Computable General Equilibrium of Real Estate and Financial Crisis Vulnerability

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Abstract

Growth in the economy of Thailand is highly related to the role of the real estate industry. While the frameworks of Social Accounting Matrix (SAM) and Computable General Equilibrium (CGE) show the interaction between real estate and other sectors in the real economy, the flow of funds accounts and Financial SAM reveals the more realistic picture of the connection between real estate and the financial market. A Financial CGE model is used to investigate the role of real estate investment in the economy of Thailand. This study discusses how the over-invested real estate market can cause the country to be vulnerable to a financial crisis. In addition, the relationship of real estate asset and property markets is incorporated into the model to capture interconnections between production sectors and financial sectors. The macroeconomic and socioeconomic indicators from the model simulation show that moderate investment in real estate sectors can lead to steady economic growth with small impacts on income disparity. In addition, various policy implications can be applied to mitigate the negative effects from real estate investment in Thailand. The analysis suggests that moderate growth in the real estate sector is desirable.

JEL classifications: R150, R310

Keywords: Computable General Equilibrium (CGE), Real Estate, Thailand

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1. Introduction

The real estate sector and the financial sector are indeed highly interconnected. As one can see, the 1997 financial crisis in Thailand originally stemmed from overinvestment in the real estate sector. To examine the role of real estate in the economy, an economy-wide analytical framework such as the Financial Computable General Equilibrium (FCGE) model is needed in order to capture interrelations among various economic sectors, including production sectors, households, the government, and financial sectors. Yet, little has been done to methodically link the real estate sector to the financial sector. In this study, a FCGE model of Thailand, which explicitly connects the real estate sector to the financial sector, is used to analyze the importance of the real estate sector in the Thai economy. To the best of our knowledge, this study is one of the first few attempts to analyze the economy-wide impacts of the real estate sector using a FCGE framework for an emerging market like Thailand.

Thailand was regarded as an example of the so-called "East Asian Economic Miracle." In 1986-1996, with the average of 10% annual growth of Gross Domestic Product (GDP), it was the fastest growing economy in the world, as shown in Figure 1. With adequate labor resources, relatively low land prices and labor costs, as well as various preferential financial and monetary policies, Thailand attracted large amounts of capital from many developed countries. One of the countries that heavily invested in Thailand was Japan, which, in the late 1980s, began to export large-scale capital to Southeast Asian countries due to the appreciation of the Yen and the collapse of the economic bubble.

In order to increase capital for improving utilities and infrastructures as well as funding export-oriented industries, the Thai Government adopted a series of preferential financial and monetary policies to accelerate the reform of financial liberalization, and expand offshore financial businesses. These policies rapidly expanded the domestic investment and credit in Thailand. However, most loans, especially personal loans, did not flow into the production sectors but rather into the stock market and real estate speculation. Moreover, the excessive expansion of bank credit fueled bubbles in the real estate industry and the economy of Thailand.

This paper analyzes the risks and benefits from additional investment in real estate in Thailand using a FCGE model. It argues that investment in real estate provides both risks and benefits to the Thai economy but in a lesser degree than the investment in two other major sectors in Thailand, agriculture and manufacturing. This study proceeds with reviews of the relevant stylized facts of Thailand and literature on real estate and economy. Methodology employed in this study is then described, followed by the discussion of data. This study concludes with the presentation of simulation results and discussion of policy implications.

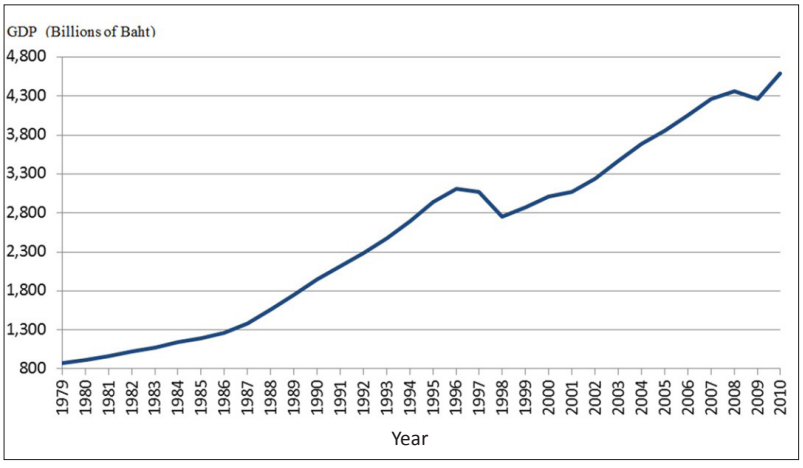


Figure 1. Gross Domestic Product (GDP) of Thailand from 1988-2010 (Source: Bank of Thailand, March 2011)

2. Background

2.1 Real Estate and Macroeconomic Growth

In general, the proportion of agricultural, manufacturing, and service sectors in the GDP of Thailand are 10%, 45%, and 45%, respectively (SCB Economic Intelligence Center, 2013). The real estate industry contributed to the growth of Thailand in a rapidly growing economy during the boom decade. During the high-growth period, the industry accounted for almost one-third of the country's GDP (see Figure 2). In addition, the construction sector, which is a real-estate-related industry, constituted about 20 percent of the growth in GDP. Altogether, real estate and its related industries were large contributors to the growth of Thai economy during the boom period.

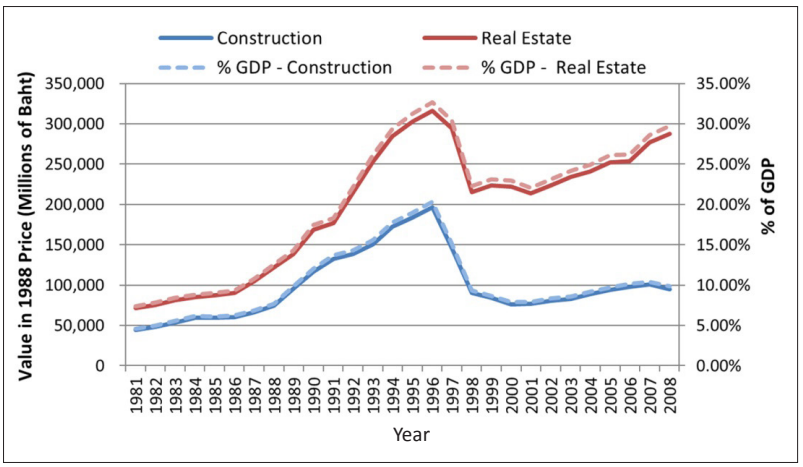


Figure 2. Value and Percent Share of GDP of Real Estate and Construction Sector, 1981-2008 (Source: Office of the National Economic and Social Development Board, 2009)

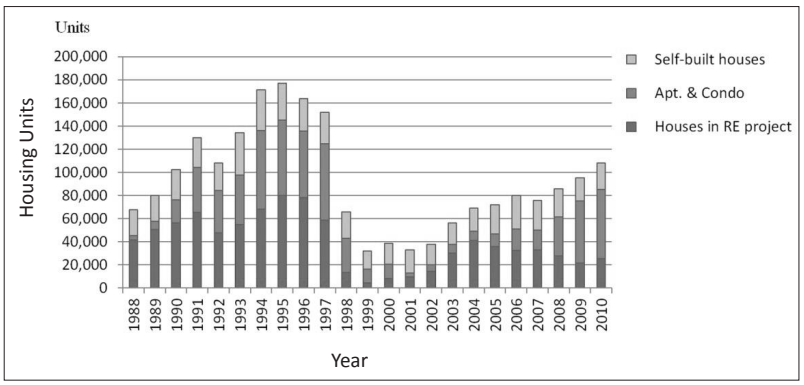


Figure 3. Newly-built Housing Units in the BMR from 1988-2010 (Source: Bank of Thailand, April 2011)

Nonetheless, the overvalued and speculative real estate market was one of the major factors causing the financial crisis in Thailand, leading to the contagion effects of the 1997 Asian financial crisis. The Thai currency, Baht, which had been pegged to the US dollar since the 1950s, collapsed in 1997. Then the exchange rate was floated in July 1997. The confidence level in the economy of both its citizens and foreigners was shattered, and poverty increased significantly. Both real estate and construction sectors suddenly collapsed right after the 1997 crisis.

Considered to be highly correlated with economic growth, the degree of the real estate investment may be best represented by newly-built housing units. Due to the prolonged nature of the real estate development process, the industry was usually lagging behind other sectors. Not until 2001—four years after the crisis—did the real estate market began to recover. Before 2000, however, the data of nationwide newly-built housing units were not available. The 2001-2010 data of newly-built units are available only for the Bangkok Metropolitan Region (BMR), which is the major real estate development region in Thailand. In 1989-2000, real estate development in the BMR accounted for more than 62% of the development in the country. In 2004, the numbers of newly-built housing units were greater than the level at the beginning of the financial meltdown (see Figure 3). Therefore, in this study, the data of new housing units in BMR will be used as proxies of real estate investment in Thailand.

In 2008, the global financial crisis caused by the real estate bubble in the US was expected to affect the real estate industry in Thailand. However, it did not hit the Thai economy as hard as many expected. Learning a valuable lesson from other crises around the world, Thai real estate developers and investors have become more professional and more cautious about overinvesting. In addition, the banking and

financial industries have provided loans to both developers and consumers with much more careful consideration. Property speculation as well as consumer confidence are low due to unstable political and economic situations. Thus, the real estate market has continued to grow steadily, and property prices have been quite stable. Even though the 2008 global financial crisis might not have had significant effects on the Thai economy, there have been direct and indirect impacts on both demand and supply in the real estate market. On the demand side, the 2008 crisis decreased disposable incomes of Thai households. The overall economy of Thailand, especially the export-based sectors, was impacted by the global economy, which in turn affected consumer confidence, income, and savings, resulting in lower disposable incomes. Further, the demand for real estate in Thailand comes from both local residents and expatriates. Due to the weak global economy, the housing demand from foreigners has decreased. Moreover, mortgage loans have been increasingly difficult to acquire. The prospective home buyers, as a result, have delayed their home buying decisions. On the supply side, developers have lowered their risks by reducing housing supply and constructing fewer housing units.

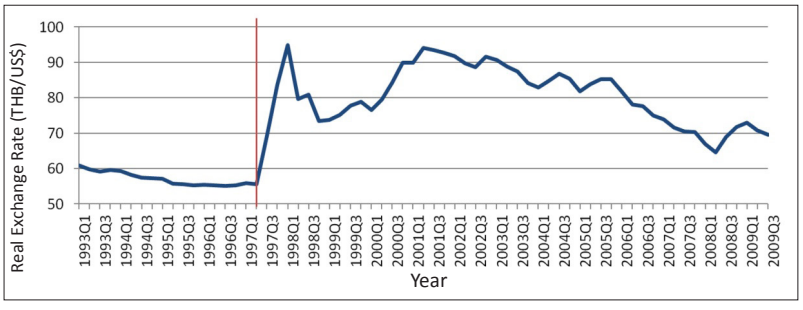
2.2 The Degree of Vulnerability to the 1997 Crisis

After 1997, many studies have investigated the economic phenomena before and during the crisis. Azis (2002) suggests three measures signaling the degree of vulnerability to a crisis, which include: 1) Real Exchange Rate (RER) appreciation, 2) lending boom, and 3) low level of foreign exchange reserve.

The fixed exchange rate regime was used in the period prior to 1997; therefore, the Thai Baht did not appreciate significantly before the crisis. As Thailand's current account balance was in deficit for a long period before the crisis, theoretically the Thai Baht was under pressure of depreciation. However, we observed that in fact the Thai Baht appreciated, indicating a large amount of capital inflow before 1997. During the crisis, the Thai Baht was attacked by currency speculators, resulting in a sharp depreciation in RER. Within a year, the RER dramatically increased from 55 THB to 95 THB per US$ in real terms. Thailand then fell into the financial crisis. Consequently, after the crisis, the Thai Baht real exchange rate appreciated during 1998-1999, and then depreciated again during 1999-2001. Since 2001, the Thai Baht real exchange rate has appreciated steadily and considerably. However, the value of the Thai Baht never reached the same level as in the early 1990s (See Figure 4).

One of the indicators of a lending boom is claims on the private sector. The data on credit from banking deposits for Thailand, unfortunately, are available only after 2001. Thus, the data for Thailand in the 1997 crisis cannot be observed. After the crisis, claims on the private sector steadily grew especially after 2001 (see Figure 5).

Figure 4. Real Exchange Rate (THB/US$), 1993-2009 (Source: The Economist Intelligence Unit Database, 2010)



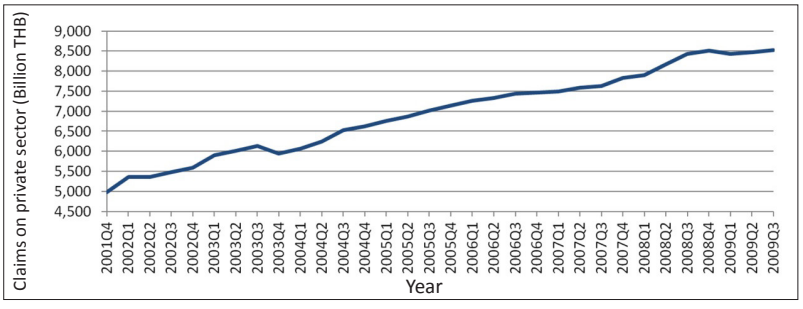
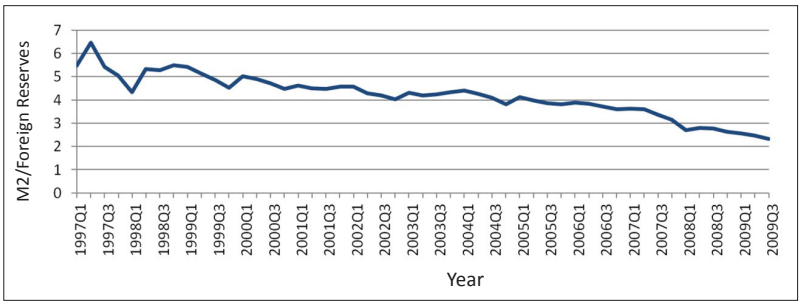


Figure 5. Thailand - Claims on private sector (Billion THB), 2001-2009 (Source: International Financial Statistics (IMF), 2010)

Finally, the third measure can be analyzed by using a ratio of broad money (M2) to foreign exchange reserve as it indicates the degree to what extent people can convert their local currency into foreign currency. The ratio reached its highest level in 1997 (see Figure 6), indicating high vulnerability to a crisis. The ratio has gradually declined since 1998. A look back at these historical data suggests that these three indicators of vulnerability to financial crisis can signal overheating economic growth to some extent. Therefore, this study uses these three indicators to measure the degree of vulnerability to another crisis.

Figure 6. Thailand - M2/Foreign Reserves, 1997 – 2009 (Source: The Economist Intelligence Unit Database, 2010)



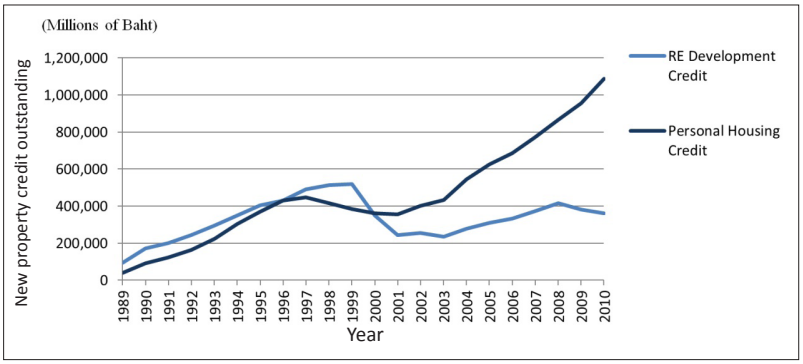


Figure 7. New property credit outstanding from 1989-2010 (Source: Bank of Thailand, April 2011)

2.3 Real estate development in the BMR

As the political, cultural, and economic capital of Thailand, the Bangkok Metropolitan Region (BMR) is one of the most populated regions in the world. Its urban structure has been dominated by the expanding network of arterial roads and ring roads since the 1960s. Due to the fact that transportation policies in the past concentrated mostly on construction of new roads rather than on traffic management, traffic congestion has become one of the most crucial problems of Bangkok (Daniere, 1995, pp. 25-45). In order to ease the chronic traffic congestion in Bangkok, the first mass transit system in Bangkok, BTS Skytrain, was introduced in the late 1990's. Soon after, MRT Subway started their operations in 2004. These mass transit systems have not only alleviated traffic problems, but also intensified real estate development, especially along the transit lines.

Real estate developers have also played an increasing role in the real estate supply in the BMR, in particular housing in real estate projects and condominiums. In 1984, only 12% of housing units in the BMR were developer-built units (Dowall, 1989, pp. 327-339). Since 1988, the number of new housing units built by real estate developers has been the majority of all new housing units. In 2010, developer-built housing units accounted for approximately 80% of all new units in BMR.

Figure 7 illustrates the value of outstanding credits of both real estate development and personal housing units from 1989 to 2010. Prior to 2000, real estate development credits exceeded personal housing credits. The real estate development credits peaked in 1999, a few years after the crisis, and dropped dramatically afterwards. After the 1997 crisis, financial institutions and real estate developers learned some lessons. The values of real estate development outstanding credits have been lower than the personal housing credits since the beginning of economic recovery. On the other hand,

personal housing credits have dramatically increased which may be the result of government housing policies since 2001. Even though the outstanding credits of developers are low, the high values of personal housing credits are still very high.

2.4 Property and Asset Markets

Pholphirul and Rukumnuaykit (2009) estimate the duration of the real estate cycle in Thailand to be approximately 69 months. The major leading indicators for the real estate cycle are construction price index, money supply (M2), property stock index and post-credit finance. They also find evidence that the real estate cycle in expansion periods is always found to lead the business/economic cycle of Thailand. The real estate business cycle in general can be explained by DiPasquale and Wheaton (1992). They are the first to propose a simple analytical framework of a four-quadrant diagram explaining connections between the space market (property market) and real estate asset market. As shown in Figure 8, this framework illustrates the interconnection between the two markets and thus is incorporated as an extension of the standard FCGE model of this study.

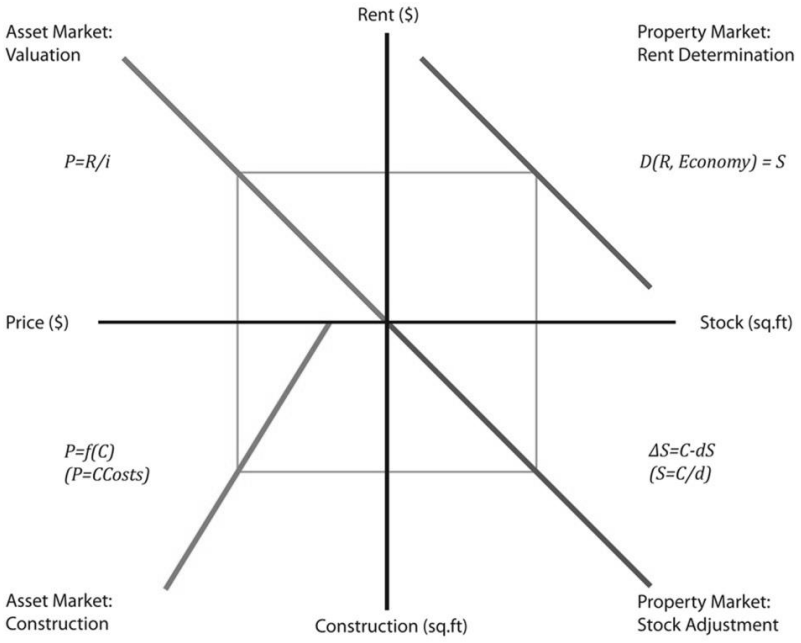


Figure 8. The relationship between property and asset markets (Source: DiPasquale & Wheaton, 1992)

In the framework of DiPasquale and Wheaton (1992), rents in the short run are determined by the demand for space which is equal to the stock of space in equilibrium, shown in the property market quadrant (the northeast quadrant). The rent determination can be represented in the following equation 1:

$$D(R,Economy) = S, \qquad \text{(e.q.1)}$$

where D is a demand for space, R is a rent, Economy is economic factors, and S is the stock of space. DiPasquale and Wheaton (1994) also suggest that the supply of housing can be represented in the following equation 2:

$$D(X,P,U,R)=S \qquad \text{(e.q.2)}$$

where demographic characteristics and real permanent income (X), housing price (P), cost of financing (U), and the alternative cost of renting (R).

Subsequently, in the asset market (the northwest quadrant), the rent determines the price for a real estate asset according to the capitalization rate, which includes the long-term interest rate, expected growth in rents, risks associated with rental income stream, and the treatment of real estate in the tax code. The real estate valuation in the asset market can be represented in the following equation 3:

$$P= R/i, \qquad \text{(e.q.3)}$$

where P is the price for a real estate asset, R is rents, and i is the capitalization rate. In the asset market (the southwest quadrant), the price of real estate assets is related to the replacement or construction costs. In the long run, the price of real estate in the asset market should be equal to construction costs in the equilibrium. Real estate construction in the asset market can be represented in the following equation 4:

$$P = f(c), \quad \text{(e.q.4)}$$

where P is the price of real estate asset, and f(c) is the function of replacement cost. The connections from the asset market then revert back to the property market through the relation of construction costs and a long-run stock of real estate space (the southeast quadrant). The stock will determine rents (NE quadrant), depending on construction costs and the depreciation rate of the stock. The stock adjustment of space in the property market can be represented in the following equation 5:

$$\Delta S = C - dS, \quad \text{(e.q.5)}$$

where *S* is the long-run stock of real estate space, *d* is the depreciation rate of stock, and *C* is new construction.

3. Methodology and Data

This study employs the Computable General Equilibrium (CGE) model framework based on the current Financial Social Accounting Matrix (FSAM) of Thailand, to analyze the role of real estate in the economy. The CGE model is then developed into the framework of a standard Financial Computable General Equilibrium (FCGE) model based on the model developed by Puttanapong (2008). The principle assumption underpinning FCGE models is the balance between total assets and liabilities held by each institution during a given period of time. FCGE models simulate theoretical behaviors of institutions in the financial market through a system of equations. The general equilibrium is achieved when all conditions and constraints hold.

This study also incorporates the FCGE model with the theoretical framework relation of property and asset market by DiPasquale and Wheaton (1992). This model is developed to measure the economy-wide impacts of real estate investment on real and financial sectors in the economy. The results of the model suggest policy implications of the socio economic impacts of real estate investments, and the degree of vulnerability to the crisis is evaluated by macroeconomic indicators from the model.

3.1 Computable general equilibrium

To examine the effect of real estate investment on the economy, the CGE model is used to explore the economy-wide impacts. The CGE model is based on the general equilibrium theory of the competitive market economy and the price mechanism. In the CGE model, a representative household determines its consumption bundles to maximize its utility subject to a budget constraint while a firm maximizes its profits by managing its inputs and outputs subject to its production technology. Based on optimized behaviors, the demand and supply of goods and factors of production are equilibrated in the markets by price adjustment.
The model involves optimizing behaviors of economic agents under given resource and technology constraints and according to indicators from market prices. In this study, the following are key specifications of this CGE model:

- There are 15 production sectors including the real estate and construction sectors, two types of factors of production (labor and capital), three types of taxes (income tax, indirect tax, and tariff), and 10 institutions (five household groups, privately owned enterprises, state-owned enterprises, financial institutions, the government, and the rest of the world).
- The exchange rate is an endogenous variable. Foreign savings are treated exogenously.
- While the government savings are endogenous, the government consumption is exogenous. Government subsidies and expenditures are exogenous.
- Capital is mobile and fully employed, and labor is also mobile. Wages are set endogenously.

The framework of the CGE model can be represented in Figure 9. The nested structure represents the connection between production and goods markets. The intermediate goods (INTM) and the value added of production (VA), which is created by Labor (L), and capital (K), are employed to produce the output (X). Some outputs will be exported as Export (E) and some will be sold domestically (D). The proportion of exported and domestic goods is controlled by the function of Constant Elasticity of Transformation (CET). The domestic goods and imported goods are used to produce composite goods to serve domestic demands. The proportion of imported and domestic goods is controlled by the function of Constant Elasticity of Substitution (CES). The values of imported and exported goods are accounted as foreign savings (SAVROW). The incomes of private institutions (YPriv), such as households and firms, are from factors of production and institutional transfers. Government

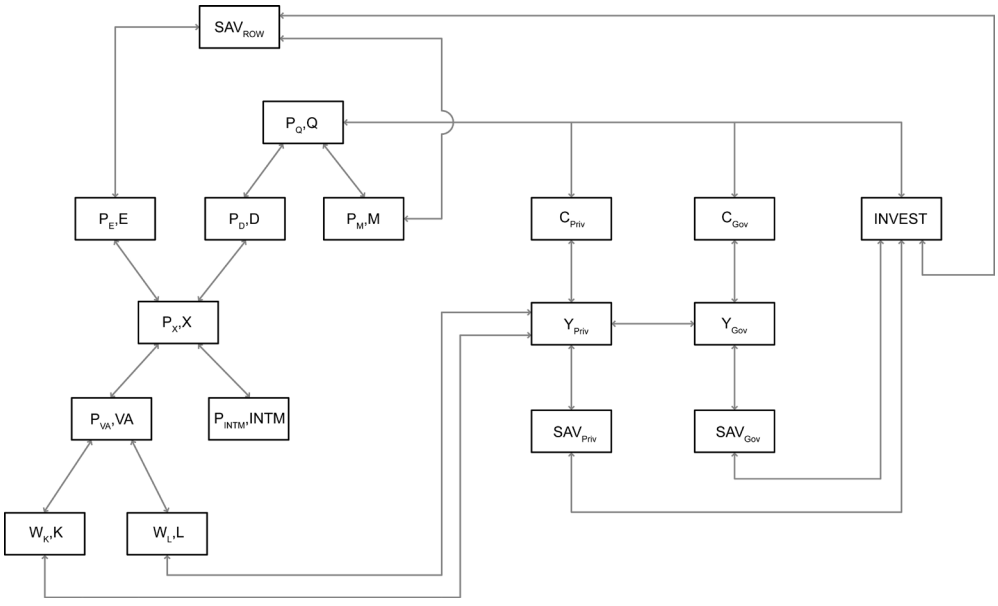


Figure 9. The structure of Computable General Equilibrium (CGE)

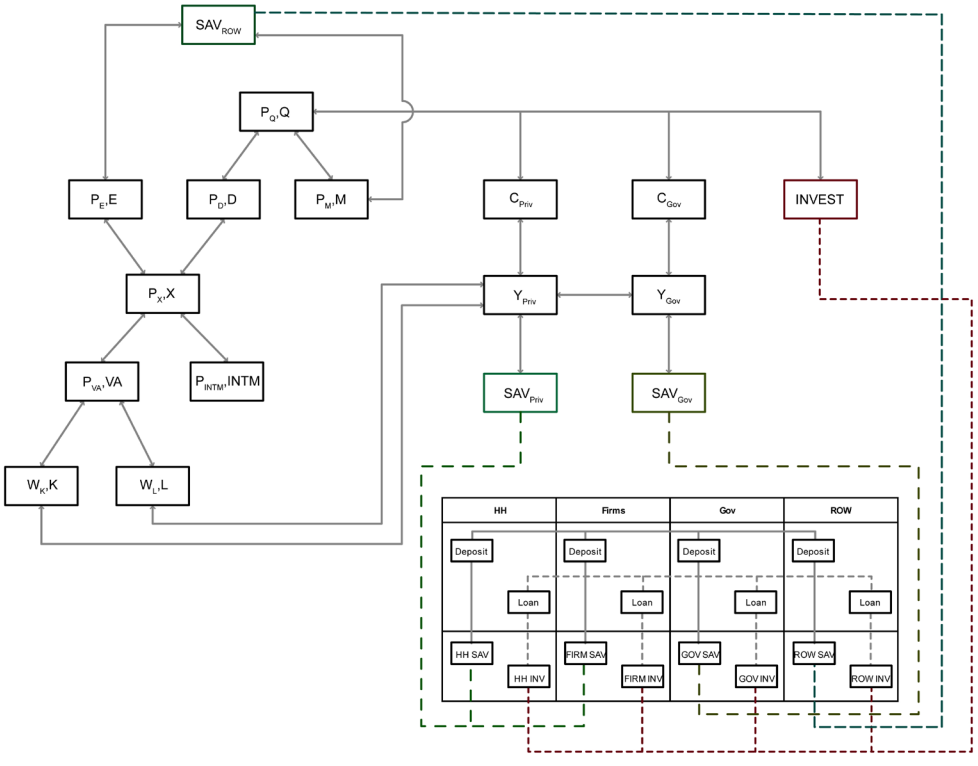


Figure 10. The structure of Financial Computable General Equilibrium (FCGE)

revenues (YGov) are from taxes and tariffs, and institutional transfers. Based on the marginal propensity to consume, the revenues of each institution will be allocated for savings and consumption. The total savings consist of private savings (SAVPriv), government savings (SAVGov), and foreign savings (SAVROW). The consumption and investment behaviors of private institutions (Cpriv) and the government (CGov), based on the Cobb-Douglas utility function, are determined by prices of goods, and disposable incomes. In this economy, the assumption of balance of total savings and investments (INVEST) must hold.

3.2 Financial computable general equilibrium

3.2.1 Standard FCGE model

The FCGE model framework is an extension of the CGE model incorporating the flow of funds account Vongpradhip (1987) and Rosensweig and Taylor (1990) were among the pioneers who developed a FCGE for Thailand. Consequently, influenced by the studies of Azis (2002) and Mansury (2002) on the economy of Indonesia, Manopiniwes (2005) and Puttanapong (2008) developed FCGE models for Thailand using SAM of Thailand and the flow of funds accounts in 2004.

Similar to the framework of Manopiniwes (2005) and Puttanapong (2008), this study presents the FCGE model for Thailand, using the 2007 FSAM as its base-year data. The model replicates the activities in the real economy and financial transactions in the Thai economy. As an extension of the CGE model, the mechanism of the financial module is included (see Figure 10). The following aspects are additional key specifications of this FCGE model:

- Balancing the balance sheets and equilibrating demand and supply of assets
- Saving and investment linkage between the real and financial markets
- Transmission of monetary policy
- Portfolio choices of institutions

The FCGE model is used to simulate the impact of real estate investment on the economy of Thailand. This model is based on the 2007 Thailand FSAM, which provides rich information about the economic activities and structures such as income distribution, transfers among institutions, production and consumption patterns, saving and investment, and flow of funds. The fact that the model is economy-wide and price-endogenous makes the FCGE model suitable for analyzing the effect of real estate investment on not only macroeconomic fundamentals but also on social factors, especially on income distribution.

In addition, this study focuses on the real estate sector in the economy of Thailand. Therefore, DiPasquale and Wheaton's framework of the real estate market will be included as the incorporated equations of the relationship between asset and property markets represent the role of real estate, especially in residential development, in Thailand.

3.2.2 Asset allocation

One important aspect in the FCGE model in this study is that households' asset allocations—representing households' investment behavior in the financial market—is incorporated explicitly in the model. Following previous studies using FCGE models, the specification of households' asset allocation is based on the theoretical framework of portfolio allocations by Tobin (1979); Brunner and Meltzer (1972); Bernanke and Blinder (1988); Bouguignon, Branson, and de Melo (1989); Thorbecke and Downey (1992); and Azis (2002). It is assumed that there is no perfect substitutability in household portfolio allocation, and the allocation to a particular kind of asset is driven by the rate of return of such asset.

Since wealth is considered a stock (as opposed to a flow), households need to allocate their amount of wealth to different kinds of assets. Due to the limitation of data, a household's wealth may be allocated between two main types of financial assets—money demand and non-money demand. The proportion of the allocation is represented by an asset allocation parameter, which is determined primarily by the average rate of return of money demand and of non-money demand.

3.2.3 Relationship of property and asset markets

As discussed previously in the literature review section, DiPasquale and Wheaton (1994) study the behavior in the housing market in the US by applying the framework of the relationship between property and asset markets (DiPasquale & Wheaton, 1992). In this study, the equations of the four quadrants from the framework are incorporated into the FCGE model.

In the property market quadrant (the northeast quadrant), the supply of housing is represented by the stock of housing in Thailand. The function of demand for space is determined by RGDP, the price of a real estate sector, and the average rate of return. In the asset market (the northwest quadrant), the price for real estate asset is determined by the capitalization rate. The real estate valuation in the FCGE model represents a price for a real estate asset, which is determined by the average rate of return and the rate of return of a real estate sector.

In the asset market (the southwest quadrant), the price of real estate assets is related to the replacement or construction costs. In this study, the replacement cost is related to the price of a construction sector. The relationship of the asset market in this quadrant is represented in the model. In the southeast quadrant, the stock of real estate at the end of the year depends on construction costs and the depreciation rate of the stock. In the FCGE model, the stock adjustment of space in the property market can be represented as a function of construction cost, the depreciation rate of stock, and the quantity of real estate.

3.3 Data

Two main sources of data are used in this study: the financial social accounting matrix (FSAM) and real estate market data of Thailand. These data sources are used as the input of the FCGE model. Almost all parameters and initial variables in the model are calibrated from these data.

3.3.1 Financial social accounting matrix

The 2007 FSAM of Thailand produced by the National Economic and Social Development Board (NESDB) and Fiscal Policy Research Institute (FPRI), is used as the major database for the FCGE model in this study. The 71-account FSAM consists of:

- Fifteen production sectors: agriculture, fishery, mining & quarrying, manufacturing, electricity & water supply, construction, wholesale & retail trade, hotel & restaurant, transportation & communication, financial intermediation, real estate and renting, public administration & defense, education, health, and other services,
- Five households which are grouped into poor and non–poor households,
- A private firm, state-owned enterprise, financial institutions, the government, and the rest of the world,
- Ten financial instruments: cash, deposits, loans and bills, government bonds, corporate bonds, listed equity, foreign assets/liabilities, non-listed equity, other items, and FOREX reserve.

Similar to the structure of SAM, the capital account in FSAM is disaggregated into ten sectors of financial instruments as well as into capital accounts of each institution based on the information of flow of funds.

3.3.2 Data of real estate market in Thailand

The main data source of real estate in Thailand is from the Real Estate Information Center (REIC), which is an organization established by the Government Housing Bank (GHB). Another source of information on the real estate market of Thailand is the Fiscal Policy Research Institute (FPRI), which is a non-profit organization under the policy supervision by the Ministry of Finance. Table 1 and Table 2, respectively, show the market value of real estate and number of housing units in Thailand from 2003 to 2007. The changes of the value of real estate and the change in number of housing units in 2004 are approximately 30% and 13%, respectively. After 2004, however, the lower changes in market value and number of housing units after 2004 may suggest that the real estate market in Thailand is currently stable.

4. Results

4.1 Simulation and results

In this study, the risks and opportunities from high investment speculation in real estate are examined. Four simulation scenarios are undertaken: (1) baseline; additional five percent increase annually in an investment in (2) real estate (scenario RE), (3) agriculture (scenario AG), and (4) manufacturing sectors (scenario MGR). The baseline simulation scenario assumes that there is an annual growth of 3.5% in real estate investment in Thailand. Three other scenarios assume that there is an additional five percent increase in an investment from a rich household in alternate sectors, which represents speculative behavior. The time frame of the simulation is 10 years. Both the risks and opportunities from the high speculation are measured from the simulation results.

The so-called risk, or vulnerability to a crisis, is analyzed. Out of the three measures discussed in Section 2, the simulation results can provide only two indicators: Real Exchange Rate (RER) appreciation and the level of foreign exchange reserve. On the other hand, the opportunities are indicated by macroeconomic fundamentals, such as GDP, Real GDP (RGDP), Price Index (PINDEX), Exchange rate (EXR), as well as socio-economic indicators, such as Incomes of the Poor (INC.Poor) and non-poor (INC.NPoor), income distribution (INC.Dist), and Unemployment Rate (UEMPR). The income distribution is measured by the ratio of the incomes of the poor to those of the non-poor household.

Table 1. The market value of real estate in Thailand, 2003-2007.

Values (Billion Baht)	2003	2004	2005	2006	2007
New Housing	146,132	208,343	246,750	281,668	311,738
		42.60%	18.40%	14.20%	10.70%
Pre-owned housing	29,619	28,489	29,055	30,852	32,900
		-3.80%	2.00%	6.20%	6.60%
Custom-Built housing	55,215	62,648	69,523	75,952	82,983
		13.50%	11.00%	9.20%	9.30%
Total	230,967	299,480	345,328	388,472	427,622
Change		29.70%	15.30%	12.50%	10.10%

Table 2. The number of housing units in Thailand 2003-2007. (Source: Fiscal Policy Research Institute (FPRI))

Unit	2003	2004	2005	2006	2007
New Housing	46,052	59,409	68,025	73,838	78,684
		29.00%	14.50%	8.50%	6.60%
Pre-owned housing	25,717	23,998	23,443	23,346	23,356
		-6.70%	-2.30%	-0.40%	0.00%
Custom-Built housing	90,902	100,170	107,741	113,786	120,174
		10.20%	7.60%	5.60%	5.60%
Total	162,671	183,577	199,209	210,970	222,215
Change		12.90%	8.50%	5.90%	5.30%

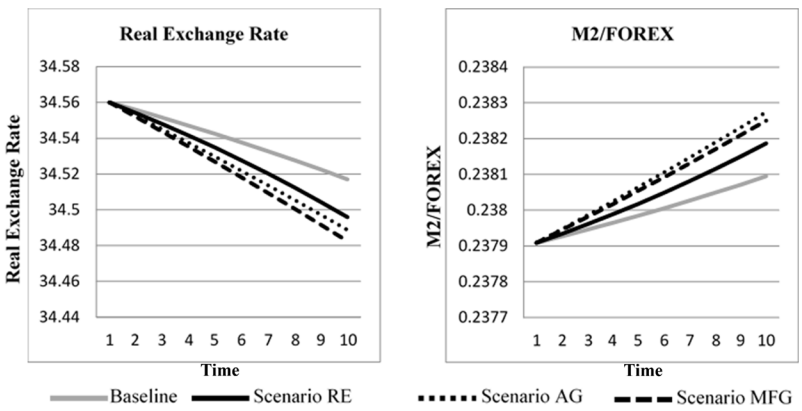


Figure 11. The indicators of vulnerability to crisis under the 5% investment increase annually in real estate, agriculture, and manufacturing sectors

In the baseline scenario, the simulation results show that the annual growth of 3.5% in real estate contributes to a slight increase of the vulnerability to a crisis as shown in Figure 11. The RER and the M2/Foreign exchange reserve ratio suggest a heightened risk to economic instability. In terms of opportunity, the results suggest that there is evidence of economic growth with real estate investment as the GDP and RGDP increases. The results, however, show a trade-off between the higher growth and higher inflation (PINDEX). Moreover, currency appreciation may make foreign investment less attractive in Thailand and hurt export-oriented sectors. In comparison to the baseline, currency in real terms depreciates in all three scenarios. The real exchange rate depreciates the most in Scenario MFG, followed by Scenario AG and RE, respectively. This result suggests that a 5 percent increase in investment in the real estate sector puts the least pressure on currency depreciation when compared to the same growth in investment in agriculture and manufacturing sectors. The M2/FOREX ratio in Scenario AG is the highest, followed closely by the ratio in Scenario MFG. These indicators suggest that a 5% additional investment in real estate does not impose as high of a vulnerability to crisis as it does in agriculture and manufacturing sectors.

Figure 12 shows the simulation results in terms of macroeconomic performance. GDP in Scenario AG is the highest among the three scenarios, followed by Scenario MFG and RE. This result conforms to the stylized fact that both agriculture and manufacturing are the predominant sectors in Thailand. However, in real terms Scenario, MFG yields the highest RGDP, followed by Scenario RE and AG. Additional investment in the agriculture sector puts an upward pressure on price the most, resulting in lower RGDP. In terms of average commodity price (PINDEX), Scenario AG has the highest inflation, followed by Scenarios MFG and RE. Similarly for the nominal exchange rate, Scenario AG has the highest degree of currency depreciation, followed

by Scenarios MFG and RE. These macroeconomic indicators suggest that investment in the agriculture sector may lead to the highest growth, but the benefit is offset by the increase in price. Additional investment in the real estate sector, on the other hand, leads to lower growth, but lower inflation as well.

In terms of social indicators, Figure 13 shows the simulation results of the baseline and three scenarios. The results suggest a positive impact on the incomes of all household groups and a lower unemployment rate. However, the impact is not evenly distributed as the income distribution indicator worsens. Scenario AG has the highest growth in income of the poor, followed by Scenarios MFG and RE. Both Scenarios MFG and AG have similar positive impacts on the income of the non-poor households, followed by Scenario RE. Additional investment in the real estate sector does not improve household income as much as in agriculture and manufacturing sectors. Scenario AG shows an improvement in income distribution while the distribution worsens in both Scenarios MFG and RE. The unemployment rate improves the most in Scenario MFG, followed by Scenarios AG and RE. Additional investment in the real estate sector does not improve income distribution as much as in the agriculture sector nor does it reduce unemployment rate as much as in the manufacturing sectors.

4.2 Policy Implications

The simulation of three scenarios of a 5% increase in investment in the real estate, agriculture, and manufacturing sectors illustrates both the risks and opportunities from such investment scenarios. Table 3 summarizes the simulation results of various indicators at the end of year 10. As can be seen, in comparison to the baseline, there is a marginal difference in terms of vulnerability to crisis among three scenarios.

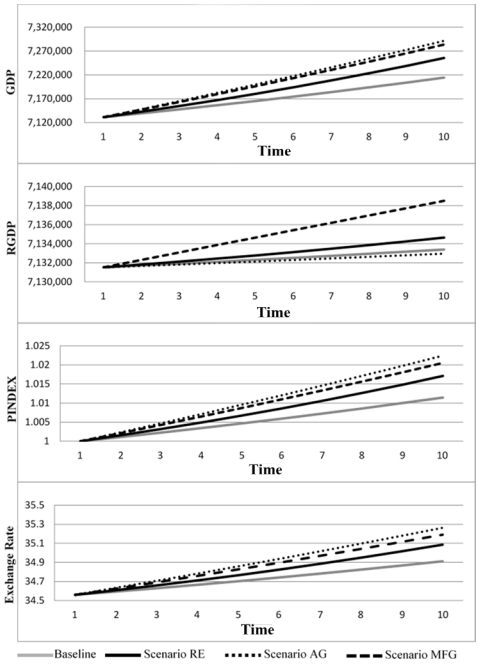


Figure 12. The macroeconomic indicators of the 5% investment increase annually in real estate, agriculture, and manufacturing sectors

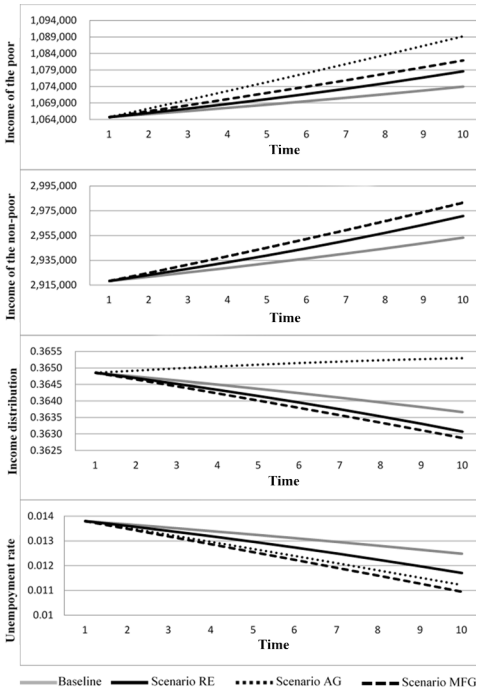


Figure 13. The socioeconomic indicators of the 5% investment increase annually in real estate, agriculture, and manufacturing sectors

Table 3. The results of 5% investment increase in real estate, agriculture, and manufacturing sectors at the end of year 10

Variables	Baseline	Real estate	Agriculture	Manufacturing
Vulnerability to crisis				
M2/FOREX	0.23810	0.23819	0.23827	0.23825
RER	34.5170	34.496	34.489	34.482
Macroeconomic indicators				
GDP	7,214,334	7,255,572	7,291,635	7,283,635
RGDP	7,133,400	7,134,646	7,132,971	7,138,499
PINDEX	1.012	1.017	1.022	1.021
EXR	34.913	35.086	35.262	35.191
Socioeconomic indicators				
Income of the poor	1,073,982	1,078,600	1,089,227	1,081,892
Income of the non-poor	2,953,232	2,970,756	2,981,759	2,981,416
Income distribution	0.3637	0.3631	0.3653	0.3629
Unemployment rate	0.0125	0.0117	0.0112	0.0109

The results suggest that, although the investment in the agriculture sector may lead to high growth in terms of GDP, it also contributes to higher inflation, resulting in lower GDP growth in real terms. In addition, the investment in manufacturing may yield to the highest RGDP growth and lowest unemployment rate, but it worsens income distribution between the poor and non-poor households. On the other hand, although a 5% additional investment in the real estate sector may not lead to high growth as much as in the agriculture or manufacturing sectors, it seems to bring a lower economic cost—in terms of inflation—as well as a lower social cost—in terms of income distribution—to the Thai economy. Investment in the real estate sector creates the least impact on increasing the average commodity price.

The simulation demonstrates that the country is unlikely to be vulnerable to a financial crisis if the real estate investment is moderate. Such investment may also benefit the Thai economy economically and socially. Therefore, monitoring mechanisms to control overheating or speculative investment in real estate are recommended. Such policies may include introducing a capital gains tax on real estate asset investment or an excise tax on real estate properties. These tax mechanisms are currently not imposed in Thailand, yet they could be elements of a policy that controls overheating or unsound real estate investment. These simulations are evidence that the investment in RE may not be a golden bullet for the Thai economy.

5. Conclusion

Growth in the economy of Thailand is highly related to the activities of the real estate industry. While the frameworks of SAM and CGE show the interactions between real estate and other sectors in the real economy, the flow of funds accounts and FSAM extend the more realistic picture of connections between real estate and the financial market. With the FCGE model, the simulations of the role of the real estate industry on the economy and social welfare can be investigated. The simulation has shown that opportunities and risks from a higher investment in real estate are not as high as a higher investment in the agriculture and manufacturing sectors. In addition, various policies can be developed and applied to mitigate the negative effects from the real estate investment in Thailand. The analysis suggests that moderate growth in the real estate sector is desirable. Thus, taxation policies, such as a capital gains tax on investment in real estate assets and an excise tax on real estate properties, should be implemented to control overheating real estate investment. Upon the availability of greater details of the FSAM and data on asset and liability holdings of institutions besides households such as government and financial instructions, this FCGE model can be extended to incorporate asset holding behaviors of such institutions. Further studies may include the examination of the relationship between the growth of GDP and the real estate price to indicate the probability of real estate bubble stage.

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