2010 International Conference on Business and Economics Research
vol.1 (2011) © (2011) IACSIT Press, Kuala Lumpur, Malaysia

The study in house market and stock market in China-HongKong-US

Jen-Shi Ni
Department of Finance and Taxation.,
Takming University of Science and Technology,
Taipei 11451, Taiwan,
jenshi@takming.edu.tw

Jin-Chung Liu
Department of Finance and Taxation,
Takming University of Science and Technology,
Taipei 11451, Taiwan,
michaelg@takming.edu.tw

***Abstract*—The aims of this study is to find out what is the relation between the housing market and equity market in China, HongKong and U.S.. Vector Autocorrelation model and Vector Error Correction Model were involved to analysis the relation relationship above countries. We founded that 1% variation of the Shanghai stock index caused a 3% change in China's housing market index, 1% change in HongKong's residential sales index, which resulted in China's housing index increase 3.5%, the HengSeng Index has a 1% variation, the housing market index to fell 1.5%.**

Keyword: VAR;House Market Index;VECM;Cointegration; impulse-response function

I. INTRODUCTION

The financial crisis of global equity market and economic recession in 2008 was caused by the U.S. subprime mortgage market. The sluggish housing market caused depression in the U.S. and global equity market, and economic recession. Does a correlation exist between the housing market and equity market in global world? Since there is a common international transmission of stock market movements effect, this study was purposed to discuss the correlation level between the housing market and stock market in China , HongKong and US.

Over the last two decades, China has achieved rapid economic growth, accompanied by rapid development of the real estate market. More closely of economic relationship between China and HongKong after 1997 Asian Crisis. HongKong benefited from China's Economic growth and RMB revaluation, giving property prices and luxury house prices to rise. However, house market and stock market are recession from boom rapidly in subprime mortgage crisis. Does a correlation exist between the housing market and equity market? .

Bonnie (1998) established a VAR model analyze housing sales and price fluctuations in the entire U.S and east, west, south and north regions. The results confirmed that home sales and price changes significantly affected economic fundamentals; regional housing sales and prices will affect regional employment and prices, and national interest rates and housing index had an influence in national employment and economy. Dua et al. (1999) used VAR and Bayesian VAR model to predict the U.S. home sales. Matteo(2005) used real GDP, GDP deflator, real housing prices, a VAR model based on FED rate to confirm the relationship between housing prices and the business cycle. Eddie and Yue (2006) established VAR model included housing price index, urban disposable income, and regional GDP and Shanghai Composite Index variables, and used VECM to analyze the housing price bubble in HongKong, Beijing and Shanghai. Gupta et al. (2008) used the VAR theory to predict the house prices in six regions of South Africa. Hott and Monnin (2008) used VAR model, cointegration test and impulse-response function to estimate housing prices in real market.

In international transmission of stock market, Jeon and Furstenberg (1990) by using the VAR model to study the correlation among the equity markets of Japan, France, Britain and USA. Becker et al (1990) discussed the transmission of stock market movements between U.S. and Japan. Corphay et al (1993) used the cointegration to study the equity markets of Japan, HongKong, Singapore, Australia and New Zealand to discover an existing long-term correlation. Kanas (1998) used the cointegration test method to determine that the equity market in 1983-1996 among USA, Britain, Germany, France, Sweden, Italy and the Netherlands did not exist with cointegration pair relations. Other studies such as Ghosh et al (1999),Blanchard and Quah (1989), Pagan and Pesaran (2008), and Mardi and Fey (2009) used the VAR model in fiscal and monetary policy effects.

Studies the correlation between the housing market and stock market, Ong (1995) studied the correlation between construction stocks and the real estate market in Singapore. Wilson and Okunev (1997) observed the Real Estate REITs and S&P500 Index and discovered a nonlinear relation between the two. Okunev et al (2002) found correlation between Australia's real estate market and stock market. Kakes and Willem (2004) found that Dutch housing market price variations significantly affect stock price changes and thereby affecting the economy. Hui and Yue (2006) point out there are strong positive correlation between Shanghai and Hongkong housing priece and Shanghai equity market composite index and Hong Seng Index. Zeno and Roland (2010) used a panel cointegration model to study the dynamic short-term and long-term impacts of overall economic variables to the international housing market.

Above researcher discussed the stock market or house market in a local economy, but we want to find the impact effect from foreign. Did stock market and house market have international transmission in China , Hongkong and U.S ? If that, what is relation and impact effect? This study discusses the housing market and equity market relation in China, HongKong and USA, based on the data from 1998M3 to

2010M2. Four parts included in this paper, section 1 is an introduction, section 2 established a VAR model and VECM model for the housing price index and stock index for China, HongKong and U.S., section 3 provides the empirical research results and conclusions are given in the last section.

II. METHDOLOGY

Due to the higly positive relation in stock and house market(Ong 1995, Patrick and Okunev 1997, Okunev , Wilson and Zurbruegg 2002, Kakes and Willem 2004 Eddie and Yue 2006, Zeno.and Roland 2010) and international transmission in stock market (Becker, Finnerty and Gupta 1 990, Corphay, Radand and Urbain 1993, Roca 1999， Ghosh, saidi, and Johnson 1999 ,Gerrits and Yuce 1999, Blanchard and Quah 1989, Pagan and Pesaran 2008, Mardi and Fey2009), we referred to the models of Eddie and Yue (2006), Hott and Monnin (2008) and Mardi and Fey(2009) to establish a VAR model to analyze the equity and housing market among China, HongKong and USA. The benchmark VAR model includes variables China's house market index(CHH) [1] , Shanghai equity market composite index (CHS), HongKong residential house sales index (HKH), HongKong's equity market HengSeng Index (HKS), U.S. housing market index (USH) and Dow Jones Industrial Average index(USS)。 The study discusses the relationship among the equity and housing indices of China, HongKong and USA.

$$Y_t = C + \sum_{i=1}^{p} \beta_i Y_{t-j} + \varepsilon_t \tag{1}$$

where β_i to β_p is a k×k size matrix, $Y_t = (Y_{1t,} Y_{2t,\cdots} Y_{kt})'$ is a k×1 size vector, C is a k×1 size intercept vector, ε_t is a k×1 random variable vector with white noise properties. The above equation is expressed as a VAR(1) matrix into (2), which coefficient β_p^{mn} indicates the lag for the p^{th} , and the degree of influence with the n^{th} variable towards the m^{th} variable.

$$\begin{bmatrix} CHH_t \\ CHS_t \\ HKH_t \\ HKS_t \\ USH_t \\ USS_t \end{bmatrix} = \begin{bmatrix} C^{CHH} \\ C^{CHS} \\ C^{HKH} \\ C^{HKS} \\ C^{USH} \\ C^{USS} \end{bmatrix} + \begin{bmatrix} \beta_1^{11} & \beta_1^{12} & \beta_1^{13} & \beta_1^{14} & \beta_1^{15} & \beta_1^{16} \\ \beta_1^{21} & \beta_1^{22} & \beta_1^{23} & \beta_1^{24} & \beta_1^{25} & \beta_1^{26} \\ \beta_1^{31} & \beta_1^{32} & \beta_1^{33} & \beta_1^{34} & \beta_1^{35} & \beta_1^{36} \\ \beta_1^{41} & \beta_1^{42} & \beta_1^{43} & \beta_1^{44} & \beta_1^{45} & \beta_1^{46} \\ \beta_1^{51} & \beta_1^{52} & \beta_1^{53} & \beta_1^{54} & \beta_1^{55} & \beta_1^{56} \\ \beta_1^{61} & \beta_1^{62} & \beta_1^{63} & \beta_1^{64} & \beta_1^{65} & \beta_1^{66} \end{bmatrix} \begin{bmatrix} CHH_{t-1} \\ CHS_{t-1} \\ HKH_{t-1} \\ HKS_{t-1} \\ USH_{t-1} \\ USS_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_t^{CHH} \\ \varepsilon_t^{CHS} \\ \varepsilon_t^{HKH} \\ \varepsilon_t^{HKS} \\ \varepsilon_t^{USH} \\ \varepsilon_t^{USS} \end{bmatrix} \tag{2}$$

The VAR model of (2) can be rearranged into a modified cointegration-error model in (3) after adding an error correction term:

$$\Delta Y_t = \Pi Y_{t-P} + \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \ldots \Gamma_{k-1} \Delta Y_{t-(P-1)} + \varepsilon_t \tag{3}$$

where, $\Pi = (\sum_{i=1}^{p} A_i) - I_k$, $\Gamma_i = (\sum_{j=1}^{i} A_j) - I_k$

The above equation is a differential VAR model added with an error correction term Y_{t-p}, in which I is a unit matrix, Γ_i is used to evaluate short-term effects, and $\Pi = \alpha\beta'$ is used to evaluate long-term effects. An adjustment coefficient matrix is indicated by α, representing the cointegration weight. The cointegration vector is indicated by β, and the rank of Π determines the number of cointegration vectors. The analysis can be divided into the following three situations:

- If rank(Π)=k, Π is a full rank, and represents all variables of vector series Y_t are stationary.
- If rank(Π)=0, vector series Y_t does not exist a cointegration relation, and (3) reduces into an ordinary one-order differential VAR model.
- If 0< rank(Π)=r<k, vector series Y_t exists a total of r cointegration vectors,

$\Pi = \alpha\beta'$， α is the adjustment coefficient matrix which represents the weight size in the cointegration relation, and β' is the cointegration vector which enables the nonstationary Y_t becomes stationary after $\beta' Y_t$ linear assembly.

The approach used its corresponding error correction representation to likely estimate as the basis, and two likelihood test rations to determine the number of cointegration vectors. The method then used the maximum likelihood function estimation $\hat{\Pi}$ to find the eigenvalues $\hat{\lambda}$, and used the matrix rank to test if the variables exist a cointegration relation. The statistic testing used the trace test and maximum eigenvalue test. The trace test and maximum eigenvalue test can be expressed by .(4), (5):

$$\left.\begin{matrix} H_0 : rank(\Pi) \le r \\ H_1 : rank(\Pi) > r \end{matrix}\right\} \quad \lambda_{trace}(r) = -T \sum_{i=r+1}^{k} \ln(1 - \hat{\lambda}_i) \tag{4}$$

$$\left.\begin{matrix} H_0 : rank(\Pi) = r \\ H_1 : rank(\Pi) = r+1 \end{matrix}\right\} \quad \lambda_{\max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \tag{5}$$

which r is the number of cointegration vectors, $\hat{\lambda}$ is the i^{th} estimated eigenvalue of the matrix. When the value of the trace test or maximum eigenvalue test is very large, the null hypothesis is then rejected.

III. EMPIRICAL ANALYSIS

A. Basic data

Three monthly data of house price index are from National house index by Statistic bureau of China, private domestic house sale index of Hongkong from rating and valuation Department , and house price indexes by Federal Housing Finance Agency U.S., named CHH, HKH and USH; others stock index data from data stream database, CHS, HKS and USS. The time period was from 1998M3 to 2010M2. The variables are listed as follow, table 1.

TABLE 1.

Table 1	CHH	CHS	HKH	HKS	USH	USS
Samples	144	144	144	144	144	144
Mean	103.16	2006.5	93.71	15066.02	178.69	10354.07
Median	103.63	1655.1	93.35	13976.53	182.69	10437.78
Maximum	109.14	5954.7	139.1	31352.58	225.41	13930.

[1] CHH refers to the index of public house, announced by the National Bureau of Statistics of China.

Minimum	94.74	1060.7	58.4	7275.04	122.91	7062.93
St.deviation	3.110	993.3	20.074	4798.879	32.868	1415.63
Skewness	-1.048	1.883	0.314	0.8835	-0.197	0.2816
Kurtosis	3.904	6.35	2.478	3.4597	1.6082	3.0710
J-B value	31.28***	152.81***	4.010	20.002***	12.558***	1.9339
Q(4)	372.25***	477.97***	461.73***	462.58***	558.31***	438.48***
Q(8)	464.8***	727.39***	781.5***	728.49***	1066.4***	640.25***

Note: Q(4) and Q(8) indicates lag 4 and lag 5 in the Ljung-Box test; ***,** *indicates significance at 1%, 5%, 10% level, respectively

B. Unit root test

Unit root test cannot reject at conventional significance level for all variables. After taking the first differences of the variables, table 2 reveal that ADF and PP unit root test results is rejected. Thus, we conclude variables are integrated of first order, I(1)..

TABLE 2.

test	Variable	Intercept	Intercept, trend	Non-intercept non-trend
ADF	CHH1	-8.915 (0)***	-8.877 (0)***	-8.942 (0)***
	CHS1	-4.054 (5)***	-4.035 (5)***	-4.047 (5)***
	HKH1	-6.119 (1)***	-6.708 (1)***	-6.139 (1)***
	HKS1	-10.274 (0)***	-10.237 (0)***	-10.263 (0)***
	USH1	-3.089 (3)**	-3.178 (13)*	-3.044 (13)**
	USS1	-4.960 (3)***	-4.993 (3)***	-4.953 (3)***
PP	CHH1	-8.900 (1)***	-8.861 (1)***	-8.926 (1)***
	CHS1	-12.43 (8)***	-12.402 (8)***	-12.452 (8)***
	HKH1	-5.588 (2)***	-6.315 (2)***	-5.826 (1)***
	HKS1	-10.269 (1)***	-10.231 (0)***	-10.282 (2)***
	USH1	-5.303 (7)***	-5.994 (6)***	-4.826 (7)***
	USS1	-10.827 (6)***	-10.791 (6)***	-10.858 (6)**

Note:
The ADF test according to the AIC criteria ; the PP test is in accordance to Newey-West using Bartlett kernel to select the bandwidth, statistics are according to MacKinnon (1996) one-sided p-values. The value within ( ) indicates the optimal number of lags

C. VAR ,Cointegration and VECM

The selection for optimal number of lags in the VAR model for the housing market index and equity market index for China-HK-USA have a total of five conditions. LR, FPE, AIC, SC and HQ. In this study we applied the AIC criteria and selected lag2 as the optimal number of lags in the VAR model. VAR(2) shows that the Chinese housing market index was significantly influenced by itself own variables of the previous month, Shanghai Stock Exchange Index was significantly influenced by itself last 2 month , and the last and second last phases of HongKong's equity market index. The HongKong housing market index was significantly influenced by own variables of the last two previous phases and the last phase of U.S. housing market. The HongKong equity market was significantly influenced by the previous last phase of the Shanghai equity market, HongKong equity market and U.S. housing market. The U.S. housing market was significantly influenced by the previous last two phases of HongKong housing market and its own variables of the previous phase. The U.S. equity market was significantly influenced by the previous last two phases of the China housing market, previous HongKong housing market and equity market phase, and the previous U.S. housing market and equity market phase. The results in standard deviation of housing price itself would lead to positive increases in future housing price in the next period was same as the Hui and Yue(2006).

The study used the Johansen cointegration test method, and by trace test and maximum eigenvalue (ME) test statistics to determine the number of cointegration vectors and lag 2 phases. From the trace test and ME Statistic, it could be seen that for the null hypothesis: H_0, r=0, and has no cointegration vector. The test results had discovered that the six variables rejected null hypothesis at a 1% significance level and occurred with cointegration relations. The result indicated that the housing market and equity market for China-HK-USA had a long and stable equilibrium relation. Other studies has same result that housing prices are all cointergrated with fundamental variables.(Hui and Yue, 2006).

The normalized cointegration coefficients and correction coefficients for cointegration are listed in Table 3. The cointegration vector is (1., -0.03, -3.45, 0.016, -2.46, -0.0008). Every 1% variation of the Shanghai stock index caused a 3% change in China's housing market index, 1% change in HongKong's residential sales index, which resulted in China's housing index increase 3.5, the HengSeng Index has a 1% variation, the housing market index to fell 1.5%, the U.S. housing index rises 1% and China's housing market index rises 2.46. This showed that the Shanghai stock composite index, HongKong residential sales index, HengSeng Index and U.S. housing market index had a significant influence toward China's housing market index.

TABLE 3.

Normalized co integrating coefficients

CHH1	CHS1	HKH1	HKS1	USH1	USS1	C
1	-0.03025	-3.45476	0.015707	-2.46476	-0.00078	1.275465
	[-3.683]***	[-6.909]***	[7.105]***	[-2.290]***	[-0.135]	[1.097]

Adjustment coefficients

D(CHH1)	D(CHS1)	D(HKH1)	D(HKS1)	D(USH1)	D(USS1)
-0.00431	6.67479	0.098049	-47.2988	-0.00318	-8.6369
[-0.465]	[3.856]***	[7.490]***	[-4.975]***	[-0.432]	[-2.207]***

Note: Values inside [ ] are the t-test values

VECM can be used to discuss the short-run dynamic adjusting effect among the variables(Engle and Granger (1990)). Table 4 shows the short and long-term effects in the cointegration correction error model for each variable. The error-correction coefficient vector was (-0.0043,6.6748, 0.0980, -47.2988, -0.0032, -8.6369), which respectively represents the adjustment coefficient of China's housing index , Shanghai stock index , HongKong's housing index, HSI, the U.S. housing index and Dow Jones Index. When China's housing market, HongKong's equity market, the U.S. housing and equity market deviated from the long-term equilibrium relation, they fell back to the long-term equilibrium whereas the Shanghai stock index and HongKong housing index rises back to the long-term equilibrium after deviation. China , HongKong and US house and stock index will down to the long run equilibrium when CHH1>0.03CHS1+3.45HKH1-

0.01HKS1+2.46USH1,up to long run equilibrium, oppositely.

What is relationship between those market in real. During the SARS outbreak in Mar. 2003, HongKong property prices plunged, HengSeng Index fell to 8,634 , a lowest point in four years, and house market index also decrease 8%, China house market index and Shanghai Composite Index dropped 3% and 6%, individually. The subprime mortgage market problems in the U.S. resulted in significant U.S. and global stock markets down. The Shanghai Composite Index was at 3,500 in April and dropped to 1,974 at September 16, negative growth rate 44% for 5 months, in 2008. In October 2007, HengSeng Index reached up to 32,000, but fell more than 1000 points on Nov. 2 due to the subprime crisis and delivering panic. With the financial crisis HongKong's property prices started to fall since Mar. 2008, which HengSeng Index plunged from 25,000 in Apr. to 13,000,−48%, at the end of the year. However, with rapid growth in economic recently, in November and December of 2009, the number of new housing constructions reached to a highest record, rising 75% than the same period in 2008. The real estate prices among 70 large and medium cities grew 5.7% than the same period in last November. HongKong house prices to greatly rise after 2009Q3. HengSeng Index rose from 13,000 by the beginning of the year to 20,000 in Sep, 53%.

On Apr.14, 2010, Both "New Four Notice" and "New No. 10 National Notice" on April 17, regulate the housing market demands as policy. These policy series against housing at the same time caused Shanghai Composite Index dropped from 3,166 on April 14 to 2,560 on Jun. 12. The house market and stock market had also contraction at the same time in Hongkong.

TABLE 4.

Table 4 D(CHH1)	D(CHS1)	D(HKH1)	D(HKS1)	D(USH1)	D(USS1)
-0.0043	6.674	0.0980	-47.298	-0.00317	-8.6369
[-0.465]	[3.856] ***	[7.490] ***	[-4.975] ***	[-0.432]	[-2.207] **

D. IRF and variance decomposition prediction

A VAR(2) impulse response function(IRF) in a matrix form as follow

$$Y_t = A_0 + A_1 Y_{t-1} + A_2 Y_{t-2} + e_t = \sum_{j=0}^{\infty} \Phi_j e_{t-j} \quad (6)$$

where Φ_j is an IRF, $e_t \sim iid(0,\sigma^2)$

Ten periods of variations and the effects were conducted from the variable changes of one standard deviation unit (Choleski decomposition). The impulse response effect among the variables could be observed in Fig. 1. The accumulated response of house market index showed on the first column and stock market index showed on the second column in China, HongKong, and U.S. The accumulated response of China housing index to HongKong stock market rises to 0.4 in four months, greater than to Shanghai stock index. The response of HongKong house index to the standard deviation from HongKong stock index increase to 3, from Shanghai stock market 0.5,however, negative response to house index from China and U.S. Slightly response of U.S. house index to other variables. Significantly accumulate response of Shanghai Stock index to the standard deviation from HongKong Stock market and U.S. house market, 100 and 50 , respectively. Response of HongKong stock market to Shanghai stock market and U.S. house market reached near 400. Hui and Yue(2006) proposed accumulate response of Shanghai stock index to house price is 15% in 12 months, Hang Seng index to housing prices in HongKong is 8% for 4 quarters.

The variance decomposition uses the individual variables in the VECM model to predict error variance. The decomposition comes from the innovation ratio of different variables. The prediction error variance is given as

$$Var[Y_{t+n} - E_t(Y_{t+n})] = Var\left[\sum_{j=0}^{n-1} \Phi_{ijs} e_{t-j}\right]$$

$$R^2_{jin} = \frac{\sum_{s=0}^{h-1} \Phi^2_{ijs} \sigma^2_j}{\sum_{j=0}^{n-1} \sum_{s=0}^{h-1} \Phi^2_{ijs} \sigma^2_j} \quad (7)$$

The expression in (7) is used to forecast error variance impact of the j^{th} exogenous variable, $e_{j,t}$ to $Y_{i,t}$. Fig 2 shows the forecast error variance decomposition of the housing market and equity market for China-HK-USA. The China and U.S. housing market were less affected by the variation of other variables. HongKong's housing market started to fluctuate and affected by HongKong's equity market after the second phase and gradually increased to 40%. The Shanghai equity market was affected by the HongKong's equity market for a continual of ten phases, about 20%. The HongKong equity market was affected by the variations of Shanghai equity market and HongKong housing market about 15% and 10%. The U.S. equity market was influenced by HongKong's equity market at a larger level, from the first phase at 30% to the tenth phase which remained a variation level of 27%.

IV. CONCLUSION

The financial crisis burst in 2008 caused the plunges in global equity and currency markets. Since there is a common international transmission of stock market and house market movement effect, therefore this study discussed the correlation of housing market and stock market for China, HongKong and US.

We founded every 1% variation of the Shanghai stock index caused a 3% change in China's housing market index, 1% change in HongKong's residential sales index, which resulted in China's housing index increase 3.5%, the HengSeng Index has a 1% variation, the housing market index to fell 1.5%, the U.S. housing index rises 1% and China's housing market index rises 2.46.

Future research, the housing market maybe included other Asia Pacific countries to study the variations and correlations among the housing market among multiple countries. Furthermore, due to international comparisons follow-up studies may include the panel data model for further discussion.

Acknowledgements

The authors are grateful for the comments and suggestions received from anonymous referees. The authors wish to thank Wen Yu for research assistance. However, we are responsible for all remaining errors of this paper.

REFERENCES

[1] Becker, K.G.,Finnery, J.E.,and Gupta, M.(1990), "Then Intertemporal Relation between the U.S. and Japanese Stock Markets ",.Journal of Finance 45(4). 1297-1306

[2] Blanchard,O., and Quah, D.(1989) "The Dynamic effects of aggregate demand and supply disturbance", The American Economic Review 79, 655-673.

[3] Bonnie,B.J(1998) "The Dynamic Impact of Macroeconomic Aggregates on Housing Prices and Stock of Houses: A National and Regional Analysis," Journal of Real Finance and Economics . 17(2) : 179-197.

[4] Corphay,A., Rad A. T., and Urbain,J.P.(1993), "Common Stochastic Trends in European Stock Markets",. Economic Letter 42(4). 385-390

[5] Dua,P., S.M. Miller.and D.J.Smyth(1999) "Using Leading indicator to Forecast U.S. Home Sales in a Bayesian Vector Autoregressive Framework," Journal of Real Finance and Economics. 18(2) : 191-205.

[6] E.C.M.Hui and S.Yue(2006) " Housing Price Bubbles in HongKong, Beijing and Shanghai: A Comparative Study," Journal of Real Estate Financial Economics. 33 : 299-327.

[7] Ghosh,A.,Saidi,R, and Johnson,K.H.(1999), "Who Moves the Asia-Pacific Stock Market-US or Japan? Empirical Evidence Based on the Theory of Cointergration", . Finacial Review 34(1). 159-170.

[8] Gupta, Rangan; Das, Sonali(2008) "Spatial Bayesian Methods of Forecasting House Prices in Six Metropolitan Areas of South Africa;" South African Journal of Economics. 76(2) : 298-313.

[9] Hott,C. & Monnin,P(2008) "Fundamental Real Estate Prices:An Empirical Estimation with International Data," Journal of Real Finance and Economics. 36 : 427-450.

[10] Jeon, B.N. and Von Furstenberg, G. M.(1990), "Growing International Co-movement in Stock Price Indexes ",. Quarterly Review of Economics & Business 30(3). 15-30.

[11] Johansen, S.(1988) "Statistical Analysis of Cointegration Vectors," Journal of Dynamics and Control. 12 : 231-54.

[12] Johansen, S.(1995) "Likelihood-based inference in cointegrated vector autoregressive models," Oxford University Press : 22-34.

[13] Kakes, J. and J. Willem. V. End (2004), "Do stock prices affect house prices? Evidence for the Netherlands," Applied Economics Letters, 11,741-744.

[14] Kanas, A(1998) "Volatility Spillover across Equity Markets European Evidence," Applied Financial Economics, 8(3),245-256.

[15] MacKinnon, J. G. (1996), 'Numerical distribution functions for unit root and cointegration tests', Journal of Applied Econometrics, 11, 601–618.

[16] Mardi D., and R. Fey,(2009) "The identification of fiscal and monetary policy in a structural VAR", Economic Modelling, 26, 1147-1160.

[17] Matteo Iacoviello (2005) "House Prices, Borrowing Constraints, and Monetary Policy in the Business Cycle; " The American Economic Review.6 : 739-762.

[18] Ong, S. E.(1995). Singapore real estate and property stocks–a cointegration test. Journal of Property Research, 12, 29-39.

[19] Wilson, J., and P.Wilson and Zurbruegg R. (2002). "Relationships Between Australian Real Estate and Stock Market Prices – a Case of Market Inefficiency", Journal of Forecasting 21, 181-192.

[20] Pagan,A.R., and Pesaran, M.H.,(2008) "On the econometric analysis of structural systems with permanent and transitory shocks and endogenous variables.", Journal of Economic dynamics and control 32(10), 3376-3395。 .

[21] Wilson, P. and J. Okunev (1997), "Using Nonlinear Tests to examine integration between real estate and stock markets", Real Estate Economics, l25(3), 487-503

[22] Zeno.Adams and Roland Fuss (2010), "Macroeconomics determinants of international housing markets", Journal of housing Economics, l9, 33-50.

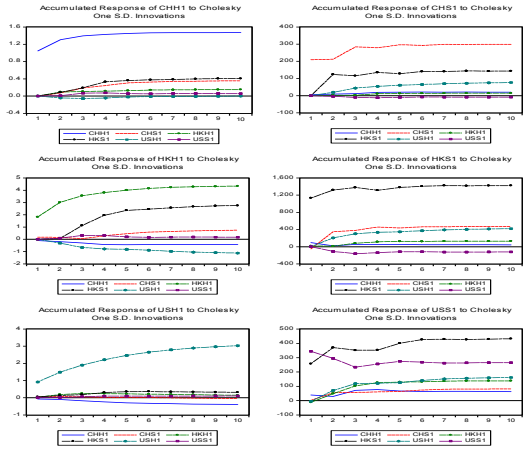

Figure 1

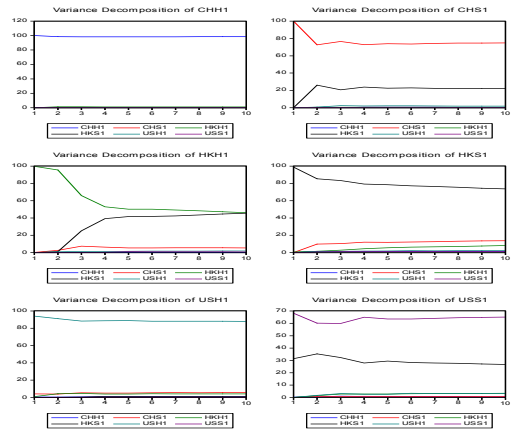

Figure 2