



Article history:

Received: 2019-02-13

Revised: 2019-04-10

Accepted: 2019-06-28

Keywords:

Clustering; Housing prices;
Regional growth

JEL Classification: E52, O18, R58

Kata Kunci:

klustering; harga rumah;
pertumbuhan daerah.

✉ Corresponding Author:

Ariyanto Adhi Nugroho:

Tel.+62 271 647 481

E-mail: ariyanto_an@staff.uns.ac.id



This is an open access
article under the CC-BY-SA license

Clustering and regional growth in the housing market: Evidence from Indonesia

**Ariyanto Adhi Nugroho, Muhammad Yusuf Indra Purnama,
Laela Rizki Fauzia**

*Department of Economics Development, Faculty of Economics and Business, Universitas Sebelas
Maret Jl. Ir. Sutami No.36A Surakarta, 57126, Indonesia*

Abstract

The housing market is one of the monetary policy instruments in macro-prudential terms. The overall policy adopted through the Loan-to-Value ratio does not accommodate different regional characteristics. Location and area characteristics are important factors that influence the development of housing property prices. This study uses panel data regression analysis, with objects of 15 cities in Indonesia during 2007-2017. The results of the analysis provide a proof that the building rent, population density, construction costs, Gross Regional Domestic Product, unemployment rate, and minimum income, affect housing prices differently in each growth category, while the LTV ratio and inflation do not have a significant effect onto house prices. The regional economic growth is used to form regional clustering based on the speed of house price growth so that monetary policy in the housing sector achieves the target.

Abstrak

Pasar perumahan menjadi salah satu instrumen kebijakan moneter dalam hal makroprudensial. Kebijakan moneter secara menyeluruh yang diterapkan pemerintah melalui rasio Loan-to-Value belum mengakomodir karakteristik daerah yang berbeda-beda. Karakteristik lokasi dan wilayah menjadi faktor penting yang memengaruhi perkembangan harga rumah. Penelitian ini menggunakan analisis regresi data panel dengan obyek 15 Kota di Indonesia selama kurun waktu 2007-2017. Hasil analisis yang dilakukan menjelaskan bahwa nilai sewa bangunan, kepadatan penduduk, biaya konstruksi, PDRB, tingkat pengangguran, dan pendapatan minimum memengaruhi harga rumah secara berbeda-beda pada masing-masing kategori. Sedangkan, rasio LTV dan inflasi tidak berpengaruh signifikan terhadap harga rumah. Maka, pertumbuhan ekonomi regional dibutuhkan untuk membentuk kluster daerah yang sesuai dengan kecepatan pertumbuhan harga rumah, sehingga kebijakan moneter pada pasar perumahan dapat mencapai tujuan yang diharapkan.

How to Cite: Nugroho, A. A., Purnama, M. Y. I., & Fauzia, L. R. (2020). Clustering and regional growth in the housing market: Evidence from Indonesia. *Jurnal Keuangan dan Perbankan*, 24(1), 83-94. <https://doi.org/10.26905/jkdp.v24i1.3565>

1. Introduction

The housing market in some countries has become one of the instruments in the monetary policy currently. One of the causes of the financial crisis that had occurred in the past was from the housing sector (Chakraborty, Goldstein, & MacKinlay, 2019; Leamer & Anderson, 2007). The global crisis in 2008 - 2009 caused by the existence of subprime mortgages in the United States proved that the housing market has a very broad impact. This crisis was triggered because there were improper home payments to lending institutions which caused bankruptcy due to home sales (takeovers) that could not be made from loans issued (Bian, Lin, & Liu, 2018; Collins, Harrison, & Seiler, 2015; Pavlov & Wachter, 2011; Seiler, 2018).

The wide impact of subprime mortgage cases is the reason the government in other countries is increasing prudence through macroprudential policies. Similar action is taken by the Indonesian government, with booming spending, markets, property, housing, and credit tightening through a Loan-to-Value (LTV) policy. LTV policy responds to the condition of the property market in Indonesia which experienced rapid growth in 2010. Furthermore, the transaction on the housing market is usually used mortgage debt.

The LTV policy in Indonesia is effective from 2012, one of which was to control the housing market in Indonesia by regulating the mortgage facility on landed houses, apartments, and home stores/home offices. The first LTV policy (in 2012) became the government's effort against the price bubble on property. However, this policy gave to the property market because it supports LTV of 70 percent for all types of housing. The second LTV policy (in 2014) has been considered the characteristics and conditions of the community. The second LTV policy was determined based on the type of house and number of housing purchases. However, the second LTV policy is still within the framework of property loans tightening.

The slow property growth and sluggish economy made the government to adjust the policy through the 3rd (2015) and 4th (2016) LTV policies. In these policies, the government issued a 90 percent relaxation of LTV for first houses with type <70 and smaller policies for different house types and purchases. The LTV policy was also implemented in 2018 to support the acceleration of the housing market. In addition, when the LTV ratio is higher, there is possible of inflated housing prices (Bian et al., 2018).

The speed of house prices growth in each region is very different. Based on the results of Bank Indonesia Residential Research, the highest house price index in the period IV-2018 was Makassar City with an index number of 327. This large index was contributed by a high price index in small type houses, 461. Things were more different in the Denpasar area, in period IV -2018 the total price index was 185. From 2012 until now, house price growth has been different in each region and type of house.

The property market study by the Indonesian Appraiser's Code of Ethics and the Indonesian Appraisal Standards (KEPI and SPI) The Directorate of Valuation of the Ministry of Finance of the Republic of Indonesia (2016) states that the basis for an appraiser to determine market prices is based on demand (desire & effective purchasing power) and supply (utility and scarcity). On the demand and supply side of the housing market, there is a monetary transfer policy that is needed by population growth and housing supply to occur in each region (Fuss, Zhu, & Zietz, 2012). Environmental factors are one of the factors that influence the decision of individuals or households to buy housing (Ioannides & Zabel, 2003). In addition, demand from housing, socio-economic factors, credit facilities, and house specifications (Fontenla & Gonzalez, 2009).

As a country with thousands of islands, Indonesia encounter problem on housing market development. The local characteristics of the housing

Clustering and regional growth in the housing market: Evidence from Indonesia

Ariyanto Adhi Nugroho, Muhammad Yusuf Indra Purnama, Laela Rizki Fauzia

complex lead to the differences in the development of the housing market in each region (Hernández-Murillo, Owyang, & Rubio, 2017; Nugroho, Purnama, & Fauzia, 2018; Tuzel & Zhang, 2017). Different characteristics of the housing market in various regions in Indonesia require spatial/cluster policies that can be adjusted to the conditions in each region. Monetary policy in the housing market will be more optimal. Besides that, differences between regions can be used as a basis for implementing macro-prudential policies (Hernández-Murillo et al., 2017).

The spatial conditions of the residential property market in various regions have different characteristics. Some regions in Indonesia such as Jabodetabek (Jakarta, Bogor, Depok Tangerang, and Bekasi) have different markets from other regions such as Sumatra, Kalimantan or other regions. In accordance with some recent research on macro-prudential policy, it would be better for the government to consider all policies that will affect the public depend on their characteristics. Adapting (Hernández-Murillo et al., 2017) research that identifies the housing cycle at the national and regional level. Grouping regions that have the same cycle. On the other hand, underdeveloped or underdeveloped areas can be overcome with different behavior compared to other regions. In line with Loutskina & Straham (2015), they investigated the impact of housing price shocks on the economy uses panel data regression during 1994-2006. The found economic growth can be triggered because of house price shocks. In addition, these effects can have more impact on financially integrated regions, so that house price shocks can increase economic volatility.

These conditions make spatial policies important to do. Classifying regions according to the same character can make it easier for governments to develop policies. The spatial policy is expected to improve the accuracy of the policies application followed by the needs and characteristics of each region. Because of the different regional characteristics, thus we need the variables to determine the

accuracy of the policy that is implemented spatially. Variables used for area clustering are related to community income, population growth, property prices, inflation, and control variables. These variables are dynamic, thus stability and economic growth can be accommodated by the spatial policy.

2. Method, Data, and Analysis

The data analyzed in this study are the type of house price growth in 15 cities in Indonesia, in the period 2007-2017. The sample city consists of the provincial capitals, such as Bandung, Bandar Lampung, Banjarmasin, Denpasar, Palembang, Semarang, Yogyakarta, Padang, Medan, Makassar, Manado, Surabaya, and Pontianak. In addition, coupled with big cities in Indonesia such as Batam and Balikpapan. These cities are the object of a survey conducted by Bank Indonesia in the Residential Survey Index. The selection of objects is due to the distribution of different geographic areas, so they have different characteristics.

This research uses two main data sources for the empirical study, which is the Central Bank of Indonesia (Bank Indonesia) and Statistics Indonesia (BPS). The data from Bank Indonesia includes housing price index and Loan-to-Value ratio. Thus, to complete the data requirements to describe characteristics in each region, we use data sourced from BPS. On the one hand, the data needed is Building rent value as the main variable. This is to describe the development of dwellings in the area not only from requests for housing purchases but also for rental housing. On the other hand, there is a control variable, namely inflation, population density, constructive cost contribution, Gross Domestic Regional Product (GDRP), unemployment, and wages. In line with (Hernández-Murillo et al., 2017), the selection of these variables is done to show the character and ability of each region.

To create the analysis, we pool data from both the dataset sources. In doing so, we are investigat-

ing the spatial variation in housing prices for cluster the region which has the same characteristics. The analysis used in this study is panel data regression. Gujarati (1995) states that panel data is a combination of time series data and cross-section data. Panel data has the characteristic of being able to provide more data, thus it will produce a greater degree of freedom, besides it will also provide a broader empirical analysis through the calculation of variable estimates and the results of panel data calculations. Panel data estimation can overcome heterogeneity or individual uniqueness by providing subject-specific variables, by looking at cross-section data, using panel data both to study the dynamics of change, and panel data are considered capable of studying complex behavioral models such as the phenomenon of technological change and economic scale. The panel data regression model approach consists of common effects, fixed effects, and random effects.

The type of house prices growth in this article, are explained through the variables below: (a) general: general price growth (Y_1); (b) slow: slow price growth (Y_2); (c) moderate: moderate price growth (Y_3); (d) fast: rapid price growth (Y_4). The explanatory variables used include: (a) main variable: (i) rent: building rent value (X_1); (ii) LTV: Loan-to-Value ratio (X_2). (b) Control variable: (i) inf: inflation (X_3); (ii) dens: population density (X_4); (iii) cons: constructive cost contribution (X_5); (iv) gdrp: Gross Regional Domestic Product (X_6); (v) unemp: number of unemployment (X_7); (vi) wages: minimum wage (X_8)

To estimate the regression model and calculation process, the general equation model is formulated as follows:

$$Y_{1it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_8 X_{8it} + m \quad (1)$$

$$Y_{2it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_8 X_{8it} + m \quad (2)$$

$$Y_{3it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_8 X_{8it} + m \quad (3)$$

$$Y_{4it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_8 X_{8it} + m \quad (4)$$

Table 1. Descriptive Statistic

Variable	Eq. 1 (general)			
	Mean	Std. Dev.	Minimum	Maximum
<i>Hp</i>	183.4398	44.9563	100	322.3
<i>Ltv</i>	75.8333	6.7561	70	85
<i>Inf</i>	5.8303	2.7811	0.35	14.82
<i>Dens</i>	8.4109	0.8228	6.4567	9.6111
<i>Cons</i>	15.6113	1.0365	13.7578	17.4047
<i>Gdrp</i>	17.6551	0.8710	16.1813	19.7146
<i>Rent</i>	14.2433	0.8960	12.6114	16.1881
<i>unemp</i>	10.6882	0.7513	9.2770	12.3307
<i>wages</i>	14.0534	0.4330	13.1223	15.0082

Variable	Eq. 2 (slow)			
	Mean	Std. Dev.	Minimum	Maximum
<i>hp</i>	162.2563	26.0090	100	204.4700
<i>ltv</i>	75.8333	6.8334	70	85
<i>inf</i>	6.1572	2.7105	2.17	14.8200
<i>dens</i>	8.4481	0.7997	6.9317	9.5635
<i>cons</i>	14.8538	0.5507	14.1070	16.0364
<i>gdrp</i>	17.1007	0.4816	16.4341	18.1456
<i>rent</i>	13.9375	0.5372	12.8746	14.6330
<i>unemp</i>	10.0498	0.4874	9.2770	11.1913
<i>wages</i>	13.9468	0.4141	13.1223	14.6945

Variable	Eq. 3 (moderate)			
	Mean	Std. Dev.	Minimum	Maximum
<i>hp</i>	188.6513	38.5625	139.0300	310.43
<i>ltv</i>	75.8333	6.7999	70	85
<i>inf</i>	5.7493	3.0287	0.35	12.68
<i>dens</i>	8.4398	0.7501	7.0892	9.6111
<i>cons</i>	15.6514	1.0854	13.7578	17.2884
<i>gdrp</i>	17.6696	0.8596	16.1813	18.9679
<i>rent</i>	14.1533	0.9681	12.6114	16.1881
<i>unemp</i>	11.0157	0.6907	9.6253	12.3307
<i>wages</i>	14.0653	0.4025	13.4030	14.8606

Variable	Eq. 4 (fast)			
	Mean	Std. Dev.	Minimum	Maximum
<i>hp</i>	207.0215	68.6747	100	322.3
<i>ltv</i>	75.8333	6.9133	70	85
<i>inf</i>	5.4742	2.2641	2.02	11.79
<i>dens</i>	8.2814	1.0162	6.4567	9.0440
<i>cons</i>	16.5505	0.4846	15.6466	17.4048
<i>gdrp</i>	18.5117	-0.6652	17.6101	19.7146
<i>rent</i>	14.8780	0.8058	13.7791	16.0783
<i>unemp</i>	10.9880	0.5561	9.7350	12.0317
<i>wages</i>	14.2034	0.4936	13.4195	15.0082

Clustering and regional growth in the housing market: Evidence from Indonesia

Ariyanto Adhi Nugroho, Muhammad Yusuf Indra Purnama, Laela Rizki Fauzia

3. Results

In this research, the housing market groups are based on the type of housing prices growth, which consists of slow, medium, and fast housing market price growth. The type of housing market price growth is a determinant of housing prices based on the selection of sample cities in Indonesia. Based on the price growth classification, the sample cities in Indonesia can be classified as (i) cities with slow growth type are Denpasar, Pontianak, Yogyakarta, Balikpapan, and Bandar Lampung; (ii) cities with medium growth types are Padang, Medan, Palembang, Banjarmasin, Semarang, Manado, and Bandung; and (iii) cities with rapid growth types are Surabaya, Makassar, and Batam.

Table 1 presents the descriptive statistic information of the data collected, grouped by the type housing market price growth classification.

The estimation model selection test of panel data regression for each group of the type of house price growth in several regions is conducted to see the response of clustering on house price conditions and regional growth in the housing market. The result of model selection estimation is summarized in the Table 2.

Based on the results of the estimation model selection tests presented in Table 2, the most appropriate model to explain the need for spatial policies in the housing market in Indonesia based on regional growth is as follows:

Equations 1 (dependent variable: general house prices growth type) using Random Effect model,

Equations 2 (dependent variable: slow house price growth type) using Fixed Effect model,

Equations 3 (dependent variable: medium house price growth type) Random Effect model,

Equations 4 (dependent variable: rapid house price growth type) using Fixed Effect model.

The estimation results of panel data regression for the four equations formulated above are summarized in Table 3 to show the effect of the LTV ratio and building rent value on housing prices in several cities in Indonesia.

The estimation result for the first equation (Eq. 1) shows the estimation for all groups of housing price growth without distinguishing the regions characteristic with the different acceleration of house prices. The estimation results show that the building rent value, population density, and the city minimum wage have a positive and significant effect on house prices. However, the estimation result is various after the data is grouped according to the acceleration of house prices.

The results of the second estimation equation (Eq. 2) show that the LTV ratio does not affect house

Table 2. Estimation model selection result for panel data

	Eq. 1 (general)		Eq. 2 (slow)		Eq. 3 (moderate)		Eq. 4 (fast)	
Chow test	<i>F</i>	11.28	<i>F</i>	111.70	<i>F</i>	21.42	<i>F</i>	24.85
	<i>Prob. F</i>	0.0000*	<i>Prob. F</i>	0.0000*	<i>Prob. F</i>	0.0000*	<i>Prob. F</i>	0.0002*
LM test	<i>Chi2</i>	87.47	<i>Chi2</i>	0.00	<i>Chi2</i>	36.90	<i>Chi2</i>	0.00
	<i>Prob. Chi2</i>	0.0000*	<i>Prob. Chi2</i>	1.0000	<i>Prob. Chi2</i>	0.0000*	<i>Prob. Chi2</i>	1.0000
Hausman test	<i>Chi2</i>	7.98	<i>Chi2</i>	19.35	<i>Chi2</i>	9.11	<i>Chi2</i>	21.03
	<i>Prob. Chi2</i>	0.1575	<i>Prob. Chi2</i>	0.0036*	<i>Prob. Chi2</i>	0.1048	<i>Prob. Chi2</i>	0.0018*

*significant at 1% level, ** significant at 5% level, *** significant at 10% level

prices in several cities in Indonesia that included in the slow-growth category. Meanwhile, the building rent value has a significant effect on a positive sign. This means that the LTV ratio does not have a sufficient effect on house prices in the slow-growth group type, while the building rent provides a positive role in house prices in the slow-growth group type.

The third model (Eq. 3), estimates the effect of the LTV ratio and the building rent value on housing prices in the sample housing market in several cities in Indonesia. The results show that the effect of LTV ratio and the building rent value on house prices in the medium house price growth has similarities to those in the slow housing market growth.

Interestingly, the fourth equation (Eq. 4), that estimates the effect of the LTV ratio and the building rent value on the fast-growing housing market show different result from the other previous model estimations. The estimation results show that there

is no significant relationship between the LTV ratio and the building rent value on the house prices growth in the medium price growth category. It means when Loan-to-Value ratio has been decreased, rapid house price growth types experience an increase even though it has a negative coefficient but it is not significant. Similarly, the building's rent value do not have an effect on housing prices in the fast-growth category. The effect of the Gross Regional Domestic Product (GRDP) is a reflection of economic conditions in each region. When the GRDP increases, house prices will tend to increase, or house prices rise.

In general housing types (Eq.1) and moderate housing (Eq. 2) showed that wages are positive significant. In line with Mankiw (2003) that one of the factors that influence demand is income. The same was stated by (Arrondel & Lefebvre, 2001) that a person would allocate his income to buy a house as a consumer item but also as an investment

Table 3. Panel data regression results

Variable	Eq. 1 (Y = general)			Eq. 2 (Y = slow)		
	Coef.	Z	P> z	Coef.	Z	P> z
<i>lto</i>	-0.6600	-1.61	0.108	-0.1668	-0.83	0.453
<i>rent</i>	99.0564	4.22	0.000*	178.5685	6.08	0.004*
<i>inf</i>	0.0632	0.11	0.909	0.6717	0.98	0.383
<i>dens</i>	35.1479	2.93	0.002*	127.8369	7	0.000*
<i>cons</i>	-2.4956	-0.11	0.908	73.2920	11.22	0.000*
<i>gdrp</i>	-2.1625	-0.16	0.871	-69.9018	-2.16	0.097***
<i>unemp</i>	1.7328	0.28	0.78	-0.2732	-0.08	0.943
<i>wages</i>	96.0621	4.47	0.000*	-9.3723	-0.77	0.485
<i>c</i>	-1408.7370	-5.75	0.000*	-993.0454	-4.13	0.015**
R ²			0.9012			0.9012
Variable	Eq. 3 (Y = moderate)			Eq. 4 (Y = fast)		
	Coef.	z	P> z	Coef.	z	P> z
<i>lto</i>	-0.8415	-1.23	0.218	-1.2776	-0.82	0.500
<i>rent</i>	59.1183	6.7	0.000*	-33.4501	-0.32	0.755
<i>inf</i>	-1.0031	-1.19	0.234	0.6175	0.24	0.832
<i>dens</i>	-5.1784	-0.36	0.722	-16.3043	-1.04	0.406
<i>cons</i>	46.6027	3.85	0.000*	270.7922	2.59	0.019**
<i>gdrp</i>	-3.6230	-0.38	0.708	266.5832	2.74	0.111
<i>unemp</i>	-37.0126	-2.31	0.021*	1.8833	0.03	0.981
<i>wages</i>	112.2213	3.47	0.001*	50.9434	1.51	0.271
<i>c</i>	-1221.5040	-4.89	0.000*	-5301.4610	-2.82	0.106
R ²			0.6891			0.96

*significant at 1% level, ** significant at 5% level, *** significant at 10% level

Clustering and regional growth in the housing market: Evidence from Indonesia

Ariyanto Adhi Nugroho, Muhammad Yusuf Indra Purnama, Laela Rizki Fauzia

asset. Meanwhile, Sabari (1994) said that the house has four dynamics, namely the dimension of location, the dimension of housing, life cycle dimension, and income dimension. The income dimension itself is related to the size of a person's income multiplied by the length of stay in a city.

4. Discussion

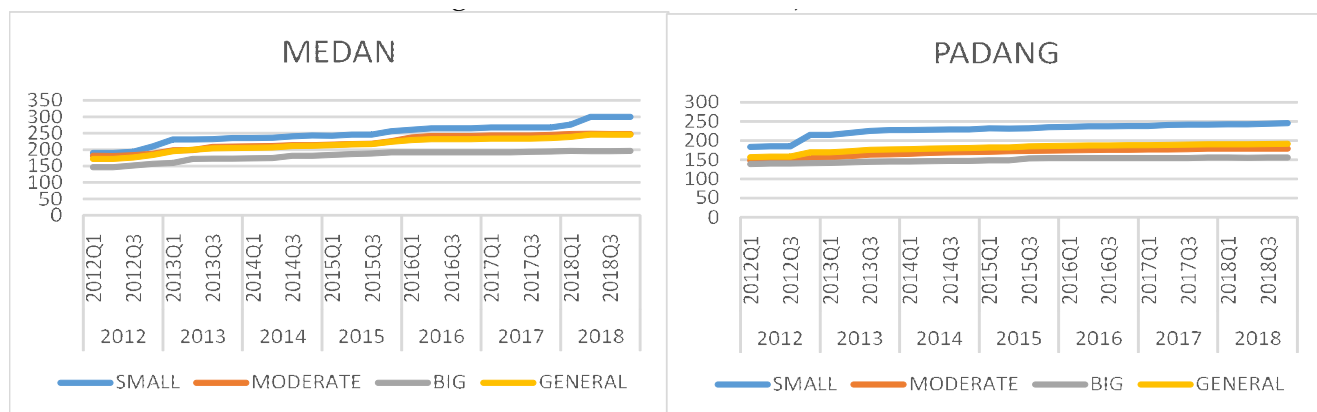
The Indonesian government's policy in implementing LTV policy applies on a national scale, even though each region has its own characteristics. The estimation results (Eq. 1, 2, 3, 4) show that the LTV ratio has no effect on house prices in Indonesia, this is supported by (Nugroho et al., 2018). This result is in line with (Glaeser et al., 2014) and (Del Negro & Otrok, 2007) who find that housing market conditions in a certain region are generally not influenced by national factors, but rather are influenced by local factors.

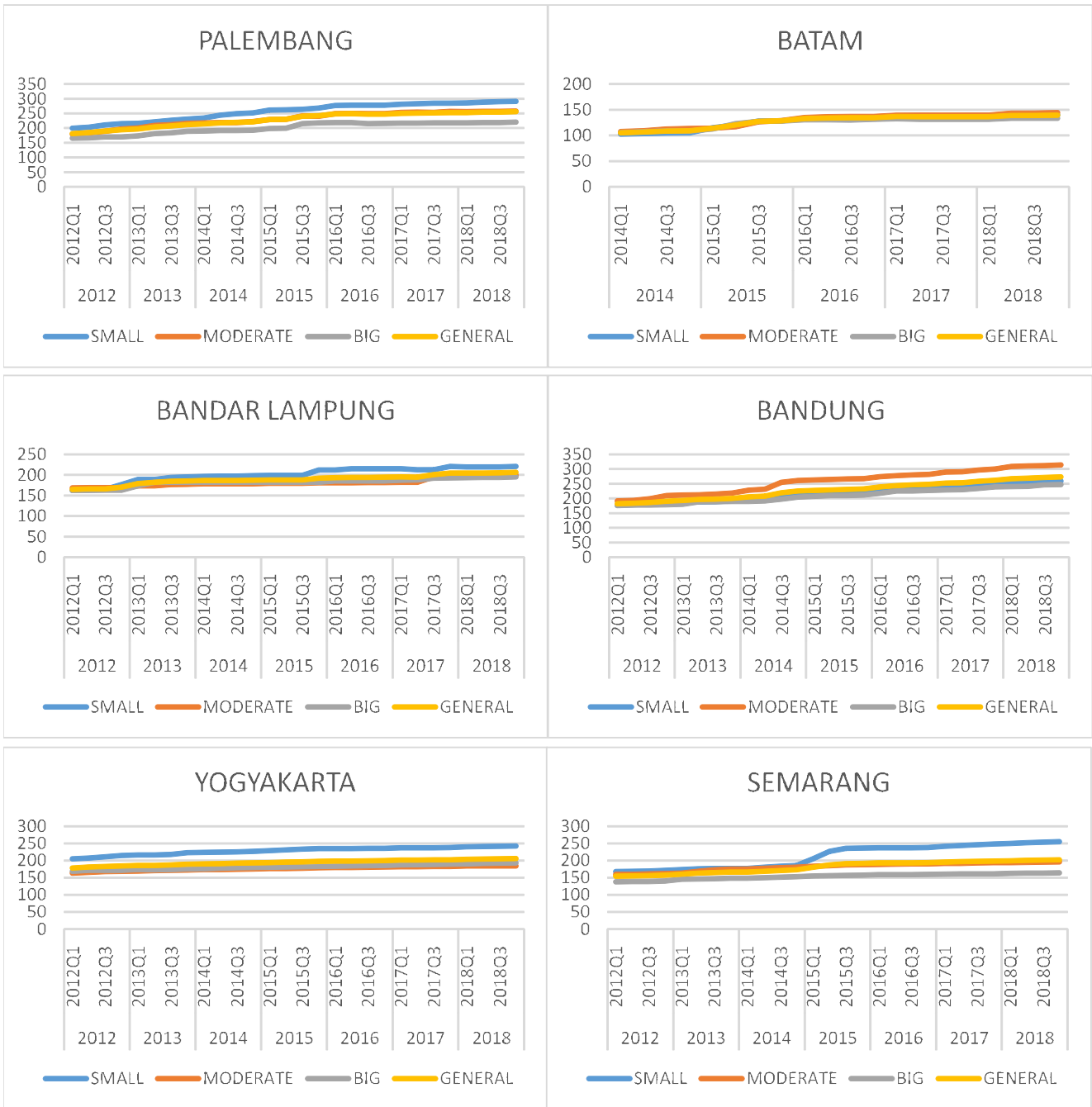
The building rent value does not have a significant effect on the type of rapid growth that is alleged because of the demand and supply side of the heterogeneous housing market. In line with (Fontenla & Gonzalez, 2009) house specifications have an effect on the demand and supply side of the housing market. On the one hand, building rental costs and location is the key to the increase in land value. In general, the area in the Central Business District (CBD), such as Surabaya and Batam, has the highest economic scale among other cities, which

could be a factor that causing the housing prices are affected by its location as the center of the economy.

The estimation results (Eq. 1, 2, 3, 4) show that inflation does not have a direct effect on house prices in all categories. In addition, construction costs have an effect caused by the value of inflation. However, house prices are more dominated by the influence of land prices that are higher than construction costs. Dong (2013) states that the results of his research show a positive relationship between inflation and house prices in China. The relationship is suspected due to the population growth in China that is extremely high, thus housings are the main consumer goods, and inflation has no impact on housing demand in general.

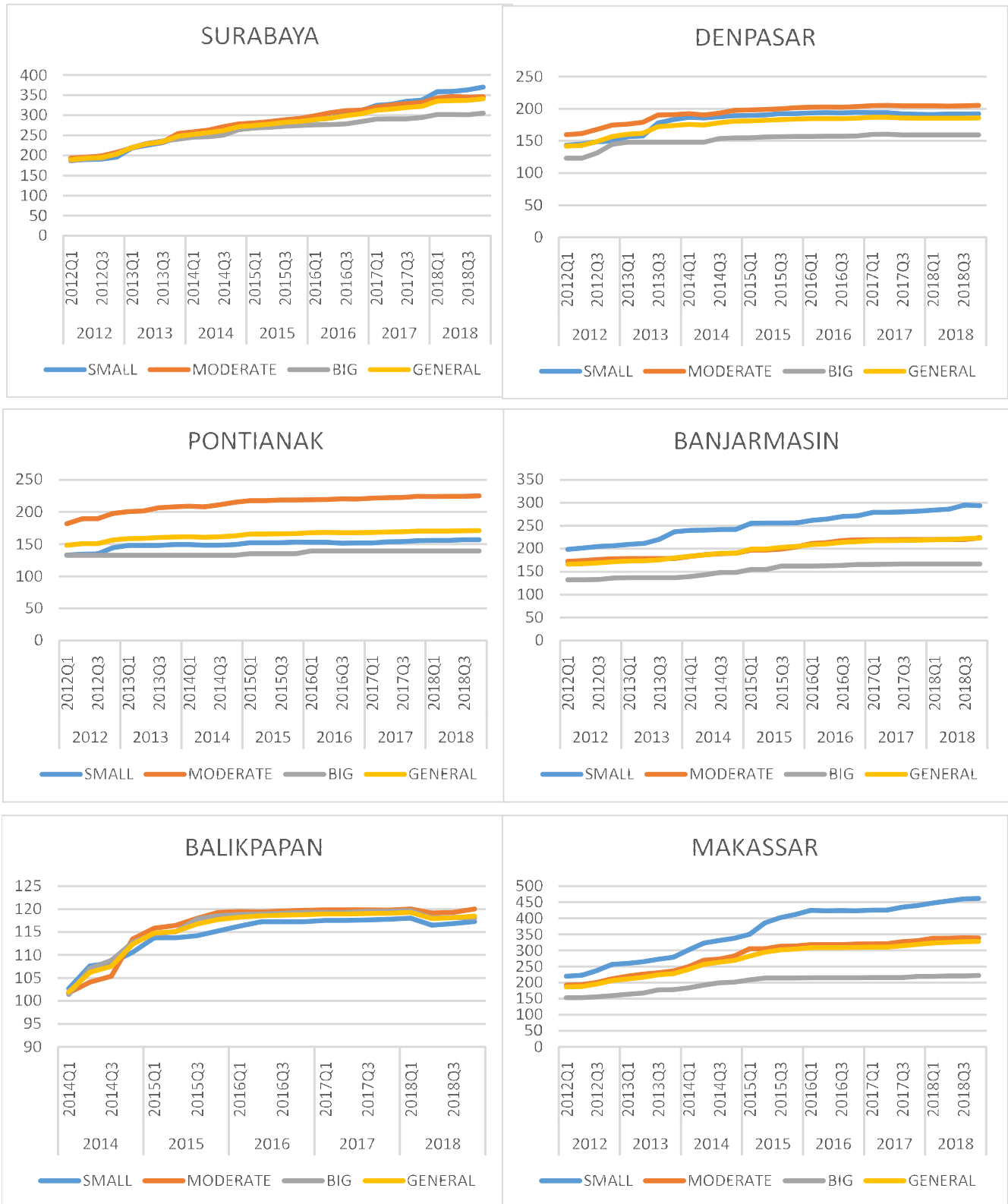
Factors that affect house prices change from the supply side usually come from developers. In contrast to building rent values, in the housing market construction costs are one of the key categories in housing financing that has an effect on housing prices in an area (Glaeser et al., 2014; Hernández-Murillo et al., 2017; Knoll, Schularick, & Steger, 2017; O'Sullivan, 2012). The estimation results presented in Table 3 show that construction costs such as building materials have a positive and significant effect. Construction costs are a proxy for developers' expectations in the housing market. Using the development of construction costs as input costs, the developer can determine the planned house price for the next period (Dong, 2013; Gelain & Lansing, 2014; Kurniawan, 2017).





Clustering and regional growth in the housing market: Evidence from Indonesia

Ariyanto Adhi Nugroho, Muhammad Yusuf Indra Purnama, Laela Rizki Fauzia



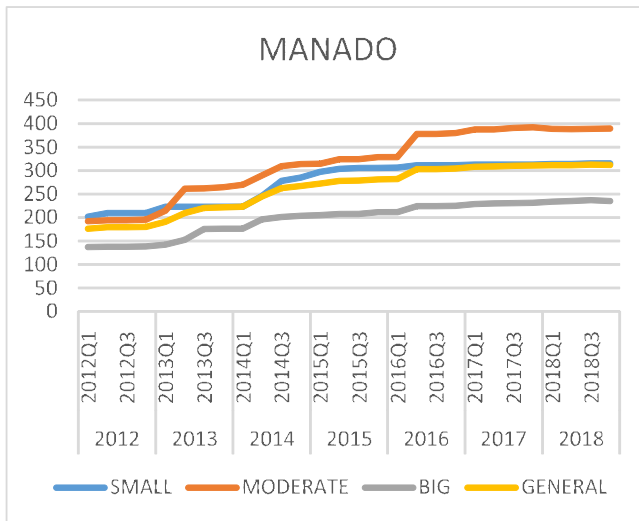


Figure 1. Residential Property Index in Each Region
 (Source: Bank Indonesia)

As shown in Figure 1 shows that house price growth in each region experiences differences in responding to the conditions of their respective regions. However, with the formation of clusters that have been formed, it shows that some regions have similarities in forming factors for house prices, especially in the presence of LTV ratio. Regional economy can be reflected through the growth of GRDP. However, GRDP is an aggregate value of the whole economic sectors in an area. The aggregate GRDP value is considered to be less reflective of housing conditions in an area. It is proven when estimation is conducted according to the type of growth, the results on the effect of GDRP on house price growth are varied. It is possible that a large GRDP value can be dominated by the contribution from the industrial sector, thus increased industrial activity will result in a slowdown in house or property prices due to uncomfortable conditions.

Changes in housing market conditions, in general, do not have a relationship with the unemployment rate in a region. However, the estimation results in Eq. 3 shows that there is a significant negative relationship between the unemployment rate and house prices, this finding is supported by (Hsu,

Matsa, & Melzer, 2018). There are two motives for buying a home: home purchase as consumer goods and investment goods. The factors in determining home purchases vary, it can be affected by income, socio-economic factors, credit facilities, and house specifications (Fontenla & Gonzalez, 2009). This is in line with the estimation results that indicate income as a factor that affects home prices under certain conditions. A house purchase is based on the specifications of the house to meet the facilities, desires, and tastes of the buyers to feel comfortable when at home. Areas or cities with relatively low living costs generally become the target for speculators or developers in building houses. Because areas with a low level of living costs have great opportunities for development. This can occur considering the purchase of housing not only as consumer goods but also as an investment.

As a country with thousands of islands, Indonesia encounter problem on housing market development. The local characteristics of the housing complex lead to the differences in the development of the housing market in each region (Hernández-Murillo et al., 2017; Nugroho et al., 2018; Tuzel & Zhang, 2017). Rising property prices during periods of high credit growth will lead to excessive expectations and speculative motives. Debtors who have more than one property loan to benefit from property price margins. This motive encourages an increase in property prices that lead to price bubbles. Then at that time, it will increase credit risk which has the potential to create a crisis when housing booms.

5. Conclusion

Strengthening the regional economy through the housing market shows the need for regional groups or clusters based on certain conditions. As in the group of house types with slow price growth, the factors that affect the price of the house are the value of building rent, construction costs, and GRDP. Meanwhile, the group of house types with medium

Clustering and regional growth in the housing market: Evidence from Indonesia

Ariyanto Adhi Nugroho, Muhammad Yusuf Indra Purnama, Laela Rizki Fauzia

price growth shows that the value of building rent, construction costs, unemployment rate, and community income affect housing prices. Differently, for the group of house types with fast price growth, the result shows that construction costs are the main factor that affects the housing price. Through the estimation result for all groups of price growth, construction costs are the main factor in changes in house prices. Furthermore, other factors that cause the housing market condition in a region must also consider the sectors of economic reinforcement, not only based on the value of a region's GRDP but other supporting factors such as the level of population density, unemployment rate, and the value of people's income. The presence of the regional housing market may depend on local factors not only the national factors. For the most part of the results, the cluster for the region that has similarities in local factors influencing both housing demand and supply. So, the possibility of different reactions on monetary policy or implementing macroprudential policy across the region. The characteristics in each

cluster may be considered spatial policy implementation.

Based on the results of the analysis above, there is a different determining factor in each cluster of regions based on the speed of the house price growth index. These differences become the basis for the government to establish policies that are more appropriate in each region. In response to this, the government through Bank Indonesia is expected to develop regional indicator variables in addition to the amount of property credit as a determinant variable for spatial LTV policy. In addition, the application of spatial LTV is mainly applied to regions that have fast and slow growth to maintain the growth and stability of the regional and national economy.

6. Acknowledgment

This work was supported by Universitas Sebelas Maret research funding (PNBP) Grant No. 516/UN27.21/PP/2019. The authors would also like to thank all contributors for their assistance in undertaking this research.

References

- Arrondel, L., & Lefebvre, B. (2001). Consumption and investment motives in housing wealth accumulation: A French study. *Journal of Urban Economics*, 50(1), 112–137. <https://doi.org/10.1006/juec.2000.2209>
- Bian, X., Lin, Z., & Liu, Y. (2018). House price, loan-to-value ratio and credit risk. *Journal of Banking and Finance*, 92, 1–12. <https://doi.org/10.1016/j.jbankfin.2018.04.006>
- Chakraborty, I., Goldstein, I., & MacKinlay, A. (2019). Monetary stimulus and bank lending. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2734910>
- Collins, A. J., Harrison, D. M., & Seiler, M. J. (2015). Mortgage modification and the decision to strategically default: A game theoretic approach. *Journal of Real Estate Research*, 37(3), 439–470. <https://doi.org/10.2139/ssrn.2194258>
- Del Negro, M., & Otrok, C. (2007). 99 Luftballons: Monetary policy and the house price boom across U.S. states. *Journal of Monetary Economics*, 54(7), 1962–1985. <https://doi.org/10.1016/j.jmoneco.2006.11.003>
- Dong, R., Gan, C., Hu, B., & Cohen, D. A. (2013). An empirical analysis of housing price bubble: A case study of Beijing housing market. *Research in Applied Economics*, 5(1), 77–97. <https://doi.org/10.5296/rae.v5i1.3433>

- Fontenla, M., & Gonzalez, F. (2009). Housing demand in Mexico. *Journal of Housing Economics*, 18(1), 1–12. <https://doi.org/10.1016/j.jhe.2008.08.001>
- Fuss, R., Zhu, B., & Zietz, J. (2012). *Why Do Local Housing Prices React so Differently to A Monetary Stimulus?* Technical Report. University of St. Gallen.
- Gelain, P., & Lansing, K. J. (2014). House price, expectation, and time varying fundamentals. *Journal of Empirical Finance*, 29, 3-25. <https://doi.org/10.1016/j.jempfin.2014.05.002>
- Glaeser, E. L., Gyourko, J., Morales, E., & Nathanson, C. G. (2014). Housing dynamics: An urban approach. *Journal of Urban Economics*, 81, 45–56. <https://doi.org/10.1016/j.jue.2014.02.003>
- Gujarati, Damodar N. dan Dawn C. Porter. (2009). *Basic Econometrics*. Fifth Edition. New York: McGraw-Hill.
- Hernández-Murillo, R., Owyang, M. T., & Rubio, M. (2017). Clustered housing cycles. *Regional Science and Urban Economics*, 66, 185–197. <https://doi.org/10.1016/j.regsciurbeco.2017.06.003>
- Hsu, B. J. W., Matsa, D. A., & Melzer, B. T. (2018). *Unemployment insurance as a housing market stabilizer*, 108(1), 49–81. <https://doi.org/10.1257/aer.20140989>
- Ioannides, Y. M., & Zabel, J. E. (2003). Neighbourhood effects and housing demand. *Journal of Applied Econometrics*, 18(5), 563–584. <https://doi.org/10.1002/jae.740>
- Knoll, B. K., Schularick, M., & Steger, T. (2017). No price like home: Global house prices, 1870–2012. *American Economic Review*, 107(2), 331–353. <https://doi.org/10.1257/aer.20150501>
- Kurniawan, I. (2017). Property price bubble: Regional analysis in Indonesia. *Journal of Developing Economies*, 2(1), 1-11. <https://doi.org/10.20473/jde.v2i1.5707>
- Leamer, E. E., & Anderson, J. E. (2007). Housing is the business cycle. *Working Paper 13428*. National Bureau of Economic Research.
- Loutschina, E., & Strahan, P. E. (2015). Financial integration, housing, and economic volatility. *Journal of Financial Economics*, 115(1), 25–41. <https://doi.org/10.1016/j.jfineco.2014.09.009>
- Mankiw, N. G. (2003). *Teori Makroekonomi*. Edisi Kelima. Jakarta: Penerbit Erlangga.
- Nugroho, A. A., Purnama, M. Y. I., & Fauzia, L. R. (2018). Monetary policy and the housing market in Indonesia/ : Evidence from selected regions. *Jurnal Keuangan dan Perbankan*, 22(4), 747–759. <https://doi.org/10.26905/jkdp.v22i4.2515>
- O’Sullivan, A. (2012). *Urban Economics*. 8th Edition. Douglas Reiner.
- Pavlov, A., & Wachter, S. (2011). Subprime lending and real estate prices. *Real Estate Economics*, 39(1), 1–17. <https://doi.org/10.1111/j.1540-6229.2010.00284.x>
- Seiler, M. J. (2018). Asymmetric dominance and its impact on mortgage default deficiency collection efforts. *Real Estate Economics*, 46(4), 971–990. <https://doi.org/10.1111/1540-6229.12176>
- Tuzel, S., & Zhang, M. Ben. (2017). Local risk, local factors, and asset prices. *Journal of Finance*, 72(1), 325–370. <https://doi.org/10.1111/jofi.12465>
-