HOUSING PRICE DIFFERENCES UNDER THE DEVELOPMENT OF NEW TOWNS: USING TAIWAN AS AN EXAMPLE

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ABSTRACT

The purpose of this study is to examine the housing price differences between new towns and old urban areas. In addition, related issues such as spread options, the anchoring effect, and the ripple effect are discussed. By investigating the static spread, dynamic spread, and new town theory, we test seven hypotheses and verify most of these hypotheses. Furthermore, the key causes of the spread are identified: For example, spread options for different residence types depend on risk attitudes; and the ripple effect and anchoring effect of neighboring areas are determined by regional compactness and market transparency. The findings and relevant factors addressed in study can serve as a reference for investment decision making as well as for governments to implement projects of new town development or old urban area revitalization.

Contribution/ Originality: The paper's primary contribution is finding that the key factors cause housing prices differences between new towns and old urban areas. It can serve as a reference for investment decision making as well as for governments to implement projects of new town development or old urban area revitalization.

1. INTRODUCTION

This study investigates the housing price difference between new towns and old urban areas as well as related issues. The causes of the difference are analyzed to further explain the anchoring and ripple effects associated with the phenomenon. The results can serve as a reference for making investment decisions. With one of the motivations for conducting this study being to provide home buyers with an advantage, we select neighboring areas, where differing residence types have been built, to analyze the price differences. Generally, a new town is an area organized to offer basic, residential, service, and convenience facilities; it comprises a balanced composition of facilities, enables the internal cohesion of the area, and provides a livable environment for residents (Clapp, 1971). Planners of new town development projects often use project titles such as "Special Zone O" as a marketing strategy to attract investors or residents. In Taiwan for example, the New Taipei City Government has

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implemented the "Taipei University Special District" (TUSD) project by imposing measures such as zone expropriation and town and street building, achieving excellent rezoning results. Originally as undeveloped, deserted land, the TUSD is located in the river reservation region of three rivers: Sanxia River, Heng River, and Dahan River. Following the rezoning, the district becomes the first new town in Taiwan that was "built from scratch" and has successfully integrated the facilities of the nearby university. Other successful examples in Taiwan include the Neihu Technology Development Park in Taipei, Pier-2 Art Center in Kaohsiung, and Hsinchu Science Park.

Contemporary ideas of new towns originate from the concept of a garden city proposed by Howard. After the New Towns Act was passed in the United Kingdom in 1946, new towns have continually emerged in the country and have since become a global trend. The successful establishment of a new town necessitates resident moving to the area and the construction of residential buildings. We consider that residences are basic needs of people and serve as centers of social and economic development. Hence, residential expansion is a symbol of urban development (Byrne and Diamond, 2007). Relatively speaking, old urban areas (e.g., historic districts) are inevitably in decline because of restrictions on land use and limitations imposed by development codes (Schaeffer and Millerick, 1991). Therefore, housing price is a vital indicator for differentiating new towns and old urban areas. Housing prices affect the decisions of home buyers, who prefer purchasing affordable houses.

2. LITERATURE REVIEW AND HYPOTHESIS

2.1. New Town Theory and Discrepancy Theory

Howard asserts that living facilities provided in new towns must be self-sufficient, and that such towns must be equipped with sufficient open space and buffer zones to prevent an excessively high population density (Howard, 1898). Taylor (1915) states that satellite cities are not new entities independent of mother town; instead, the social and economic structure of satellite cities are influenced by those of mother town. For example, the government-led TUSD project is aimed at establishing a satellite-type new town that integrates university resources with cultural and educational facilities, provides a residential community, and incorporates regional and neighborhood businesses as complementary features. However, the renewal and revitalization of old urban areas also plays a vital role (Leinberger, 2005). For example, Sanxia Old Street is the most well-preserved and the oldest historic district in Taiwan. The neighborhood area showcases numerous historic sites, including an arch bridge, Baroque architecture, and Sanxia Zushi Temple, which is acclaimed as a "hall of oriental arts." Preserved in its original form, the Sanxia Old Street was reopened in 2007 following a renovation project that spans 3 years and costs US$10 million. Currently, the Zushi Temple and the Old Street of the Sanxia are famous tourist attraction in Taiwan.

The discrepancy theory was originally developed to discuss job satisfaction as a form of organizational behavior. Specifically, job satisfaction denotes individual perception of the discrepancy between actual and expected remuneration (Locke, 1969; Lawler, 1973). Nevertheless, a cognitive anchor is necessary for reducing such a discrepancy. Tversky and Kahneman (1974) argue that human decisions are biased because the decision-making process involves anchoring and behavior adjustment. For example, buyers are prompted to anchor their decisions on previous seller reference prices or the local market prices. However, such decisions are often biased because of information asymmetry (Wong et al., 2012) and poor transparency (Lin and Vandell, 2007) during transactions. The price of a real estate varies according to its features and locations; hence, houses located in neighboring areas can differ in their prices. For example, Lambson et al. (2004) report that out-of-state buyers have paid a notably higher premium when purchasing apartment buildings in downtown Phoenix. Therefore, we explore housing price differences in areas neighboring the TUSD and elaborate on related issues such as the spread option, anchoring effect, and ripple effect.

From the perspectives of static spread, dynamic spread, and new town theory, we consider factors such as transportation, history, and culture to develop seven hypotheses. Figure 1 lists the hypotheses and relevant theories and illustrates their associations.
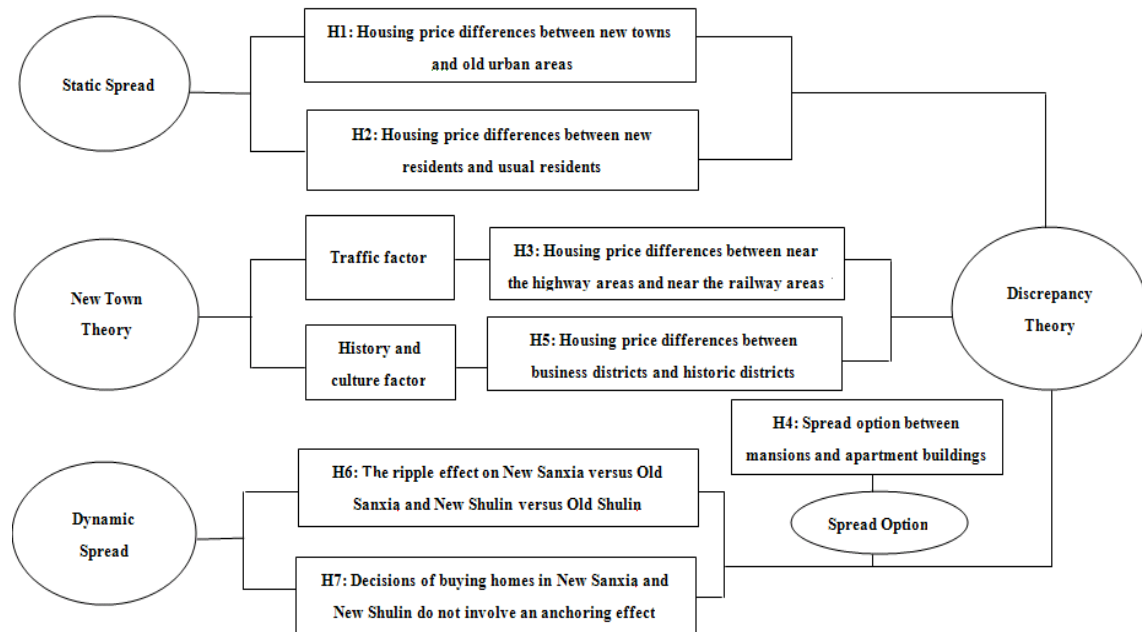

Fig-1. Relationship between hypothesis and related theory

Source: authors' construction.

2.2. Hypothesis

Tan (2010) defines new towns as small cities specifically built in the periphery of large cities to accommodate the excess population. Equipped with six schools and six parks, the TUSD is a university special zone featuring a low building coverage ratio, high greenness coverage, underground cables and telecommunications equipment, and an environment tuned for living. Previous studies have found that factors such as school quality (Ries and Somerville, 2010) and park size (Song and Knaap, 2004; Hoshino and Kuriyama, 2010) have significant influences on housing prices. In the case of implementing revitalization projects to rundown areas (to the south of the TUSD is Old Sanxia and to the north is Old Shulin), these projects fail inevitably because of the lack of public participation and explicit policy support (Leinberger, 2005). Regional development can be observed from housing prices and population distribution (Rice and Venables, 2003). Accordingly, we propose the following hypothesize.

H1: Housing prices are significantly higher in new towns than in old urban areas.

The definition of usual residents stated by the United Nations in 2007 involves people residing or planning to reside in an area and have been residing in the local country for more than 12 months. Therefore, we define new residents as registered population that has been residing in an area for a particular period, and usual residents of old urban areas as registered population that has been residing in the area for a particular number of years. For example, the TUSD and Old Sanxia had a resident population of approximately 10,000 and 80,000 in 2004, respectively. Over a span of 12 years, the populations of the TUSD and Old Sanxiz in 2016 increased by 400% and 5% to approximately 50,000 and 83,000, respectively, indicating that the TUSD demonstrates a population growth rate 80 times that of Old Sanxia. Plantinga et al. (2013) assert that urban differences affect people's willingness to move. In addition, potential housing demand is affected by migration. When in-migration surpasses out-migration, housing demand increases, and ultimately housing prices increase. In other words, population is crucial factors influencing housing prices. Accordingly, another hypothesis is formulated as follows.

H2: The housing prices of areas inhabited by new residents are significantly higher than those in areas inhabited by usual residents.

As a booster of regional development, transportation plays a critical role in inducing growth and development in metropolitan areas (Landis *et al.*, 1995; Rice and Venables, 2003). Transportation also has a positive effect on housing prices (Ryan, 1999; Yiu and Wang, 2005). Old Shulin is a major railway hub, and the TUSD is an access point of Formosa Freeway. Railway facilities have a notably positive effect on housing prices (Zhang *et al.*, 2016). Furthermore, the house value can decrease as a property is located farther away from a station (Hewitt and Hewitt, 2012) or increase because of reduced noise and pollution (Debrezion *et al.*, 2005). Highway accessibility can reduce transportation costs (Forkenbrock, 1990) and generally has a positive effect on housing prices (Levkovich *et al.*, 2016). However, the effect differs slightly as location varies because the peak effect usually occurs when a property is located 4 to 5 km from a highway access point (Debrezion *et al.*, 2005). Therefore, we propose the following hypothesis.

H3: Housing prices are significantly higher in areas neighboring highways than in areas neighboring railway stations.

Kirk (1995) asserts that spread option is a vital tool for reducing risks in energy markets. Carmona and Durrleman (2003) define a spread option as an option written on the difference of two underlying assets at time *t*,

namely, $S_2(t)$- $S_1(t)$. We apply the concept of spread option to real estate to examine the spread premiums across differing property types, in order to facilitate investors in choosing appropriate investment targets. Goodman and Goodman (1997) report that compared with cooperative housing, condominium housing exhibited a spread premium of 12%. Note that apartment buildings are featuring at least 11 floor levels and equipped with elevators; mansions are featuring 6-10 floor levels and equipped with elevators. Therefore, we propose the following hypothesis.

H4: Spread options exhibit between mansions and apartment buildings.

The U.S. National Park Service (NPS) defines a historic district as a region that "possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development" (The Nation Park Service (NPS), 2012). Coffin (1989) indicates that the location of a historic district has positive effects on housing prices. The value of houses located in such districts can exceed that of houses located in neighboring non-historic districts by 5% to 27% (Clark and Herrin, 1997). However, Schaeffer and Millerick (1991) contend that locating in a historic district can decrease the asset value of houses because these districts are restricted by land use and development codes. The oldest districts generally make the most desirable candidates for old urban area renewal (McMillen and McDonald, 2004). Although the urban renewal of the oldest districts can prevent urban blight, the focus of related development codes on preserving historic relics might be viewed unfavorably by interested parties (Cox, 2014). The Sanxia Old Street is the most well-preserved and oldest historic district in Taiwan. By contrast, Old Shulin was a busy business hub due to its status as a major railway station in the early days. Man (1995) maintains that neighboring a business district has a significant influence on housing prices. Accordingly, we hypothesize as follows.

H5: Housing prices are significantly higher in business districts than in historic districts.

A ripple effect pertains to how the impact of housing prices creates "ripples" and disseminates from a particular area and subsequently affects prices in other areas (Meen, 1999). For example, housing prices in neighboring areas can mutually affect each other (Oikarinen, 2004; Chiang and Tsai, 2016) whereas housing prices in distant areas exert mutually negligible effects (Lee and Chien, 2011). By narrowing the scope of the ripple effect to small areas (e.g., administrative districts such as counties and township), we propose the following hypothesis.

H6a: Housing prices in neighboring areas of New Sanxia and Old Sanxia mutually exert a ripple effect.

H6b: Housing prices in neighboring areas of New Shulin and Old Shulin mutually exert a ripple effect.

An anchoring effect refers to the phenomenon in which consumer choice behavior is determined by the difference between a current market price and the reference price consumers have in mind (Northcraft and Neale,

1987). In this study, Dayi Road is selected to divide the TUSD into two regions. Particularly, areas located to the east of Dayi Road are considered New Shulin and areas to the west of Dayi Road are considered New Sanxia. The two areas sharing the same transportation and living facilities raises the question of whether an anchoring effect exists in the decision-making of home purchasing prices in these two areas. Chang *et al.* (2014) maintain that anchoring has a significant influence on the price a buyer is willing to pay. Home buyers are prompted to use reference prices as the anchor value when they perceive substantial uncertainty. Therefore, we propose the following hypothesis.

H7: Decisions of buying homes in New Sanxia and New Shulin do not involve an anchoring effect.

3. RESEARCH DATA

This study employs secondary data analysis. The data are retrieved from the Real Estate Actual Selling Prices Inquiry Service Network hosted by the Ministry of the Interior. We collect data of 1,922 mansion transactions and 8,078 apartment building transactions made in Sanxia and Shulin districts of New Taipei City between July 2012 and June 2016. Excluding abnormal transactions (e.g., transactions between friends and family) and transactions involving illegal construction yields an effective sample size comprising 1,731 apartment building transactions in the TUSD and 772 mansion transactions in the rundown areas of Sanxia and Shulin. The currency unit used in this study is thousand U.S. dollar, with US$1 = NT$30. The area unit is ping, with 1 ping = 3.3058 m².

It is worth noting that the aforementioned housing prices refer to the actual selling prices of real estate, comprising both land and building prices. Real estate consists of land and building improvements; therefore, the characteristics of real estate are closely related to those of land. Specifically, the characteristics of real estate include immobility, durability, and heterogeneity; however, previous research has mostly limited to discussion regarding these characteristics solely (Qadeer, 1981; Zenon 2011). Based on the properties of real estate, such as individual characteristics and location, the real estate market can be divided into various submarkets. In particular, a housing submarket can be defined as "a collection of units that are close substitutes for each other, but poor substitutes for units in other submarkets (Megbolugbe *et al.*, 1991)." We use the property types defined by Allen *et al.* (1995) as a basis for segmenting various housing submarkets (i.e., mansions and apartment buildings) before analyzing related spread options.

In this study, we estimate the historical volatility of housing price returns. Bennett and Gil (2012) assert that historical volatility can be measured using one of the following three approaches: the classic measurement of close-to-close (CC) prices, high-low prices, and high-low-open-close prices. In particular, the CC method uses historical stock information to predict volatility. Because the real estate market involves individual bargaining and therefore does not consider open and close prices, and because the highest and lowest prices in Taiwanese real estate transactions are usually abnormal transactions, we adopt only the CC method to assess volatility.

Table-1. Basic Statistics of New Towns and Old Urban Districts unit：US$1,000/ping

	TUSD	new Sanxia	new Shulin	rundown areas	old Sanxia	old Shulin
number	1730	770	961	772	372	400
mean	7.7662	7.7784	7.7561	6.8106	6.0654	7.5037
SD	0.9237	0.8896	0.9501	1.2663	0.9274	1.140
skewness	0.0587	-0.1955	0.2303	0.1168	-0.0710	-0.2389
kurtosis	0.1692	0.0461	0.2486	-0.3865	-0.0359	-0.1306
J-B statistic	8.5024**	1.4990	12.0224***	19.6611***	0.1578	2.0878
P-value	0.0143**	0.4761	0.0025***	5.38E-05**	0.9242	0.3521
critical value	$\chi^2_{(2,0.05)}$ =5.9915, $\chi^2_{(2,0.1)}$ =4.6052, $\chi^2_{(2,0.01)}$=9.2103					

Note: 1. J-B = n× $[\frac{s^2}{6} + \frac{(k-3)^2}{24}]$ ，s: skewness; k: kurtosis.

2.*show low-level (10%) significant; **show moderate-level (5%) significant; ***show severe-level (1%) significant.

Table 1 illustrates that the average housing prices in new towns are higher than those in old urban areas; however, the standard deviations of housing prices in old urban areas are greater than those in new towns, indicating the greater risks of purchasing houses in old urban areas. The absolute skewness and kurtosis values were <2, meeting the standard of normal distribution as defined by Bollen and Long (1993) nevertheless, the Jarque-Bera test result violates the standard of Bollen and Long (1993). Sirmans *et al*. (2005) indicate that the logarithm of housing prices approaches a normal distribution, meaning that housing transaction prices exhibit an abnormal distribution (i.e., lognormal distribution). Accordingly, the parent samples of the present study should also exhibit a log-normal distribution.

4. APPLICATION AND ANALYSIS

Table 2 lists the t test results regarding all of the hypotheses. Specifically, housing prices are significantly higher in new towns than in old urban areas (t =18.847, p = .00001); hence, H1 is supported. The living environment of the TUSD is similar to that envisioned by Howard, who describes new towns as ideal cities combining the advantages of both urban and countryside areas (Howard, 1898). In other words, living environment has a significant influence on housing prices. This inference is consistent with the findings of Ries and Somerville (2010). In conclusion, differences between the housing prices of new towns and old urban areas are attributed to the distinct living environments in the two regions. Therefore, housing prices increase when the living environment is favorable.

Titman *et al*. (2014) adopt employment growth rate and population growth rate as the proxy variables of housing demand growth, revealing that the growth in housing demand is persistent; hence, the two proxy variables are indeed factors influencing housing prices. In the present study, the housing prices in areas inhabited by new residents are significantly higher than those in areas inhabited by usual residents (t =32.111, p = .0144); thus, H2 is supported. Specifically, the population growth in areas inhabited by new residents is 80 times that in areas inhabited by usual residents, indicating greater demands for housing in the former area. Consequently, the housing prices rise. This finding is consistent with that of Plantinga *et al*. (2013). In other words, differences between the housing prices in areas inhabited by new and usual residents are determined by the population growth rate of the respective areas. Housing prices increase with high population growth.

Table-2. Empirical Results of Research Hypothesis

Hypothesized Path	t-value	P-value	Test
H1: Housing prices are significantly higher in new towns than in old urban areas	18.847***	0.00001***	Support
H2:The housing prices of areas inhabited by new residents are significantly higher than those in areas inhabited by usual residents	32.111***	0.0001***	Support
H3:Housing prices are significantly higher in areas neighboring highways than in areas neighboring railway stations	4.289***	0.0144**	Support
H4:Spread options exhibit between mansions and apartment buildings	18.847***	0.00001***	Support
H5:Housing prices are significantly higher in business districts than in historic districts	19.287***	0.00002***	Support
H6a:Housing prices in neighboring areas of New Sanxia and Old Sanxia mutually exert a ripple effect	29.641***	0.00005***	Support
H6b:Housing prices in neighboring areas of New Shulin and Old Shulin mutually exert a ripple effect	3.901***	0.0001***	Support
H7:Decisions of buying homes in New Sanxia and New Shulin do not involve an anchoring effect	0.503	0.615	Not support

Note: Based on two-tailed test: for t-value greater than 1.648 or smaller than -1.648(*); for t-value greater than 1.964 or smaller than -1.964(**); for t-value greater than 2.585 or smaller than -2.585(***).

Compared with light rail stations, accessibility to highway access points has a stronger positive effect on housing prices (Seo *et al*., 2014) because generally, a location within a 2 km distance of a railway or light rail station

results in higher housing prices, whereas a location within a 4–5 km distance of a highway access point (Debrezion et al., 2005) results in higher housing prices. The results of the present study show that housing prices are significantly higher in areas neighboring highways than in areas neighboring railway stations ($t = 4.289$, $p = .0001$); hence, H3 is supported. A railway, which runs only at particular hours, is usually less available than a highway, which can operate 24 hours a day. In addition, highways create a stronger appeal for developing commercial and residential areas, ultimately improving the asset value of houses located along the highways (Forkenbrock, 1990). Therefore, the prices of houses located near highway and railway stations differ because the two types of facility exhibit distinct accessibilities.

Spread premiums exist across different residence types (Goodman and Goodman, 1997). In Taiwan, home buyers prioritize price (56.7%) as a factor in decision-making. In other words, home buyers have spread options between different residence types. The results of this study reveal a t value of 18.847 and a p value of .00001, indicating the presence of spread options between mansions and apartment buildings; thus H5 is supported. Kirk (1995) regards spread options as an instrument for risk management. Olsen (1998) indicates that investors make dissimilar decisions because of varying risk attitudes. Farley (2000) maintains that investors with a high risk tolerance are willing to bear great risks in pursuit of high returns, whereas investors with a low risk tolerance are unwilling to take risks. In the present study, the unit prices of mansions and apartment buildings are US$6,811 per ping and US$7,766 per ping, respectively, with an approximate 14% spread premium. Table 3 and Figure 2 show the differences in the returns and risks between buying mansions and apartment buildings. In addition to spread premiums and the living environment, the investment decisions are also determined by risk attitudes. Risk averters and lovers tend prefer to live in apartment buildings and mansions, respectively.

Table-3(a). Rate of return on housing prices (July 2012- June 2016)   unit: %

	new Sanxia	new Shulin	old Sanxia	old Shulin	TUSD	rundown areas
2012/7~12	0.268	0.151	0.223	0.313	0.087	0.160
2013/1~6	0.028	0.047	-0.485	0.274	0.035	0.158
2013/7~12	0.130	0.079	0.706	-0.101	0.025	-0.047
2014/1~6	-0.265	-0.102	0.294	0.115	-0.056	0.029
2014/7~12	0.202	0.005	-0.716	0.406	0.081	0.222
2015/1~6	-0.051	0.054	0.450	-0.993	-0.019	-0.560
2015/7~12	0.181	0.087	-0.060	1.080	0.023	0.652
2016/1~6	-0.219	-0.167	0.456	-0.646	-0.090	-0.404
2012-2016	0.060	0.043	0.111	0.113	0.017	0.054

Source: authors' construction.

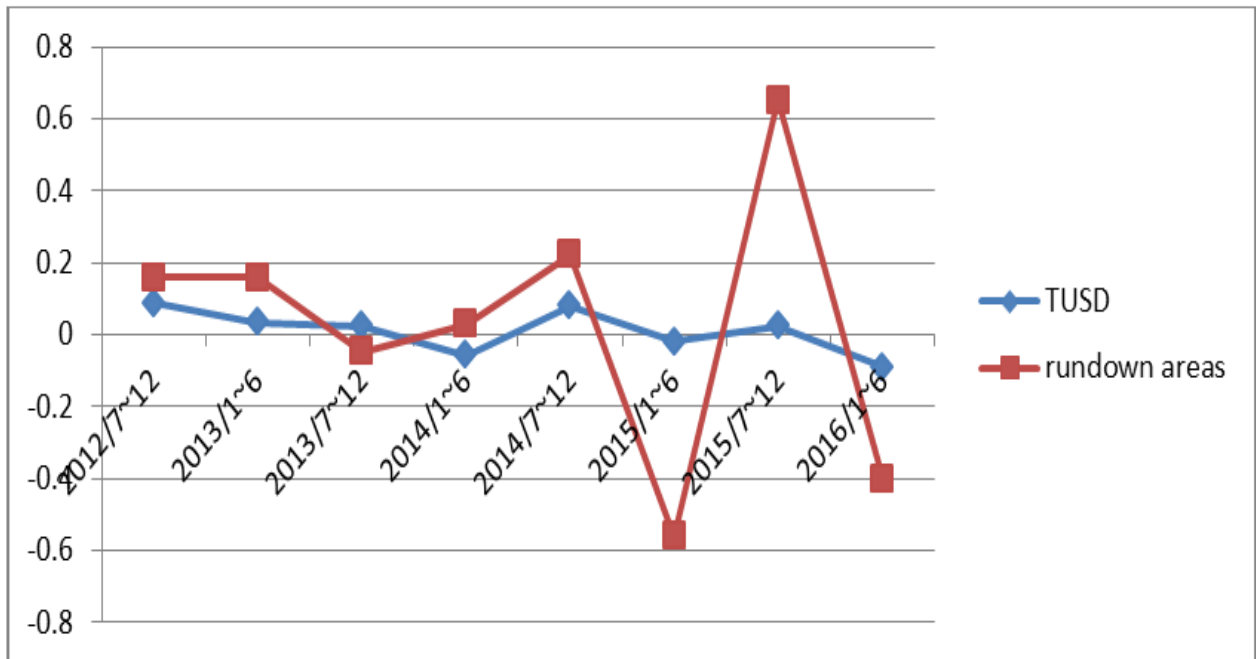**Table-3(b).** Volatility on housing prices (July 2012- June 2016)   unit: %

	new Sanxia	new Shulin	old Sanxia	old Shulin	TUSD	rundown areas
2012/7~12	14.939	14.489	21.434	23.701	14.305	22.702
2013/1~6	12.825	13.490	22.749	19.318	13.161	21.845
2013/7~12	11.658	13.494	16.518	25.831	12.565	21.181
2014/1~6	12.646	11.432	14.487	11.169	11.944	13.822
2014/7~12	10.737	10.560	14.487	13.520	10.662	15.002
2015/1~6	11.179	13.732	11.227	10.266	12.884	13.037
2015/7~12	10.664	14.439	13.712	16.129	12.899	16.113
2016/1~6	10.485	13.272	18.271	18.922	12.006	19.811
2012-2016	12.417	13.282	17.781	19.008	12.834	19.117

Source: authors' construction.

Old Shulin is an old urban area featuring a mix of residential and commercial buildings. Song asserts that small-scale business activities in residential areas can boost housing prices. Old Sanxia is a historic district characterized by historical buildings and relics; however, the value of the area is declined because of the restrictions on land use and development codes (Schaeffer and Millerick, 1991). In the present study, housing prices are significantly higher in business districts than in historic districts ($t = 19.287$, $p = .00002$); hence, H4 is supported.

Regulations governing the land use and development codes of business districts are less rigorous than those on historic districts. In Taiwan for example, renovation and reconstruction projects in historic districts are bound by the Cultural Heritage Preservation Act; consequently, the costs of such projects increase substantially. Therefore, differences between the housing prices in business and historic districts are attributed to the extent of restrictions on land use and development codes.

(a) **Rate of return on housing prices**

(b) **Volatility on housing prices**
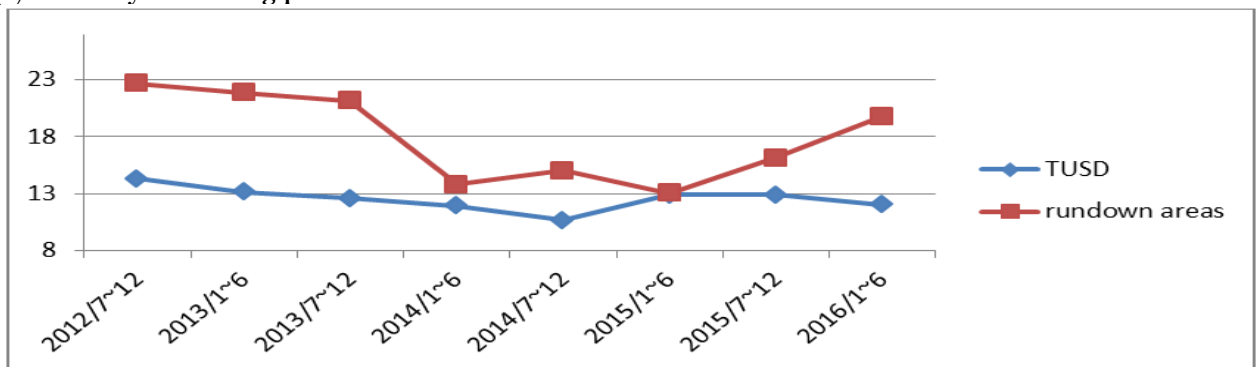
Fig-2. Rate of return and volatility for both TUSD and rundown areas

Source: figures from Table-3(a) and Table-3(b) TUSD and Rundown Areas.

Oikarinen (2004) reports that ripple effects exist when housing prices in the center and periphery of an economy change. The results of the present study show *t* values of 29.641 (New Sanxia and Old Sanxia) and 3.901 (New Shulin and Old Shulin) and the corresponding *p* values of 0.00005 and 0.0001. Therefore, H6 is supported, verifying that housing prices in neighboring areas mutually exert ripple effects. Table 4 and Figure 3 show how the housing prices in neighboring areas change in a synchronous manner, confirming the presence of a mutual ripple effect in the housing prices of these areas. Zhu *et al.* (2013) argue that cooperation should be promoted between housing markets, particularly among geographically diverse areas featuring similar economic conditions. In other words, ripple effects are particularly strong in areas featuring similar economic conditions and are geographically linked. Hence, the ripple effects of neighboring areas are determined by spatial linkage and the similarity in economic conditions.

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Table-4. Unit price of each ping (July 2012- June 2016)   unit: US$ 1,000/ping

	new Sanxia	new Shulin	old Sanxia	old Shulin	TUSD	rundown areas
2012/7~12	6.815--	6.798--	5.203--	6.542--	6.805--	5.888--
2013/1~6	7.429↑	7.423↑	5.679↑	7.143↑	7.426↑	6.526↑
2013/7~12	8.183↑	8.200↑	6.320↑	7.679↑	8.191↑	6.959↑
2014/1~6	8.498↑	8.409↑	6.505↑	8.043↑	8.449↑	7.170↑
2014/7~12	8.416↓	8.401↓	6.450↓	8.038↓	8.406↓	7.199↑
2015/1~6	8.202↓	8.153↓	6.311↓	7.972↓	8.171↓	7.249↑
2015/7~12	7.975↓	7.926↓	6.265↓	7.899↓	7.947↓	7.251↑
2016/1~6	8.059↑	7.966↑	6.509↑	7.911↑	8.009↑	7.254↑
2012-2016	7.778↓	7.756↓	6.065↓	7.504↓	7.766↓	6.811↓

Source: authors' construction.

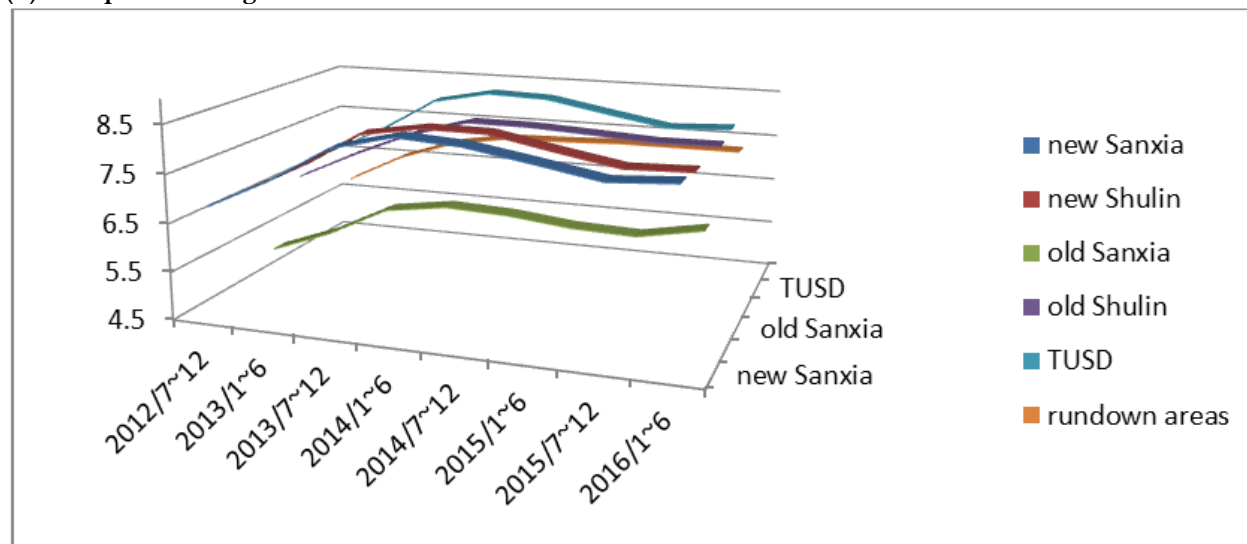**(a) Unit price flat**
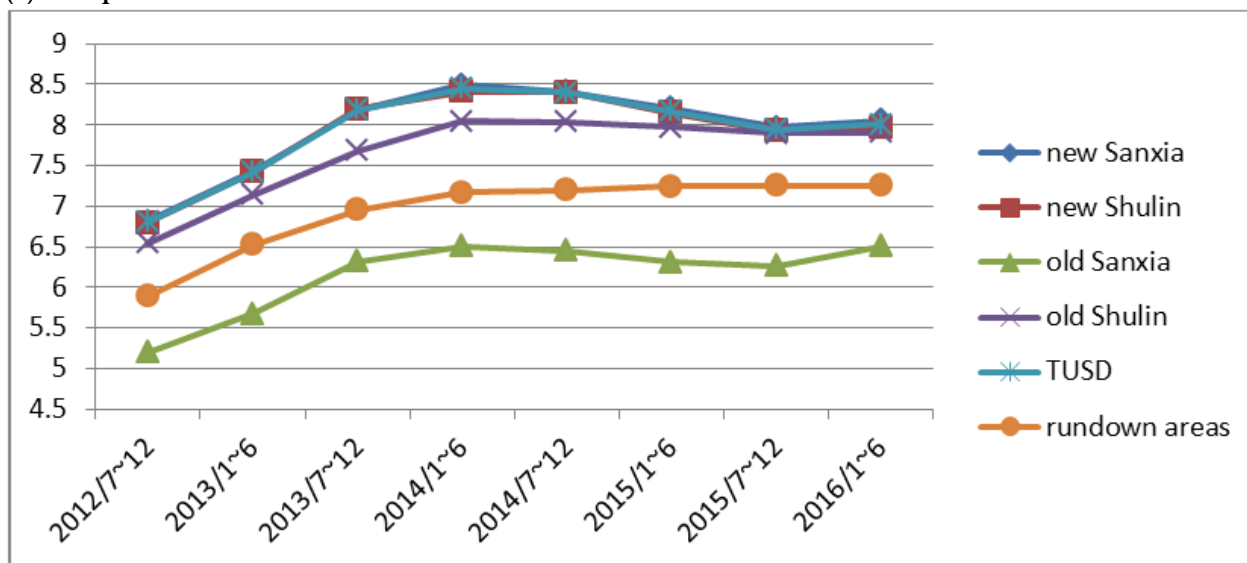
(b) Unit price stereogram

Fig-3. Unit price flat and stereogram of TUSD and rundown areas

Source: figures from Table-4.

An official investigation report on housing demand conducted by the Taiwanese government reveals that 81% of home buyers have used the actual selling prices provided on the Real Estate Actual Selling Prices Inquiry Service Network as referential anchors, and that 92% of the buyers note the effect of such information on purchase prices. The anchoring effect is induced by an unconscious or voluntary cognitive process (Tversky and Kahneman, 1974;

Wilson *et al.,* 1996). In the present study, the results showed a t value of 0.503 and a p value of 0.615, which means that the housing prices in New Sanxia and New Shulin differ non-significantly. Therefore, H7 was rejected, indicating that the decisions investors make involving houses located in differing districts have anchoring effects. In other words, history transaction prices (the actual selling prices provided on the Real Estate Actual Selling Prices Inquiry Service Network) serve as effective anchors. Granados *et al.* (2006) states that a transparent market is intended to provide unbiased, complete, and accurate market information. Transparency is defined as the accessibility to information of market prices, supply and demand, and other commodities being traded (Law and Smullen, 2008). Hence, the intensity of anchoring effect is determined by market transparency. The likelihood of bias and error is low when transparency is high; in such a situation, referential anchors are considered effective anchors.

5. CONCLUSION AND DISCUSSION

From the perspectives of static spread, dynamic spread, and new town theory, we conduct tests and analysis. Except for H7, the remaining six hypotheses are supported, concurring with the theoretical bases provided by Titman *et al.* (2014). However, previous studies on anchoring and adjustment have primarily used a questionnaire survey or experimental design approach to identify referential anchors (Northcraft and Neale, 1987; Wilson *et al.,* 1996). For example, Chang *et al.* (2014) use data collected through the hedonic price method to assess referential anchors. By contrast, we use actual selling prices to directly calculate and assess the anchoring effect. This method enables us to avoid the self-disclosure bias, common method variance, and situational errors associated with the questionnaire survey method (Cooper and Emory, 1995). Therefore, the data we collected exhibit superior reliability and validity (Smith *et al.,* 2011). Secondary data must be accurate, reliable, precise, impartial, effective, appropriate, and immediate (Tasic and Feruh, 2012) and secondary analysis is advantageous for its cost-effectiveness and convenience (Smith, 2008). In addition, collecting a representative large sample size facilitates greater effectiveness and more generalizable results (Smith *et al.,* 2011).

The empirical results of this study show that the housing prices in new towns are significantly higher than those in old urban areas (H1). The key factor is living environment, which is consistent with the theoretical basis of "garden city" (Howard, 1898). Furthermore, the housing prices in areas inhabited by new residents are significantly higher than those in areas inhabited by usual residents (H2). We infer that the key factor is population growth and this inference accords with the principle that population growth induces housing demands (Plantinga *et al.,* 2013; Titman *et al.,* 2014). Moreover, the housing prices in areas neighboring highways are significantly higher than those in areas near railway stations (H3). We conclude the key factors as transportation and accessibility (Seo *et al.,* 2014) and confirm that for housing prices, the effect of door-to-door transport is greater than that of point-to-point transport. The housing prices in business districts are significantly higher than those in historic districts (H5), suggesting the difference in land use and development codes (Schaeffer and Millerick, 1991) as the key factor. For example, increasing the condition of restrictions on a target plan can reduce the number of feasible solutions (Hill and Jones, 2011). Furthermore, the housing prices of differing residence types present spread options (H4), implying risk attitude as the key factor (Olsen, 1998). This confirms that spread options are an effective hedging instrument (Carmona and Durrleman, 2003). The housing prices of neighboring areas mutually exert a ripple effect (H6). We identify that the key cause is regional compactness, which is notably affected by geographical proximity and economic conditions (Zhu *et al.,* 2013). Finally, purchasing decisions involving houses located in different districts involve an anchoring effect (H7), revealing market transparency as a key factor (Law and Smullen, 2008). This finding concurs with the theory of anchoring (Tversky and Kahneman, 1974). Overall, the aforementioned findings and key factors can serve as a reference for making investment decisions as well as for governments to implement projects of new town development or old urban area revitalization.

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