Taiwan Real Estate Market in Post Asian Financial Crisis Period

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Abstract

When Asian financial crisis damaged the real estate markets in Southeast and East Asia, it seems had little impact on the real estate market in Taiwan. However, the long-lasting recession in the real estate market was projected to cause the domestic financial crisis during the post Asian crisis period. Our empirical evidences support the widely believed viewpoint that Asian crisis did not have a significant impact on the real estate market in Taiwan right away. The real estate market performance did cause the stock market performance during the post crisis period. However, we do not find strong evidences showing that the real estate market performance has caused the performance of the banking system since the Asian financial crisis.

Keywords: Asian Financial Crisis, Real Estate Market, Structural Change, Granger Causality

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1. Introduction

Asian financial crisis hit East and Southeast Asia in 1997. King (2001) suggests that the Asian financial crisis was triggered by Japanese commercial banks[1] who reduced their exposure to Asia in response to emerging troubles in Thailand and South Korea. Kwack (2000) finds the 3-month loan interest rate and non-performing loan rates of banks are major determinants of the Asian financial crisis. Quigley (2001) suggests that activities of real estate market were an important contributing force to the financial crisis of 1997 in the Asian economies.

How did the Asian Crisis influence the real estate markets in Southeast and East Asian economies? The financial crisis did greatly affect the real estate markets of several Asian economies. Kim (2000) points out that both purchase price of housing and the construction of new house dropped dramatically in Korea. Leung, Cheng and Leong (2002) observe the residential housing price in Hong Kong has dropped by 50% and the price for both office and industrial property has dropped by more than half. Renuad(2000) indicates the vacancy rate of downtown residential property in Bangkok reached the peak. Mera and Renaud (2000) and Quigley (2001) mention

[1] Before the crisis, Japanese banks had been severely weakened by the collapse of the real estate market and stock market bubble in 1990.

that both property prices and occupancy rates have declined dramatically in other Asian markets.

Compared to other Asian economies, the real estate market in Taiwan seems only slightly affected by the Asian financial crisis. As shown in Figure 2, the real estate cycle indicator[2] did not fluctuate dramatically during the crisis period. The housing price did not drop significantly and the number of vacant house did not jump dramatically during the crisis period. Other real estate indicator variables such as the land incremental tax revenue and quantity of house traded did not change dramatically either.[3]

In addition to statistical evidences, there are several intuitive reasons for real estate researchers to claim that the Asian crisis did not have a significant impact on Taiwan's real estate market. First, Taiwan's real estate market had not been internationalized.[4] Second, both macroeconomy and financial sector were influenced lightly during the crisis period.[5] Third, Taiwan real estate market had

[2] It comprises of the registered number of transferred land, the area of housing construction license permit, the average percentage change in the median prices of pre-sales and existing house, and the use rate of house.
[3] See Figure 3~Figure 6.
[4] Taiwan's real estate market was not open to the international communities. Therefore, the crisis in other economies did not have contagious effects on Taiwan's real estate market.
[5] See Naughton (2000).

experienced a long-lasting real estate recession before the crisis[6]. The real estate market had been trapped in a trough of the real estate cycle, so it was not observed a significant fluctuation during the crisis period.

It is widely believed, but the hypothesis, to our knowledge, has not been tested. Using the structural change test, the paper examines weather Asian financial crisis had the immediate effect on the real estate market as well as macroeconomy and the financial sector in Taiwan. Our empirical evidences support the widely believed viewpoint that the Asian crisis did not have an immediate and negative impact on the real estate market in Taiwan.

The real estate recession has become more serious since the Asian financial crisis. The real estate cycle indicator continued to fall after financial crisis. Foreign research institutes and medias predicted the financial sector was in danger of domestic crisis during the post crisis period. One of possible causes is the long-lasting real estate recession.[7] Using the Granger Causality test, we examine the causality relationship between the real estate market and the financial sector during the post

[6] The real estate market had been performing very well during the period from the first oil crisis in 1972 to the bubble economy in late 1980s. The real estate market in Taiwan, however, has been experiencing the downturn and the recession since the early 1990s.
[7] The other possible cause is the poorly performed macroeconomy.

crisis period. We find the poor performance of real estate market did cause the poor performance of the stock market during the post crisis period. We do not, however, find strong evidences showing that the poor performance of real estate market has caused the poor performance of banking system.

In addition, we also examine the causality relationship between the real estate market and the macroeconomy. Traditionally, several macroeconomic variables[8] are usually considered as the leading indicators of the real estate market performance. Our empirical results find that these key macroeconomic variables are more likely to granger cause the real estate variables. This finding supports the hypothesis that macroeconomic variables such as gross domestic product, money supply and consumer price index are leading indicators of the real estate market.

The remainder of our paper is laid out as follows: the next section will introduce the real estate market performance over time. Data and variables are described in section three. Section four discusses econometric methodologies employed in the study. Empirical results are displayed in section five. Section six has the concluding remark.

[8] They are GDP growth rate, money supply change rate, the total amount of bank loan for construction, CPI change rate.

2. Taiwan's Real Estate Market in Past Decades

Before the Asian financial crisis happened, Taiwan's real estate market had experienced three big cycles since 1970. The main reasons for the first two cycles were the 1st and 2nd oil crisis. The major reason for the third cycle was the bubble economy. Figure 2 indicates that the recent peak of the real estate cycle before the financial crisis happened in 1992. The real estate market has experienced a long period recession since then. The real estate cycle did not have a significant volatility during the crisis period of 1997~1998. However, the real estate cycle indicator (RECI) continued to fall after 1998.

In addition to the real estate cycle indicator, we can also describe the real estate market performance over time using various key real estate variables. Pre-sales median housing price (HPM), land value incremental tax (APPTAX), and traded quantity of house (Q) can be considered as trade side indicators of real estate market. As shown in Figure 3, the median price of pre-sales house had been maintained above 200 thousands per ping[9] since 1990. The price level did not drop significantly

[9] 3.3 square meters.

during the Asian crisis period. It has been very stable since the crisis. Owing to high land costs, the housing price has a downward rigidity regardless of real estate cycle. Figure 4 indicates that the land incremental value tax revenue reached the peak in 1992 and fell gradually afterwards. It even went up temporarily during the crisis period. However, it had been falling quickly during the post crisis period. Figure 5 shows that the quantity of house traded had started to fall since reaching the peak in 1988. However, it had been remained at a stable level till 2000. The quantity fell significantly in 2001 and then gradually climbed lately.

The quantity of vacant house (VAC) can be used as the use side indicator of real estate market. The quantity of vacant house, shown in Figure 6, jumped dramatically in 1994 and then has been remained at a high level since then. However, there was no big increase in the quantity of vacant house during the crisis period.

We can use the construction stock index (CSTK) as the investment side indicator of real estate market. The construction stock index, as shown in Figure 7, dropped dramatically from the peak in 1991. After remaining at a low level for a while, the index even climbed during the period of financial crisis. However, it fell

dramatically right after the financial crisis. The index reached the lowest point in 2002.

The area of construction license permit (PERMIT) can be considered as the production side indicator of real estate market. The area of construction license permit reached the peak in 1994 and then fell gradually afterwards. It was maintained at a steady level during the crisis period, but fell dramatically during the post crisis period.

Generally speaking, most real estate researchers have not been optimistic on the performance of the real estate market. The collapse of the stock market in the last years made the real estate market recession even worse. One major effect on the real estate market of shrinking stock assets was the low incentive to purchase a property. A lot of developers and construction companies went bankruptcy and exited the industry during this time. In addition to these factors, the poor performance of the macroeconomy continued to erode consumer's confidence. The real estate market, therefore, has done poorly since the beginning of 21st century. In the third quarter of 2001, according to Taiwan real estate cycle indicators, the market was still in the trend of recession. Although most indicators are still not performing well, the real estate market has shown the initial signs of recovery beginning in the

fourth quarter of 2001. Owing to several government's favorable policies as well as the recovery of international economic cycle, more people believe the real estate market is going to recover slowly in coming years.

3. Related Variables and Data Description

In addition to various real estate variables mentioned in the previous section, we include several key macroeconomic and financial variables in our empirical study. Gross domestic product (GDP), money supply (M1b), consumer price index (CPI) are used as macroeconomic indicators, while primary loan interest rate (PR), Taiwan stock weighted index (TSTK) and Non-Performing Loan Ratio (NPLR) are used as financial indicators.

Table 1 summarizes the definition, unit, and data source of various empirical variables used in the study. The real estate cycle indicator (RECI) is obtained from the "Real Estate Cycle Indicators Report".[10] The data of the pre-sales median price of house (HPM) is obtained from the Rental Report. The quantity of house traded (Q) is calculated according to the number of reported house trade tax provided by

[10] It is published by Building Research Institute, Ministry of Interior, and Taiwan Real Estate Research Center, National Chengchi University, Taiwan.

Taipei Tax Statistical Annual Abstract. The quantity of vacant house[11] is calculated according to the data of Tai Power Company. The data source of the area of construction permit (PERMIT) variable is the Construction Statistical Annual Abstract. Both data of land value incremental tax (APPTAX) and construction stock index (CSTK) are provided by AREMOS data set of Ministry of Education. The AREMOS data set of Ministry of Education also provides information regarding various macroeconomic and financial variables. Both the real estate cycle indicator and non-performing loan ratio are the seasonal data, while all other variables are monthly data. The data samples of RECI, APPTAX, Q, GDP, M1b, PR, and TSTK cover from the first quarter of 1971 to the third quarter of 2001. The data of HPM started from the first quarter of 1974. The data of VAC, CSTK, and PERMIT started from the first quarter of 1980, 1981, and 1982, respectively. We only have the data of NPLR starting from June of 1995. We use the July of 1997 as the break point to divide the full time period into two sub-periods: ante crisis period and post crisis period. As shown in Table 2, we find the time series data of these variables are non-stationary according to the unit root test results. They are all integrated one I(1).

[11] The house is defined as a vacant house as the household's consumption of electricity is lower than a certain degree.

4. Methodology

Structural Change

The econometrics literature contains a vast amount of work on issues related to structural change, most of it specifically designed for the case of a single structural change. The structural change is a statement about parameters, which only have meaning in the context of a model. We say that a structural break has occurred if at least one of these parameters has changed at some *breakdate* in the sample period. Chow(1960) is the typical and classical test for structural change. He splits the sample into two subperiods, estimates the parameters for each subperiod, and then tests the equality of the two sets of parameters using *F* statistics. This Chow test was extended to cover various econometric models of interest. [Andrews and Fair (1988)]. The limitation of the Chow test is that the *breakdate* has to be known in advance. In some cases, similar breakdates give very different answers. The necessary solution is to treat the breakdate as unknown. Quandt (1960) proposed a solution taking the largest Chow statistic over all possible breakdates.[12] This is Quandt's statistic.

[12] This is the likelihood ratio test under normality.

If the breakdate is unknown a prior, then the chi-squared critical values are inappropriate and the Quandt statistic had no practical application. Therefore, the recent econometrics literature has switched the interest to various models with an unknown change point. [Andrews (1993), Andrews and Ploberger (1994), and Hansen (1997)] The literature addressing the issue of multiple structural changes is relatively rare. Chong (1995) shows how to estimate multiple breakdates sequentially. Bai and Perron (1998) consider the more general case of a partial structural change model where not all parameters are subject to shifts. Their method is sequential, starting by testing for a single structural break. If the test rejects the null hypothesis that there is no structural break, the sample is split in two and the test is reapplied to each subsample. This sequence continues until each subsample test fails to find evidence of a structural break. Chong (2001) develops a comprehensive asymptotic theory for an AR(1) model with a single structural break of unknown timing.

This paper would like to test weather the Asian financial crisis had the impact on the real estate market, macroeconomy, and the financial sector. We examine weather various variables had structural change at the time point when the Asian financial

crisis happened. The breakdate time point is exogenous, so we use both Chow's and Quandt's statistic to test the structural change. Since the financial crisis period covers from 1997 to 1998, we choose two exogenous breakdate time points to test the structural change. One is the starting point of crisis period July of 1997; the other is the ending point of crisis period December of 1998.

Granger Causality Test

One common use of vector autoregression (VAR) has been in testing for causality between variables. Causality defined by Granger (1969) is inferred when lagged values of a variable, say x, have explanatory power in a regression of a variable y on lagged values of y and x. The VAR can be used to test the hypothesis. Granger (1988) discussed some developments in a concept of causality.

We use the Granger Causality tests to examine the causality relationship between the real estate variables, macroeconomic variables and financial variables. We test each pairwise combination of one real estate variable and one macroeconomic or financial variable. In addition to using the full time period, we also examine the causality relationships for two sub-periods: ante crisis period and post crisis period.

5. Empirical Results

As shown in Table 3, we find real estate cycle indicator (RECI) did not have structural changes during Asian financial crisis period.[13] In addition, we find all real estate variables excluding the construction stock index did not have structural changes using July of 1997 as the breakdate. As what we mentioned earlier, the construction stock index even went up temporarily during the crisis period. This was not, however, because of the Asian financial crisis. If we use the December of 1998 as the breakdate, all real estate variables except the land incremental value tax variable did not have structural changes. The lock-in effect, but not the crisis effect, could be the major reason for the structural change of the land incremental value tax variable during the crisis period. According to these structural change test results, we find that the Asian financial crisis did not have a negative and significant influence on the real estate market during the crisis period.

Contrary to real estate variables, several key macroeconomic and financial

[13] Using either June of 1997 or December of 1998 as the breakdate.

variables such as gross domestic product (GDP), consumer price index (CPI) and Taiwan stock index (TSTK) all experienced structural changes during the financial crisis period. In addition, money supply (M1b) did have the structural change on July of 1997, while it did not have the one on December of 1998. Both primary loan interest rate (PR)[14] and non-performing loan ratio (NPLR)[15] did not have structural changes during the crisis period. By summarizing these results, we find macroeconomic performances and stock market performance did have changes during the crisis period. However, we do not have strong evidences showing that the changes in Taiwan's macroeconomy and stock market during that period were simply due to the Asian crisis.

Figure 1.1~1.3 show the granger causality test results. On the left hand side of each figure, we list various macroeconomic and financial variables. Real estate variables are listed on the right hand side of each figure. The arrow sign indicates that one variable granger causes another variable.

As shown in Figure 1.1, we find macroeconomic variables were more likely to granger cause the real estate variable in past decades. For instance, gross domestic

[14] The possible reason is that the primary loan interest rate has a downward rigidity in Taiwan.
[15] The non-performing loan ratio was remained at 4.5% during the crisis period. See Figure 10.

product granger causes the land incremental value tax, the quantity of house traded, and the construction stock index. The money supply granger causes the median price of pre-sales house, the land incremental value tax, the quantity of traded house, and the construction stock index. The consumer price index granger causes the quantity of vacant house. On the other hand, the real estate variable was less likely to granger cause macroeconomic variables. One of few examples is that both land incremental value tax and the quantity of vacant house granger cause gross domestic product. These results confirm that gross domestic products, money supply and consumer price index are considered as the leading indicators, but not coincident indicators of the real estate market in Taiwan.

Taiwan stock index granger causes the real estate cycle indicator and the quantity of traded house, while both the quantity of vacant house and construction stock index granger cause Taiwan stock index. This suggests that the real estate market and stock market had mutual causalities in past decades. Both housing price and construction stock index granger cause the primary loan interest rate. In addition, we find the non-performing loan ratio has no causality relationships with any real estate variable. This outcome is possibly because the non-performing loan ratio has a too short time length of the sample period. Therefore, we cannot make any

conclusion on the causality relationship between the real estate market and the non-performing loan ratio.

If we only use the time series data prior to the Asian financial crisis, shown in Figure 1.2, we find similar results[16] with those obtained using the data of the full time period. Macroeconomic variables were also more likely to granger cause the real estate variable during the ante crisis period. Compared to other variables, the money supply was the most likely to granger cause real estate variables, while the quantity of house traded was the most likely to be granger caused by macroeconomic variables during that period. Gross domestic product granger causes the quantity of traded house and the construction stock index, while the real estate cycle indicator and the quantity of vacant house granger cause the gross domestic product.

During the post crisis period, as shown in Figure 1.3, the causality relationships between real estate variables and macroeconomic variables became ambiguous. One possible reason for this is the time length of the post crisis period is short. We find the money supply did not granger cause any real estate variable, while the housing price granger causes the money supply during the post crisis period. However, both gross domestic product and consumer price index were still more likely to granger

[16] The ante crisis period covers the most part of the full time period.

cause real estate variables during that period. For instance, gross domestic product granger causes the land incremental value tax, while the consumer price index granger causes both the quantity of house traded and the quantity of vacant house.

The primary loan interest rate granger causes the housing price during the post crisis period. In addition, both the quantity of vacant house and the construction license permit granger cause Taiwan stock index. This suggests that poor performance in the real estate market did cause the poor performance in the stock market during the post crisis period. We still do not find a significant causality relationship between the real estate market and the non-performing loan ratio during the post crisis period.

6. Conclusion

The Asian financial crisis greatly affected the real estate markets of several Asian economies. However, it seems did not have a significant impact on the real estate market in Taiwan. Using the structural change test, our empirical evidences prove that the Asian financial crisis did not have an immediate and negative impact on the real estate market in Taiwan.

By summarizing the granger causality test results, we find macroeconomic variables are generally more likely to granger cause real estate variables. This finding confirms that macroeconomic variables such as gross domestic product, money supply, and consumer price index should be considered as leading indicators, but not coincident indicators of the real estate market.

Our results suggest that both real estate market and stock market had mutual causalities in past decades. However, the real estate market performance did cause the stock market performance during the post crisis period. There do not exist strong evidences showing that the real estate market performance did cause the performance of the banking system after the Asian crisis happened.

This paper is not finished yet. We would also like to test when real estate market had structural changes during the post crisis period using the frontier technique of endogenous breakdate points in the near future.

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Table 1. List of Variables

Variable	Definition	Unit	Data source
RECI	Real Estate Cycle Indicator	points	Real Estate Cycle Indicators Report
HPM	Median price of Pre-sales housing	Ten thousands/ping	Rental Report
APPTAX	Land Value Incremental Tax	Thousands	AREMOS
Q	Traded quantity of house	units	Tax Statistical Abstract
VAC	Vacancy quantity	Households	Tai-power
CSTK	Construction Stock Index	points	AREMOS
PERMIT	Area of construction permit	Square meters	Construction Statistical Abstract
GDP	Gross Domestic Product	Million	AREMOS
M1b	Money supply	Million	AREMOS
CPI	Consumer Price Index	%	AREMOS
PR	Primary loan rate	%	AREMOS
TSTK	Taiwan Stock Index	points	AREMOS
NPLR	Non-Performing Loan Ratio	%	AREMOS

Table 2. Unit root test

Variables	5% critical value	1% critical value
RECI	**I(1)**	**I(1)**
HPM	**I(1)**	**I(1)**
APPTAX	**I(1)**	**I(1)**
Q	**I(1)**	**I(1)**
VAC	**I(1)**	**I(1)**
CSTK	**I(1)**	**I(1)**
PERMIT	**I(1)**	**I(1)**
GDP	**I(1)**	**I(1)**
M1b	**I(1)**	**I(1)**
CPI	**I(1)**	**I(1)**
PR	**I(1)**	**I(1)**
TSTK	**I(1)**	**I(1)**
NPLR	**I(1)**	**I(1)**

Table 3. Structural Change Test

Variables/breakdate	June, 1997	December, 1998
RECI	No structural change	No structural change
HPM	No structural change	No structural change
APPTAX	No structural change	Structural change
Q	No structural change	No structural change
VAC	No structural change	No structural change
CSTK	Structural change	Structural change
PERMIT	No structural change	No structural change
GDP	Structural change	Structural change
M1b	Structural change	No structural change
CPI	Structural change	Structural change
PR	No structural change	No structural change
TSTK	Structural change	Structural change
NPLR	No structural change	No structural change

Note: We use both F-statistic and Log-likelihood ratio to judge weather the variable has the structural change at the exogenous breakdate.

Figure 1.1. Granger Causality Test Results

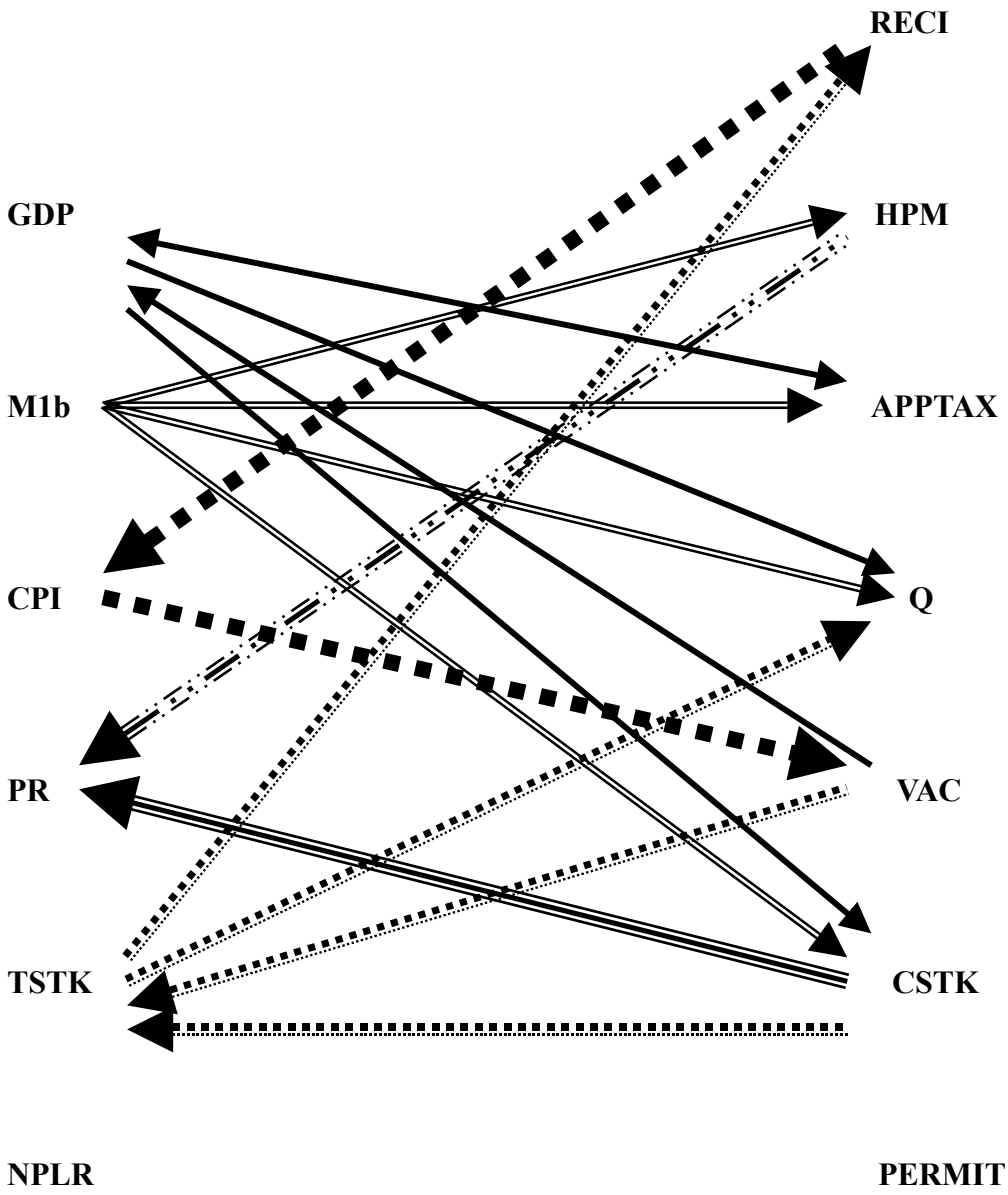

Figure 1.2. Granger Causality Test Results (ante crisis period)

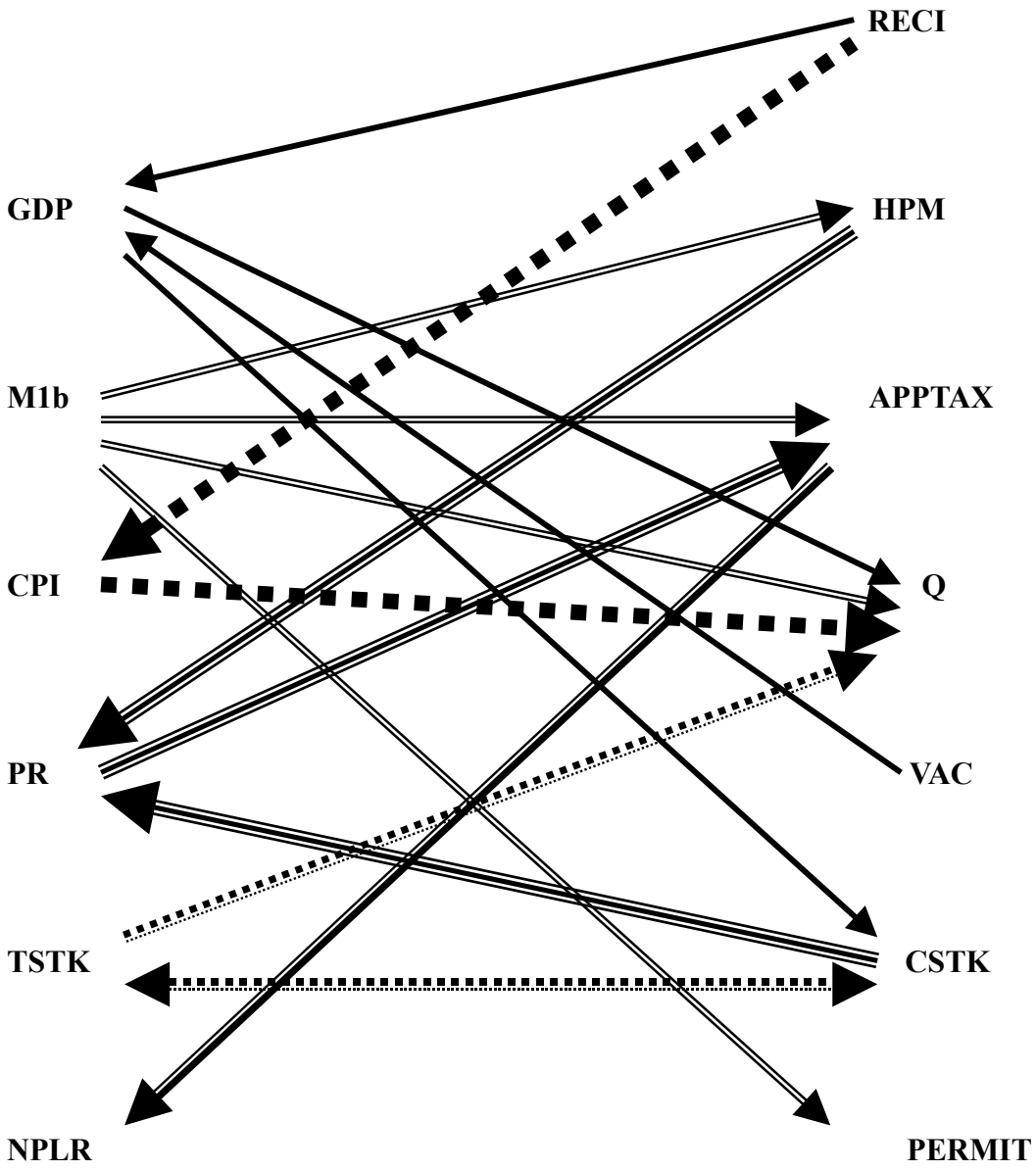

Figure 1.3. Granger Causality Test Results (Post crisis period)

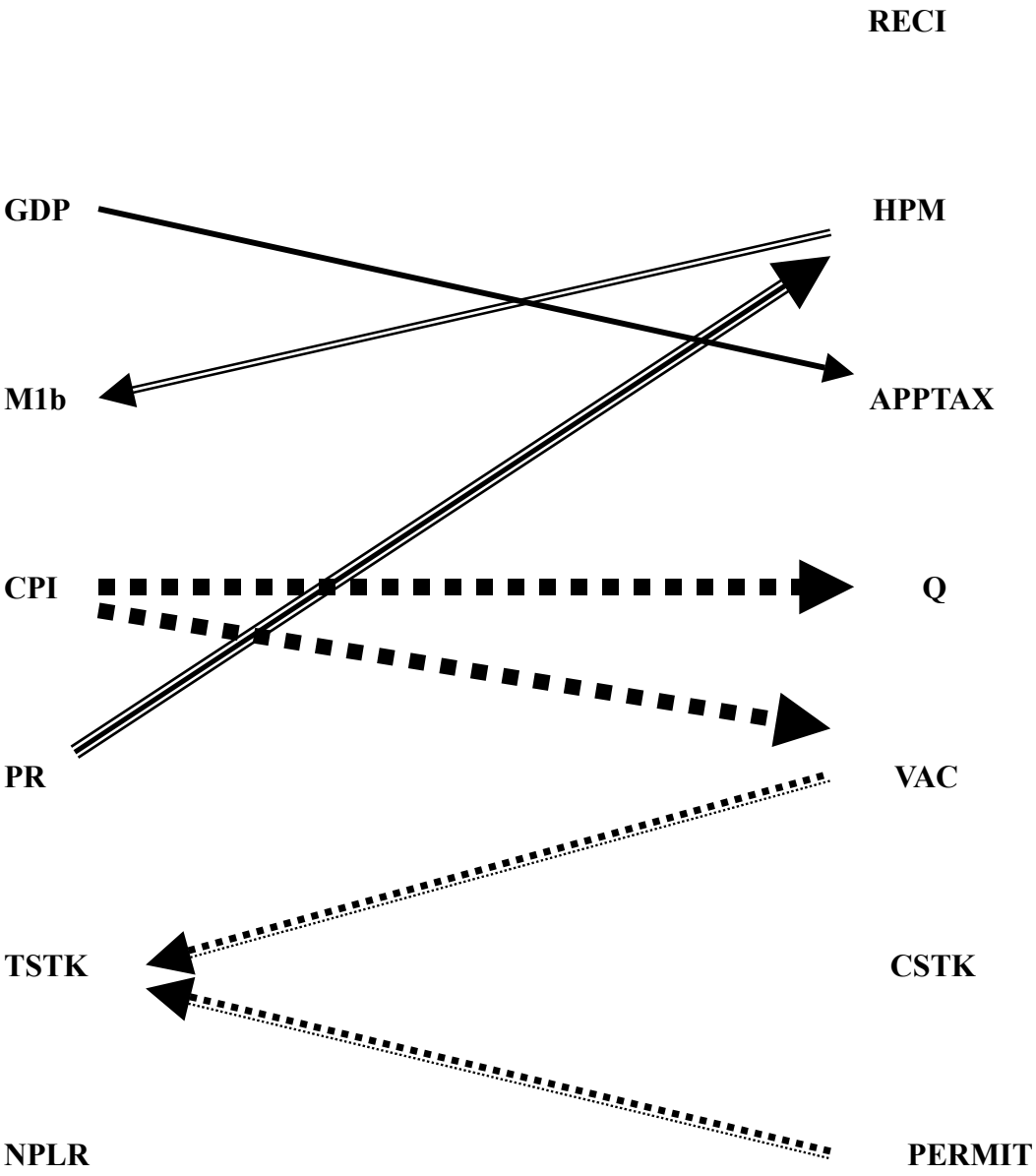

Figure 2. Real Estate Business Cycle

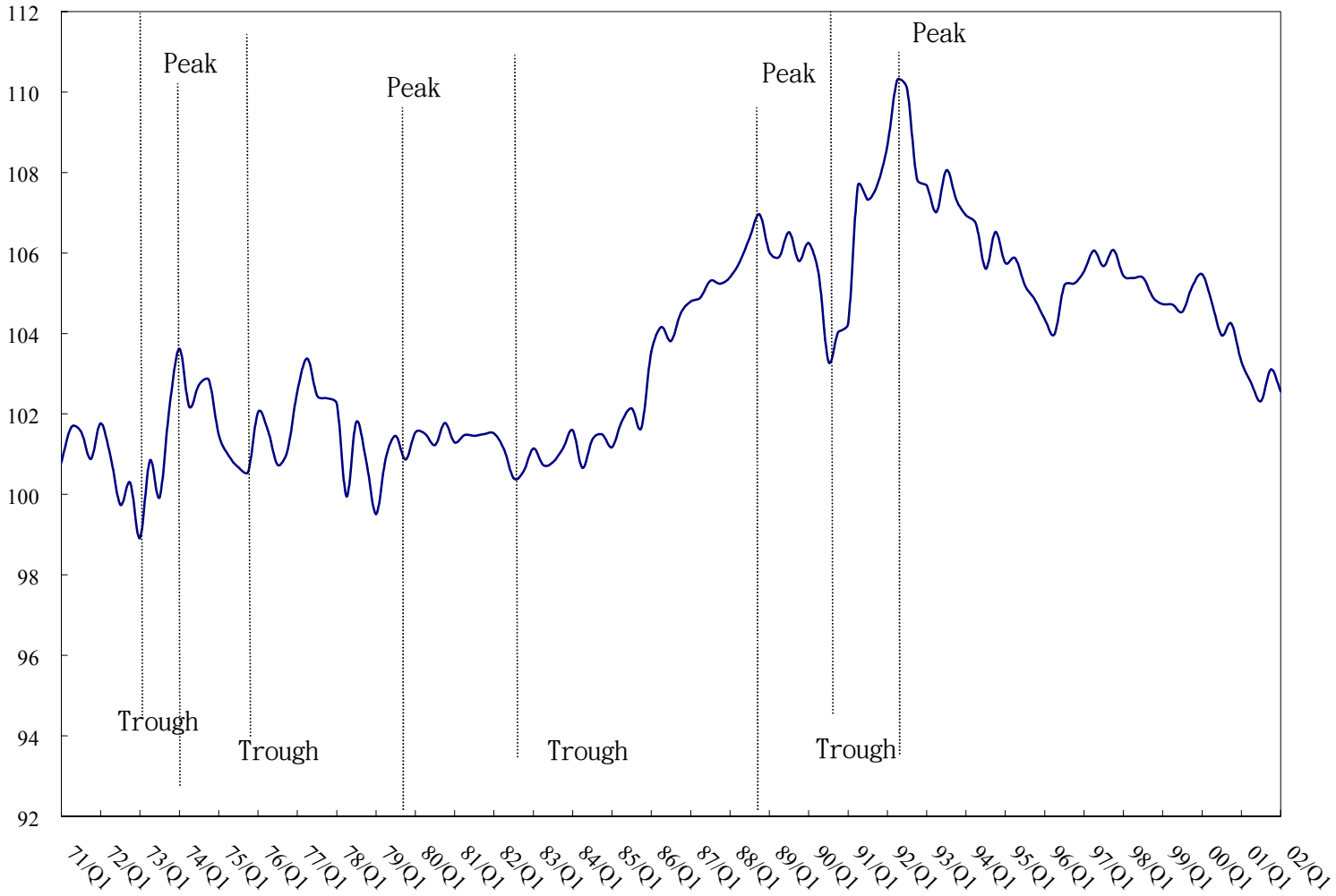

Figure 3. Median Price of Pre-sales Housing (thousands/ping)

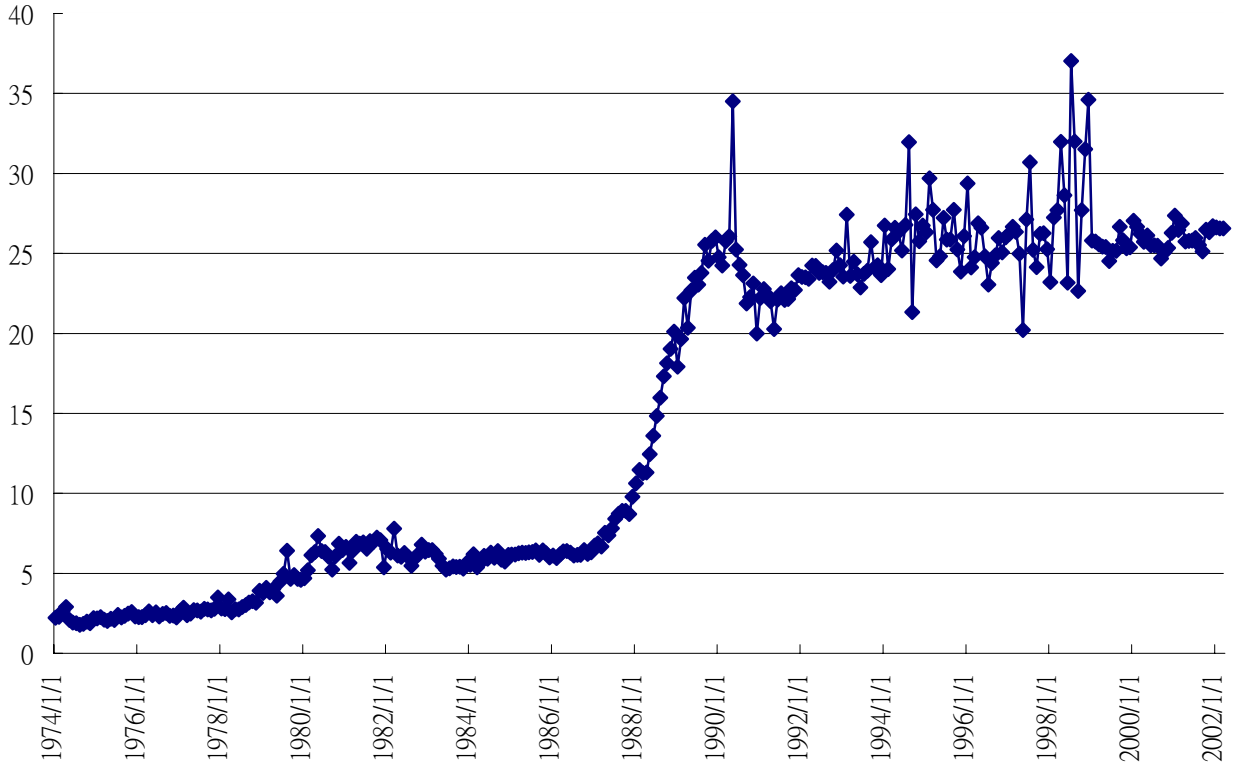

Figure 4. Land Value Incremental Tax(ten million)

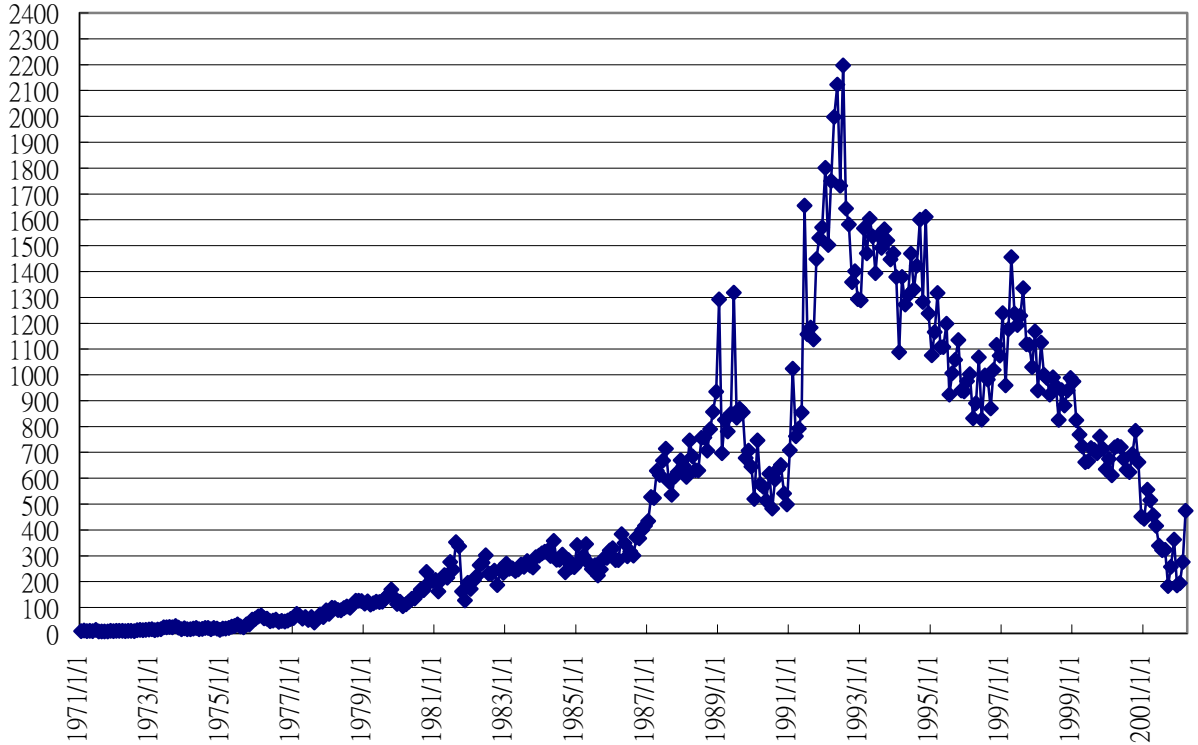

Figure 5. Traded Quantity of House

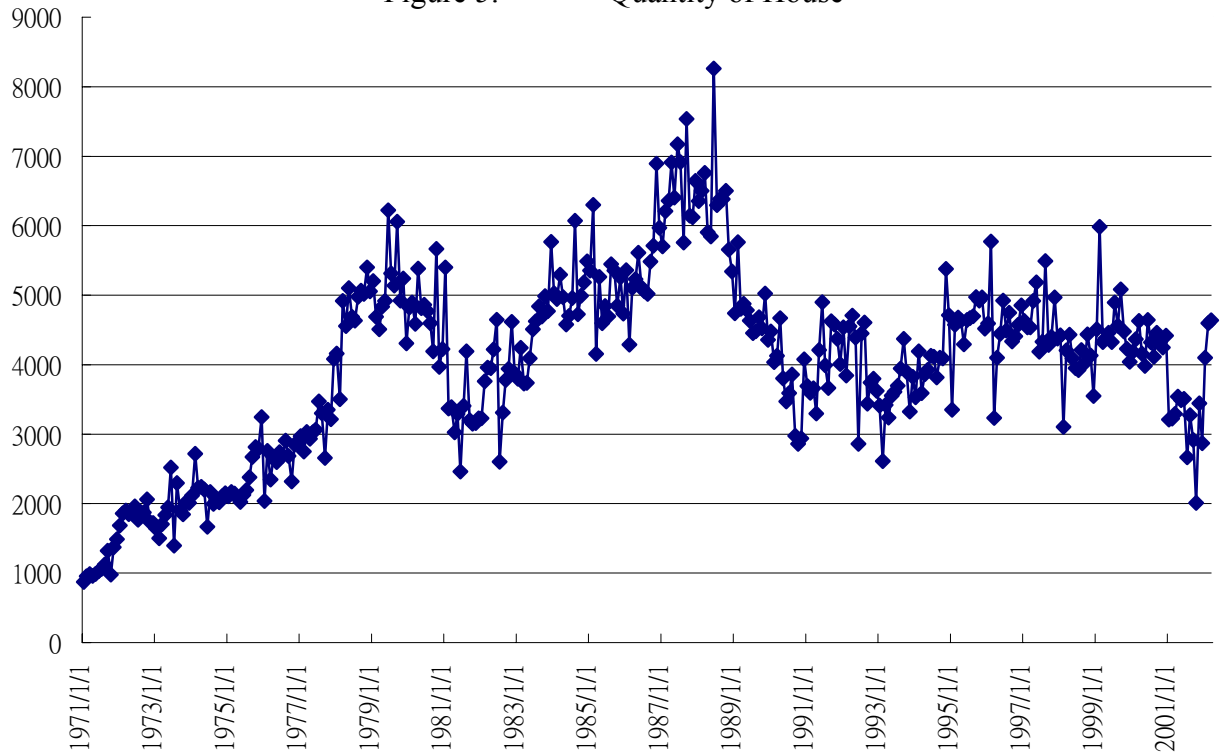

Figure 6. Vacant House

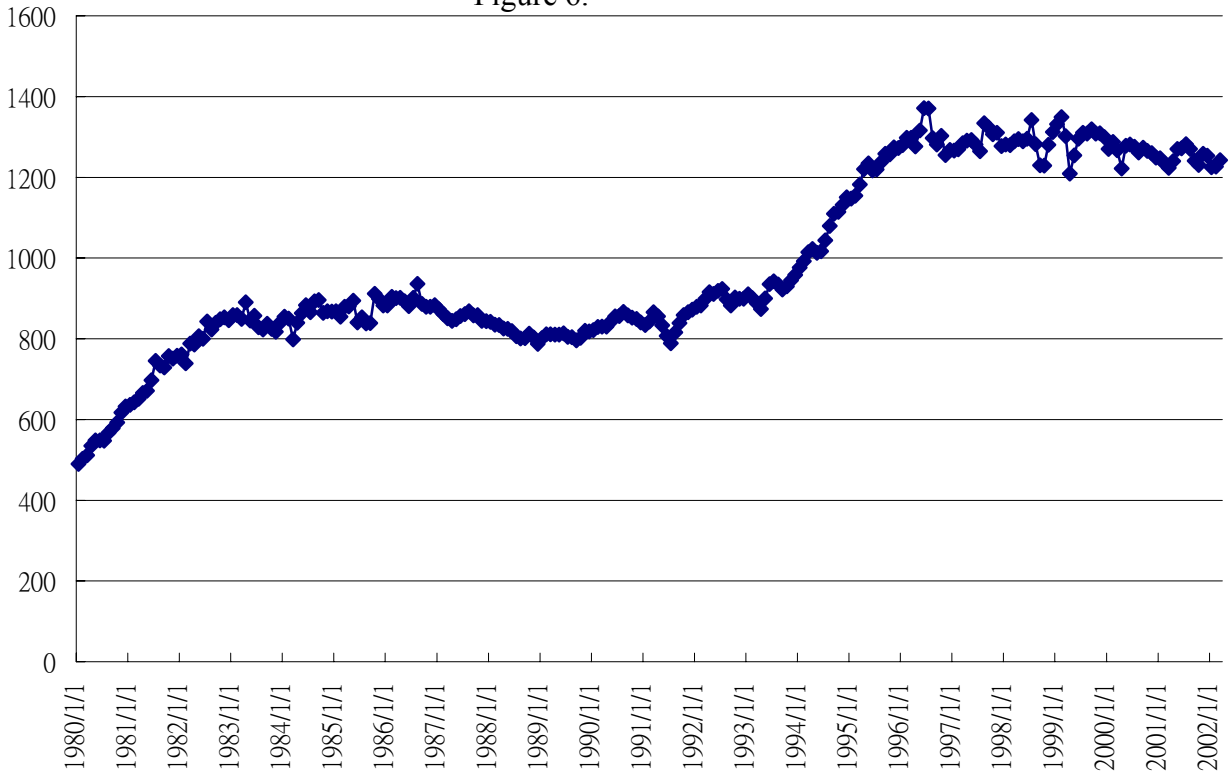

Figure 7. Construction Stock Weighted Index

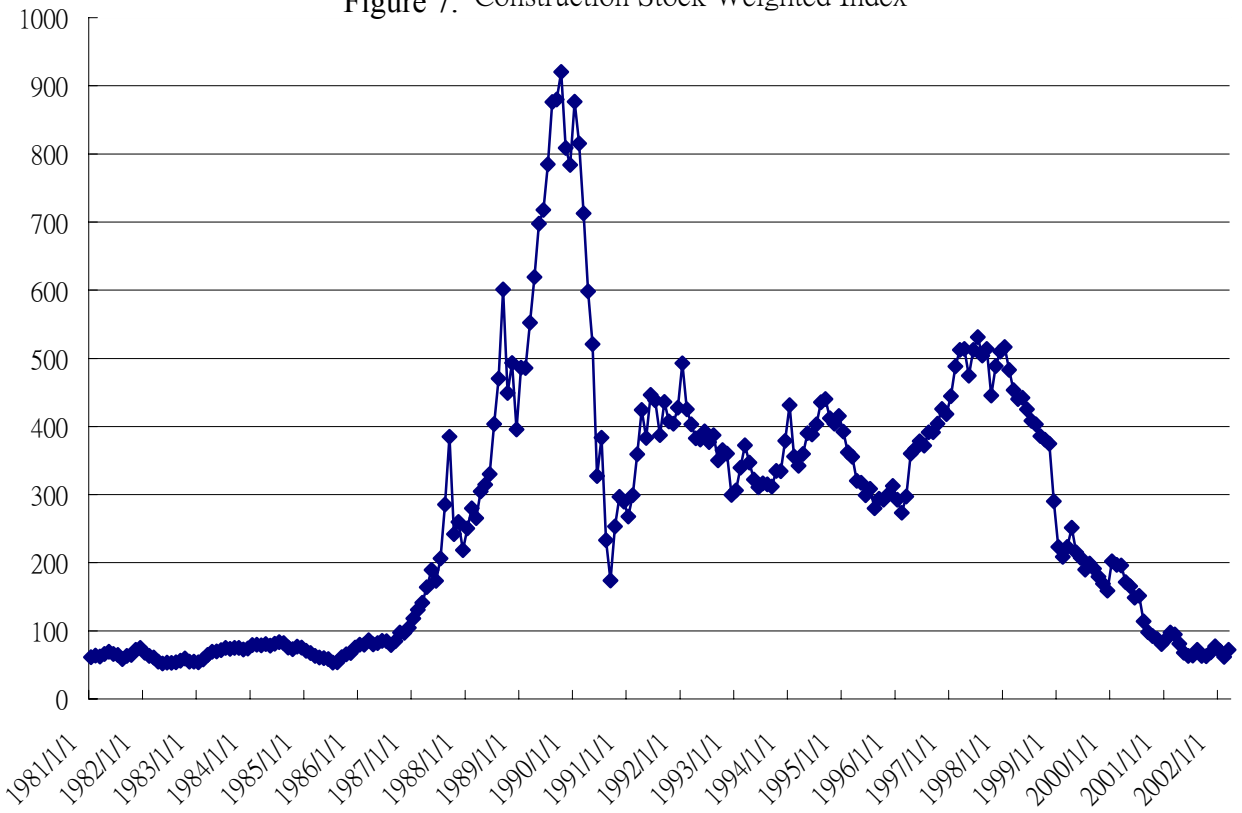

Figure 8. Construction License permit(Square Meters)

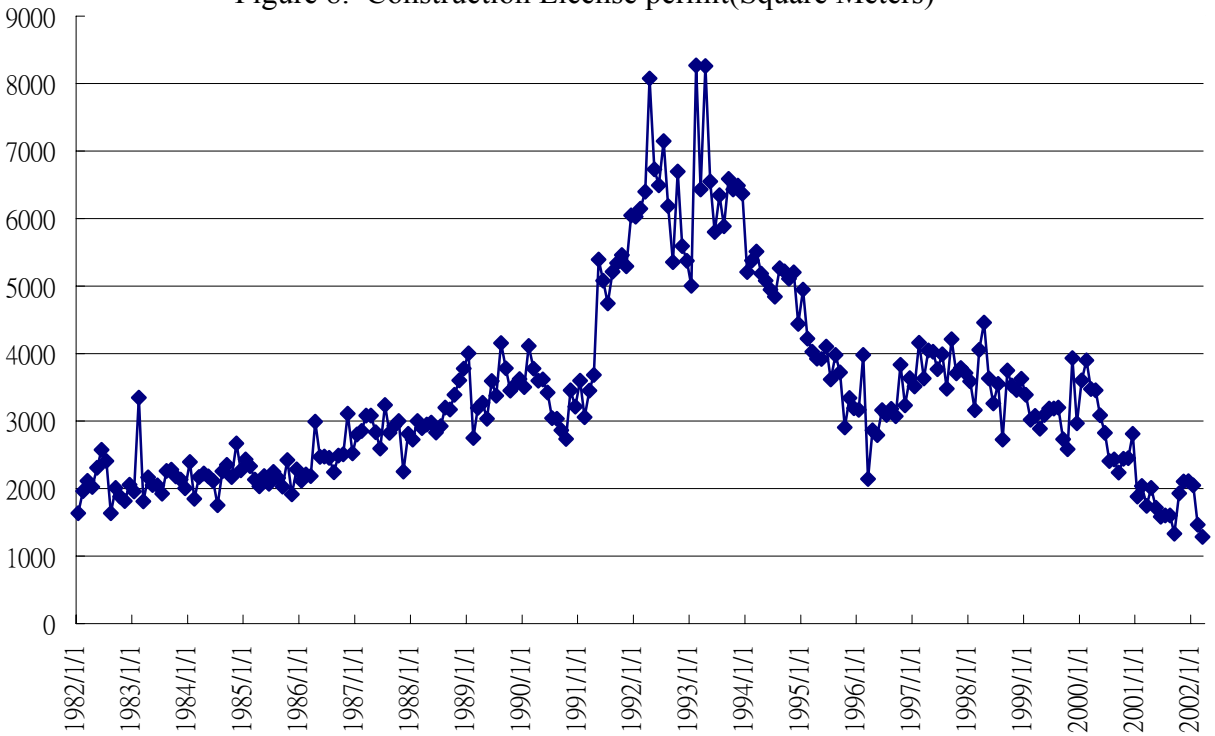

Figure 9. Taiwan Stock Weighted Index

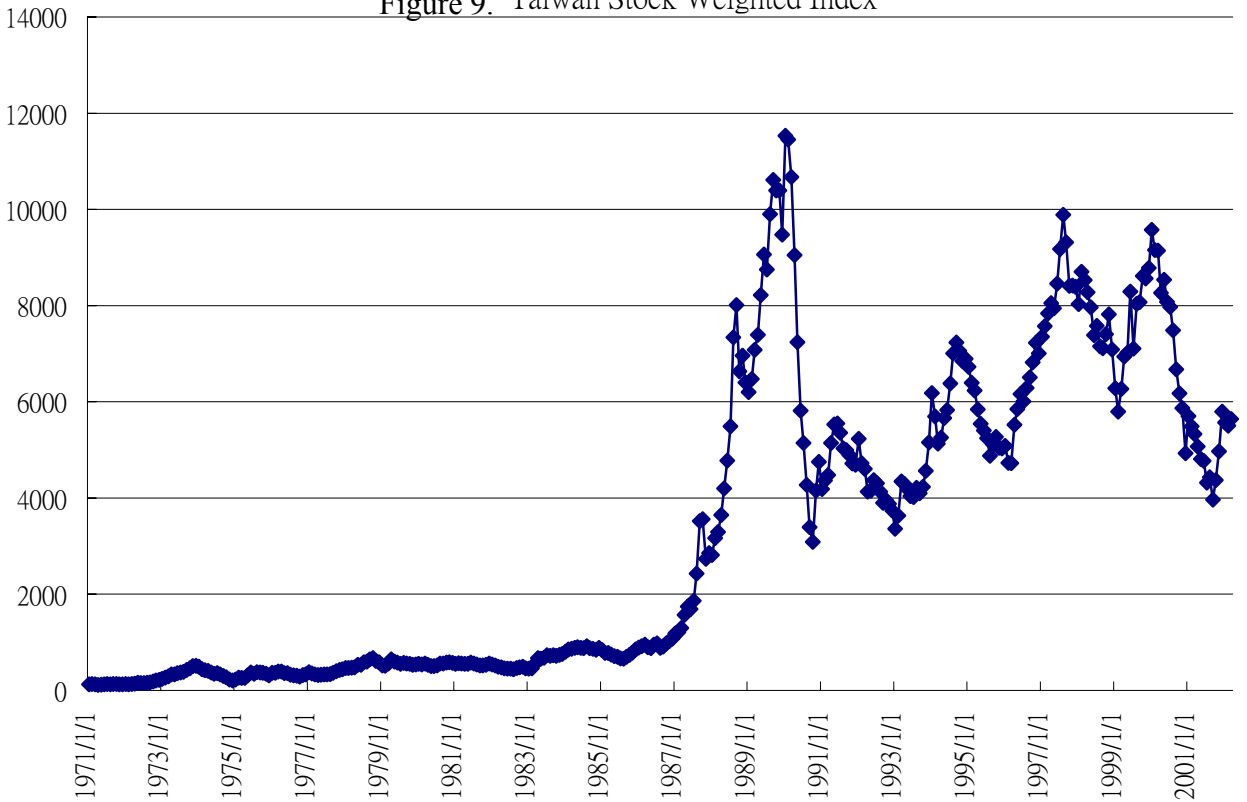

Figure 10. Non-Performing Loan Ratio