How does Liquidity in the Financial Market Affect Real Estate Market Yields?

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1. Introduction

After the 2008 global financial crisis, many countries have implemented expansionary post-crisis monetary policies. For instance, the Federal Reserve in U.S lowered the federal funds rate to near zero and authorized a series of large-scale asset purchases of longer-term securities to increase liquidity in the market. In case of Japan, its central bank announced an additional asset purchase program as part of the comprehensive monetary easing together with "virtually zero interest rate policy" (Rogers et al, 2014), and the Public Bank of China also cut its long-term benchmark bank loan leading to tremendous expansion of money supply and bank loans. These expansionary monetary policies have drawn attention of many researchers resulting in a plethora of debates and explanations regarding the impacts of global liquidity.

According to the literature, increased liquidity of financial markets is considered to have substantial impacts on real estate markets. However, there are only a few studies that cover how liquidity in the financial markets affects commercial real estate markets; i.e., whether liquidity has a positive effect commercial real estate value, leading to a decrease in yields (capitalization rates). This study aims to answer this question.

This research sheds light on the relationship between monetary liquidity and real estate markets across the Asia countries. In particular, not only does the research examine the effects of 'normal' liquidity on real estate market but also the effects of 'excess' liquidity. This is because the 'excess' liquidity (defined as the amount of liquidity beyond the capacity of the real sector in economy) is expected to propel market activity, affecting real estate market prices and risk

premium. The proxies of monetary liquidity here are approached by quantity measures (broad money supply).

The study focuses on six major office markets in Asia; China, Japan, Korea, Taiwan, Singapore, and Hong Kong. Plus, the panel model used in the study includes variables assessing normal liquidity, excess liquidity, and key determinants of yields. The data used in the econometric analysis are primarily based on RCA database and Bloomberg.

This paper's empirical result contributes in twofold. First, the study further explores the determinants of commercial real estate yields. Second, it identifies the impacts of liquidity in financial markets on the commercial real estate markets by analyzing major office markets in Asia.

2. Literature review

2.1 Determinants of Yields.

Yields are defined as a ratio of net operating income over the value of the property. The income flow and the property value play an essential role in making real estate investment decisions, and thus determinants of yields have been the focus of a variety of previous researches. According to Heinig et al., (2016), a standard yield model uses the following four components: the yields as the dependent variable, and the risk-free rate, the expected rent, and the risk premium as the independent variables. Many studies have examined determinants of yield based on this standard model, including Sivitanides et al(2001)'s research.

Sivitanides et al.(2001) examines determinants of yields in four property types; office, industrial, retail and apartment. They use a metropolitan level sample of yields in U.S and construct an estimation model including real rent index, annual percent change in the real rent

index, 10-year treasury rates as a proxy for risk-free rate, and annual percent change in CPI. They argue that movements in market-specific yields are shaped by the time path of local rental growth and national common influences; interest rates and CPI.

Chervachidze and Wheaton(2010) also explores yields in U.S from first quarter of 1980 to third quarter of 2009**.** The primary contribution of this study is that it addresses the importance of both debt availability and corporate risk premium in its estimation model. Debt availability is proxied by ratio of the annual growth rate in Total Debt Outstanding (debt securities plus loans) to GDP. Risk premium is calculated as the spread between Moody's AAA Corporate Bond Index and the 10-year T-Bond yield. Adding to the risk-free rates and real rent ratio, these explanatory variables are also found significant in U.S real estate market.

Tsolacos et.al (2009) seeks to provide empirical evidence on explaining retail yield levels and variation in eight Asia-Pacific centers. The yield specification they present is based on the equation below and its roots in the basic discount cash flow and pricing models.

$$Y = \emptyset(g, r, T) + \varepsilon_t$$

Y is the yield; g is the rental growth rate, and r is the discount rate; T is the period between rent reviews and ε_t allows for random and independent shocks. Guided by above framework, (real) rent growth and (long-term) interest rates are used in their empirical specification. The results suggest that interest rates have a statistically significant positive effect and real rent growth has a very significant negative impact on yields.

Our brief review of previous studies reassures Tsolacos et. al(2009)'s remark that most of the variables used in existing studies are conceptually based on the time and location variation of rental growth rate and discount rate. In our specification, in addition to the risk-free rate and real rent growth, we attempt to improve on the existing literature by including variables:

liquidity in financial market. It is anticipated to affect asset risk and price which will be dealt with in the next section.

2.2 Liquidity and Asset markets

Since Fisher(1932) stressed the relationship between monetary factor and asset markets, there have been many researches regarding the impacts of monetary liquidity on asset market. According to Meltzer(1995), this monetary impulse applies both to the countries with and without developed financial markets, and it has transitional effects on prices even where long-term bonds or Treasury bills do not exist. Therefore, understanding the impacts of liquidity in financial market on asset market offers common implications in explaining changes in yields across different office markets.

Bernanke and Kuttner(2005) divided the monetary liquidity's effects on the asset market into two transmission channels; perceived risk and asset's price. Firstly, the perceived risk can be explained by the framework of bid-ask spread, a price difference between buyers and sellers in the procedure of asset transaction. For instance, if there is a sufficient flow of money in the market or there are many potential buyers and sellers who can bid at a price close to the market equilibrium price, the asset's risk is reduced, and the return rate is lowered(Acharya and Pederson, 2005). On the contrary, when the investors are faced with an insufficient flow of money in asset markets, a higher return on assets would be required. (Amihus and Mendelson, 1986). This is because investors would be bearing higher risk in a slowing-down of economic activity and, hence demand more risk premium (Bernanke and Kutter, 2005). This corroborates that market-observed expected asset return is negatively associated with the level of monetary liquidity.

Secondly, monetary liquidity affects asset's price. Adalid and Detken(2007) looks at the relationship between liquidity shocks and asset price in 18 OECD countries. By using VAR, IV, Quantile and Panel analysis, they show systematic evidence across the countries and time periods establishing a robust positive association between broad money growth and aggregate residential property price booms.

Ahearne et al. (2005) also models house prices in 18 major industrial countries from 1970 to 2005 and highlighted the interaction of house price with other elements of financial and economic environments. The result confirms that easing monetary policy preceded the past housing price surges and could conceivably raise the probability of their occurrence of the intensity of the rise.

A recent study by Xiaoqing and Chen (2011) describe the connection between key monetary policy variables and the housing market in China. They concluded that faster money supply growth, declining long-term interest rates and loosening mortgage down payment policy tend to raise the subsequent home price growth rate and suggest that monetary policy actions are the key driving forces behind the change in real estate price growth rate.

Through the previous literature, many studies have identified the effects of 'normal' monetary liquidity which are measured by aggregated money supply or growth rate of money supply on asset markets. However, normal liquidity does not adequately capture or only partially reflects the expansion of monetary liquidity. Assume a situation that the monetary liquidity increases in accordance with the acceleration of economic activities (increase in the growth of GDP). In this expanding economy, an increase of aggregated money can be compatible with the objective of price stability, without creating a situation of overheating. This is because increased money is absorbed by enhanced transaction demand. Taking into consideration of this deficiency of

‘normal’ liquidity, we should further explore not only the ‘normal’ liquidity in financial market but also the ‘excess’ liquidity in financial markets.

Excess liquidity is often defined as a difference between the growth of aggregated money and that of nominal GDP(Baks and Kramer, 1999; Ruffe and Stracca, 2006, Guo and Li,2011). In other words, should the money supply expand permanently faster than nominal GDP, excess liquidity is created (Deutsche Bank, 2007). For this reason, excess liquidity can reflect the booms and busts of the economy and overcome the limits of normal liquidity.

In addition to this, there have been various studies presenting how excess liquidity affects real estate market more directly than normal liquidity. Guo and Li(2011) provide empirical support in their study regarding china’s residential market. They employ a VAR model to test the effects of excess liquidity on housing price. The results reveal that a boom(bust) in the excess liquidity leads a boom(bust) in housing prices and the effect peaks three-quarter after an increase in excess liquidity.

Belke et al.(2008) also find that excess liquidity fuels housing prices more than consumer prices in the Euro area and U.S, and he points out that the higher sensitivity of housing prices to excess liquidity results from the lower price elasticity of housing supply. Therefore, the additional demand caused by the excess liquidity will be reflected to a higher degree of price increases in housing rather than increases in other commodities.

The abovementioned previous studies have observed the time-lag effects of liquidity on asset markets’ prices and risks. They have also verified that excess liquidity influences asset market more directly than normal liquidity. However, previous studies suffer from some drawbacks. First, the impacts of monetary liquidity on commercial real estate market remain poorly understood. Real estate markets are heavily affected by the nation’s financial markets and

macroeconomy (Diasquale and Wheaton,1992). In spite of this stylized fact, only a little work has been produced on cross-border office market, and most of them focus on the impact of liquidity on residential real estate market. Secondly, there is no empirical research to identify the effects of excess liquidity on office market. Therefore, this study aims to address the gap.

3. Data and Descriptive Statistics

1) Data

This study contains office market data from six Asian countries over the time period of the first quarter of 2007 through the fourth quarter of 2015. Six data series are used in this paper; yields, year on year real rent growth(Rrentyg), ten-year government bond rate (LTI) as a proxy for risk-free rate, GDP, and broad money, M2. Yields are obtained from Real Capital Analytics and the source of rent data is CBRE. The economic data, LTI, M2 and GDP are primarily compiled from Bloomberg.

In order to measure the liquidity in financial market, we use M2 measure of money supply. M2 includes narrow money (M1) and financial instruments that can be converted to cash in relatively short order such as 24-hour money market funds and short-term time deposit. Therefore, we use the M2 to better reflect investors' liquidity and their changes in the composition of their portfolios than M1.

Excess liquidity (excess) is calculated as the gap between the growth rate of M2 and that of nominal GDP. Plus, we also check the robustness using another proxy variable (money gap) which is widely used in measuring the excess liquidity (Bruggeman and Annick, 2007; Alessi and Detken, 2009).

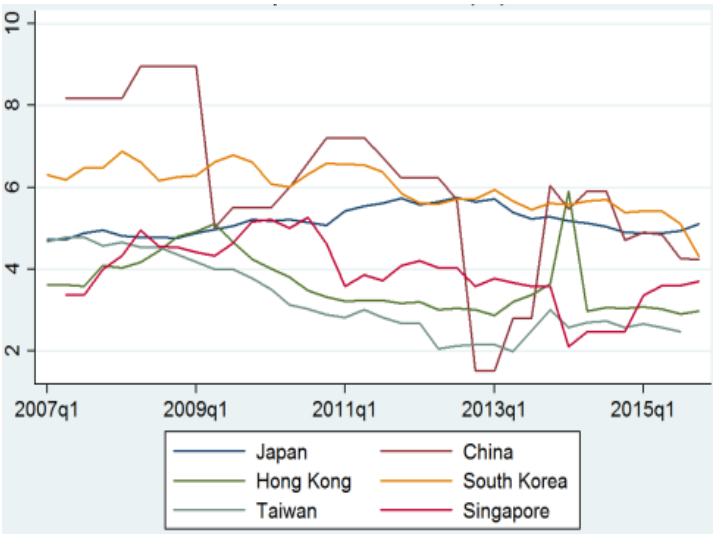
The money gap is defined as the deviation of broad money to nominal GDP from its trend level which is computed as the Hodrick-Prescott(HP) filtered series of the ratio of broad money to

nominal GDP, using a smoothing parameter of 1600.[1]

2) Descriptive statistics

Figure 1 demonstrates yields trends in six countries. The minimum yields on our sample is 1.5%, and the maximum reaches 9.0% in China. And the standard deviation varies by the country. The standard deviation of Japan and South Korea are 0.32 and 0.55, respectively, but that of China is 2.0. It implies that Japan and South Korea is relatively less risky markets than China.

Figure 1. Yields Trends (%), 2007Q1-2015Q4



Next, we review the trends in broad money supply over the periods 2007Q1-2015Q4. Figure 2 shows natural log of money supply trends. Log transformation is used to adjust the unit of scale. Money supply continuously increases over the periods in all countries, which verifies that Asian countries have introduced an expansionary monetary policy to boost their economies.

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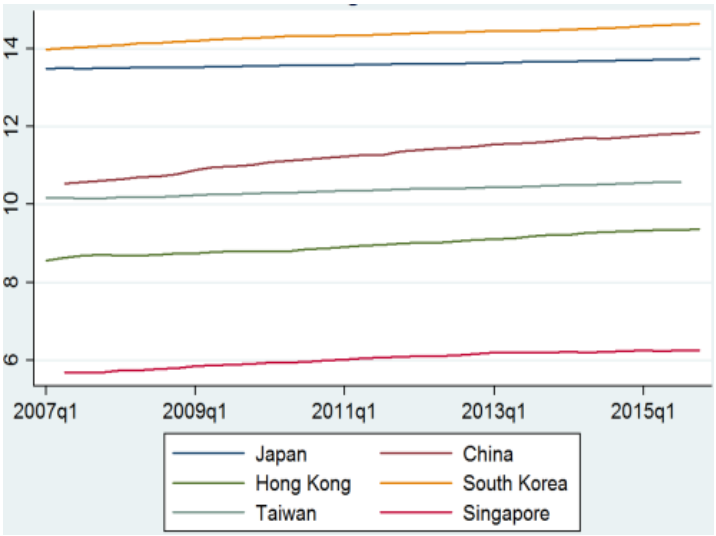
[1] HP filter is a widely used trend-removal technique and the smoothness of the trend depends on the smoothing parameter; the trend becomes smoother as the parameter becomes larger (StataCorp, L. P. (2013). In our analysis, a smoothing parameter of 1600 is adopted according to Prescott(1997)'s recommendation on quarterly data.

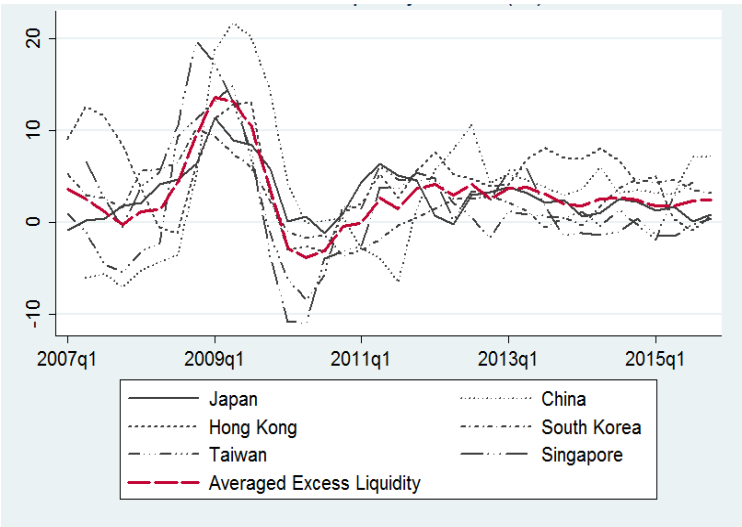
Figure 2. Natural log of M2 Trends, 2007Q1-2015Q4



As shown in Figure 2, normal liquidity (M2) does not show any variation over the periods, and thus real estate market's volatility associated with a change of liquidity cannot be properly explained by normal liquidity.

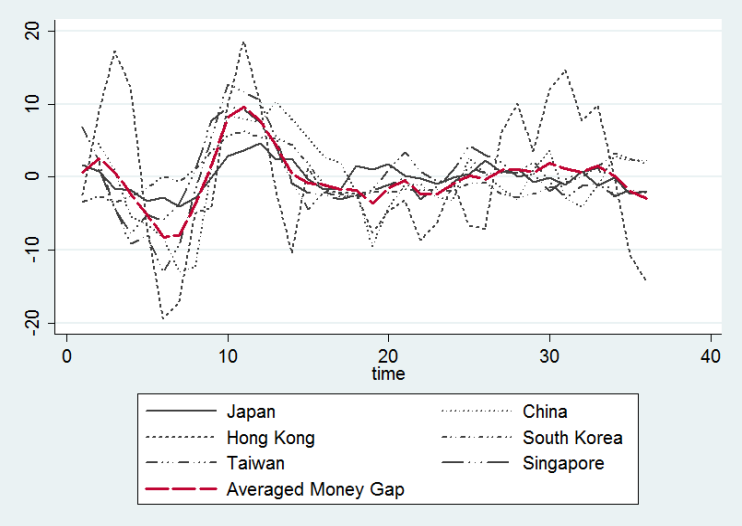
On the contrary, excess liquidity shows different trends in Figure 3. In between late 2008 and 2009, there was a sharp fall in GDP across the countries primarily triggered by spillover effects of global financial crisis while the yearly growth rates of M2 rose by expansionary monetary policy. As a result, excess liquidity sizably increased. This movement corresponding to ups and downs of the real economy as well as fluctuations of money supply verifies that the effects of liquidity on real estate markets are understood more clearly by measuring the level of 'excess' liquidity. However, a dramatic increase in excess liquidity did not last long. The reason is that Asian economy quickly rebounded to the pre-crisis level in 2010 and the growth rate of money supply declined over the previous years.

Figure 3. Excess Liquidity Trends (%), 2007Q1-2015Q4



Then it went up again but in a weaker amplitude. Sovereign debt crisis in Europe contributed to the slowdown of yearly growth rate of GDP from late 2010, and thus the level of excess liquidity escalated in Asian countries. The magnitude of the shock from the euro crisis was significantly smaller than that of the financial crisis. However, the impacts continued as euro crisis is still far from being fundamentally resolved (Lee et al, 2013).

Figure 4. Money gap trends (%), 2007Q1-2015Q4



Another measurement to check liquidity in the financial market is money gap, a ratio of M2 to nominal GDP. As shown in Figure 4, the averaged trend of six countries is volatile enough to display financial market movement. When money gap shows a positive value, it indicates the oversupply of liquidity in comparison to the transaction demand. On the contrary, when money gap is negative, it implies the tightened liquidity conditions.

Overall trends of money gap in six countries exhibit similar movement with that of excess liquidity in Figure 3. Between the first quarter of 2009 and first quarter of 2010, money gap reached its peak resulting from the expansionary monetary policy of each country caused by impacts of global financial crisis. After the crisis, the trends in money gap has been fluctuating in a relatively smaller amplitude partly due to the spillover effects of recession in eurozone.

4. Empirical outcome

In this section, the impacts of financial market liquidity on yields are examined across six major office markets in Asia. The empirical specification consists of base model, ln(natural log)M2 model, money gap model and excess liquidity model. Base model intends to follow the standard modeling of yields used in previous literature. It includes the fundamental determinants of yields: 10-year government bond interest rates and real rent growth rates. LnM2 model is employed to measure the impact of normal liquidity on yields, and both the money gap and the excess liquidity models show the effects of excess liquidity on office markets. Especially, one-quarter lagged values of the liquidity variables are used to reflect the above empirical outcome of past researches and to examine the time-lag effect of liquidity on yields.

Table 1 Correlation between yields and fundamental and liquidity variables.

	Yield	LTI	Rrentyg	lnm2	money gap	excess liquidity

	Lag	0	0	0	0	1	0	1	0	1
Yield	0	1.0000								
LTI	0	0.5002	1.0000							
Rrentyg	0	-0.1027	0.1337	1.0000						
lnm2	0	0.4751	0.1506	-0.1651	1.0000					
	1	0.4774	0.1530	-0.1376	1.0000	1.0000				
money gap	0	-0.0576	0.0215	-0.3132	0.0078	0.0121	1.0000			
	1	-0.0796	0.0307	-0.2163	0.0071	0.0055	0.7042	1.0000		
excess liquidity	0	-0.0528	0.0124	-0.1821	0.0156	0.0052	0.3873	0.0024	1.0000	
	1	-0.0973	0.0412	-0.2990	0.0182	0.0191	0.5769	0.4089	0.7871	1.0000

Table 1 shows the correlation between yields and independent variables. First, long-term interest rate (LTI) and yearly growth rate of real rent (Rrentyg) is anticipated to be positive and negative respectively, and the signs of correlation are consistent with the expectations.

Contemporary and lag liquidity variables, and yields share negative correlations except for lag lnm2. Based on literature reviews and slightly higher correlation coefficient, the liquidity variables tend to accelerate or decelerate the yields and further examination. Plus, the higher positive correlation between money gap and excess liquidity exhibits that the money gap is also able to capture the changes in excess liquidity. Lnm2 variables will be dealt with in detail later.

Next, the detailed panel analysis results of fixed-and random effects model are presented in Table 2. In both models, similar to the previous literature, time-lag effects of liquidity on real estate market are identified. However, since Hausman test did not reject the null hypothesis that the random effects estimator is consistent, the random effects are preferred in all cases with the exception of lnM2 model.

Table 2. Lag effects of liquidity on office yields

	Base Model		lnM2 Model		Money Gap Model		Excess Liquidity Model	
Variables	Fixed-effect model	Random-effect model	Fixed-effect model	Random-effect model	Fixed-effect model	Random-effect model	Fixed-effect model	Random-effect model
	Coef. (t- stat)	Coef. (t- stat)	Coef. (t- stat)	Coef. (t- stat)	Coef. (t- stat)	Coef. (t- stat)	Coef. (t- stat)	Coef. (t- stat)
LTI	0.454*** (4.79)	0.470*** (5.14)	0.038 (0.44)	0.404*** (4.29)	0.480*** (4.94)	0.491*** (5.24)	0.479*** (5.12)	0.492*** (5.44)
Rrentyg	-0.760** (-2.02)	-0.790** (-2.11)	-0.710** (-2.26)	-0.721* (-1.87)	-0.880** (-2.18)	-0.906** (-2.25)	-1.201*** (-2.98)	-1.224*** (-3.04)
Lag. lnM2			-2.922*** (-10.61)	-0.470*** (-2.96)				
Lag. Money Gap					-2.700** (-2.08)	-2.745** (-2.12)		
Lag. Excess Liquidity							-0.055*** (-3.97)	-0.055*** (-3.96)
Constant	3.544*** (14.44)	3.490*** (8.03)	36.07*** (11.74)	8.682*** (4.72)	3.471*** (13.92)	3.417*** (7.39)	3.638*** (15.10)	3.578*** (8.13)
obs	209				200			
BIC	589.94		477.24		565.45		554.03	

*p<0.1, **p<0.05 ***p<0.01

The LTI variable presents a positive coefficient as expected. Normally investment in real estate is considered riskier than that of 10-year government bond, and thus it would be reasonable for real estate investors to require a higher return. Therefore, when risk-free rate increases, it exerts upward pressure on yields.

The estimated coefficient of Rrentyg has a negative sign and statistically significant. Real rent growth variables capture the impacts of space market fundamental on yields. To be specific, weak space market raises yields since investors sense heightened perceived risk level and decelerated cash flow growth (Sivitanides et al., 2003). On the contrary, strong space market leads to lower yields.

Turning to the extended model, BIC (Bayesian Information Criteria) lag-length selection is introduced to determine the best fitting lag length of liquidity variables, and its statistics are presented in the Table 2. The first liquidity variable, lag lnM2 shows a statistically significant negative effect as expected. However, as seen in Figure 2, lnM2 steadily increases without variation while yields fluctuates. That is to say, liquidity which is measured by M2 does not reflect contextual economic conditions and the fluctuations of yields. Therefore, combined with the unexpected sign of correlation coefficient, it can be argued that identifying the effects of excess liquidity is deemed to be more appropriate.

Both lagged money gap and excess variables have statistically significant negative effects. They show that increased excess liquidity has generated strong downward pressure on the subsequent yields. As discussed in theoretical review, increased excess liquidity lowers the level of perceived risks, and additional demand in real estate market raises its prices. These effects are evidenced in our estimation as well. Furthermore, the sign and significance of the

risk-free rates and real rent growth rate variables are not changed by added proxy variables of excess liquidity. This represents that money gap, and excess variables are orthogonal to the base variable, and both robustness and statistical significance confirm the value of the impacts of excess liquidity on real estate market.

Figure 5 to 10 present fitted yields and actual yields during periods of increasing excess liquidity. It is based on the results obtained by the excess liquidity model panel regression. By comparing the fitted and actual yields, this study aims to examine the impacts of excess liquidity on value of real estate. A period of increasing excess liquidity is defined as increasing periods with at least two consecutive quarters in reference to the Bruggeman (2007)'s definition. Additionally, in case of a period of increasing excess liquidity separated by a quarter of relatively decreasing excess liquidity, it is considered as a consecutive increasing excess liquidity.

As seen in literature review and empirical outcome, excess liquidity seems to cause subsequent price booms. Thus, fitted yields are anticipated to exhibit higher values that than of actual yields, and median values of the difference between fitted yields and actual yields have been positive in all countries but China[2]. Figure 5 to 10 identifies it. However, the model predicts slightly lower yields than actual yields in some quarters of each country. This may have resulted from random error component that reflects unobservable factors that our regressors were unable to capture.

[2] Median value is used to minimize the impact of outliers, and the median values of fitted yield minus actual yield for each country are as follows; Japan (0.30), China (-1.49), Hong Kong (0.22), South Korea (0.004), Taiwan (0.16) and Singapore (0.05).

To be more specific on each country, Japan's actual yields were lower than its fitted value for the earlier years in the periods of increasing excess liquidity. From the first quarter of 2011, the actual yields exceeded fitted yields, and the unexpected outcome of higher actual yields seems to be affected by unprecedentedly high risk premium. Normally, Japan office market has lower risk premium due to market maturity. However, as the Bank of Japan's asset purchase program and expansionary monetary policy pushed 10-year Japanese Government Bond Yields close to historic lows, the spread of office yields over risk-free rate (yield spread) has increased along with the risk premium. As a consequence, the actual yields remained high. Similarly, in South Korea, the periods where actual yields exceeded fitted yields goes along with the periods of increasing yield spread.

As for China, investors require higher yields than other commercial real estate market due to the market's relatively lower maturity. Therefore, actual yields maintained higher than what was predicted. However, the gap between actual yields and fitted yields has been noticeably reduced recently because of investor's optimistic expectation caused by recent buoyant office demand from financial and TMT(Technology, Media, and Telecom) companies and high rental growth. In case of Hong Kong, the actual yields were lower than the fitted yields except for the periods affected by 2008 financial crisis. Especially, the impacts of excess liquidity on yield were obvious after 2010 because of maintained lower yields spreads resulted from robust office demand and the bulk of leasing activity (CBRE, 2015). Taiwan and Singapore also showed well-identified impacts of excess liquidity on yields.

5. Conclusions

As expansionary post-crisis monetary policies began to implement globally, the impacts of liquidity in financial market have drawn attention of many researchers. However, its impacts on office markets remain poorly understood because most previous studies have focused on the residential real estate market. Therefore, this study aims to explore the influences of excess liquidity on office markets in six Asian countries using quarterly data from 2007:Q1 to 2015:Q4. The reason that excess liquidity is used instead of normal liquidity is because excess liquidity captures the effects of expanded liquidity in real estate markets more accurately.

Our yield specification includes long-term interest rates, real rent growth and lagged excess liquidity. The empirical results provide us evidence that an increase in long-term interest rates raises office yields. Plus, the real rent growth has significant negative effects on office yields. Finally, an increasing excess liquidity tends to decelerate the value of office yields in six Asian countries. This effect of excess liquidity shows that liquidity in financial market has a positive effect on commercial real estate value, leading to a decrease in yields. On top of that, by comparing the level of fitted and actual yields, we further explore the impacts of the periods of increasing excess liquidity in each country. The empirical outcome is consistent with our hypothesis that office market may be overvalued due to increasing excess liquidity.

In this paper, we contribute to enhance our understanding of commercial real estate yield determinants. Secondly, we identify the impacts of liquidity in financial market on major office markets in Asia. However, although the random-effect panel model partly addressed the individual effects, our panel regression model does not fully capture the heterogeneity across countries. In order to do so, for example, various proxies for estimating risk premium across

countries can be considered, and the inclusion of such variable will be a topic of future work.

Figure 5 Actual vs Fitted yield in Japan during periods of increasing excess liquidity

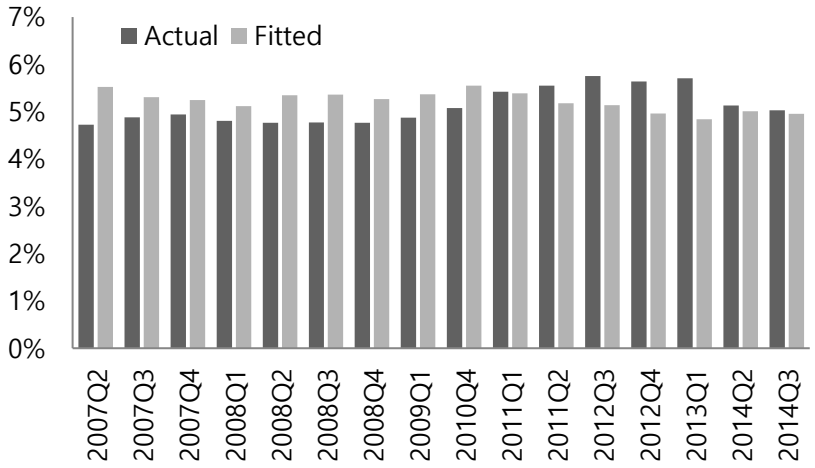


Figure 6 Actual vs Fitted yield in China during periods of increasing excess liquidity

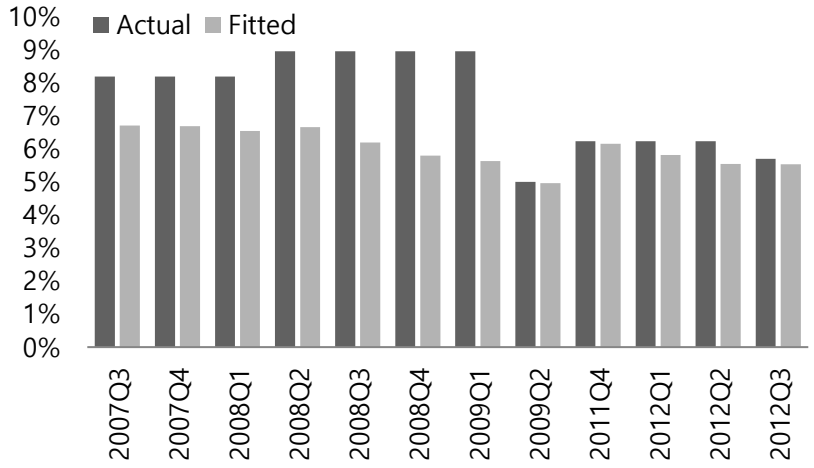


Figure 7 Actual vs Fitted yield in Hong Kong during periods of increasing excess liquidity

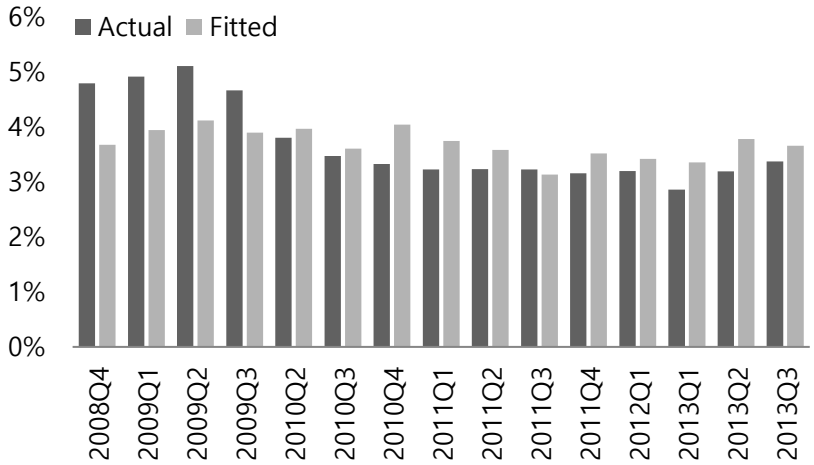


Figure 8 Actual vs Fitted yield in South Korea during periods of increasing excess liquidity

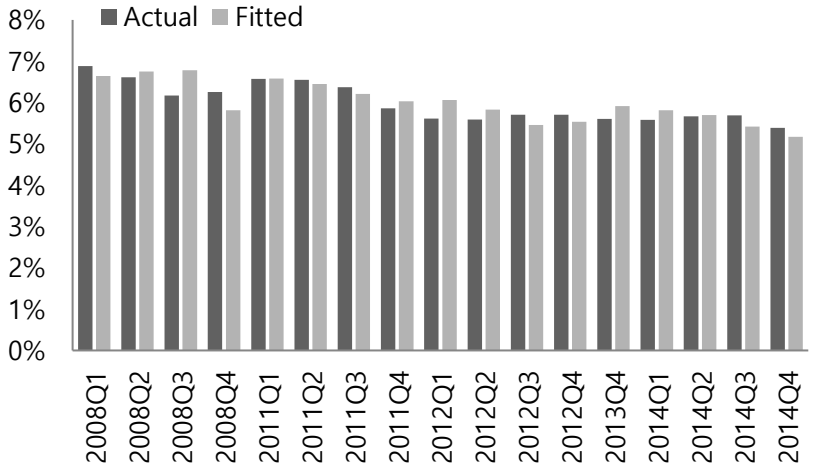


Figure 9 Actual vs Fitted yield in Taiwan during periods of increasing excess liquidity

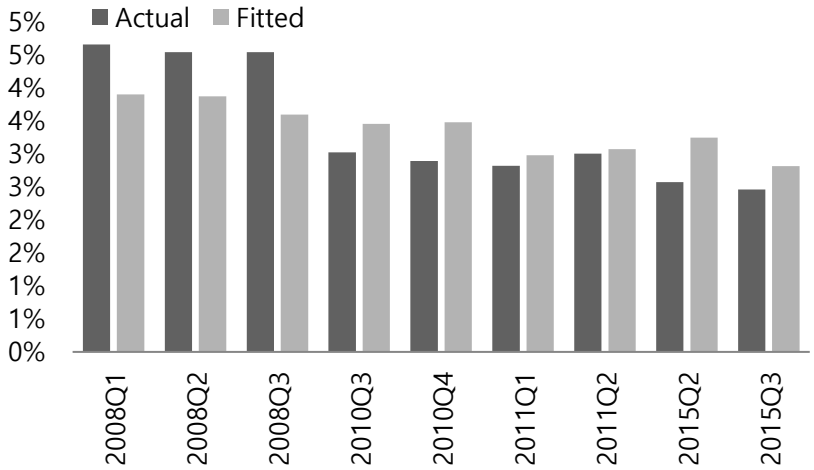


Figure 10 Actual vs Fitted yield in Singapore during periods of increasing excess liquidity