading volume characteristics. Note also that these methods of separating regression between market conditions are also consistent with the original Chang et al., 2000 herding model.

To distinguish between high and low volume days, +1 Standard Deviation (S.D., hereafter) of volume distribution shall be classified as high volume days, while -1 S.D. shall be low volume days instead. This shall leave the medium volume days as days of volume distribution lying between -1 S.D. and +1 S.D.

Thereby, a statically significant negative value of β_2 in equation (4), (5) and (6) would be indicator of presented herding behavior in high volume days, medium volume days and low volume days respectively.

$$CSAD_{m,t}^{Up} = \beta_0 + \beta_1 \left|R_{m,t}^{Up}\right| + \beta_2 \left(R_{m,t}^{Up}\right)^2 + e_t \quad (7)$$

$$CSAD_{m,t}^{Down} = \beta_0 + \beta_1 \left|R_{m,t}^{Down}\right| + \beta_2 \left(R_{m,t}^{Down}\right)^2 + e_t \quad (8)$$

Equation (7) and (8) are employed to test Hypothesis 2B, where superscription Up and Down are days when market performance is positive and negative respectively. Hence, a statically significant negative value of β_2 in equation (7) would be evidence of presented herding behavior on days with positive return, while a statically significant negative value of β_2 in equation (8) would be evidence of presented herding on days with negative return.

To test for Hypothesis 3A and 3B, the following empirical specification are employed to investigate if dividend yield and yield gap have some relationships with herding behavior.

$$CSAD_{m,t}^{HDY} = \beta_0 + \beta_1 \left|R_{m,t}^{HDY}\right| + \beta_2 \left(R_{m,t}^{HDY}\right)^2 + e_t \quad (9)$$

$$CSAD_{m,t}^{MDY} = \beta_0 + \beta_1 \left|R_{m,t}^{MDY}\right| + \beta_2 \left(R_{m,t}^{MDY}\right)^2 + e_t \quad (10)$$

$$CSAD_{m,t}^{LDY} = \beta_0 + \beta_1 \left| R_{m,t}^{LDY} \right| + \beta_2 \left(R_{m,t}^{LDY} \right)^2 + e_t \quad (11)$$

Equation (9) – (11) are employed to test Hypothesis 3A, where the superscription HDY, MDY and LDY are stand for high dividend yield, medium dividend yield and low dividend yield days respectively. To distinguish between high and low dividend yield days, days with low dividend yield of PF/REIT market are days when their average dividend yield are lie on -1 S.D. of their average dividend yield distribution, while days with high dividend yield of PF/REIT market are day when their average dividend yield are lie on +1 S.D. of their average dividend yield distribution. This shall leave the medium dividend yield days as days of their average dividend yield are lie between -1 S.D. and +1 S.D of average dividend yield distribution. Note that dividend yield of any funds/trusts shall be equally-weighted average by the number of funds/trusts trading on that particular day.

$$CSAD_{m,t}^{LYG} = \beta_0 + \beta_1 \left| R_{m,t}^{LYG} \right| + \beta_2 \left(R_{m,t}^{LYG} \right)^2 + e_t \quad (12)$$

$$CSAD_{m,t}^{MYG} = \beta_0 + \beta_1 \left| R_{m,t}^{MYG} \right| + \beta_2 \left(R_{m,t}^{MYG} \right)^2 + e_t \quad (13)$$

$$CSAD_{m,t}^{SYG} = \beta_0 + \beta_1 \left| R_{m,t}^{SYG} \right| + \beta_2 \left(R_{m,t}^{SYG} \right)^2 + e_t \quad (14)$$

Equation (12) – (14) are employed to test Hypothesis 3B, where superscription LYG, MYG and SYG are stand for large yield gap, medium yield gap and small yield gap days respectively. The yield gap shall be measured by averaged dividend yield of PF/REIT market minus the 10-year Thai government bond yield.

To categorize among them, days with small yield gap are days when their yield gap are lie on -1 S.D. of their yield gap distribution while days with large yield gap are day when their yield gap are lie on +1 S.D. of their yield gap distribution instead. This shall leave the medium yield gap days as days of their yield gap are lie between -1 S.D. and +1 S.D of yield gap distribution.

To test for Hypothesis 4, this paper calculates the Discount Premium Index (DPI) to examine how funds/trusts price differ from their NAV, which can be calculated as follows:

$$DPI_t = \frac{\sum_{i=1}^{n} DEV_{i,t}}{n} \quad (15)$$

Equation (15) is the index, which represented the equally-weighted average of NAV deviation of each PF/REIT's NAV from its closed price on day t.

The deviation of each PF/REIT's NAV from its close price can be calculated as follows:

$$DEV_{i,t} = \frac{NAV_{i,t} - P_{i,t}}{NAV_{i,t}} \quad (16)$$

Therefore, if the DPI_t are greater than zero, those days are cross-sectional discount days. On the contrary, if the DPI_t are less than zero, those days are cross-sectional premium days instead.

To test if herding has relationship with cross-sectional premium/discount to NAV, the following empirical specifications shall be implemented;

$$CSAD_{m,t}^{Discount} = \beta_0 + \beta_1 \left| R_{m,t}^{Discount} \right| + \beta_2 \left(R_{m,t}^{Discount} \right)^2 + e_t \quad (17)$$

$$CSAD_{m,t}^{Premium} = \beta_0 + \beta_1 \left| R_{m,t}^{Premium} \right| + \beta_2 \left(R_{m,t}^{Premium} \right)^2 + e_t \quad (18)$$

Thereby, a statically significant negative value of β_2 in equation (17) would be evidence of presented herding behavior on cross-sectional discount days, while a statically significant negative value of β_2 in equation (18) would be evidence of presented herding on cross-sectional premium days.

To test for Hypothesis 5 and 6, Equation (1) will be used once again. Notwithstanding, the samples will be categorized into tercile portfolios. For Hypothesis 5, the portfolios shall be ranked from highest market capitalization portfolio (Large Market Capitalization Portfolio) to lowest one (Small Market Capitalization Portfolio), using yearly-weighted average of its market capitalization. These portfolios would be reconstituted every end of year. In the similar fashion, for Hypothesis 6, the portfolios shall be ranked from highest percent free float portfolio (High Free Float Portfolio) to lowest one (Low Free Float Portfolio), using yearly-weighted of its percent free float. These portfolios would be also reconstituted every end of year.

The descriptive statistics and correlation matrix of market trading volume, market return, average market dividend yield and average premium/discount to NAV will also be provided to see the relationships between them.

6. Empirical Results

6.1 Herding on Different Market Conditions

Table 1 presents the descriptive statistics of the $CSAD_{m,t}$ and $R_{m,t}$ including the factors/criterions this paper uses to separate the market conditions which are market volume, dividend yield, yield gap and DPI_t. Note that the samples of variables used to separate market conditions i.e., market volume, dividend yield, yield gap and DPI will be winsorized at the 1st and 99th percentiles to mitigate the impact of outliers. However, the actual histogram of key variables based on 100 bins will be also shown in Figure 1.

Table 1

Descriptive Statistics

	Mean	S.D.	Skewness	Excess Kurtosis
$CSAD_{m,t}$	0.687%	0.241%	1.502	3.859
$R_{m,t}$	-0.001%	0.266%	-0.482	7.051
Market Volume (Million)	13.675	8.007	2.291	6.551
Dividend Yield	5.472%	0.477%	0.288	-0.527
Yield Gap	3.020%	0.561%	-0.182	-1.119
Discount/Premium Index	0.321%	4.155%	0.074	-0.621

Table 1 presents the descriptive statistics of key variables. The samples of variables used to separate market conditions (market volume, dividend yield, yield gap and discount/premium index) will be winsorized at the 1st and 99th percentiles.

$CSAD_{m,t}$ is the daily cross-sectional absolute deviation of PF/REIT's returns. $R_{m,t}$ is their daily average return.

Yield gap is the difference between dividend yield and 10-year Thai government bond yield.

Discount/Premium Index is calculated as $DPI_t = \frac{\sum_{i=1}^{n} DEV_{i,t}}{n}$, while $DEV_{i,t} = \frac{NAV_{i,t} - P_{i,t}}{NAV_{i,t}}$.

The samples are estimated for the period 30/12/2014 - 30/12/2019. The unit of the S.D. is similar to the unit of the observed values.

Figure 1: The histogram of actual key variables based on 100 bins.

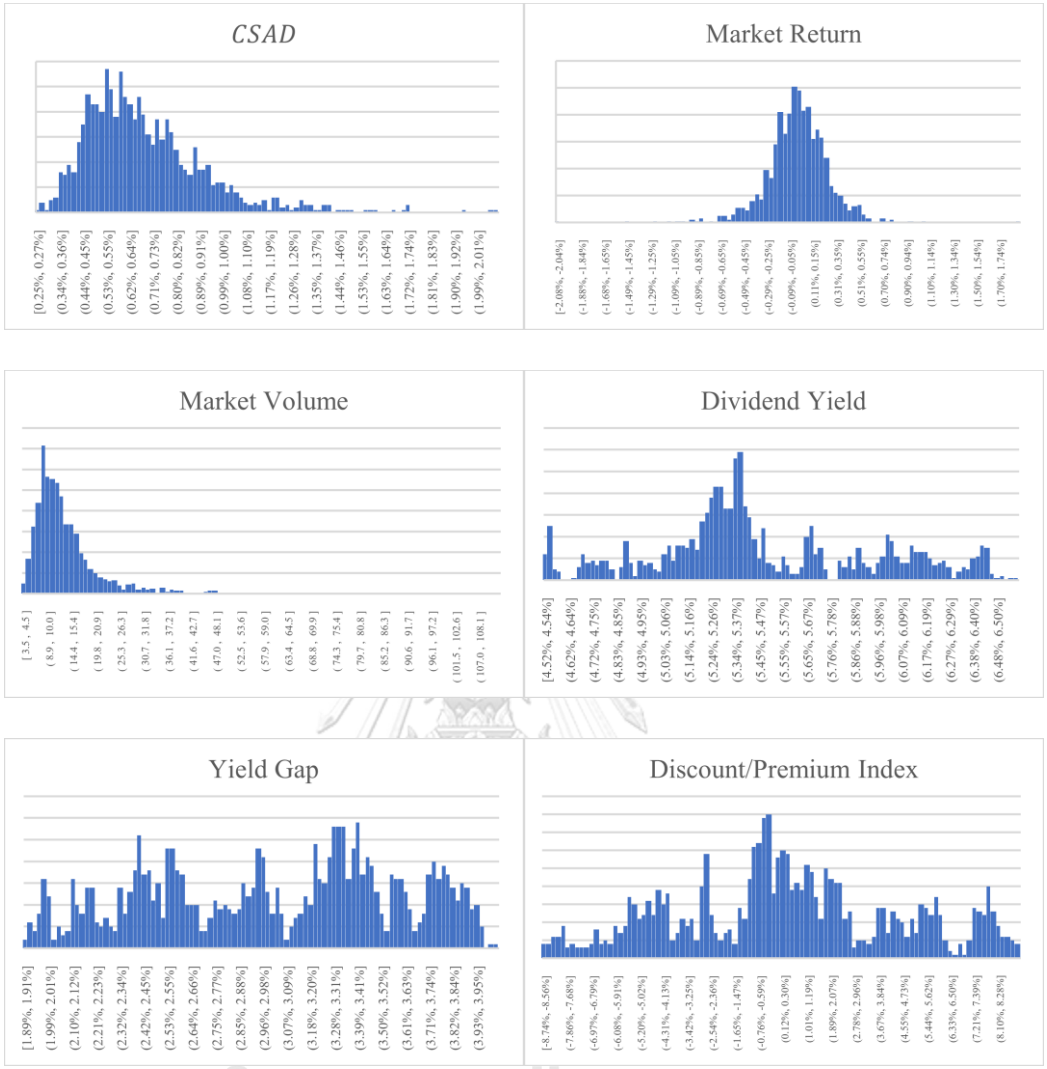


Table 2 presents the correlation matrix of the variables this paper uses to separate the market conditions which are market volume, market return, dividend yield, yield gap and DPI_t.

Table 2
Correlation Matrix

	Market Volume	$R_{m,t}$	**Dividend Yield**	**Yield Gap**	**Discount/Premium Index**
Market Volume	1.000	-0.015	-0.173	0.123	-0.273
$R_{m,t}$	-0.015	1.000	-0.008	0.015	-0.030
Dividend Yield	-0.173	-0.008	1.000	0.741	0.539
Yield Gap	0.123	0.015	0.741	1.000	0.015
Discount/Premium Index	-0.273	-0.030	0.539	0.015	1.000

Table 2 presents the correlation matrix of key variables. $R_{m,t}$ is their daily average return.
Yield gap is the difference between dividend yield and 10-year Thai government bond yield.
Discount/Premium Index is calculated as $DPI_t = \frac{\sum_{i=1}^{n} DEV_{i,t}}{n}$, while $DEV_{i,t} = \frac{NAV_{i,t} - P_{i,t}}{NAV_{i,t}}$.
The samples are estimated for the period 30/12/2014 - 30/12/2019.

Table 3 presents the regression results from equation (1), (4) – (14) and (17) – (18). As the estimates from the Panel A in Table 3, the coefficient β_2 is statically significant and negative at -16.259. Therefore, presence of herding behavior is confirmed in Thai PF/REIT market for the period between 2015 - 2019. This result is consistent with Philippas et al., 2013 which confirmed existence of herding behavior in U.S. REIT market during 2004-2011 period and also with Rattanasri and Vichitthamaros, 2018, which confirmed existence of herding behavior in Thai stock market during 2005-2015 period.

According to Panel B in Table 3, the coefficients β_2 are negative and statically significant at -12.741 on high volume days and -10.446 on medium volume days. These results implied that those days are exhibiting herding behavior. On the low volume days, however, the coefficient β_2 is positive at 146.862. This implies that there is no herding behavior on those days since $CSAD_{m,t}$ keep increasing as market return increasing. This finding is similar to Y. Cui, B. Gebka and V. Kallinterakis., 2019 as they found the strong herding behavior in U.S. closed-end fund market during 1992-2016 period on high volume days however not in the low volume days. Note that the quite low value of the coefficients β_1 on low volume days is consistent with

Brooks, et al., 2005 as they claimed the beta estimates will be downward biased in extreme cases of thin trading. $CSAD_{m,t}$ herein, therefore, is more sensitive to $R^2_{m,t}$ in low volume days.

According to Panel C in Table 3, the coefficients β_2 are statically significant and negative at -20.516 on positive market days and -14.951 on negative market days. These imply that there are herding behaviors on both up and down market days. This finding reaches the similar conclusion with Y. Cui, B. Gebka and V. Kallinterakis, 2019 and Chang et al.,2000 who have confirmed herding in South Korea and Taiwan on both up and down market days.

According to Panel D in Table 3, the coefficient β_2 is statically significant and negative at -26.957 on high dividend yield days. This suggests that there is herding behavior in high dividend yield days. The coefficient β_2 is also statically significant and negative on medium dividend yield days. This suggests that these days are also exhibiting herding behavior. The coefficient β_2 is statically significant and positive at 78.857 on low dividend yield days. This implies that there is no herding behavior on those days since $CSAD_{m,t}$ keep increasing as market return increasing. These findings are opposed to the hypothesis this paper assumes at the beginning as this paper deems that herding might be present on low dividend yield days as a result of momentum strategies or technical investors. Nevertheless, the results are not indicating so since herding is present on high dividend yield days instead. The possible explanations for this situation might be due to the fact that in term of PF/REIT investor, high dividend days are viewed as more attractive than low dividend yield days. As PF and REIT are asset class which offering stable income in nature (in form of dividend), investor who considering buying PF/REIT should be ones loving the dividend. Therefore, those investors may look for the high dividend yield first. On the other hand, investor who not loving the dividend might not consider buying PF/REIT at the first place, thereby they might look for other asset class which providing more growth opportunity such as common equity rather than PF/REIT with low dividend yield. In term of herding from selling, however, it might be the case that some investors who have already bought the high dividend yield found one of the important fact in Thai PF/REIT market that the high dividend yield is not coming from the dividend which should

have been increase through time, however, from the market price which keep decreasing. Therefore, those investors shall sell those names and cause the presence of herding. On the other hand, selling high dividend yield might not result in buying the low dividend yield as they also have other asset classes to buy.

According to Panel E in Table 3, the coefficient β_2 is statically significant and negative at -33.699 on large yield gap days. This suggests that there is significant herding behavior in large yield gap days. The coefficient β_2 is also statically significant and negative on medium yield gap days. This suggests that these days are also exhibiting herding behavior. The coefficient β_2 is statically significant and positive at 83.699 on small yield gap days. This implies that there is no herding behavior on those days since $CSAD_{m,t}$ keep increasing as market return increasing. Note that the results in Panel E are consistent with Panel D after controlling for the 10-year Thai government bond yield. These findings are also opposed to the hypothesis this paper assumes at the beginning, however the possible explanations should be similar to the case of high dividend yield days.

According to the Panel F in Table 3, the coefficient β_2 is statically significant and negative at -17.366 on cross-sectional premium days, however, statically significant and positive on cross-sectional discount days. These results suggest that there is herding behavior on cross-sectional premium days however not in cross-sectional discount days. These results are consistent with this paper hypothesis as herding might be present as a result of momentum strategies or technical investors. Also, the public returns (as measure by REIT's premium/discount) are more efficient in processing information than real return (as measure by appraisal-based NAV of REIT) (Chiang, 2009) and there is significant liquidity premium in REIT prices relative to property NAV, (Clayton, J. and G. Mac Kinnon, 2002). Therefore, PF/REIT investors might not really care if the market price is trading at premium to NAV. In other word, NAV might not be the good proxy for considering buying or sell PF/REIT. Notwithstanding, the results are opposed to Cui, Y. et al., 2019 as they found herding is stronger on cross-sectional discount days in the U.S. closed-end fund market. They claimed that closed-end fund trade at a discount as compensation for their enhanced noise trader risk (Investor Sentiment Theory). Note that U.S. closed-

end funds were normally trading at 10-20% discount to NAV on average (Lee, C.M., Shleifer, A., Thaler, R.H., 1991). Unfortunately, this is not the case for Thai PF/REIT market. For example, on 30/12/2019, Thai PF/REIT were trade at 4% premium to NAV on average. The difference might be due to the fact that the investable assets under U.S. closed-end funds normally are stocks or bonds which their market prices can be easily to observe in the secondary market, however, the investable assets under Thai PF/REIT normally are real assets such as hotels, retails, offices or warehouses which their market prices are quite difficult to be observed and convinced. Therefore, U.S. closed-end funds investors could easily observe the U.S. closed-end fund's NAV and try to trade them when those funds are trading at discount, on the other hand, there is no such a condition on Thai PF/REIT as those investors might not actually care about the NAV.

Figure 2: Market Price to NAV of individual Thai PF/REIT on 30 Dec 2019

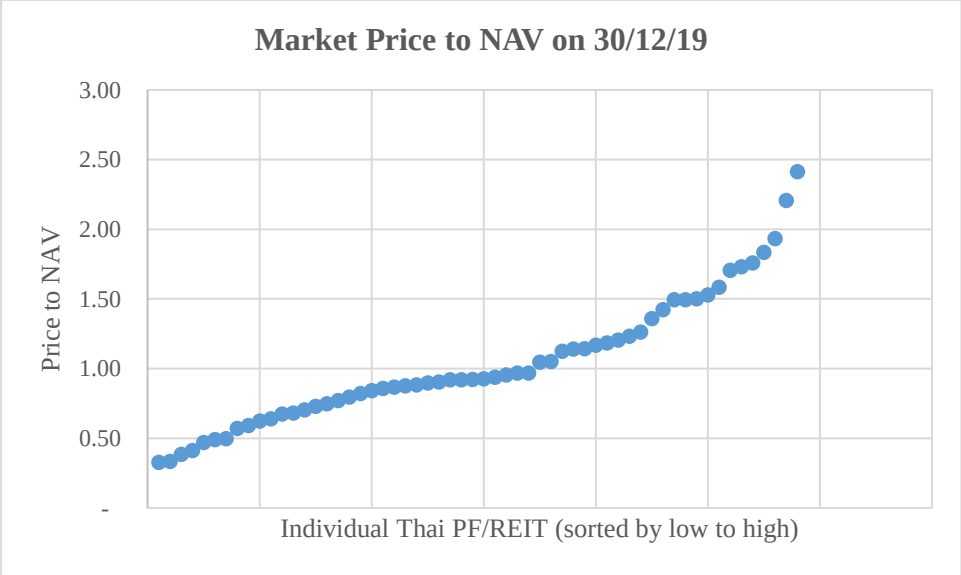


Table 3

Testing on different market conditions

Panel	β_0	β_1	β_2	R^2	Observations
Panel A: Herding in Thai PF/REIT market	0.005	1.064	-16.259	0.500	1,220
	(0.000)***	(0.000)***	(0.000)***		
Panel B: Herding and Market Volume					
High Volume	0.006	0.885	-12.741	0.608	135
	(0.000)***	(0.000)***	(0.042)**		
Medium Volume	0.005	1.021	-10.446	0.454	1,041
	(0.000)***	(0.000)***	(0.044)**		
Low Volume	0.004	0.513	146.862	0.774	44
	(0.000)***	(0.056)*	(0.001)***		
Panel C: Herding and Market Return					
Positive Return	0.005	1.072	-20.516	0.491	609
	(0.000)***	(0.000)***	(0.001)***		
Negative Return	0.005	1.071	-14.951	0.510	611
	(0.000)***	(0.000)***	(0.005)***		
Panel D: Herding and Dividend Yield					
High Dividend Yield	0.004	1.134	-26.957	0.503	259
	(0.000)***	(0.000)***	(0.000)***		
Medium Dividend Yield	0.005	1.022	-9.584	0.517	791
	(0.000)***	(0.000)***	(0.035)**		
Low Dividend Yield	0.005	0.546	78.857	0.681	170
	(0.000)***	(0.004)***	(0.009)***		
Panel E: Herding and Yield Gap					
Large Yield Gap	0.005	1.185	-33.699	0.491	228
	(0.000)***	(0.000)***	(0.000)***		
Medium Yield Gap	0.005	0.994	-7.712	0.524	733
	(0.000)***	(0.000)***	(0.070)*		
Small Yield Gap	0.005	0.586	83.699	0.497	259
	(0.000)***	(0.000)***	(0.000)***		
Panel F: Herding and Discount/Premium to NAV					
Discount to NAV	0.005	0.765	43.332	0.479	634
	(0.000)***	(0.000)***	(0.001)***		
Premium to NAV	0.005	1.017	-17.366	0.552	586
	(0.000)***	(0.000)***	(0.000)***		

Table 3 presents the results from the following equation; $CSAD_{m,t} = \beta_0 + \beta_1|R_{m,t}| + \beta_2 R_{m,t}^2 + e_t$

$CSAD_{m,t}$ is the daily cross-sectional absolute deviation of PF/REIT's returns. $R_{m,t}$ is their daily average return. The equation is estimated for the period 30/12/2014 - 30/12/2019.

Parentheses are the estimated one-sided p-values.

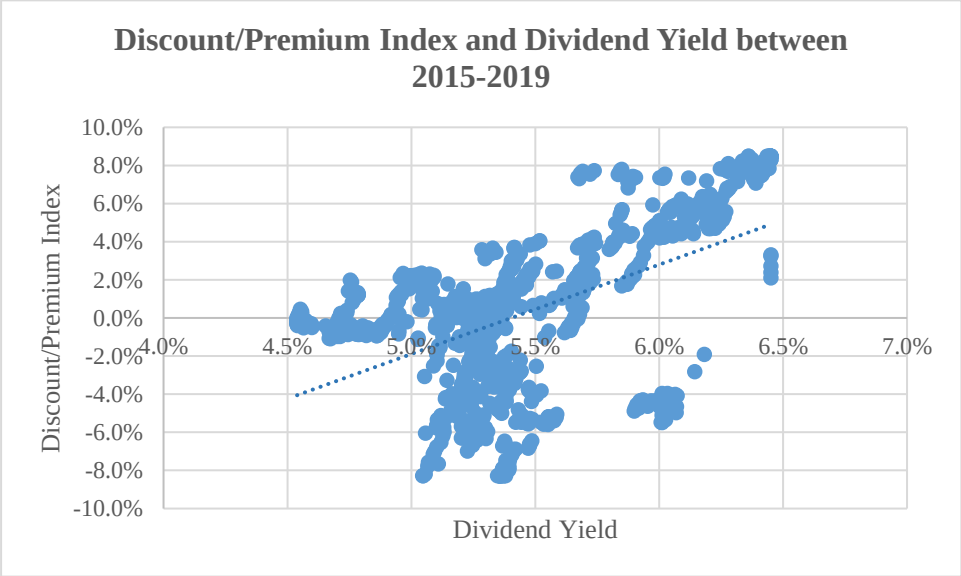
***,**,* denotes that the coefficient is significant at the 1%,5% and 10% level.

6.2 Herding Insight between Cross-Sectional Premium/Discount Days and High/Low Dividend Yield Days

The results between Panel D (including E) and F might seem abnormal at the first sight as herding are presented in both high dividend yield (including large yield gap) and cross-sectional premium days. Nevertheless, this situation could be explained in 2 perspectives. First, despite the same closed price on any particular days, the high dividend yield days might be the same days as cross-sectional premium days. Holding the closed price constant (as it is the same day), the average market NAV might be decrease as a result of asset devaluation or disposal. At the same time, the average market dividend amount might be increase that days.

To verify this situation, this paper runs the Chang et al.,2000 herding model deeper one further step to see if there is also herding behavior present in the mutually same days on cross-sectional premium days and high dividend yield days. According to the Panel A in Table 4, the coefficient β_2 is negative mutually on cross-sectional premium days and high dividend yield days, however not statically significant. Although these results might suggest at least that these days are inclined to exhibit herding behavior as the $CSAD_{m,t}$ tend to decrease as the market return increases, there is no enough evidence to confirm so. The results, therefore, cannot support the first perspective.

Figure 3: Discount/Premium Index and Dividend Yield between 2015-2019



Second, the high dividend yield days and the cross-sectional premium days might not be the same days. Holding the NAV and dividend amount constant (in order to see the price impact), the closed price on those days might be different. Since herding is present in both high dividend yield days and the cross-sectional premium days and herding might present due to both buying the same REIT/PF or selling the same REIT/PF, there are possibilities that the herding in cross-sectional premium days may arise as a result of buying those names causing the prices to be higher. This situation might be happened as investors do not really care about the NAV and some investors are likely to buy the names with expected future good stories such as the potential asset injection, improvement in asset performance which in turn shall boost the expected dividend payment in the future. Therefore, they do not do care if the price is kept increasing beyond the NAV. On the other hand, the herding in high dividend yield days may arise as a result of selling those names causing the prices to be lower. This situation could be partly explained as many Thai PF/REITs which offering high dividend yield, are not that good names for example, there is no historical dividend growth, no future expected asset injection or bad outlooks.

To verify this situation, this paper also runs the Chang et al.,2000 herding model to see if herding on high dividend yield days and the cross-sectional premium days might have relationship with buying and selling. Unfortunately, the best method herein is to use the positive market return days as the proxy of buying days while the negative market returns days as the proxy of selling days instead. This presumption is quite making sense as buying tend to increase the price, while selling tend to decrease the price.

To investigate if herding on high dividend yield days is stronger on negative market days, according to the Panel B in Table 4, the coefficient β_2 is mutually statically significant and negative at -26.857 on high dividend yield and negative market days. However, the coefficient β_2 is also mutually statically significant and negative at -40.304 on high dividend yield and positive market days. These results therefore suggest that herding on high dividend yield days are presented in both positive and negative market days.

To investigate if herding on cross-sectional premium days is stronger on positive market days, according to the Panel C in Table 4, the coefficient β_2 is mutually statically significant and negative at -20.574 on cross-sectional premium and positive market days. However, as the same results in Panel B, the coefficient β_2 is mutually statically significant and negative at -15.385 on cross-sectional premium and negative market days as well. These results therefore suggest that herding on cross-sectional premium days are presented in both positive and negative market days.

These results, therefore, cannot be entirely used to support the second perspective as herding on high dividend yield and cross-sectional premium to NAV days are present in both up and down market.

Table 4

Testing on different market conditions (2 dimensions)

Panel	β_0	β_1	β_2	R^2	Observations
Panel A: Discount/Premium to NAV and Dividend Yield					
Discount to NAV on High Dividend Yield days	0.005	0.993	5.990	0.495	218
	(0.000)***	(0.000)***	(0.391)		
Discount to NAV on Low Dividend Yield days	0.006	-0.041	134.859	0.403	59
	(0.000)***	(0.452)	(0.005)***		
Premium to NAV on High Dividend Yield days	0.005	0.767	-10.395	0.593	41
	(0.000)***	(0.002)***	(0.230)		
Premium to NAV on Low Dividend Yield days	0.005	0.835	51.600	0.527	111
	(0.000)***	(0.001)***	(0.129)		
Panel B: Market Return and Dividend Yield					
High Dividend Yield on Positive Return days	0.004	1.223	-26.857	0.574	130
	(0.000)***	(0.000)***	(0.001)***		
High Dividend Yield on Negative Return days	0.005	1.186	-40.304	0.463	129
	(0.000)***	(0.000)***	(0.007)***		
Low Dividend Yield on Positive Return days	0.005	0.729	56.909	0.522	86
	(0.000)***	(0.006)***	(0.122)		
Low Dividend Yield on Negative Return days	0.005	0.380	96.403	0.419	84
	(0.000)***	(0.099)*	(0.019)**		
Panel C: Market Return and Discount/Premium to NAV					
Discount to NAV on Positive Return days	0.005	0.828	34.048	0.417	318
	(0.000)***	(0.000)***	(0.168)		
Discount to NAV on Negative Return days	0.005	0.745	44.133	0.519	316
	(0.000)***	(0.000)***	(0.007)***		
Premium to NAV on Positive Return days	0.005	1.050	-20.574	0.575	291
	(0.000)***	(0.000)***	(0.001)***		
Premium to NAV on Negative Return days	0.005	0.994	-15.385	0.535	295
	(0.000)***	(0.000)***	(0.006)***		

Table 4 presents the results from the following equation; $CSAD_{m,t} = \beta_0 + \beta_1|R_{m,t}| + \beta_2 R_{m,t}^2 + e_t$

$CSAD_{m,t}$ is the daily cross-sectional absolute deviation of PF/REIT's returns. $R_{m,t}$ is their daily average return. The equation is estimated for the period 30/12/2014 - 30/12/2019. Parentheses are the estimated one-sided p-values.

***,**,* denotes that the coefficient is significant at the 1%,5% and 10% level.

6.3 Herding on Market Capitalization and Percent Free Float

From this now, this paper shall present the relationship between the herding behavior and the PF/REIT's market capitalization and percent free float after categorizing those names into tercile portfolios.

According to the Panel A in Table 5, for the large market capitalization portfolio, the coefficient β_2 is statically significant and positive at 23.2376. This result suggests that the herding behavior is not present for the PF/REIT which have large market capitalization. For the mid and small market capitalization portfolio, on the other hand, the coefficients β_2 are statically significant and negative at -16.163 and -58.049 respectively. This result can confirm the presence of herding behavior within PF/REIT which having medium and small market capitalization. These results are consistent with this paper's hypothesis as the higher the information asymmetry in small firms. Addition, the results are quite similar to Cui, Y. et al., 2019 as they found herding in U.S. closed-end fund is present in all portfolio size, with its magnitude increasing as market cap declines.

According to the Panel B in Table 5, for the high and low percent free float portfolio, the coefficients β_2 are statically significant and negative at -25.200 and -23.715 respectively. These results suggest that there is herding present in PF/REIT which either having high or low percent free float. Notwithstanding, for the medium percent free float portfolio the coefficient β_2 is statically significant and positive at 1.822. These results suggest that herding is not present within PF/REIT which having medium percent free float. Therefore, the results are inconclusive here as they are not consistent along the portfolios. The percent free float perhaps has no relationship with herding behavior (at least for this investigated period). The results are also in line with Vo, X. V., et al., 2019 as they detected the presence of herding in Vietnam stock market for every market liquidity including high, medium and low liquidity, however depended on specific sample period between 2005-2017.

Furthermore, one important thing this paper found is the components of medium percent free float portfolio approximately 41-50% or 9-10 names from 20-22 names are also the components of large market capitalization portfolio which have already confirmed no presence of herding behavior.

Table 5

Testing on Market Capitalization and Percent Free Float

Panel	β_0	β_1	β_2	R^2	Portfolio's component
Panel A: Herding and Market Capitalization					
Large Market Capitalization Portfolio	0.005	0.553	23.376	0.312	20-22 names
	(0.000)***	(0.000)***	(0.000)***		
Mid Market Capitalization Portfolio	0.004	0.870	-16.163	0.282	20-22 names
	(0.000)***	(0.000)***	(0.001)***		
Small Market Capitalization Portfolio	0.006	1.843	-58.049	0.297	20-22 names
	(0.000)***	(0.000)***	(0.000)***		
Panel B: Herding and %Free Float					
High %Free Float Portfolio	0.005	1.339	-25.200	0.261	20-22 names
	(0.000)***	(0.000)***	(0.002)***		
Medium %Free Float Portfolio	0.005	0.739	1.822	0.262	20-22 names
	(0.000)***	(0.000)***	(0.377)		
Low %Free Float Portfolio	0.005	1.093	-23.715	0.291	20-22 names
	(0.000)***	(0.000)***	(0.000)***		

Table 5 presents the results from the following equation; $CSAD_{m,t} = \beta_0 + \beta_1|R_{m,t}| + \beta_2 R_{m,t}^2 + e_t$

$CSAD_{m,t}$ is the daily cross-sectional absolute deviation of PF/REIT's returns. $R_{m,t}$ is their daily average return.

Tercile portfolios are ranked from the highest market capitalization/percent free float to the lowest ones.
The equation is estimated for the period 30/12/2014 - 30/12/2019. Parentheses are the estimated one-sided p-values.

***,**,* denotes that the coefficient is significant at the 1%,5% and 10% level.
Number of portfolio's components is varying from year to year due to PF/REIT brand-new initiation or termination.

7. Conclusion

This paper examines the herding behavior in Thai PF/REIT for the period between 2015-2019. This paper also investigates further whether herding behavior appears likewise in different market conditions, for example, high/low volume days, up/down market days, high/low dividend yield days and cross-sectional premium/discount to NAV days. Besides, this paper also researches whether herding has relationship with PF/REIT characteristics such as market capitalization and percent free float. To examine so, this paper implements the Chang et al., 2000 herding measurement model which developed from the original Christie and Huang, 1995 model.

The empirical results indicate that there is statically significant herding in Thai PF/REIT market. This result is consistent with Philippas et al., 2013 who confirmed herding in U.S. REIT market, Chang et al., 2000 who confirmed herding behavior in emerging equity market and Rattanasri and Vichitthamaros, 2018 who found herding behavior in SET index.

In addition, the empirical results also indicate that herding is present in both days of positive and negative market return and also present in medium to high volume days. These results are in line with Y. Cui, B. Gebka and V. Kallinterakis., 2019. Herding is also present consistently on high dividend yield days and large yield gap days when comparing to 10-year Thai Government bond yield, however, these results are opposed to the paper's hypothesis at the beginning. The possible explanation might be due to the fact that in term of PF/REIT investor, high dividend yields are viewed as more attractive than low dividend yields otherwise, they might consider buying other asset classes at the first place. In term of cross-sectional premium or discount to NAV days, the empirical results suggest that herding in present only in cross-sectional premium to NAV days as PF/REIT investors might not actually pay attention to the NAV.

The results of herding in both high dividend yield days and cross-sectional premium to NAV days might looks reverse at first sight, however there are possible 2 perspective explanations for this situation; first, those days could be the same days as they are days with NAV is decreasing while the dividend amount is increasing and second, those days are different days which the herding might arise due to buying in cross-sectional premium to NAV days and selling in high dividend yields days. Unfortunately, the explicit empirical results still being inconclusive here.

In term of relationship between herding behavior and PF/REIT characteristics, the empirical results suggest that herding is present in small market capitalization portfolio (also medium market capitalization portfolio), however, not in large market capitalization portfolio. The possible explanation for these results is the smaller the firms (PF/REIT) are, the higher information asymmetry. However, the presence of herding when categorized the PF/REIT into tercile portfolios according to their percent free float, the conclusion cannot be reached as herding is present in both high

and low percent free float portfolio, on the other hand, not in medium percent free float portfolio. The results are, however in line with Vo, X. V., et al., 2019 as they detected the presence of herding in Vietnam stock market for every market liquidity depended on specific sample period. Note herein that, the components of medium percent free float portfolio approximately 41-50% or 9-10 names from 20-22 names are also the components of large market capitalization portfolio which have already confirmed no presence of herding behavior.

In summary, herding behavior, a type of behavioral bias, might not be purely occurred from noise trading. However, it might have a little relationship with the fundamentals as this paper's empirical results which indicate herding behavior present in high dividend yield and large yield gap days rather than low dividend yield and small yield gap days which should be the case if investors follow what they perceive other investors are doing, rather than their own analysis" (Chen, 2019) or as a result of momentum strategies or technical investors.

Hopefully, this paper might give support evidences to mixed results and interpretations of many literatures which following Chang et al., 2000 herding measurement model

First, herding is not present purely according to specific asset class within the same country as this paper confirms herding behavior in Thai PF/REIT market in accordance with Rattanasri and Vichitthamaros, 2018 who confirmed herding in SET market. These findings are supplement to the results earlier that herding is present in U.S. REIT market (Philippas et al., 2013), however not in U.S. equity market (Chang et al., 2000).

Second, herding might not be purely present according to the location where the same asset class was located as this paper confirms herding behavior in Thai PF/REIT market in accordance with the presence of herding in U.S. REIT market (Philippas et al., 2013). These findings are also supplement to the results earlier since there were evidences of herding in emerging equity market, on the other hand, not in developed equity market.

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