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BANKING & FINANCE | RESEARCH ARTICLE

Theoretical foundations of real estate market behavior

Truong Hong Trinh^{1*}

Abstract: The explanation of the price and value of real estate is still a big challenge that limits forecasting the market value, and explaining bubbles and crashes in the real estate market. Thus, this paper extends the theory of market equilibrium to redefine the value concept for explaining market behavior in real estate. The demand–supply analysis is used to define market value and value distribution between sellers and buyers in the real estate market. From this base, the roles of investors and credit institutions are identified in promoting real estate activities, and also in causing bubbles and crashes in the real estate market. Moreover, numerical experiments are used to conduct market behavior in typical situations with defined demand and supply functions in the real estate market. The research results and findings provide key implications for providers, investors, customers, credit institutions, and governance in the real estate industry. The paper also contributes to the theoretical foundations for further research on market behavior and valuation in real estate.

Subjects: Marketing; Social Sciences; Area Studies; Asian Studies; Economics, Finance, Business & Industry; Business, Management and Accounting; Marketing; Relationship Marketing; Retail Marketing

Keywords: market behavior; market value; market bubbles; market crashes; real estate

The complexity of the real estate market with potential risks has attracted researchers to explain the behaviors of providers, customers, investors, credit institutions, and government. In this paper, the demand–supply analysis is used to define market value and value distribution between sellers and buyers in the market. The roles of investors, brokers, and credit institutions are identified in promoting the real estate activities, and also the main drivers in causing bubbles and crashes in

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the real estate market. The research findings provide key implications for providers, customers, investors, and credit institutions in the real estate industry.

1. Introduction

Real estate is one of the most important economic sectors because the demand to own real estate for living houses and income-generating sources increases along with socio-economic development. However, the real estate market also embraces many potential risks that have attracted researchers in explaining behaviors of consumers, investors, credit institutions, and government. Many earlier researches have attempted to identify the inherent market characteristics and use underlying economic theories to explain real estate market behavior. However, the complexity of the real estate market is still a big challenge in forecasting market value, bubbles, and crashes in the real estate market.

Real estate is defined as the physical land and those human-made items which attach to the land (IVSC, 2003). The real estate market is an environment in which real estate trades between buyers and sellers through a price mechanism. In such a market, the market value is defined as the estimated amount for which real estate should exchange on the date of valuation between a willing buyer and a willing seller in the market (IVSC, 2003). The market value is determined by using one or more basic valuation approaches, including the cost approach (Miller & Geltner, 2005), sales comparison approach (Kummerow, 2003; Miller & Geltner, 2005), and income capitalization approach (Floyd & Allen, 2002). In fact, each method is suitable for some kinds of real estate in real estate appraisal. These real estate valuations require the reference to market transactions that reflect supply and demand conditions as well as buyers' and sellers' expectations of future benefits of ownership (Kummerow, 2003). However, these basic valuation methods lack a theoretical foundation for supply-demand analysis to explain behavior and market equilibrium.

Moreover, the real estate market involves many parties with the pricing setting power, the party's capital, and experience. Case and Shiller (1988) argued that buyers and sellers do not have enough information to perceive behavior in the real estate market. Many empirical studies have found that real estate owners delay selling when prices are high (Asabere & Huffman, 1993; Miller, 1978) and explain why owners do not lower prices when demand falls to delay for market increasing again (Genesove & Mayer, 1994). The complexity of the real estate market requires extending the theory of market equilibrium to conduct individual and cooperative behaviors (Trinh, 2021; Trinh, 2018).

For these motivations, this paper seeks theoretical foundations for explaining market behavior in real estate. The real estate market also involves many participants such as providers, credit institutions, and government authorities in related markets, such as credit and mortgage markets. Market behavior is always connected with the behaviors of participants in related markets (Andrews, 1978; Trinh & Long, 2022). In the next section, the theory of market equilibrium redefines market equilibrium, including production equilibrium and consumption equilibrium. Market equilibrium and surplus concepts are the base to explain market behavior. Section 3 uses demand-supply analysis to conduct market behavior with many participants in the related market and explain the phenomenon of bubbles and crashes in the real estate market. Section 4 provides numerical experiments to conduct market behavior in typical situations in the real estate market. The main findings and implications are summarized in the conclusion section.

2. Market equilibrium

Neoclassical economists explain market behavior through the mechanism of market equilibrium. However, the neoclassical theory of market equilibrium explains a commodity's price through the relationship between supply and demand in the market (Marshall, 1890, 1920). From the base of market equilibrium, economists explain consumer surplus and producer surplus (Hicks, 1941; Marshall, 1890). However, the explanation of a commodity's value is still a big challenge that will affect the way to explain value distribution between producers and customers in the market.

Besides, there is a distinction between price and value, in which value is perceived and created in the consumption process (Grönroos, 2008; Vargo & Lusch, 2004; Wikström, 1996; Woodruff & Gardial, 1996), price takes the role of value distribution between producers and consumers (Trinh, 2018). Thus, the extended theory of market equilibrium explains market behavior in today's economy.

From the value creation perspective, the value creation system integrates both production and consumption processes. First, the producer takes the role of value facilitator who uses production inputs to make the commodity's value foundation and transfer it to the customer through the exchange. Then, the value of a commodity is created in consumption, as illustrated in Figure 1.

In the production process, the producer uses capital and labor to create the production quantity (Q). Since the Cobb Douglas function is estimated with observed data of capital and labor in production, the Cobb Douglas production function is expressed as follows:

$$Q = f(K_1, L_1) = A_1 \times K_1^{\alpha_1} \times L_1^{\beta_1} \tag{1}$$

where A_1 is the total production productivity factor. K_1 and L_1 are production capital and production labor. α_1 and β_1 are the output elasticity of input production factors.

The production cost function (TC_1) is determined upon the combination of production capital (K_1) and production labor (L_1) as follows:

$$TC_1 = w_{K_1} \times K_1 + w_{L_1} \times L_1 \tag{2}$$

where w_{K_1} and w_{L_1} are the unit costs of production capital and production labor.

The production profit function (Π) is determined by total revenue (TR) minus total production cost (TC_1) as follows:

$$\Pi = TR - TC_1 = p \times Q - w_{K_1} \times K_1 - w_{L_1} \times L_1 \tag{3}$$

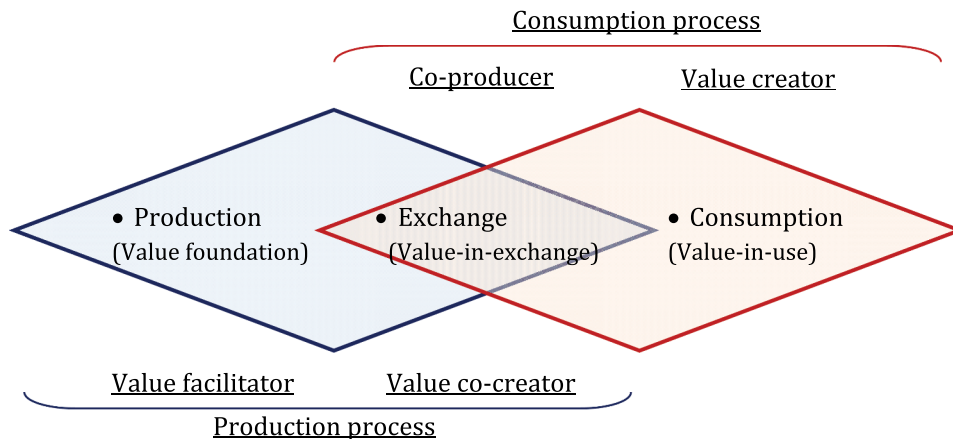
where TR is the total revenue ($TR = p \times Q$) and p is the unit price.

In the consumption process, the customer adds capital and labor to consume the quantity (Q). Since the Cobb Douglas function is estimated with observed data of capital and labor in consumption, the Cobb Douglas consumption function is expressed as follows:

$$Q = f(K_2, L_2) = A_2 \times K_2^{\alpha_2} \times L_2^{\beta_2} \tag{4}$$

Figure 1. Value creation perspective.

Source: Adapted from Grönroos and Voima (2012) and Trinh (2018)



where A_2 is the total consumption productivity factor. K_2 and L_2 are consumption capital and consumption labor. α_2 and β_2 are the output elasticity of input consumption factors.

The consumption cost function (TC_2) is determined upon the combination of consumption capital (K_2) and consumption labor (L_2) as follows:

$$TC_2 = w_{K_2} \times K_2 + w_{L_2} \times L_2 \tag{5}$$

where w_{K_2} and w_{L_2} are the unit costs of consumption capital and consumption labor.

The consumption utility function (U) is determined by total utility (TU) minus total consumption cost (TC_2) as follows:

$$U = TU - TC_2 = (v - p) \times Q - w_{K_2} \times K_2 - w_{L_2} \times L_2 \tag{6}$$

where TU is the total utility ($TU = u \times Q$), $u = v - p$ is the unit utility and v is the unit value.

Since the value creation system integrates both the production process and consumption process, the total cost (TC) is the sum of total production cost (TC_1) and total consumption cost (TC_2) as follows:

$$TC = TC_1 + TC_2 = w_{K_1} \times K_1 + w_{L_1} \times L_1 + w_{K_2} \times K_2 + w_{L_2} \times L_2 \tag{7}$$

The net value function (V) is determined by total value (TV) minus total cost (TC), the net value (V) also equals the sum of production profit (Π) and consumption utility (U) as follows:

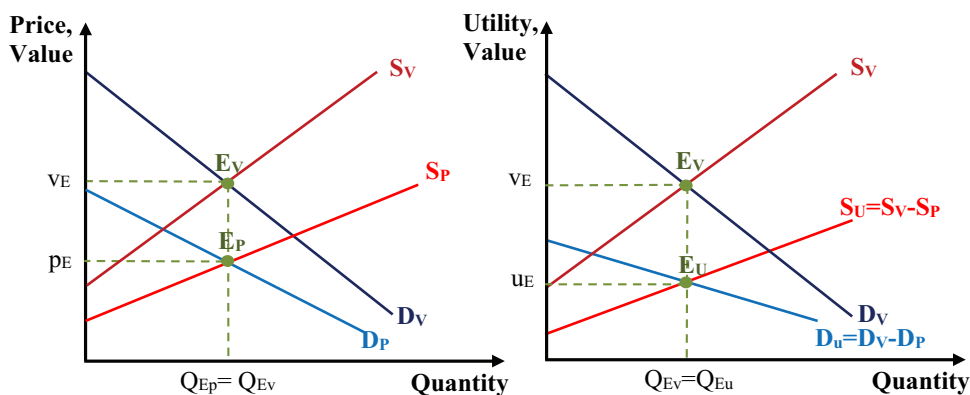
$$V = TV - TC = v \times Q - (w_{K_1} \times K_1 + w_{L_1} \times L_1 + w_{K_2} \times K_2 + w_{L_2} \times L_2) = \Pi + U \tag{8}$$

Since a commodity's value is created in consumption, a commodity's price plays a role in value distribution between the producer and the customer (Trinh, 2019). Thus, the theory of market equilibrium extends with both production equilibrium and consumption equilibrium to explain the price and value of a commodity in the market. The extended theory of market equilibrium defines market demand (D_V) including production demand (D_P) and consumption demand (D_U), and market supply (S_V) including production supply (S_P) and consumption supply (S_U). The value of a commodity is determined upon market equilibrium that depends on both production and consumption. The consumption demand (D_U) presents the additional value in consumption ($D_U = D_V - D_P$), and the consumption supply presents the additional cost in consumption ($S_U = S_V - S_P$), as illustrated in Figure 2.

Production equilibrium (E_P) occurs at an equilibrium price (p_E) where the quantity supplied in production (Q_{S_P}) is equal to the quantity demanded in production (Q_{D_P}). Consumption equilibrium (E_U) occurs at an equilibrium utility (u_E) where the quantity supplied in consumption (Q_{S_U}) is equal

Figure 2. Market equilibrium.

Source: Trinh (2018)



to the quantity demanded in consumption (Q_{Du}). Market equilibrium (E_v) occurs when the production equilibrium quantity (Q_{Ep}) equals the consumption equilibrium quantity (Q_{Eu}), the equilibrium value (v_E) determines the value of a commodity at the level of market equilibrium quantity (Q_{Ev}). The market will be in disequilibrium when the production equilibrium quantity (Q_{Ep}) is greater than (or less than) the consumer equilibrium quantity (Q_{Eu}), then the market occurs surplus (or shortage) in production (or consumption). Meanwhile, surplus (or shortage) information will provide producers and consumers to adjust production behavior (production equilibrium) and consumption behavior (consumption equilibrium) to reach the market equilibrium.

According to the rational choice theory, a profit-maximizing firm produces a quantity where marginal revenue (MR) equals marginal production cost (MC_1). In this quantity, the production supply curve (S_p) will intersect the production demand curve (D_p), as shown in Figure 3.

From this relationship, the production supply curve (S_p) depends on the marginal production cost (MC_1) and the production demand (D_p) as follows:

$$p_s(Q) = MC_1 - p'_D(Q) \times Q \tag{9}$$

where $p'_D(Q)$ is the first derivative of the production demand function $p_D(Q)$. The firm profit in the market is the area A_1JA_2 (the area below MR and above MC_1) which is also the producer surplus $A_1E_pA_2$ (the area lies below D_p and above S_p), as illustrated in Figure 3.

Similarly, the utility-maximizing customer consumes a quantity where the marginal utility (MU) equals the marginal consumption cost (MC_2). At this quantity, the consumption supply curve (S_u) intersects the consumption demand curve (D_u), as shown in Figure 4.

Figure 3. Firm profit and producer surplus.

Source: Trinh (2019)

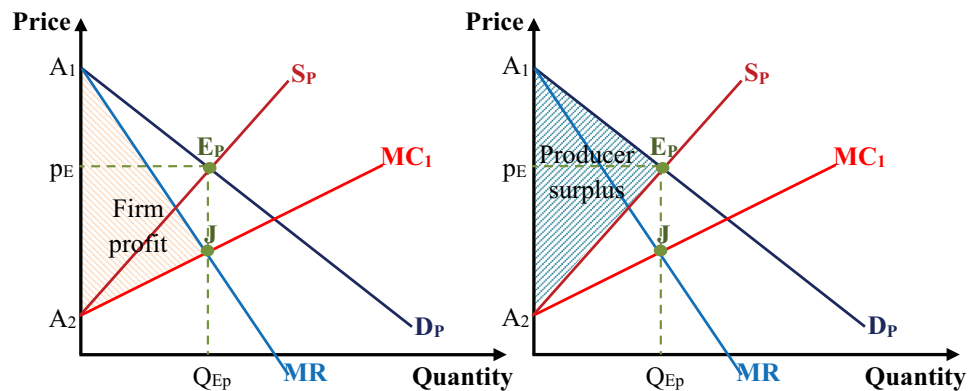
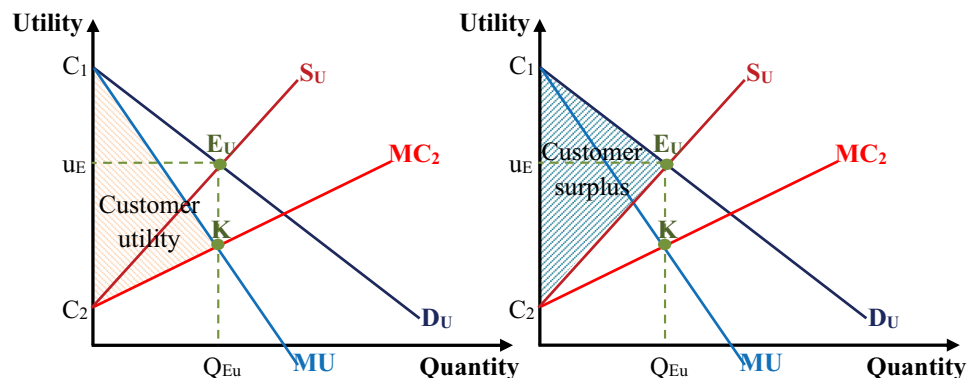


Figure 4. Customer utility and customer surplus.

Source: Trinh (2019)



From this relationship, the consumption supply curve (S_U) depends on the marginal consumption cost (MC_2) and the consumption demand (D_U) as follows:

$$u_S(Q) = MC_2 - u'_D(Q) \times Q \tag{10}$$

where $u'_D(Q)$ is the first derivative of the consumption demand function $u_D(Q)$. The customer utility in the market is the area C_1KC_2 (the area below MU and above MC_2) which is the same as the consumer surplus $C_1E_U C_2$ (the area lies below D_U and above S_U), as illustrated in Figure 4.

Since the marginal analysis indicates the value balance between firm profit and customer utility, the market maximizes the net value (the sum of firm profit and customer utility) at the quantity at which the marginal value ($MV = MR + MU$) is equal to the total marginal cost ($MC = MC_1 + MC_2$). At this quantity, the market supply curve (S_V) intersects the market demand curve (D_V), as shown in Figure 5.

From this relationship, the market supply curve (S_V) depends on the total marginal cost (MC) and the market demand (D_V) as follows:

$$v_S(Q) = MC - v'_D(Q) \times Q \tag{11}$$

where $v'_D(Q)$ is the first derivative of the market demand function $v_D(Q)$. The net value in the market is the area $(A_1 + C_1) L (A_2 + C_2)$ (the area lies below MV and above MC) is also the total surplus $(A_1 + C_1) E_V (A_2 + C_2)$ (the area lies below D_V and above S_V), as illustrated in Figure 5.

Since the market equilibrium is redefined and economic surplus is reformulated, the extended theory of market equilibrium reveals that market value is created in the consumption process, and the price plays a role in value distribution between producers and customers in the market.

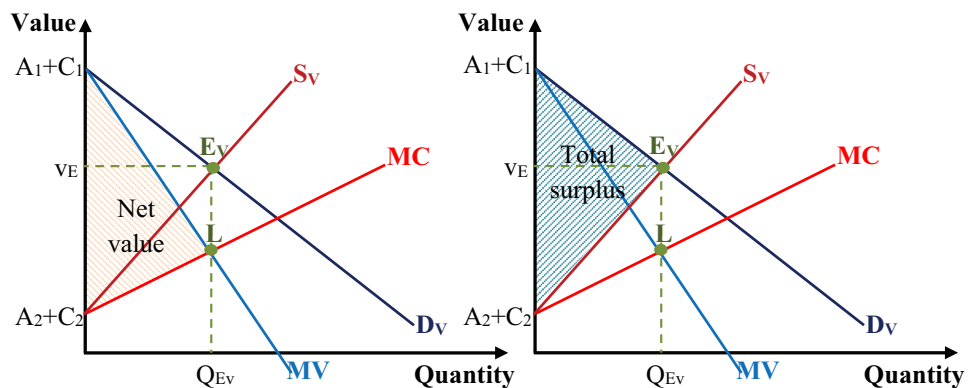
3. Market behavior

The extended theory of market equilibrium provides the basis for explaining the behaviors of buyers and sellers in the market. However, the real estate market involves many participants, in which the market depends on the driving factors of supply and demand, such as population growth, inflation, income, capital investment, and property taxes. The change of these factors is the basis for determining the scope of stable growth and the normal price of the real estate market, which is the base for investment and consumption decisions in the real estate market (Hott & Monnin, 2008).

While real estate value reflects the expected value of investors and consumers in the future, real estate price reflects the exchange value of real estate in the market at a point in time. Accordingly, price is the starting point for buyers with the future expected value, but it is the ending point for sellers in realizing the real estate value in the market. For example, an investor who buys real

Figure 5. Net value and total surplus.

Source: Trinh (2019)



estate at the market price with the expected value at a future time is greater than the purchase price. When an investor resells that real estate, it realizes its value. Similarly, consumers buying real estate for living houses or personal investments also expect the real estate value to be greater than the current purchase price. Therefore, the real estate value reflects the expected value and value distribution among real estate market participants.

Figure 6 illustrates the initial market equilibrium (where the participants reach equilibrium status in the real estate market) which determines the value of the real estate (v_{E0}) at the market equilibrium quantity (Q_{Ev0}) where the market supply (S_{v0}) intersects the market demand (D_{v0}). The market demand (D_v) is generally forecast to increase faster than the market supply (S_v) due to the demand growth rate being higher than the supply growth rate. As a result, the real estate value also increases along with the total surplus towards the normal value path, in which the normal value is determined based on the growth rate of supply and demand without any third-party intervention (speculation or credit expansion).

The fluctuation of market value reflects the distribution of economic surplus between buyers and sellers in the market. Figure 7 illustrates producer surplus (seller) as AE_pB and consumer surplus (buyer) as CE_uD . The total surplus (market) is FE_vG (the sum of producer surplus and consumer surplus).

When real estate brokers participate in the real estate market, the brokers act as intermediaries in transactions between buyers and sellers. Brokerage activities will increase market liquidity (transactions between buyers and sellers take place faster). Thus, the buyer and seller incur a real estate brokerage fee and reduce the costs related to information retrieval and asymmetric information. The tradeoff between information costs and brokerage costs will affect the ability to

Figure 6. Market equilibrium and real estate value.

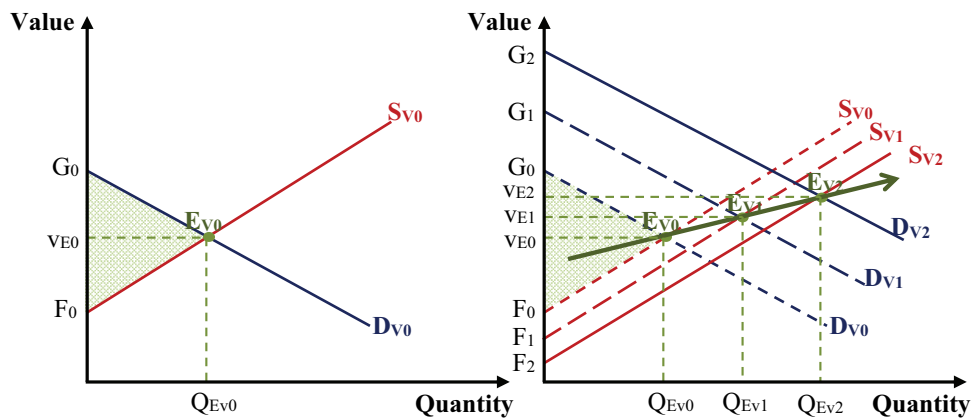


Figure 7. Value distribution between buyers and sellers.

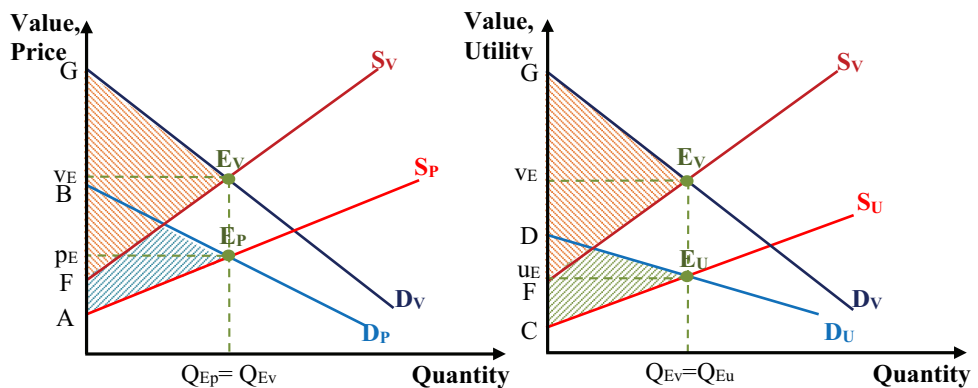
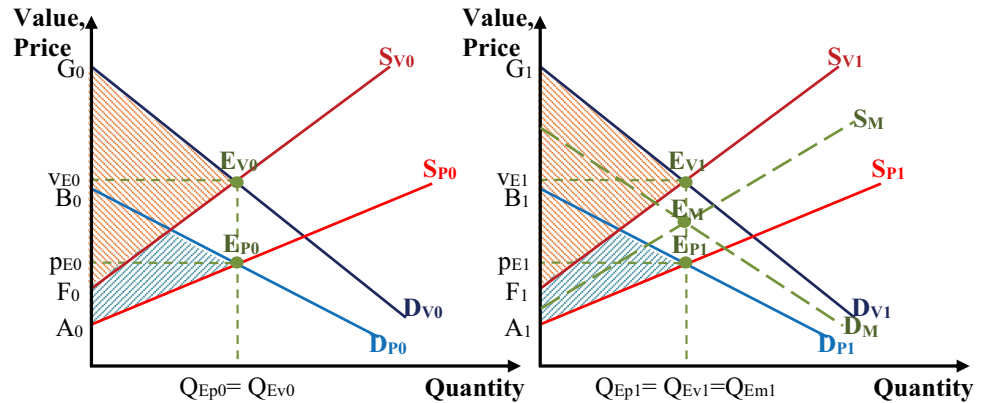


Figure 8. Market equilibrium with the broker participation.



increase or decrease the market supply. Meanwhile, market liquidity will increase supply and demand in the real estate market. However, brokers have also shared a portion of the economic surplus in the market, as shown in Figure 8. The brokerage equilibrium (E_M) is determined at the equilibrium market quantity (Q_{Ev}) where the brokerage demand (D_M) intersects the brokerage supply (S_M). The total surplus (the market) is equal to the sum of producer surplus (sellers), brokerage surplus, and consumer surplus (buyers).

With the participation of investors, the investors buy real estate from the providers or other investors (sellers) and resell it to consumers or other investors. Investors' speculation will affect the real estate market's supply and demand, influencing market value and liquidity. The investor's buying activities will reduce the real estate supply when the price is lower than the normal value. When the price is higher than the normal value, the investor will sell the real estate, which increases the real estate supply.

Figure 9 illustrates the market equilibrium with investor participation. When investors buy real estate in the market, it reduces the market supply and reduces the total surplus, in which the decrease in the total surplus reflects the cost of investment capital. When the investors sell their real estate, it increases supply and increases the total surplus, in which the increase in the total surplus reflects the return on investment. The difference between the return on investment and the cost of investment capital reflects the investor surplus in the real estate market. Besides, trading activities will delay (the liquidity cycle) and increase demand over time.

The real estate bubble occurs when the real estate value increases abnormally compared to the normal value with the participation of credit institutions. The real estate bubble would not have occurred without some behavioral aspects related to market participants (Brzezicka & Wisniewski,

Figure 9. Market equilibrium with investor participation.

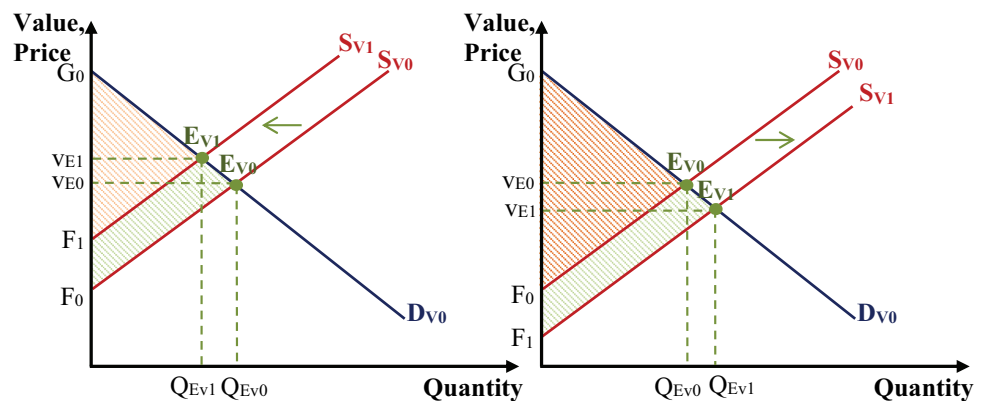
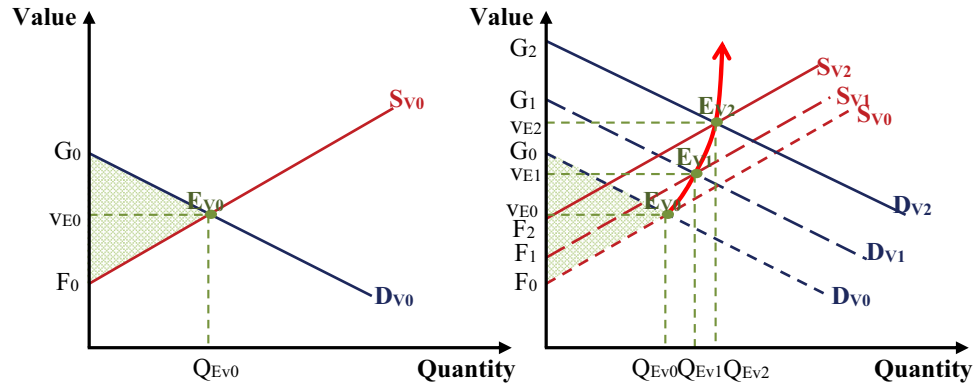


Figure 10. Bubbles in the real estate market.

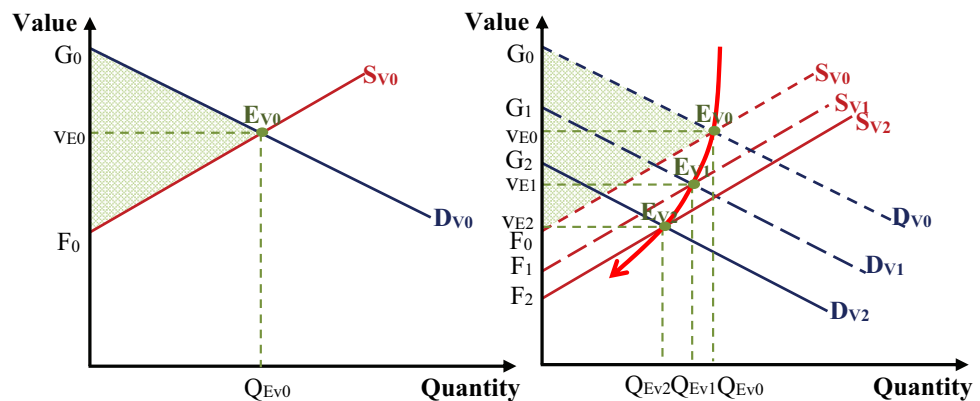


2014). Credit institutions are the capital source for investors and consumers. When the credit policy is expanded, the demand for real estate increases, and investors borrow money to buy real estate. The credit-expanding policy increases the market demand but decreases the market supply, which raises the real estate value. In addition, mortgage loans increase trading activities among investors, increasing the speed of demand growth and market liquidity in the real estate market. The increasing virtual demand and abnormal value will form a real estate bubble, as shown in Figure 10.

Market bubbles are the phenomenon that artificially increases real estate value and risks for investors and credit institutions. When the level of risk increases, credit institutions tightening credit sources will cause real estate demand and value reduction. Since the real estate value falls due to lower demand and an increase in supply from investor costs, the real estate collateral is at risk of being sold by credit institutions. This effect causes the supply to increase, the value of the real estate to continuously decline along with the loss of market liquidity, and as a result, the real estate market crashes, as illustrated in Figure 11.

Credit institutions are also at risk when the real estate collateral cannot be sold under a mortgage loan. Therefore, these credit institutions balance the minimum risk of mortgaged loans and the competition among credit institutions in the regulations of the central bank. When the market involves credit institutions to provide loans to consumers and investors, the market's total surplus will be partly shared as interest expenses on loans for credit institutions. If the consumer buys the real estate at a bubble value, the consumer surplus goes into the seller (investors). If the consumer buys at the crash value (lower than the normal value), the seller surplus passes on to the consumer. When credit institutions take part in the market as credit

Figure 11. Crashes in the real estate market.



providers, a part of the buyers' and sellers' economic surplus will be shared with the credit institutions in the form of interest expenses.

4. Numerical experiments

These numerical experiments are used to conduct market behavior that provides theoretical insights and practical implications in real estate. The first experiment examines market equilibrium, economic surplus, and market behavior under tax policies. The second experiment will expand with the participants of brokers and investors. The third experiment identifies the normal value path, and explains the abnormal value path with the participants of investors and credit institutions.

The first experiment examines market equilibrium and economic surplus with the participation of providers and consumers in the real estate market. The functions of market demand and market supply are assumed as follows:

$$p_D = 20 - \frac{1}{5} \times Q; p_S = 5 + \frac{1}{10} \times Q \tag{12}$$

$$u_D = 10 - \frac{1}{10} \times Q; u_S = \frac{1}{10} \times Q \tag{13}$$

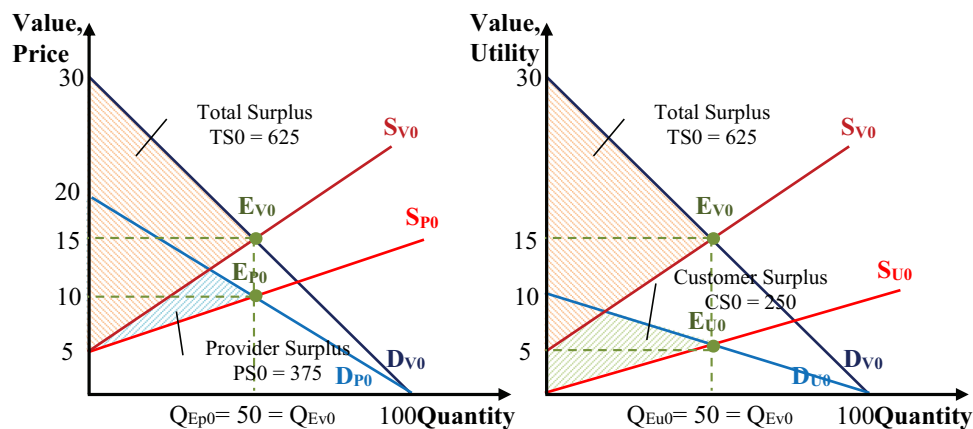
$$v_D = 30 - \frac{3}{10} \times Q; v_S = 5 + \frac{2}{10} \times Q \tag{14}$$

Market equilibrium occurs at the quantity ($Q_{Ev0} = 50$) where the production's equilibrium quantity ($Q_{Ep0} = 50$) equals the consumption's equilibrium quantity ($Q_{Eu0} = 50$) as illustrated in Figure 12. Market equilibrium is the basis for determining provider surplus and consumer surplus. The total surplus ($TS0 = 625$) is equal to the sum of the provider surplus ($PS0 = 375$) and the consumer surplus ($CS0 = 250$) as illustrated in Figure 12.

The market equilibrium determines the equilibrium value ($V_{E0} = 15$) and the equilibrium quantity ($Q_{Ev0} = 50$) in the real estate market where the value reflects the expected value of buyers (customers) and the price plays the role of a value distribution between providers and consumers in the market.

To examine the tax policy on market equilibrium and economic surplus, it assumes government imposes a unit tax ($t = 3$) on the providers. Then, the supply and demand function changes under the tax policy as follows:

Figure 12. Market equilibrium and economic surplus.



$$p_D = 20 - \frac{1}{5} \times Q; p_S = 8 + \frac{1}{10} \times Q \tag{15}$$

$$u_D = 10 - \frac{1}{10} \times Q; u_S = \frac{1}{10} \times Q \tag{16}$$

$$v_D = 30 - \frac{3}{10} \times Q; v_S = 8 + \frac{2}{10} \times Q \tag{17}$$

Figure 13 illustrates the new market equilibrium defining the equilibrium value ($V_{E1} = 16.8$) and the equilibrium quantity ($Q_{E1} = 44$). The total surplus ($TS1 = 616$) includes the provider surplus ($PS1 = 273.6$), the consumer surplus ($CS1 = 246.4$), and the government surplus ($GS1 = 132$).

When the market is in disequilibrium as in the above experiment, where the production's equilibrium quantity ($Q_{Ep1} = 40$) is less than the consumption's equilibrium quantity ($Q_{Eu1} = 50$), the government can adjust its tax and subsidy policy to affect the demand and the supply towards the market equilibrium. For instance, the government reduces the unit tax to providers at $tp = 1.8$ and increases the unit tax to customers at $tc = 1.2$. The market would then reach a new equilibrium at $Q_{E1} = 44$, in which the provider surplus ($PS1 = 290.4$), the consumer surplus ($CS1 = 193.6$), and the government surplus ($GS1 = 132$) are determined at the new market equilibrium.

The second experiment examines market behavior with the participation of brokers and investors. When the market has the participation of a broker, the brokerage costs incurred will affect the market supply, and brokerage activities also increase the market demand for real estate.

Where the brokerage costs paid by the sellers (providers) will directly affect the production supply, and the market demand is assumed to be increasing as follows:

$$p_D = 24 - \frac{1}{5} \times Q; p_S = 6 + \frac{1}{10} \times Q \tag{18}$$

$$u_D = 12 - \frac{1}{10} \times Q; u_S = \frac{1}{10} \times Q \tag{19}$$

$$v_D = 36 - \frac{3}{10} \times Q; v_S = 6 + \frac{2}{10} \times Q \tag{20}$$

Figure 14 illustrates market equilibrium at $V_{E1} = 18$ and $Q_{E1} = 60$. Total surplus ($TS1 = 960$) includes provider surplus ($PS1 = 540$), consumer surplus ($CS1 = 360$), and broker surplus ($BS1 = 60$).

Figure 13. Market equilibrium under tax policy.

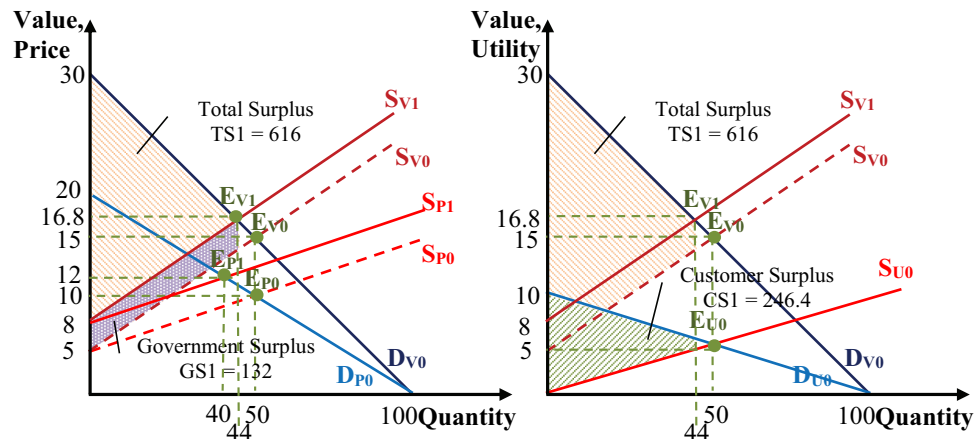
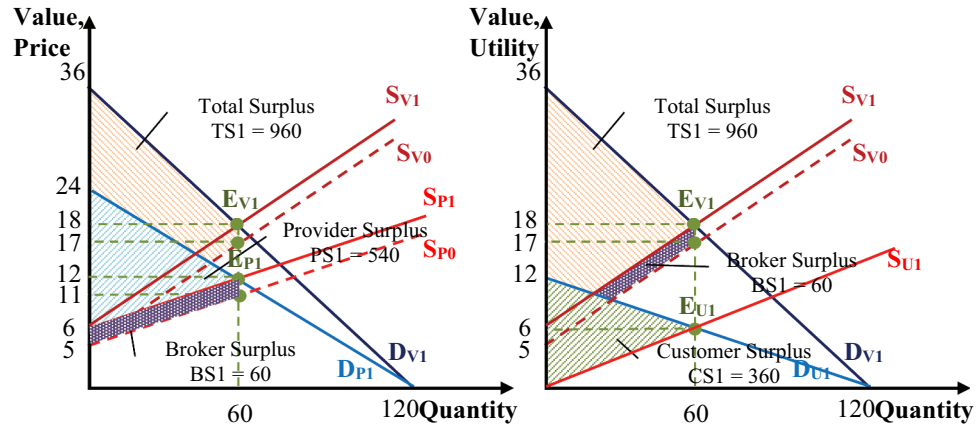


Figure 14. Market equilibrium with brokerage costs paid by providers.



In case of the brokerage costs paid by the buyers (consumers) will directly affect the consumption supply, and the market demand is assumed to be increasing as follows:

$$p_D = 23 - \frac{1}{5} \times Q; p_S = 5 + \frac{1}{10} \times Q \tag{21}$$

$$u_D = 13 - \frac{1}{10} \times Q; u_S = 1 + \frac{1}{10} \times Q \tag{22}$$

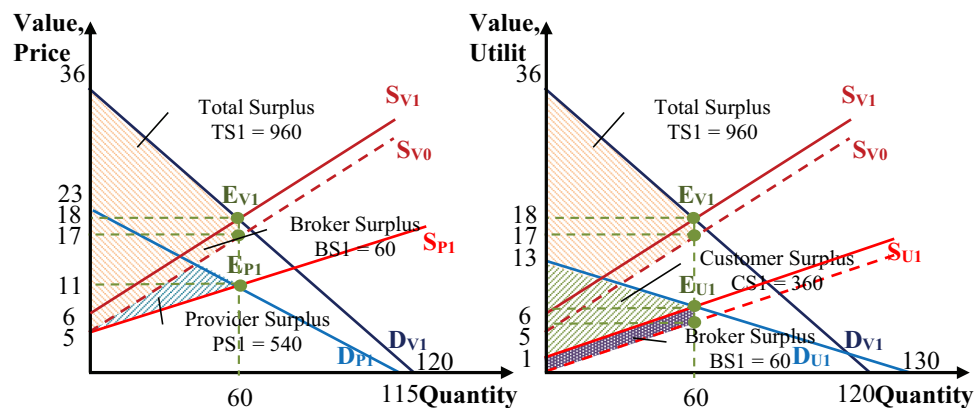
$$v_D = 36 - \frac{3}{10} \times Q; v_S = 6 + \frac{2}{10} \times Q \tag{23}$$

Figure 15 illustrates market equilibrium at $V_{E1} = 18$ and $Q_{E1} = 60$. Total surplus ($TS1 = 960$) includes provider surplus ($PS1 = 540$), consumer surplus ($CS1 = 360$), and broker surplus ($BS1 = 60$).

In the case of brokerage costs paid by both the sellers and buyers, it will directly affect production supply and consumption supply and increase the demand in the real estate market. When the value of real estate increases more than the brokerage costs, it will increase the provider surplus or customer surplus in the real estate market.

When the market has investor participation, buying real estate by investors will increase demand and decrease supply, and vice versa when investors sell real estate, it will decrease demand and increase supply. The experiment assumes that investor participation does not affect market equilibrium and market value, but only directly affects the production equilibrium and consumption equilibrium.

Figure 15. Market equilibrium with brokerage costs paid by customers.



In case investors buy real estate, buying real estate by investors affects the functions of demand and supply is assumed as follows:

$$p_D = 24 - \frac{1}{5} \times Q; p_S = 6 + \frac{1}{10} \times Q \tag{24}$$

$$u_D = 6 - \frac{1}{10} \times Q; u_S = -1 + \frac{1}{10} \times Q \tag{25}$$

$$v_D = 30 - \frac{3}{10} \times Q; v_S = 5 + \frac{2}{10} \times Q \tag{26}$$

Figure 16 illustrates provider surplus (PS1 = 375), consumer surplus (CS1 = 100), and investor surplus (IS1 = 150). When the effect of production demand increasing is greater than that of production supply decreasing, it will partly transfer consumer surplus to investor surplus.

In case an investor sells real estate, selling real estate by investors affects the functions of demand and supply is assumed as follows:

$$p_D = 16 - \frac{1}{5} \times Q; p_S = 4 + \frac{1}{10} \times Q \tag{27}$$

$$u_D = 14 - \frac{1}{10} \times Q; u_S = 1 + \frac{1}{10} \times Q \tag{28}$$

Figure 16. Market equilibrium with the participation of buying investors.

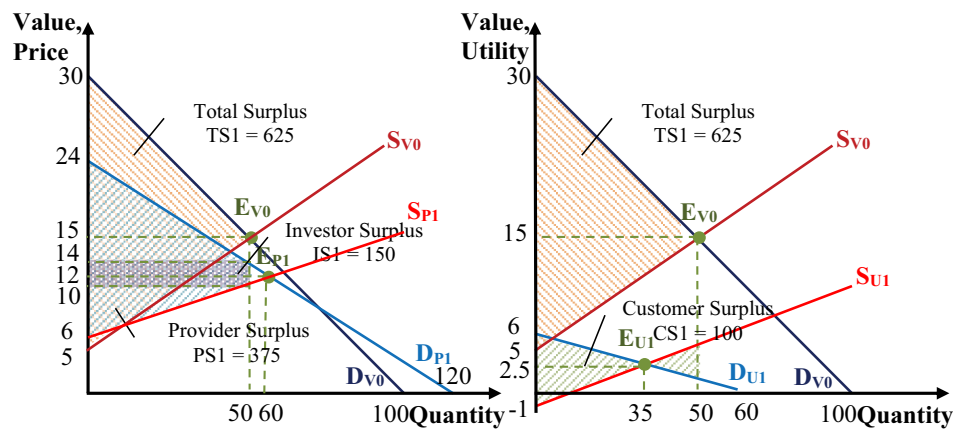
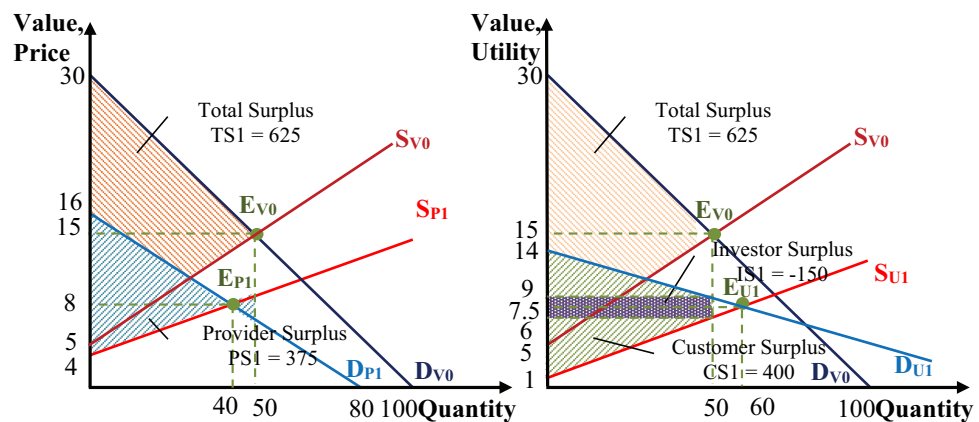


Figure 17. Market equilibrium with participation of selling investors.



$$v_D = 30 - \frac{3}{10} \times Q; v_S = 5 + \frac{2}{10} \times Q \quad (29)$$

Figure 17 illustrates provider surplus (PS1 = 375), consumer surplus (CS1 = 400), and investor surplus (IS1 = -150). When the effect of production demand decreasing is greater than that of production supply increasing, it will partly transfer investor surplus to customer surplus.

In the case where investor participation affects market equilibrium and market value, then provider surplus (PS1), consumer surplus (CS1), and investor surplus (IS1) will be determined based on the new market equilibrium. Therefore, identifying the normal value is very important in analyzing investors' effect on market value and changes in provider surplus and consumer surplus in the real estate market.

The third experiment analyzes the normal value path and explains the abnormal value path with the participation of investors and credit institutions. To identify the normal value path, the experiment assumes the changes in market supply and market demand over time corresponding to the following three situations:

Case 1:

$$p_{D1} = 22 - \frac{1}{5} \times Q; p_{S1} = 4 + \frac{1}{10} \times Q \quad (30)$$

$$u_{D1} = 12 - \frac{1}{10} \times Q; u_{S1} = \frac{1}{10} \times Q \quad (31)$$

$$v_{D1} = 34 - \frac{3}{10} \times Q; v_{S1} = 4 + \frac{2}{10} \times Q \quad (32)$$

Case 2:

$$p_{D2} = 25 - \frac{1}{5} \times Q; p_{S2} = 4 + \frac{1}{10} \times Q \quad (33)$$

$$u_{D2} = 14 - \frac{1}{10} \times Q; u_{S2} = \frac{1}{10} \times Q \quad (34)$$

$$v_{D2} = 39 - \frac{3}{10} \times Q; v_{S2} = 4 + \frac{2}{10} \times Q \quad (35)$$

Case 3:

$$p_{D3} = 27 - \frac{1}{5} \times Q; p_{S3} = 3 + \frac{1}{10} \times Q \quad (36)$$

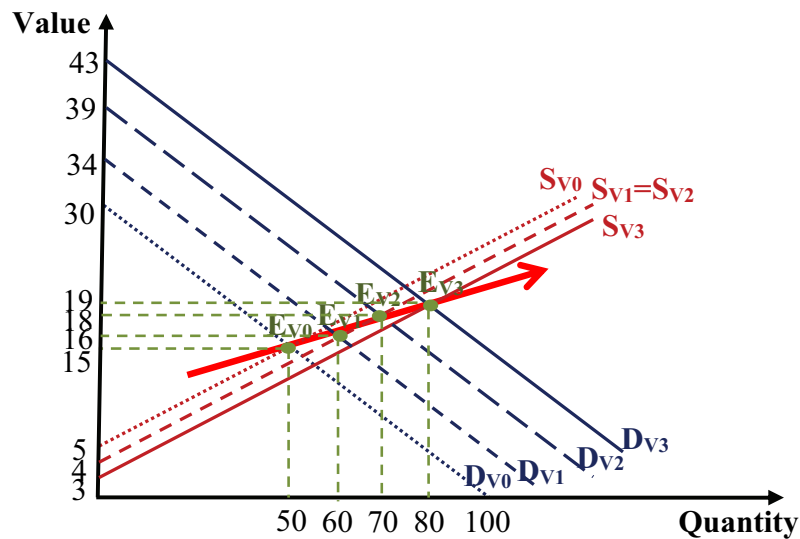
$$u_{D3} = 16 - \frac{1}{10} \times Q; u_{S3} = \frac{1}{10} \times Q \quad (37)$$

$$v_{D3} = 43 - \frac{3}{10} \times Q; v_{S3} = 3 + \frac{2}{10} \times Q \quad (38)$$

Figure 18 illustrates the upward trend in real estate value from cases in Table 1 because the growth rate of demand is greater than the growth rate of supply over time. Conversely, if the growth rate of demand is smaller than the growth rate of supply, the market tends to decrease the value of real estate. The relationship between value, price, and quantity in the demand-supply model is endogenous, so a supply and demand change will affect the market's equilibrium value, price, and quantity. Although analyzing determinants of demand and supply will clarify the

Table 1. Market equilibrium and economic surplus for the experimental cases				
Cases	Case 0	Case 1	Case 2	Case 3
Q_E	50	60	70	80
P_E	10	10	11	11
u_E	5	6	7	8
v_E	15	16	18	19
PS	375	540	735	960
CS	250	360	490	640
TS	625	900	1225	1600

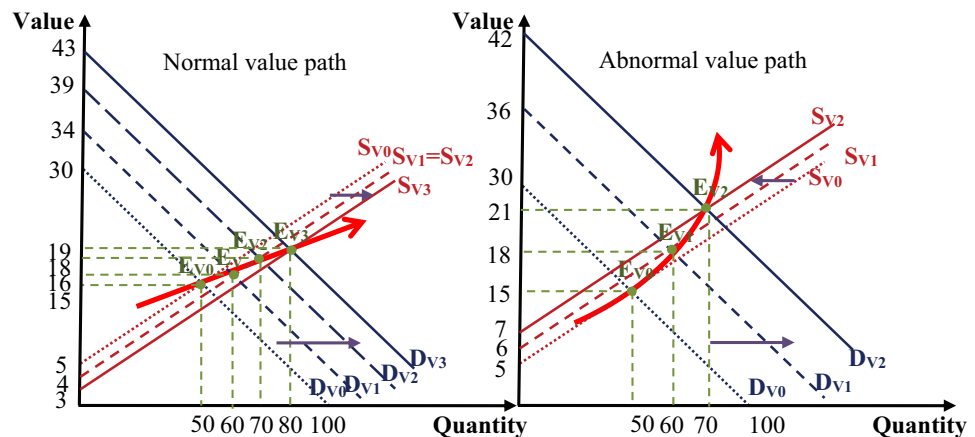
Figure 18. Market equilibrium and normal value path.



exogenous relationship (not defined within the demand–supply model), the impact of exogenous variables on each endogenous variable is studied in empirical research.

When the market has the participation of investors and credit institutions, credit expansion policies and mortgage loans will encourage investors to increase investments that lead to increasing demand and reducing supply. As a result, the value of real estate increases above the normal value as illustrated in Figure 19.

Figure 19. Market equilibrium and abnormal value path.



The investors' speculation may cause the phenomenon of abnormal value and market bubbles. If the market value exceeds the normal value during the bubble phase, it will transfer consumer surplus to investor surplus. Conversely, if the market value is lower than the normal value during the crash phase, it will transfer investor surplus to consumer surplus.

5. Conclusions

The theory of market equilibrium is a fundamental theory to explain the behavior of producers and consumers in the market. In this paper, the theory of market equilibrium explains individual rational behavior towards production equilibrium and consumption equilibrium, but the ultimate decisions rely on cooperative rational behavior towards market equilibrium. Therefore, market equilibrium and economic surplus are keys to explaining value creation and value distribution in the market. In addition, the theory of market equilibrium is expanded to analyze the real estate behavior with many participants, including land suppliers, investors, customers, and credit institutions. These participants will affect the relationship between demand and supply, leading to changes in real estate value, in which price plays an important role in the value distribution in the market. Moreover, the behavior of investors and credit institutions plays a crucial role in promoting real estate activities. It is also the main driver in causing bubbles and crashes in the real estate market.

The significant findings are summarized about the real estate market behavior as follows. First, the participation of investors seems not to increase the customer utility but only increases the price and value of the real estate. Second, brokers' participation makes buying and selling activities done quickly; consumers have the opportunity to choose the real estate with their preferences that increase consumer utility. Third, credit institutions stimulate the demand of both consumers and investors. The increase in investment demand will reduce real estate supply; thus, price and value tend to increase. Fourth, the participation of land providers increases supply, which leads to a decrease in the price and value of real estate. If the supply is greater than the demand, the expanding credit policy will adjust supply and demand toward the stability of the real estate value. Fifth, government tax policies and credit regulations can reduce the real estate market's risk of bubbles and crashes.

The paper contributes theoretical foundations for further research on market behavior and valuation models in the real estate industry. Since market supply depends on its marginal cost and market demand, and the price is determined upon this interdependence of demand and supply, the demand–supply model allows researchers to consider the effects of tax and subsidy policies, credit regulations that lead to changes in the demand–supply relationship and market value in real estate. In addition, research on the equilibrium mechanism under the policies and regulations is the basis for promoting real estate activities, limiting the formation of bubbles and crashes in the real estate market.

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