Master's Thesis of Urban and Regional Planning

The Effect of Land Transaction Volume with Chinese Investors on Jejudo's Housing Sales Price

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주택매매가격에 미치는 영향

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Abstract

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Foreign real estate investment in Jejudo, especially Chinese land transaction volume has grown considerably during the last few years since Jeju Special Self-Governing Province issued the Real Estate Investment Immigration System promotion program in 2010. The main purpose of this study is to explore the relationship between Jeju's housing sales price and land turnover with foreign investors, aiming at Chinese real estate investors. This trend is estimated to exert an important macroeconomic effect on maintaining a higher housing price and even a long lasting housing bubble. The modeling of Jeju's housing sales price is proposed from the point of view of a positive economic reaction for the real estate industry and from the point

of view of an enormous demand for the travel industry. Using time series data from October 2012 to February 2016, the hypothesis arising from land trading volume with Chinese investors modeling reveals the consistency of this approach. There are also other relevant determining factors that exist from the housing price side and from the whole real estate dimension. Indeed, the real Gross Regional Domestic Product growth rate, Jeju's population growth rate, and Korean benchmark interest rate are all related determinants, which explain the sustained increase in Jejudo's housing purchase price. It is acknowledged that the control variables are multivariate and the Multiple Linear Regression Analysis is applied into this research paper. On the other hand, taking time series into consideration, Stata statistical method is also implemented into this study. Last but not least, in order to find out whether the relationship between the economic variables is spurious or nonsensical, the Unit Root Test Using ADF Test and Cointegration Test are interpreted adequately and put into use. In the final conclusion, the research results show that there is the presence of a contemporaneous long-term relationship between Jeju's housing sales price and Chinese land transaction volume.

Keywords: Chinese land transaction volume, Jeju's housing sales price, Real Estate Investment Immigration System, foreign real estate investment, Multiple Linear Regression Analysis, Stata statistical method, the Unit Root Test Using ADF Test, Cointegration Test

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CHAPTER I. INTRODUCTION

1. Research Objectives and Significance of Study

Housing is an important asset and it made a significant contribution to the total assets of many households. Given the significance of housing, housing has drawn a lot of attention from the investors and researchers. Extensive studies have also been placed on the determinants of housing prices such as Abelson *et al* (2005). More importantly, there have been a number of studies that provide appealing insights on the relationship between housing price and foreign real estate investment.

This study aims to extend the current literature by examining the housing price, its determinants, and land turnover with Chinese real estate investors in Jeju Island over the period of October 2012—February 2016 on a monthly basis. Foreign investors can be allowed to apply for the residential and permanent residency qualification by investing in the real estate market in these regions including Jeju Island (since February 2009), Alpensia Pyeongchang in Gangwon-do (since February 2010), Yeosu in Gyeongdo (since September 2011), Midan City in Incheon and Youngjong integrated resort (since December 1st 2011), Haeundae-gu in Busan and Gijang-gun (since May 20th 2013). However, Song Inho and Chung Jiyoung (2014) presented that just only in Jeju Island and mainly based on Jeju City and Seogwipo City (409 cases and 265.7 billion won by the end of March 2013) until now, there exists virtual investment, and there are non-existent investment earnings in the remaining three regions. Hence, in this study, all land transactions relative with foreign investors in Jeju Island or in South Korea means in Jeju City and Seowipo City.

2. Research Methodology

Given that predicting how much the amount of land transaction with Chinese speculators affects Jeju's housing price and estimating how well other determinants of housing price influences Jeju's housing price, the independent variables are multivariate and the statistical model must be Multiple Linear Regression Analysis. Multiple regression analysis is an expanded simple regression analysis statistical method to put a variety of independent variables in order to explain the total sum of squares at the best. In other words, a specific situation is under the influence of a variety of variables in most cases. As is seen, there is more than one influence factor affecting Jeju's housing price mentioned in the literature. Hence, it has to be subjected to take Multiple Linear Regression Analysis. What's more, because the database based on the month classification is time series, the Multiple Linear Regression Model has to be analyzed through the Stata technique.

3. Thesis Outline

The remainder of this study is organized as follows: Section 2 reviews the previous literature on the determinants of housing price and how foreign real estate investment affects housing sales price. Section 3 analyzes the status quo of Chinese real estate investment in Jeju. Section 4 applies Multiple Linear Regression Analysis and Stata technique to establish the regression model, and then investigates whether there is the existence of cointegration relationship between Jeju's housing sales price, Chinese land transaction volume and a variety of other control factors in the established function model. The anticipated results are also reported and presented in Section 4. The last section concludes the paper.

CHAPTER II. LITERATURE REVIEW

1. Literature Review about the Determinants of Housing Price

The strong evidence of linkages between housing price and macroeconomic fundamental determinants has already appeared in a lot of literature. Jud and Winkler (2002) have showed that the benchmark interest rate is a significant factor for the real US housing price appreciation. Likewise, Adams and Füss (2010) and Demary (2010) have also demonstrated that a higher interest rate can reduce real estate prices. A higher interest rate increases the return of other fixed-income assets relative to the return of real estate, thus shifting the demand from real estate into other assets leading to lower real estate prices. Karantonis and Ge (2007) focus on the Sydney housing market and presented that real interest rate, speculative investment and dwelling completions are the driving forces of housing price in Sydney. More importantly, Tu (2000) has highlighted the importance of analyzing the regional housing markets in which the Australian housing markets at sub-national level are highly segmented.

On the other hand, Dolde and Tirtiroglu (1997) examined the housing price volatility and found the time-varying volatility evidence in the Connecticut and San Francisco housing markets. Crawford and Fratantoni (2003) have also offered the evidence of time-varying volatility in the US and Hong Kong housing markets, respectively. Therefore, time-varying volatility can be an important factor generating heteroscedasticity for analyzing the housing price volatility and should be considered as time series and eliminated in the regression model.

Miller and Peng (2006) demonstrated about the metropolitan statistical areas (MSA) in the USA exhibit volatility clustering effect. Additionally, the estimated volatility series is caused by gross metropolitan

product (GMP) growth rate. More recently, Hossain and Latif (2007) have also offered the evidence of time-varying housing price volatility in the Canadian housing market. The results also showed that the gross domestic product growth rate is the determinant of house price volatility with using an impulse response analysis.

Moreover, Libertad Gonzalez and Francesc Ortega's (2013) results suggest that Spain's large immigration wave during the 2000s had large effects on the housing market, both on prices and quantities. Ye, Sun and Wang (2014) combined with the existing literature and empirical test and demonstrated that the skyrocket of housing price is closely related to the changes of population structure and speeding up of urbanization. Kuang, Zhu and Liu (2012) also concluded that the housing price is primarily determined by national population, implying that the housing price does not deviate from the economic fundamentals. Zhou and Guo (2015) show that the population growth has a strong positive relationship with housing price growth.

In summary, there has been a multitude of literature concerned with the housing price determinants thus it can be seen that how important these influential factors—Jeju's Gross Regional Domestic Product per captita, Jeju's resident population, and Korean benchmark interest rate have effect on Jeju's housing sales price which is consistent with expectations and the previous literature.

2. Literature Review about Foreign Real Estate Investment Affecting Housing Sales Price

There have been a number of studies that provide appealing insights on the relationship between foreign real estate investment and housing price. This part intends to review some of the articles, which are more relevant to this research study.

Bo and Bo (2007) have examined the relationship between house prices and international capital flows over the period of 1998 to 2006 in China and concluded that in the short run, the increase of housing prices attracts the inflows of foreign capitals; in the long run, foreign capitals help to boost the rise of house prices. Brixiova et al. (2010) concluded that massive capital inflows led to credit and real estate booms during 2000–2007 in Estonia because these external financing fuelled rapid domestic credit growth, mainly to households for real estate purchases in the form of foreign currency loans. Downs (2007) also concluded that a surge in capital flows was a crucial factor influencing the rise in global commercial real estate prices during the 2002 to 2007 period. Rangel (2010) found that the real GDP growth and capital flows were consistently significant explanatory variables for the case of Malaysia and Singapore.

Guo and Huang (2010) studied the extent of the impact from hot money—speculative capital inflow on the fluctuations of China's real estate market. Their results indicated that hot money has driven up property prices as well as contributed to the accelerating volatilities in property market due to its enormous size and its short-term characteristic of investing. By applying a panel data model, Cheng et al. (2006) found that the hot money had made a significant contribution to the price change of real estate in China. Zheng et al. (2009) showed that home prices in Chinese cities increases in response to FDI inflows. Likewise, Ben-Yehoshua (2008) also argued that strong economic growth and impressive flows of FDI contributed to real estate price increases in metro cities of China.

In another study, Cordero and Paus (2008) noted that a large amount of foreign investment in Costa Rica' real estate sector contributed to development of real estate prices over the period of 2004-2006. Sajor (2003) argued that unprecedented flow of international portfolio investment in real estate facilitate boom. A study by Rajan and Siregar (2002) showed that

portfolio capital inflows in East Asia was the main factor that explain the rebound in regional growth rates, surges in equity prices and stabilization of exchange rates during the pre-crisis boom period. Mihaljek (2005) noted that the increased level of foreign capital into the real estate market would raise the demand for property and consequently this would tend to drive real estate prices up in Croatia due to the relatively fixed short-run supply of real estate.

In conclusion, the impact of the variable of foreign real estate investment on Jeju's housing price is essential and indispensable, but we also need to control other potentially important variables that have been discussed in the former part, including Jeju's real Gross Regional Domestic Product per capita (or GRDP increase rate), Jeju's resident population (or population growth rate) and Korean interest rate. All of the control variables can have multi-directional relations with Jeju Island's housing sales price.

CHAPTER III. THE ANALYSIS OF THE STATUS QUO OF CHINESE REAL ESTATE INVESTMENT IN JEJUDO

1. Introduction to Jeju

Jejudo (Jeju), officially named the Jeju Special Self-Governing Province, is the largest island off the coast of the Korean Peninsula, and the main island of Jeju Province. The island lies in the Korea Strait, southwest of South Jeolla Province. According to the welfare, health care and female Department of the Jeju Special Self-governing Province official statistics, Jejudo's total area is 1849 km^2, the total population is 607346 by December 31st 2014, and the population density is 328.47 per km^2. Its capital is Jeju City,

and its subdivisions have only two cities, that is, Jeju City and Seogwipo City. Their populations are 448834 and 158512, respectively. Therefore, the research paper is focused on these two cities in Jeju Province.

Jeju is a focal point of international affairs and is able to offer people many kinds of recreational activities with breathtaking vistas, a temperate climate and a unique traditional culture keeping true to its ecological treasures. There are also a wide variety of native foods provided for tourists in Jeju. Therefore, due to its open economic policy (Real Estate Investment Immigration System will be interpreted detailed later), lower housing price compared to some of China's metropolises, and more comfortable climate compared to Chinese inland cities, Jeju makes the most of beauty and unique charm to attract considerable numbers of Chinese real estate investors. As a result, Jeju is in the process of changing into an International Free City on the world stage.

The location map of China and South Korea, the measuring distance between Shanghai City and Jeju City, and the three-dimensional map of Jeju Special Self-governing Province aiming at Jeju City and Seogwipo City are shown in Figure 1, Figure 2 and Figure 3 respectively. In China, Shanghai City is the closest city to Jejudo and Figure 2 shows that the measured distance is 538.54km^2, implying that it is very convenient for Chinese real estate investors to travel to Jejudo within 1.5 hours flight time.

Figure 1: The Location Map of China and Korea

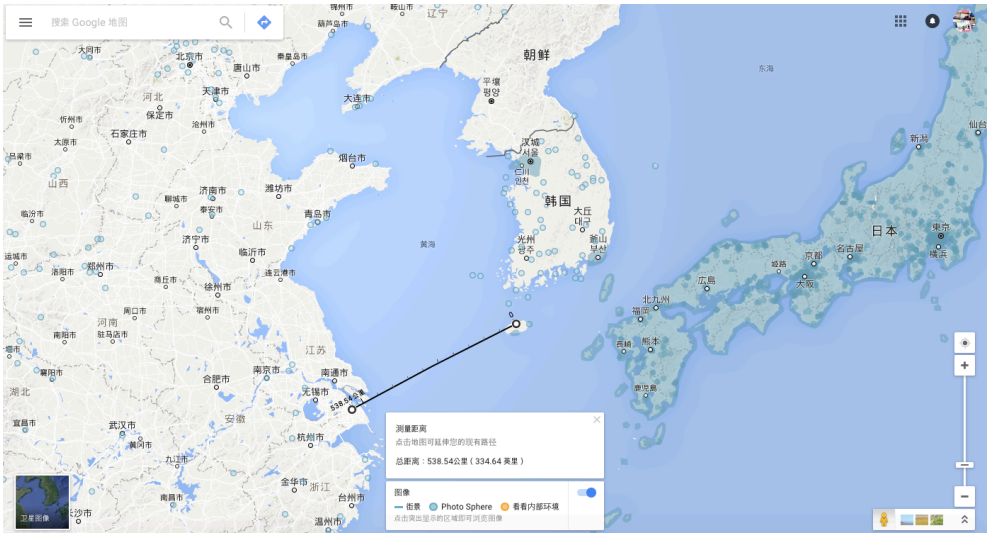

Figure 2: The Measuring Distance between Shanghai City and Jeju City

Figure 3: The Three-dimensional Map of Jeju Special Self-governing Province Aiming at Jeju City and Seogwipo City

2. Real Estate Investment Immigration System in South Korea

Real Estate Investment Immigration System can be defined as the system of combining real estate investment and immigration which means that foreign investors who invest over a certain amount of investment during a period of time can be granted the right to live in specified countries designated as investment targets. It aims for stimulating foreign investment, revitalizing the regional economy and activating Korea's real estate market. In February 2010, Jeju Special self-governing Province was selected to be the first location to launch Real Estate Investment Immigration System, followed by Alpensia region in PyeongChang Gangwon-do, Korea Versus Gradient Tourism in Yeosu-si Jeollanam-do and Youngjong Downtown Incheon and other regions chronologically.

South Korea's Real Estate Investment Immigration System is based on "Foreign Investment Promotion Act", investor, investor's spouse and

investor's children who meet the investment requirements will be granted residency status (F-2, 3 years) is:

① Foreigners who have been staying for over 3 years in South Korea, granted enterprise investment residency status (D-2) and invest above US $ 500,000;

② Foreigners as domestic employees who have been stayed for more than 3 years in South Korea, dispatched to domestic foreigner investment company that invest over US $ 500,000;

③ Foreigners who invest over US $ 300,000 and employ more than 2 South Korean employees related to the real estate investment;

④ Foreigners who invest to real estate assets in accordance with the criteria of investment area, investee, and investment amount etc which Ministry of Justice appoint

Meanwhile ① foreign investors who invest over US $ 500,000 and employ more than 5 local residences; ④ foreigners who have been continuing to invest relative with real estate market in South Korea for over 5 years.

The Ministry of Justice acknowledged that it's necessary to continue to live in South Korea after considering these people's economic capability, behavior, basic literacy etc who meet the requirements above and investor, investor's spouse and investor's children will be given the right of application for permanent residency status (F-5) in the Republic of Korea.[1)]

Real Estate Investment Immigration System is that generally foreigners who can continue to hold certain assets for a specified period of time in specified countries' real estate market can be given the right to live in the specified countries. South Korea's Real Estate Investment Immigration System is that foreigners who meet the requirement about investment area,

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[1)] "Enforcement Decree of the Immigration Control Act" (11.01.2011) Article 12 of Annex 1 and foreigners residing qualification 27- (F-2) Reference

investee and investment amount appointed by the Ministry of Justice can obtain residency rights or permanent residency rights. That is, even if foreign investors don't have any retention condition or employment condition, they who meet the requirement about asset condition can be granted the retention qualification according to South Korea's Real Estate Investment Immigration System.[2)]

That is, in terms of recreation facilities, foreign investors who invest more than a certain amount of money (5 hundred million-1.5 billion, Hanwha benchmark) can be granted the residential qualification, and if foreign investors who have been continuing a stable investment for 5 years are acknowledged to have enough economic capability, good behavior, and basic literacy etc by the Ministry of Justice, the foreign investors, their spouse and their children can be granted the permanent residency. On the basis of the definition of the Real Estate Investment Immigration System above, South Korea's Real Estate Investment Immigration System has dual characters—direct investment system and indirect investment system. In aspect of direct investment, South Korea's Real Estate Investment Immigration System doesn't need to go through the investment operation organiz7ation, and foreign investors just invest directly relative with the real estate. Meanwhile, in regards to indirect investments, South Korea's Real Estate Investment Immigration System has a certain limit (fixed term's trading) on the private property right about the real estate investment.

Kang Dongkwan (2013) presented that the whole land ownership areas of the foreigners staying in South Korea are 222,620,000 m^2 (226.21km^2), occupied 0.2% of the homeland area (100,148km^2) based on the benchmark of 2013[3)] and the whole investment amounts are 32 trillion and

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2) See "Enforcement Decree of the Immigration Control Act" Article 12 and "Enforcement Decree" Annex 1

3) During 12 years the land fluctuation owned by foreigners amounted to 11,000,000 ㎡, disposal of 6,690,000㎡ and 4,310,000㎡ (1.9%) has increased

353.2 billion won based on the official price benchmark by the end of 2012. Also, the investment area is 38,530,000 m^2 in Gyeonggi-do (17%), 38,080,000 m^2 in Jeonnam (16.8%), 35,440,000 m^2 in Gyeongbuk (15.7%), 22,010,000 m^2 in Chungnam (9.7%), and 19,120,000 m^2 in Gangwon (8.5%), respectively. Meanwhile, the investment amount is 10 trillion 167.3 billion won in Seoul, 6 trillion 14 billion won in Gyeonggi-do, 2 trillion 712.5 billion won in Busan, and 2 trillion 509.5 billion won in Incheon, respectively, according to the land value.[4)]

3. Land Ownership Status Classified by Nationality

In the case of Jeju Island, at the end of 2012 South Korea's foreign investment amount in real estate from 199.4 billion won increased to about 6 trillion 345 billion 139 million won by March 2015, while other areas don't show this investment performance even though they import the Real Estate Investment Immigration System. Song and Chung (2014) presented specific contents as follows:

1) The amount of foreign investment flowing into Jeju Island through Real Estate Investment Immigration System was 371.5 billion in December 2013 (562 cases), while other areas don't show this investment performance even they

[4)] In terms of land ownership classified by foreign nationality, the investment area of the overseas Korean who have foreign nationalities is 1 trillion 29.11 million ㎡ (57.1%), the joint ventures are 72.03 million ㎡ (31.8%), other pure foreign corporation legal persons are 15.48 million ㎡ (6.9%), pure foreigners are 9.08 million ㎡ (4.0 %), and government organizations and etc are 510,000 ㎡ (0.2%). In terms of nationality, US has 22.07 million ㎡ (54.0%), Europe has 23.58 million ㎡ (10.4%), Japan has 19.16 million ㎡ (8.5%), China has 5.3 million ㎡(2.3%), and other countries have only 56.10 million (24.8%). (Source: Domestic "land, Transport and Maritime statistics" (http://stat.mltm.go.kr), housing / land - foreign land status)

import the Real Estate Investment Immigration System.

2) Jeju Island's obvious achievement is not only the implementation of Real Estate Investment Immigration System, but it also promotes domestic tourists and foreigners to travel to Jeju Island through Chinese visa exemptions and duty-free shops permission. Influenced through multiple factors such as foreign exchange policy etc.[5)]

3) Real Estate Investment Immigration System can encourage investment in the area of negative foreign investment performance and diversify the plans of investment targets.

4) The land holding status of foreigners who live in Jeju Island plunged in the second half of 2011 and continued to increase. Recently, on the basis of land ownership status classified by nationality the acquired share of Chinese nationality shows significantly compared to the US and Japan. Based on the fourth quarter of 2013, 46.6% of Jeju Island's land held by Chinese turned out to be overwhelming compared with U.S (9.5%) and Japan (7.8%).

Furthermore, according to the research result written by Kim Tae-il (2015), from 2004 to 2014, the 10-year change result of land ownership status classified by nationality is that, by the end of May 2014, the whole land areas of US land owners are 3,709,408㎡, Japanese nationality land owners are 2,116,561㎡, and Chinese nationality land owners are 3,569,180㎡ following the United States. Kim Tae-il (2015) presented the trend of land area owned by the United States and Japan tended to increase, especially the land area owned by the United States increased a lot after 2004. However, since the

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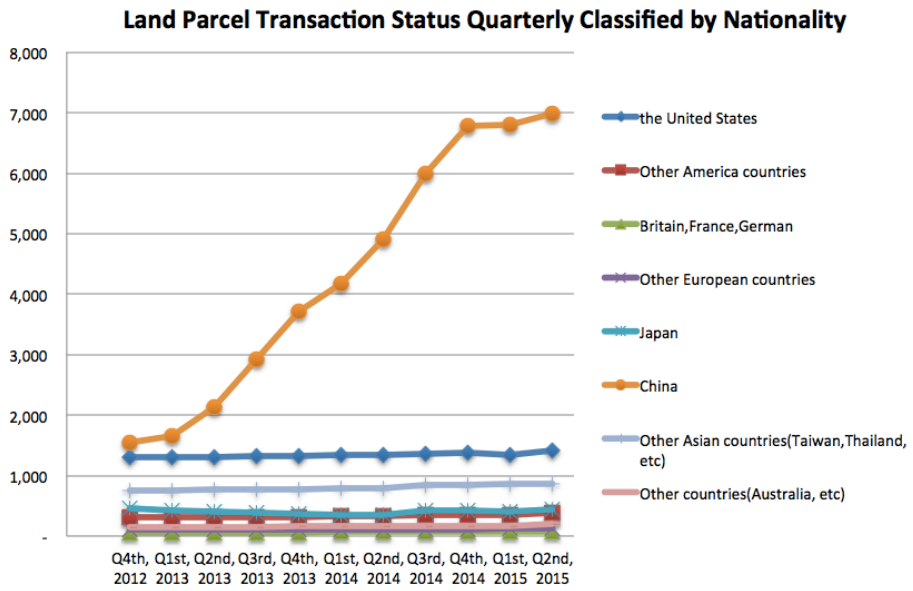
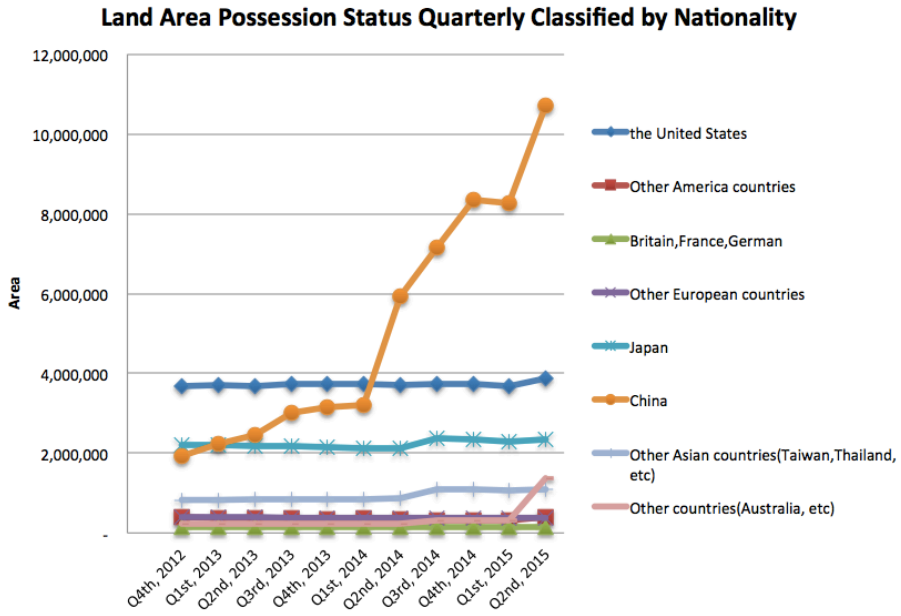
[5)] Yi hojun *et al*, The Economic Performance Analysis on basis of Promoting Jeju Special Self-Governing Province/ Jeju International Free City, the Korea Development Institute, 2013.

beginning of 2010 the land area owned by Chinese has been rising rapidly and become the largest land area following after the United States. Under the background of this soaring land areas owned by Chinese, Kim Tae-il (2015) thought that visa exemption and Real Estate Investment Immigration System imported in 2010 have a great influence on this phenomenon. Since 2010 the land transaction cases with Chinese have been increasing rapidly in proportion to land transaction areas. Kim Tae-il (2015) believed that in terms of American and Japanese landowners, while the number of the land transaction case is small, the land transaction areas are large. However, Chinese land owners purchased small land parcels in huge quantities comparatively, except for a certain large-scale development areas. Kim Tae-il (2015) presented that the purchased parcel ratio of the Jeju City and Seogwipo City are the highest among all of regions in Jeju Isaland. Meanwhile, the purchased parcel ratio of the Jeju City showed the highest proportion, but after 2013 the purchased parcel ratio of Seogwipo City is going higher between Jeju City and Seogwipo City.



* Data Source: architecture and land registration statistics, urban planning/land, Jeju Special Self-governing Province official website

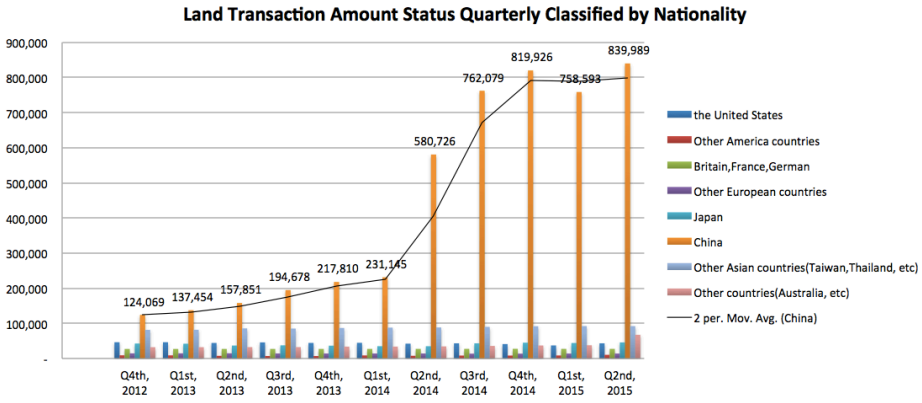
Figure 4: Land Parcel Transaction Status Quarterly Classified by Nationality



* Data Source: architecture and land registration statistics, urban planning/land, Jeju Special Self-governing Province official website

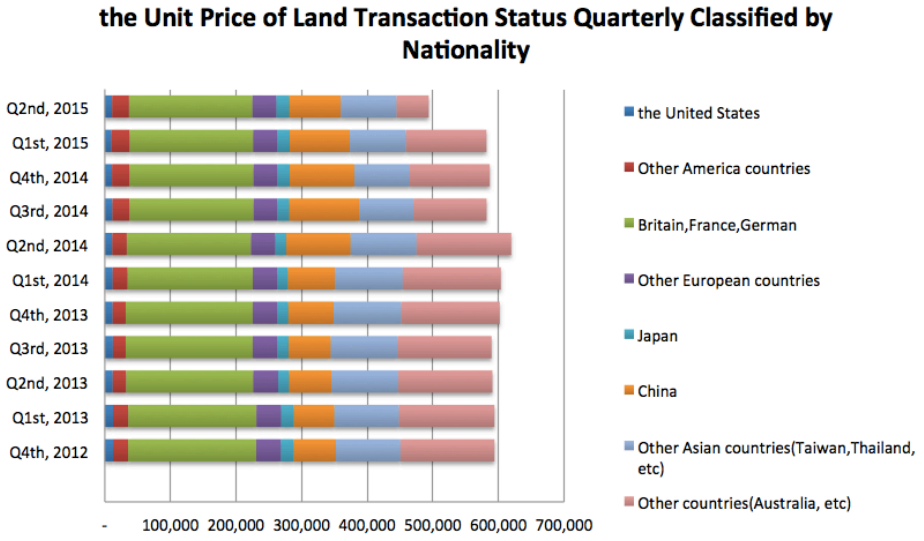
Figure 5: Land Area Possession Status Quarterly Classified by Nationality (unit: m^2)

From Figure 4, it is very apparent to know that from the fourth quarter of 2012 to the second quarter of 2015 the number of Jeju Island' land transaction parcels with Chinese is continuing to increase sharply. The average of every year's growth rate is about 16.8%, and by June 2015, the total growth ratio of Chinese land transaction parcels has boosted to 352% compared to the fourth quarter of 2012. From Figure 5, it is also obvious to know that in 2014, land transaction area with Chinese rocketed suddenly and exceeded the United States in the same year becoming the largest transaction country with Jeju Island with respect to the land transaction area. By June 2015, the total growth ratio of Chinese land transaction area has increased to 456% compared to the fourth quarter of 2012. The more interesting thing is that in the second season of 2014, the growth rate of land transaction area is about 84%. At the same time, the growth rate of land trading volume is about 151% and the unit price increased to 34% in the 2014's second quarter.



* Data Source: architecture and land registration statistics, urban planning/land, Jeju Special Self-governing Province official website

Figure 6: Land Transaction Amount Status Quarterly Classified by Nationality (unit: million won)



* Data Source: architecture and land registration statistics, urban planning/land, Jeju Special Self-governing Province official website

Figure 7: The Unit Price of Land Transaction Status Quarterly Classified by Nationality (unit: won/m^2)

In Figure 6, from the fourth season of 2012 to the second season of 2015, Chinese land transaction numbers have been steady, and much higher than the United States, Japan and other countries, especially from the second quarter of 2014. By June 2015, the total growth ratio of Chinese land transaction amount has boosted to 577% compared to the fourth quarter of 2012. However, there is an interesting situation; that is, in Figure 7, with respect to the unit price of land transaction, Britain, France and Germany bear much more expenses than other countries (burden ratio: about 33%).

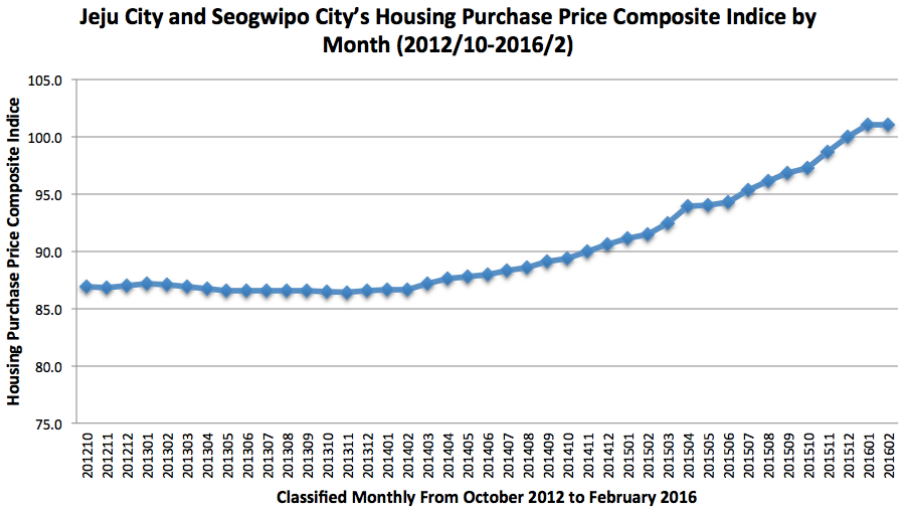
In conclusion, by analyzing Figure 4 to Figure 7, for one thing, there is no doubt saying that China's real estate investment is playing a much more important role than the United States, Japan and other countries. Therefore, in terms of foreign investment capital, investigating Chinese investors can be considered as an indispensable anchor and illuminate this research paper's right direction. For another thing, China's property investors have started to

have positive response strongly in the second season of 2014 and invested a large number of financial funds into Jeju's real estate market since Real Estate Investment Immigration System was initiated in February 2010. Moreover, although Chinese investment increase rate begins to flatten since the second quarter of 2014, it is very reasonable to believe optimistically that Chinese investment in Jeju Island will still increase continually in the future.

CHAPTER IV. VARIABLES, MODEL, RESULTS AND ANALYSIS OF DATA

1. Variables and Model

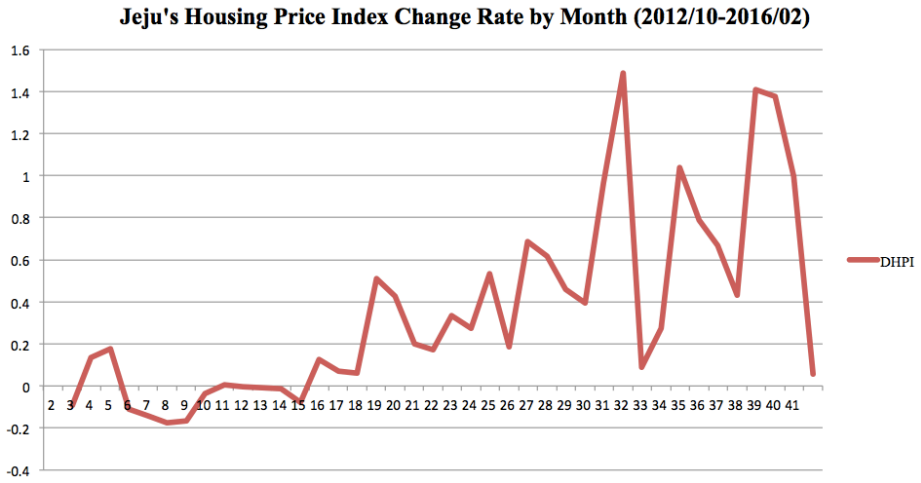
The main purpose of this study is to explore the relationship between Jeju's housing price and land transaction amount with Chinese real estate investors in Jeju Island aiming at Jeju City and Seogwipo City. Wherein, the time data is obtained on a monthly basis from October 2012 to February 2016 and CHN (Land Transaction Amount with Chinese Investors) includes buying land whenever these foreigners or enterprises do not maintain a permanent residence in South Korea.



* Data Source: KB National Bank Real Estate Statistics (2015.12=100.0)

Figure 8: Jeju City and Seogwipo City's Housing Purchase Price Composite Indice by Month (2012/10-2016/2)

As shown in Figure 8, it's obvious to know that from October 2012 to February 2016 Jeju City and Seogwipo City's housing price are growing steadily. Combining with Figure 6 above, it's logical and reasonable to presume there may be probably positive relationship between Jeju's housing price and Chinese land transaction volume. However, the fluctuation of Jeju's housing price index is not strikingly obvious on a monthly basis in Figure 8. On the other hand, as shown in Figure 9, after differencing the housing price index, the fluctuation of housing price index change rate is very significant. As a result, it is adequately believed that the rate of housing price index variance can embody Jeju's housing price variation tendency more clearly and then to estimate the more accurate relationship between Jeju's housing price variation and its determinant factors.



* Note: the data of DHPI is first differenced Jeju's housing price index (unit: %); X-axis labels mean the monthly time code; Data Source: KB National Bank Real Estate Statistics (2015.12=100.0)

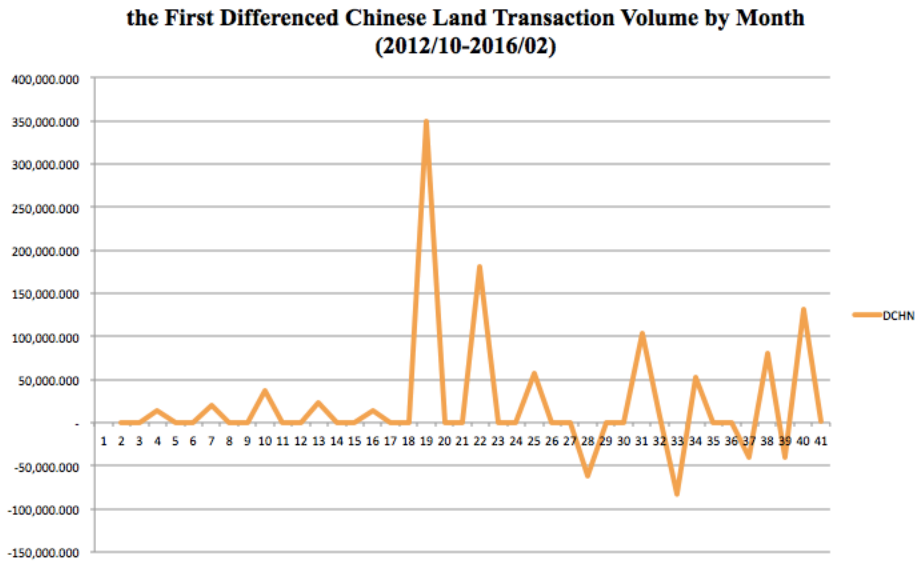
Figure 9: Jeju's Housing Price Index Change Rate by Month (2012/10-2016/02)

In the same way, after differencing the CHN data (Land Transaction Amount with Chinese Investors), Figure 10 shows that the fluctuation of Chinese land transaction volume between each month is very significant. Therefore, as shown in Table 1, DCHN is represented the first differenced Chinese land transaction volume and its unit is million won, with the maximum trading variance turnover reaching up to 349581 million won in April 2014.

Table 1: DCHN Data Summary Listing By Month (unit: million won)

month	201210	201211	201212	201301	201302	201303	201304
DCHN	NA	0.0000	0.0000	13385	0.0000	0.0000	20397
month	**201305**	**201306**	**201307**	**201308**	**201309**	**201310**	**201311**
DCHN	0.0000	0.0000	36827	0.0000	0.0000	23132	0.0000
month	**201312**	**201401**	**201402**	**201403**	**201404**	**201405**	**201406**
DCHN	0.0000	13335	0.0000	0.0000	349581	0.0000	0.0000
month	**201407**	**201408**	**201409**	**201410**	**201411**	**201412**	**201501**
DCHN	181353	0.0000	0.0000	57847	0.0000	0.0000	-61333
month	**201502**	**201503**	**201504**	**201505**	**201506**	**201507**	**201508**
DCHN	0.0000	0.0000	103712	8045	-83038	52677	0.0000
month	**201509**	**201510**	**201511**	**201512**	**201601**	**201602**	
DCHN	0.0000	-40477	79965	-39982	130874	1497	

* Data Source: the data of land transaction volume with Chinese businessmen is obtained from Jeju Special Self-governing Province official website



* Note: X-axis labels mean the monthly time code; Unit: million won; Data Source: the data of land transaction volume with Chinese businessmen is obtained from Jeju Special Self-governing Province official website

Figure 10: The First Differenced Chinese Land Transaction Volume by Month (2012/10-2016/02)

Table 2: the Descriptive Statistics of DCHN Time Series

Series	DCHN
Sample	2012M10-2016M02
Observations	40
Mean	21194.93
Median	0.000000
Maximum	349581.0
Minimum	-83038.00
Range	432619.0
Std. Dev	70556.73
Dispersion	4978251558
Skewness	2.906211
Kurtosis	13.46625

As shown in Table 2, the descriptive statistics of time series is the first difference of Chinese land transaction volume over the period from October 2012 to February 2016 on a monthly basis (DCHN). Its arithmetic mean is 21194.93, the maximum is 349581.0, the minimum is -83038.00, and the dispersion value is 4978251558. Range shows the difference between the maximum variance and the minimum variance when prioritizing the data. Standard deviation is an indicator, which measures how far the each variable is away from the average value. So, as shown in Table 2, the range value is 432619.0, and the standard deviation value is 70556.73. In probability theory and statistics, skewness is a measure of the asymmetry of the probability distribution of a real-valued random variable about its mean. In table 2, the skewness value is 2.906211, much higher than zero, indicating that the DCHN distribution is very asymmetrical and it is positive skewed. Positive skew indicates that the tail on the right side is longer or fatter than the left side of the probability density function and the mass of the distribution is concentrated on the left of the figure. In a similar way to the concept of skewness, kurtosis is a descriptor of the shape of measuring the vertical deviation, that is, how vertical the peak is distributed. And as shown in Table 2, the kurtosis value of DCHN is 13.46625, indicating that the peak distribution is very high compared to other data.

On the other hand, in order to estimate the impacts of the remaining control variables, it is necessary to hold constant other potentially important influences on housing price within the confines of a regression model. Combining the empirical literature review about the determinants of housing price and foreign real estate investment aforementioned, the model chosen to estimate Jeju Island's housing price index change rate is specified as follows:

DHPI (Rate of Jeju's housing price index variance) $=f$ {the first difference of Chinese land transaction volume in Jejudo (DCHN), Jeju's real Gross Regional Domestic Product growth rate (RGRDP), Jeju's residence population growth rate (POPGR), and Korean benchmark interest rate (IR)}

Hence, we specify the long-run relationship between DHPI (Jeju's housing price index change rate), DCHN (the variation of Chinese land trading volume in Jeju), and determinants of Jeju's housing price—RGRDP (Jeju's real Gross Regional Domestic Product growth rate), POPGR (Jeju's resident population growth rate), and IR (Korean benchmark interest rate) in a linear form using Multiple Linear Regression as follows:

$$DHPI_t=\beta_0+\beta_1 DCHN_t+\beta_2 RGRDP_t+\beta_3 POPGR_t+\beta_4 IR_t+u_t \qquad (1)$$

Function (1) where dependent variable (Y): DHPI, independent variable (X): DCHN, RGRDP, POPGR, IR, and where t = 1,……n, T denotes the time period, and u_t is assumed to be the serially uncorrelated error term.

In consequence, the first control variable is main content of this research study, that is, the change in Chinese land transaction volume (DCHN), and the remaining three factors are the determinants of housing price. The remaining part of this section will emphatically analyze the model about the relationship between the dependent variable—the rate of Jejudo's

housing price index variance and the independent variable—the variation of land turnover with Chinese investors in Jejudo. The dependent variable and all other influence factors are summarized in Table 3.

Table 3: Dependent Variables and Independent Variables Summary Listing

month	time	DHPI	DCHN	RGRDP	IR	POPGR
201210	1	NA	NA	5.2	3.00	1.30
201211	2	-0.093139	0.0000	5.2	2.75	1.30
201212	3	0.133803	0.0000	5.2	2.75	1.30
201301	4	0.176282	13385	5.1	2.75	1.71
201302	5	-0.110370	0.0000	5.1	2.75	1.71
201303	6	-0.142965	0.0000	5.1	2.75	1.71
201304	7	-0.177297	20397	5.1	2.75	1.71
201305	8	-0.164512	0.0000	5.1	2.75	1.71
201306	9	-0.035866	0.0000	5.1	2.50	1.71
201307	10	0.006354	36827	5.1	2.50	1.71
201308	11	-0.003438	0.0000	5.1	2.50	1.71
201309	12	-0.007823	0.0000	5.1	2.50	1.71
201310	13	-0.012145	23132	5.1	2.50	1.71
201311	14	-0.080332	0.0000	5.1	2.50	1.71
201312	15	0.127459	0.0000	5.1	2.50	1.71
201401	16	0.071219	13335	4.8	2.50	2.02
201402	17	0.062595	0.0000	4.8	2.50	2.02
201403	18	0.510136	0.0000	4.8	2.50	2.02
201404	19	0.429276	349581	4.8	2.50	2.02
201405	20	0.200815	0.0000	4.8	2.50	2.02
201406	21	0.172182	0.0000	4.8	2.50	2.02
201407	22	0.332734	181353	4.8	2.50	2.02

201408	23	0.276132	0.0000	4.8	2.50	2.02
201409	24	0.531339	0.0000	4.8	2.25	2.02
201410	25	0.188063	57847	4.8	2.25	2.02
201411	26	0.684157	0.0000	4.8	2.00	2.02
201412	27	0.618955	0.0000	4.8	2.00	2.02
201501	28	0.461057	-61333	6.2	2.00	1.06
201502	29	0.396548	0.0000	6.2	2.00	1.06
201503	30	0.966803	0.0000	6.2	2.00	1.06
201504	31	1.487165	103712	6.2	1.75	1.06
201505	32	0.088202	8045	6.2	1.75	1.06
201506	33	0.272570	-83038	6.2	1.75	1.06
201507	34	1.036544	52677	6.2	1.50	1.06
201508	35	0.786865	0.0000	6.2	1.50	1.06
201509	36	0.667985	0.0000	6.2	1.50	1.06
201510	37	0.433474	-40477	6.2	1.50	1.06
201511	38	1.406955	79965	6.2	1.50	1.06
201512	39	1.375086	-39982	6.2	1.50	1.06
201601	40	0.996119	130874	5.2	1.50	1.06
201602	41	0.057334	1497	5.2	1.50	1.06

* Data Source: the data of Jeju's housing price index is obtained from KB National Bank Real Estate Statistics (the housing price index in 2015 is set as 100.0); the data of DHPI is first differenced Jeju's housing price index (unit: %); the data of land transaction volume with Chinese businessmen is obtained from Jeju Special Self-governing Province official website (unit: million won); the data of DCHN is the first differenced Chinese land transaction volume (unit: million won); the data of the real Gross Regional Domestic Product growth rate (RGRDP) is obtained from Ministry of land, Infrastructure and Transport (unit: %)
(Note: because the 2016 data of RGRDP has not been shown in Ministry of land, Infrastructure and Transport, the 2016 data of RGRDP is predicted according to the official report,
see http://www.jeju.go.kr/news/bodo/list.htm?act=view&seq=959026); the data of Jeju's population increase rate (POPGR) is obtained from Korean Statistical Information Service (unit: %); the data of Korea's benchmark interest rate (IR) is obtained from the Bank of Korea (unit: %).

2. Regression Results and Stata Analysis of Data

As shown in Table 4, the total number of observation is 40 based on the month classification from October 2010 to February 2016 and F (4, 35) value is 15.82. "SS" is sum of squares, the regression sum of squares is 5.05819797, the residual sum of squares is 2.79717816 and the total sum of squares is 7.85537614. "Df" means degrees of freedom. "MS" is mean squares, that is, estimates of variance across groups. Mean squares are used in analysis of variance and are calculated as a sum of squares divided by its appropriate degrees of freedom. Moreover, the Mean Squared Error (MSE) is a measure of how close a fitted line is to data points. The smaller the Mean Squared Error, the closer the fit is to the data. Root Mean Squared Error (Root MSE) is the square root of the mean square error. That is probably the most easily interpreted statistic, since it has the same units as the quantity plotted on the vertical axis. Therefore, as shown in Table 4, Root MSE is 0.2827, meaning that the model result is very accurate.

R^2 (the square of the coefficient of multiple correlation) is a statistic that will give some information about the fit of a model. In Multiple Linear Regression, the R^2 coefficient of determination is a statistical measure of how well the regression curve approximates the real data points. An R^2 of 1 indicates that the regression line perfectly fits the variables. The use of an adjusted R^2 is an attempt to take account of the phenomenon of the R^2 automatically and spuriously increasing when extra explanatory variables are added to the model. Consequently, as shown in Table 4, R-squared is 64.39% (the regression sum of squares/ the total sum of squares) and adjusted R-squared is 60.32%. The R-squared value indicates that the regression sum of squares of X variables—DCHN, IR, RGRDP, POPGR take up 64.39% in the total sum of squares.

Table 4: Stata Analysis Result

Source	SS	df	MS	Number of obs=	40
Model	5.05819797	4	1.26454949	F(4,35)=	15.82
Residual	2.79717816	35	0.079919376	Prob>F=	0.0000
Total	7.85537614	39	0.201419901	R-squared=	0.6439
				Adj R-squared=	0.6032
				Root MSE=	0.2827

DHPI	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
DCHN	1.69e-06	6.68e-07	2.53	0.016	3.37e-07	3.05e-06
IR	-0.6752555	0.1486106	-4.54	0.000	-0.9769512	-0.373560
RGRDP	0.3921162	0.1960887	2.00	0.053	-0.005965	0.7901974
POPGR	0.4753544	0.2709106	1.75	0.088	-0.0746234	1.025332
_cons	-1.025723	1.499657	-0.68	0.498	-4.070189	2.018744

Durbin-Watson d-statistic(5, 40) = 1.764305

Table 4 illustrates that the probability of DCHN's occurrence is 0.016<0.1, which shows that the difference is marked and there is statistical significance representing the meaningful result. The probability value of RGRDP and the probability value of POPGR are 0.053 and 0.088, respectively, less than the lower bound critical value (1%). Though their statistical methods are on a yearly basis, their results still reveals meaningful. Furthermore, the P(IR)=0.000 is infinite approach to zero, meaning that there is a strikingly strong negative relationship between the housing price index change rate and the interest rate. Finally, the estimation error is -1.025723, so it is obvious to derive the final formula as follows:

$$DHPI_t = -1.025723 + (1.69e\text{-}06)\, DCHN_t - 0.6752555 IR_t + 0.3921162 RGRDP_t + 0.4753544 POPGR_t \qquad (2)$$

In statistics, standardized coefficients or beta coefficients are the estimates resulting from regression analysis that have been standardized so

that the variances of dependent and independent variables are 1. As a result, standardized coefficients refer to how many standard deviations a dependent variable will change, per standard deviation increase in the predictor variable. Standardization of the coefficient is usually done to answer the question of which of the independent variables has a greater effect on the dependent variables in a multiple regression, especially when the control variables are measured in different units of measurement, like variables in Function (2).

As shown in Function (2), if 1% of the variation of Chinese land turnover increases, 0.00000169% of Jejudo's housing price index change rate grows correspondingly, indicating that the amount of Chinese land transaction volume change exerts a very small impact on Jejudo's housing price index increase rate; if 1% of GRDP growth rate gains, 0.392% of Jeju's housing price index change rate increases relatively; in the same way, if 1% of Jeju's population growth rate rises, 0.475% of Jeju's housing price index change rate increases accordingly; however, if 1% of interest rate reduces, 0.675% Jeju's housing price index change rate increases correspondingly.

However, Durbin-Watson statistic value is 1.764305, which is substantially less than 2, meaning that there is statistical evidence that the error terms are positively autocorrelated. With respect to autocorrelation, sometimes autocorrelation results because the underlying time series is nonstationary.

3. Nonstationary Time Series Processing Steps and Analysis of Data

1) The Definition of Stationary Stochastic Processes

A type of stochastic process that has received a great deal of attention and scrutiny by time series analysts is the so-called stationary

stochastic process. Broadly speaking, a stochastic process is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the distance or gap or lag between the two times periods and not the actual time at which the covariance is computed. In the time series literature, such a stochastic process is known as a weakly stationary, or covariance stationary, or second-order stationary, or wide sense, stochastic process. In short, if a time series time is stationary, its mean, variance, and autocovariance (at various lags) remain the same no matter at what point we measure them; that is, they are time invariance. If a time series is not stationary in the sense just defined, it is called a nonstationary time series. In other words, a nonstationary time series will have a time-varying mean or a time-varying variance or both. What should be mentioned is that a special type of stochastic process (or time series), namely, a purely random, or white noise process. It is called a stochastic process purely random if it has zero mean, constant variance σ^2, and is serially uncorrelated[6)], denoted as the error term $\mu_t \sim N(0, \sigma^2)$; that is, μ_t is independently and identically distributed as a normal distribution with zero mean and constant variance. If a time series is nonstationary, studying its behavior is only for the time period under consideration. Each set of time series data will therefore be for a particular episode. As a consequence, it is not possible to generalize it to other time periods. Therefore, for the purpose of forecasting, such nonstationary time series may be of little practical value.

In regressing a time series variable on another time series variable(s), one often obtains a very high R^2 even though there is no meaningful relationship between two variables, yet a regression of one on the other variable often shows a significant relationship. This situation exemplifies the problem of spurious, or nonsense regression, whose nature has been explained before. It is therefore very important to find out if the relationship between economic

[6)] If it is also independent, such a process is called strictly white noise.

variables is spurious or nonsensical.

2) The Unit Root Test Using ADF Test

A test of stationary or nonstationary that has become widely popular over the past several years is the unit root test. The starting point is the unit root (stochastic) process. It is started with as follows:

$$Y_t = \rho Y_{t-1} + \mu_t \qquad 1 \leq \rho \leq 1 \qquad (3)$$

Where μ_t is a white noise error term in Function (3)

It is known that if $\rho=1$, that is, in the case of the unit root, Function (3) becomes a random walk model without drift, which we know is a nonstationary stochastic process[7]. Therefore, when regressing Y_t on its (one-period) lagged value Y_{t-1} and finding out if the estimated ρ is statistically equal to 1. If it is 1, then Y_t is nonstationary. This is the general idea behind the unit root test of stationary. For theoretical reasons, Function (3) is manipulated as follows: Subtract Y_{t-1} from both side of Function (3) to obtain:

$$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + \mu_t = (\rho-1)Y_{t-1} + \mu_t \qquad (4)$$

Which can be alternatively written as:

$$\Delta Y_t = \delta Y_{t-1} + \mu_t \qquad (5)$$

Where $\delta=(\rho-1)$ and Δ, as usual, is the first difference operator.

In practice, therefore, instead of estimating Function (3), estimating Function (5) and testing the null hypothesis that $\delta=0$. If $\delta=0$, then $\rho=1$, that is we have a unit root, meaning the Y_t time series under consideration is nonstationary. But if it is negative, it is concluded that Y_t is stationary.[8] The only question is which test we use to find out if the estimated coefficient of Y_{t-1} in Function (5) is zero or not.

Dickey and Fuller (Dickey and Fuller 1979,1981) have developed a

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[7] See Damodar N. Gujarati, 2003, Basic Econometrics, fourth edition, Mc Graw Hill, P798-P817

[8] Since $\delta=(\rho-1)$, for stationary ρ must be less than one. For this to happen δ must be negative.

test, known as the augmented Dickey-Fuller (ADF) test. This test is conducted by adding the lagged values of the dependent variable ΔY_t. To be specific, the ADF test here consists of estimating the following regression:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \Sigma \alpha_i \Delta Y_{t-i} + \varepsilon_t \qquad (6)$$

Where ε_t is a pure white noise error term;

where Σ means i=1,2,……m;

and where $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$, etc.

The number of lagged difference terms to include is often the error term in Function (6) is serially uncorrelated. In ADF we will test whether $\delta=0$ and the ADF test follows the same asymptotic distribution as the DF statistic, so the same critical values can be used.[9)]

As shown in Figure 11 and Figure 12, the solid vertical line in the two diagrams represents the zero axis; observations above the line are positive values and those below the line are negative values. As is very clear from Figure 12, for a purely white noise process the autocorrelations at various lags hover around zero. In the meanwhile, the probability of the first differenced DHPI is much higher than the upper bound critical value and its partial correlation coefficient distribution is very random. This is the picture of a correlogram of a stationary time series. Thus, if the correlogram of an actual economic time series resembles the correlogram of white noise time series, it is said that time series is probably stationary. On the contrary, as shown in Figure 11, the most striking feature of this correlogram is that the autocorrelation coefficient at various lags are very high and the probability of DHPI is less than the lower bound critical value, intensively indicating that DHPI has a unit root. Figure 11 is the typical correlogram of a nonstationary time series; the autocorrelation coefficient starts a very high value and declines gradually and slowly toward zero as the lag lengthens, and the partial correlation coefficient starts a very high value and declines sharply. Therefore,

9) Want to see more detailed content, see Damodar N. Gujarati, 2003, Basic Econometrics, fourth edition, Mc Graw Hill, P792-P817

in order to verify whether the time series variables used in this paper are nonstationary, DHPI series is estimated by ADF test and the results are exhibited in Table 5 and Table 6 respectively as follows:

Sample: 2012M10 2016M02
Included observations: 40

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.585	0.585	14.738	0.000
		2	0.337	-0.008	19.757	0.000
		3	0.424	0.350	27.939	0.000
		4	0.555	0.297	42.336	0.000
		5	0.404	-0.067	50.188	0.000
		6	0.195	-0.143	52.064	0.000
		7	0.295	0.157	56.488	0.000
		8	0.392	0.036	64.536	0.000
		9	0.308	0.022	69.669	0.000
		10	0.086	-0.190	70.081	0.000
		11	0.076	-0.074	70.418	0.000
		12	0.147	-0.080	71.710	0.000
		13	0.024	-0.171	71.746	0.000
		14	-0.067	0.045	72.039	0.000
		15	-0.071	-0.035	72.382	0.000
		16	-0.064	-0.131	72.666	0.000
		17	-0.162	-0.107	74.578	0.000
		18	-0.163	0.114	76.615	0.000
		19	-0.167	-0.063	78.839	0.000
		20	-0.141	0.115	80.505	0.000

Figure 11: Correlogram of DHPI, AC=autocorrelation, PAC=partial autocorrelation, Q-stat=Q statistic, Prob=probability.

Sample: 2012M10 2016M02
Included observations: 39

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.150	-0.150	0.9504	0.330
		2	-0.403	-0.435	7.9536	0.019
		3	-0.075	-0.286	8.2008	0.042
		4	0.306	0.052	12.489	0.014
		5	0.082	0.064	12.805	0.025
		6	-0.384	-0.273	19.952	0.003
		7	0.024	-0.032	19.982	0.006
		8	0.194	-0.065	21.923	0.005
		9	0.165	0.134	23.368	0.005
		10	-0.203	0.029	25.630	0.004
		11	-0.126	-0.007	26.543	0.005
		12	0.211	0.084	29.184	0.004
		13	-0.022	-0.093	29.213	0.006
		14	-0.107	-0.043	29.946	0.008
		15	-0.013	0.079	29.957	0.012

Figure 12: Correlogram of the first differenced DHPI, AC=autocorrelation, PAC=partial autocorrelation, Q-stat=Q statistic, Prob=probability.

Table 5: DHPI-*I*(0) ADF Test Result

Null Hypothesis: DHPI has a unit root
Exogenous: None
Lag Length: 3 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.727257	0.8675
Test critical values:	1% level	-2.630762	
	5% level	-1.950394	
	10% level	-1.611202	

*MacKinnon (1996) one-sided p-values.

Table 6: DHPI-*I*(1) ADF Test Result

Null Hypothesis: D(DHPI) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.670472	0.0000
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

*MacKinnon (1996) one-sided p-values.

As shown in Table 5, P-value is greater than the upper bound critical value, and then the null hypothesis of a unit root is accepted, indicating DHPI series is considered nonstationary. In the meanwhile, as shown in table 6, P-value is less than the lower bound critical value, and then the null hypothesis of a unit root is rejected, indicating the first-differenced DHPI time series is considered stationary and the level series is integrated of order one, noted as *I*(1). Therefore, by that analogy, all the time series variables can be verified by ADF unit root test and can be organized as follows:

Table 7: Time Series Variables ADF Test Results Summary

Name	DHPI	DCHN	IR	RGRDP	POPGR
Property	Dependent Variable	Independent Variable	Independent Variable	Independent Variable	Independent Variable
Result	$I(1)$	$I(0)$	$I(0)$	$I(1)$	$I(1)$

As shown in Table 7, the first-differenced DHPI time series is considered stationary and the level series is integrated of order one, labeled as $I(1)$; the first-differenced RGRDP time series is considered stationary and the level series is integrated of order one, noted as $I(1)$; the first-differenced POPGR time series is considered stationary and the level series is integrated of order one, flagged as $I(1)$; however, the DCHN time series and the IR time series are directly considered stationary and there is no need to be first differenced, both marked as $I(0)$.

3) Testing For Cointegration

Cointegration analysis is a test for relationships between nonstationary variables. Economically speaking, time series variables will be cointegrated if they have a long-term, or equilibrium, relationship between them. Nonstationary data is usually differenced to obtain stationary as mentioned above. Engle and Granger (1987) showed that if two nonstationary variables, though stationary only after differencing, can be linearly combined such that the combination is stationary in level, then the two variables are said to be cointegrated. If two time series variables are cointegrated, then their permanent or secular trends would adjust to an equilibrium state, and error-correction models could be identified to adjust for transitory deviations. Cointegration analysis also sieves out spurious regressions where high

correlations and R^2 do not necessarily indicate true relationships.

In short, the first step in the test for cointegration establishes the order of integration for the time series. Since a two-variable cointegration test requires that variables be integrated of order one, the data should be stationary only in their first difference, and not in levels. The first step is essentially a test of unit roots. The augmented Dickey-Fuller procedure (ADF test) is commonly used to test for unit roots aforementioned. The next step is to estimate the cointegration regression such that: $Y_t = \alpha+\beta X_t+\mu_t$ where α and β are the cointegration parameters to be estimated.

Formally stated, nonstationary series can be said to be integrated of order *d* if it can be transformed into a stationary series by differencing *d* times. Suppose two nonstationary time series variables, X_t and Y_t, are first-difference stationary; X_t and Y_t are considered integrated of the first order, denoted as $X \sim I(1)$ and $Y \sim I(1)$. If a linear combination $Z_t = Y_t - \beta X_t$ is stationary, then X, and Y, are cointegrated, i.e. $Z_t \sim CI(0)$. Hence, now that the regression model has been expressed in Function (1) as follows:

$$DHPI_t=\beta_0+\beta_1 DCHN_t+\beta_2 RGRDP_t+\beta_3 POPGR_t+\beta_4 IR_t+u_t \qquad (1)$$

Or it can be also expressed by the formula as follows:

$$u_t = DHPI_t - \beta_0 - \beta_1 DCHN_t - \beta_2 RGRDP_t - \beta_3 POPGR_t - \beta_4 IR_t \qquad (7)$$

After unit root analysis aforementioned, $DHPI_t$, $RGRDP_t$, $POPGR_t$, IR_t are individually $I(1)$ and $DCHN_t$ is stationary itselt, that is it is $I(0)$. What is noteworthy is that, albeit that time series variables have stochastic trends, suppose their linear combination is $I(0)$. So to speak, the linear combination cancels out the stochastic trends in these time series variables. The warning that the regression of a nonstationary time series on another nonstationary time series may produce a spurious regression has been interpreted. If

independent variables and dependent variable are taken as $I(1)$ variables, savings defined as u_t could be $I(0)$. As a result, the regression model would be meaningful (i.e., not spurious). In this case it can be said that the independent variables and dependent variable are cointegrated. In short, provided that the residuals from regression like Function (7) are $I(0)$ or stationary, the traditional regression methodology (including the t and F tests) is applicable to data involving (nonstaionary) time series. The valuable contribution of the unit root, cointegration, etc. is to force us to find out if the regression residuals are stationary. As Granger notes, " A test for cointegration can be thought of as a pre-test to avoid 'spurious regression' situations." In the language of cointegration theory, a regression such as Function (7) is known as the cointegrating regression and the slope parameter β is known as the cointegrating parameter. The concept of cointegration can be extended to a regression model containing k regressors. In this case there will be k cointegrating parameters. A number of methods for testing cointegration have been proposed in the literature. Two comparatively simple methods will be discussed in this research paper: (1) the ADF unit root test on the residuals estimated from the cointegrating regression and (2) the Johansen cointegration test.

It has been discussed how to apply the ADF unit root test. There is one precaution to exercise, however. Since the estimated u_t is based on the estimated cointegrating parameter β, the ADF critical significance values are not quite appropriate. Engle and Granger have calculated these values, which can be found in the reference[10)]. Therefore, the ADF test in the present context is known as Engle-Granger (EG) or Augmented Engle-Granger (AEG) Test. Hence, by applying EG test, the residual result is shown in Table 8 as follows:

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10) R. F. Engle and C. W. Granger, " Co-integration and Error Correction: Representation, Estimation and Testing," Econometrica, vol. 55, 1987, pp. 251-276

Table 8: RESIDUAL-*I*(0) EG Test Result

Null Hypothesis: RESID01 has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.964443	0.0000
Test critical values:	1% level	-2.627238	
	5% level	-1.949856	
	10% level	-1.611469	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID01)
Method: Least Squares

Sample (adjusted): 2013M01 2016M02
Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID01(-1)	-1.254017	0.210249	-5.964443	0.0000
D(RESID01(-1))	0.369780	0.160610	2.302350	0.0272

R-squared	0.527333	Mean dependent var	-0.021289
Adjusted R-squared	0.514203	S.D. dependent var	0.362661
S.E. of regression	0.252772	Akaike info criterion	0.138535
Sum squared resid	2.300164	Schwarz criterion	0.224723
Log likelihood	-0.632159	Hannan-Quinn criter.	0.169200
Durbin-Watson stat	1.976741		

As shown in table 8, P-value is less than the lower bound critical value, and then the null hypothesis of a unit root is rejected, indicating the level (0) Residual is considered stationary, denoted as *I*(0). In the meantime, Durbin-Watson statistic value is 1.976741, which is very closely approach to 2, indicating that there is no presence of autocorrelation.

However, the EG test is usually applied when there are only two variables. As is well-known, there are five variables in the regression model. As a result, the Johansen cointegration test should be supplemented to confirm

whether dependent variable and independent variables are relatively cointegrated. The Johansen test can be seen as a multivariate generalization of the augmented Dickey- Fuller test. The generalization is the examination of linear combinations of variables for unit roots. The Johansen test and estimation strategy—maximum likelihood—makes it possible to estimate all cointegrating vectors when there are more than two variables[11]. Generally speaking, if there are N variables which all have unit roots, there are at most N-1 cointegrating vectors. The Johansen test provides estimates of all cointegrating vectors. However, there is a precondition before applying the Johansen test, which is that all variables must be the same order integration. Albeit that Johansen's methodology is typically used in a setting where all variables in the system are *I*(*d*), there is additional statement as follows: if the number of variables is more than two variables, that is, the number of explanatory variables is more than one, dependent variable's order of integration can not be higher than any each independent variables' order of integration. When dependent variable's *I(d)* is higher than some other explanatory variables' *I(d)*, there must be at least two independent variables' *I(d)* which are higher than dependent variable's *I(d)*. If there are only two independent variables, these independent variables' *I(d)* must be in the same order. That is, when more than two nonstationary series, which have different *I(d)*, are taken into cointegration test, there must be some other independent variables which have comparatively lower order of integration. Because they are less volatile compared to higher-order-sequence, that will not influence cointegrating results a lot. In terms of higher-order-sequence, because of their great fluctuation, they have a tremendous impact on the stability of the regression residuals. Anyway, as shown in Table 7, the dependent variable (DHPI)'s *I(d)* is higher than independent variables—IR and DCHN' *I(d)*, however, there are also two independent variables—RGRDP and POPGR' *I(d)*

[11] Results generally go through for quasi-maximum likelihood estimation.

which are higher than DHPI's *I(d)*. As a result, the Johansen cointegration test can be applied into this paper's model.

Also, Erik Hjalmarsson and Pär Österholm (2007) mentioned that having stationary variables in the system is theoretically not an issue and Johansen (1995) stated that there is little need to pre-test the variables in the system to establish their order of integration. For instance, if a single variable is $I(0)$ instead of $I(1)$, this will reveal itself through a cointegrating vector whose space is spanned by the only stationary variable in the model. In conclusion, the Johansen cointegration test is appropriate for this research paper's model.

Table 9: The Johansen Cointegration Test Result

Sample (adjusted): 2013M01 2016M02
Included observations: 38 after adjustments
Trend assumption: Linear deterministic trend
Series: DHPI DCHN IR POPGR RGRDP
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.657251	97.10518	69.81889	0.0001
At most 1 *	0.550677	56.41640	47.85613	0.0064
At most 2	0.381089	26.01587	29.79707	0.1282
At most 3	0.164577	7.783683	15.49471	0.4888
At most 4	0.024706	0.950617	3.841466	0.3296

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.657251	40.68878	33.87687	0.0066
At most 1 *	0.550677	30.40053	27.58434	0.0212

At most 2	0.381089	18.23219	21.13162	0.1214
At most 3	0.164577	6.833065	14.26460	0.5091
At most 4	0.024706	0.950617	3.841466	0.3296

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

In conclusion, there are two types of the Johansen tests, either with the trace test or the maximum eigenvalue test, and the differences might be a little bit different. As shown in Table 9, the trace test and the maximum eigenvalue test both indicate there are two cointegrating equilibriums at the 5% confidence level. That means that there is the existence of at least two cointegrating equations to represent a long-term relationship between DHPI, DCHN, RGRDP, IR and POPGR. Therefore, no matter whether using EG test or applying Johansen test, the two results both show that the null hypothesis of a unit root is rejected, indicating the level (0) Residual is considered stationary and there is a long-term relationship between DHPI, DCHN, RGRDP, IR and POPGR.

CHAPTER V. CONCLUSION

The conclusion can be summed up into five parts:

1. There is a positive and significant relationship between Jeju's housing price index change rate and the variation of land turnover with Chinese property investors in Jeju. In other words, the higher change degree of Chinese land transaction amount in a host country would lead to higher housing price fluctuation more probably;
2. Concerning about other determinants of housing price, the gravity of land turnover variance with Chinese speculators perhaps plays a subordinate role in Jeju's housing price appreciations under this research study;
3. There is a contemporaneous long-term relationship between Jeju's housing price index increase rate (DHPI), the variation of Chinese land transaction volume (DCHN), Jeju's real Gross Regional Domestic Product growth rate (RGRDP), Jeju's population growth rate (POPGR) and Korean benchmark interest rate (IR);
4. Jeju's housing price index increase rate is positively correlated to Jeju's real Gross Regional Domestic Product growth rate (RGRDP) and Jeju's resident population growth rate (POPGR);
5. There is a negative relationship between Jeju's housing price index fluctuation rate and Korean benchmark interest rate. That is, the higher the benchmark interest rate, the lower the future housing price index change rate;

However, there are a couple of limitations to be acknowledged in this research. First and foremost, the aim of this paper has been to investigate the effect of foreign investment in real estate sector (FREI) on housing prices

over the fourth quarter of 2012 to the second quarter of 2016 on a monthly basis. In order to address this question empirically, it is demonstrated that the Chinese land transaction amount is represented as Chinese real estate investment. It does lead further evidence to the growing belief that the use of foreign land turnover as a proxy for property fluctuation rate may be unwarranted. Consequently, a greater number of samples may be able to provide a more generalization model and subsequent interpretations that the use of Chinese land transaction amount variance as a proxy for Jejudo's housing price increase phenomenon is questionable, especially if applied to all of Korea.

Secondly, the Multiple Linear Regression Analysis results indicate that the land trading volume with Chinese businessmen exerts a little effect on the variance of Jeju's housing sales price. The reason why this study's result comes out is mainly accounting for two factors: one is due to the small sample size and another is because the unit of Chinese land transaction volume time series is million won, different from others' units (%). The land turnover database opened by Jeju Special Self-governing Province official website is very limited because Korea's Real Estate Investment Immigration System hasn't been in operation for a long time (2010 founded) and has been suspended. Therefore, it is the important limitation that there is insufficient evidence to establish a variety of data on a monthly basis. As a consequence, it can be a conceivable reason why the regression parameter result of Chinese land trading volume change rate is lower than expected.

On the other hand, the EG test result and the Johansen test result show clearly that despite that housing price index change rate, population growth rate, GRDP increase rate are individually first-difference stationary, the linear combination between them is integrated. The error terms from the cointegration regression are highly stationary and have no presence of

autocorrelation. Thus, there is a contemporaneous long-term relationship between Jeju's housing price index increase rate and the change of Chinese land transaction volume, not likely to be spurious regression. However, it is not clearly known that the relationship between Jeju's housing price index change rate and the variation of Chinese land turnover is strong or not, which warrants further research. Accordingly, with respect to other determinants of housing price, the gravity of land turnover with Chinese speculators maybe plays a subordinate role in Jeju's housing price appreciations under this research study.

Finally, testing for cointegration process treatment, however, may result in a loss of low-frequency information or long-run characteristics of the data. In any case, the study shows that Jeju's housing price index growth rate and the amount of Chinese land trading volume change are cointegrated; that is, there is a long-term, or equilibrium, relationship between the two. Of course, in the short run there may be disequilibrium and it has not been done in this research paper yet. Above all, the thesis still has a lot of complemented space and deficiency to be researched further concerning about these.

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APPENDIX

APPENDIX 1: Land Parcel Transaction Status Quarterly Classified by Nationality

Classification by nationality	the United States	Other America countries	Britain, France, German	Other European countries	Japan	China	Other Asian countries(Taiwan, Thailand, etc)	Other countries(Australia, etc)
Q4th, 2012	1,298	315	49	110	453	1,548	746	147
Q1st, 2013	1,298	312	49	112	417	1,659	749	148
Q2nd, 2013	1,296	311	54	114	398	2,140	763	154
Q3rd, 2013	1,330	319	55	115	385	2,917	763	155
Q4th, 2013	1,330	321	55	114	375	3,705	768	156
Q1st, 2014	1,338	326	67	113	355	4,168	781	161
Q2nd, 2014	1,337	329	70	114	346	4,901	792	163
Q3rd, 2014	1,354	340	72	113	422	5,997	843	166
Q4th, 2014	1,371	343	75	116	416	6,788	848	162
Q1st, 2015	1,348	353	74	120	408	6,804	863	169
Q2nd, 2015	1,417	387	74	120	438	6,991	867	202

APPENDIX 2: Land Area Possession Status Quarterly Classified by Nationality (m^2)

Classification by nationality	the United States	Other America countries	Britain, France, German	Other European countries	Japan	China	Other Asian countries(Taiwan, Thailand, etc)	Other countries(Australia, etc)
Q4th, 2012	3,693,662	394,442	138,761	385,602	2,214,395	1,929,408	827,821	224,307
Q1st, 2013	3,711,081	380,468	138,761	385,939	2,207,168	2,221,538	828,140	221,272
Q2nd, 2013	3,681,460	370,168	140,396	386,614	2,185,430	2,455,422	841,894	225,229
Q3rd, 2013	3,738,628	366,216	140,409	380,923	2,167,427	3,015,029	839,575	225,260
Q4th, 2013	3,741,114	352,849	140,409	380,093	2,140,055	3,149,791	841,098	225,372
Q1st, 2014	3,738,035	381,393	142,811	381,405	2,122,441	3,220,948	849,605	226,874
Q2nd, 2014	3,706,593	350,736	144,033	381,535	2,117,074	5,922,327	877,805	238,159
Q3rd, 2014	3,724,625	320,696	144,517	379,519	2,361,454	7,169,058	1,085,386	320,746
Q4th, 2014	3,723,934	313,805	145,489	379,569	2,337,233	8,338,532	1,085,480	302,844
Q1st, 2015	3,676,342	309,913	145,158	381,209	2,298,341	8,260,260	1,078,959	306,423
Q2nd, 2015	3,874,256	404,769	145,157	381,392	2,334,563	10,721,576	1,083,644	1,378,868

APPENDIX 3: Land Transaction Amount Status Quarterly Classified by Nationality (million won)

Classification by nationality	the United States	Other America countries	Britain, France, German	Other European countries	Japan	China	Other Asian countries(Taiwan, Thailand, etc)	Other countries(Australia, etc)
Q4th, 2012	46,261	9,069	27,089	14,607	42,361	124,069	81,490	32,117
Q1st, 2013	46,254	8,886	27,089	14,639	41,842	137,454	81,748	32,119
Q2nd, 2013	44,176	7,600	27,170	14,760	36,658	157,851	85,699	32,317
Q3rd, 2013	45,793	7,156	27,172	14,232	37,208	194,678	85,200	32,320
Q4th, 2013	44,278	7,041	27,172	14,140	36,373	217,810	86,802	33,793
Q1st, 2014	44,558	8,717	27,226	14,133	34,828	231,145	87,834	33,910
Q2nd, 2014	42,144	7,735	27,271	14,219	34,727	580,726	88,284	34,382
Q3rd, 2014	43,103	8,351	27,329	13,744	43,063	762,079	89,960	35,728
Q4th, 2014	41,006	8,351	27,478	13,750	44,738	819,926	91,738	36,920
Q1st, 2015	37,102	8,616	27,293	13,976	43,885	758,593	92,175	37,566
Q2nd, 2015	43,199	10,410	27,293	14,045	45,725	839,989	92,129	67,410

Appendix 4: DCHN-*I*(0) ADF Test Result

Null Hypothesis: DCHN has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.638171	0.0000
Test critical values:	1% level	-2.625606	
	5% level	-1.949609	
	10% level	-1.611593	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DCHN)
Method: Least Squares

Sample (adjusted): 2012M12 2016M02
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DCHN(-1)	-1.073914	0.161779	-6.638171	0.0000

R-squared	0.536954	Mean dependent var	38.38462
Adjusted R-squared	0.536954	S.D. dependent var	109496.0
S.E. of regression	74509.26	Akaike info criterion	25.30054
Sum squared resid	2.11E+11	Schwarz criterion	25.34320
Log likelihood	-492.3606	Hannan-Quinn criter.	25.31585
Durbin-Watson stat	1.997543		

Appendix 5: RGRDP-*I*(0) ADF Test Result

Null Hypothesis: RGRDP has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.160563	0.6219
Test critical values:	1% level	-2.624057	
	5% level	-1.949319	
	10% level	-1.611711	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RGRDP)
Method: Least Squares

Sample (adjusted): 2012M11 2016M02
Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGRDP(-1)	-0.001321	0.008229	-0.160563	0.8733

R-squared	0.000661	Mean dependent var	0.000000
Adjusted R-squared	0.000661	S.D. dependent var	0.280110
S.E. of regression	0.280017	Akaike info criterion	0.316752
Sum squared resid	3.057979	Schwarz criterion	0.358974
Log likelihood	-5.335034	Hannan-Quinn criter.	0.332018
Durbin-Watson stat	1.998680		

Appendix 6: RGRDP-*I(*1) ADF Test Result

Null Hypothesis: D(RGRDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.082763	0.0000
Test critical values:	1% level	-3.610453	
	5% level	-2.938987	
	10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RGRDP,2)
Method: Least Squares

Sample (adjusted): 2012M12 2016M02
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RGRDP(-1))	-1.000000	0.164399	-6.082763	0.0000
C	0.000000	0.046050	0.000000	1.0000

R-squared	0.500000	Mean dependent var	0.000000
Adjusted R-squared	0.486486	S.D. dependent var	0.401314
S.E. of regression	0.287581	Akaike info criterion	0.395294
Sum squared resid	3.060000	Schwarz criterion	0.480605
Log likelihood	-5.708242	Hannan-Quinn criter.	0.425903
F-statistic	37.00000	Durbin-Watson stat	2.000000
Prob(F-statistic)	0.000000		

Appendix 7: IR-*I*(0) ADF Test Result

Null Hypothesis: IR has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.731492	0.0075
Test critical values:	1% level	-2.624057	
	5% level	-1.949319	
	10% level	-1.611711	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IR)
Method: Least Squares

Sample (adjusted): 2012M11 2016M02
Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IR(-1)	-0.016904	0.006189	-2.731492	0.0094

R-squared	0.012456	Mean dependent var	-0.037500
Adjusted R-squared	0.012456	S.D. dependent var	0.090405
S.E. of regression	0.089840	Akaike info criterion	-1.956884
Sum squared resid	0.314780	Schwarz criterion	-1.914662
Log likelihood	40.13769	Hannan-Quinn criter.	-1.941618
Durbin-Watson stat	2.144131		

Appendix 8: POPGR-*I*(0) ADF Test Result

Null Hypothesis: POPGR has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.494864	0.4955
Test critical values:	1% level	-2.624057	
	5% level	-1.949319	
	10% level	-1.611711	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(POPGR)
Method: Least Squares

Sample (adjusted): 2012M11 2016M02
Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
POPGR(-1)	-0.008446	0.017067	-0.494864	0.6235

R-squared	0.005032	Mean dependent var	-0.006000
Adjusted R-squared	0.005032	S.D. dependent var	0.174265
S.E. of regression	0.173826	Akaike info criterion	-0.636844
Sum squared resid	1.178401	Schwarz criterion	-0.594622
Log likelihood	13.73689	Hannan-Quinn criter.	-0.621578
Durbin-Watson stat	1.995632		

Appendix 9: POPGR-*I*(1) ADF Test Result

Null Hypothesis: D(POPGR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.090353	0.0000
Test critical values:	1% level	-3.610453	
	5% level	-2.938987	
	10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(POPGR,2)
Method: Least Squares

Sample (adjusted): 2012M12 2016M02
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(POPGR(-1))	-1.001247	0.164399	-6.090353	0.0000
C	-0.006162	0.028666	-0.214939	0.8310

R-squared	0.500624	Mean dependent var	0.000000
Adjusted R-squared	0.487127	S.D. dependent var	0.249821
S.E. of regression	0.178910	Akaike info criterion	-0.553951
Sum squared resid	1.184321	Schwarz criterion	-0.468640
Log likelihood	12.80204	Hannan-Quinn criter.	-0.523342
F-statistic	37.09240	Durbin-Watson stat	2.000003
Prob(F-statistic)	0.000000		

Abstract in Korean

국문초록

제주특별자치도가 부동산투자이민제도를 2010년에 발표한 뒤, 제주도에 대한 해외 부동산 투자 중에서 중국인의 거래량이 급증하고 있다. 따라서, 본 논문은 중국인 부동산투자자들을 중심으로 제주도 주택매매가격과 외국인 토지거래금액 사이의 관계를 밝히고자 한다. 현재 부동산 상황을 미뤄보면, 높아진 주택 가격과 고착화 된 부동산 거품에 거시경제적 효과가 미칠 것이다. 그에 따라 부동산 산업에 대한 긍정적인 경제 반응과 여행산업에 대한 급격한 수요 증가를 분석하여, 제주도 주택 판매 가격을 모델링 했다. 2012년 10월 ~ 2016년 2월 시계열 자료를 검토한 결과, 토지 거래 금액에 대한 가정과 중국인 투자자 모델링을 통해 본 논문의 접근 방식이 얼마나 일관적인지 확인할 수 있었다. 또한, 주택 가격과 전체 부동산 측면에서 다른 관련 결정 요소들을 발견할 수 있었다. 실제로, 지속적으로 증가하는 제주도 주택 구입가격을 설명하기 위해, 관련 결정요인인 실질 지역 내 총생산 성장률, 제주도 인구성장률, 한국 기준금리를 사용했다. 또한, 본 연구논문에선 통제변인의 다변량적 특성 때문에 다중 선형회귀 분석을 적용시켰고, 시계열을 고려하여 스타타 (STATA) 통계 프로그램을 사용하였다. 마지막으로 말하자면, 경제변수들 사이의 관계가 비정상적이거나 존재하지 않는지 확인하기 위해 ADF단위근검정과 공적분검정을 시행하고, 그 결과 값을 분

석하였다. 그 결과, 제주시 주택판매가격과 중국인 토지거래금액 총량의 공동시기와 장기간적인 상관관계가 드러났다.

주요어: 중국인 토지거래금액, 제주도 주택매매가격, 부동산투자이민제도, 외국인부동산투자, 다중 선형회귀분석, 스타타 (STATA) 통계 프로그램, ADF 단위근검정, 공적분검정

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