The effect of housing prices on consumption and economic growth – the case of Taiwan

Tsoyu Calvin Lin, Shih-Hsun Hsu & Yu-Lun Lin

Published online: 06 May 2019.

Submit your article to this journal ☐

View Crossmark data ☐

Routledge
Taylor & Francis Group

Check for updates

The effect of housing prices on consumption and economic growth – the case of Taiwan

Tsoyu Calvin Lin[a] , Shih-Hsun Hsu[b] and Yu-Lun Lin[a]

[a]Department of Land Economics, National ChengChi University, Taipei City, Taiwan; [b]Department of Economics, National ChengChi University, Taipei City, Taiwan

ABSTRACT

In many countries around the world since the subprime-mortgage crisis in 2008, soaring housing prices under central governments' quantitative easing (QE) monetary policies have deteriorated home affordability. For example, in Taipei's environment of long-term low property taxes, the price-to-income (PTI) ratio reached 16 in 2014, which is higher than the corresponding ratios in most cities around the world. The fiscal pressure that mortgage payments impose on households seems to crowd out their consumption capability and thus to counter economic growth. However, current literature has revealed diverse effects of housing prices on consumption in far-flung countries. To discover the influence of housing prices on consumption and economic growth, we collected data in Taiwan for empirical analysis. Results show that the stock price index has had a significant positive effect on consumption, whereas interest rates have played a minimal role in consumption. Results also show that rising house prices have had a negative effect on consumption, indicating that high housing prices trigger the crowding-out effect on consumption and in turn contribute to sluggish economic growth. The findings of this study provide the government in Taiwan with policy implications for directing housing prices in ways that facilitate both long-term housing affordability and economic sustainability. Further, this paper explains that, across countries, differences among homeowners' home-equity 'cash-out' behaviors may help explain the differences among the behaviors' diverse effects on consumption. Results of this study not only empirically strengthen academia's knowledge of housing prices' effects on consumption but also suggest that the policy-driven development or promotion of home-equity financing may enhance consumption and revive flagging economies.

1. Introduction

After the end of global deflation in 2002, Taiwan experienced moderate economic growth until 2007. In 2008, the subprime mortgage crisis struck the United States and severely deteriorated the worldwide economy and asset markets. To promote

economic growth, the government of Taiwan in 2009 implemented a quantitative easing (QE) monetary policy,[1] intending to spur economic growth through 'transmission effects'.[2] The implementation of the QE policy led to a significant surge in housing prices in Taiwan. As shown in Figure 1, the House Price Index (HPI) in Taiwan's major cities rose from index 100 in 2003 to 150 in 2008, and then – after the implementation of the QE policies – continuously soared to 290 in 2013. During the same period, the economy experienced slow growth (Figure 2) and wages stagnated.

The surge in housing prices not only deteriorated housing affordability for the majority of Taiwan's population but also raised the question of whether or not high housing prices can cyclically spur consumption and economic growth. If a continuous increase in housing can be proved to lead to positive consumption and economic growth, then governments should orient their economic policy toward promotion of housing investment, regardless of whether the investment involves homeownership or house hoarding. The following equation shows the current breakdown of gross domestic product (GDP) in Taiwan, and Figure 3 illustrates the related historical trends.

$$GDP = \text{domestic consumption } (60\%) + \text{ investment } (20\%) \\ + \text{ government spending } (10\%) + (\text{export–import})(10\%)$$

Before 1990, net exports played an important role in Taiwan's economic growth, accounting for about 20% of GDP. However, in recent decades, net exports as a percentage of GDP have declined to approximately 10%, while domestic consumption as a percentage of GDP has reached approximately 60%. In short, consumer spending has become the most important factor in Taiwan's GDP.

Many economic factors, such as income, wealth, inflation, money-supply policy and interest rates (IR), affect consumer behaviors. According to the theory of consumption proposed by Friedman (1957), income and wealth are the most important
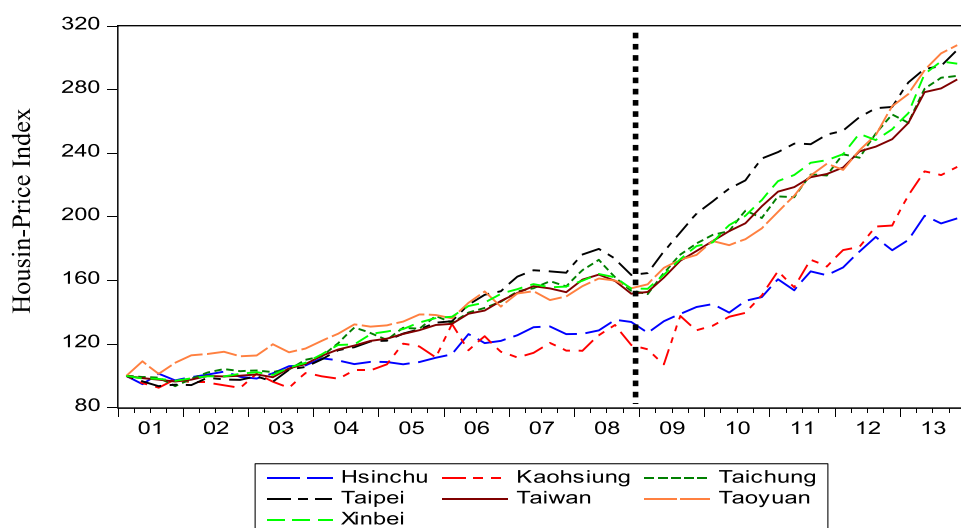

Figure 1. Trends in Taiwan's House Price Index (HPI). Source: Sinyi Realty Inc., Taiwan (2001–2013).
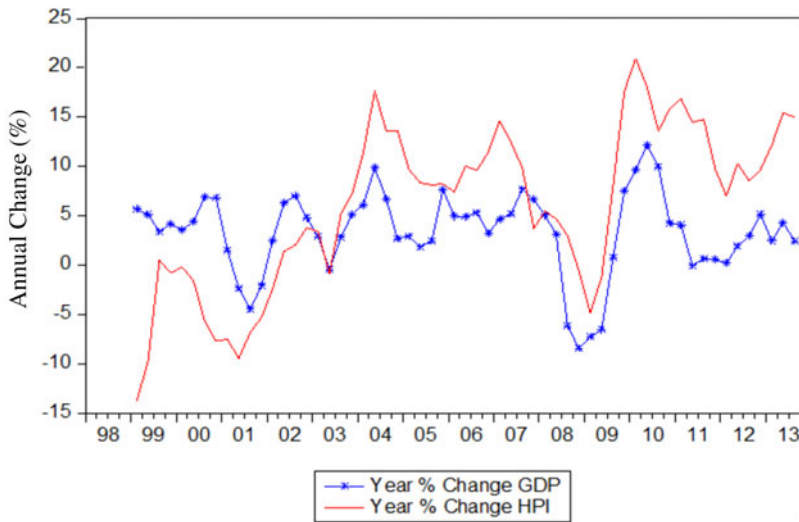
Figure 2. The growth of gross domestic product (GDP) and the House Price Index (HPI) in Taiwan. Source: National Statistics, Taiwan; Sinyi Realty Inc. (1998–2013).
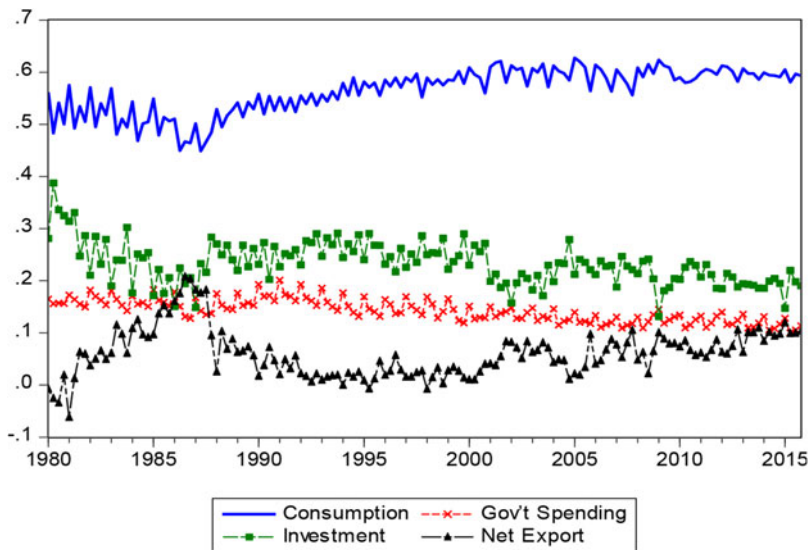

Figure 3. The component ratio of GDP in Taiwan. Source: Taiwan Economic Journal (TEJ) Database (1980–2015).

among these factors. In addition to income from labor, income from assets affects consumption. Regarding governmental monetary policy, it is worth exploring the 'transmission effect' of real estate – that is, whether or not the appreciation of real-estate values can initiate the wealth effect or boost consumption and investment. Figure 4 shows that the annual growth of consumption in Taiwan has been declining since 2010, a pattern that has deviated from the housing prices (HPI). This inconsistency among housing prices, wealth and consumption merits significant attention.
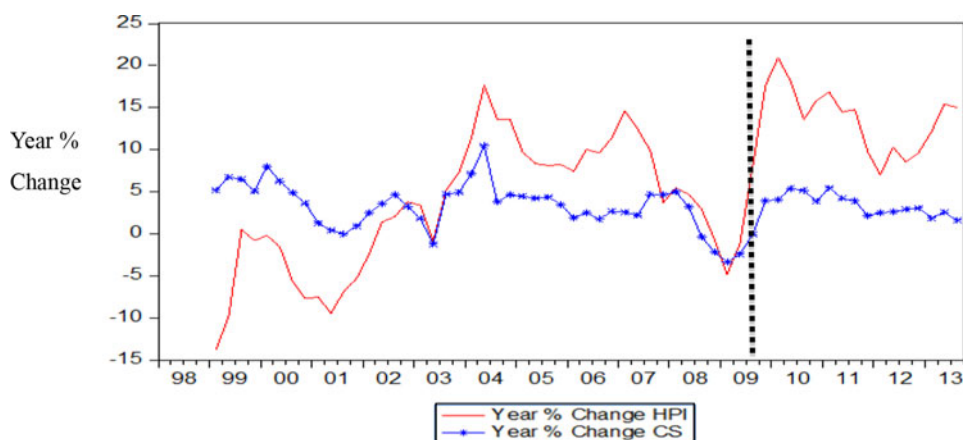
Figure 4. Trends in consumption (CS) and the House Price Index (HPI) in Taiwan. Source: National Statistics; Sinyi Realty Inc. (1998–2013).

The role of real estate (and specifically of new housing construction) in national production is critical during different stages of national development. During the post-war period from 1945 to 1960, houses were regarded mainly as consumption goods with little direct productivity extending to consumers. Residential investment did not make a marginal contribution to national productivity. From the perspective of a nation's resource allocation, over-investment in housing is inefficient because such investment impedes the long-term liquidity of a great amount of money (Strassman 1970). Leung (2003) also argued that housing-price growth beyond a certain fraction of total economic growth rate is not sustainable.

During the 1950s and 1960s, it is believed that residential investment contributed to economic growth (chiefly in the construction industry), with additional effects felt in the productivity of employment, savings, investment and labor (Turin 1973; Liu, Park, and Zheng 2002; Dlamini 2012; Chang, Simo-Kengne and Gupta 2013)[3]. Between 1960 and the early 2000s, economists began regarding the economic development driven by the construction and real-estate industries as a type of investment product (Harris and Arku 2006). First, some economists believed that real estate is simply a type of consumer product. Second, other economists believed that real estate is the locomotive of economies, initiating industrial activity and driving economic growth. A third viewpoint among economists was that real estate generates wealth[4] and can become a type of investment product. These three viewpoints co-existed throughout the aforementioned period, although the balance among them varied.

The international literature on housing prices and general consumption provides inconsistent conclusions. Some studies indicate that the wealth associated with real estate (or more specifically with houses) has had a significant positive effect on consumer spending. For example, Cooper (2010) stated that housing prices can generate realized or unrealized wealth effects. Canner, Dynan, and Passmore (2002) and Haurin and Rosenthal (2006) stated that there are constraints on real estate liquidity's effects on consumption. After housing prices increased, households pay off their mortgage and thus experience a loosening of liquidity constraints, which in turn promotes

consumption. Case, Quigley, and Shiller (2013) used the 'aggregate value of owner occupied housing' and 'retail sale' of state data as proxies of 'housing price' and 'consumption' for empirical analysis. Their conclusion implies that the increases in housing market wealth have positive effects on housing consumption, but declines in housing market wealth have negative and somewhat larger effects upon consumption.

However, few studies have explored the causality between prices of real estate and consumption, whereas quite a few more studies have emphasized macroeconomic factors' effects on consumption. For example, Attanasio et al. (2009) indicated that real-estate wealth and mortgage constraints are not the main factors influencing consumer spending. Buiter (2010) found that changes in housing prices do not have a wealth effect on consumption. Li and Yao (2007) pointed out that housing prices in the United States affected the homeowners' budget constraints, which in turn affected the homeowners' general consumption of products and services. Housing prices' wealth effects should vary from one consumer group to the next. They found that each 11.5% increase in housing prices creates a 2% real wealth effect for homeowners who are over 65. Homeowners between their late 20s and their mid-30s face a long horizon of future housing consumption and are expected to move up the housing ladder. Overall, increases in housing prices tend to enhance the wealth effect for old homeowners and tend to have a negative wealth effect for young homeowners'.

Results from related literature are not consistent. However, most of these studies were conducted prior to the implementation of monetary policies after the subprime-mortgage crisis. Duca, Muellbauer, and Murphy (2010) categorized the distinct effects of housing collateral on consumption. In the US, UK and Australian economies, where mortgage equity withdrawal (MEW) activities are active, increases in housing prices tend to have a positive effect on consumption because households may 'cash out' their home equity and this move would have an amplifying effect on consumption. However, in Japan and Italy, where housing affordability is low due to high housing prices, homeowners are inclined to save more for their children's housing because housing prices rise significantly, and this emphasis on saving consequently crowds out potential consumption. Since 2009, many countries have experienced real-estate bubbles caused by QE monetary policies. If housing price or wealth in the housing market has positive effect on consumption, the financial crisis caused by the burst of the real estate bubble should have never occurred. The government policy should therefore have been oriented to keep boosting up the housing price. To clarify these inquires, our current study explores the effects that changes in housing prices can have on economic growth and consumer spending within QE environments. Specifically in this study, we provide the Taiwanese government with substantive policy directions regarding whether it should (1) manipulate housing prices in pursuit of long-term housing affordability and economic sustainability or (2) adjust monetary policy affecting mortgage refinancing in pursuit of a counter-weight to escalating housing prices.

2. Theory review

This section discusses the Fisher equation and consumption theory. The importance of traditional monetary policies, the wealth effect resulted from housing prices and related important influential factors are discussed here as well.

2.1. Fisher equation

Irving Fisher (1911) established the Fisher equation regarding the money supply, velocity of money, prices and production, as shown in the following equation. The Fisher equation explains that money supply (M) multiplied by the velocity of money (V; the frequency of money spent in repeated purchases of goods within a year) equals the price level (P) multiplied by total output (Q):

$$MV = PQ \tag{1}$$

Several economic phenomena can be articulated according to the Fisher's equation:

1. Under the assumption of constant V and Q, the money supply will affect commodity prices. Specifically, an increase in the money supply will lead to a rise in inflation ($M\uparrow \rightarrow P\uparrow$).
2. Under the assumption of constant M and Q, commodity prices will rise owing to a rise in the consumption rate ($V\uparrow \rightarrow P\uparrow$). By contrast, the expectation of rising commodity prices may lead to higher consumption to avoid losses of purchasing power in real terms ($P\uparrow \rightarrow V\uparrow$). For example, the economic growth in Japan continued to decline after the real-estate bubble burst in the early 1990s. As unemployment grew and income stagnated, consumption declined and the decline caused an overstock of goods and a reduction in production, eventually leading to an uncomfortable situation ($V\downarrow \rightarrow P\downarrow$). This state of affairs explains why Prime Minister Abe intended to solve the deflation trap by easing monetary policies in ways that would bolster both consumption and the economy ($P\uparrow \rightarrow V\uparrow$).
3. Under the assumption that M and V are constant, commodity prices will increase as the total output of products decreases ($Q\downarrow \rightarrow P\uparrow$), a scenario that causes demand for commodities to exceed the supply of commodities, in turn triggering inflation.
4. Under the assumption that V and P are constant, M and Q are positively related to each other. As the economy grows, the country can increase the money supply without affecting the inflation (i.e., commodity prices). The increase in the money supply would drive up assets prices (e.g., stocks and real estate). This outcome is one of the transmission effects that most governments intended to achieve when easing monetary policy recently. In general, the appreciation of real estate or stock prices will increase wealth and, in turn, will stimulate consumption, eventually accelerating economic growth.

In an environment characterized by long-term low IR caused by an easing of monetary policy, Taiwan recently witnessed a great amount of money invested in real-estate markets. Although housing prices surged significantly, changes in consumer spending decreased gradually and negatively affected economic growth. This experience is inconsistent with traditional theory. In explaining the relationship between housing prices and the consumer price index (CPI), Fama and Schwert (1977) pointed out that only private residential real estate is the complete hedge against both

expected and unexpected inflation. Their assumption regarding the relationship between asset prices and inflation is consistent with the causality attributed to M and P in the Fisher equation.

2.2. Consumer theory

Many economic factors, such as income, wealth, the CPI, money supply policy and IR, may affect consumer behaviors. Friedman (1957) proposed consumption theory and pointed out that income and wealth significantly influence consumer behaviors, as shown in the following equation:

$$
\begin{aligned}
\text{Permanent income} &= \frac{LI_1}{(1+i)} + \frac{LI_2}{(1+i)^2} + \ldots + \frac{LI_n}{(1+i)^n} + \frac{AI_1}{(1+i)} + \frac{AI_2}{(1+i)^2} + \ldots + \frac{AI_n}{(1+i)^n} \\
&= \sum_{t=1}^{n} \frac{LI_t}{(1+i)^t} + \sum_{t=1}^{n} \frac{AI_t}{(1+i)^t},
\end{aligned}
$$

(2)

where LI is the labor income, AI is the asset income and i is the discount rate.

Consumers determine the volume of consumption on the basis of their permanent income rather than current income. In Equation (2), the sum of the discounted value of labor income in the future is called 'human wealth' ($\sum_{t=1}^{n} \frac{LI_t}{(1+i)^t}$) and the sum of the discounted value of the asset income in the future is 'non-human wealth' ($\sum_{t=1}^{n} \frac{AI_t}{(1+i)^t}$). In addition to salary-based income obtained from work, wealth obtained from assets (such as stocks and real estate) affect consumer spending. Thus, when an appreciation of real-estate values (ignited by investment activity) transforms into the wealth effect, one would expect there to be a boost in consumer spending.

To empirically illustrate the relationships among housing prices and consumption and economic growth in this study, we employed national income per capita as human wealth and the Sinyi HPI as well as the weighted average stock index as non-human wealth, to analyze the consumption theory and the wealth effect. Regarding the role of monetary policy in the Fisher equation, we selected IR to stand for the money supply. GDP represents Q and the CPI represents P. The total consumption expenditure is a proxy variable for the circulation of money.

3. Data collection and research method

Table 1 shows the descriptive statistics of the variables of interest in this study. The HPI across Taiwan was compiled by Sinyi Realty Inc. The weighted average stock price index (SPI) was collected from the Taiwan Economy Journal (TEJ) Database.

Table 1. Descriptive statistics, rate of change of variables (%).

Variable	GDP	CS	HPI	SPI	Income	IR	CPI
Mean	0.0092	0.0086	0.0127	0.0060	0.0072	−0.0215	0.0026
Median	0.0052	0.0018	0.0104	0.0070	0.0037	−0.0079	0.0024
Maximum	0.0814	0.1021	0.1569	0.3551	0.0988	0.0787	0.0239
Minimum	−0.0764	−0.0410	−0.0976	−0.3114	−0.0866	−0.2929	−0.0291
Std. dev.	0.0392	0.0255	0.0391	0.1179	0.0454	0.0556	0.0093

The mortgage IR were provided by the Central Bank of Taiwan. Other variables, namely GDP, consumption (CS), the CPI and national income per capita (Income), are data published quarterly of National Statistics, Taiwan. The sample period ranges from Q1 of 1998 to Q3 of 2013, including 64 quarterly data sets. For all variables in levels, the possible seasonality was removed by Census X12 in Eviews.[5] We then analyzed the rate-of-change relationship among variables (after logarithms) as shown in Table 1 and their dynamics in Figure 5.

To select an appropriate model for relevant verification, this study adopts the augmented Dickey–Fuller (ADF) test to determine the existence of unit root for the rates of change of variables. Table 2 presents the results of the ADF verification. According to the results within the 10% significance level, all the rates of change of variables rejected the null hypothesis significantly, indicating the stationarity of variables. We thus can conclude that all of the rates of change used in this study are I(0) series.

According to the results of unit root verification, all variables' rate of change belongs to the I(0) series. To analyze the relationships among GDP, consumption and other variables in the current study, we adopted the VAR model proposed by Sims (1980). Using this model, we were specifically able to estimate the direct effect relationship between the inter-temporal variables, provided that each variable belonged to the I(0) series. The VAR analysis of the relationships among variables of interest is essentially an analysis of the direct effects among variables. To include indirect effects in the overall model, we further analyzed the generalized impulse responses based on the resulted estimates of the models. Through the impulse-response function, such an analysis renders observable impulses of specific variables relative to other variables.

4. Empirical results

4.1. Vector autoregression (VAR) model

The mathematical expression of VAR employed in this study can be expressed as follows.

$$y_t = \alpha + \sum_{i=1}^{p} \beta_i y_{t-i} + \varepsilon_t, \tag{3}$$

where y_t represents the (6×1) vector of endogenous variables, y_{t-i} is the (6×1) vector composed of y_t lagged i period vector, β_i is the (6×6) of the coefficient matrix and ε_t is the vector of disturbances.

We employed two VAR models in the empirical analysis. The endogenous variables in the first model include consumption (CS), the HPI, the SPI, IR, income and the CPI. Table 3 presents the corresponding estimation results concerning the relationship between consumption and housing prices. The second VAR model involving GDP, HPI, SPI, IR, income and CPI is designed to capture the relationship between GDP and HPI, and the estimation results are presented in Table 4.

According to the estimated coefficients of the VAR model in Table 3, current CS is influenced by previous HPI, SPI and consumption. The previous HPI (rate of change) has a significant negative effect on current CS (rate of change). Some studies

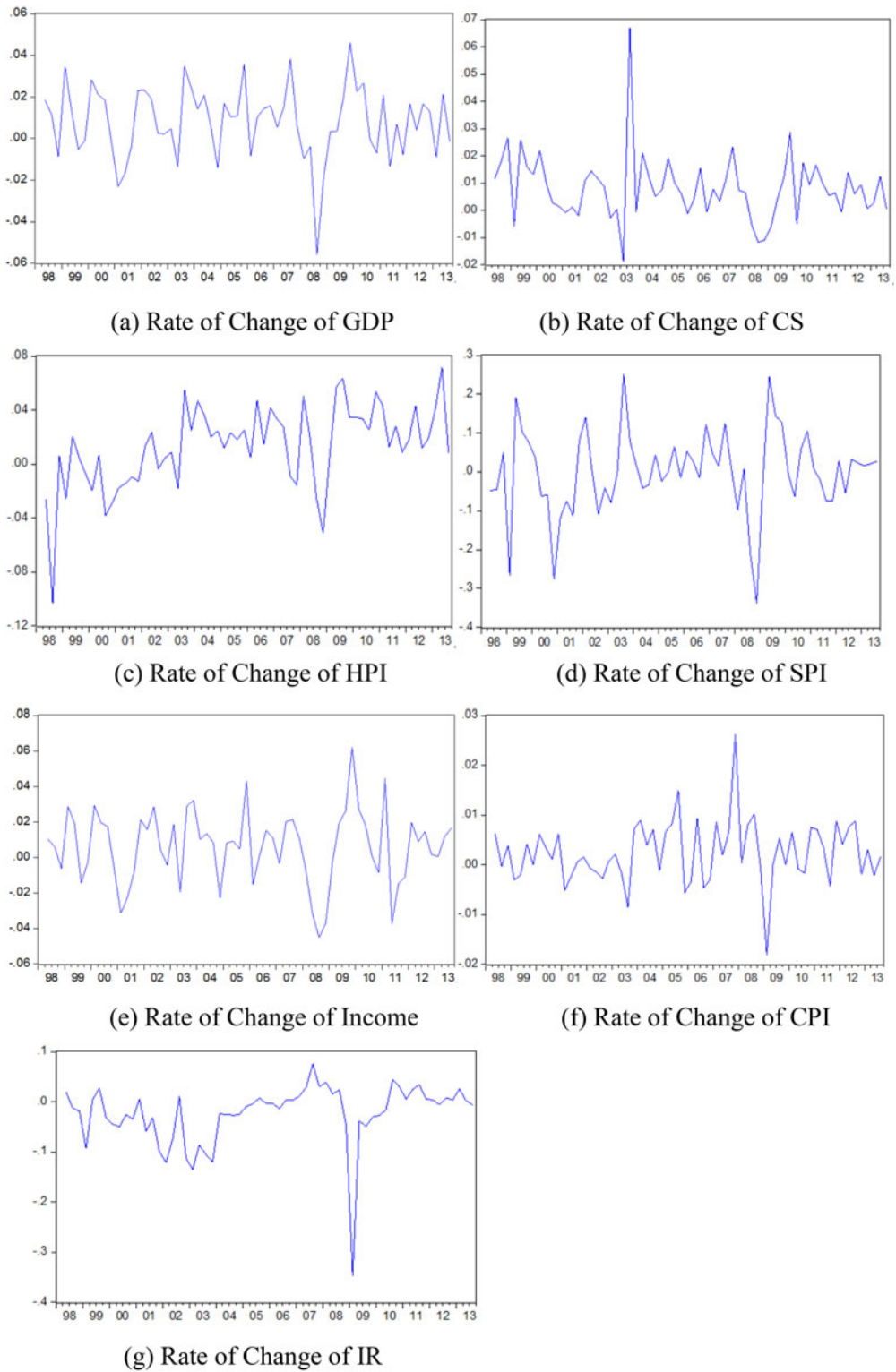(a) Rate of Change of GDP

(b) Rate of Change of CS

(c) Rate of Change of HPI

(d) Rate of Change of SPI

(e) Rate of Change of Income

(f) Rate of Change of CPI

(g) Rate of Change of IR

Figure 5. Rates of changes of all variables (after logarithms).

Table 2. ADF unit root test of variables (% change).

The rates of change of variables	t-Value	p-Value	Lags	Result
GDP[c]	−5.63	0.00	3	I(0)
CS[c]	−8.58	0.00	0	I(0)
HPI[ti]	−9.07	0.00	0	I(0)
SPI[c]	−5.79	0.08	3	I(0)
Income[c]	−5.30	0.00	0	I(0)
CPI[c]	−7.29	0.00	0	I(0)
IR[c]	−5.07	0.00	0	I(0)

Note: The automatic lag-length selection criteria, which decides the number of lags included in the ADF test, is based on SIC with a maximum lag length of 10. "c" indicates that a constant term and "ti" indicates that a constant term as well as a linear time trend have been included in the model.

Table 3. VAR results relative to consumption (CS) and the House Price Index (HPI).

	CS		HPI	
Variables	Coefficient	T-statistics	Coefficient	T-statistics
CS (−1)	0.3867**	[2.3522]	−1.2066***	[−2.7788]
HPI (−1)	−0.0875*	[−1.7605]	0.2397*	[1.8263]
SPI (−1)	0.0485***	[2.7901]	0.1144**	[2.4910]
INCOME (−1)	0.0122	[0.1869]	0.1448	[0.8415]
CPI (−1)	−0.3733	[−1.4886]	−0.0373	[−0.0810]
IR (−1)	−0.0021	[−0.2474]	−0.0472***	[−2.7961]
C	0.0294***	[3.0956]	0.0657***	[3.1341]

Notes: We selected the optimal lag length (1) according to the Akaike information criterion (AIC) and likelihood-ratio (LR) test statistics.
*The significance levels of 10%.
**The significance levels of 5%.
***The significance levels of 1%.

Table 4. VAR results relative to the gross domestic product (GDP) and the House Price Index (HPI).

	GDP		HPI	
Variables	Coefficient	T-statistics	Coefficient	T-statistics
GDP (−1)	0.4389	[1.5040]	−0.4032	[−0.7274]
HPI (−1)	0.0036	[0.0508]	0.3436***	[2.5567]
SPI (−1)	0.0696***	[3.2960]	0.0438	[1.0920]
INCOME (−1)	0.0029	[0.0127]	0.2614	[0.5947]
CPI (−1)	−0.8343***	[−3.3064]	−0.4203	[−0.8770]
IR (−1)	−0.0012	[−0.1330]	−0.0592***	[−3.4019]
C	0.0270***	[1.9523]	0.1118***	[4.2589]

***The significance level of 1%.

indicated that real estate could ignite the wealth effect and further accelerate economic development through the effects of employment, investment and productivity. Real-estate investment has therefore been considered an important variable in economic growth. However, results of this study show that housing prices negatively affected consumer spending, in turn perhaps adversely affecting economic growth. The reason for the diverse results may be the diverse backdrops of the studies: sample periods characterized by diverse economic conditions, diverse housing prices, diverse income levels and diverse levels of affordability can explain rather dramatic fluctuations in results such as the ones being discussed.

In the early 1980s, the overall economy as well as average income in Taiwan grew rapidly. Most households lived in a purchased (not rented) residence. Housing prices

grew alongside the economy, and income, and the wealth effect followed accordingly. This phenomenon is consistent with empirical and theoretical findings presented in previous literature. However, low IR, low property taxes and low capital gains taxes, together with the government's easing of its monetary policy after the subprime crisis attracted flows of capital, directing them into Taiwan's real estate market for investment and hoarding. This pattern contributed to the significant surge in housing prices at the time. On one hand, the increasingly unaffordable housing in Taiwan neither contributed to consumption or productivity, nor created the wealth effect. On the other hand, house buyers increasingly treated housing as an investment good for hoarding, not for lease. The negative leading effect of housing prices on consumption is evidence not only of resource mis-allocation but also of high housing prices' crowding-out effect on consumption spending.

In Taiwan, the previous SPI (rate of change) had a significant positive effect on consumption (rate of change) during the sample period, showing that the stock markets had generated wealth effects on consumer spending. In general, the effects of stock markets and real-estate markets on consumption can vary significantly from place to place and time to time. Compared to real-estate investments, stocks can have the characteristics of small investments, transparent information and high liquidity. Profits from investments in stocks are relatively easy to realize, leading to increases in consumer spending, or the creation of the wealth effect. Moreover, the development of stock markets can help companies increase production, employment and income and eventually promote economic growth. Thus, compared to real-estate markets, stock markets can make a stable contribution to consumer spending and economic growth.

As for the relationship between IR and consumption, our analytical results in this study show IR's insignificant effect on consumption, indicating the limits to strategies that aim to promote consumer spending through a reduction of IR or an easing of monetary policy. In addition, according to the Fisher equation ($MV=PQ$), money supply and consumption rate vary inversely, with the product of PQ held constant. A government that intends to increase consumption spending through monetary policy should first stimulate economic growth or inflation. After the US subprime mortgage crisis in 2008 and its profound effects on the global economy and financial markets, the Taiwanese government eased its monetary policy to encourage economic growth. However, economic growth in Taiwan has remained lethargic, while real-estate prices have surged since 2009. Consequently, the crowding-out effect on consumption has been significant, as has been the slowing down of the economy.

Our analysis also shows that the previous term of SPI (rate of change) had a significant positive effect on HPI (rate of change), indicating that the wealth effect can be transferred from stock markets to housing markets. However, we found that consumption was negatively related to HPI, showing that there was a crowding-out effect between consumption and HPI. Furthermore, we found that previous IR negatively affected the HPI, suggesting that reductions in IR can lead to a surge in housing prices.

Table 4 presents the results of our VAR analysis regarding the relationship between economic growth and housing prices. As shown in Table 4, the previous

term of HPI did not significantly affect GDP, indicating that rising housing prices did not contribute to economic growth in the 15-year research period. The results also imply that it is difficult to use a real-estate market as a 'locomotive industry' to bolster an economy operating against the backdrop of monetary easing.

The previous term of SPI had a significant positive effect on current GDP, a finding similar to our result about consumption. As discussed above, the development of stock markets can directly stimulate consumption and raise productivity for industries because stock investors can realize their profits and transfer to consumption without creating any crowding-out effect. Thus, unlike the real estate market, the stock market can make a steady positive contribution to both consumption and economic growth.

As for the relationship between inflation and economic growth, previous CPI had a significant negative effect on current GDP, a finding that is consistent with the proposition in the Fisher equation. The rise in price levels may, in general, encourage consumption and subsequent production, purchasing activities and eventually a merit cycle of economic growth. This pattern can explain why the proponents of 'Abeconomics' in Japan intended to employ a QE policy in 2009 to fuel inflation and, thus, to resolve the long-standing deflationary dilemma.

4.2. Impulse response function

For this study, we have employed the impulse response function to observe the reaction of specific variables to other variables. In general, there are two kinds of impulse response functions: the impulse response function decomposed by Cholesky and the general impulse function. The former establishes the order of a variable's influence on another variable according to the degree of this influence. The latter, proposed by Pesaran and Shin (1988), helps researchers analyze results of impulse responses without regard to order and can prevent the possible distortion of causality caused by preconceptions. For the current study, we conducted our analysis based on the general impulse response function (GIRF). The definition of the function is below.

$$\text{GIRF}(x_t; u_{ilt}, n) = E\left(x_{t+n}|u_{ilt} = \sqrt{\sigma_{i,l}}, \Omega_{t-1}\right) - E(x_{t+n}|\Omega_{t-1}), \qquad (4)$$

where Ω_{t-1} is the information set in $t-1$ period, $\sigma_{i,l}$ is the variance in the j equation in the ith variable-diagonal elements of the covariance matrix and n is the length of the forecast period.

By observing differences between two expected values, we noted that we could project future possible trends. The empirical results are shown in Figures 6–8. Note that Figures 6 and 8 come from estimated results of the second VAR model while Figure 7 is based on the first one.

As shown in Figure 6a and e, both positive standard deviation impulses of INCOME and positive standard deviation impulses of GDP had a long-term consistent and positive effect on GDP, with positive and steady growth of around 2–4%. Increases in SPI also had a positive effect on GDP, but the effect started to decline after four quarters, indicating a significant limit to using merely the stock market to jump-start an economy (Figure 6c). When we included indirect effects in the model,
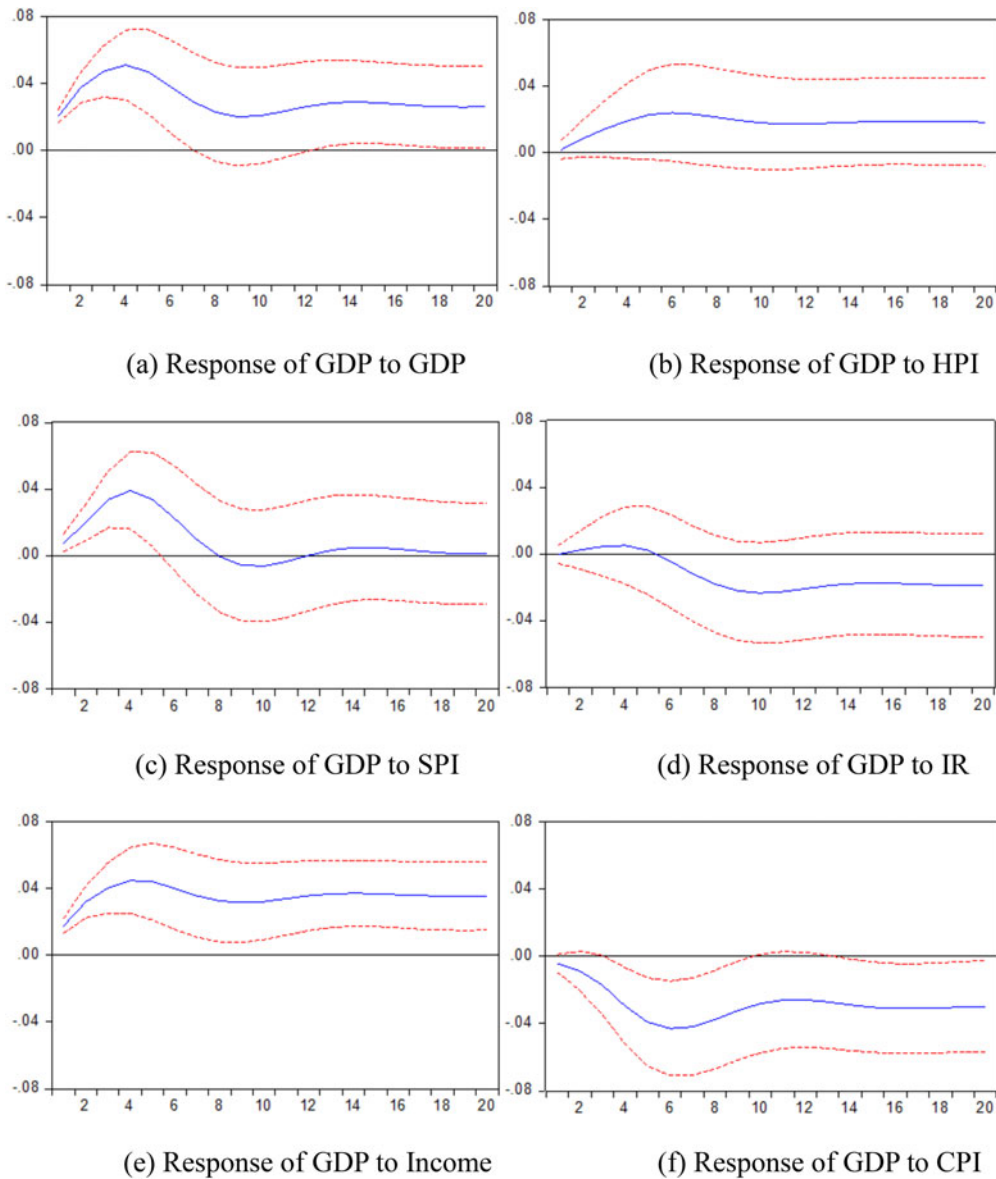
(a) Response of GDP to GDP

(b) Response of GDP to HPI

(c) Response of GDP to SPI

(d) Response of GDP to IR

(e) Response of GDP to Income

(f) Response of GDP to CPI

Figure 6. Impulse response function relative to GDP.

INCOME had a continuous 4% positive response on GDP after one year, a finding that is consistent with the consumption theory proposed by Friedman. The expected increase in income would indirectly affect consumption and domestic investment and thus lead to economic prosperity.

In Figure 6b, a positive standard deviation impulse of HPI caused an insignificant increase in short-term economic growth of only 2%. Although HPI has a crowding-out effect on consumption, increases in housing prices indicate the effect of the construction industry of total investment as it is one element included in the overall

production of the economy. However, in terms of overall long-term averages, increases in housing prices did not significantly affect economic growth.

A positive standard deviation impulse of IR had a slightly discontinuous negative effect on the Taiwanese economy, as shown in Figure 6d. Taiwan's Central Bank has frequently used IR as a direct monetary-policy tool to adjust demand for real-estate investment as well as to adjust housing prices and, thus, housing purchase, with the overall goal of promoting healthy economic growth. Of course, IR also affect financial-market investments, exchange-rate levels and subsequent export activity. In terms of overall long-term averages, increases in IR had a slightly negative effect on Taiwan's economy during the period of time under examination.

We analyzed impulse responses of variables to consumption. As shown in Figure 7a, c, e, a positive standard deviation impulse of CS, SPI and INCOME had long-term consistent and positive (2–4%) effects on consumer spending (CS). As the previous term of consumption had a positive direct effect on current consumption, one can reasonably suspect that, in general, a vicious cycle of deflation may occur if consumption stagnates for a long time. Such a cycle may result in continuously declining economic growth, increasing unemployment and declining income. As already discussed, the fact that consumer spending accounted for over 60% of GDP in Taiwan can also explain this cycle's importance for economic growth. It is also worth noting that INCOME and CS positively affected CS, a finding that is consistent with the Fisher's equation and Friedman's consumption theory.

Because the price changes of stocks and real estate affected consumer spending, we selected SPI and HPI to explore the degree to which they had a wealth effect. For a positive standard deviation impulse, SPI had a positive effect: on average, the short-term effect on growth was 2–3% and the long-term effect on growth was approximately 2%. The results show that, in Taiwan, the wealth effect existed in the stock market and could promote consumption. By contrast, HPI had as insignificant positive effect on consumption. A positive standard deviation impulse of HPI had an effect of slightly less than 1% on CS, indicating an insignificant wealth effect. From these findings, we can argue that, in general, if the growth of Taiwan's real-estate market cannot significantly contribute to healthy economic growth, then great amounts of capital stalled in the real-estate sector will suppress other industries' development by crowding these industries out. Furthermore, housing affordability will deteriorate when housing prices surge and mortgage pressures build: these outcomes effectively eat away at consumer spending. However, when we analyzed the crowding-out effect relative to impulse responses in Taiwan during this period of time, negative volatility remained insignificant. In 2010, Taiwan had 1,560,000 vacant houses,[6] which accounted for 19.25% of the housing stock in Taiwan. Regarding home ownership, owners with more than two houses account for only 3.6% of total homeowners in Taiwan, implying that the wealth effect is relevant for only a very small portion of the total population.

In Figure 7f, we can see that a positive standard deviation impulse of CPI had an instant negative effect on CS. After only 1.5 years, the negative effect had reached the 3% level, strongly suggesting that, in general, increasing CPI will negatively affect consumption when real-income growth is nearly zero. Regarding our analysis of the
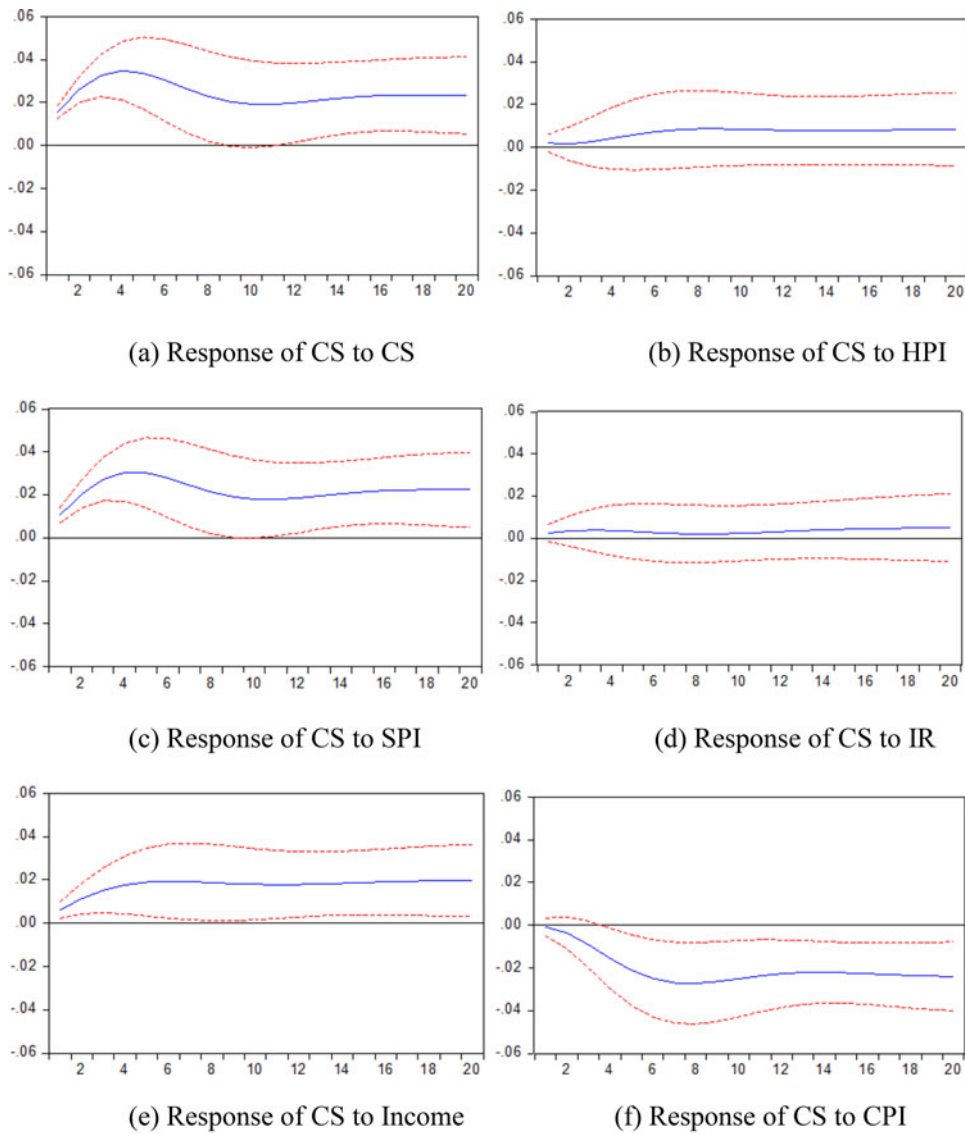
Figure 7. Impulse response function relative to CS.

data set, we found – by contrast – that a negative standard deviation impulse of IR had an insignificant (1%) negative effect on CS (Figure 7d). This finding suggests that, in general, a decline in IR does not enhance consumption momentum. A powerful example of this pattern is Japan, where consumers lack confidence in the future against the backdrop of long-term deflation and where the economy is falling into the 'liquidity trap'.

Figure 8 presents our analysis of impulse responses of variables to HPI. We found that a positive standard deviation impulse of HPI had a long-term consistent and positive effect on itself. Our comparison of GDP and CS and HPI reveals that the impulse of HPI was the most immediate and significant factor, eliciting a 4% positive
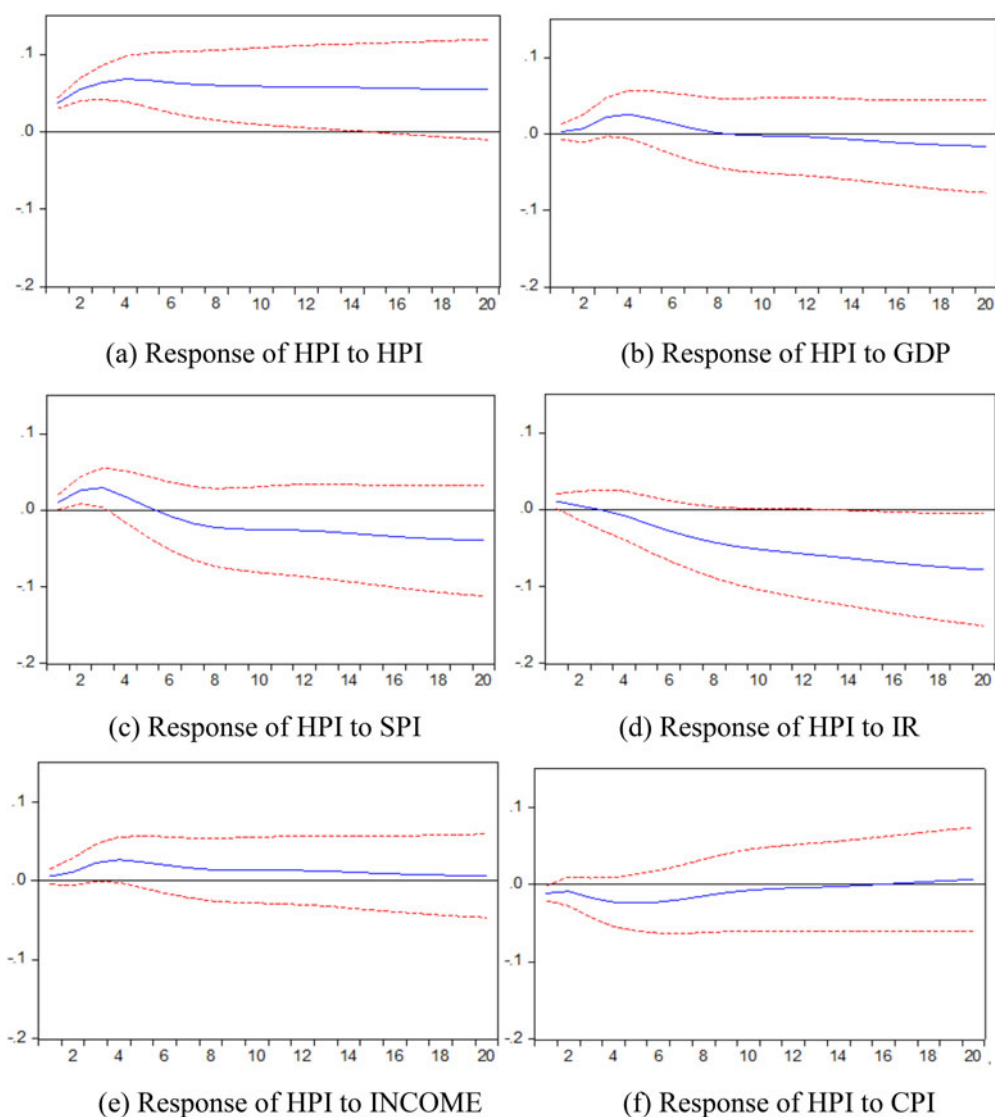
Figure 8. Impulse response function relative to HPI.

response in Q1 and corresponding to steady, positive growth of around 5–6% after 1.5 years. These findings are evidence that, in general, continuous unexpected increases in housing prices may increase real-estate investment, attracting funds from other industries.

As shown in Figure 8c, a positive standard deviation impulse of SPI had a short-term 2% positive effect on HPI. The effect gradually declined to zero, and for 1.5 years thereafter, this impulse had a 3% negative effect on HPI. This finding indicates that, in general, the stock market can positively affect the housing market in the short-term but can negatively affect the housing market in the long-term. A possible reason for this scenario is that the realization of short-term stock investment profits will spill over into the real-estate market, triggering the wealth effect. In the long run, these two markets

will compete with each other for investment capital. For example, a rise in stock-market values may cause real-estate funds to transfer to the stock market.

Upon analyzing our data, we discovered that a positive standard deviation impulse of IR had around a 1% positive effect on short-term housing prices, as shown in Figure 8d. However, the effect on HPI continued to decrease and, after one year, was negative. The magnitude of such adverse effect increases as time goes on with around 8% negative response after 4 years. These findings strongly indicate that, in the case of Taiwan, the government's policy of monetary easing contributed to low IR and, in turn, was one of the main reasons for the continuous increase in Taiwan's housing prices.

5. Conclusion

To constrain excessive investment in real estate, which can lead to a bubble in that market, the Taiwanese government introduced a luxury tax in 2010, requiring the registration of transaction prices, and increased non-residential property taxes. As discussed, these policy tools merely reduced the transaction volume of real estate. In fact, the targeted prices remained unchanged or even slightly increased. The main reason for this unintended outcome is that these policies caused only a decline in the transaction volume as house-hoarding costs (e.g., IR and taxes) remained low. The current study's empirical results show that previous housing prices in Taiwan had a significant negative effect on consumer spending. The conclusion is different from that of Case, Quigley, and Shiller (2013), which employed the 'aggregate value of owner occupied housing' and 'retail sale' of state data in the United States to explore the relation between 'housing price' and 'consumption'. Several issues are worth discussing for different results between these two studies and previous literature. First, the critical point for policy concern is to explore how the housing prices affect the consumption and the subsequent economic growth. The 'aggregate housing wealth' only accounts for the wealth of homeowners and real estate investors. It may neglect the consumption capability of those non-homeowners. Second, the validity of 'retail sale' as the proxy of 'consumption' is also questionable. The consumption volume or ratio of the GDP may be the variable of consumption of higher validity. Last but not the least, if housing price or wealth has positive effect on consumption, there should have never been financial crises caused by the burst of the real estate bubble. Government policies should therefore always have been oriented to keep boosting up the housing price. The most worth-noting and impressing lesson is the 2008 US subprime crisis, which proves that a high but unaffordable housing price of 'irrational exuberance' is unsustainable and eventually detrimental to the economic growth.

For policy implication, because consumption accounts for the heaviest weight (around 60% in many countries) in GDP components, it is important to explore the effect of rising housing prices on economic growth, and how the government should develop and adjust related policies to cope with these price changes.

5.1. Monetary policy

The reduction of IR through the policy of monetary easing did not, in Taiwan's case, significantly affect consumption. Indeed, the interest-rate reduction caused housing

prices to surge and endangered the economy's stability, further deteriorating income distribution, housing affordability and the consumption capability of the public. Regarding mortgages for the purchase of at least a third house, the Central Bank of Taiwan limited the loan-to-value percentage to 50%. Nevertheless, the effect remained insignificant. The general behavior of Taiwan's housing market and the specific results of our current empirical analysis indicate that the Taiwanese government's monetary policy should focus on constraining the capital that flows to house-hoarding markets. Currently, in Taiwan, the total value of housing mortgages accounts for over 45% of GDP, and the average vacancy rate for the housing stock is 20%. These two figures, alone, are striking evidence that Taiwan's housing-finance system has been facing a crisis in recent years and that this crisis has threatened the stability of Taiwan's financial markets. As the Central Bank deals simultaneously with IR, inflation, exchange rates and economic growth, relevant actors should not blindly assume that the housing market merits 'benign neglect' – after all, the unaffordability of housing is highly detrimental to consumption. In addition, as less than 7% of Taiwan's population owns two or more houses, the wealth effect contributed only insignificantly to consumption while housing prices surged.

5.2. Economic policy

The current study also shows that the weighted stock index had a significant positive effect on consumption, implying that, in general, stock markets can create a virtuous cycle. This cycle, in turn, can lead to increases in domestic consumption, corporate investment and employment – and ultimately can lead to healthy economic growth. Therefore, the government should promote a sound environment for stock-market investment as well as the development for industries and should expect that a sound investment environment will promote sustainable economic development.

5.3. Housing finance policy

In general, as real income stagnates, fear of deflation may further endanger the consumption rate. To avoid the vicious cycle of the 'liquidity trap', the Taiwanese government should focus on reasonable growth of overall wages. This growth can promote consumption and reduce the price-to-income (PTI) ratio for home ownership. The alleviation of the mortgage burden may result in increased consumption, which can spur positive economic growth. The analytical results in this study show that the surge in Taiwan's housing prices crowded out the consumption, and thus, researchers and officials alike should consider two policy alternatives for sustainable economic development. First, the government should promote reasonable, affordable housing prices so that potential financially solvent homebuyers can escape destructive mortgages; in this way, the government will be combating the 'crowding out' effect on consumption. Downward pressure on housing prices is realizable through the imposition of increased costs (e.g., property tax) on those who would hoard houses (without renting), through constraints on the financing of multiple houses and through increases in the supply of public rental housing. Second, let us keep in mind

that MEW activities – bolstered by the rise in housing prices – have exhibited positive effects on consumption in some countries and the MEW ratio accounts for less than 1% of total housing equity in Taiwan; thus, the development and encouragement of MEW activities seems to be a reasonable alternative solution geared toward augmenting consumption and bolstering subsequent economic growth while housing prices rise. This alternative solution involves changing consumers' behaviors and seems difficult to achieve, but the introduction of tax deductions for certain levels of MEW interests may serve as an effective catalyst in implementing this policy.

Notes

1. The United States launched its quantitative easing (QE) monetary policy in 2009 in order to rescue the national economy and asset markets, a strategy that was followed by Taiwan and many countries around the world. In the case of Taiwan, the rediscount rates were continuously reduced from 3.6% in mid-2008 to 1.25% in early 2009.
2. In theory, the "Transmission Effect" (1) significantly changes a market's inflationary expectations and reduces real interest rates, (2) bolsters asset prices and promotes consumption and investment through wealth access, (3) reduces long-term interest rates and promotes domestic investment, and (4) leads to the depreciation of exchange rates and promotes exports.
3. Turin (1969) showed that, between 1955 and 1965, the construction industry in developed countries accounted for 5–8% of GDP. Liu et al. (2004) argued that residential investment had stronger short-term effects on economic growth than non-residential investment, and that residential investment had a long-term effect on economic growth. Dlamini (2012) stated that investment in infrastructure in developed counties correlated importantly and highly with long-term economic growth.
4. When housing prices increase, owners realize capital gains from real estate, which further stimulates property owners' consumer spending. The appreciation of the value of houses increases property owners' wealth. Although property owners do not invariably cash out all their wealth, the very existence of the wealth certainly facilitates increases in consumer spending.
5. The Census X-12 Method is a seasonally adjusted procedure established by Taiwan's Census Bureau. This procedure has undergone many revisions and has become one of the most common seasonally adjusted methods in use. The seasonal variation of time series may cover up actual trends of economic processes.
6. According to the Ministry of the Interior in Taiwan , 'vacant house' refers to houses that no one is frequently living in, or not temporarily away from (e.g., for family issues, for work issues, or for an extended vacation), and that owners neither trying to sell nor to rent

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

Notes on contributors

Tsoyu Calvin Lin is the professor in the Department of Land Economics, National Chengchi University (NCCU) in Taiwan. His major research interests include real estate and financial

markets and housing policy. He has published academic works on the *Journal of European Real Estate Research, Resources Policy, Economic Modelling*, and *the Pacific-Basin Finance Journal*, etc.

Shih-Hsun Hsu is the associate professor in the Department of Economics, NCCU. His research interests include economic performance evaluation and forecasting and econometrics. He has published his works on the *Journal of Econometrics, International Journal of Forecasting*, and *American Economic Review*, etc.

Yu-Lun Lin gained his master degree in Land Economics in NCCU. He is currently a senior researcher in the department of Land Management, Formosa Plastic Group in Taiwan.

ORCID

Tsoyu Calvin Lin 🆔 http://orcid.org/0000-0003-3628-5493
Shih-Hsun Hsu 🆔 http://orcid.org/0000-0002-8564-4846

References

Attanasio, O. P., L. Blow, R. Hamilton, and A. Leicester. 2009. "Booms and Busts: Consumption, House Prices and Expectations." Economica 76: 20–50. doi:10.1111/j.1468-0335.2008.00708.x.

Buiter, W. H. 2010. "Housing Wealth Isn't Wealth." *Economics: The Open-Access, Open-Assessment E-Journal* 4: 1–29. doi:10.5018/economics-ejournal.ja.2010-22.

Canner, G., K. Dynan, and W. Passmore. 2002. "Mortgage Refinancing in 2001 and Early 2002." *Federal Reserve Bulletin* 12: 470–481.

Case, K., J. Quigley, and R. Shiller. 2013. "Wealth Effects Revisited, 1975–2012." Working Paper 18997, National Bureau of Economic Research.

Chang, T., B. D. Simo-Kengne, and R. Gupta. 2013. "The Causal Relationship between Exports and Economic Growth in the Nine Provinces of South Africa: Evidence from Panel-Granger Causality Tests." *International Journal of Economic Policy in Emerging Economies* 6 (3): 296–310. doi:10.1504/IJEPEE.2013.056940.

Cooper, D. 2010. "Did Easy Credit Lead to Overspending? Home Equity Borrowing and Household Behavior in the Early 2000s." Federal Reserve Bank of Boston, Public Policy Discussion Papers 09-07.

Dlamini, S. 2012. *Relationship of Construction Sector to Economic Growth*. Reading, UK: School of Construction Management and Engineering, University of Reading.

Duca, J., J. Muellbauer, and A. Murphy. 2010. "Housing Markets and the Financial Crisis of 2007–2009: Lessons for the Future." *Journal of Financial Stability* 6 (4): 203–217. doi:10.1016/j.jfs.2010.05.002.

Fama, E. F., and G. W. Schwert. 1977. "Asset Returns and Inflation." *Journal of Financial Economics* 5 (2): 115–146. doi:10.1016/0304-405X(77)90014-9.

Friedman, M. A. 1957. *A Theory of the Consumption Function*. Princeton, NJ: Princeton University Press.

Harris, R., and G. Arku. 2006. "Housing and Economic Development: The Evolution of an Idea since 1945." *Habitat International* 30 (4): 1007–1017. doi:10.1016/j.habitatint.2005.10.003.

Haurin, D. R., and S. S. Rosenthal. 2006. House Price Appreciation, Savings, and Consumer Expenditures. Working Paper, Ohio State University.

Leung, C. K. Y. 2003. "Economic Growth and Increasing House Prices." *Pacific Economic Review* 8 (2): 183–190. doi:10.1111/j.1468-0106.2003.00219.x.

Li, W., and R. Yao. 2007. "The Life Cycle Effects of House Price Changes." *Journal of Money, Credit and Banking* 39: 1376–1409.

Liu, H., Y. W. Park, and S. Zheng. 2002. "The Interaction between Housing Investment and Economic Growth in China." *International Real Estate Review* 5: 40–60.

Pesaran, M. H., and Y. Shin. 1988. "Generalized Impulse Response Analysis in Linear Multivariate Model." *Economic Letters* 58: 17–29.

Sims, C. A. 1980. "Macroeconomics and Reality." *Econometrica* 48: 1–48.

Strassman, W. P. 1970. "Construction Productivity and Employment in Developing Countries." *International Labour Review* 101: 503–518.

Turin, D. A. 1973. *The Construction Industry: Its Economic Significance and Its Role in Development.* London: University College Environment Research Group.