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Global Liquidity, Capital Inflows and House Prices in ASEAN Economies

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Abstract

Quantitative Easing (QE) policies, adopted by the advanced economies since 2009, have led to abundant global liquidity. In the same period, the ASEAN-5 economies (Indonesia, Malaysia, the Philippines, Singapore and Thailand) have recorded strong capital inflows, particularly portfolio inflows. Asset prices, in particular house prices in these economies, have also experienced excess buoyancy. This paper studies the relationship between global liquidity, house prices and capital flows. Empirically, capital inflows have had a positive effect on residential house prices in Indonesia, Malaysia, the Philippines and Singapore. After accounting for domestic demand (using real GDP growth as a proxy), capital inflows have still had a positive impact in Indonesia and Singapore. The authorities of these economies have implemented similar macroprudential measures to safeguard financial stability and reduce speculative activity. The effectiveness of the measures has been seen mainly through a reduction in housing transactions.

Keywords: Capital Flows, Residential House Price, Macroprudential, ASEAN Economies

JEL Classifications: E44, E58, G28, R31

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1. Introduction

The onset of the global financial crisis in 2008/09 plunged major advanced economies into severe economic recession. In response, several major central banks implemented Quantitative Easing (QE) policies to stimulate domestic demand and revitalize impaired financial channels. For example, the QE measures adopted by the U.S. Federal Reserves (U.S. Fed) continued from early 2009 to end-2014 in three phases[1] and mainly involved a series of asset purchase programs to expand the U.S. Fed's holding of longer-term securities. From March 2009 to April 2013, the increase in holdings of securities in all the three QE phases reached around USD2.2 trillion.

Other major central banks have used QE for similar reasons. The Bank of Japan (BOJ) was a forerunner in implementing unconventional monetary policies through its introduction of QE, credit easing and stock purchases in early 2000s. From October 2010 to April 2013, the total assets of the BOJ increased by 35 percent. The BOJ's balance sheet continues to expand further, due to the implementation of further easing policies (labelled as Qualitative and Quantitative Monetary Easing, QQME, in the Abenomics) aimed at boosting the monetary base at an annual pace of about ¥60 to ¥70 trillion. The Bank of England (BOE) and the European Central Bank (ECB) have administered a series of QE programs staggered and at times, overlapping with the U.S. Fed's QE programs. Since the first implementation of its QE program in March 2009, the total assets of the BOE have grown by almost 2.5 times, equivalent to 26 percent of GDP, as of the end 2012. Before 2015, the QE policy of the ECB aimed to provide liquidity to mitigate massive deleveraging being undertaken by Eurozone banks and safeguard financial stability. In January 2015, the ECB announced an asset-purchase program to buy 60 billion euros (around US$68 billion) a month of assets including government bonds through September 2016.

An immediate consequence of these QE programs in the major advanced economies is abundant global liquidity. Total liquidity generated by the three central banks (US Fed, BoE and BoJ) is estimated to be US$3.95 trillion in the period from early 2009 to early 2013. Because of the yield seeking behavior of international investors, a significant part of the liquidity went to the regions with higher growth differentials. Among desired destinations, the ASEAN economies in the Asian region were a popular choice up until the US taper talk in late May 2013. The ASEAN-5[2] economies saw average GDP growth of 4.7% between 2009 and 2012. Consequently, the abundance of global liquidity has led to large capital inflows to the ASEAN-5 economies.

While capital inflows may help deepen and broaden financial markets in the ASEAN economies and provide more funds for the economy, they may also create excessive increases in asset prices and at the same time destabilize financial markets. In the countries with relatively shallow asset markets,

[1] The U.S. Fed started to reduce the amount of monthly asset purchases under its so-called QE3 phase in January 2014 and the US QE program ended in end-2014.

[2] The ASEAN-5 refers to Indonesia, Malaysia, the Philippines, Singapore and Thailand.

large capital inflows can easily translate into asset price inflation and eventually to price bubbles, and thus a sudden reversal of capital flows can result in destabilizing asset markets (Balakrishnan *et al.,* 2012).

Combining large capital inflows and strong domestic demand (due to continuous urbanization and robust growth), residential property prices in the ASEAN-5 economies saw rapid growth from the second quarter of 2009 to the first quarter of 2013. Although the bulk of capital inflows were in portfolio investment, particularly in local currency (LCY) debt securities, house prices in the ASEAN-5 rose sharply. The reason is that local corporates deposit the proceeds from issuing LCY bonds into the local banking system, and local banks are then under pressure to lend via mortgage loans and loans related to the real estate sector, since the local corporations, the traditional customers of local banks, have less of a need to borrow (Aziz and Shin, 2013).

In order to cool down speculative activity and avoid large asset price bubbles, the authorities of the ASEAN-5 economies have implemented sector-specific macro-prudential measures to ensure financial stability. Common measures are loan-to-valuation regulation (alongside the imposition of special and/or introduction of stamp duties/additional stamp duties on buyers and/or sellers), debt-to-income regulation (including imposition of the requirement for financial institutions to conduct credit affordability assessment based on prudent debt-service ratio), as well as caps on credit growth. Some of these measures appear to have successfully reduced speculative activity, thereby helping to deliver financial stability (AMRO, 2013).

In this paper, our main objective is to study the relationship between capital inflows (due to abundant global liquidity resulted from the QE programs of major central banks) and house prices in the ASEAN-5 economies, as there are very few studies on this issue in the literature. Moreover, we review the effectiveness of the sector-specific macro-prudential measures in mitigating risks to financial stability. The structure of the paper is as follows: First we look at the increase in global liquidity resulting from QE in advanced economies and capital flows to the ASEAN region; Secondly we review residential house price movements in the ASEAN-5 economies; Thirdly we investigates empirically whether the recent rapid price rises in the ASEAN-5 residential property markets are related to capital inflows; Fourthly we discuss the effectiveness of property sector-specific macro-prudential measures taken by the authorities; Lastly we provide a conclusion.

2. Quantitative Easing in Advanced Economies

Although the primary purpose of unconventional monetary policy measures adopted by major central banks is to maintain financial stability and boost growth in their respective economies, there may be spillover effects, especially given the huge size of liquidity injections and asset purchases (IMF, 2013).

QE programs in the unconventional monetary policies of the three major central banks have provided huge liquidity to their economies in order to stimulate growth. As shown in Table 1, the U.S. Fed, the

BOE and the BOJ engaged in significant asset purchases. Such asset purchases accounted for as much as 90 percent of the U.S. Fed's and BOE's balance sheet, and up to 70 percent of the BOJ's balance sheet as of April 2013. This form of unconventional monetary policy is most likely to spill over to affect other countries due to its size and nature (Morgan, 2011). The huge amounts of money pumped in by the respective central banks into their domestic economies may not be fully absorbed by domestic entities, and some of it would likely find its way to other economies in the form of capital inflows. When comparing the QE periods using the U.S. Federal Reserve's QE dates, it can be seen that the period from March to October 2009 (known as QE1) had the highest dollar value boost.

QE programs were implemented in staggered and sometimes overlapping periods (Table 2). The BOE's launch of the Asset Purchase Facility coincided with the U.S. Fed's QE1, however, the re-opening of this facility occurred in the interim between QE2 and QE3 (between October 2011 to July 2012). For the BOJ, asset purchases (which include JGBs, Commercial Papers, Corporate Bonds, ETFs, and J-REITs) have been steadily rising since the launching of the Asset Purchase Program (APP) in October 2010 (Figure 1).

There may be several reasons as to why liquidity that is not absorbed in the advanced countries could spill over to other economies. The low interest rate environment in advanced countries has resulted in lower yields, which could drive fund managers to other jurisdictions that offer higher returns (so-called push factors). Characteristics of the region could have also played a part in attracting capital flows, as countries in the region have better growth prospects and offer higher returns (so-called pull factors).

To gauge the possible impact of QE measures on capital flows to the ASEAN[3] region, correlations between the consolidated QE of the U.S. Federal Reserve, BOJ and BOE against various measures of capital flows to the region are shown in Table 3.

All of the correlation coefficients are positive, with the exception of EPFR debt security flows, providing some evidence that there are co-movements between QE and capital flows to the region for the period under consideration. The correlation coefficients between the level data of QE and capital flows are in the range of +0.28 to +0.54. The lagged effect (3-months lag) of QE on capital flows is also computed (QEt-3), showing some weakening of the co-movement of a particular QE episode on future capital flows.[4]

To gauge spillovers, the volatility of the variables and QE are computed using a 6-month rolling standard deviation, as the increase in the correlation of volatility is considered as empirical evidence

[3] The ASEAN region is composed of the following ten countries: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam.

[4] This could be expected as unannounced QE that change the dynamics of monetary policy in a major economy or that is designed to address severe weakness arising from a crisis would have a significant contemporaneous impact on sentiment driven capital flows, especially if such QE were seen as building confidence and triggering a "risk-on" environment. However, as economic agents adjust, other factors could drive capital flows leading to a weaker lagged relationship (IMF 2013).

for contagion and spillover (Yiu *et al.*, 2010). We report these in Table 3. As shown, correlation coefficients computed by this method are much weaker, ranging from +0.1 to +0.3, with only Bank for International Settlements (BIS) cross-border flows registering a correlation above this range at +0.43. The weaker correlations point to the fact that many factors can impact capital flows to the region, such as market sentiment, a search for yield amid a low interest rate environment and better growth prospects in the region. However, the weak correlations point to some spillovers emanating from QE towards capital flows.

By mapping out the volatility across various QE periods, we can visually gauge the co-movement of QE and capital flows to the region (figure 2). For simplicity, we only focus on measures by the U.S. Federal Reserve, chronologically known as QE1, QE2 and QE3. As with Table 3 above, we use a 6-month rolling standard deviation to gauge volatility in the following charts and possible spillovers and contagion through changes in the co-movement or correlation of the respective variables. The figure shows that heightened volatility during periods of QE generally corresponded to heightened volatility in gross portfolio flows to the region, particularly for the U.S. Fed's QE1.

3. House Prices in the ASEAN-5 Economies and Capital Inflows

This section reviews residential house prices in ASEAN-5 economies (Indonesia, Malaysia, the Philippines, Singapore and Thailand) during the period of strong capital inflows after the Global Financial Crisis (GFC). These countries comprise the major economies of the ASEAN region, accounting for about 72 percent of ASEAN population and 90 percent of GDP. Moreover, these ASEAN-5 economies have relatively open and more developed financial and real estate markets compared to the other five ASEAN economies. Following the GFC in 2008-2009, these ASEAN-5 economies in general have seen sharp increases in house price, particularly in 2011-2012 (Figure 3).

Indonesia is emerging as one of the major property markets in the ASEAN region supported by strong economic growth (above 6 percent GDP growth per year in 2007-2012), a large population (242 mn people in 2011 and the largest ASEAN country in population), high domestic consumption, growing urbanisation and an emerging middle class. The main authority responsible for housing policy in Indonesia is the Ministry of Housing and, based on the guidelines provided by the ministry, local governments issue local and regional programs on housing and urban development, as well as development and building permits. Because of both strong domestic and external demand, residential house prices in Indonesia increased by 6.01 percent annually in 2011-2012 (Figure 4).

Malaysia is one of the most vibrant economies in the ASEAN region with a population of almost 30 million people and GDP per capita of US$10,578 in 2012. It is one of the region's key tourist destinations. In terms of economy expansion in recent years, Malaysia's GDP grew by around 4.7% in 2013 compared with 5.6% and 5.1% in 2012 and 2011 respectively. The Ministry of Urban Wellbeing, Housing and Local Government is the housing policy authority. Due to continuing urbanisation (the estimated annual increase of the urbanisation population is 2.4% between 2010 and 2015), strong

economic growth[5] and foreign investment, in 2011-2012, national residential house prices increased by 11.1 percent and only turned modest in late 2013 (Figure 4).

Over the past few years, the Philippine economy has gained expansion momentum and achieved a healthy growth rate attributable to robust remittances from overseas Filipinos, strong growth of the offshore and outsourcing industry, and relatively prudent fiscal policy. This has resulted in strong growth in the Philippine residential market from the late-2000s. The average price of a luxury 3-bedroom condominium in Makati CBD in Manila increased by 6.8 percent per annum in 2011 and 2012, reflecting strong demand from both domestic and foreign investors (Figure 4). The main authority for housing policy in the Philippines is the Housing and Urban Development Coordinating Council.

In Singapore, the residential property market is segregated into the private sector and the public sector. Owner-occupied flats built by the public sector's Housing Development Board (HDB) account for about 80 percent of the total housing stock, while the private market accounts for the remaining 20 percent. The HDB flats are only available to Singapore citizens and permanent residents. The Ministry of National Development (MND) is the key government ministry responsible for national land use planning and development and together with the HDB and Urban Redevelopment Authority (URA), these organisations provide suitable homes for Singaporeans and all those who come to Singapore are provided. Due to high population growth and strong demand from foreign investors, in 2010-2012 residential house prices in both private and public sectors grew 8.6 and 10.4 percent respectively, as depicted in Figure 4.

Following political unrest in 2008-10, the Thai economy returned to robust growth. In Thailand, residential property demand has increased due to continued urbanisation, and house prices rose at a fast pace in 2010-2012 as capital flowed into the economy. The Ministry of Social Development and Human Security is the policy making government agency most directly related to housing policy. As shown in Figure 4, the house price index based on residential property in Bangkok and its vicinity grew by 4.9% annually during 2011 to 2012.

After the GFC, the ASEAN-5 economies have seen a resurgence in capital inflows. The drop in capital inflows to the region during the GFC was followed by a rebound during 2010-2012 (Figure 4). Gross capital inflows to Indonesia in 2010-2012 increased to 4.3 percent of GDP from 1.3 percent of GDP during the period of 2008Q4-2009Q2. Malaysia saw a surge in gross capital inflows to 11.7 percent of GDP in 2010-2012 after seeing 19.4 percent of GDP capital outflows in 2008Q3-2009Q2. In the Philippines, gross capital inflows increased to 4.7 percent of GDP following a 3.4 percent outflows in 2008Q1-2009Q2. Gross capital inflows to Singapore surged to 40.8 percent of GDP in 2010-2012 from capital outflows of 25 percent of GDP in 2008Q2-2009Q4. Thailand saw a rebound of gross

[5] Ong and Chang (2013) investigate the macroeconomic determinants of Malaysian housing market and find out that real GDP growth is the most significantly factor of house price movement in Malaysia.

capital inflows in 2010-2012 to 6.2 percent of GDP from capital outflows of 1.6 percent of GDP 2008Q2-2009Q2.

4. Method and Results

The correlation between capital inflows and residential prices documented above begs the question of whether developments in house prices in the ASEAN-5 economies in 2011-2012 (or in a longer period) are related to strong capital inflows to the region. A common hypothesis is that capital inflows correlate positively with house prices either because of the direct effect of capital inflows on house prices through liquidity and lower interest rate, or because both are affected by common factors which drive up capital inflows and house prices simultaneously (Favilukis *et al.,* 2012). An increase in credit supply or lower interest rates may lead to higher demand for housing and drive up house prices. Meanwhile, a stronger domestic economy may drive both house prices and capital inflows.

A number of studies have examined factors driving the movement in house prices in Asia. Glindro *et al.* (2011), for example, examine the determinants of house prices in Asia-Pacific economies, including Malaysia, the Philippines, Singapore and Thailand. Using panel regressions, they find that the increase in house prices in Asia-Pacific as a group is mainly a response to stronger fundamentals. However, their study differs from this study on two key points: (1) it does not investigate directly the impact of capital inflows on house prices; and (2) their sample period (from 1993 to 2006) does not include the period of abundant global liquidity resulting from the unprecedented QE programs implemented by several major central banks from 2009 to 2012. Using a panel VAR on a group of five emerging Asian economies (namely Korea, Hong Kong, Malaysia, Thailand and Taiwan), Tillmann (2013) investigates how house prices respond to capital inflows, and he finds that capital inflows are significant in explaining higher house prices. Tillman's study does not look at the impact of capital inflows on house prices in individual countries separately, unlike this study which investigates the relationship in each of the ASEAN-5 economies.

Covering a broader group of countries, Aizenman and Jinjarak (2009) find that the role of current account variations in explaining real estate valuation in a sample of 43 countries in advanced and emerging economies is larger than other factors, such as real interest rate and inflation. This suggests that house price movements may be related to capital inflows. On the other hand, Favilukis *et al.* (2012) find that house price increases are driven by a relaxation of credit constraints and a decrease in the costs of housing transactions. Their empirical results show that, if anything, the role of capital inflows in explaining house price movements is very small. The positive effect of capital inflows on house prices through lower interest rates is dampened by an increase in the housing risk premium and residential investment and the housing stock.

All of the aforementioned studies use a panel data approach. While this may overcome a small sample size problem, it can mask differences between the economies. In this paper, instead of using a panel data approach, we look at the relationship between house prices and capital inflows in each

of the ASEAN-5 economies separately. Leung *et al.* (2013) also look at the global commodity price impacts on house prices in Australia and New Zealand separately in light of the heterogeneity between the two economies, which includes institutional settings of the housing market, the conduct of monetary policy and economic structure.

To examine the relationship between capital inflows and house price movements in the ASEAN-5, we utilise regression analysis.[6] Following Favilukis *et al.* (2012), instead of estimating a structural equation for house prices, regression analysis is used to look at the association between house prices and capital inflows. In their models, Favilukis *et al.* (2012) employ regressions without including the lag of the dependent variable as an explanatory variable. Aizenman and Jinjarak (2013), however, find that the largest factors accounting for real estate valuation is the lag of real estate valuation itself. Thus in this study, we include lags of house price growth as explanatory variables. This is intended to capture the importance of 'momentum' or 'persistence' in house price movements.

Our regression is based on the following equation:

$$Y_{j,t} = \sum a_{j,i} Y_{j,t-i} + b_j K_{j,t} + c_j GDP_{j,t} + \varepsilon_{j,t} \qquad j = 1, \dots, n \text{ and } t = 1, \dots, T \tag{1}$$

where $Y_{j,t}$, $K_{j,t}$ *and* $GDP_{j,t}$ denote respectively house price growth, gross capital inflows as a percentage of GDP and real GDP growth of country j at time t on a quarter-to-quarter basis. The regressions are estimated using quarterly data ranging from 2001Q1 to 2012Q4, depending on the availability of house price data for each country. A description of the source of house prices and other data is given in the appendix. In this study we use nominal house prices instead of real house prices. Except for Indonesia, the growth of nominal house prices moves closely with the growth of real house prices measured by nominal house prices less inflation. In Indonesia, however, given certain high and volatile inflation periods, real house prices tend to fluctuate in the opposite direction to the inflation rate.

The estimation results in Table 4 show that, for Indonesia and Singapore (both the private and public markets), the coefficient on the capital inflows variable is positive and significant at the 5 percent level while those for Malaysia and the Philippines are significant at 10 percent level. This suggests that the rise in house prices in Indonesia, Malaysia, the Philippines and Singapore is related to the size of capital inflows. The coefficients on some of the lags of house price growth are positive and significant at least at the 10 percent level, suggesting some persistence in house price growth in the ASEAN-5 economies. Singapore (the public market) has a negative signed coefficient on the second lag of

[6] Using Augmented Dickey-Fuller test, we investigate the stationarity of the two variables (house price growth and capital flows) and find that all capital flows and house price growth series are stationary, except for Thailand (although here the data pass the Phillip-Perron test and therefore are taken as stationary). To study the long-term relationship in the case of mixed series of I(0) and I(1) variables, because of the difficulty of determining I(0) or I(1), the bounds tests by Pesaran *et al.* (2001) can be used. However, bounds tests will give inconclusive inference if the test statistic falls within the bounds. Cheung *et al.* (2008) used Pesaran's bounds test to study the long-term relationship between Chinese and US interest rates given a mix of I(0) and I(1) series.

house price growth, indicating some degree of mean reversion in this market). Thailand is the only country in which capital inflows have statistically no effect on house price growth in the sample period. This may due to the political crisis in the period between 2008 and 2010 which caused a lot of uncertainty in the economic environment of the housing market for both overseas and domestic investors.

To look at the robustness of the regression results, we add GDP growth to the regressions to control for domestic economic conditions: house prices are expected to rise during periods of strong economic growth and to slow down during periods of weak economic growth.[7] Adding GDP growth to the model changes the estimation results to some extent (Table 5). The coefficient on the capital inflows for Indonesia and Singapore (the private market) remains positive and significant at least at the 10 percent level. The coefficient on GDP growth itself is significant for Singapore (the public market) at the 1 percent significant level and for Malaysia and the Philippines at the 5 percent level, indicating that domestic demand may be the main driver of house price growth in the sample period. The coefficient on GDP growth of other countries, however, is not statistically significant. For Thailand, capital inflows and GDP growth do not have a statistically significant effect on house prices. The coefficients on some lags of house price growth remain significant for all five countries.

Although, in general, the results in Table 5 show a positive association between capital inflows and house prices in some ASEAN-5 economies, the magnitude of the relationship varies across countries. These differences could be due to diversity in factors such as per capita income, consumer confidence, and the size of population. Moreover, as increases in house prices reflect a combination of stronger demand and limited supply, the condition of house supply in each economy may also contribute to the dynamics of the house prices in each economy. In addition, institutional factors (such as ownership, mortgage contract, real estate taxes and housing financing system) may also play a role in the development of real estate markets. Lastly, the intensive use of macroprudential measures in housing markets could affect the dynamics of house price growth, as suggested by the mean reversion behaviour in public house prices in Singapore.

5. Property-Sector Macroprudential Measures

The resurgence in capital inflows to the ASEAN region in the period from 2009 to 2012 has brought renewed concern to policymakers since the associated adverse effect could cause a rapid increase in bank credit growth and asset prices, increasing financial fragility. The traditional interest rate policy is, however, not effective in dealing with strong capital inflows because raising interest rates attract more inflows leading to increased appreciation pressures. This presents a dilemma to policymakers. ASEAN policymakers have been relying on macroprudential measures to ensure financial stability in

[7] Some empirical studies have shown the importance of economic growth for house price movements. For Asia-Pacific economies see, for example, Glindoro et al. (2011).

the face of the risk of asset price bubbles, particularly in the real estate market.[8] This section outlines property-sector specific measures adopted by ASEAN economies, such as loan-to-value (LTV) ceilings on mortgage loans and stamp duties on property transactions, and reviews the effectiveness of some of these measures.[9]

All ASEAN-5 economies use macroprudential measures to reduce the systemic risks stemming from a boom-bust cycle of property markets. Among them, Singapore in particular has had several rounds of tightening of LTV limits based on property values and a borrower's net worth. This reflects the fact that Singapore's property market is vulnerable to large swings in prices because of limited land supply. The Singaporean Monetary Authority has reduced the limits on the debt-to-service ratio (SDR) of mortgage borrowers on several occasions to 40 percent, and the stressed DSR to 50 percent. In June 2013, it introduced a Total Debt Servicing Ratio (TDSR) framework for all property loans granted by financial institutions to individuals. The framework requests financial institutions to assess the debt servicing ability of borrowers applying for property loans, taking into consideration all of their other outstanding debt obligations. In Singapore, property buyers also have to pay a Special Stamp Duty (SSD) on a sliding scale if their holding period is within certain periods less than a total period of 36 months.

Indonesia, Malaysia, the Philippines and Thailand all use LTV regulations to limit credit risks and maintain financial stability. They also adopt other macroprudential measures to cool down their booming markets and curb speculation. Indonesia has imposed a LTV ratio for residential property borrowings at a maximum of 70 percent to raise the minimum down payment on housing loans to 30 percent. Malaysia has imposed a maximum LTV ratio for third mortgages and LTV caps for housing loans by non-individuals to streamline requirements across all borrowers. Besides LTV regulation, Malaysia has raised real property gains tax from the disposal of properties made within a period not exceeding 2 years, and within a period of 2 to 5 years from the date of purchase. The Philippines has limited real estate loans (bank's loans to real restate are capped at 20 percent of total lending) and has imposed a maximum LTV ratio. The Pilipino authorities have implemented general loan-loss provisions and large exposure limits. Thailand has tightened the maximum LTV ratio for high value mortgages (above THB10 mn) and imposed higher risk weights for both high value mortgages and residential mortgages (less than THB10 mn) with an LTV above the regulatory cap.

The macroprudential measures taken the ASEAN-5 economies so far have had mixed effects.[10] After several rounds of implementation of macroprudential measures, Singapore has seen a marked reduction in residential property transactions and a slower rate of expansion in housing/mortgage

[8] A literature review of macroprudential policy can be found in Galati and Moessner (2011) and Moreno (2011) discusses the policymaking from a "macroprudential" perspective in emerging market economies.

[9] Ahuja and Nabar (2011) discuss the use of macroprudential policies for banking stability during property booms with a cross-country analysis for Asian economies.

[10] We have investigated the effect of macroprudential measures empirically and find that the measures have no statistically significant effect on house price change in the sample period, although the results are not reported in this paper.

loans. House prices only started to decline in the third quarter of 2013 due partly to the effect of the anticipation of US QE tapering around the end of 2013. In the HDB resale market, house prices fell by 0.9 percent, 1.5 percent and 1.5 percent in the third quarter and fourth quarter 2013 and first quarter of 2014 respectively. In the private property market, private home prices dropped by 0.9 percent and 1.3 percent in the last quarter of 2013 and the first quarter of 2014.

Among the other four ASEAN economies, since the imposition of the new LTV regulation for third residential mortgages in late 2010, Malaysia has observed that the annual growth in lending to borrowers with three or more housing loans has moderated sharply but the nationwide average growth in residential property prices is still on an upward trend albeit at a slower pace. In Indonesia and the Philippines, the rate of credit growth peaked in mid-2012, then moderated afterward. In Thailand, it is ambiguous whether tightening the maximum LTV ratio in 2009 and 2010 has had an immediate effect on dampening credit growth, particularly in the real estate sector.

6. Conclusion

Since the early 2009, the Quantitative Easing (QE) policies adopted by major advanced economies have led to an abundant supply of global liquidity. The ASEAN region has experienced strong portfolio inflows, particularly in the first phase of the US QE program. Local corporations in the ASEAN region have deposited the proceeds from issuing local currency bonds into the local banking system, and local banks have been under pressure to lend to other sectors such as the housing market.

The residential housing markets in Indonesia, Malaysia, the Philippines, Singapore and Thailand have been very vibrant during this period of strong capital inflows associated with QE programs in the US, EU and Japan. The major ASEAN economies saw their residential house prices increased in a range of 4 to 11 percent per annum in 2011-2012. The pressure on house prices only started to mitigate in the wake of the May 2013 “US tapering episode”.

We have investigated the relationship between house price movements and capital inflows in the five major ASEAN economies by using a simple linear regression model. The empirical results show a general positive association between capital inflows and house prices in the ASEAN-5 economies with some variation across countries. The only exception is Thailand where capital inflows have no statistically significant effect on house prices. This may be due to a political crisis in the period between 2008 and 2010 which caused a large degree of uncertainty in the economy and housing market for both overseas and domestic investors. If GDP growth is taken into account in our regressions, the positive relationship between house prices and capital inflows is somewhat weaker.

The ASEAN-5 economies have resorted to macroprudential measures to reduce systemic risks stemming from a boom bust cycle in their house markets amid strong capital inflows. Although it is not easy to clearly measure the effectiveness of these sector-specific macroprudential measures, our

observations suggest that they have had a marked effect on reducing the number of residential property transactions, and moderated the growth of mortgage loans. As a result so far, speculative activities have been curtailed and financial stability has been maintained.

A crucial step in the implementation of macroprudential measures is the calibration of parameters, in particular the timing of these policies, subsequent changes and withdrawal. A reliable real time stamping method of house price movements would be a useful tool to policy makers in using macroprudential measures to manage boom bust cycles in property markets. Thus, economists and researchers, in both the public and private sectors, have been searching for such a tool. Phillips, Shi and Yu (PSY, 2011) propose an advanced method to time stamp asset price movements based on the idea of identifying explosiveness in the dynamic behaviour of asset prices after taking account of fundamental values. Yiu *et al.* (2013) have successfully applied this method of identifying bubbles to the Hong Kong residential property market. Future research using this method could investigate house price dynamics under the influence of property sector macroprudential policy in these ASEAN economies amid strong capital inflows.

References

Ahuja, Ashvin and Malbar Nabar (2011), "Safeguarding Banks and Containing Property Booms: Cross-Country Evidence on Macro-prudential Policies and Lessons from Hong Kong SAR," IMF Working Paper, WP/11/284.

Aizenman, Joshua and Yothin Jinjarak (2009), "Current Account Patterns and National Real Estate Markets," *Journal of Urban Economics,* 66(2): 75-89.

Aizenman, Joshua and Yothin Jinjarak (2013), "Real Estate Valuation, Current Account and Credit Growth Patterns before and after the 2008-9 Crisis," NBER Working Paper, No.19190.

ASEAN+3 Macroeconomic Research Office (AMRO) (2013), "Global Liquidity, Asset Price Movements, and Macroprudential Measures in ASEAN+3 Economies," *AMRO Thematic Study,* No.1/2013, Singapore.

Aziz, Iwan J. and Hyun Song Shin (2013), "How Do Global Liquidity Phases Manifest Themselves in Asia," ISBN: 978-92-9254-277-1, Manila, Asian Development Bank.

Balakrishan, Ravi, Sylvia Nowak, Sanjaya Panth and Yiqun Wu (2012), "Surging Capital Inflows to Emerging Asia: Facts, Impacts and Responses," IMF Working Paper, WP/12/130, Washington.

Favilukis, Jack, David Kohn, Sydney Ludvigson and Stijn Van Nieuwerburgh (2012), "International Capital Flows and House Prices: Theory and Evidence," NBER Working Paper, No.17751.

Cheung, Y. W., Dickson Tam and Matthew S. Yiu (2008), "Does the Chinese Interest Rate Follow the US Interest Rate?" *International Journal of Finance and Economics,* 13: 53-67.

Galati, Gabriele and Richhild Moessner (2011), "Marcoprudential Policy — A Literature Review," BIS Working Papers, No.337.

Glindoro, Eloisa T., Tientip Subhanij, Jessica Szeto and Haibin Zhu (2011), "Determinants of House Prices in Nine Asia-Pacific Economies," *International Journal of Central Banking,* 7(3): 163-204.

International Monetary Fund (IMF) (2013), "Unconventional Monetary Policies: Recent Experience and Prospects," April, Washington.

Leung, Charles K. Y., Song Shi and Edward Tang (2013), "Commodity House Prices," *Regional Science and Urban Economics,* 43: 875-87.

Moreno, Ramon (2011), "Policymaking from a "Macroprudential" Perspective in Emerging Market Economies," BIS Working Paper, No.336.

Morgan, Peter (2011), "Impact of US Quantitative Easing Policy on Emerging Asia," ADBI Working Paper, No.321, Tokyo.

Ong, Tze San and Yee Shan Chang (2013), "Macroeconomic Determinants of Malaysian Housing Market," *Human and Social Science Research,* 1(2): 119-27.

Pesaran, Hashem M., Yongcheol Shin and Richard Smith (2001), "Bounds Testing Approaches to the Analysis of Level Relationships," *Journal of Applied Econometrics,* 16: 289-326.

Phillips, Peter, Shu-ping Shi and Jun Yu (2011), "Detecting Multiple Bubbles," Yale University, Cowles Foundation Discussion Paper, No.1843.

Tillmann, Peter (2013), "Capital Inflows and Asset Prices: Evidence from Emerging Asia," *Journal of Banking and Finance,* 37: 717-29.

Yiu, Matthew S., Alex Ho and Daniel Choi (2010), "Dynamic Correlation Analysis of Financial Contagion in Asian Markets in Global Financial Turmoil," *Applied Financial Economics,* 20(4): 345-54.

Yiu, Matthew S., Jun Yu and Lu Jin (2013), "Detecting Bubbles in Hong Kong Residential Property Market," *Journal of Asian Economics*, 28: 115-24.

Table 1. Changes in the Major QE Instruments for Selected Periods

	Pre-QE: Sep '08 to Feb '09	Mar '09 to Oct '09[(a)]	Nov '09 to Oct '10[(b)]	Nov '10 to Jun '11[(c)]	Jul '11 to Aug '12[(d)]	Sep '12 to Apr '13[(e)]
U.S. Fed (USD bn)						
Changes in securities held outright	*102.1*	*1,108.5*	*254.2*	*604.1*	*-72.4*	*474.1*
Total assets (end of period)	*1,916.5*	*2,161.8*	*2,295.5*	*2,865.4*	*2,813.0*	*3,318.6*
BOE (£ billion)						
Changes in Gilts	*0.0*	*174.8*	*16.1*	*-0.3*	*148.7*	*27.1*
Total assets (end of period)	*177.1*	*235.3*	*244.2*	*236.2*	*386.7*	*403.9*
BOJ (¥ trillion)						
Change in JGBs & Others	*0.0*	*0.0*	*22.9*	*16.7*	*22.4*	*13.9*
Total assets (end of period)	*122.2*	*111.4*	*120.3*	*129.6*	*150.0*	*164.3*

Notes: (a) Period referred to U.S. Fed QE1 and start of BOE Asset Purchase Facility; (b) October 2010 was the start of BOJ's Asset Purchase Program; (c) Period referred to U.S. Fed QE2; (d) Re-launch of the BOE Asset Purchase Facility; (e) Period referred to U.S. Fed QE3. QE3 was still continuing, however, period was up to April 2013 only due to data availability Securities held outright by the U.S. Fed included Federal Agency Debt Securities mainly by Fannie Mae and Freddie Mac, Mortgage-backed securities and U.S. Treasury securities. For BOE the instrument was mainly purchases of debt securities called gilts. BOJ bond purchases included JGBs, Commercial Papers, Corporate Bonds, ETFs, and J-REITs (this include operations under the following programs: Funds-Supplying Operations against Pooled Collateral, Fund-Provisioning Measure to Support Strengthening the Foundations for Economic Growth, Funds-Supplying Operation to Support Financial Institutions in Disaster Areas and Asset Purchase Program)

Sources: U.S. Fed, BOE and BOJ

Table 2. Consolidated QE Amounts for Selected Periods (USD Billion)

USD bn	**Pre-QE: Sep '08 to Feb '09**	**Mar '09 to Oct '09[(a)]**	**Nov '09 to Oct '10[(b)]**	**Nov '10 to Jun '11[(c)]**	**Jul '11 to Aug '12[(d)]**	**Sep '12 to Apr '13[(e)]**
U.S. Fed (changes in securities held)	102.1	1,108.5	354.1	604.1	-72.4	474.1
BOE (changes in Gilts)	0.0	274.4	25.1	-0.5	235.1	42.7
BOJ (changes in JGBs & Others)	0.0	0.0	255.7	203.2	284.2	162.1
Total	**102.1**	**1,382.9**	**634.8**	**806.7**	**446.9**	**678.9**

Notes: (a) Period referred to U.S. Fed QE1 and start of BOE Asset Purchase Facility; (b) October 2010 was the start of BOJ's Asset Purchase Program; (c) Period referred to U.S. Fed QE2; (d) Re-launch of the BOE Asset Purchase Facility; (e) Period referred to U.S. Fed QE3. QE3 was continuing as of April 2013;

Sources: U.S. Fed, BOE and BOJ

Table 3. Correlation Coefficients between the QE and Capital Flows

	Levels		Volatility	
	QE	QE_{t-3}	QE	QE_{t-3}
Gross portfolio flows	+0.54	+0.41	+0.26	+0.22
Portfolio equity	*+0.48*	*+0.25*	*+0.17*	*+0.26*
Portfolio debt	*+0.45*	*+0.52*	*+0.20*	*+0.05*
BIS cross border flows	+0.39	+0.24	+0.43	+0.19
EPFR equity flows	+0.28	+0.02	+0.14	+0.12
EPFR debt security flows	-0.06	+0.08	-0.14	-0.26

Note: Correlation coefficients were computed by using data between October 2008 and Q4 2012 for Balance of Payment and Bank for International Settlements (BIS) international banking statistics, and March 2013 for EPFR (a private data provider of institutional and individual investor flows and fund manager allocations driving global markets). Volatility was computed using a 6-month rolling standard deviation. To allow for the computation of a 6-month rolling standard deviation, quarterly data on balance of payments and BIS international banking statistics converted to monthly frequency through interpolation. For level data, no such conversion was performed.

Table 4. Regression Results

(Dependent variable: house price growth, Independent variables: lags of house price growth, gross inflows)

	Indonesia	Malaysia	Philippines	Singapore (Private)	Singapore (Public)	Thailand
Capital Inflows to GDP Ratio	0.093**	0.023*	0.089*	0.010**	0.024**	-0.021
	(0.038)	(0.013)	(0.044)	(0.004)	(0.009)	(0.053)
Lag 1 of House Price Growth	0.343*	--	0.097	0.608***	0.683***	-0.093
	(0.165)		(0.152)	(0.117)	(0.142)	(0.148)
Lag 2 of House Price Growth	--	0.233	0.271*	--	-0.408***	0.125
		(0.136)	(0.146)		(0.142)	(0.143)
Lag 3 of House Price growth	0.394**	0.246*	0.381**	0.153	--	-0.217
	(0.156)	(0.140)	(0.149)	(0.109)		(0.161)
Lag 4 of House Price growth	--	0.292*	--	--	--	0.487***
		(0.145)				(0.161)
Lag 5 of House Price growth	--	0.236	--	--	--	--
		(0.153)				
Adj. R^2	0.085	0.254	0.377	0.457	0.437	0.282
Residual test (Q-stat, up to lag 20)	Passed	passed	passed	Passed	Passed	Passed

Note: Numbers in parentheses denote standard errors: ***, **,* is significant at 1 percent, 5 percent, and 10 percent, respectively.

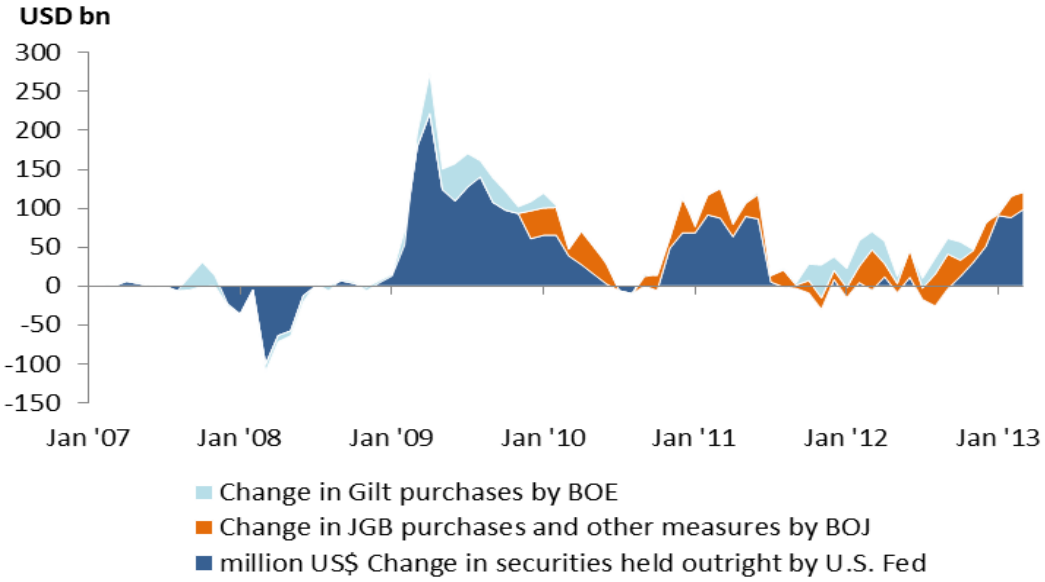
Table 5. Regression Results

(Dependent variable: house price growth, Independent variables: lag of house price growth, gross inflows, GDP growth)

House Price	Indonesia	Malaysia	Philippines	Singapore (Private)	Singapore (Public)	Thailand
Capital Inflows to GDP Ratio	0.144***	0.013	0.004	0.008*	0.006	-0.010
	(0.051)	(0.015)	(0.047)	(0.004)	(0.009)	(0.064)
Lag 1 of House Price Growth	0.315*	-0.255	0.381**	0.602***	0.716***	-0.097
	(0.185)	(0.160)	(0.183)	(0.117)	(0.124)	(0.149)
Lag 2 of House Price Growth	--	0.236	0.274**	--	-0.377***	0.194
		(0.140)	(0.132)		(0.124)	(0.164)
Lag 3 of House Price Growth	0.317*	0.281*	0.421***	0.157	--	-0.267
	(.0148)	(0.1143)	(0.143)	(0.109)		(0.171)
Lag 4 of House Price Growth	0.116	0.334**	-0.414**	--	--	0.470***
	(0.192)	(0.144)	(0.186)			(0.163)
Lag 5 of House Price Growth	--	0.235	--	--	--	--
		(0.152)				
GDP Growth	-0.151	0.298**	0.418**	0.099	0.721***	0.162
	(0.192)	(0.135)	(0.179)	(0.097)	(0.191)	(0.183)
Adj. R^2	0.127	0.331	0.526	0.458	0.572	0.278
Residual test (Q-stat, up to lag 20)	passed	passed	passed	passed	passed	passed

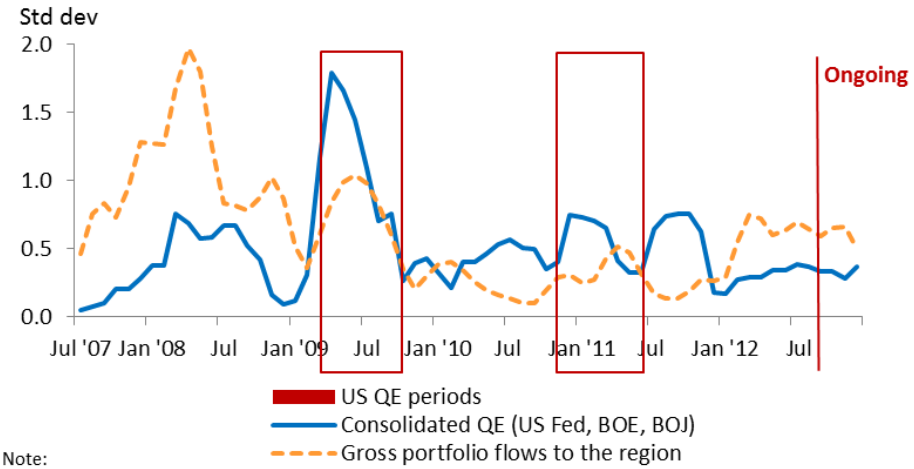
Note: Numbers in parentheses denote standard errors: ***, **,* is significant at 1 percent, 5 percent, and 10 percent, respectively.

Figure 1. Evolution of the Main QE Instruments across Time



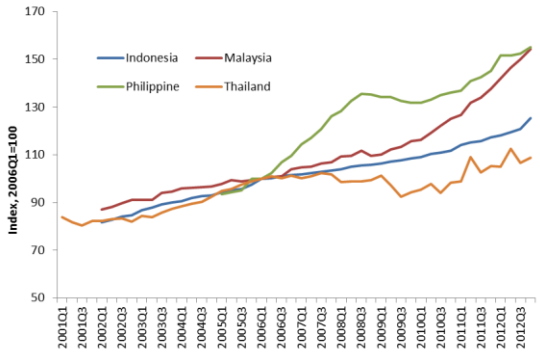
Sources: U.S. Fed, BOE and BOJ

Figure 2. Volatility of Consolidated QE and Portfolio Flows to the Region

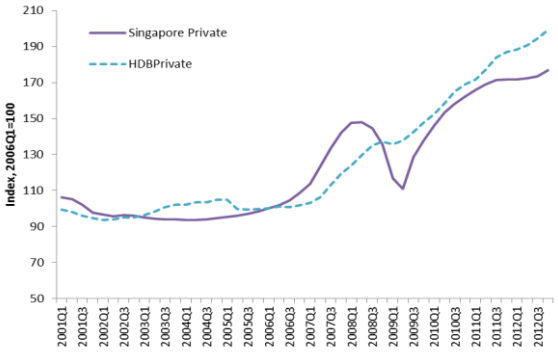


Note:
Data are only available for China, Hong Kong, Indonesia, Korea, Malaysia, Philippines,Singapore, Thailand and Vietnam.
Sources: U.S. Fed, BOE, BOJ, EPFR & AMRO Staff Calculations

Figure 3. House Price Index in ASEAN-5 Economies

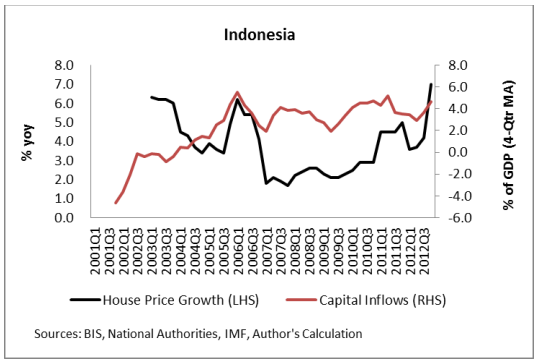


Sources: National Authorities, BIS, Colliers International, Authors' Calculations

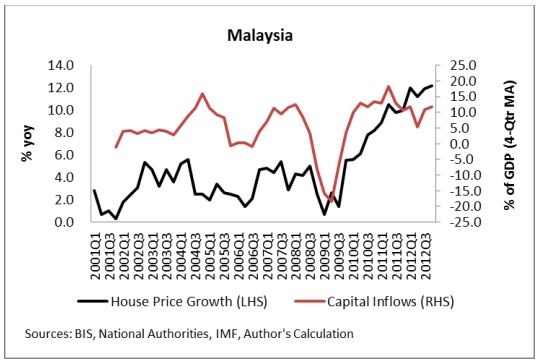


Sources: National Authorities, BIS, Authors' Calculations

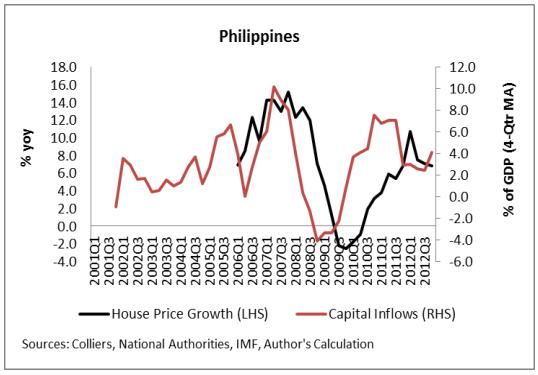
Figure 4. ASEAN-5 Economies: House Price Growth and Capital Inflows



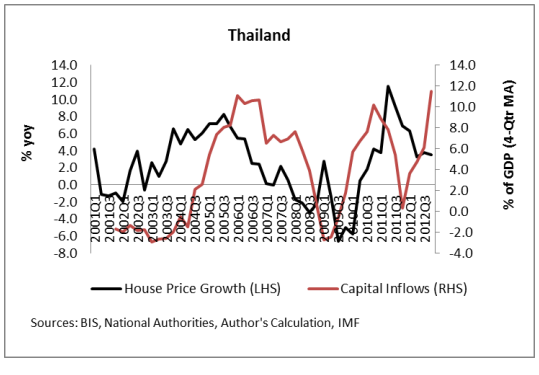
Sources: BIS, National Authorities, IMF, Author's Calculation



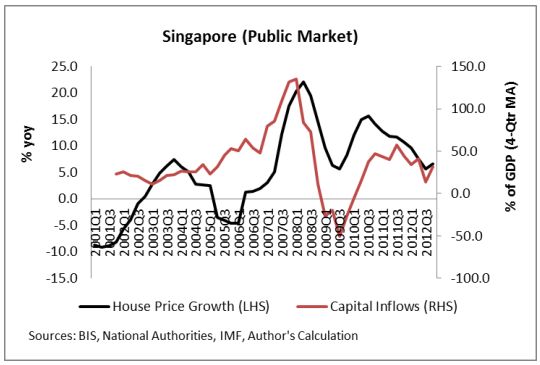
Sources: BIS, National Authorities, IMF, Author's Calculation



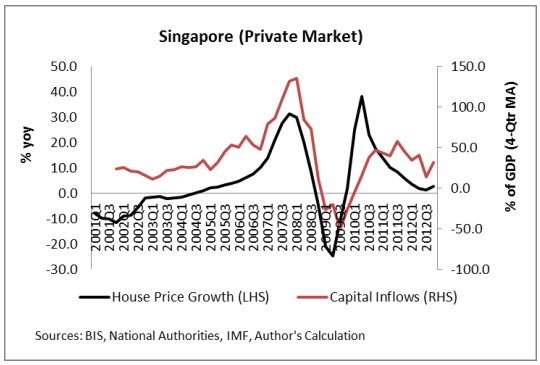
Sources: Colliers, National Authorities, IMF, Author's Calculation



Sources: BIS, National Authorities, Author's Calculation, IMF



Sources: BIS, National Authorities, IMF, Author's Calculation



Sources: BIS, National Authorities, IMF, Author's Calculation

Appendix. Description of House Price Indexes and their Sources

Country	Period	Index and Source
Indonesia	Q1:2002-Q4:2012	Residential property prices, new houses (big cities) Source: Bank Indonesia
Malaysia	Q1:2001-Q4:2012	Residential property prices, all dwellings Source: Ministry of Finance
Philippines	Q1:2005-Q4:2012	Prices of residential luxury 3 bedroom apartments in Makati CBD, Metro Manila. Source: Colliers International
Singapore	Q1:2001-Q4:2012	Private residential prices. Source: Urban Redevelopment Authority HDB residential prices Source: Housing Development Board
Thailand	Q1:2001-Q4:2012	Housing price index. Source: Government Housing Bank, Bank of Thailand