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PROPERTY PRICE BUBBLE: REGIONAL ANALYSIS IN INDONESIA

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Abstract

The aim of this study is to look at the influence of fundamental factors of demand and supply side of the property prices in five major Cities in Indonesia using data panel regression methods. In addition, this study analyzes the regional property and the price bubble in Indonesia using the Hodrick Prescott filter analysis. The results of the panel data regression method Showed that the demand-side fundamentals such as economic growth and inflation have a positive effect on property prices as well as interest rate, while the loan to value(LTV) Negatively Affect the price of the property. On the other hand, the fundamental factors of supply-side variable, that is developer's price expectations impact positively the price of the property. HP filter analysis identifying the bubble in every city that lasted for two periods during the study.

***Keywords**: Property price, property price bubble, fundamental factors, hp filter*

INTRODUCTION

The crisis in the US (Lehman Brothers went bankrupt and AIG collapse in September 2008), which later spread to Europe showed that the instability in the financial sector have a serious impact on the real sector. The financial crisis driven by credit-driven bubbles turn into a global crisis and has led to a drastic fall in economic activity. An increase in the global price of housing significantly beginning in 1995-2011. For example, house prices in Australia, Sweden, Spain, Ireland and the UK before going bad debts in the United States has increased two times greater than in the early 1990s (Quigley, 2001). Housing growth increased by more than 70% from the period of January 2001 and its peak in May 2006, it is this which brings to the emergence of the financial crisis.

The increasing price of housing led to the emergence of the volatility of the price of housing is the cause of bad credit and rising house prices (Miles, 2008). Many researchers believe that a significant house price growth could potentially lead to the emergence of bubble. When the bubble burst, this will jeopardize the economic stability of a country. For example, Glindro, et al. (2011) found that the bubble in asset prices is one of the systemic risk of a banking crisis that arise from the increased credit for property growth.

Minsky (1986) describes how the asset price bubbles and erupted occur through five stages such as displacement, boom, euphoria, profit taking and panic. When there is a bubble in the property market, the increase in housing prices raised expectations on house prices in the long term. This is how the bubble in housing prices occurred.

Research on the property price bubble has previously been carried out by several researchers. Michal and Lubos (2012) through research on the analysis of regional housing price bubbles in the Czech Republic and the factors that influence it found that there was overvalued (bubble) property price in 2003/2004 and 2007/2008 caused by fundamental factors such as economic growth, inflation and rate flower.

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In addition to the scope of a national scale, Bank Indonesia also conducted surveillance on a regional scale. Every region in Indonesia, is different in the level of economic development, so the growth in property prices is also different. There are five big city where residential property price growth exceeded the growth in property prices in 9 other cities surveyed (Primary Residential Property Price Survey, 2014). Namely, Medan, Jakarta, Surabaya, Manado and Makassar. Based on the pattern of annual growth, it can be indicated that five major cities in property prices tend to be a trigger rise in property prices in nine other cities, namely Denpasar, Bandung, Bandar Lampung, Padang, Banjarmasin, Pontianak, Semarang, Palembang and Yogyakarta.

The increase in housing loans boosted the expectations of increase in property prices that could steer the economy towards the bubble. Bank Indonesia shall supervise the residential property price movements to be aware of the property price bubble, so it can be anticipated as early as possible. The development of residential property prices continued to rise and increased significantly since 2012.

To prevent the credit risk due to the rising of housing price that potentially leads to the bubble condition, Bank Indonesia issued a policy instrument that is the loan to value (LTV). Loan to value policy is the maximum provision of financing can be given against the property value at the time of credit or financing based on the price of the final assessment. Control of the particular credit like property is expected to reduce the growth of property prices and prevent the price bubble.

The aim of the study is the first, as we saw earlier that property price bubble is influence very significantly on the economy as a whole. Therefore, this study will look at whether factors such fundamental determinant of the price of the property in terms of supply and demand as economic growth, inflation, interest rates, price expectations of developers and macroprudential policies (loan to value) affect the property prices in five major cities in Indonesia, Second, analyze the regional property prices in Indonesia if there is property price bubble that occurred.

THEORETICAL FRAMEWORK

Property Market Theory

The theory of the property market by Miles (2008) have two approaches. That is property as standard goods and property as financial assets. Housing as an investment has the advantage of it’s durability, and the presence of it’s real form

Definition of the property according to Sullivan (2012: 367) is a consumer goods (housing) which has three distinctive characteristics compare to other goods. First, the housing that are heterogeneous means differ in size, location, function / usability, and style. Second, the house is naturally durable and can depreciate quickly or slowly in accordance with the maintenance by the owner. Third, reduce the cost of owner’s displacement, in the presence of home one's will reduces the costs for activities such as bathing, sleeping, eating and so on in different place.

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Property Price Bubble

According to Bank Indonesia (2012), the property price bubble is a situation where the increase of property prices happen tobe very drastically far beyond it's normal condition. The reasonableness of the price increase apply gradually with increasing levels of inflation or income. If the rapid price movement trend continues, there will be the outbreak of the conditions that make the property bubble property prices fall, followed by the overall economic collapse that will cause problems in the form of national economic recession.

Up to now there is no clear definition upon bubble condition that being accepted internationally. Some researchers revealed a general definition of a bubble. Glindro, et al (2011) stated that the fundamental value of housing is determined by the condition of long-term economic conditions. If there are deviations in the value of long-term fundamentals that indicate the occurrence of a bubble. The same oppinion expressed by Dong (2013), which captures the phenomenon of bubble by comparing the actual price and the long-term trend of the estimation. If the actual price is above its long-term trend of more than three consecutive terms indicate the occurrence of a bubble. Landergren (2013) defines three definitions for the property price bubble, among others: (1) Housing prices are above their long-term trend; (2) House prices can not be explained by fundamental factors; and (3) Estimated indicative model predicts house prices will fall.

Location Theory

In forming property prices, one of the most important determinants of the price of the property is land. According to O'Flaherty (2005: 116) departing from something that is 'priceless' land could become the most expensive commodity. So that the land factors could cause housing price bubble.

The element that causing land values increased dramatically is the location factor. Intended location factor is how far the location of the land to the Central Business District (CBD) or can also be called magnet site, where the CBD is a place where the center of economic activity mainly takes place as well as the seat of government is located. On this basis, the value of land will be higher when the distance of the land is closer to the center of the CBD. Conversely when the distance getting further the values began to decline.

In the housing industry a major factor in the provision of property by developers who have a high cost factor is land. The closer the location of which will be built by the developer to the CBD, it will be more expensive the input costs to be paid, so that the consequences of the high cost of inputs in the provision of property led to soaring property prices and cause bubble.

In addition, other things that can cause land prices to rise is the accessibility of the land be reached from the CBD / magnet site by private or mass transportation. In terms of accessibility, ie the availability of transportation access such as roads, bridges and others as well as the emergence of mass transportation such as buses and the monorail that will certainly reduce the cost of resident to reach the city center. This is in turn will equalize the price of land from the nearest to the farthest regions of the CBD.

Rational Asset Price Bubble Theory

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Santos and Woodford (1997) brought the rational theory of asset price bubble where indicate that the bubble occurs when asset prices deviate over the fundamental price. Asset prices are not in accordance with fundamental caused by supply and demand factors. the offers of assets is limited, while the demand continues to rise. This condition make the price of assets diverge from its fundamental price. Therefore, it must be recognized by the investor that the risk of the property market is high, eventhough the return rate is high as well. As stated by Simans (1989) that the rate of return and the risk of an asset alaways related positively.

ANALITYCAL MODEL

The model used in this study refers to earlier research by Wong, et al. (2011), Cameron, et al. (2011), Michal and Lubos (2013) and Dong (2013). The following econometric models that have been modified to suit the purpose of the study:

$$IHPRit = \beta0 + \beta1 + \beta2\ PDRBit\ LRIT\ INFit + \beta3 + \beta4\ \beta5\ DLTVit + exit + \varepsilon it \ldots\ldots..(1)$$

Information:

IHPRit : Residential Property Price Index of 5 major cities in Indonesia
PDRBit : Economic Growth of 5 major cities in Indonesia in quarter t
LRIT : Interest rates of 5 major cities in Indonesia in quarter t
INFit : Inflation of 5 major cities in Indonesia in quarter t
DLTVit : Dummy policy loan to value. 1 when the policy LTV being implemented, otherwise 0.
Exit : Developer's Price expectation of 5 major cities in Indonesia
εit : error term

RESEARCH METHODOLOGY

The approach used in this research is quantitative approach, by which the research conduct by looking at the effect of economic growth, inflation, interest rates, a dummy for a policy loan to value and price expectations of developers to property prices in five major cities in Indonesia during the period of the first quarter of 2006 until the fourth quarter of 2014, carried out by the method of panel data regression and further analyze the property price bubble utilizing the HP filter.

Data used in this research is secondary data. Data were used from 5 major cities (Medan, Jakarta, Surabaya, Manado and Makassar) in Indonesia. Secondary data used in this research is time series data in the form of quarterly basis, starting from the first quarter of 2006 until the fourth quarter of 2014. The data sources used include Housing Price Index Residential (IHPR), loan interest rate and the data of price expectations of the developers of Bank Indonesia, the data Gross Domestic Product (GDP) as well as the Consumer Price Index is collected from the Central Statistics Agency (BPS).

Panel Data Regression Method

The analysis technique used in this study to see the effect of independent variables on the dependent variable is the panel data regression methods. Data panel is a combination of

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time series and cross section. Data panel has dimensions of space and time. There are several benefits when doing regression using panel data (Gujarati, 2013: 237).

There are several methods that can be used to estimate the panel data regression model that is Pooled Least Square (PLS), Fixed Effects Model (FEM) and the Random Effect Model (REM). To select the most appropriate estimation technique used between Pooled Least Square, Fixed Effect and random effects model, three kind of test can be utilized, namely the Chow test, Hausman test and Lagrange Multiplier test. Chow test is used to choose between Pooled Least Square and fixed effect models. Lagrange Multiplier test is used to determine wether to select Pooled Least Square or random effect model. Hausman test, finally, is used to choose between the fixed effect model and random effect model. The following is the stages of testing:

1. Selection of the estimation model
   a. Chow test
   b. Test Lagrangian Multiplier
   c. Hausman test
2. Classical Assumption Testing
   a. test of Multicollinearity
   b. test of Heteroskidastity
   c. autocorrelation test
3. Statistical test of
   a. t-statistic
   b. The F-statistic

Hodrick Prescott filter (HP filter) Method

The Methods Hodrick Prescott Filter (HP Filter) was first introduced by Hodrick Prescott in 1997. This method is used to perform the decomposition of long-term and cyclical trends in the univariate models (Enders, 2004). This method is technically a double-sided linear filter (backward-forward) used in calculating the smoothed-trend series data (Y) by means minimizing loss function (L), the variance y around value, with a certain penalty. Equation on Hodrick Prescott Filter as follows:

$$Yt=\acute{\tau}Tt+\acute{c}Tt \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Where the observed time series data is smoothed-trend series and the data cycle (cycle).

$$Min\ L=1T\Sigma(yt\ Tt=1-\tau t\ )2+\ \lambda T\Sigma\{(\tau t+1-\ \tau t\ )-(\tau t\ -\tau t-1)\}\ 2T-1t=2 \ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Penalty parameter λ controls the stimulus of series, If λ reach the infinite value the trend value is constant, resulting in linear trend patterns (Enders, 2004). Hodrick Prescott recommend = 100 for annual data (annual data), = 1600 for quarterly data and = 14400 for monthly data (monthly data). HP-filter method has been widely used by researchers to look at the long-term trend of the dependent variable as well as a threshold value.

The threshold value determined by the HP filter method consists of the upper threshold and lower threshold. The boom period is determined when the actual data are above the upper threshold that is greater than the standard deviation. While the burst period is consider to occure when the actual data are below the lower threshold that is smaller than the standard deviation(Vladimir, et al., 2009).

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RESULT AND DISCUSSION

Fundamentals Property Price Determinants in 5 Cities of Indonesia

Based on the description above in the fundamental factors determinants of property prices, there are variables that influence the price trough the process of demand and supply, Michal and Lubos (2011) and Dong (2013) explains that property prices are formed under the influence of factors of demand (demand) and supply factors (supply). In this study the demand side variables included in the model are economic growth, inflation, interest rates and loan to value. Besides, the supply side using the variable of price expectations of the developers. By using a panel data method results can be explained as follows.

One variable that is affecting property prices is economic growth. Analysis using panel data methods get results that economic growth significantly affect the property prices. These results are consistent with the finding of Igan and Loungani (2013), Cameron, et al. (2006) and Michal and Lubos (2011) where the research indicate that economic growth significantly affect housing prices. While the regression results of this study show that economic growth has positive influence on property prices. These results are supported by previous research as well as the hypothesis that economic growth is positively related to the price of the property.

Next Variables of the demand factors that affect the property price index is inflation. The estimation results of this research explained that inflation significantly influence property prices. But the inflation variable coefficients show positive sign indicating that the increase of inflation followed by increase in property prices. These results are not in line with research conducted by Cameron et al (2006) in his study of British regional property prices by using inflastion as a variable that represents the demand factors on property prices, found that inflation is significantly and negatively affect the property prices due to the existence of inflation, demand for housing fell so prices will go down. These results reject the initial hypothesis which says that inflation will demonstrate negative influence. This is because even if the price of other goods increased, people assume that house prices would keep continue to increase over time. In addition, along with the high economic growth in major cities in Indonesia reflects the condition that the public welfare are getting higher. This led to the shifting background of housing demand by the public. At first the public assumes that housing is a standard goods means that people consider housing as a commodity consumption, however with the increasing in incomes and social welfare the housing consumption patterns will also change, where people consider housing as a financial asset or an investment. This is happen because the expectations by the public that the price of the property in the long term will continue to rise. This is supported by the theory of the property market by Miles (1995) that the property has two approaches that is as standard goods and financial assets. Housing as an investment has the advantage of durability by nature. This result is supported by research from Dong (2013). According to Dong (2013), his research on the analysis of property price bubble regional analysis in China found that the inflation variable used in the analysis has a positive effect on the price of the property resulting from population growth is very high in China cause a reduction in the soil to develop new housing so that the property become a major consumer goods and inflation does not lead to reduced public demand for housing.

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Others demand factors used in this study is the interest rate. The interest rate used in this research is the lending rates. Regression results show that the interest rate significantly influence property prices. While the interest rate relationships with property prices is negative. Thus, it can be interpreted that the higher the interest rate, the lower the level of property prices. Vice versa, if the low interest rates will increase the demand for property prices and caused property prices to rise. These results are supported by the research of Cameron, et al.

The estimation results with LTV as a dummy variable shown significant results where LTV policy affect property prices significantly. Bank Indonesia issued a special macroprudential policies to reduce the risk to the property bubble boom as the financial crisis has occurred in the United States in 2008 as a result of the subprime mortgage. Based on the results of the regression coefficient, LTV demonstrate significant impact on the decline in property prices. This is supported by previous studies of Wong, et al. (2011) and Dong (2013) that their loan policies *to value* causing a decrease in one's ability to meet the initial down payment purchase residential housing so demand will decline and lower the price of the property itself.

Meanwhile, another factor that affects the price of the property that is a factor of the supply side (Supply) and variable supply factors used in this study is the variable price expectations of the developers. From the results of the regression method used panel data showed that the variables of price expectations of developers significantly influence the price of the property and has a positive relationship. The variable "developers' price expectations" is an interpretation of the expectations of the developer to be an increase in input costs in the supply of properties such as building materials (construction cost), through the development of input costs (construction cost) that the developers would expect property prices in the coming period.

This result is supported by research from Dong (2013) and Gelain and Lansing (2014), which uses a variable construction cost as the interpretation of the variable factors of supply. Their findings is that construction costs (construction cost) is positively associated with housing prices due to higher input prices in making one home it will increase the price of the house itself.

Analysis of Property Price Bubble in 5 Cities of Indonesia

There are several kinds of methods in analyzing the property price bubble conducted by several researchers in various countries. However, Dong (2013) said in determining the definite method in this research that no one size fits all. Based on the research of Michal and Lubos (2011), Dong (2013) and Vladimir et al (2009) The method used in an intensive search to identify the property price bubble in each city is a method of HP filter that has been used by some previous researchers to analyze the period in which the bubble is occure.

This study gives an evident that the property price bubble occurred in 5 major cities (Medan, Surabaya, Jakarta, Manado and Makassar) in Indonesia. The occurrence of bubble occurs in each of the different periods in Table 4.1. Bubble that occurred in that period occurred because the actual value of residential property price index is above the trend of long-term, this is in accordance with the theory of rational asset price bubble by Santos and Woodford (1997) that bubbles occur in the Saar asset prices deviate above trend long term.

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Then Dong (2013) sharpen the analysis by saying that the period of bubble occurs when the actual price of the property price is above its long-term trend for more than three consecutive terms.

Analysis Results Table 5 Property Price Bubble in Big Cities in Indonesia

City	*Property Price Bubble*			
	period I		**period II**	
Medan	Q1 2008 - Q2 2009		Q1 2013	- Q4 2014
Jakarta	Q3 2006 - Q2 2009		Q1 2013	- Q4 2014
Surabaya	Q3 2006 - Q2 2009		Q3 2013	- Q4 2014
Manado	Q1 2008 – Q2 2009		Q4 2013	- Q4 2014
Makasar	Q1 2008 – Q2 2009		Q4 2013	-Q4 2014

Source: Results of analysis using Eviews 7

table 5 the periods of the property price bubble in each of the cities in the study. To analyze the property price bubble researchers using the HP filter method. This method has been widely used by researchers to analyze the occurrence of a bubble. As research conducted by Michal and Lubos (2011), Dong (2013) and Afanasieff (2015). In Michal research and Lubos (2011) on regional analysis of the bubble in housing prices and the factors that influence in the Czech Republic. By using the analytical approach Hodrick-Prescott (HP filter) and found that overvalued (bubble) in property prices in 2002/2003 as well as in most of the year 2007/2008.

This study uses the HP filter is used to determine the bubble period of long-term trends as well as to determine the outbreak of the bubble (boom property). The threshold value is determined using the HP filter with the upper threshold and lower threshold. This is supported by research from Vladimir, et al. (2009) determined that the boom period when the actual value is above the upper threshold is determined while the bust period when the actual value is below the lower threshold. The threshold value is determined from (+δ) standard deviation of the long-term trend for the upper threshold while the lower threshold value is determined by (-δ) standard deviation of the long-term trend.

In determining the bubble period, as the theory of rational asset price bubble (Santos and Woodford, 1997) that bubbles occur in the Saar asset prices deviate above the long-term trend. Then Dong (2013) sharpen the analysis by saying that the period of bubble occurs when the actual price of the property price is above its long-term trend for three consecutive periods

The results of the analysis of property price bubble in this study, the bubble period are found in each city occurred as many as two periods. The first period started in the second quarter of 2006 (Jakarta and Surabaya) and the first quarter of 2008 (Medan, Manado and Makassar) until the second quarter of 2009. In general, bubble that occurred in the first period is caused by the rising cost of building materials. For the case of Jakarta and Surabaya who first identified this bubble because in addition to the rising prices of building materials also

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because of the high cost of licensing to build the house. Meanwhile, after entering the period of the first quarter of 2008 the increase in property prices is attributed not only to the continued increase in building materials but also caused by increased wages.

The rising price of property until the bubble in the first period is mostly due to the rising cost of input factors in the supply of property. This result is supported by research from Dong (2013) and Gelain and Lansing (2014), which uses a variable construction cost as a factor variable interpretations and findings that deals in construction costs (construction cost) positively associated with price home due to the higher prices of inputs in making a home will increase the price of the house itself.

The next bubble period occurred in the span of the first quarter 2013 to the fourth quarter of 2014. Conditions that driven the occurence of bubble in this period is due to the impact of the world economic slowdown. Due to the influence of the financial crisis in 2008 which

transmitted in many developed countries is therefore in that period many countries are still trying to recover its economy, it is also shows an impact on Indonesia. The economic slowdown is not only an impact on Indonesia in general, but also have an impact to the regional scale in Indonesia.

The economic slowdown condition people's purchasing power or demand for property decreases. But the economic slowdown does not lower the residential property price index that occurred in each of the cities even property prices continue to rise. This is because due to expectations of people who argue that property prices will always go up in the long term so that people who have excess funds to invest in the form of property. This helped create a demand for property continues to exist as well as the availability of the property supply is not faster growth will lead to increased demand for residential property price index continues to increase. (Bank Indonesia, 2014).

On the other hand, Indonesia is the fourth most populous country in the world and has a pretty good economic growth in some other developing countries make the developers continue to invest to increase the supply of housing. Continued increase in supply of residential property in the midst of an economic slowdown that occurs coupled with a financing facility used to buy housing mostly using a mortgage will increase the risk of default and potentially make the bursting of the bubble which will affect the worsening economy.

However, Bank Indonesia as the agency that runs the monetary instrument has anticipated the impending bubble. In 2012, Bank Indonesia issued a macroprudential policy that is loan to value through SE No. 14/10 / DPNP and repalce with SE No. 15/40 / DKMP for housing credit control. From the results of econometric analysis of the regression results indicate that LTV dummy variables significantly affect the price of the property, but the results of different coefficients with the hypothesis that the relationship dummy LTV negative effect on property prices.

According to the Bank Indonesia in the survey stated that the price of residential property after the policy is issued LTV LTV policy effectively reducing defaults due to the credit cycle and increased prices caused more expectation and speculation the community will be the price of the property. According to Lind (2011) about the kinds of the bubble, a bubble that occurred in 5 major cities in Indonesia is Irrational Bubble Expectation is a state

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with market participants becoming too optimistic and think that property prices will continue to rise rapidly in the long term. Growth is expected to be much higher than the historical average. By Therefore, market participants feel that the high prices are formed fairly rational, and still decided to buy although not supported by higher revenues.

CONCLUSION

1. The independent variables (economic growth, inflation, interest rates, price expectations of developers and dummy LTV) individually and jointly affect the dependent variable.
2. Based on analysis of the property price bubble using the Hodrick-Prescott Filter (HP Filter) on property prices in five major cities in Indonesia. The study states that in the study period, price bubble occurred throughout the period. In general the bubble period in every major city occurred as many as two periods. The first period of rising property prices due to increasing prices of building materials (supply factor) in the provision of property while in the second period due to public expectations that property prices will be higher in the long term to make people who have excess funds to invest in the form of property.

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Appendix

Appendix 1: Estimation Results Poole Least Square (PLS)

source	SS	df	MS
Model	163646.4	5	32729.28
Residual	25077.81	179	144.1253
Total	188724.2	184	32873.4

Number of obs = 180
F(5,174) = 227.09
Prob > F = 0.0000
R - squared = 0.86.33
Adj. R-squared = 0.86.33
Root MSE = 12.005

ihpr	Coef	Std.Err	T	P >|t|	{95% Conf.	Interval
pdrb	0.000778	8.89E-06	8.74	0	6.02E-05	0.0000953
ihk	1.65182	0.108589	15.21	0	1.437535	1.866141
Ir	-5.64472	0.894963	-6.31	0	-7.4111	-3.878342
dItv	-14.3788	3.51449	-4.09	0	-21.3153	-7.442305
eks	0.840099	0.177779	4.73	0	0.489219	1.190979
_cons	-105.508	22.17802	-4.76	0	-149.28	-61.73528

Appendix 2: Estimation Results Random Effect Model (REM)

Random-effects GLS regession
Group variable: city

R-sq within = 0.8863
between = 0.7713
overall = 0.8671

corr(u_i,X) = 0 (assumed)

Number of obs = 180
number of groups = 5
Obs per| group: min = 36
avg = 36.0
Max = 36
wald vchi2(5) = 1135.45
Prov> chi2 = 0.0000

ihpr	Coef	Std.Err	t	P >|t|	{95% Conf.	Interval
pdrb	0.0000777	8.89E-06	8.74	0	6.02E-05	0.0000953
ihk	1.65182	0.108589	15.21	0	1.437535	1.866141
Ir	-5.64472 .	0.894963	-6.31	0	-7.4111	-3.878342
dItv	-14.37882 3	3.51449	-4.09	0	-21.3153	-7.442305
eks	0.840099	0.177779	4.73	0	0.489219	1.190979
_cons	-105.5079	22.17802	-4.76	0	-149.28	-61.73528
sigma_u	1. 1735289					
sigma_e	5.5929275					
rho	0.08780843 (fraction of varience due to u_i)					

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Appendix 3:Results Estimatees of Fixed Effect Model (FEM)

Fixed-effects (within) regression — Number of obs = 180
Group variable: city — number of groups = 5
Obs per| group: min = 36
R-sq within = 0.8955 — avg = 36.0
between = 0.6563 — max = 36
overall = 0.8498 — wald vchi2(5) = 291.36
Prov> chi2 = 0.0000

corr(u_i,X) = 0 (assumed)

ihpr	Coef	Std.Err	t	P >|t|	{95% Conf.	Interval
pdrb	0.0000592	.000047	8.74	0	6.02E-05	9.53E-05
ihk	1.393568	.1022063	15.21	0	1.437535	1.866141
Ir	-2.007285	.9417447	-6.31	0	-7.4111	-3.87834
dItv	-15.1313	2.932197	-4.09	0	-21.3153	-7.44231
eks	0.8594394	.1505824	4.73	0	0.489219	1.190979
_cons	-26.74894	22.32726	-4.76	0	-149.28	-61.7353
sigma_u	5.2402798					
sigma_e	5.5929175					
rho	0.467482		(fraction of variance due to u_i)			
F test that all u_i=0				F(4,170)	Prob > F = 0.0000	

Appendix 4: Election Results Estimation Model Lagrange Multiplier Test)

ihpr (city,t) = Xb + u(city)+e(city,t)

Estimated results:

	Var	**sd=sqrt (Var)**
ihpr	150.4992	12.26781
e	31.28084	5.592928
u	3.011123	1.735259

Test : Var (u) = 0

chibar2(01) = 70.45

Prob > chibar2 = 0.0000

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Appendix 5: Election Results Estimation Model (Hausman Test)

	(b) fe	(B) re	(b-B) Difference		sqrt(diag(V_b-V_B)) S.E.
pdrb	0.0000592	0.000777	-0.000185		0.0000461
ihk	1.392568	1.65182	-0.2582527	-	
Ir	-2.007285	-5.64472	-3.637435		0.2931292
dltv	-15.1313	-14.3882	0.7524738	-	
eks	0.8594394	0.84009	0.0193404	-	

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 177.15

Prob>chi2 = 0.0000

(V_b-V_B is not positive definite)

Appendix 6: Test Results Multicollinearity

Variable	VIF	1/VIF
Ihk	4	0.25007
dltv	3.09	0.323128
Ir	2.16	0.462578
Eks	1.36	0.733994
pdrb	1.04	0.960199
Mean VIF	2.33	

Appendix 7: Test Results Heteroskeidastity

Modified wald test for groupwise heteroskedasticity in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (5) = 184.19

Prob>chi2 = 0.0000

Appendix 8: Autocorelation Results

Wooldridge test for autocorrelation in panel data

H0 = no first order autocorrelation

F(1,4) = 450.484

Prob > F = 0.0000

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Appendix 9: PCSE Method

Linear regression, correlated panels corrected standard errors (PCSEs)

Linear regression, correlated panels corrected standard errors (PCSEs)

Group variable: city	Number of obs = 180
Time variable : date2	number of groups = 5
Panels : correlation (balanced)	Obs per| group: min = 36
Autocorrelation : no autocorrelation	avg = 36.0
Estimated covariances = 15	max = 36
Estimated autocorrelations = 0	R-squared = 0.8671
Estimated coefficients = 6	wald vchi2(5) =785.38
	Prov> chi2 = 0.0000

Panel-corrected

ihpr	Coef	Std.Err	z	P >|t|	{95% Conf.	Interval
pdrb	7.77E-05	5.81E-06	13.38	0	6.63E-05	8.91E-05
ihk	1.65182	0.138185	11.95	0	1.380983	1.922658
Ir	-5.64472	1.069982	-5.28	0	-7.74185	-3.5476
dItv	-14.3788	4.419854	-3.25	0	-23.0416	-5.71607
eks	0.840099	0.200626	4.19	0	0.446879	1.233319
_cons	-105.508	27.02801	-3.9	0	-158.482	-52.5339