INVESTIGATING THE EXISTENCE OF CAUSAL RELATIONSHIP OF THE STOCK AND REAL ESTATE MARKETS IN HONG KONG

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Abstract: This study examines the relationship of the stock market and the real estate market of Hong Kong to determine whether they are closely correlated, independent or the relation changes over time. The study period is from January 1997 to December 2016. Secondary data drawn from the Heng Seng index (HSI) and Private Domestic Price Indices (PDPI), representing the Hong Kong stock market and the real estate performances respectively, are used for statistical analysis. The Granger Causality test results indicate that these two markets of Hong Kong are bilateral causal and affect each other.

Key words: stock market; real estate market; granger causality test; cointegration

JEL classification codes:

JEL: G11 - Portfolio choice; Investment decisions; JEL: G15 - International financial markets; JEL: E17 - Forecasting and Simulation

1. INTRODUCTION

Hong Kong experienced the Asian Financial Crisis (AFC) in 1997 just after the transfer of her sovereignty to the People's Republic of China; the AFC brought a panic drop of the Heng Seng index (HSI) from 16,265.7 (end of month closing index, July 1997) to 7,275.04 (end of month closing index, August 1998), the market value evaporated by more than half in one year. At the same time, the real estate market saw the Private Domestic Price Indices (PDPI) fall from 172.9 (October 1997) to 95.6 (October 1998). The parallel significant falls seem to indicate the existence of correlation between the Hong Kong stock market and the Hong Kong real estate market.

During the breakout of the Severe Acute Respiratory Syndrome (SARS) in 2003, the stock market fell to the bottom of the HSI 8634.45 (end of month closing index, March 2003) since 1993, and the real estate market dropped to the bottom of PDPI 58.4 (July 2003) since 1991, then both gradually picked up after that. It also shows that the two markets demonstrate the same pattern of fall and rise.

However, the experience of Hong Kong during and after the Global Financial Tsunami in 2008 was not the same. The stock market, represented by the HSI, fell from 25,755.35 (end of month closing index, April 2008) to 12,811.57 (end of month closing index, February 2009), then it was kept in a range of about 900 points until mid-2017, except for a brief spike in mid-2015. Meanwhile, the real estate market, represented by PDPI, despite falling from 126.6 (June 2008) to 104.8 (December 2008), real estate prices continued to rise consistently to a rocket high level of 306.1 in September 2015.

Researchers have found no conclusions on the relationship of these two markets in Hong Kong. Studies by Quan and Titman's (1997), Quan and Titman (1999), Garvey, Santry and Stevenson (2001), Liow, Ooi, and Gong (2005) and Tien and Zhuang (2013) show little evidence of the Hong Kong's stock and real estate markets having any long and short term relationship. Hui, Zuo, and Hu (2011) show Hong Kong's real estate and stock markets do not have a long-run equilibrium by using traditional cointegration test. However, when pattern-

based mining approach was applied, similar positive correlations are found between the stock market and the real estate market. Hui and Ng (2012) find that the inherent relationship between the stock and real estate medkets has evidently changed over time. In the short-run, a positive relationship has been found between the two markets in the periods between 1984 and 1989 as well as between 1990 and 1994. However, the correlation between the two markets was weak in the long-run. Chan and Woo's (2013) research concludes that the real estate and stock prices in Hong Kong have positive and two-way causal impacts on each other.

Since the financial and real estate markets have contributed more than 30% to the Gross Domestic Product (GDP) of Hong Kong in 2015 (Census and Statistics Department, HKSAR, 2015), it is worth critically evaluating whether there is a stable relationship between these two markets or their relationship changes based on special factors mentioned above and the data during the period of 1997-2016.

2. LITERATURE REVIEW

The relationship between the stock and real estate markets is an important topic in the economics, financial and wealth management field as their relationship influences people's investment decisions and portfolio optimizations (Hui *et al.,* 2011). Traditionally, it is hypothesized that there is a high correlation between these two markets. However, scholars have had three different findings on the relationship between these two markets, including no relationship exists (segmented), relationship exists (integrated) and mixed relationship; there is no generally agreed answer.

2.1. No relationship exists

Some scholars find no relationship between the stock and the real estate markets. The study of Wilson, Okunev and Ta (1996) used Australia as the case, they found that there was no consistent conclusion under the investigation by using Capital Asset Pricing Model (CAPM) and co-integration methods to examine the relationship between stock and real estate markets. Ong (1995) used the real estate index and the index of real estate stocks in Singapore to examine their relationship. Investing in the

real estate stocks has been regarded as a kind of indirect investment in the real estate market, so theoretically both had a long-term relationship. However, Ong (1995) employs co-integration method and finds no co-integration relationship between the real estate stocks and the real estate market.

Wilson and Okunev (1999) investigate the relationship between the stock and real estate markets of the United States, the United Kingdom and Australia by using the non-linear technique and fractional cointegration for testing their long-term co-dependence. They find that there was no relationship in the long term in the United States and the United Kingdom, but the result in Australia was unclear. In addition, Garvey, Santry and Stevenson (2001) investigate these two markets in Australia, Hong Kong, Japan and Singapore and show little evidence of these markets having long and short term relationship.

Quan and Titman (1999) employ simple univariate regression and time-series analysis to examine the relationship between the stock and the real estate markets for 17 countries and find that other than Japan, all other 16 countries did not show relationship between these two markets.

Liow *et al.* (2005) study the long-run and short-term relationships among four Asian real estate and stock markets of Japan, Hong Kong, Singapore and Malaysia; and four European property stock markets of UK, France, Germany and Italy. The combined findings indicate minimal cointegration, weak mean transmission and lack of significant evidence of cross-volatility spillovers among the Asian and European real estate and stock markets.

Guo and Long's (2013) research also indicates that no obvious long-term equilibrium or causality exists between China's stock market and real estate market, which implies that, in China, these two financial markets could not effectively substitute each other.

2.2. Relationship exists

On the other hand, some scholars discover that there is a relationship between the stock and real estate markets. Wilson, Okunev and Zurbruegg (2000) study the relationship between the stock market and the real estate

market in United States from 1972 to 1998 using Granger Causality test and find that the real estate market notably affected the stock market. The same conclusion is reached under the structural changes situation. Ling and Naranjo (1999), based on Arbitrage Pricing Theory, find that E-REITs and the stock market had integration when studying the United States' stock and real estate markets from 1978 to 1994. Also, Jud and Winkler (2002) discover that housing price appreciation in 130 metropolitan areas across the United States was strongly influenced by the stock market appreciation.

Sutton (2002) shows that stock prices play an essential role in the movement of real estate prices in the United States, the United Kingdom, Canada, Ireland, Netherlands and Australia. The research by the Bank of International Settlements (2003) also presents similar result that stock prices tend to lead the house price fluctuations by a 2-3 years lag in several countries. Shen and Lu (2008) also separately show positive correlations between real estate markets and stock markets in Japan, Singapore and China.

Chan and Woo's (2013) research concludes that real housing and stock prices in Hong Kong have positive and two-way causal impacts on each other, evidence of wealth and credit-price effects. Since rises in the stock market lead to rises in the housing market, the wealth effect of the stock market on the real economy is greater and longer lasting than that generated by the housing market, as seen from the results of the impulse response functions (IRFs) and variance decompositions (VDs). This is because stock-wealth effects may be further generated through the housing markets.

By examining the return linkages between the stock market and the real estate market in the United States, Luchtenberg and Seiler (2014) study the effect the recent global financial crisis had on the level of integration between these two markets.

2.3. Mixed Relationship

The remaining scholars point out the possibility of a mixed relationship between the stock and real estate markets. Quan and Titman's (1997) study shows that in contrast to the findings of existing country-specific studies, in the aggregate, the relation between real estate

values and stock prices is strong and positive. This strong and positive relation is found in cross-sectional as well as time-series regressions and appears to be pervasive across the 17 countries examined. However, they point out that four of the countries with the most reliable data, the United States, Australia, Canada and Hong Kong, all show insignificant relations between stock and real estate prices in individual studies.

Hui *et al.* (2011) show in their study that the traditional cointegration test does not find evidence for a long-run equilibrium between the real estate and stock markets in two different regions (i.e. the United Kingdom and Hong Kong). However, when pattern-based mining approach is applied to examine how these two markets interact with one another, the results indicate that both similarity and dissimilarity exist. Similar positive correlations are found between the stock markets and the real estate markets in both the United Kingdom and Hong Kong. It seems that the spiraling upturn or co-movement of both prices in these two regions happens in two successive phases. This can be attributed to two transmission mechanisms, namely wealth effect and credit-price effect.

Tien and Zhuang (2013) estimate the dynamic conditional correlation (DCC) models using real total returns of stocks and direct real estate prices in six sample markets. The results show significant time-varying effects in the conditional covariance between the returns of the two asset in most of the sample markets, except for the Irish real estate market, the Australia's industrial property market, as well as the residential and retail property markets in Hong Kong and Singapore.

Gao and Gu (2012) study the relationship between the real estate market and the stock market in China and examine the Chinese real estate market in three sub-periods based on real estate sales price indexes from January 1999 to November 2009. The results show that the fluctuations of Chinese real estate market and the stock market have stage correlation.

The findings of Hui and Ng (2012) reveal that even though the trend in residential real estate prices was similar to that of stock index in Hong Kong during the sample periods, the inherent relationship between them had evidently changed over time. The two structural breaks

detected indicate the changes in the causality relation between these two markets. In the short-run, a positive relationship has been found between the two markets in the periods between 1984 and 1989 as well as 1990 and 1994. However, the correlation between the two markets was weak in the long-run. In other words, there was no causal relationship between the two markets. The movement of the markets can only be explained by other macroeconomic variables.

3. METHODOLOGY

3.1. Data Description

In this study, the relationship between Hong Kong stock market and real estate market from January 1997 to December 2016 is examined. For the Hong Kong stock market, Hang Seng Index (HSI) is employed and the monthly data is collected from the website of Yahoo Finance for which the historical data is adopted from the Hong Kong Stock Exchange. Since Hang Seng Index is a daily index, the last day's closing price index (HSI) of the month was selected to be the monthly data used in this study. The monthly data of Hang Seng Index was composed by every last day's closing price index (HSI) of the month from January 1997 to December 2016. For the real estate market, the Private Domestic Price Index (PDPI) for all classes is used and the monthly data is collected from Rating and Valuation Department of the Government of Hong Kong Special Administrative Region. Both indexes are taken in natural logarithm.

3.2. Data Analysis

Granger causality test is used to examine the relationship between Heng Seng Index (LHSI) and Private Domestic Price Indices (LPDPI). To test whether the data are stationary, the Augmented Dickey-Fuller test (ADF) is employed to test for a unit root. The t-statistic method for testing $\rho = 0$ is used, whereas Augmented Dickey-Fuller distribution is read, rather than Student t statistic. If the t-statistic of the coefficient is above the critical value of Augmented Dickey-Fuller test, then a unit root is not present.

Unit root test is employed to confirm the cointegration of the residual. After confirming that the

residual $\hat{e}$ of LHSI and LPDPI is stationary, it can conclude that they are cointegrated. According to the Granger representation theorem, when two variables are cointegrated, it can use ECM to express their relationship. The Vector Error Correlation Model (VECM) is used to run the Granger causality test. Both long run and short run relationships can be obtained in the ECM model. Four possible outcomes are obtained in Granger causality: a) LHSI Granger causes LPDPI; b) LPDPI Granger causes LHSI; c) Feedback or bilateral causality, i.e. they interact with each other; and d) Independence, i.e. there is no causality between them.

4. RESULTS

4.1. Augmented Dickey-Fuller Unit Root Test

Usual t-statistics cannot be used for testing the presence of unit root in the data. Therefore, augmented Dickey Fuller test was used to test for unit root of LHSI and PODPI. In table 4.1, the ADF statistic critical value is at 5% confidence level, the null hypothesis ($p = 0$, there is a unit root within the data) of both Hang Seng Index (LHSI) and Private Domestic Price Indices (LPDPI) of the real estate market cannot be rejected. However, the null hypotheses of the first difference of LHSI and LPDPI are rejected. In other words, they are stationary in first difference.

Since both of the LHSI and LPDPI are stationary in the first difference, the differenced variables of DLHSI and DLPDPI are used to run a regression at the same order of stationary.

4.2. Granger Causality Test

The results of Table 4.2 show that both estimated coefficients on DLHSI and DLPDPI are statistically significantly different from zero. It means both of them are bilateral causal and affect each other.

5. CONCLUSION AND DISCUSSION

The result of bilateral causality between the stock market and the real estate market deserves discussion on the factors affecting the relationship. Previous studies have named mainly two such factors, including wealth effect

Table 4.1
Augmented Dickey-Fuller Unit Root Tests on LHSI and LPDPI

Time Series	Current Level	P-value	First Differenced	P-value
LHSI	-1.587431	0.4874	-14.12590**	0.0000
LPDPI	0.330111	0.9794	-8.316868**	0.0000

Note: **Significant at 5% confidence level with a critical value -23873492

Table 4.2
Estimation Results of Granger Causality Tests (1997.1-2016.12)

	Period	Null Hypothesis	F-statistic
Lag = 2	1997.1-2016.12	DLHSI does not Granger Cause DLPDPI	32.21367**
		DLPDPI does not Granger Cause DLHSI	2.843026**

Notes: **Significant in at 5% confidence level

(Hui *et al.* 2011), and credit-price effect (Chen, 2001; Kapopoulos and Siokis, 2005).

The wealth effect is the transmission of the riches earned in the stock market into the purchase of real estate, or other assets, to consolidate the wealth earned. Real estate is thus seen as both for consumption, to live in, and for investment, to lease out. Thus a 'portfolio adjustment' effect is in force, strengthening the relationship between the two. (Brueckner 1997; Kapopoulos and Siokis 2005). The credit-price effect is through higher stock prices, the personal or firm's financial position is improved, and therefore cost of borrowing to invest can be reduced, and thus more investment follows. (Chen, 2001; Kapopoulos and Siokis, 2005).

The starting point of both approaches is rising stock prices. However in the context of Hong Kong, people do not start at investing in the stock market, they start at purchasing real estate since the Chinese, or even oriental, thinking is to get a place for themselves first, and buy more if affordable. This applies even today despite the wide-spread of investment products, including stocks. Investing in stocks was not that common until the inauguration of the Mandatory Pension Fund Scheme (MPFS), to which all legitimate employers and employees are mandated to contribute, in 2000. From then on the investment in stocks is aligned with economic growth that drives wages.

As the starting point for Hong Kong people is buying real estate, most will only invest in stocks when they have more than they need for a property, either for consumption or for investment. With limited land supply and interruptive government measures in Hong Kong, property prices have continued to rise. Investing in stocks, even through mutual or private funds, is more liquid than investing in real estate, and will usually be considered if they have spare cash, or their real estate consumption or investment needs are met. Viewed from this angle, the wealth effect is less impactful on the relationship between the stock market and the real estate market. In fact, the wealth effect of a rising stock market is more likely to be reflected on the consumption of luxury items than on the property market. Meanwhile, the credit-price effect has not taken into consideration the risk attitude of the Hong Kong people, who have gone through a number of crises related to both stocks and real estate over the last 50 years. The rising wealth from the stock market is usually considered to be short term gains that may not last and therefore will not support the purchase of long term assets.

However, a rising stock market or a rising real estate market indicates a better economic picture that improves the risk-reward picture of any investment. As the Hong Kong people crave for real estate as a corner stone for stable living and investment, the rising stock market gives them the assurance they need. A publicly traded stock market in existence since the early twentieth century is

more visible than the relatively younger bond market, which is still largely over the counter, or the insurance products. A buoyant stock market encourages them to take more risk in longer term assets. Meanwhile a booming real estate market, to the extent that it becomes less accessible for some of the Hong Kong people due to high prices, may turn to the stock market for gains to enhance their own wealth rather than depending on the real estate for stable living that they cannot afford.

One interrupting factor is the money flows from the People Republic of China since Global Financial Crisis (GFC). Most of them have gone into the property market first, true to the Chinese mentality, then to the stock market, upon the liberation of the Chinese financial markets.

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