Speculating China economic growth through Hong Kong? Evidence from the stock market IPO and real estate markets

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Abstract

This paper argues that since China closes her asset markets, investors turn to Hong Kong instead. The initial public offerings (IPO) of Chinese firms in the Hong Kong stock market and the local housing market of Hong Kong improve the prediction of each other, as they may serve as a coordinator of herds among investors. Alternative explanations such as the "production conjecture" and "underlying factor conjecture" are found to be inconsistent with the data. Our results are also consistent with the increasing importance of Chinese tourists in the world. Directions for future research are also discussed.

Keywords: Animal Spirits conjecture, production conjecture, underlying factor conjecture, causality, wealth effect
JEL classification numbers: G10, R20, R33

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"… But if we look up *confidence* in the dictionary, we see that it is more than a prediction. The dictionary says that it means "trust" or "full belief." The word comes from the Latin *fido*, meaning "I trust." The confidence crisis that we are in at the time of this writing is also called a *credit crisis*. The word *credit* derives from the Latin *credo*, meaning "I believe."… In good times, people trust. They make decisions spontaneously. They know instinctively that they will be successful… Asset values will be high and perhaps also increasing…. When people are confident they go out and buy; when they are unconfident they withdraw, and they sell. Economic history is full of such cycles of confidence followed by withdrawal."

George Akerlof and Robert Shiller, Animal Spirits, 2009.

1.Introduction

The emergence of China as a great economic power has been widely recognized. For instance, according to the World Development Indicators, in 2000, the aggregate GDP for China, Germany, Japan, U.K. and the U.S. were approximately (all in constant 2000 dollars) 1,198 billions, 1,886 billions, 4,731 billions, 1,477 billions and 9,899 billions respectively. By 2011, these figures became 3,541 billions, 2,131 billions, 5,059 billions, 1,756 billions and 11,744 billions respectively. These figures show that China has indeed overtaken some major economies in terms of the aggregate GDP. If China has appreciated her currency (Renminbi) as much as some commentators had suggested, the GDP figures of China in the recent decade could be even more pronounced.

Empirical researches suggest that *on average*, a high economic growth is associated with a high return in the stock market.[1] Thus, it would be natural to suggest that one should invest in the China stock market. On the other hand, it may not be easy for individual investors to "capture" such phenomenal growth financially. For one thing, China does not open her asset markets. Information flows in China is under severe monitoring and very often non-local investors can only make "guesses". Foreigners have limited participation in the Chinese real estate and stock markets. Foreign financial intermediations are only allowed to provide limited services to Chinese customers in restricted areas. In fact, Renminbi, the currency of China, is not even convertible.

Since investors do not have full access of the Chinese asset markets, some would choose to invest in *correlated markets*. Among those markets, Hong Kong is often highlighted for a variety of reasons. On top of the geographical and cultural proximities, there may also be some sound economic reasons. Trades in goods and services, as well as factors' mobility between mainland China and Hong Kong began in the 1970s, and since then continued to grow (Sung, 1991). Due to the large flow of visitors between Hong Kong and the Mainland China, Hong Kong has access to more updated information about China. In addition, many authors (see Genberg and He, 2008 and the reference therein) have shown evidences that the economic activities between China and Hong Kong are closely related. Therefore, if there are some good news in China (including productivity growth, favorable economic policies, etc.), Hong Kong economy will typically be benefited. The good news would also be "capitalized" in the Hong Kong asset markets. In addition, some

[1] Among others, see Levine (2002), Levine and Zervos (1998).

Chinese corporations are listed in the Hong Kong stock market and investors can trade them directly. In fact, some studies demonstrate that there are indications for increasing integration between the stock markets of China and Hong Kong (for instance, see Cheng and Glascock, 2005).

This paper attempts to contribute to the literature by considering a *special segment of the stock market*, which is the IPO (initial public offerings), i.e. the first sale of stock of a private company to the public. The activities of IPO have received increasing attention in both the media and the academic circle. Clearly, it is beyond the scope of this paper to review this literature.[2] It seems fair to summarize that the previous literature focuses on the *microeconomic aspect* of IPO. To complement the literature, this paper attempts to focus on a *macroeconomic issue*, namely, how IPO activities interact with the real estate market. In previous researches (for instance, Case and Quigley, 2007; Case, Quigley and Shiller, 2005), they emphasized on the wealth effects of both the stock market and real estate market on the consumption. However, this paper finds that the IPO value relative to the total market capitalization is typically negligible. Thus, the movement of the IPO should have *no significant wealth effect*, and may therefore *identify a separate channel* through which the stock market and the real estate markets can be related. The following figure shows the case of Hong Kong and confirms this statement graphically.

(Insert Figure 1)

The case of Hong Kong is selected by this paper with good reasons. Despite its small geographical size, Hong Kong is an important financial market in the region. Hong Kong is the second largest Asian financial market (Newell et al, 2007). According to a recent study, out of the 20 largest IPO in Asia for the period 1997-2011 (in terms of the current year nominal value), 10 of them are held in Hong Kong.[3] Wall Street Journal (2012) even states that "for the third year in a row the world's leading exchange for new stock offerings was located not in New York, but in Hong Kong".[4] In terms of the real estate market, Hong Kong has a very good legal system (Newell et al, 2007). Leung, Wong and Cheung (2007) shows that in terms of the average number of transactions per unit of housing, Hong Kong

[2] For instance, different aspects of IPO, including the issuing activity, under-pricing, and long-run performance, etc. have been widely discussed in the literature. Among others, interested readers are referred to survey papers such as Ritter and Welch (2002), Yong (2007), among others.
[3] See Appendix 1C for details.
[4] Clearly, the literature on IPO is too large to be reviewed here. The appendix provides a summary of some selected papers.

housing market is several times more "liquid" than the U.S. In addition, the boundary of Hong Kong is fixed by the Basic Law. The fixed boundary and constrained supply of land also facilitate the comparison across different time periods. Moreover, Hong Kong has a simple tax system, maintains a constant exchange rate throughout the sampling period, and provides equal treatments to foreign investors. All these features contribute to our choice of Hong Kong for the case study.

How can the IPO activities be related to the real estate markets? One possible channel is that an increase (decrease) in IPO activities may *reflect* an improvement (or deterioration) of the "market sentiment" (among others, Baker and Wurgler, 2007; Cornelli, Goldreich, and Ljungqvist, 2006; Helwege and Liang, 2004). In fact, stock market IPO is included in the list of variable which is used to construct the "market sentiment" variable (Brown and Cliff, 2004), and *indeed IPO activity is the only time series available for Hong Kong during our sampling period* (see Appendix 2). Alternatively, IPO might reflect that the businessmen are *confident* of the economic future, and thus raise funds through IPO for investments and further expansions (Akerlof and Shiller, 2009). Investors express their *trust* to the businessmen through subscribing the IPO. Thus, the IPOs of Chinese firms help to coordinate the "herd" of investors in HK.[5]

This hypothesis seems to be consistent with the previous literature as well as the particular situation of Hong Kong.[6] Among others, Hong, Kubik, and Stein (2004) find that social interactions would affect the stock market participation. It should be noticed that while the IPO in the United States is mainly marketed to institutional investors, individual investors have a much larger share in Hong Kong. It is partly due to the fact that the underwriters in Hong Kong typically will make the minimum amount of stock IPO subscription very affordable and hence allows much more individual investors to participate.[7] And since the Chinese economy which is not completely transparent, the "market sentiment" may play an even larger role.

[5] We are very grateful to Paul Anglin for suggesting this interpretation.
[6] For instance, Lee, Wong, and Yuen (2007) find that, among others factors, investors' experience, media's report, margin and electronic applications, and family and friend recommendations are the significant factors that positively relate to the frequency of individual investors to subscribe IPO in Hong Kong.
[7] This seems to be a general practice in Hong Kong. For instance, while the Lehman Brothers Bonds are typically sold to institutional investors and private equity in the USA and Europe, Lehman Brothers Mini-Bonds are marketed in Hong Kong and Singapore. When Lehman bankrupts, many individual investors lost their life-time savings and led to a series of political protest and demonstrations. For more details, see http://www.stockbrokerfraudblog.com/2008/11/protestors_in_asia_decrying_le_1.html.

Another feature which distinguishes Hong Kong from the Western countries is the lack of channels for individuals to invest in commercial real estate. For instance, Hong Kong does not have any REIT until very recently.[8] Thus, for the individual investors who hold an "optimistic" view, they can only invest in housing market or to subscribe IPO in the stock market. Notice that as the housing units in Hong Kong are mainly owned by individual households, which is similar to the case in the United States, households may play a more important role than institutional investors and developers. And since households would arguably be more vulnerable to "market sentiment" and "social interactions", the "market sentiment channel" may appear more significantly in the housing market than in the commercial real estate market. In fact, Wang et al (2000), Leung et al (2013) have proposed that "over-confidence" on the household side may explain a significant portion of the housing market dynamics in Hong Kong. This paper can be understood as an indirect test of that class of "conjecture". If the "market sentiment" is indeed the driving force, we would observe a positive and significant relationship between the IPO and the housing market, but not necessarily the commercial real estate markets. For the future reference, we label this possible channel as "the animal spirits conjecture", or "speculation conjecture".

Another merit for choosing Hong Kong to "test" the animal spirits conjecture relates to the government policy. Companies from all over the world are welcomed to list their stocks in Hong Kong, with neither discrimination nor favouritism. Thus, the IPOs listed in Hong Kong include those from Hong Kong domestic firms, Mainland China firms, as well as foreign firms. And since the major operations and income sources of the Mainland and foreign firms are outside Hong Kong, a comparison of the cases of domestic firms, Chinese firms and foreign firms would shed further light on the validity of the "animal spirits conjecture". We will get back to this point later.

Can the IPO activities be related to the real estate markets for *other reasons*? One possibility is that the funds generated from IPO are used for the business growth, which would lead to a significant amount of trading in the commercial real estate market. Brau, Ryan and DeGraw (2006) suggest that 82% of the CFO responded that the issuance of IPO is to gain additional financing for immediate and long-term growth. On the other hand,

[8] REIT is introduced to Hong Kong in 2005, and hence for most of the sampling period, it is not an option for the investors. Even now, the share of commercial real estate owned by REIT is very small in Hong Kong. The sizes of REIT are generally very small in Hong Kong. For more details, see the appendix 3, Leung and Tang (2012), among others.

Pagano, Panetta and Zingales (1998) find that the primary reason for going public is to rebalance their accounts. Needless to say, the funds allocation strategies may vary from firm to firm, and from country to country. One of our conjectures is that when firms obtain fund through IPO, they will invest in commercial real estate, among other things.[9] And thus when the number or the real value of IPO increases, more funds will be channeled to the commercial real estate market. As a result, the commercial real estate price would also increase. We label this as our "production conjecture."

Alternatively, the IPO activities may also be a signal of the conditions of overall economy. It may be that there are variables that are "seen by agents but not the econometrician" (Hamilton and Whiteman, 1985). In other words, some important variables are left out from the system and the regression model is essentially mis-specified. Recent research also indicates the importance of "news shock" (shocks that will affect the future but not the current period productivity) in accounting for the aggregate business cycles (for instance, see Beaudry and Portier, 2006, 2007; Jaimovich and Rebelo, 2007). Thus, when those "good signals" appear, the economy is expected to improve. More companies will issue IPO to raise capital from the market.[10] At the same time, there will be more business expansion, including more investment in the commercial real estate markets. As a result, both IPO issues and commercial real estate prices will increase. In fact, the same underlying factor that can drive both the IPO activities and commercial real estate market could potentially drive the housing market as well. For instance, Kan et al (2004), Leung (2007) show in a dynamic equilibrium model that a productivity shock can lead to an increase in output, an increase in the stock price, as well as in prices of both commercial and residential real estates, and find support from U.S. city level data. Thus, we could observe co-movements among all real estate markets and the stock market activities (including IPO) driven by some "omitted variable." For the future reference, we will label this class of explanation as our "underlying factor conjecture."

[9] Notice that even foreign and Mainland China firms have investment in the Hong Kong real estate market. For firm-level evidence of commercial real estate investment of Chinese firms, see Dong et al (2012), among others.

[10] At the micro-level, there are many studies which suggest the signaling effect of IPO issuance activities. Among others, Chen, Jhou and Yeh (2007) suggest that the IPO underwriter retention rate can serve as a signal of the firm value to investors, which can reduce the information asymmetry between issuers and investors. Allen and Faulhaber (1989) proved that under-pricing of IPO is a credible signal to investors, because only good firms can recoup the loss after their performances are realized. In the aggregate, therefore, if the number of IPO issuance increases, it may means that there are many good firms raising capital from the market and the aggregate output is expected to be high.

It may be instructive to summarize the discussion up to this point. The "animal spirits conjecture" and "underlying factor conjecture" would predict the relationship between housing market and IPO, while "production conjecture" and "underlying factor conjecture" is used to determine the relationship between commercial real estate market and IPO. Since all these theories on the relationship between the IPO activities and the real estate market are logically plausible, it demands an empirical investigation to verify which is quantitatively more significant. Putting it in another way, the degrees of co-movement among the IPO activities, the commercial real estate, and the residential housing provides an indirect test (or confirmation) for alternative conjectures. Clearly, if all these conjectures fail, then we will not find any relationship between the IPO activities and the real estate markets. And it seems to be the "priors" of many economists, as reflected in many seminars and conferences when this paper was presented. On the other hand, any statistically significant relationship identified between the IPO activities and real estate markets would constitute a "new stylized fact" to be explained. Table 1 summarizes the discussion.

(Insert Table 1)

The organization of this paper is presented as follows. The next section will briefly discuss the data construction. The methodology applied in this research will then be described. The following section presents the empirical results, and its economic interpretation. The appendix will follow a concluding section.

2 Data

The study collects the time series of stock market indices, housing prices and macro-economy indicators from the government websites and CEIC, which covers the period from January 1994 to December 2011 [Table 2]. We proceed with several steps. First, all nominal variables have to be deflated by consumer price index[11], so that the real variables are used throughout the analysis. Second, we check the stationarity of the series. It is instructive to take a look of the time plots of each variable, and then confirm the ordering by Augmented Dickey Fuller (ADF) test[12]. Third, we will perform some statistical test, which will be explained in the next section.

[11] In Hong Kong, the government produces several consumer price indices. CPI (A) represents the consumption bundle of the most of the population. In case of the best lending rate, the real rate is equal to the nominal rate minus the inflation rate.
[12] Details are available upon request.

(Insert Table 2)

Let's briefly explain the movements of each variable. Clearly, as shown in figures 2 and 3, the number and real value of IPO do not exhibit any trend for the sampling period. Particularly, there are three peaks to be noticed. The first one is the "asset bubble period" in 1997 (for instance, see Barton, 2007), where the adverse selection problem may be serious in the market; the second one is the recovery of Severe Acute Respiratory Syndrome (SARS)[13] in 2004, where the firms' profits were (temporarily) suppressed by the SARS disease and they chose to raise funds from the stock market, hoping that it would catch the attention of long-term investors; and the last one is the recovery from the collapse of Lehamn Brothers in 2009. When we further dis-aggregate the data, it is found that IPO activity was mainly originated from the Chinese firms (figures 4 and 5), at which they treat Hong Kong financial market as a platform to promote its brand name to international investors.

(Insert Figures 2 to 5)

As in the case of many other economies, stocks and real estates are the two most common investment vehicles in Hong Kong. In early 1990s, Asian countries including Hong Kong experienced rapid economic growth. The speculations in stock market and real estate market raised the prices to a peak and created an asset bubble (among others, see Barton 2007). During the Asian financial crisis, there was a significant withdrawal of international funds, which induced a "fire sale" and consequently a collapse of asset prices (Chen and Leung, 2008; Leung and Tang, 2012). After the SARS infection in 2003, the Beijing government allowed the people from Mainland China to visit and invest in Hong Kong through "individual travel" scheme. Since then the real estate prices "regained the momentum'', so to speak, and they started to catch up with the stock price. On the other hand, the discrepancy between the Hang Seng Index and the Hang Seng China Enterprise Index may reflect the relative economic development of Hong Kong and China. As shown by the Figure 6, the former used to stay above the latter. However, in 2003, because of the rapid development in China, Chinese stocks became an attractive investment to investors, and HSCEI rose sharply. This results to a narrowing of dispersion of the two curves in 2006

[13] The virus appears to have originated from Guangdong, China in November 2002. Totally, 1755 people in Hong Kong were suffering from this virus. 299 citizens were died from this virus, representing 17% death rate, which is the highest proportion over the world.

[Table 6]. We test their correlations and find that de-trend financial market and de-trend real estate market variables are little correlated with each other. Instead, strong correlations exist among de-trend HSI and de-trend HSCEI, as well as de-trend OP with de-trend HP[14] and de-trend RP, both representing 1% statistical significance in the whole sampling [Table 3].

(Insert Figure 6, Table 3)

On top of the stock market price, its real trading volume (TV) is also used as the recent research suggests it contains important information that is not revealed by prices.[15] As shown in Figure 7, TV has two peaks over the past 14 years. In 1997, a "bubble" was created in the hi-tech stocks, which pushed TV to near 6 billion. In 2006, the increased participation in the primary and secondary market raises the TV to 10 billion.

(Insert Figure 7)

The best lending rate (BLR) is the rate of interest that banks lent to their favored customers. Since Hong Kong is dominated by the adjustable rate mortgage, a reduction in BLR encourages more investment in the housing market. Figure 8 plots the movement of HSBC[16] best lending rate, which is very representative for the Hong Kong economy. It ranges between -5% to more than 13% during the sampling period (a *negative* real interest rate means that the nominal interest rate is below the inflation rate).

(Insert Figure 8)

3 Empirical Results

3.1. Vector Auto-Regressive analysis

[14] Some of the figures are calculated from less than 20 transactions in a certain month. Hence, it is sensitive to some particular transactions. For example, the sudden drop in the real office prices in 2006 is mainly due to unexpectedly high prices in November and December 2005.

[15] Clearly, the literature on the importance of trading volume is too large to be discussed here. Among others, see Lo and Wang (2000), Leung and Feng (2005) for a review of the literature.

In many previous studies of IPO, it focuses on individual stock IPO and hence takes the market as given. Our study, on the other hand, allows the interactions between the stock market and the real estate market to be happened. An appropriate tool to study such interactions is VAR because it *does not presume any "exogenous" variable*. We first apply the VAR model on our monthly data series in order to maximize the number of data points. Table 4 describes in detail the variables included in each of the VAR models and its optimal lags[17]. Notice that all models include the trading value of stock market, the stock market index (Hang Seng Index) and the interest rate (all in real terms). Clearly, the inclusion of these variables provides control for the economic fundamentals. These variables perhaps reflect some of the "market sentiments" as well.

(Insert Table 4)

On top of them, Model 1 includes *real office price* (as a proxy for the commercial real estate) as well. When we introduce the IPO activities (number and real value of IPO) in Model 1, we obtain Models 2 and 3. Hence, by comparing Model 1 vis-à-vis Model 2 and 3, we can highlight the importance of IPO activities. Next, we produce Models 6 to 8 by replacing the real office prices in Models 1 to 3 with the prices of real retail property, or shortly, *real retail prices*. Similar method is applied to r*eal housing prices* in Models 9 to 11. Implicit in these formulations is the notion that the behavior of different real estate prices can differ. We will verify this conjecture in the empirical analysis in the later part. Finally, in models 4 and 5, we only include the variables for economic fundamentals and IPO activity, and exclude the real estate prices. Therefore, by comparing Model 4 vis-à-vis Models 2, 7 and 10, it is possible to highlight the importance of real estate prices.[18]

We begin by examining the case of commercial real estate prices. Recall that statistically speaking, the better is the model, the smaller would AIC be. Table 5 Panel A shows that introducing IPO as an additional variable in the models does *not* improve the prediction of office prices. In addition, Panel B tells that the model *without the IPO variables* gives the *best* prediction of retail property prices. In other words, no empirical support is found for the "production conjecture."

[17] We run from lag 1 to 6 for all VAR models, and the model with smallest Akaike Information Criteria (AIC) gives the best fitting.

[18] By the same token, the importance of real estate prices can be highlighted by comparing Model 5 vis-à-vis Model 3, 8 and 11.

On the other hand, Panel C of table 5 shows that introducing IPO activities will improve the prediction of the housing price. This is consistent with the "animal spirits conjecture" or "underlying factor conjecture". With the increase in the amount of funds raised from IPO, it reflects either an improvement of the economic environment or the market sentiment, and this motivates investors to participate in the housing market.

Now we turn to the prediction on IPO. Two interesting points are highlighted in the Panels D and E of the Table 5. First, adding housing price could reduce AIC significantly, which is consistent with the "animal spirits conjecture" or "underlying factor conjecture". Second, adding office price does not show an improvement of the prediction, which is in contrast to the "production conjecture".

(Insert Table 5)

In sum, the results show that at least marginally, housing price always plays a more important role than the commercial real estate prices in predicting IPO. It is somewhat surprising because capital raised from IPO will typically remain with those large corporations. Typically, they do not re-invested in the Hong Kong housing market which is dominated by a large number of individual occupiers-investors. In other words, we do not find any evidence for the "production conjecture". However, the evidence can be consistent with the "animal spirits conjecture" or "underlying factor conjecture". To further differentiate the two conjectures, we now turn to a more dis-aggregate analysis.

3.2. Granger Causality Analysis

In the previous section, we apply the VAR model on the aggregate IPO data and find that IPO does help to predict the housing price, and vice versa, while commercial real estate price does not seem to have much interaction with the IPO market (neither the number nor the real value). To improve our understanding, we would now dis-aggregate the IPO data by the company origin and employ the Granger Causality test for the analysis.[19] Since the test for some variables are very sensitive to the selected number of lags, we choose the lags from 1 to 6 for the monthly data set. The majority rule would decide whether X Granger causes Y. For robustness, we also apply AIC criteria to choose the optimal lag, and base on this lag to decide the causality relationship of the variables.

[19] See Hamilton (1994) for more details.

Let's first focus on housing market. As summarized in Table 6, based on AIC criteria, Chinese IPO (in terms of number or real value) and housing market *does Granger cause each other*. There is *no consistent pattern* between the other IPOs and the housing market. It is very interesting because the activities of Chinese firms are *mainly operated in Mainland China*. Intuition might suggest that the IPO of Chinese firms should *not* exert any direct effect on the Hong Kong housing market, but in fact, they do. Previously, we have also shown that IPO constitutes a tiny component of the total market capitalization and hence the "wealth effect" is unlikely to be the explanation. This apparently "puzzling" phenomenon can however be consistent with the "animal spirits conjecture". IPO of Chinese firms may signal a continuation or even further improvement of the Chinese economy. Since some of the economic growth would "spillover" to the Hong Kong economy, the housing demand is expected to increase. Alternatively, the IPO of Chinese firms may reflect an improvement of the "market sentiment" and hence stimulate the investment in the housing market and hence the real housing price. With such anticipation, people would buy the housing today speculatively, as an attempt to capture the benefit of the expected economic growth of China. And the additional fact that the IPO of Hong Kong firms do *not* granger cause or caused by the Hong Kong housing market seems to provide a challenge for the "production conjecture" to be valid in this sample.

Needless to say, there is always an alternative explanation. In the current context, it is the "underlying factor conjecture". In that case, the IPO of Chinese companies serves as a leading indicator of the economic boom in the subsequent periods, which will also lead to an increase in the housing price. To further differentiate these two competing hypotheses, we would examine the interactions between the office price and the IPO market.

(Insert Table 6)

Table 7 reveals a striking pattern that the Hong Kong and Chinese IPO (whether measured in terms of number or real value) does *not* Granger cause office and retail property prices. This is clearly at odd with the "production conjecture" because at least some funds that are raised by Hong Kong companies IPO should be invested in Hong Kong, including the commercial real estate. In addition, it presents a challenge to the "underlying factor conjecture" because it is not clear why the "unobservable underlying factor" stimulates *only the housing market but not the office and retail property markets.*

One may argue that the lack of evidence of interactions between the IPO activities and the commercial real estate market is related to the company financing method. It may be that companies prefer using internal financing to external financing for expansion (Gaud, Hoesli and Bender, 2007), and if they choose external one, bank financing is always preferable to listing of stocks (Jebjerg and Kyhl, 1999). While this may be true, it makes the relationship between the IPO and the housing market even *more puzzling*, because *individual households do not finance their home purchase with IPO neither*.

(Insert Table 7)

3.3. Out of Sample Forecasting

Thus far, we have used VAR (Vector Auto-Regressive models) and Granger Causality analysis to evaluate competing theories. In a sense, these are all "in-sample-fitting." In the literature, there are discussions about whether one should use in-sample-fitting (ISF) or out-of-sample-forecasting (OSF) as a criterion to evaluate models, including Cheung, Chinn and Pascual (2005), Inoue and Kilian (2004), Meese and Rogoff (1983), among others. It seems that there is no consensus on the issue. In this section, we will provide some simple OSF as an alternative assessment for competing theories.

To perform OSF, our first step is to re-estimate all of our VAR models for the sample 1994M1 to 2006M12. We find that the point estimates are similar to the full sample version, except that the "optimal numbers of lags" may change in some models.[20] We then take those VAR models to predict the values of different variables during the period 2007M1 to 2011M12, and then confront with the data. Following the literature, we use two metrics to measure the performance of the models. They are the Mean Absolute Error (MAE) and Root Mean Square Error (RMSE):

$$MAE = (T-h)^{-1}\sum_{i=1}^{T-h}|y_i - \hat{y}_i|; RMSE = \left[(T-h)^{-1}\sum_{i=1}^{T-h}(y_i - \hat{y}_i)^2\right]^{1/2},$$

where T is the sample size, h is the forecast horizon (i.e. how many periods ahead we need to predict, y_i is the true value, and $\hat{y}_i = E(y_{i+h} \mid \Omega_i)$ is the h-period ahead forecast given the period i information set, Ω_i. Clearly, the RMSE tends to "punish big mistakes more heavily"

[20] Details will be available upon request.

than the MAE. Apparently, there is no consensus of which measure is better, so we use both measures in our evaluation.

Table 8 displays the OSF results of different models. As usual, our first column (counting from the left to right) always represents the model with only the basic set of variables. Panels A and B show that adding IPO does not improve the forecast of office price and retail price respectively. However, as shown in Panel C, adding IPO does improve the forecast of housing price. To some extent, these results are consistent with our earlier findings that "animal spirit conjecture" holds while the other two conjectures fail.

(Insert Table 8)

More encouraging results can be found in Panels D and E. Relative to the "basic model," adding retail property price helps to predict IPO activities. It is consistent with the conjecture that an increase in China economic growth would encourage more firms to launch IPO in Hong Kong stock market and at the same time stimulates the demand of retail property, probably through investors and tourists. At the same time, since there is no channel for individuals to invest in the Hong Kong office market, office price is not affected by number of IPO.

3.4 Robustness check

In this section, we are going to confirm our main findings by doing sub-period analysis. Since Hong Kong was attacked by Asian Financial Crisis in 1997, the market fundamentals may change thereafter[21], and this motivates us to check whether the same results hold for the two sub-samples. Specifically, throughout the robustness check, we divide the sample into two sub-periods: the first sub-period is from Jan 1994 to Dec 1999 and the second sub-period is from Jan 2000 to Dec 2011.

Table 9 present the results of the VAR analysis, which are revealing. In the first sub-sample, it is shown that the prediction of office price is significantly improved with the introduction of IPO [Panel A1, Table 9]. In addition, the prediction of the house price is the best without any IPO variable [Panel C1, Table 9]. At the same time, the prediction of the number of IPO is significantly improved with the inclusion of the house price [Panel D1,

[21] Refer to Leung and Tang (2011) for details.

Table 9]. Thus, it seems that there is some evidence for each of the conjectures. In the second (i.e. Jan. 2000 and after), the picture is very different. Introducing the IPO variables do not significantly improve the prediction of office price and retail property price [Panel A2, B2, Table 9]. On the other hand, IPO variables help to improve the prediction of house price [Panel C2, Table 9]. In addition, the inclusion of the office price or retail property price would actually worsen the prediction of the number of IPO, whereas the inclusion of house price can improve it [Panel D2, Table 9]. The inclusion of house price also leads to the greatest improvement in the prediction of the real value of IPO, among all different property prices [Panel E2, Table 9]. Clearly, the second sub-period provides very clear support of the "animal-spirit conjecture" only. Thus, our findings are consistent with the observation that China enjoys significant economic growth since 2000, and therefore the more active China's IPO, the more confident of the investors.

(Insert Table 9)

In the robustness check on the relationship between dis-aggregate level of IPO and real estate markets, it reveals that Chinese IPO and housing market granger cause each other in second sub-sample, which provides further supporting evidence of "animal spirits conjecture" [Table 10]. In addition, the possibilities of "production conjecture" and "underlying factor conjecture" can be eliminated because the IPO activity and commercial real estate market do not granger cause each other [Table 11].

(Insert Tables 10 and 11)

4 Conclusions

The IPO activities and the real estate prices could be related through the "production conjecture", the "underlying factor conjecture", or the "animal spirits conjecture" (or "speculation conjecture"). In this paper, we attempt to determine which conjecture is more consistent with the data. We employ different econometric tools in our investigation.

The results from VAR models on aggregate basis show that the prediction of the housing market can be improved by the introduction of IPO variables, and vice versa, validating the "animal spirits conjecture." On the other hand, the prediction of office and retail market cannot be improved by adding IPO variables, and vice versa, which seems to be at odd with both "production conjecture" and "underlying factor conjecture."

Granger causality test is then applied on more dis-aggregate IPO data. Consistent results are found. Commercial real estate market and IPO market do *not* granger cause each other. In addition, even IPO by Hong Kong firms do *not* Granger cause or caused by the Hong Kong housing market. These results seem to be at odd with the "production conjecture" and "underlying factor conjecture." On the other hand, the "animal spirits conjecture" is confirmed by the causality relationship between housing market and IPO of Chinese firms.

The analysis is extended to the out-of-sample forecasting. Particularly, the introduction of IPO activity does not improve the forecasting of commercial real estate prices, while it reduces the forecasting error of housing prices, and thus providing strong evidence to support our findings.

Finally, we perform robustness check by dividing the data into two subsamples. Interestingly, while there is evidence consistent with each of the conjectures in the first sub-period, the second sub-period, which spans from Jan 2000 to Dec 2011 where China experiences substantial economic growth, provides support *only* to the "animal spirits conjecture."

The robustness check also confirms that our "animal spirits conjecture" is consistent with the observation that an improvement of the Chinese economy will lead to more tourism activities in Hong Kong and hence stimulate the retail property price. In fact, the United Nations' World Tourism Organization recently reports that the number of international trips made by Chinese travellers grew from 10 million in 2000 to 83 million in 2012. And the spending by Chinese tourists in 2012 is $102 billion.[22] If the Chinese economy and related tourism continues to expand, the findings of this paper may also be relevant to other countries. Future research should investigate the impact of Chinese tourists and investors on the real estate markets.

Future research can be extended in other directions as well. First, this and other studies have confirmed the importance of the "animal spirits" or the "market sentiment" in both the financial market and real estate market. More effort should be devoted to further investigate the mechanism behind such sentiment. Secondly, many research efforts suggest including

[22] For more details, see UPI (2013).

real estate to achieve diversification benefits.[23] In light of the results here, it would be interesting to investigate what the optimal portfolio as well as the optimal trading rules would be. Thirdly, there is an increasing attention towards Chinese economies. More efforts are needed to study the investors' preferences in investing in China. Last but not the least, more research efforts should be devoted to investigate if there are other segments of the stock market interact with the real estate market, and if so, what the mechanisms are.

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[23] The literature is too large to be reviewed here. Among others, see Chun, Sa-Aadu and Shilling (2004).

Table 1 Summaries of the implication of different conjectures

	Housing ⟷ IPO	Commercial Real Estate ⟷ IPO
Animal Spirits conjecture	✓	**X**
Production conjecture	**X**	✓
Underlying Factor conjecture	✓	✓

Table 2 Data Description and Summary Statistics

Sampling Period: 1994M1 – 2011M12

	Symbol	Mean	SD	Max	Min	Order	Source
Number of Initial Public Offerings	NO_IPO	4.13	3.38	18.00	0.00	I(0)	Hong Kong Exchange and Clearing Limited (http://www.hkex.com.hk)
Real Dollar Value of Initial Public Offerings (HKD mn)	RD_IPO	21.50	35.66	234.81	0.00	I(0)	
Real Trading Value in Stock Market (HKD mn)	TV	5428.16	5819.27	32958.69	405.18	I(1)	
Real Hang Seng Index	HSI	139.54	44.10	297.46	63.82	I(1)	
Real Office Price Index	OP	1.48	0.61	2.79	0.57	I(1)	Rating and Valuation Department (www.rvd.gov.hk)
Real Retail Price Index	RP	1.43	0.53	3.02	0.79	I(1)	
Real Housing Price Index	HP	1.03	0.26	1.63	0.60	I(1)	
Real Best Lending Rate	BLR	5.04%	4.01%	13.68%	-5.12%	I(1)	Hong Kong Monetary Authority (www.info.gov.hk/hkma)
China Real GDP (seasonal adjusted)	CGDP	42926.89	29247.46	117888.3	8632.49	I(1)	CEIC
Real Retail Sales Value (CNY mn, seasonal adjusted)	RRSV	180.60	39.34	304.71	124.94	I(1)	
Number of Visitors from China (seasonal adjusted)	VFC	822432.8	651224.2	2526836	102996	I(1)	
Number of Visitors from Foreign (seasonal adjusted)	VFF	841960.1	188803.9	1176794	128599	I(1)	

Table 3 Correlations between Real Estate Markets and Stock Market

	DOP	DRP	DHP	DHSI	DHSCEI
DOP	1				
DRP	0.34***	1			
DHP	0.56***	0.47***	1		
DHSI	0.06	0.08	0.05	1	
DHSCEI	-0.04	0.05	-0.01	0.77***	1

*** denotes 1% statistical significance

Table 4 Summary of the variables used in VAR

Models	Model #1	Model #2	Model #3	Model #4	Model #5	Model #6	Model #7	Model #8	Model #9	Model #10	Model #11
OP	✓	✓	✓								
RP						✓	✓	✓			
HP									✓	✓	✓
TV	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HSI	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BLR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NO_IPO		✓		✓			✓			✓	
RD_IPO			✓		✓			✓			✓
Optimal lag	5	4	4	4	4	4	4	4	4	4	3

Table 5 AIC of monthly VAR Models

Sampling period: 1994M1 to 2011M12

Panel A:

	Prediction of OP without IPO (Model #1)	Prediction of OP with NO_IPO (Model #2)	Prediction of OP with RD_IPO (Model #3)
AIC	**-2.5819**	-2.4781	-2.5028

Panel B:

	Prediction of RP without IPO (Model #6)	Prediction of RP with NO_IPO (Model #7)	Prediction of RP with RD_IPO (Model #8)
AIC	**-2.9579**	-2.9460	-2.9561

Panel C:

	Prediction of HP without IPO (Model #9)	Prediction of HP with NO_IPO (Model #10)	Prediction of HP with RD_IPO (Model #11)
AIC	-4.2193	**-4.2428**	**-4.2687**

Panel D:

	Prediction of NO_IPO without OP, RP & HP (Model #4)	Prediction of NO_IPO with OP (Model #2)	Prediction of NO_IPO with RP (Model #7)	Prediction of NO_IPO with HP (Model #10)
AIC	5.2439	5.2403	**5.1995**	**5.1984**

Panel E:

	Prediction of RD_IPO without OP, RP & HP (Model #5)	Prediction of RD_IPO with OP (Model #3)	Prediction of RD_IPO with RP (Model #8)	Prediction of RD_IPO with HP (Model #11)
AIC	37.4645	37.4697	37.4437	**37.3926**

* Details of the VAR results will be available upon request.

Table 6 Granger Causality Test in housing market

Sampling period: 1994M1 to 2011M12

Panel A:

Number of IPO of the corresponding companies	Using majority rule		Using AIC criteria	
	Granger causes housing price	Granger caused by housing price	Helps to predict housing price	Helps to be predicted by housing price
1. Hong Kong company	X	X	X	X
2. China company	✓	✓	✓	✓
3. Foreign company	X	✓	X	X

Panel B:

Real IPO value of the corresponding companies	Using majority rule		Using AIC criteria	
	Granger causes housing price	Granger caused by housing price	Helps to predict housing price	Helps to be predicted by housing price
1. Hong Kong company	X	X	X	X
2. China company	✓	✓	✓	✓
3. Foreign company	X	X	X	✓

* Details of the results are available upon request.

Table 7 Granger Causality Test in commercial real estate market

Sampling period: 1994M1 to 2011M12

Panel A:

Number of IPO of the corresponding companies	Using majority rule		Using AIC criteria	
	Granger causes office / retail property price #	Granger caused by office / retail property price ^	Helps to predict office / retail property price #	Helps to be predicted by office / retail property price ^
1. Hong Kong company	X / X	X / X	X / X	X / X
2. China company	X / X	✓ / ✓	X / X	✓ / ✓
3. Foreign company	X / ✓	X / X	✓ / X	X / X

Panel B:

Real IPO value of the corresponding companies	Using majority rule		Using AIC criteria	
	Granger causes office / retail property price #	Granger caused by office / retail property price ^	Helps to predict office / retail property price #	Helps to be predicted by office / retail property price ^
1. Hong Kong company	X / X	X / X	X / X	X / X
2. China company	X / X	✓ / ✓	X / X	✓ / ✓
3. Foreign company	X / X	X / X	X / X	X / X

In each cell of this column, the first entry represents whether IPO variable granger causes offices, while the second entry represents whether IPO variable granger causes retail property.

^ In each cell of this column, the first entry represents whether IPO variable is granger caused by offices, while the second entry represents whether IPO variable is granger caused by retail property.

** Details of the results are available upon request.

Table 8 Out-of-Sample Forecasting Results

(In-sample period: 1994M1 – 2006M12; out-of-sample period: 2007M1 – 2011M12)

Panel A: Out-of-Sample Forecasting of Office Price

	Model 1	Model 2	Model 3
Mean absolute error	**0.0629**	0.0688	0.0694
Root mean square error	**0.0792**	0.0868	0.0875

Panel B: Out-of-Sample Forecasting of Retail Property Price

	Model 6	Model 7	Model 8
Mean absolute error	**0.0524**	0.0528	0.0532
Root mean square error	**0.0691**	0.0694	0.0700

Panel C: Out-of-Sample Forecasting of Housing Price

	Model 9	Model 10	Model 11
Mean absolute error	0.0389	**0.0383**	**0.0363**
Root mean square error	0.0469	**0.0459**	**0.0429**

Panel D: Out-of-Sample Forecasting of Number of IPO

	Model 4	Model 2	Model 7	Model 10
Mean absolute error	3.6946	3.7356	**3.5284**	3.7029
Root mean square error	4.7706	4.9773	**4.6309**	4.9642

Panel E: Out-of-Sample Forecasting of Real Value of IPO

	Model 5	Model 3	Model 8	Model 11
Mean absolute error	3.33E+07	**3.11E+07**	**3.30E+07**	**3.02E+07**
Root mean square error	5.32E+07	**5.09E+07**	**5.31E+07**	**5.04E+07**

Table 9 Robustness check: AIC of monthly VAR Models in two sub-sample periods

Sub-sample 1: 1994M1 – 1999M12

Panel A1:

	Prediction of OP without IPO (Model #1)	Prediction of OP with NO_IPO (Model #2)	Prediction of OP with RD_IPO (Model #3)
AIC	-1.5685	**-1.7165**	-1.5401

Panel B1:

	Prediction of RP without IPO (Model #6)	Prediction of RP with NO_IPO (Model #7)	Prediction of RP with RD_IPO (Model #8)
AIC	-2.3511	-2.3226	-2.3250

Panel C1:

	Prediction of HP without IPO (Model #9)	Prediction of HP with NO_IPO (Model #10)	Prediction of HP with RD_IPO (Model #11)
AIC	**-3.6474**	-3.2924	-3.4594

Panel D1:

	Prediction of NO_IPO without OP, RP & HP (Model #4)	Prediction of NO_IPO with OP (Model #2)	Prediction of NO_IPO with RP (Model #7)	Prediction of NO_IPO with HP (Model #10)
AIC	4.8372	4.8285	4.8680	**4.6340**

Panel E1:

	Prediction of RD_IPO without OP, RP & HP (Model #5)	Prediction of RD_IPO with OP (Model #3)	Prediction of RD_IPO with RP (Model #8)	Prediction of RD_IPO with HP (Model #11)
AIC	36.3205	36.3442	36.2974	36.3393

Sub-sample 2: 2000M1 – 2011M12

Panel A2:

	Prediction of OP without IPO (Model #1)	Prediction of OP with NO_IPO (Model #2)	Prediction of OP with RD_IPO (Model #3)
AIC	-3.2378	-3.1975	-3.2434

Panel B2:

	Prediction of RP without IPO (Model #6)	Prediction of RP with NO_IPO (Model #7)	Prediction of RP with RD_IPO (Model #8)
AIC	-3.3439	-3.3492	-3.2815

Panel C2:

	Prediction of HP without IPO (Model #9)	Prediction of HP with NO_IPO (Model #10)	Prediction of HP with RD_IPO (Model #11)
AIC	-4.7437	**-4.8026**	**-4.7538**

Panel D2:

	Prediction of NO_IPO without OP, RP & HP (Model #4)	Prediction of NO_IPO with OP (Model #2)	Prediction of NO_IPO with RP (Model #7)	Prediction of NO_IPO with HP (Model #10)
AIC	5.3293	5.3537	5.3447	**5.3210**

Panel E2:

	Prediction of RD_IPO without OP, RP & HP (Model #5)	Prediction of RD_IPO with OP (Model #3)	Prediction of RD_IPO with RP (Model #8)	Prediction of RD_IPO with HP (Model #11)
AIC	37.7537	37.6956	37.6863	**37.5925**

* Details of the VAR results will be available upon request.

Table 10 Robustness check: Granger Causality Test in housing market in two sub-samples

Sub-sample 1: 1994M1 – 1999M12

Panel A1:

Number of IPO of the corresponding companies	Using majority rule		Using AIC criteria	
	Granger causes housing price	Granger caused by housing price	Helps to predict housing price	Helps to be predicted by housing price
1. Hong Kong company	X	X	X	X
2. China company	X	✓	X	X
3. Foreign company	X	✓	X	✓

Panel B1:

Real IPO value of the corresponding companies	Using majority rule		Using AIC criteria	
	Granger causes housing price	Granger caused by housing price	Helps to predict housing price	Helps to be predicted by housing price
1. Hong Kong company	X	X	X	X
2. China company	✓	✓	✓	X
3. Foreign company	X	X	X	X

Sub-sample 2: 2000M1 – 2011M12

Panel A2:

Number of IPO of the corresponding companies	Using majority rule		Using AIC criteria	
	Granger causes housing price	Granger caused by housing price	Helps to predict housing price	Helps to be predicted by housing price
1. Hong Kong company	X	X	X	X
2. China company	✓	✓	✓	✓
3. Foreign company	✓	X	✓	X

Panel B2:

Real IPO value of the corresponding companies	Using majority rule		Using AIC criteria	
	Granger causes housing price	Granger caused by housing price	Helps to predict housing price	Helps to be predicted by housing price
1. Hong Kong company	X	X	X	X
2. China company	✓	✓	✓	✓
3. Foreign company	X	✓	✓	✓

* Details of the results are available upon request.

Table 11 Robustness check: Granger Causality Test in commercial real estate market in two sub-samples

Sub-sample 1: 1994M1 – 1999M12

Panel A1:

Number of IPO of the corresponding companies	Using majority rule		Using AIC criteria	
	Granger causes office / retail property price #	Granger caused by office / retail property price ^	Helps to predict office / retail property price #	Helps to be predicted by office / retail property price ^
1. Hong Kong company	X / X	X / X	X / X	X / X
2. China company	✓ / X	X / ✓	✓ / X	X / ✓
3. Foreign company	X / X	X / X	X / X	X / X

Panel B1:

Real IPO value of the corresponding companies	Using majority rule		Using AIC criteria	
	Granger causes office / retail property price #	Granger caused by office / retail property price ^	Helps to predict office / retail property price #	Helps to be predicted by office / retail property price ^
1. Hong Kong company	X / X	X / X	X / X	X / X
2. China company	✓ / ✓	X / ✓	✓ / ✓	X / ✓
3. Foreign company	X / X	X / X	✓ / X	X / X

Sub-sample 2: 2000M1 – 2011M12

Panel A2:

Number of IPO of the corresponding companies	Using majority rule		Using AIC criteria	
	Granger causes office / retail property price #	Granger caused by office / retail property price ^	Helps to predict office / retail property price #	Helps to be predicted by office / retail property price ^
1. Hong Kong company	X / X	X / X	X / X	X / X
2. China company	✓ / X	✓ / ✓	X / ✓	✓ / ✓
3. Foreign company	X / ✓	X / X	X / ✓	X / X

Panel B2:

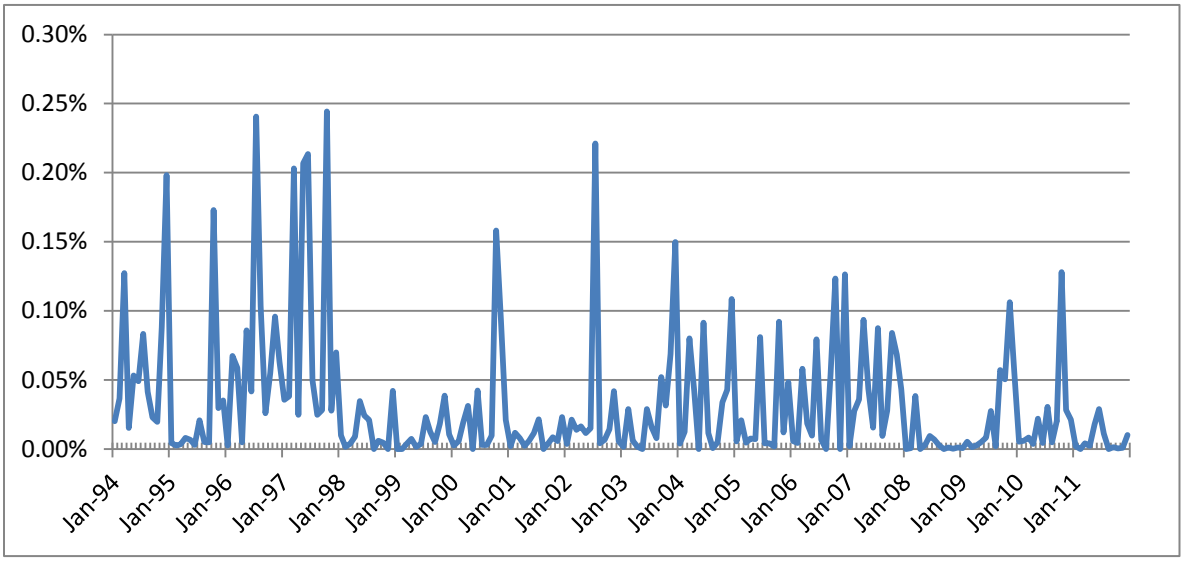
Real IPO value of the corresponding companies	Using majority rule		Using AIC criteria	
	Granger causes office / retail property price #	Granger caused by office / retail property price ^	Helps to predict office / retail property price #	Helps to be predicted by office / retail property price ^
1. Hong Kong company	X / X	X / X	X / X	X / X
2. China company	X / X	✓ / ✓	X / X	✓ / ✓
3. Foreign company	X / X	X / X	X / X	X / X

In each cell of this column, the first entry represents whether IPO variable granger causes offices, while the second entry represents whether IPO variable granger causes retail property.

^ In each cell of this column, the first entry represents whether IPO variable is granger caused by offices, while the second entry represents whether IPO variable is granger caused by retail property.

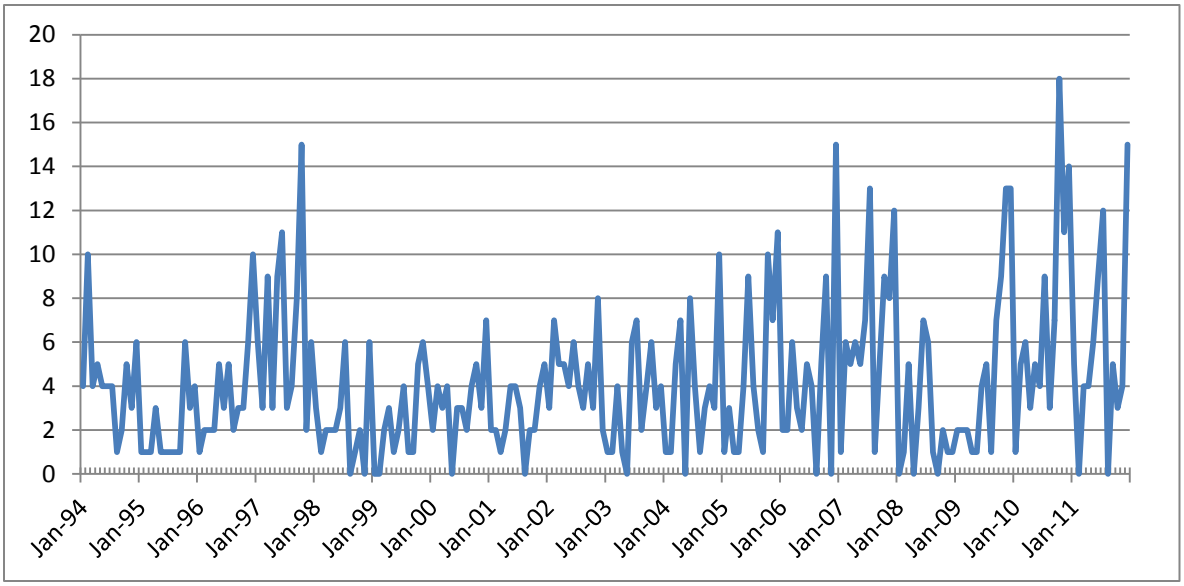
** Details of the results are available upon request.

Figure 1 Ratio of the value IPO to the total market capitalization against time



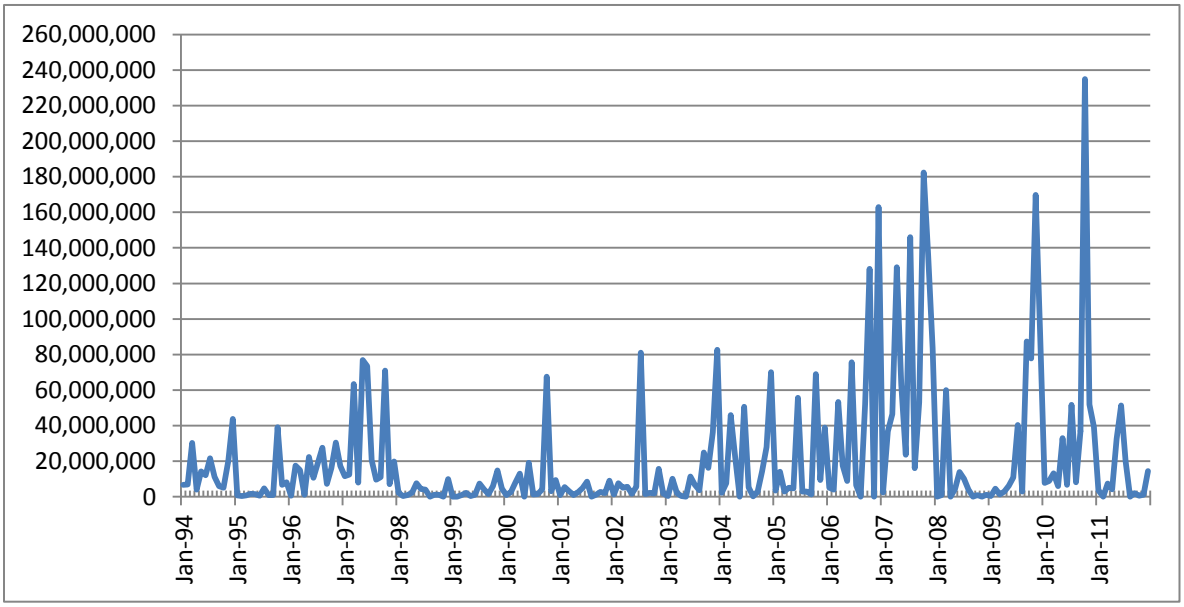
Source: Hong Kong Exchanges and Clearing Limited (www.hkex.com.hk)

Figure 2 Number of IPO against time



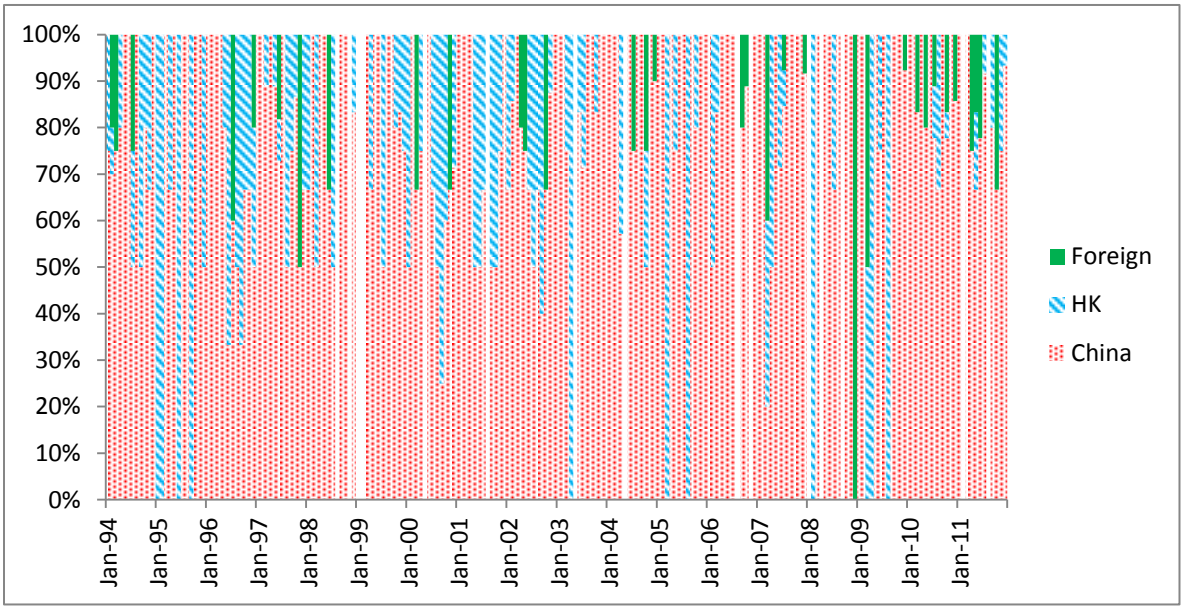
Source: Hong Kong Exchanges and Clearing Limited (www.hkex.com.hk)

Figure 3 Real value of IPO against time



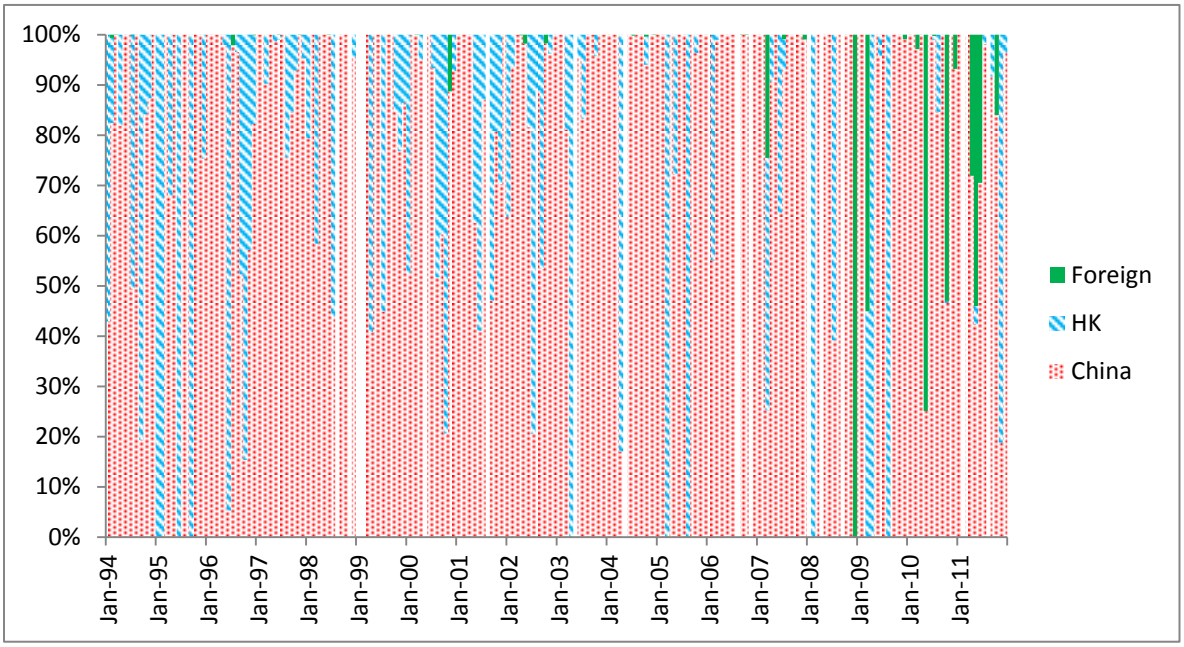
Source: Hong Kong Exchanges and Clearing Limited (www.hkex.com.hk)

Figure 4 Composition of IPO (By number of IPO companies)



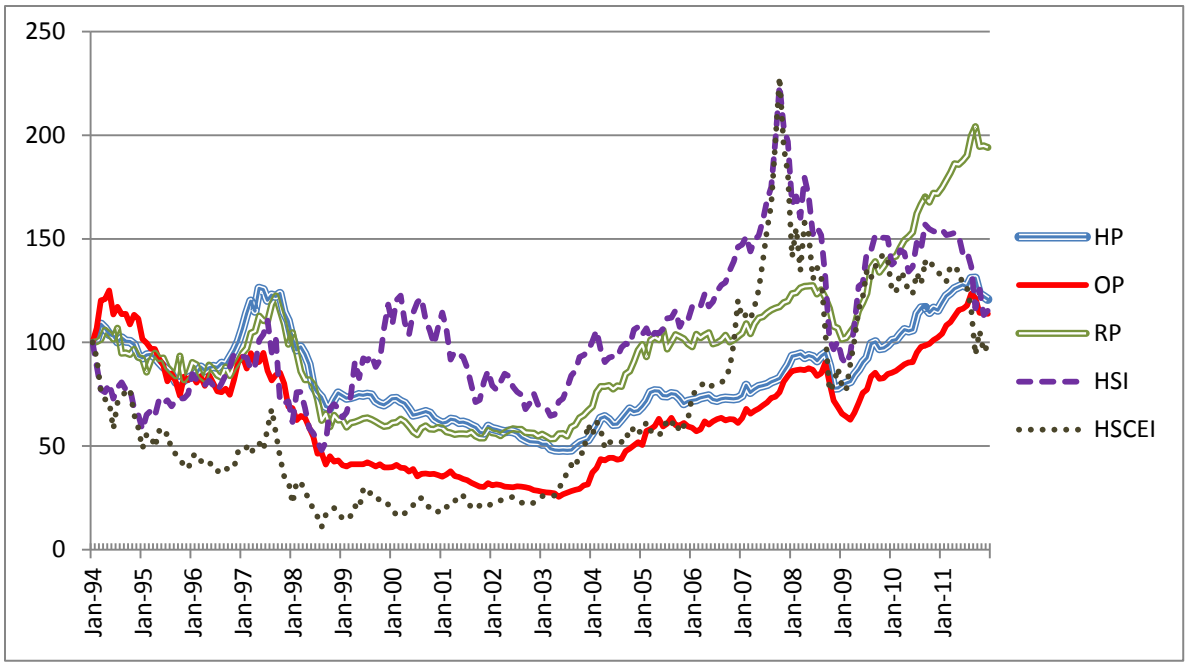
Source: Hong Kong Exchanges and Clearing Limited (www.hkex.com.hk)

Figure 5 Composition of IPO (By value of IPO companies)



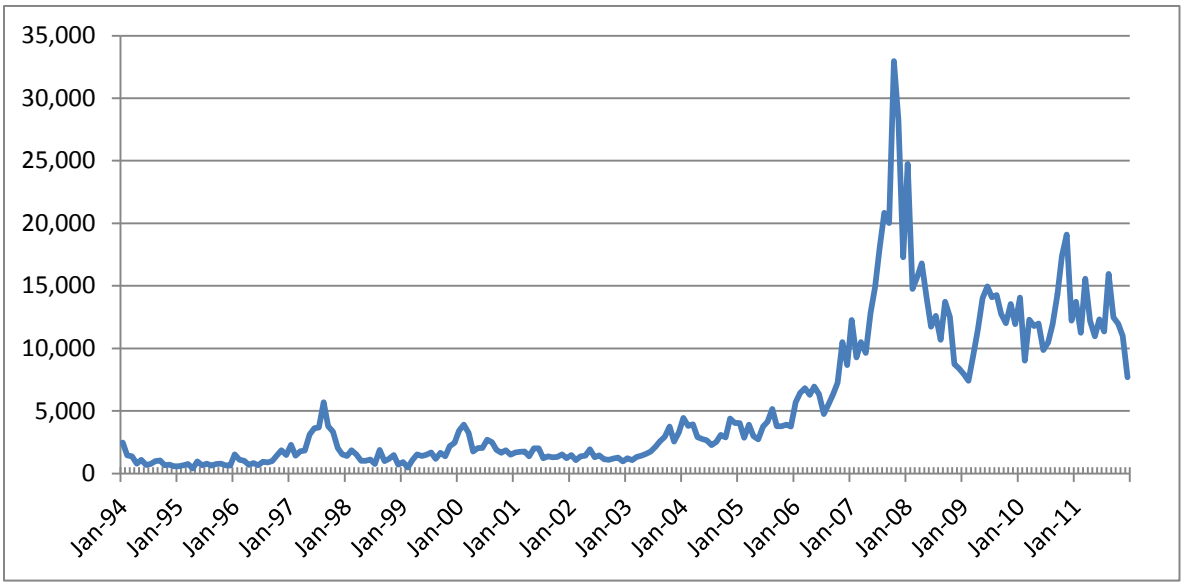
Source: Hong Kong Exchanges and Clearing Limited (www.hkex.com.hk)

Figure 6 Time plot of the real Hang Seng Index (HSI), real Hang Seng China Enterprise Index (HSCEI), real office price index (OP), real retail price index (RP) and real housing price index (HP) (rebased as 100 at Jan 1994)



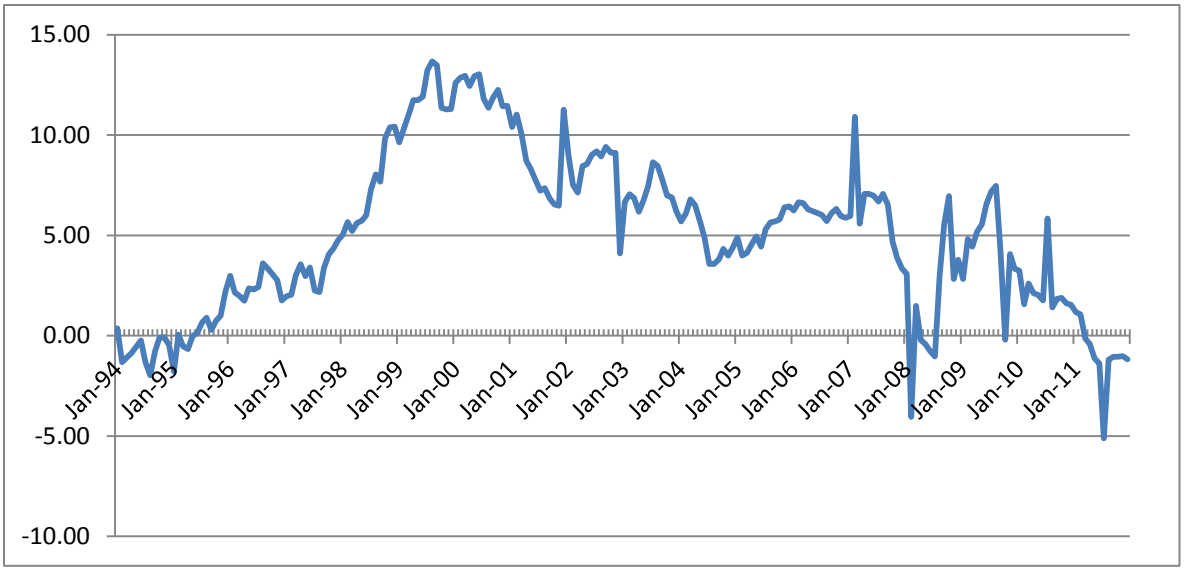
Sources: Hong Kong Exchanges and Clearing Limited (www.hkex.com.hk) and Rating and Valuation Department (www.rvd.gov.hk)

Figure 9 Real trading value in Hong Kong Stock Exchange



Source: Hong Kong Exchanges and Clearing Limited (www.hkex.com.hk)

Figure 10 Best Lending Rate



Source: Hong Kong Monetary Authority (www.info.gov.hk/hkma)

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APPENDIX

Appendix 1

This appendix attempts to summarize some related previous literature with tables.

A: Previous literature on the relationship between the variables of stock market and performance of initial public offerings

	Loughran and Ritter (2004)	Alvarez and Gonzalez (2005)	Buttimer, Hyland, and Sanders (2005)	Jain and Kini (2006)
NAREIT index	N.A.	N.A.	Positive and significant	N.A.
Excess monthly return	N.A.	N.A.	Positive and significant	N.A.
Market adjusted return	N.A.	Positive and significant	N.A.	N.A.
Small minus big	N.A.	N.A.	Positive and significant	N.A.
High minus low	N.A.	N.A.	Positive and significant	N.A.
Cahart's (1997) momentum variable	N.A.	N.A.	Negative	N.A.
Bond interest rate	N.A.	N.A.	Positive	N.A.
Bond default rate	N.A.	N.A.	Positive	N.A.
Assets before listing	Negative and significant	Negative	N.A.	N.A.
Offering size	N.A.	Positive	N.A.	Positive
ROA in previous year	N.A.	Positive	N.A.	N.A.
Fraction of shares retained by original owners	Positive and significant	Positive	N.A.	Positive
Online subscription	Positive and significant	N.A.	N.A.	N.A.
Investor banker prestige	Positive and significant	N.A.	N.A.	Positive and significant
Risk of offering	N.A.	N.A.	N.A.	Negative

B: Previous literature on the factors affecting the frequency of applying IPO shares in Hong Kong

	McGuinness (1993)	Vong (2006)	Lee, Wong, Yuen (2007)
Investors' education level	N.A.	N.A.	Negative and significant
Investors' experience	N.A.	N.A.	Positive and significant
Media's information	N.A.	N.A.	Positive and significant
Online subscription	N.A.	N.A.	Positive and significant
Margin subscription	N.A.	N.A.	Positive and significant
Investment Horizon	N.A.	N.A.	Negative and significant
Reading prospectus	N.A.	N.A.	Positive and significant
Family recommendation	N.A.	N.A.	Positive and significant
Friend recommendation	N.A.	N.A.	Positive and significant
Weighted P/E ratio	N.A.	Positive and significant	N.A.
Average % change of HSI in the last three months	Positive	Positive and significant	N.A.
Earnings / Assets	Positive and significant	N.A.	N.A.
Net assets	Positive and significant	N.A.	N.A.
Age of the firm	Positive and significant	N.A.	N.A.

C: Twenty largest IPO in Asia

The following table shows that Hong Kong has been involved in several large scale IPO.

Rank	Issuing date	Issuer	Funds raised (US billion)	Nation / Country	Industries	Stock Exchange
1	July 2010	Agricultural Bank of China	19.228	China	Banking	Hong Kong / Shanghai
2	Oct 2006	Industrial and Commercial Bank of China	19.092	China	Banking	Hong Kong / Shanghai
3	Oct 1998	NTT Mobile	18.099	Japan	Telecommunications	Tokyo
4	Oct 2010	AIA	17.816	Hong Kong	Insurance	Hong Kong
5	May 2006	Bank of China	11.186	China	Banking	Hong Kong / Shanghai
6	Mac 2010	Dai-ichi Mutual Life Insurance	10.986	Japan	Insurance	Tokyo
7	Nov 1997	Telstra Corp	9.819	Australia	Telecommunications	New York
8	Oct 2005	China Construction Bank	9.227	China	Banking	Hong Kong / Shanghai
9	Jul 2009	China Engineering	7.592	China	Capital goods and services	Shanghai
10	Apr 2007	Citic Bank	5.946	China	Banking	Hong Kong
11	Nov 2007	China Railway	5.877	China	Construction	Hong Kong
12	Oct 2007	China Telecom	4.225	China	Telecommunications	New York
13	Dec 2007	China Pacific Insurance	4.071	China	Insurance	Shanghai
14	Oct 1997	Indosat	3.970	Indonesia	Telecommunications	New York
15	Jan 2006	Lotte Department Store	3.739	South Korea	Retail	London
16	Dec 2003	China Life	3.475	China	Life insurance	New York
17	Oct 2000	Sinopec Corp	3.462	China	Oil & natural gas	Hong Kong
18	June 2005	China Shenhua	3.276	China	Coaling	Hong Kong
19	Mar 2000	Petrochina	2.891	China	Oil & natural gas	New York
20	Nov 2005	The Link REIT	2.790	Hong Kong	Real estate investment trust	Hong Kong

(Source: Renaissance Capital, www.renaissancecapital.com)

Appendix 2: IPO and Market Sentiment

This appendix shows that for Hong Kong during the sampling period, IPO is indeed the only data series that is available for formal analysis.

Table A2-1: A Summary of the availability of "Market sentiment variables" used by Brown and Cliff (2004)

Close-fund funds	Not available
IPO	1994 – present; monthly; HKEX; ***employed by this paper***
Liquidity	HKEX takes surveys in 1999 and 2004 about the liquidity of stock market.
Percentage change in margin borrowing	*Not available*
Percentage change in short interest	*Not available*
Ratio of short sales to total sales	1999 – present; monthly; HKEX
Odd-lot sales to purchases	*Not available*
Put-to-call trading volume	1996 - 2008; 1996-1999 yearly; 2000 – 2008 monthly; HKEX
Activity by non-commercial traders	*Not available*
Activity by small traders	*Not available*
Expected volatility / current volatility	*Not available*
Net purchases of mutual funds	Market value and trading value for exchange-traded fund is available from 2005 (HKEX).
SMB	*Not available*

Appendix 3: Real Estate Investment Trust (REIT) in Hong Kong

The history of REIT in Hong Kong can be traced back to 25 November 2005, where Link (00803), the first REIT, was introduced. Link holds the retail facilities and carparks acquired from Hong Kong Housing Authority, and these properties are all located near public housing. The market capitalization of Link was 64.377 billion in December 2011, which is the biggest REIT in Hong Kong. Other than Link, seven REITs with relatively small market capitalization were launched in the market, which made up to a total eight REITs in 2011 [Table A3-1]. In terms of market capitalization, Link overall shares nearly half of the REIT market in Hong Kong [Figure A3-1], and the whole REIT market constitutes less than 1% of the total [Figure A3-2].

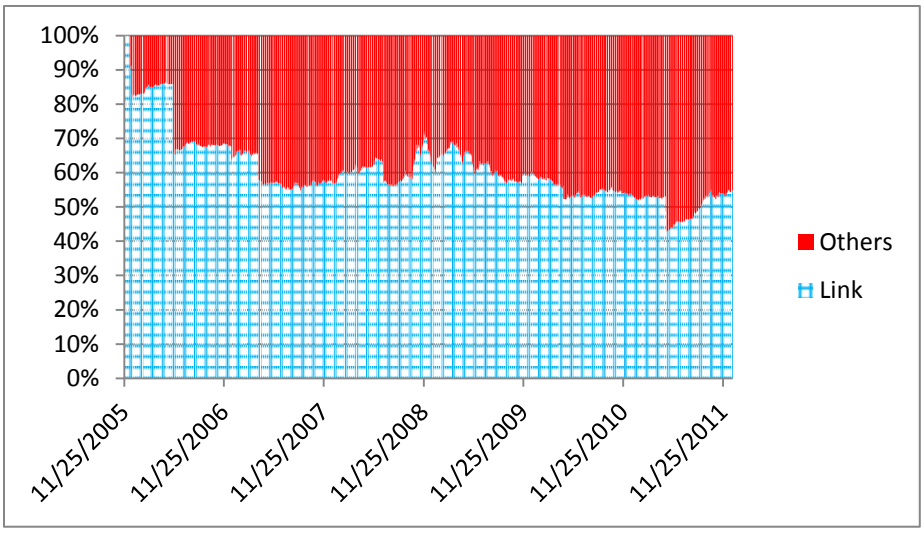
Table A3-1 Real Estate Investment Trust in Hong Kong

Stock Code	Name of REIT	Starting date of trading	Market Capitalization (HKD billion) (as at 30 December 2011)	Share of Stock Market Capitalization (%)
00823	Link Real Estate Investment Trust	25 November 2005	64.337	0.369
00808	Prosperity Real Estate Investment Trust	16 December 2005	2.041	0.012
00405	GZI Real Estate Investment Trust	21 December 2005	3.656	0.021
02778	Champion Real Estate Investment Trust	24 May 2006	14.473	0.083
00435	Sunlight Real Estate Investment Trust	21 December 2006	3.551	0.020
01881	Regal Real Estate Investment Trust	30 March 2007	5.830	0.033
87001	Hui Xian Real Estate Investment Trust	29 April 2011	17.834	0.102
00778	Fortune Real Estate Investment Trust	20 Apr 2010	6.370	0.036

Stock Market Capitalization (as at 30 December 2011 = 17.452 HKD billion)

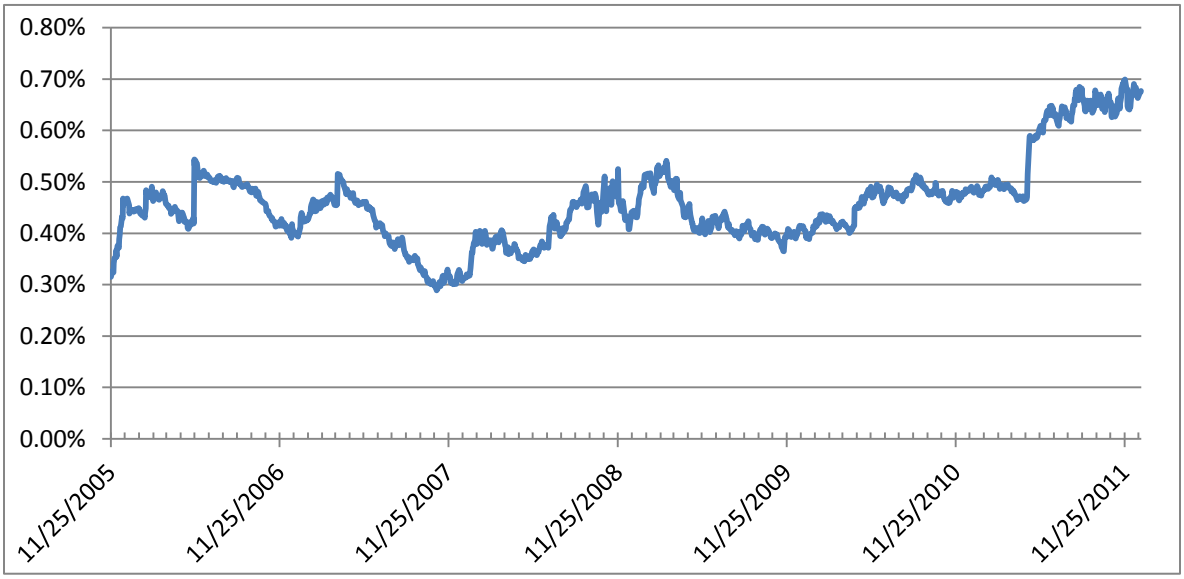
Sources: Datastream and Hong Kong Exchanges and Clearing Limited

Figure A3-1 Share of REIT market in Hong Kong



Source: Datastream

Figure A3-2 Market Capitalization of REIT relative to Total Market Capitalization



Sources: Datastream and Hong Kong Exchanges and Clearing Limited