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Effects of Capital Flow on the Equity and Housing Markets in Hong Kong

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Abstract

The revival of strong capital flows to emerging economies in the aftermath of the Global Financial Crisis in 2008-09 has rekindled the debate on the adverse effects of excessive capital inflows. We study the effects of official and illicit capital flows on Hong Kong, which is a small and open economy with minimal restrictions on cross-border fund movements. To illustrate the effects of different types of capital flows, we study official and illicit flows on Hong Kong's equity and residential housing markets. It is found that the official and illicit capital flow measures reflect different facets of flow movements and exhibit differential effects on the equity and residential housing markets. The results highlight the complexity of managing capital flows, and the relevance of policies targeting specific sectors.

Keywords: Capital flows, currency-based measure, illicit flow measure, equity market, real estate market

JEL classification: F32, E42, G15, R30

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1. Introduction

The 2008-9 global financial crisis (GFC) caused major advanced economies into severe economic recession. In response, accommodative monetary policies, dubbed Quantitative Easing (QE), were introduced by a few advanced countries to stimulate domestic demand and revitalise impaired financial markets. However, the QE programs raised concerns about overabundance of global liquidity. It is estimated that from early 2009 to early 2013, the central banks in the US, UK and Japan generated liquidity of US$3.95 trillion.[1] The excess liquidity has led to capital flows to the rest of the world in search of good returns. Economies in the Asian region, especially emerging ones, were among the most popular destinations for yield-seeking capital.[2]

The surge in global liquidity, and the related excess capital flows to emerging markets after the GFC, rekindled the debate on the adverse capital flow effect on these economies.[3] Capital inflows usually help deepen and broaden financial markets and provide additional funds for the economy. However, policymakers in emerging Asian economies are extremely concerned about the economic threats caused by unchecked/excessive capital flows that undermine the structural integrity and the medium to long-term economic prospects of their economies. These threats are not only triggered by quantitative easing, but also by a reversal and withdrawal of such policy. The potential danger of the tapering policy is clearly illustrated by volatile responses of emerging markets to rumours and discussions in mid-2013 about the possibility of the US Fed to scale down its QE policy.

There are numerous studies on capital flows, covering a range of issues, including their determinants, benefits and costs. Some studies have been revived to investigate what and how policies should be adopted to manage capital flow effects. It is generally agreed that the effect on economic performance depends on both the nature of the flows and the economic and institutional environment of the recipient economy. Furthermore, capital flows can have non-negligible effects on monetary and

[1] The US generated US$2.2 trillion liquidity between March 2009 and April 2013 (Yiu and Sahminan, 2015).

[2] For US QE effects on Asian economies, see Aziz and Yarcia (2014) and Cho and Rhee (2013)

[3] For brevity, capital flows and cross-border capital flows are used interchangeably.

financial stability and on the real economy. Empirical studies, however, yield inconclusive evidence on the net benefits of capital flows.[4]

Capital controls of different forms have been imposed by different countries to curb capital flows and, hence, their adverse effects. In general, researchers affirm that capital controls associated with market interventions cause capital misallocation and inefficient use of resources, which has severe costs in terms of long-term growth and welfare. Despite this, capital controls are still commonly used in some developing countries.[5] The IMF in the early 2010s modified its policy stance on capital controls. A series of IMF studies expounds that, under certain conditions, capital control measures and macro-prudential policies provide protection against macroeconomic and financial instabilities (Ostry et al., 2010, 2011; The Strategy, Policy and Review Department, IMF, 2011). However, Gochoco-Bautista and Rhee (2013) argue the new IMF framework is hard to implement. In summary, the emerging general consensus recognises the positive roles of macro-prudential policies and capital controls in managing macroeconomic and financial instability.

Hong Kong provides a good setting for assessing capital flows and their effects on the recipient economy. Its minimal capital controls and large financial sector, one of the largest in the world, mean it is heavily exposed to international capital flows. In addition, it has adopted the Linked-Exchange-Rate (LER) System, which is a modern currency board system that pegs the Hong Kong dollar to the US dollar for more than thirty years. Limited exchange rate flexibility and free capital mobility mean the effect of capital flow can quickly show up in its monetary system and real economy. Hong Kong, in response must maintain a high level of economic flexibility, adopts appropriate macro policies and suitable macro-prudential measures to mitigate effects of volatile capital movement.[6]

[4] See, for example, Obstfeld (1998), Levine and Carkovic (1999), Edwards (2001), Obstfeld (2007), Reisen and Soto (2001), and Berument and Dincer (2004).

[5] There are many studies on the reassessment of the cost and benefits of capital controls, e.g. Fernald and Babson (1999), Yu (2009) claims capital controls help China avoid global financial volatility in global financial crises.

[6] Darbar and Wu (2015) study the macro-prudential policy of five economies, including Hong Kong.

When capital flows into an economy, it will typically increase the demand for local currency assets, including deposits, bonds, stocks and real estate. The inflow will push up the asset prices of the recipient economy. In the case of Hong Kong, equity and property are among the most popular asset classes to foreign investors. The Hong Kong stock market is one of the largest in Asia and the world. It also ranks high in the global IPO and fundraising activities. The housing market in Hong Kong is often deemed speculative and, from time to time, gets into the news for its high real estate prices. The price rises of these two asset classes in recent years are commonly attributed to capital inflows. Thus, it is worth investigating capital flow effects on these two markets in Hong Kong.

Under the LER system, Hong Kong avails itself of a timely measure of recorded capital flows, the so-called currency-based (CB) measure, which is based on changes in the monetary base and the net spot foreign currency position of the banking system. The measure emphasises on transactions based on currency conversion. The CB measure has been used frequently in empirical studies on the effects of capital flow on Hong Kong's real economy and its asset markets.[7] He, *et al.* (2009) and the HKMA Research Department (2012), for example, have expounded the applicability of the CB measure in the case of Hong Kong.[8] Furthermore, during and after the US QE periods, the inflows to the Asian region were mainly through the domestic banking systems, which are arguably more captured by the monetary aggregates and balance sheets of central banks (Chung *et al*, 2014 and Aziz and Shin, 2015).

One limitation of the official CB measure is that, for various reasons, some cross-border transactions are not recorded officially. [9] While the official balance of errors and omissions captures discrepancies in officially recorded fund movements, other measures are perceived to offer better gauges of cross-border illicit flows. The most commonly used measures of illicit capital movements is the World Bank

[7] The currency-based measure is quite commonly used by practitioners in the Hong Kong financial market (Lam, 2014; Tang and Lau, 2014).

[8] He, *et al*. (2009) and The Research Department of HKMA (2012) note that a measure of capital flows based on Balance of Payments (BoP) statistics has limitations on studying capital flow effects on Hong Kong. For instance, as an international financial centre, offshore loans booked through Hong Kong involve only inflows and outflows of foreign currencies. These transactions are recorded under the BoP statistics but have no implications for the Hong Kong dollar exchange rate. Alternatively, when switching between Hong Kong and foreign currencies involving only residents (or only foreigners) due to, say, portfolio re-balancing, the activity is captured by the currency-based measure but not the BoP statistics.

[9] In this study, illicit capital flows refer to cross-border capital transactions that are either intentionally or due to technical reasons not (completely) recorded in official statistics.

Residual (WBR) measure based on Balance of Payments (BoP) data. Conceivably, the magnitude of illicit flows and their effects can be different from official flows. However, the WBR measure may still have limitations inflicted by other measures of capital flows based on BoP data (see footnote 7).

Against this backdrop, we study the effects of capital flow on Hong Kong using the CB measure and the WBR measure. In the next section, we describe, in the context of Hong Kong, the measures of official and illicit capital flows. The effects of capital flow on the two asset markets are examined in Section 3, while Section 4 offers concluding remarks.

2. Measuring Capital Flows

Hong Kong is conscious of effects of capital flow on its economy. In the mid-1990s, bank regulators of Hong Kong were aware of the surge of capital flows into the emerging markets and the associated adverse impacts on the banking system (Carse, 1995). During and after the Asian Financial Crisis, the volatile capital movements and their pressures on recipient economies reminded authorities of the importance and challenge of the surveillance of capital flows (Yam, 2000). Since the early 2000s, the Hong Kong Monetary Authority has regularly reported capital flows in and out of the Hong Kong economy in its reports, particularly in the Half-Year Monetary and Financial Stability Report.

Capital flows into Hong Kong are perceived to be triggered by activities undertaken by investors that include: shifting investment portfolios towards Hong Kong dollar equities; subscribing to initial public offerings in Hong Kong; conducting carry trade with the Hong Kong dollar as the target currency; acquiring real estate assets in Hong Kong; and parking money in Hong Kong for future investment in, say, China.[10]

To gauge capital flows in and out of the Hong Kong dollar, we use a measure based on the sum of the monetary base and the net spot foreign currency (FC) position of the banking system. When

[10] See, for example, Hong Kong Monetary Authority (2009, p. 50). In general, academic studies include pull factors that are home-country specific determinants, such as the domestic economic reform program, and push factors that are foreign determined, such as the US quantitative easing policy (Fratzscher, 2012).

foreign investors want to hold more Hong Kong dollar assets, they will convert their foreign currency deposits into Hong Kong dollar deposits. If there is a net inflow, the net spot FC position of the Hong Kong banking system increases. When Hong Kong banks do not want to increase their net spot FC position, they can sell the foreign currency to the Hong Kong Monetary Authority under the LER arrangement. The action will increase the total Hong Kong dollar liquidity in the Hong Kong banking system and the monetary base. Thus, we can use the CB measure, which is the sum of the monetary base and the net spot FC position of the banking system, to gauge Hong Kong's capital movement.

The CB measure data used in the subsequent analyses are constructed as follows. The monetary base and net spot FC position stock series are first-differenced and normalised by GDP. The resulting CB data are stationary. Henceforth, for convenience, we call the resulting CB data series the CB measure. The CB measure from the first quarter of 2002 to the last quarter of 2015 is plotted in Figure 1. The data volatility is noticeably higher during the GFC period.

In this study, we use the World Bank Residual (WBR) measure to gauge illicit capital flows in and out of Hong Kong.[11] The WBR measure has been widely used in empirical studies to measure illicit capital flows. Using information derived from BoP statistics, the value of illicit flows is given by the discrepancy of the uses and sources of funds. There are outward (inward) flows when the total source of funds is larger (less) than the total use of funds. The WBR is given by:

$$WBR = -(\Delta ExD + NFDI - CAD - \Delta IR) \quad (1)$$

where the sources of funds are given by the change in external debts (*ΔExD*) and the net foreign direct investment (*NFDI*), and the uses of funds are the current account deficit (*CAD*) and the change in international reserves (*ΔIR*). The negative sign (-ve) for the whole formula is to maintain consistency with the convention that inflows have a positive sign as in the currency-based measure of official flows. If all transactions are reported appropriately, the double-entry accounting principle should make the sources of funds equal the uses of funds.

[11] Some capital movements not captured by official data in developing countries, and methods to estimate them, are discussed in detail by Kar and Cartwright-Smith (2009) and Kar and Spanjer (2014).

Similar to the CB measure, the WBR normalised by GDP and first differenced is used in the following regression exercise. The adjusted WBR series is stationary. For brevity, we hereafter call the adjusted WBR series the WBR measure. Figure 2 shows the WBR measure. The series appears to be more volatile in the latter half of the sample period.

Despite Hong Kong imposing limited restrictions on capital mobility and being one of the most open economies, the WBR measure shows that the magnitude and variability of illicit flows are comparable, if not higher than those of the official CB measure. Nevertheless, these two measures do not move in tandem. The estimates of correlation coefficient between CB and WBR measures in the whole sample, before and after the crisis periods, are -0.33, -0.60 and -0.25, respectively. These simple correlation coefficient estimates suggest that the official and illicit capital flows display different patterns, and capture different facets and types of information of cross-border fund movements.

3. Economic Implications

For a small open economy with a fixed exchange rate, massive capital outflow can easily trigger a confidence crisis and economic turmoil, while excessive capital inflow can lead to mis-allocation and an over-heated economy. Even equipped with its high level of foreign exchange reserves and prudential fiscal and monetary policy stances, Hong Kong is quite vigilant about international capital movements and their potential negative impacts (Hong Kong Monetary Authority, 2008).

In view of the surge in global liquidity and the global low-interest-rate environment, there are, among developing economies, growing concerns about the adverse effects of excessive capital flows. A typical complaint is that abundant capital influx leads to artificially underestimated credit risk and, subsequently, to asset price bubbles. Under the LER System, the domestic asset markets of Hong Kong are susceptible to pressure of excessive capital flow. Nevertheless, with its laissez-faire economic policy stance, Hong Kong is, in general, reluctant to impose capital controls to regulate capital flows.

In the next two subsections, we study the effects of capital flows on the Hong Kong equity and real estate markets.

3.1 Equity Market

The return on the Hang Seng Index (HSI), the currency-based measure and the WBR series are graphed, respectively, in Figures 3 and 4. Overall, the change in the CB measure tracks the return on the Hang Seng Index better than the WBR measure.

To formally investigate the effect of official and illicit capital flows on the Hong Kong equity market, we use the following regression specification:

$$Y_t = \alpha + \sum_{j=1}^{p} \beta_j Y_{j,t-j} + \theta X_t + \lambda D_t + \tau D_t X_t + \varepsilon_t, \qquad (2)$$

where Y_t is the return on the Hang Seng Index, X_t is the capital flow measure, the lagged dependent variable is included to account for persistence and p is up to 2, D_t are the US QE dummies, the interaction term D_tX_t is included to allow for different capital flow effects in various QE episodes, and ε_t is the regression error term.[12]

The results of estimating the effect of capital flow captured by the CB measure are presented in Table 1a. The column labelled “Model 1” gives the capital flow effect in the presence of lagged stock index return. The CB measure is statistically significant at the 1% level and the persistence of the lagged quarterly return of the HSI is insignificant. The finding is in accordance with the common wisdom that capital flow contributes positively to the local equity market. The CB measure retains its significance in the presence of the QE variables (Model 2). Indeed, the inclusion of the three QE dummy variables and the interaction term do not improve the overall fitness of the regression equation; the estimated

[12] Definitions of variables used in this sub-section and the rest of the paper are given in Appendix A.

adjusted R^2 of Model 2 is smaller than that of Model 1. Model 3 gives the parsimonious specification by sequentially dropping the "most" insignificant variable from Model 2. The two significant interaction terms indicate that the capital flow displays different effects on the HSI during the first two QE episodes. In summary, the CB measure, which captures capital flow via currency conversion, has a positive effect on the local equity market, and this can be influenced by the QE policy.

Arguably, other economic factors can contribute to variations in equity returns.[13] To assess the robustness of the capital flow effect in Table 1a, we augment equation (2) with a few economic control variables and estimate the following augmented specification:

$$Y_t = \alpha + \sum_{j=1}^{p} \beta_j Y_{j,t-j} + \theta X_t + \gamma W_t + \phi Z_t + \delta M_t + \lambda D_t + \tau D_t X_t + \varepsilon_t, \qquad (3)$$

where W_t contains global and regional stock returns, Z_t includes Hong Kong's real GDP growth, and M_t comprises China's real GDP growth.[14] The returns on the MSCI Global Index, MSCI Asia Pacific Index and MSCI Asia Pacific (excluding Japan) Index are the proxies of global and regional stock returns. Lagged control variables are used to avoid endogeneity issues. China's real GDP growth is included to reflect the close economic link between China and Hong Kong.[15]

The results of estimating (3) are presented in Table 1b. Similar to Table 1a, the CB measure is statistically significant at the 1% level in all the variants of (3) reported in Table 1b. In other words, the inclusion of these economic control variables does not materially affect the capital flow effect on HSI returns in all cases. Individually, only the MSCI Asia Pacific (excluding Japan) Index and China's real GDP growth rate yield a noticeable increase in the estimate of adjusted R^2 since the former increases the adjusted R^2 from 0.18 (Model 1, Table 1a) to 0.25 (Model 3, Table 1b) and the latter to 0.28

[13] There is plenty of literature on the relationship between equity prices and economic fundamentals/policies, such as Galeotti and Schiantarelli (1994), Laopodis (2011), and Campbell et al. (2014).

[14] In some similar studies on asset prices, the number of financial and real variables on the right hand side of the equation is large and principal components are used to reduce the dimension, e.g. Leung et al. (2006). However, as the number of financial and real variables in this study is quite small and for easy economic interpretation, we do not consider using principal components.

[15] Additional economic variables, including the change in the Hong Kong current account balance and China's net exports via Hong Kong (a proxy of China's hot money flows via the trade mis-invoicing channel), were considered in the preliminary stage. These variables turned out to be insignificant and, thus, were not presented for brevity.

(Model 5, Table 1b). However, China's real GDP growth is the only economic control variable that is significant in the presence of other controls and the US QE variables. The finding attests to the importance of China's growth on the Hong Kong equity market in which stocks of Chinese companies constitute about half of the market index. In the presence of economic control variables, the interaction term involved the second QE episode is the only significant QE related variable. Thus, the capital flow, as quantified by the CB measure, exerts a positive effect on the Hong Kong stock market after allowing for the US QE policy and economic control variables.

To investigate the effects of illicit capital flow on Hong Kong's equity market, we employ specifications (2) and (3) with the WBR measure replacing the CB measure. Table 2a presents the results pertaining to the WBR measure. The estimation results, in contrast to the CB measure case, indicate that HSI returns are persistent; the estimated coefficient of the lagged return is statistically significant (Model 1 and Model 3). The lagged WBR measure is statistically significant at the 10% level; indicating a positive effect on the local equity market and an upward pressure on the HSI index. However, the marginal explanatory power of the illicit capital flow measure is lower than that of the CB measure; an adjusted R^2 estimate of 0.04 (Model 1, Table 2a) versus 0.18 (Model 1, Table 1a). In the presence of WBR, the US QE effects are not quite stable. In searching for the parsimonious specification (Model 3), only the first QE dummy variable is significant. When the significant US QE effect is accounted for, the adjusted R^2 estimate increases to 0.08, and the WBR measure remains statistically significant.

The results of estimating equation (3) with the WBR as the capital flow variable are presented in Table 2b. The estimation results show that, in the presence of control variables, the WBR measure retains its statistical significance, albeit at the 10% level. Individually, HK's real GDP growth is the only economic control variable that is statistically significant and noticeably increases the adjusted R^2 estimate. This economic control variable is also statistically significant under "Model 7" and "Model 9", the parsimonious specifications excluding and including QE-related variables. Note that, since all the QE-related variables turned out to be insignificant (Model 8), the two parsimonious specifications are the same. In passing, we point out that "Model 7" yields an estimate of adjusted R^2 that is smaller than "Model 6", which includes a few insignificant economic control variables; namely, the regional stock index and the China factor. However, the parsimonious specification is favoured by information criteria,

including BIC and HQC. Therefore, we consider Model 7 (and Model 9) as the preferred parsimonious model.

Table 3 presents the combined effects of the CB and WBR measures on the local equity market returns. Model 1 is based on the parsimonious specifications in Tables 1b and 2b. Both the CB and WBR measures remain statistically significant at the 5% level along with the economic control variable - China's real GDP growth rate. These two types of capital flows both exert positive effects on the local equity market and, by comparing the magnitudes of their coefficient estimates, one can suggest that the effect of the official CB flow is stronger than that of the illicit WBR flow. Similar to the results in Tables 1a and 1b, the presence of the CB measure does not affect the significance of China's real GDP growth but renders the Hong Kong real GDP growth and global and regional stock indexes insignificant. The pattern of significant US QE dummy variables and interaction terms is not similar to that of Table 1b; indicating the QE effect is not quite robust across these specifications. In summary, the parsimonious model (Model 3) shows that, in the presence of the significant China factor and QE effects, the Hong Kong stock market is significantly affected by both the official and illicit flows as captured by the CB and WBR measures.

3.2 Residential Property Market

The Hong Kong real estate market is one of the most expensive and least affordable one in the world. The high price and low affordability are usually attributed to overseas demand and speculative forces. In this subsection, we assess the implications of capital flows for the domestic residential property market in Hong Kong. Figures 5 and 6 graph returns on the residential property price index compiled by the Hong Kong Rating and Valuation Department against, respectively, the CB and WBR capital flow measures. Apparently, the CB measure displays a pattern comparable to that of residential property price index returns. The WBR measure, on the other hand, is more volatile than the return on the residential property index.

The investigation of empirical effects of capital flows on the Hong Kong residential property market is again using the specifications (2) and (3).[16] Specifically, the dependent variable is the return on the Hong Kong residential property price index. The CB and WBR measures will be used sequentially as the capital flow variable.[17]

The results of estimating the effect of the CB measure on the return on property price index are presented in Table 4a. Compared with the stock index HSI, the property price index displays a more complex dependent structure; the first two lags of the return series are statistically significant. After controlling for its own history, the return on the residential property price index is still significantly affected by capital flows captured by the CB measure. Indeed, in the three specifications in Table 4a, the empirical evidence suggests that capital inflow tends to be associated with an increase in the property price. The inclusion of the US QE dummy variables and their interaction terms does not alter the significance of the CB measure. The parsimonious model—Model 3, Table 4a shows that, during the second QE period, the return on the residential property price index is relatively higher and the effect of CB capital flow is weaker. If the magnitude of the coefficient estimate of CB measure is used to gauge the strength of the capital flow effect, one can suggest that capital flows have a stronger impact on the stock market than on the real estate market (Tables 1a and 4a).

The capital flow effects in the presence of economic control variables stipulated by specification (3) are reported in Table 4b. While the estimated effect is slightly lower than the one in Table 4a, the CB measure exhibits a significantly positive effect in all but one specification in the presence of these economic control variables. On individual control variables, only the MSCI Asia Pacific (excluding Japan) Index and Hong Kong's real GDP growth rate are statistically significant at the 5% level. In the parsimonious model (Model 7), without the QE-related variables, these two control variables, the global stock index and the CB measure, are statistically significant. The included variables explain 56% of the variation of the return on the Hong Kong residential property price index. The significant

[16] Some studies of Hong Kong house prices adopt the VAR framework, such as Chang et al. (2013) and Leung and Tang (2015a, b). However, this study focuses on the effect of capital flows on asset markets and VAR may not outperform linear regression for the purpose. Thus, for simplicity, this study adopts regression only.

[17] Similar to the case of HSI regression, we, at the stage of preliminary analyses, examined various potential determining factors, including variables that represent the macroprudential policies for managing the Hong Kong real estate market. These variables turned out to be insignificant and, thus, were not presented for brevity.

QE- related variables in the parsimonious model (Model 9) including QE policy effects are similar to those reported in Table 4a. Apparently, the significant QE variables do not alter the effects of other variables in the specification.

Effects of the WBR measure of illicit capital flows on the residential property price index derived from specifications (2) and (3) are presented in Tables 5a and 5b, respectively. There is no statistical evidence of the WBR measure influencing returns of the property price index. In Tables 5a and 5b, the estimated effect of the WBR measure is small and statistically insignificant. Comparing with Table 4b, results in Table 5b show the effects of the two economic control variables; namely the MSCI Asia Pacific (excluding Japan) index and Hong Kong real GDP growth rate are similar in the presence of CB and WBR measures. The US QE-related variables, however, show a different pattern. That is, the QE effect, compared with the economic control variable effect, is less robustly estimated across these specifications.

Table 6 presents the combined effects of the CB and WBR measures. The estimation results are largely in line with those in Tables 4 and 5: the CB measure is significant, whereas the WBR measure is not. The MSCI Global Index, the MSCI Asia Pacific (excluding Japan) Index and Hong Kong's real GDP growth are significant; and the QE effects are similar but not the same as those in the previous tables. It is noted that the parsimonious model (Model 3) in Table 6 commands an adjusted R^2 estimate slightly smaller than the one in Table 4b (Model 9, Table 4b), indicating that the inclusion of WBR does not help to explain the variability of the Hong Kong residential property price index.

4. Concluding Remarks

Hong Kong is a small economy dependent on international trade and financial activities. Its openness and small size make Hong Kong susceptible to excessive international capital flows. As an international financial centre with limited capital controls, it is imperative for Hong Kong to have a good gauge of cross-border fund movements and to be prudent in managing the effects of these flows. In this exercise, we study the effects of capital flow on the Hong Kong economy; specifically, we focus

on the two asset markets, namely the equity market and the real estate sector. The results of our exercise may serve as a good reference point for economies in the region that are liberalising their capital accounts.

We can draw a few observations from the exercise. First, an overarching issue is which measure of capital flows should be considered? There are a few operational measures of capital flows. Some focus on transactions reported in official accounts, and some are designed to reveal capital movements not officially recorded. In our exercise, we used the CB measure, is based on official records of transactions involving currency conversion deemed appropriate for the Hong Kong monetary system. For illicit capital flows, we employed the commonly used WBR measure.

Second, although Hong Kong is one of the most open economies, the measures of official and illicit flows have comparable magnitudes, and have low degrees of correlation. The different operational measures of capital flows, official and illicit, have different implications for the equity market and the real estate sector. While official and illicit capital measures affect the equity market, the magnitudes of their impacts are not the same. Further, we find that only the official capital measure, and not the illicit flow measure, effects the housing market. That is, different types of capital flows can have different effects in the markets and across markets.

Third, the study highlights the complexity of managing capital flows in an open economy. Authorities must recognise that different types of official and illicit flows can have different impacts on different sectors of their economies. To achieve the desired policy effect, capital management policies, particularly macro-prudential policies, must be capital flow and economic-sector specific. The policy formulation process is further complicated by a) the classification of capital flows can be more complicated than the dichotomy approach adopted in this exercise, and b) the differences in market, institutional and legal environments can alter the implications of capital flow on the economy.

Fourth, our empirical findings indicate that the effects of the US QE policy vary across regression specifications. The three QE episodes can have different implications for the effects of capital flows on the Hong Kong equity and real estate markets.

Lastly, our regression results show the Hong Kong economy is affected by both internal and external economic factors; and the capital flow is not the only or mainly determining factor. Among these economic control variables, the significant impact of China's growth on the Hong Kong equity market is worth noting. Our results confirm the Chinese influences commonly discussed in the media. Thus, in view of the growing economic ties between Hong Kong and Mainland China, and China's expansion into international financial markets, Hong Kong should be conscientious about the capital flows to and from China.

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Appendix. Definition of Variables

HSI	Quarter-on-quarter percentage change in the Hang Seng Index (Dependent variable of Table 1a – 3)
PPI	Quarter-on-quarter percentage change in the Residential Property Price Index: 1999=100 (Dependent variable of Table 4a – 6)
Currency-based capital inflows	The sum of Hong Kong monetary base and net spot foreign currency positions of banks in Hong Kong (% of GDP)
Monetary Base	Monetary base of Hong Kong (% of GDP)
Banks' Net Spot FC Position	Net spot foreign currency positions of banks in Hong Kong (% of GDP)
WBR	World Bank Residual measure (% of GDP)
MSCI Global	The MSCI Index is a free-float weighted equity index. It was developed with a base value of 100 as of December 31, 1987. It includes both emerging and developed world markets. (Quarter-on-quarter percentage change)
MSCI Asia Pacific Inc JP	The MSCI Asia Pacific Index is a free-float weighted equity index. It was developed with a base value of 100 as of December 31, 1987. (Quarter-on-quarter percentage change)
MSCI Asia Pacific Exc JP	The MSCI Asia Pacific excluding Japan Index is a free-float weighted equity index. It was developed with a base value of 100 as of December 31, 1987. (Quarter-on-quarter percentage change)
HK Real GDP	Hong Kong's real GDP growth rate (Quarter-on-quarter percentage change)
China Real GDP	China's real GDP growth rate (Quarter-on-quarter percentage change)
QE1	Dummy variable for QE1, with value = 1 for 2009Q1-2009Q4; and = 0 for other quarters.
QE2	Dummy variable for QE2, with value = 1 for 2010Q4-2011Q2; and = 0 for other quarters.
QE3	Dummy variable for QE3, with value = 1 for 2012Q3-2013Q1; and = 0 for other quarters.

Table 1a: Hang Seng Index (HSI) and the Currency-Based Measure of Capital Flows

	Model 1	**Model 2**	**Model 3**
Constant	-0.23	-0.59	-0.40
AR(1)	0.18	0.12	
Currency-based measure (1st Diff) (% of GDP)	0.91***	0.80*	0.83**
QE1		-8.06	-10.22*
QE2		-0.23	
QE3		0.11	
QE1* Currency-based measure (1st Diff) (% of GDP)		2.91	3.39*
QE2* Currency-based measure (1st Diff) (% of GDP)		-1.40***	-1.39***
QE3* Currency-based measure (1st Diff) (% of GDP)		0.40	
$\overline{R}^2$	0.18	0.15	0.21

Note: All estimations are adjusted for heteroskedasticity and autocorrelation using the Newey-West HAC Standard Errors and Covariance.
*** Significant at 1%; ** significant at 5%; * significant at 10%

Table 1b: Hang Seng Index (HSI) and the Currency-Based Measure of Capital Flows with Control Variables

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Constant	-0.35	-0.33	-0.98	-0.31	-13.05*	-10.86*	-13.14*	-12.18*	-13.18*
AR(1)	0.06	0.09	-0.52	0.17	0.01	-0.50			
Currency-based measure (1st Diff) (% of GDP)	0.97***	0.96***	1.08***	0.84***	1.00***	1.00***	1.00***	0.91**	1.04***
MSCI Global	0.16					-0.22			
MSCI Asia Pacific Inc JP		0.11							
MSCI Asia Pacific Exc JP			0.73*			0.73			
HK Real GDP Growth Rate				0.18		0.17			
China Real GDP Growth Rate					5.54*	4.31*	5.58*	4.96**	5.55*
QE1								-6.21	
QE2								0.30	
QE3								3.33	
QE1* Currency-based measure (1st Diff) (% of GDP)								2.17	
QE2* Currency-based measure (1st Diff) (% of GDP)								-1.32**	-1.43***
QE3* Currency-based measure (1st Diff) (% of GDP)								0.13	
$\overline{R}^2$	0.17	0.16	0.25	0.17	0.28	0.30	0.30	0.26	0.30

Note: All estimations are adjusted for heteroskedasticity and autocorrelation using the Newey-West HAC Standard Errors and Covariance.
*** Significant at 1%; ** significant at 5%; * significant at 10%

Table 2a: Hang Seng Index (HSI) and the WBR Measure

	Model 1	Model 2	Model 3
Constant	1.68	1.02	1.01
AR(1)	0.27**	0.18	0.24*
WBR measure (% of GDP) (1st Diff)	0.14*	0.13	0.14*
QE1		9.56**	9.69**
QE2		-2.04	
QE3		3.19*	
QE1* WBR measure (% of GDP) (1st Diff)		-0.69	
QE2* WBR measure (% of GDP) (1st Diff)		-0.24**	
QE3* WBR measure (% of GDP) (1st Diff)		0.14	
$\overline{R}^2$	0.04	0.01	0.08

Note: All estimations are adjusted for heteroskedasticity and autocorrelation using the Newey-West HAC Standard Errors and Covariance.
*** Significant at 1%; ** significant at 5%; * significant at 10%

Table 2b: Hang Seng Index (HSI) and the WBR Measure with Control Variables

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Constant	1.72	1.68	1.54	1.07	-9.32	-6.33	0.81	0.29	0.81
AR(1)	0.49**	0.44**	-0.16	0.25**	0.12	-0.34			
WBR measure (% of GDP) (1st Diff)	0.15*	0.15*	0.13*	0.16**	0.13*	0.13	0.15*	0.16*	0.15*
MSCI Global	-0.30					-0.84*	-0.94*	-0.77	-0.94*
MSCI Asia Pacific Inc JP		-0.21							
MSCI Asia Pacific Exc JP			0.44			1.12	1.00**	0.85*	1.00**
HK Real GDP Growth Rate				0.54**		0.53**	0.49**	0.51	0.49**
China Real GDP Growth Rate					4.84	3.15			
QE1								6.01	
QE2								-0.18	
QE3								2.33	
QE1* WBR measure (% of GDP) (1st Diff)								-0.05	
QE2* WBR measure (% of GDP) (1st Diff)								-0.01	
QE3* WBR measure (% of GDP) (1st Diff)								-0.04	
$\overline{R}^2$	0.04	0.03	0.05	0.11	0.12	0.25	0.23	0.14	0.23

Note: All estimations are adjusted for heteroskedasticity and autocorrelation using the Newey-West HAC Standard Errors and Covariance.
*** Significant at 1%; ** significant at 5%; * significant at 10%

Table 3: Hang Seng Index (HSI), the WBR Measure and the Currency-Based Measure with Control Variables

	Model 1	Model 2	Model 3
Constant	-9.64*	-9.74	-12.16*
WBR measure (% of GDP) (1st Diff)	0.15**	0.17**	0.11*
Currency-based measure (1st Diff) (% of GDP)	0.72**	0.74*	0.87***
MSCI Global	-0.48	-0.24	
MSCI Asia Pacific Exc JP	0.54	0.43	
HK Real GDP Growth Rate	0.28	0.38	
China Real GDP Growth Rate	4.09*	3.81	5.22**
QE1		-25.90	-8.15**
QE2		-0.99	
QE3		381.64	
QE1* WBR measure (% of GDP) (1st Diff)		1.91	
QE2* WBR measure (% of GDP) (1st Diff)		-0.18	
QE3* WBR measure (% of GDP) (1st Diff)		19.99	
QE1* Currency-based measure (1st Diff) (% of GDP)		5.84	2.45*
QE2* Currency-based measure (1st Diff) (% of GDP)		-1.59***	-1.12**
QE3* Currency-based measure (1st Diff) (% of GDP)		-93.06	
$\overline{R}^2$	0.33	0.25	0.31

Note: All estimations are adjusted for heteroskedasticity and autocorrelation using the Newey-West HAC Standard Errors and Covariance.
*** Significant at 1%; ** significant at 5%; * significant at 10%

Table 4a: Property Price Index (PPI) and the Currency-Based Measure of Capital Flows

	Model 1	Model 2	Model 3
Constant	0.98	0.83	0.87
AR(1)	0.77***	0.78***	0.75***
AR(2)	-0.34***	-0.36**	-0.34***
Currency-based measure (1st Diff) (% of GDP)	0.30***	0.27**	0.32***
QE1		-0.33	
QE2		2.44***	2.53***
QE3		-1.09	
QE1* Currency-based measure (1st Diff) (% of GDP)		0.20	
QE2* Currency-based measure (1st Diff) (% of GDP)		-0.20	-0.25**
QE3* Currency-based measure (1st Diff) (% of GDP)		0.23	
$\overline{R}^2$	0.47	0.42	0.46

Note: All estimations are adjusted for heteroskedasticity and autocorrelation using the Newey-West HAC Standard Errors and Covariance.
*** Significant at 1%; ** significant at 5%; * significant at 10%

Table 4b: Property Price Index (PPI) and the Currency-Based Measure of Capital Flows with Control Variables

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Constant	1.10	1.10	1.08	0.88	-1.00	1.08	0.76	0.64	0.67
AR(1)	0.70***	0.68***	0.62***	0.75***	0.75***	0.57***	0.57***	0.57***	0.55***
AR(2)	-0.32***	-0.30**	-0.25**	-0.32***	-0.29**	-0.15	-0.15	-0.16	-0.14
Currency-based measure (1st Diff) (% of GDP)	0.25**	0.23**	0.20*	0.28***	0.28***	0.16	0.16*	0.13	0.19**
MSCI Global	0.08					-0.27*	-0.26*	-0.28*	-0.28*
MSCI Asia Pacific Inc JP		0.11							
MSCI Asia Pacific Exc JP			0.12**			0.34***	0.33***	0.36***	0.34**
HK Real GDP Growth Rate				0.12**		0.16*	0.16**	0.16**	0.14**
China Real GDP Growth Rate					0.83	-0.14			
QE1								-1.97	
QE2								1.87**	2.07***
QE3								2.28	
QE1* Currency-based measure (1st Diff) (% of GDP)								0.37	
QE2* Currency-based measure (1st Diff) (% of GDP)								-0.26*	-0.30**
QE3* Currency-based measure (1st Diff) (% of GDP)								-0.35	
$\overline{R}^2$	0.48	0.49	0.51	0.48	0.47	0.55	0.56	0.52	0.55

Note: All estimations are adjusted for heteroskedasticity and autocorrelation using the Newey-West HAC Standard Errors and Covariance.
*** Significant at 1%; ** significant at 5%; * significant at 10%

Table 5a: Property Price Index (PPI) and the WBR Measure

	Model 1	Model 2	Model 3
Constant	1.72**	1.36	1.64**
AR(1)	0.77***	0.78***	0.80***
AR(2)	-0.41***	-0.42***	-0.46***
WBR measure (% of GDP) (1st Diff)	-0.01	0.004	0.002
QE1		2.44	
QE2		2.07**	1.91**
QE3		1.53*	1.40*
QE1* WBR measure (% of GDP) (1st Diff)		-0.02	
QE2* WBR measure (% of GDP) (1st Diff)		0.13***	0.13***
QE3* WBR measure (% of GDP) (1st Diff)		-0.19***	-0.20***
$\overline{R}^2$	0.37	0.36	0.37

Note: All estimations are adjusted for heteroskedasticity and autocorrelation using the Newey-West HAC Standard Errors and Covariance.
*** Significant at 1%; ** significant at 5%; * significant at 10%

Table 5b: Property Price Index (PPI) and the WBR Measure with Control Variables

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Constant	1.71**	1.64**	1.54*	1.54**	-0.85	1.72	1.09	0.78	0.84
AR(1)	0.66***	0.63***	0.57***	0.74***	0.74***	0.51***	0.52***	0.49***	0.47***
AR(2)	-0.35***	-0.32***	-0.26**	-0.37***	-0.34***	-0.14	-0.14	-0.10	-0.06
WBR measure (% of GDP) (1st Diff)	0.001	0.002	0.01	-0.01	-0.01	0.01	0.01	0.02	0.02
MSCI Global	0.13**					-0.30**	-0.29*	-0.24	-0.24*
MSCI Asia Pacific Inc JP		0.15**							
MSCI Asia Pacific Exc JP			0.16***			0.40***	0.38***	0.34***	0.35***
HK Real GDP Growth Rate				0.16**		0.18**	0.18**	0.20**	0.21**
China Real GDP Growth Rate					1.06*	-0.27			
QE1								0.57	
QE2								1.41	
QE3								1.64	
QE1* WBR measure (% of GDP) (1st Diff)								-0.44	-0.56**
QE2* WBR measure (% of GDP) (1st Diff)								0.001	
QE3* WBR measure (% of GDP) (1st Diff)								-0.08	
$\overline{R}^2$	0.42	0.44	0.48	0.40	0.39	0.53	0.54	0.51	0.54

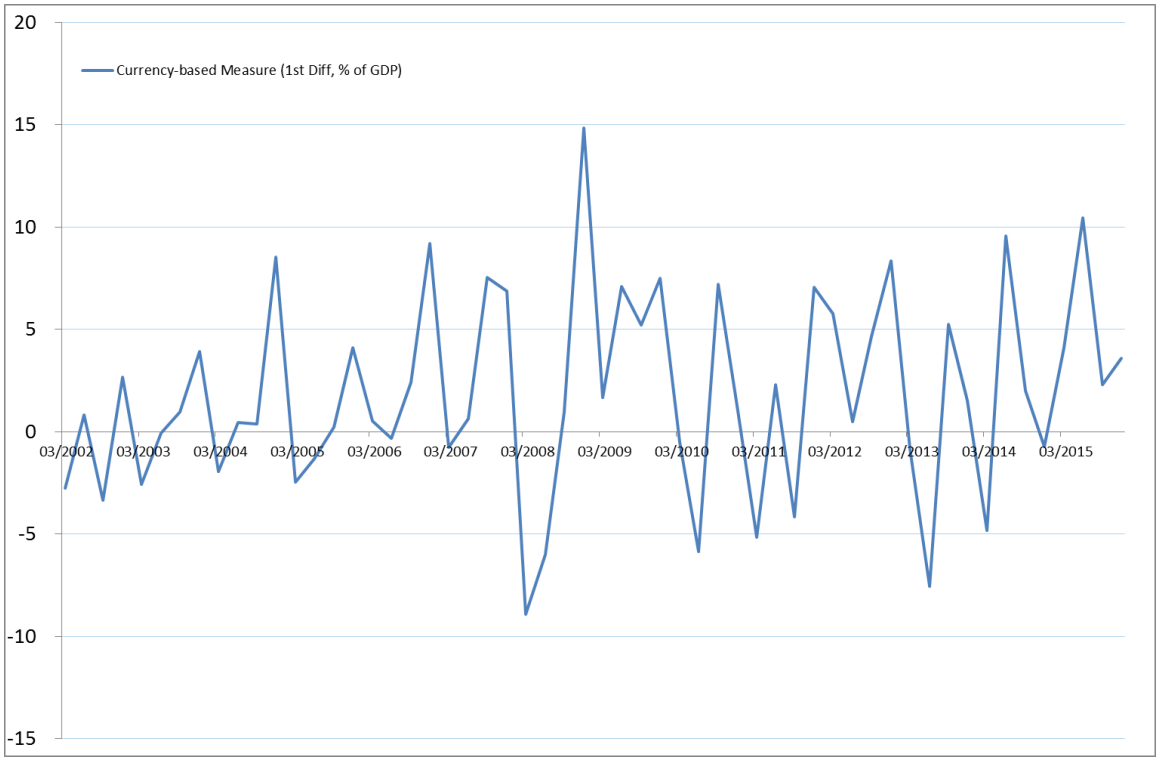
Note: All estimations are adjusted for heteroskedasticity and autocorrelation using the Newey-West HAC Standard Errors and Covariance.
*** Significant at 1%; ** significant at 5%; * significant at 10%

Table 6: Property Price Index (PPI), the WBR Measure and the Currency-based Measure with Control Variables

	Model 1	Model 2	Model 3
Constant	0.75	0.57	0.65
AR(1)	0.57***	0.58***	0.57***
AR(2)	-0.15	-0.16	-0.15
WBR measure (% of GDP) (1st Diff)	-0.005	0.01	-0.01
Currency-based measure (1st Diff) (% of GDP)	0.17*	0.12	0.20**
MSCI Global	-0.26*	-0.26	-0.28*
MSCI Asia Pacific Exc JP	0.32**	0.35**	0.34**
HK Real GDP Growth Rate	0.16**	0.17*	0.14**
QE1		-3.76	
QE2		1.62**	2.05***
QE3		3.16	
QE1* WBR measure (% of GDP) (1st Diff)		-0.49	
QE2* WBR measure (% of GDP) (1st Diff)		0.25***	0.27***
QE3* WBR measure (% of GDP) (1st Diff)		-0.10*	
QE1* Currency-based measure (1st Diff) (% of GDP)		0.46	
QE2* Currency-based measure (1st Diff) (% of GDP)		-0.62***	-0.70***
QE3* Currency-based measure (1st Diff) (% of GDP)		-0.48	
$\overline{R}^2$	0.55	0.51	0.54

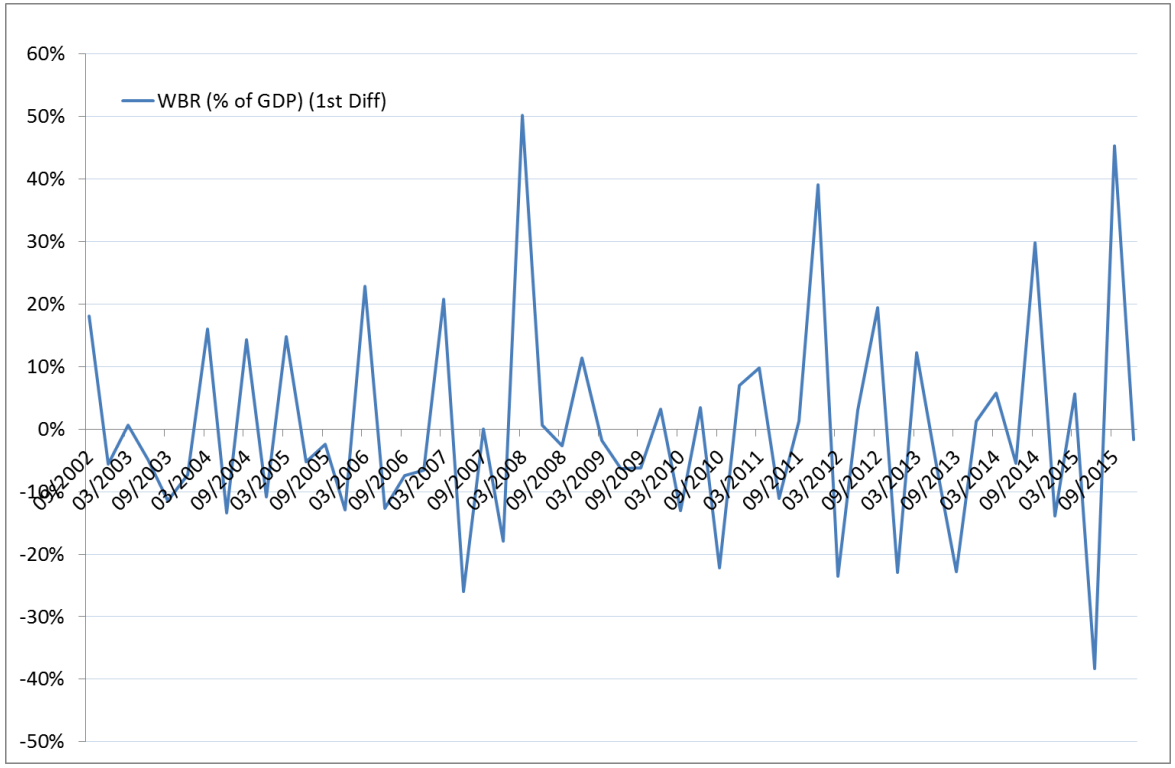
Note: All estimations are adjusted for heteroskedasticity and autocorrelation using the Newey-West HAC Standard Errors and Covariance.
*** Significant at 1%; ** significant at 5%; * significant at 10%

Figure 1: The Currency-Based Measure of Capital Flow



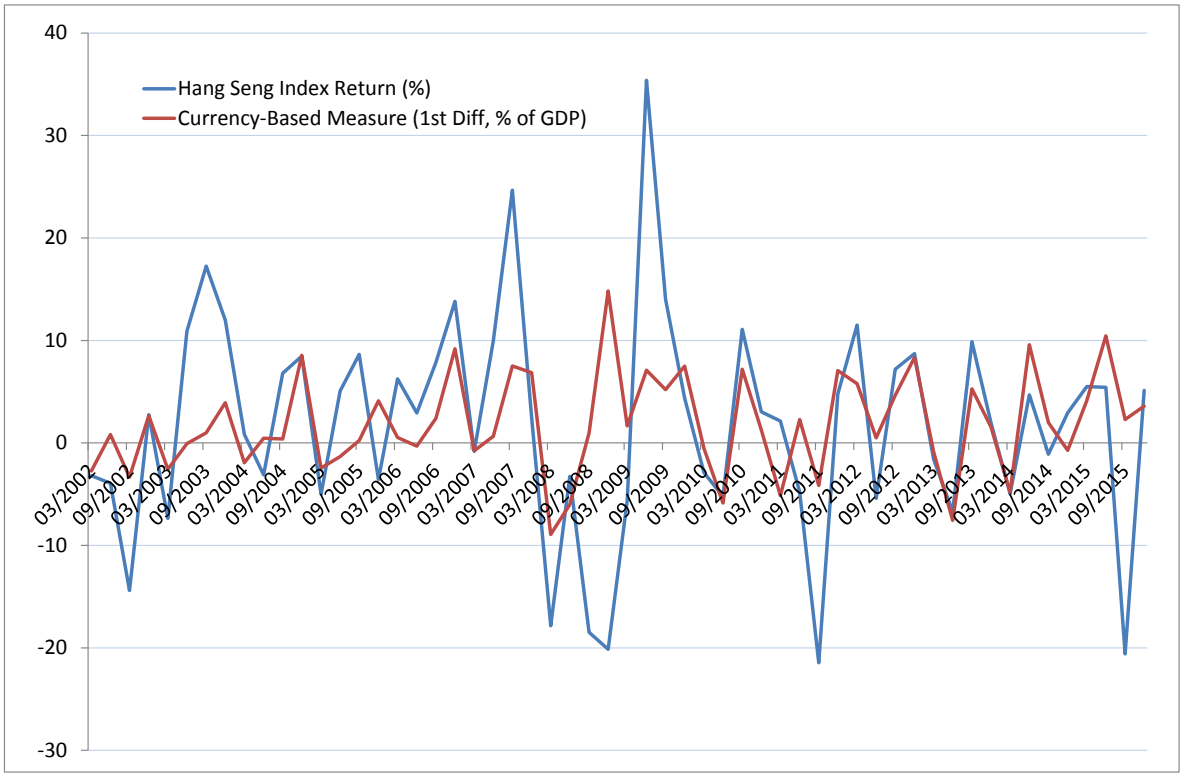
Sources: CEIC and authors' calculations

Figure 2: The WBR Measure of Illicit Flow



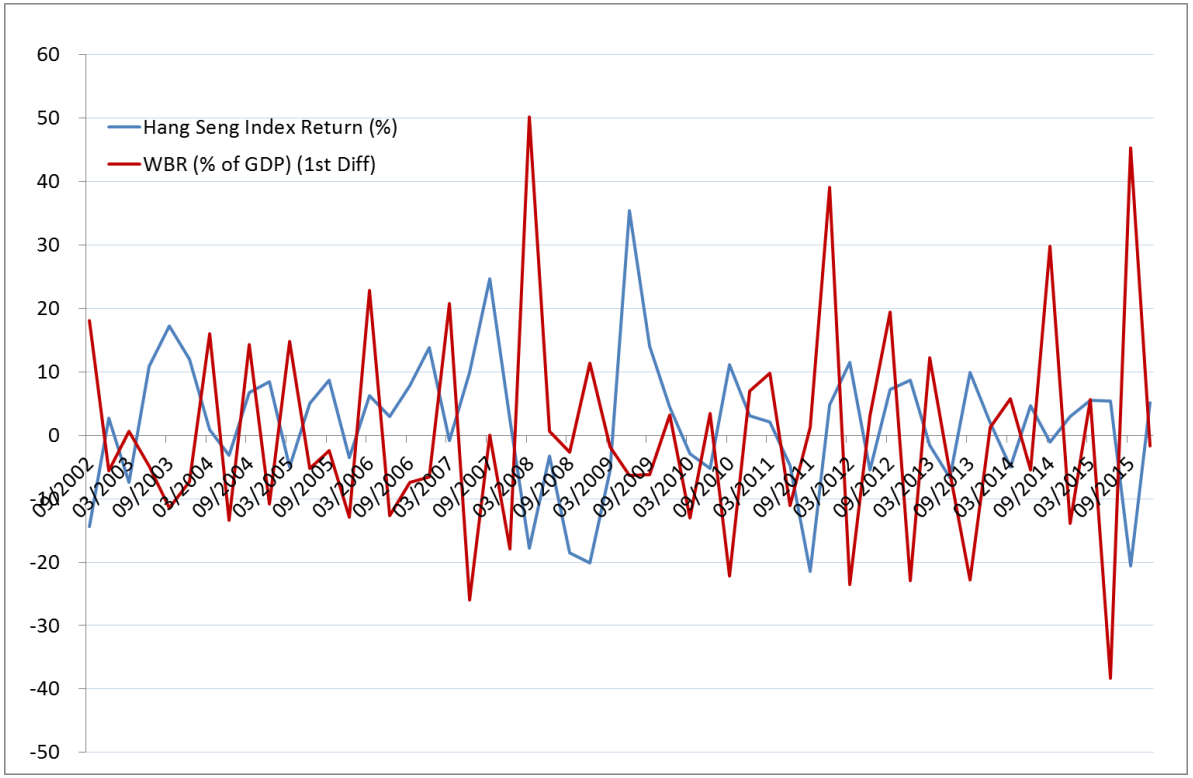
Source: CEIC and authors' calculations

Figure 3: The Currency-Based Measure and the Hang Seng Index Return



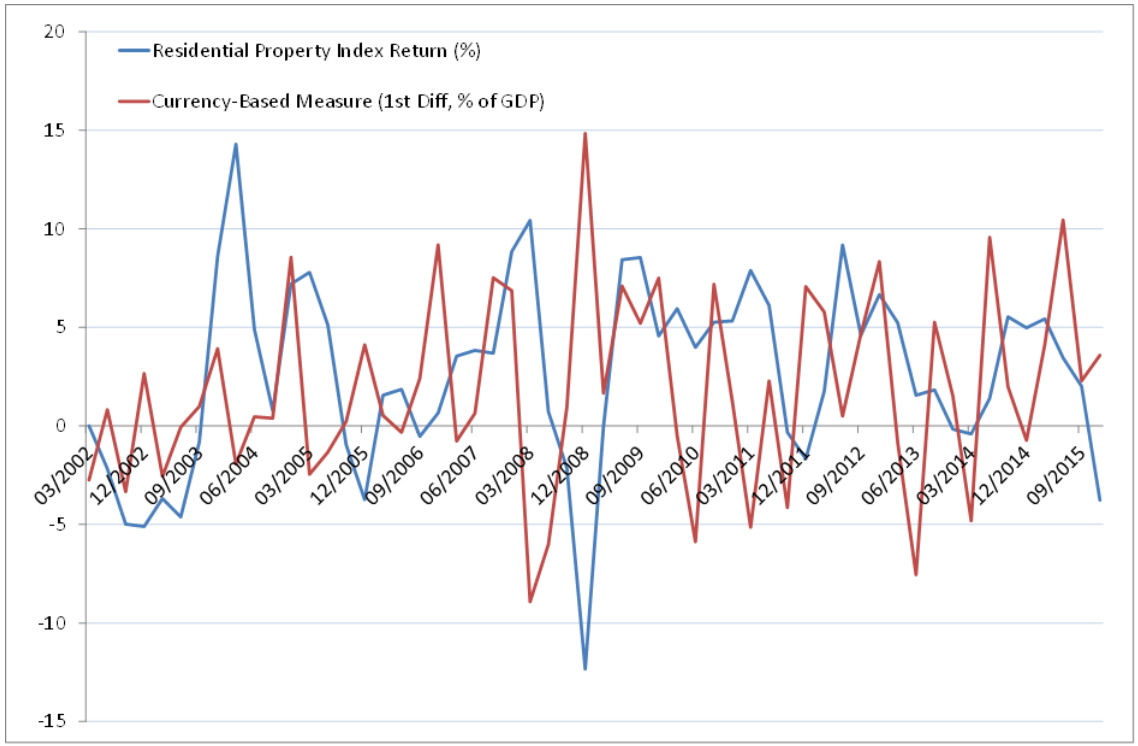
Sources: CEIC and authors' calculations

Figure 4: The WBR Measure and the Hang Seng Index Return



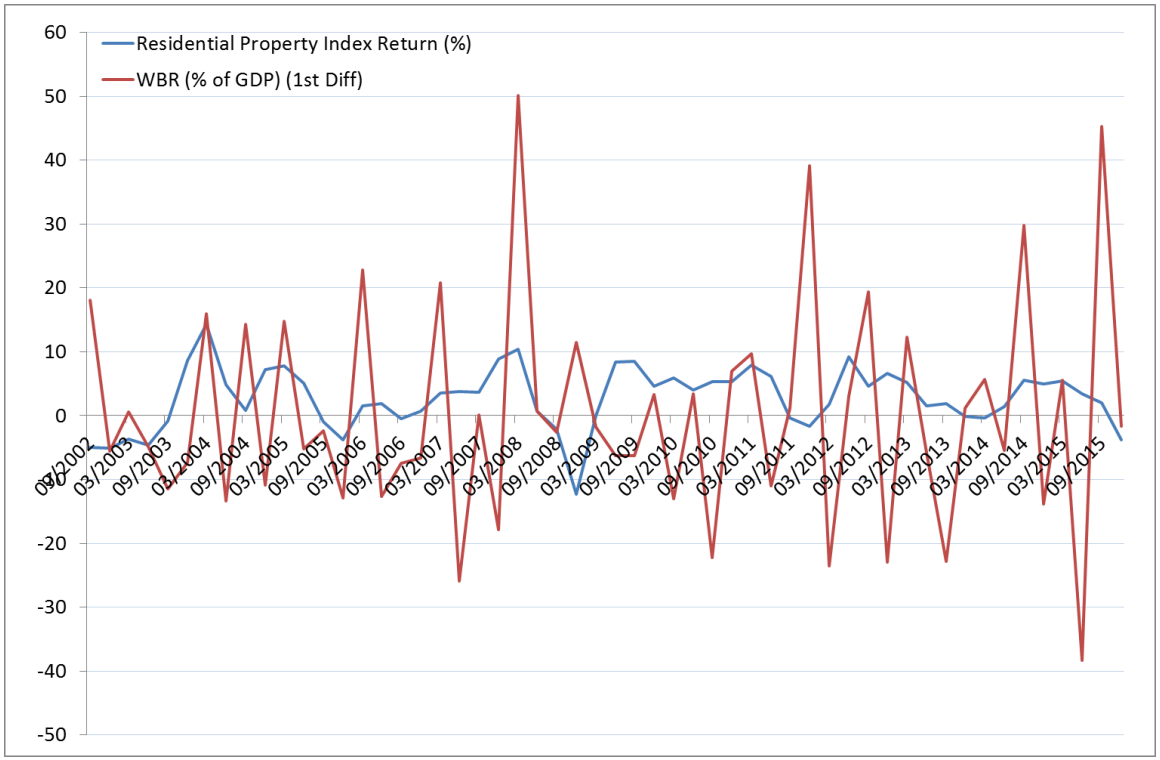
Sources: CEIC and authors' calculations

Figure 5: The Currency-Based Measure and the Real Estate Price Index Return



Sources: CEIC and authors' calculations

Figure 6: The WBR Measure and the Real Estate Price Index Return



Sources: CEIC and authors' calculations