The Dynamics Relationship Between Inflation And Economic Growth In Indonesia:

A Regional Thresholds Approach



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OUTLINE

1. Introduction
2. Related researches
3. Procedures
4. Research findings
5. Conclusions, policy implications and limitations

INTRODUCTIONS

Background and Objectives

BACKGROUND

❖The conventional view in macroeconomics holds that low inflation is a necessary condition for fostering economic growth.

❖The debate about the precise relationship between inflation and growth remains open, the question of the existence and nature of the link between inflation and economic growth has been the subject of considerable interest and debate.

❖Different schools of thought offer different evidence on this relationship. For example, *structuralists* believe that inflation is essential for economic growth, whereas the *monetarists* see inflation as detrimental to economic growth.

OBJECTIVES

❖The purpose of this paper is to re-examine the relationship between inflation rate and economic growth.

❖It attempts to estimate precise threshold levels of inflation in relation with economic growth.

❖Particularly, the questions that are addressed in this paper are: (1) Is there any threshold level of inflation in the case of Indonesia above which inflation affects growth rate of GDP differently? (2) Is such a structural break statistically significant?

❖To fill the gap in the literature by introducing a quantitative methodology related with the topics

RELATED RESEARCHES

RELATED RESEARCHES

1	Fischer (1993) examined the possibility of non-linearities in the relationship between inflation and economic growth in panel of ninety-three countries. Using both cross-section and panel data for a sample that includes both developing and industrialized countries, results from this study suggest a negative relationship between inflation and growth.
2	Sarel (1996) used a panel data of eighty-seven countries during the period 1970–90 and tested a structural break in the relationship between inflation and growth and found evidence of a significant structural break at an annual inflation rate of 8 per cent — implying below that rate, inflation does not have a significant effect on growth, or it may even show a marginally positive effect.
3	Bruno and Easterly (1998) examined the determinants of economic growth using annual consumer price index (CPI) inflation of twenty-six countries which experienced inflation crises during the period 1961–92. In their empirical analysis, inflation rate of 40 per cent and over is considered as the threshold level for an inflation crisis.
4	Khan and Senhadji (2001) used an unbalanced panel data with 140 countries covering the period 1960–98 to estimate the threshold levels for industrial and developing countries. Using the non-linear least squares (NLLS) estimation method, Khan and Senhadji (2001) estimated that the threshold levels for industrial countries and developing countries were at 1–3 per cent and 11–12 per cent respectively.
5	Singh and Kalirajan (2003) specifically addressed the issue of existence of the threshold effect by using annual data from India for the period 1971–98. They also suggest that there is no threshold level of inflation for India; however, their findings clearly suggest that an increase in inflation from any level has negative effect on economic growth.

PROCEDURES

Methodology
Data Collection and Estimation Methods

Methodology (I) : Panel Model, Pooled Least Square Approach

$$Y_{it} = \alpha + x^{j}_{it}\beta_{j} + \varepsilon_{it}$$

For $i = 1, 2, \ldots, N$ and $t = 1, 2, \ldots, T$

N is number of *cross section* and *T* is number of period.

Methodology : Panel Model, Fixed Effect Approach

$$Y_{it} = \alpha_i + x_{it}^{j}\beta_j + \sum_{i=2}^{n} aiDi + \varepsilon_{it}$$

Y_{it} = dependent variable for time t and for *cross section* i
α_i = *intercept* changing amongst *cross section* i
x_{it}^{j} = independent variable j in time t for *cross section* i
β_j = parameter for variable j
ε_{it} = *error component in time* t for *cross section* i
Di = dummy variables for cross section i
ai = parameter of dummy variables for cross section i

Methodology : Panel Model, Random Effect Approach

$$Y_{it} = \alpha + x^{j}_{it}\beta_{j} + \varepsilon_{it}$$

$$\varepsilon_{it} = u_i + v_t + w_{it}$$

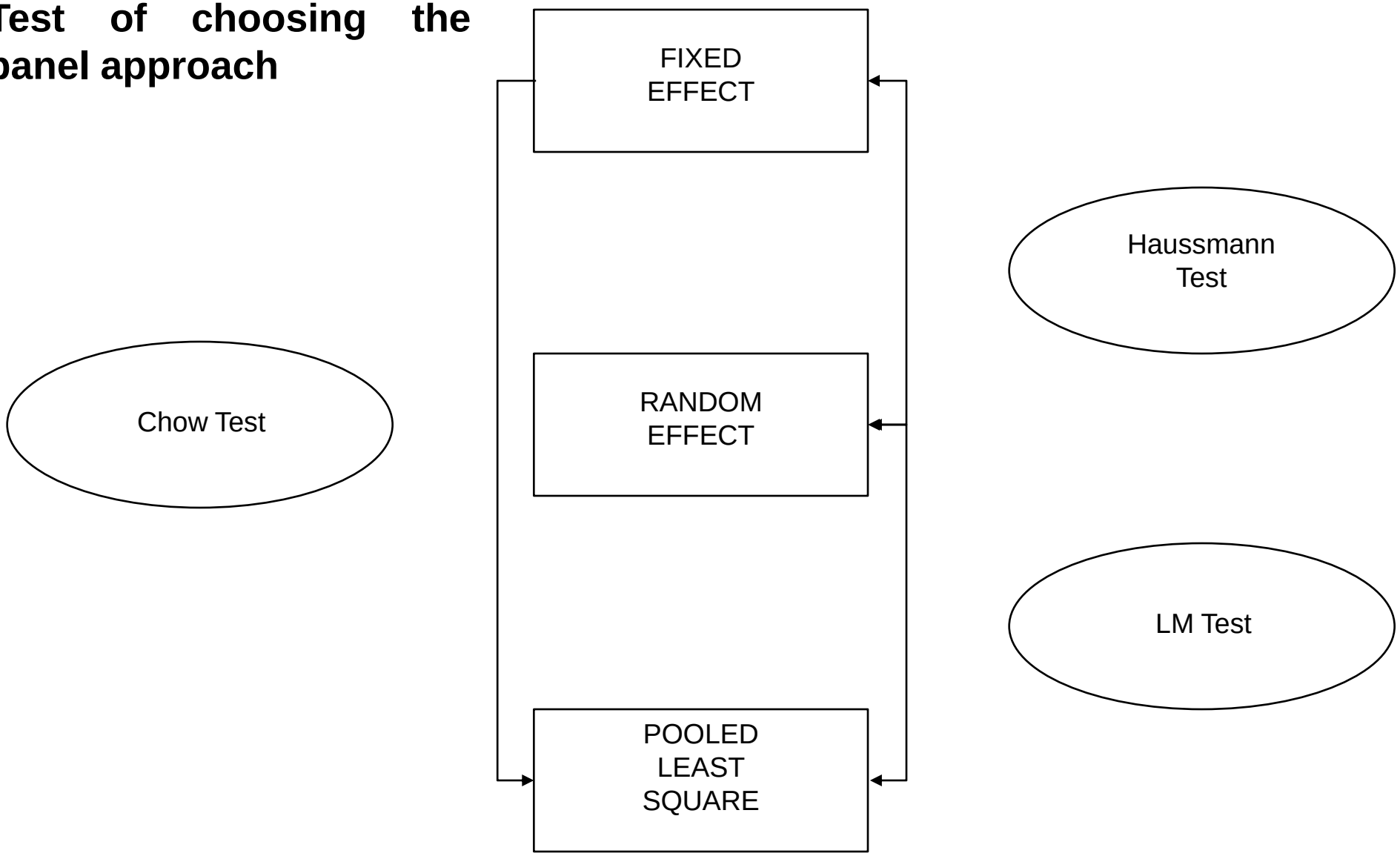
$u_{i=component\ of\ cross\ section\ error}$

v_t=component of time series error

w_{it}=component of combination error

Assumptions: there is no correlation in individual errors and combination error, This method is actually done by including different parameter both cross section and time series into the error terms.

Test of choosing the panel approach



Methodology (II): Spatial Panels

- **Elhorst (2003):** Spatial panels typically refer to data containing time series observations of a number of spatial units (zip codes, municipalities, regions, states, jurisdictions, countries, etc.). This interest can be explained by the fact that panel data offer researchers extended modeling possibilities as compared to the single equation cross sectional setting.
- **1. Spatial Lag Model (SAR):**

$$y_{it} = \delta \sum_{j=1}^{N} w_{ij} y_{jt} + \alpha + x_{it}\beta + \mu_i\,(\text{optional}) + \lambda_t\,(\text{optional}) + \varepsilon_{it},$$

$\sum_j w_{ij} y_{jt}$: **Interaction effect Yit and Yjt**

$\delta,$: **coeff of endogenous interaction effects**

α : **constant**

x_{it} : **parameter**

μ_i : **spatial effect**

λ_t : **time effect**

Methodology: Spatial panels

- **2. Spatial Error Model (SEM)**

$$y_{it} = \alpha + x_{it}\beta + \mu_i\,(\text{optional}) + \lambda_t\,(\text{optional}) + \phi_{it},$$

$$\phi_{it} = \rho \sum_{j=1}^{N} w_{ij}\phi_{it} + \varepsilon_{it}$$

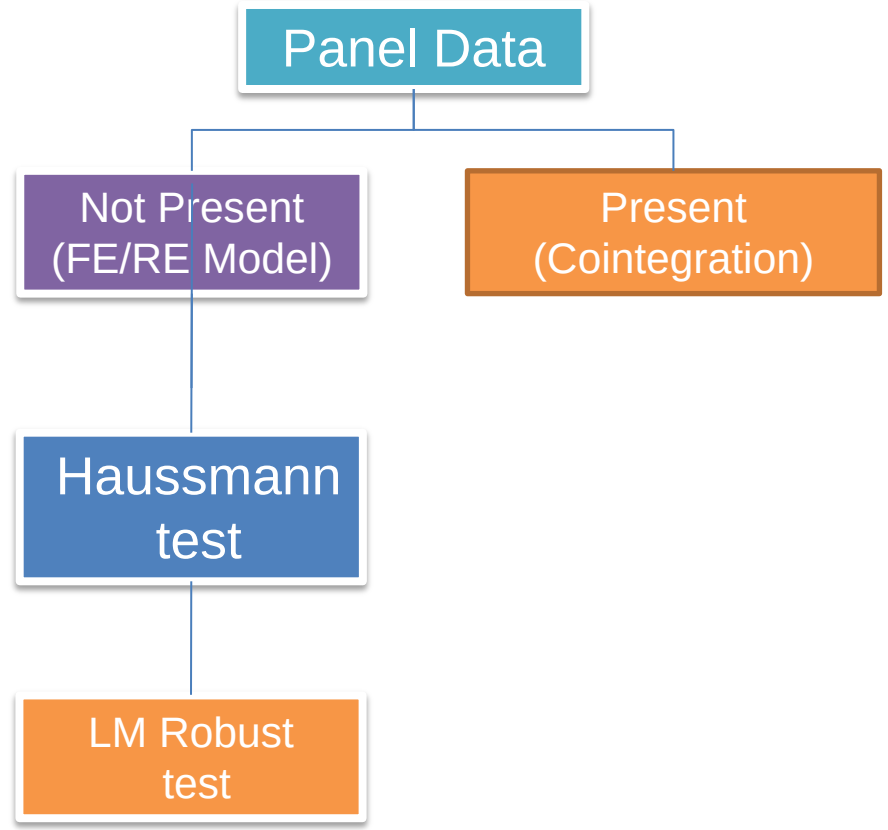
ρ **: Spatial Autocorrelation Coefficient**

ESTIMATION METHODS

Unit Root Test

FE or RE?

SAR or SEM Model?



Example of matrix W

MATRIX W for provinces (30 x 30 Binary Queens Contiguity Matrix)

(Forced contiguity for islands → neighbors if distance < 150 km between two major islands)

W	1. NAD	2. SUMUT	3. SUMBAR	4. RIAU	5. JAMBI	6. SUMSEL	7. KEP. BABEL	8. BENGKULU	9. LAMPUNG	10. DKI JAKARTA	11. JABAR	12. BANTEN	13. JATENG	14. DIY	15. JATIM	16. KALBAR	17. KALTENG	18. KALSEL	19. KALTIM	20. SULUT	21. GORONTALO	22. SULTENG	23. SULSEL	24. SULTRA	25. BALI	26. NTB	27. NTT	28. MALUKU	29. MALUT	30. PAPUA
1. NAD	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2. SUMUT	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. SUMBAR	0	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4. RIAU	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5. JAMBI	0	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6. SUMSEL	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7. KEP. BABEL	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8. BENGKULU	0	0	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9. LAMPUNG	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10. DKI JAKARTA	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11. JABAR	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12. BANTEN	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13. JATENG	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14. DIY	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15. JATIM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
16. KALBAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
17. KALTENG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0
18. KALSEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
19. KALTIM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0
20. SULUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
21. GORONTALO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
22. SULTENG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0	0	1	0
23. SULSEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
24. SULTRA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
25. BALI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
26. NTB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
27. NTT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
28. MALUKU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
29. MALUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1
30. PAPUA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0

Example of matrix W

MATRIX W for provinces (26 x 26 INVERTED DISTANCES based on GIS)

	ACEH	SUMUT	SUMBAR	RIAU	JAMBI	SUMSEL	BENGKULU	LAMPUNG	DKI	JABAR	JATENG	DIY	JATIM	BALI	NTB
ACEH	0	0.3189479	0.160015	0.1328702	0.1198644	0.0906165	0.106813584	0.081917872	0.070347	0.0688543	0.0573799	0.0555435	0.0497462	0.0451362	0.0408522
SUMUT	0.3189479	0	0.310795	0.2018486	0.1898874	0.125012	0.159955433	0.110226729	0.090189	0.0877822	0.0697447	0.0670983	0.0585566	0.0522595	0.0464803
SUMBAR	0.160015	0.310795	0	0.2162602	0.3125325	0.1724539	0.315224573	0.161579538	0.1205677	0.1169738	0.0853528	0.0817823	0.0682643	0.0598845	0.0520701
RIAU	0.1328702	0.2018486	0.2162602	0	0.3734638	0.2354843	0.194598585	0.154927954	0.1261495	0.1202082	0.0946886	0.0893031	0.0775604	0.0670604	0.0584742
JAMBI	0.1198644	0.1898874	0.3125325	0.3734638	0	0.3631372	0.40305022	0.242090832	0.1679136	0.1587529	0.1100721	0.103481	0.0846102	0.0720587	0.0613855
SUMSEL	0.0906165	0.125012	0.1724539	0.2354843	0.3631372	0	0.2765095	0.377938615	0.2703256	0.2438411	0.1551759	0.1417568	0.1101486	0.0897977	0.0738729
BENGKULU	0.1068136	0.1599554	0.3152246	0.1945986	0.4030502	0.2765095	0	0.323976607	0.1917513	0.1839959	0.1148332	0.1089472	0.0851441	0.0726234	0.0611819
LAMPUNG	0.0819179	0.1102267	0.1615795	0.154928	0.2420908	0.3779386	0.323976607	0	0.4697679	0.4236769	0.1774313	0.1641084	0.1147386	0.0932832	0.075047
DKI	0.070347	0.090189	0.1205677	0.1261495	0.1679136	0.2703256	0.191751343	0.469767948	0	2.4000494	0.2837583	0.2521891	0.1504927	0.1159657	0.0888714
JABAR	0.0688543	0.0877822	0.1169738	0.1202082	0.1587529	0.2438411	0.183995899	0.423676888	2.4000494	0	0.2938064	0.2639045	0.1524899	0.1176085	0.0896656
JATENG	0.0573799	0.0697447	0.0853528	0.0946886	0.1100721	0.1551759	0.114833227	0.177431286	0.2837583	0.2938064	0	1.5001554	0.3159312	0.1959795	0.1290439
DIY	0.0555435	0.0670983	0.0817823	0.0893031	0.103481	0.1417568	0.108947213	0.164108389	0.2521891	0.2639045	1.5001554	0	0.3384395	0.2100824	0.1344195
JATIM	0.0497462	0.0585566	0.0682643	0.0775604	0.0846102	0.1101486	0.085144104	0.114738644	0.1504927	0.1524899	0.3159312	0.3384395	0	0.4857098	0.216914
BALI	0.0451362	0.0522595	0.0598845	0.0670604	0.0720587	0.0897977	0.072623377	0.093283243	0.1159657	0.1176085	0.1959795	0.2100824	0.4857098	0	0.3720116
NTB	0.0408522	0.0464803	0.0520701	0.0584742	0.0613855	0.0738729	0.0611819	0.075047038	0.0888714	0.0896656	0.1290439	0.1344195	0.216914	0.3720116	0
NTT	0.0348513	0.0387591	0.0423339	0.0471235	0.0484649	0.0559077	0.048017483	0.056078688	0.063388	0.0637529	0.0814073	0.0834863	0.1095101	0.1384817	0.2203017
KALBAR	0.070017	0.0853764	0.0954805	0.1472311	0.1370742	0.1903584	0.113019793	0.137275818	0.1471569	0.1399557	0.1456024	0.1334655	0.1298173	0.1061717	0.0901833
KALTENG	0.0569038	0.0668897	0.0742163	0.0993543	0.0973218	0.1271907	0.087400775	0.108193806	0.1244762	0.1210172	0.1536987	0.1437812	0.1700801	0.1407461	0.1212278
KALSEL	0.0488994	0.0563929	0.0624709	0.0773743	0.077876	0.097657	0.07317507	0.090199428	0.1057617	0.1044967	0.1456931	0.1416657	0.2076956	0.1931821	0.1795736
KALTIM	0.0490679	0.0549181	0.0574949	0.0752715	0.0701216	0.0815949	0.063033941	0.071268215	0.0768882	0.0754423	0.0875571	0.0847341	0.0991057	0.0944371	0.0948702
SULUT	0.0358705	0.0388698	0.0403151	0.048087	0.0462243	0.0514756	0.043411861	0.047961954	0.0514114	0.0509919	0.0588188	0.058278	0.0685293	0.0713748	0.0803578
SULTENG	0.0391277	0.0431839	0.0456744	0.0549285	0.0534902	0.0613467	0.050353828	0.057240504	0.062773	0.0622765	0.0752353	0.07457	0.0927752	0.0982745	0.1146706
SULSEL	0.0405088	0.0454555	0.0493442	0.0582577	0.0584511	0.0690465	0.056037199	0.066050795	0.0749334	0.0746662	0.0972136	0.0973552	0.1347424	0.1544646	0.2061995
SULTRA	0.0366098	0.0405681	0.0436208	0.0505041	0.0505848	0.0583452	0.048823507	0.056374452	0.0629074	0.0628077	0.0786076	0.0791145	0.102959	0.1187931	0.1615748
MALUKU	0.0299526	0.0323762	0.0340266	0.0385234	0.0381662	0.0422823	0.03692838	0.040970657	0.0442433	0.0441766	0.0514315	0.0516777	0.060934	0.0667286	0.079894
PAPUA	0.0256047	0.0273071	0.0284187	0.0315678	0.0312537	0.0339417	0.030395517	0.03308605	0.0352063	0.0351746	0.039678	0.0398683	0.0451843	0.0485329	0.0554368

Methodology (III): A Dynamic Panel Threshold Model

$$y_{it} = \mu_i + \beta_1 z_{it} I(q_{it} \leq \gamma) + \beta_2 z_{it} I(q_{it} > \gamma) + \varepsilon_{it}$$

subscripts i = 1, . . . ,N represents the province and t = 1, . . . , T indexes time. μ_i is the country specific fixed effect , the error term is $\varepsilon_{it} \sim (0, \sigma^2)$.

I(·) is the indicator function indicating the regime defined by the threshold variable qit and the threshold level γ .

Zit is a m-dimensional vector of explanatory regressors which may include lagged values of y and other endogenous variables.

The vector of explanatory variables is partitioned into a subset z_{1it}, of exogenous variables uncorrelated with ε_{it}, and a subset of endogenous variables z_{2it}, correlated with $\varepsilon_{it.}$

In addition to the structural equation (1) the model requires a suitable set of k ≥m instrumental variables x_{it} including z_{1it}.

***Methodology (III)*: A Dynamic Panel Threshold Model**

This model develops a dynamic panel threshold model that extends Hansen's (1999) original static set up by endogenous regressors. And this extension builds on the cross-sectional threshold model of Caner and Hansen (2004) where GMM type estimators are used in order to allow for endogeneity

Following Caner and Hansen (2004), we estimate a reduced form regression for the endogeneous variables, z_{2it}, as a function of the instruments x_{it}. The endogenous variables, z_{2it}, are then replaced in the structural equation by the predicted values $\hat{Z}_{2it}$. In step two, equation (1) is estimated via least squares for a fixed threshold, where the z_{2it}'s are replaced by their predicted values from the first step regression. Denote the resulting sum of squared residuals by $S(\gamma)$. This step is repeated for a strict subset of the support of the threshold variable q from which in a third step the estimator of the threshold value γ is selected as the one associated with the smallest sum of squared residuals, that is= argmin $S_n(\gamma)$.

In accordance with Hansen (1999) and Caner and Hansen (2004), the critical values for determining the 95% confidence interval of the threshold value are given by
$\Gamma = \{ \gamma$: LR(γ) ≤C(α)}, where C(α) is the 95% percentile of the asymptotic distribution of the likelihood ratio statistic LR(γ).

Methodology

- **In This Research:**

Y_{it}	$GDRP_{it}$	: Gross Domestics Regional Products
X_{it}	INF_{it}	: Inflation rates
	$Initial_{it}$	: Initial income per capita
	$Open_{it}$	: Economic opennes
	Pop_{it}	: Population rates
	TOT_{it}	: Term of trades
	$Loan_{it}$	: Loans realized in regional

Anselin dan Rey (2008): specification of spatial correlation in observation can be analyzed using either spatial lag model or spatial error model.

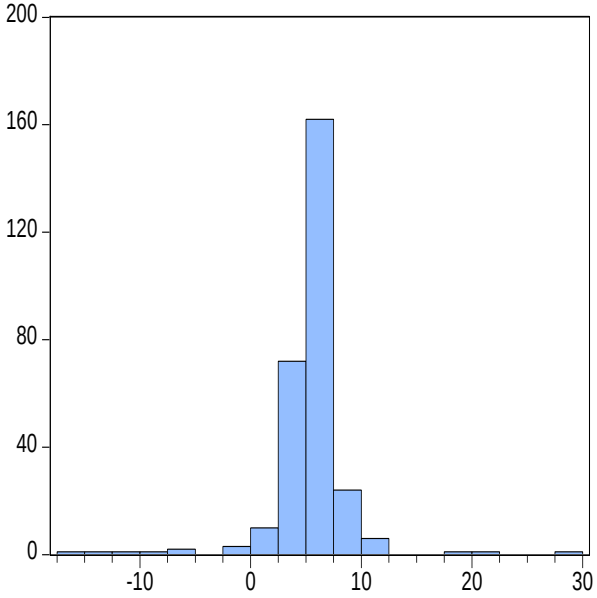
DATA COLLECTION

VARIABLES	EXPLANATIONS	SOURCES
GDRP	Annual growth rate of real regional GDP in constant 2000 prices	Statistic Office (BPS)
INF	Annual percentage change of the CPI index (inflation rates)	Statistic Office (BPS)
Initial	GDP per capita in 2000 constant prices, from the previous period, in logs	Statistic Office (BPS)
POP	Annual growth rate of population	Statistic Office (BPS)
OPEN	Openness is measured as the share of exports plus imports in the GDP	Statistic Office (BPS)
TOT	The annual percentage change in the terms of trade where the terms of trade are measured as exports divided by imports	Statistic Office (BPS)
LOAN	Loans extended to regional economics based on location	Bank Indonesia

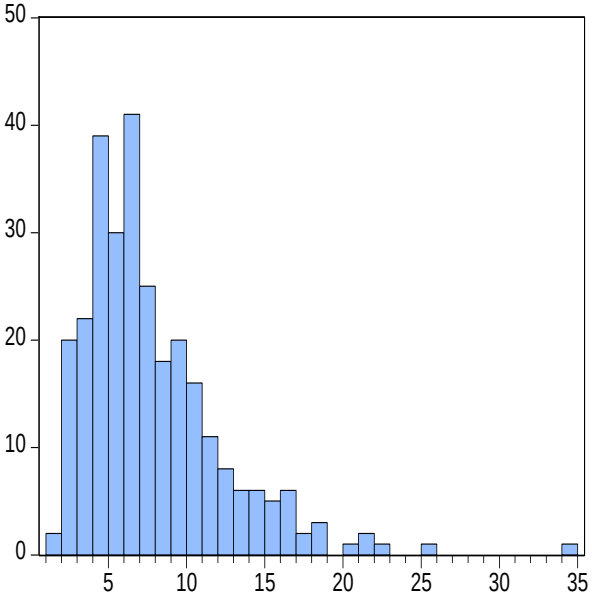
Data annually from 2002 up to 2012 from 26 provinces in Indonesia

RESEARCH FINDINGS
Estimation Outputs

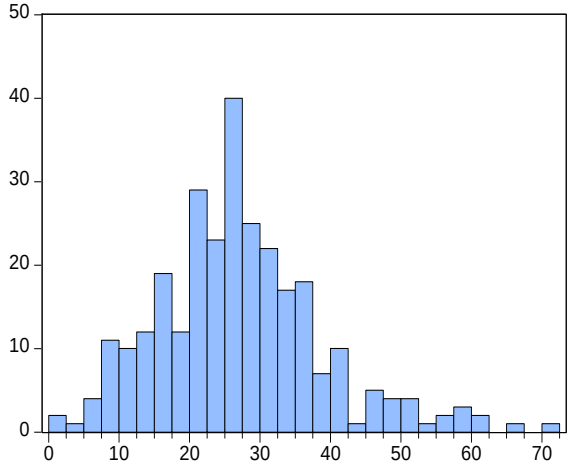
Discritive statistics of The Data



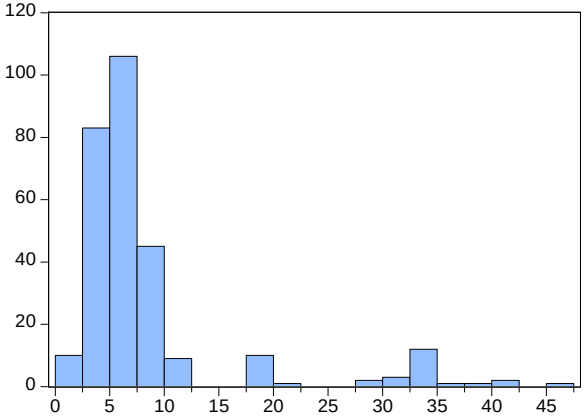
Series: GDRP	
Sample 2002 2012	
Observations 286	
Mean	5.375013
Median	5.571760
Maximum	29.47507
Minimum	-17.13379
Std. Dev.	3.478036
Skewness	-0.654663
Kurtosis	22.64922
Jarque-Bera	4621.359
Probability	0.000000



Series: INF	
Sample 2002 2012	
Observations 286	
Mean	7.846332
Median	6.673759
Maximum	34.69216
Minimum	1.379898
Std. Dev.	4.459660
Skewness	1.724780
Kurtosis	8.091206
Jarque-Bera	450.6866
Probability	0.000000



Series: LOAN	
Sample 2002 2012	
Observations 286	
Mean	26.99556
Median	25.91540
Maximum	70.79451
Minimum	0.021659
Std. Dev.	11.80378
Skewness	0.695608
Kurtosis	3.964185
Jarque-Bera	34.14288
Probability	0.000000



Series: INITIAL	
Sample 2002 2012	
Observations 286	
Mean	8.575603
Median	6.156315
Maximum	45.09369
Minimum	2.118532
Std. Dev.	8.185851
Skewness	2.609382
Kurtosis	9.034452
Jarque-Bera	758.4973
Probability	0.000000

Auxiliary Tests

Result of Unit Root Test

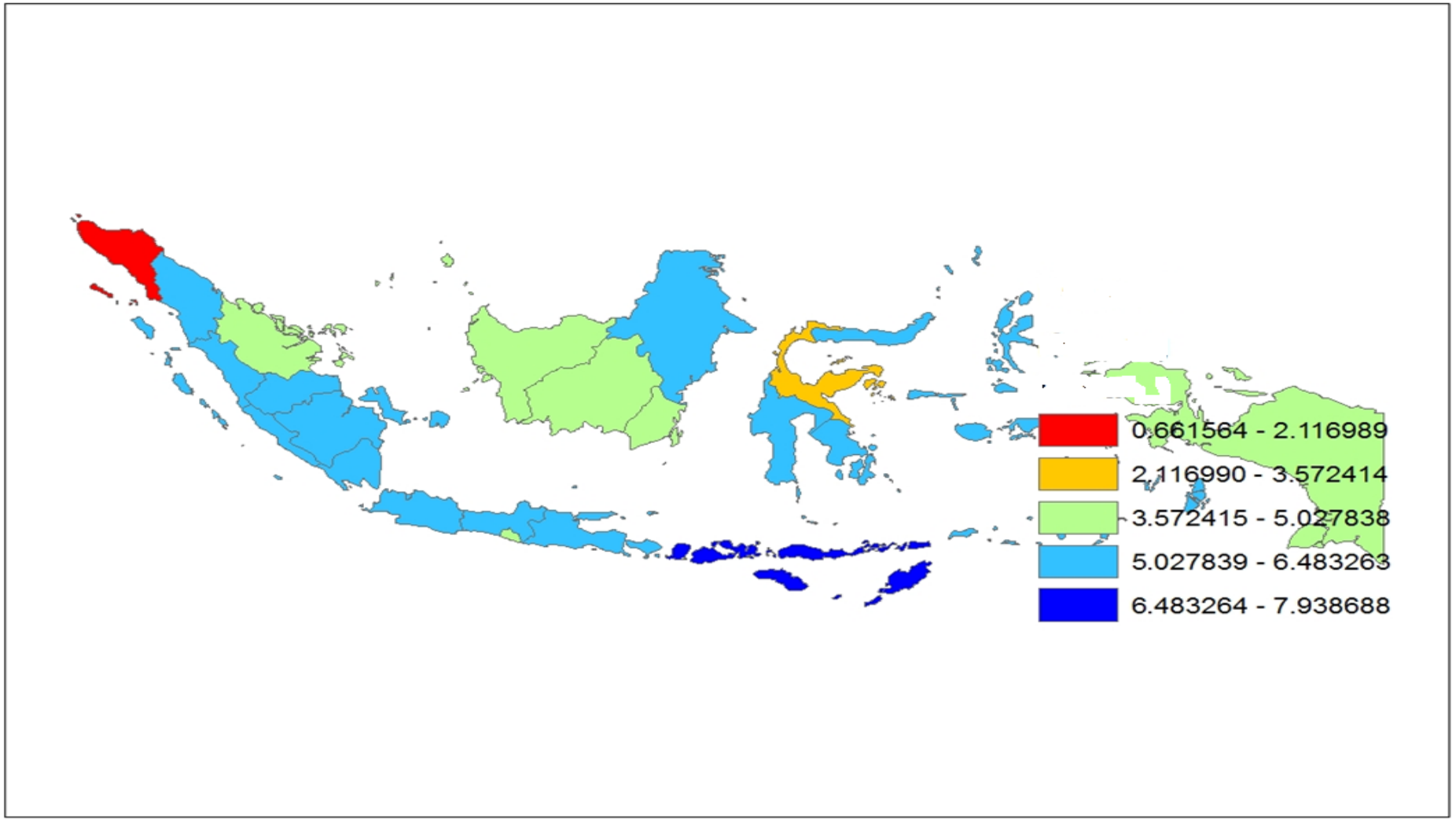
Variable	Levin, Lin & Chu	
	T-stat	Significant
GDRP	-2.51	***
INF	-6.03	***
Loan	-13.75	***
Opennes	-3.78	***
POP	-8.95	***
Initial	-2.95	***
TOT	-4.61	***

***,**,* indicating level of significancy 1%,5% and 10%

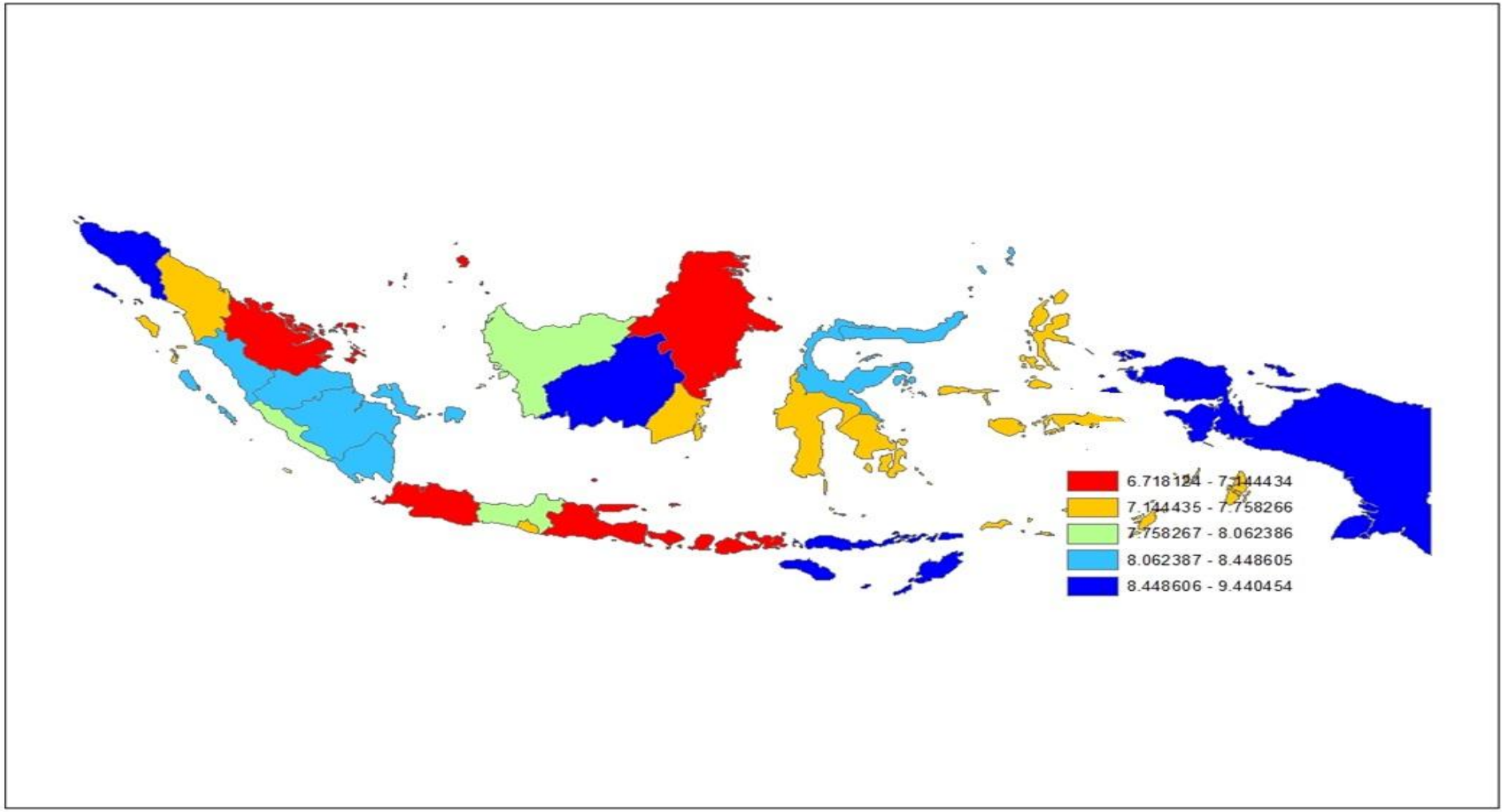
❖Levin Liu Test for panel unit root confirms the stationary of the variables. Null of unit root is rejected at 1% level of confidence

❖ Cointegration test is not necessary

REGIONAL ECONOMIC GROWTH

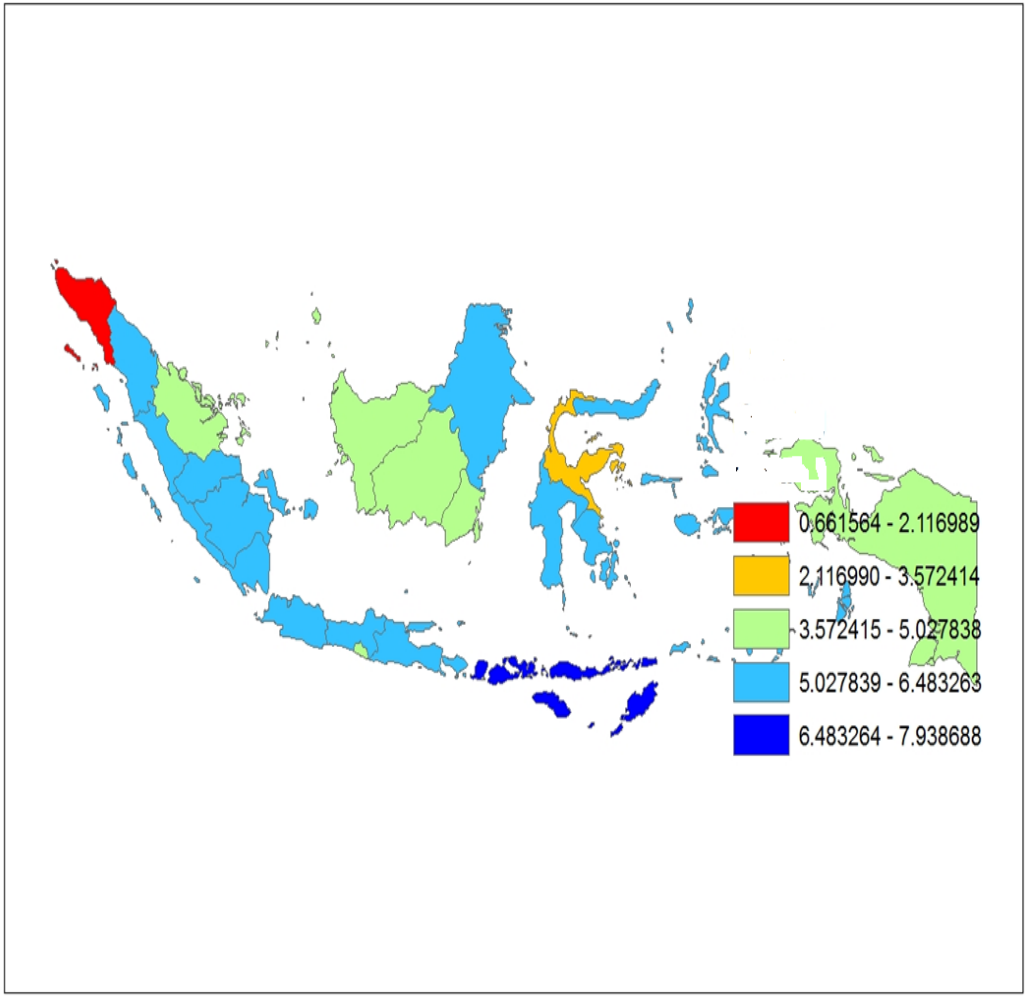


REGIONAL INFLATION RATES



INFLATION VS GDRP





PANEL APPROACH

The Impact of Inflation on Economic Growth				
Variable	PANEL			
	FE		RE	POOL
INF	-0.278	**	-0.111	-0.058
INITIAL	0.182	***	-0.051	-0.034
LOAN	0.009	**	-0.024	0.007
OPEN	0.951	***	1.054	1.218
POP	0.001	***	0.001	0.003
TOT	-0.010		0.016	-0.015
C	3.781	***	7.270	5.944
Durbin-Watson stat	1.673		2.260	2.180
R-Squared	0.536		0.037	0.112
Observation	286			
Hausman Test	9.65			
Chow Test	17.59			

***,**,* indicating level of significant 1%,5% and 10%

- Because Hausmann test and Chow test are significant, FE panel approach is the best option.
- Fixed Effect Model shows that inflation rates, initial (income per capita), loan, opennes and population rates are significant determinants of regional economics growth, only term of trades is not significant.
- The signs of impact are as expected.
- The most of important thing is there is regionally negative correlated economic growth and inflation rates both in FE, RE as well as pool panel approach.

SAR APPROACH

The Impact of Inflation on Economic Growth			
Variable	PANEL		
	FE		RE
INF	-0.0893	***	-0.1015
INITIAL	1.1641	**	0.3269
LOAN	0.1099	**	0.0533
OPEN	0.0440	**	0.0244
POP	0.0226	**	0.0241
TOT	-0.0003		-0.0002
Spatial Autocorrelation	0.1860		0.1450
R-Squared	0.1944		0.1089
Observation	286		
Hausman Test	18.32		
LM Test			
Robust LM Test no spatial lag	20.37		
Robust LM Test no spatial error	22.81		

***,**,* indicating level of significant 1%,5% and 10%

- Because Hausmann test is significant, FE panel approach is the best option.
- Fixed Effect Model shows that inflation rates, initial (income per capita), loan, opennes and population rates are significant determinants of regional economics growth, only term of trades and spatial autocorrelation are not significant.
- The signs of impact are as expected.
- The most of important thing is there is regionally negative correlated economic growth and inflation rates both in FE, RE approach.

SEM APPROACH

The Impact of Inflation on Economic Growth			
Variable	SEM		
	FE	RE	
INF	-0.1948	-0.2054	***
INITIAL	1.1171	0.5328	*
LOAN	0.2564	0.0653	**
OPEN	0.0541	0.0399	
POP	0.0356	0.0329	*
TOT	-0.0005	-0.0001	
Spatial Autocorrelation	0.4409	0.4125	
R-Squared	0.1681	0.1322	***
Observation	286		
Hausman Test	4.48		
LM Test			
Robust LM Test no spatial lag	20.37		
Robust LM Test no spatial error	22.81		

***,**,* indicating level of significant 1%,5% and 10%

- Random Effect Model shows that only opennes and TOT are not significant determinants of regional economic growth.
- The signs of impact are as expected.
- The most important thing is this model suggests stronger and positive spatially correlated among province than SAR, showing commoving and integrating economy are guaranteed, in terms of economic growth, and negatif relationship between inflation and regionally economics growth.

Because of Robust LM test, so this approach is bettter than SAR.

Thresholds Approach (1..all ins)

$\tilde{y}$	4.616
95% confidence interval	[4.61 - 4.71]
Impact of inflation	
$\hat{\beta}_1$	1.429
	**
$\hat{\beta}_2$	-0.105
	***
Impact of covariates	
$initial_{it}$	2.227
	***
$dloan_{it}$	0.143
	*
$dpop_{it}$	0.00041
	*
$dopen_{it}$	1.319
	**
$dtot_{it}$	-0.0063
$\hat{\delta}_1$	-3.448
Observations	286
N	26

•The estimated inflation threshold of 4.61% as well as the marginal effects of inflation on growth strongly support the prevailing inflation targets of Bank Indonesia. The 95% confidence interval ([4.61, 4.71]) indicates that the critical value of inflation for Indonesia. Both regime-dependent coefficients of inflation are significant and plausibly signed. Inflation is positively correlated with economic growth if below the threshold (=1.429), while the opposite is true for higher inflation (= -0.105). The absolute size of the inflation coefficients suggest that correlation between inflation and economic growth of Indonesia is stronger when inflation is low.

Thresholds Approach (2..1 ins)

$\widetilde{y}$	4.616
95% confidence interval	[4.43 - 11.11]
Impact of inflation	
$\widehat{\beta}_1$	1.051
	***
$\widehat{\beta}_2$	-0.091
	***
Impact of covariates	
$initial_{it}$	1.625
	***
$dloan_{it}$	0.121
	*
$dpop_{it}$	0.00013
	*
$dopen_{it}$	1.201
	***
$dtot_{it}$	-0.0108
$\widehat{\delta}_1$	-2.404
Observations	286
N	26

It is worth emphasizing that our results are robust with respect to the choice of instruments. The only notable exception refers to the confidence interval of the inflation threshold. If the instrument count is reduced to one, estimation is less efficient and the 95% confidence interval of the inflation threshold widens to [4.43, 11.11]. As a consequence, the evidence on the long-run growth effects of inflation rates around 5% must be viewed with caution

CONCLUSIONS

Research conclusions, policy implications and limitations

CONCLUSIONS

The research suggested that:

1. There is regionally negative correlated economic growth and inflation rates both in FE, RE and pool approach as well as in ordinary panel, SAR and SAM approach.
2. Inflation distorts economic growth provided it exceeds a certain critical value. For the case of Indonesia, we estimated that inflation rates exceeding a critical value of 5% are negatively correlated with economic growth. Inflation rates above this threshold come along with significantly lower growth rates. The absolute size of the inflation coefficients suggest that correlation between inflation and economic growth of Indonesia is stronger when inflation is low. According to the 95% confidence intervals, this conclusion holds at least for inflation rates ”below but close to 5%”.
3. In terms of regionally economic growth , there is strong and positive spatially correlated among province, showing commoving and integrating economy within territory of Indonesia.
4. However, policy conclusions based on reduced form estimates have to be viewed with caution. In particular, the estimated inflation-growth nexus does not necessarily reflect causality but rather correlation.

Policy Implications

1. For the case of Indonesia, our results support the inflation targets of about 5% which are more or less explicitly announced by Bank Indonesia as central bank mandated to achieve and maintain price stablity. Of which internal price stability is in the form of inflation rates target, and of external price stability is in the form of foreign exchange rates.
2. Because Indonesia is very diverse, policy in achieving the target need to consider local characteristic.
3. Therefore, analyzing underlying inflation in terms of regional approach is a much.

Research Limitations

1. This research is limited to country (province) level - data and analysis.
2. Further researches should focus more on the industry level analysis, thus have to be facilitated by the availability of industry level data in order to examine the sensitivity of inflation to industry performance.
3. Because this analysis is based on annually data, for further researches should consider using more high frequency data, such as quartely or even monthly.

Thank You



