# ARDL Panel Strength in Detecting Economic Stability Leading Indicators toward CIVI Countries

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**ABSTRACT:-** The short-term goal of this research is to analyze the contribution of changes in macroeconomic instruments due to changes in monetary policy instruments with inflation expectations that can maintain economic stability, including (Interest Rates, Exchange Rates, Money Supply, Inflation Expectations, GDP and Inflation). The specific target in this study is to find the Leading indicator of the effectiveness of controlling economic stability in each CIVI country. The material used in this study is quantitative material with panel data in 4 CIVI countries, secondary data sources in time series, i.e. from the first quarter of 2000 to the first quarter of 2017. The data analysis model in this study is the ARDL Panel, analysis model. The ARDL Panel analysis results show that the Leading indicator of country effectiveness in controlling the stability of CIVI countries, such as India (Interest, Exchange Rate, Amount of money supply, Inflation Expectations and GDP) and Vietnam (Interest, Amount of money circulating and GDP). Other countries such as Indonesia controlling economic stability is carried out by interest and the money supply, while China is carried out through the money supply.

Keywords:- interest rates, exchange rates, money supply, inflation expectations, GDP and inflation

# I. INTRODUCTION

Monetary policy is not something that stands by itself, but several variables are interdependent in the economy. On the one hand, monetary policy is much influenced by factors in the economy, while on the other hand monetary policy can also directly affect monetary and financial conditions which in turn will affect the real sector conditions or commonly called the real sector. The implementation of monetary policy cannot be done separately from other macroeconomic policies, such as fiscal policies, sectoral policies, and other policies. Warjiyo, (2003) inflation targeting is a framework for monetary policy that is marked by announcements to the public about the inflation target figures for a period. Considering how crucial this discussion of inflation is, it is no wonder that BI has set it as the ultimate goal in implementing its monetary policy. The phenomenon of the problem in this study is seen from the various responses of macroeconomic variables to the ability of monetary policy transmission in controlling the economy in CIVI countries, as follows:



Figure 1. Inflation Development in CIVI Countries 2000 to 2017

The figure above shows that there was a tendency for inflation in CIVI countries during the period 2000 to 2017. The movement is almost the same in Vietnam, Indonesia, and China, which is a significant increase in inflation in 2008. It is due to the impact of global problems, such as the increase in global food prices. That way, the community will also become more prosperous (Boediono, 2010). Inflation from time to

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time can undermine the value of money owed by the community. With aggregate prices rising, this will reduce the value of real money in the economy. This can reduce the welfare of the people of a country concerned. Price stability is a barometer of a country's real economic growth. Political rumors can also trigger an increase in inflation. Not to mention the consumeristic pattern of society, especially on consumer goods due to economic openness, which makes the economic performance of a country increasingly undermined by inflation (Khalwaty, 2000).



Figure 2. Development of CIVI Country GDP in 2000 to 2017

The graph above shows that there has been a tendency for an increase in GDP in CIVI countries during the period 2000 to 2017. However, Indonesia, Vietnam, and India have seen a slowdown in economic growth, in contrast to China which experienced significant economic growth. According to Basukianto (2015), in Efforts to maintain an efficient growth rate require the intervention of the government to reduce the primary sector and increase the role of the non-primary sector. In other words, the tendency to increase in general prices continuously or inflation can occur if the increase in the money supply has exceeded the actual needs. If "the money supply increases, the price of goods will also increase" (Rivai, et al, 2007). Inflation is also known as a monetary phenomenon, in other words, if the amount of money in circulation exceeds what society needs, people will tend to spend their money by increasing consumption of goods and services. As long as production capacity remains available, the increase in consumption will increase production and will expand employment opportunities. However, if the production capacity has been saturated, the increase in demand for goods and services will in turn increase prices in general or inflation (Pohan, 2008: 35).

# II. ECONOMIC STABILITY

In this study, the relationship of fiscal policy and monetary policy to macroeconomic stability, each of the fiscal policy and monetary policy variables is related to macroeconomic stability variables. Where each of the fiscal policy variables contributes to the variables of macroeconomic stability.GDP is influenced by the rate of inflation. Inflation is a dilemma that haunts every country's economy. Its development continues to increase providing obstacles to economic growth in a better direction. Inflation tends to occur in developing countries such as Indonesia with an agrarian-style economic structure. Failure or shocks in the country will cause price fluctuations in the domestic market and end with inflation in the economy (Baasir, 2003: 265).

Inflation and Interest Rates. Zulverdi (1998) states that there is a relationship between the interest rate and the inflation rate which is estimated that the interest rate is also influenced by inflation or in other words the inflation rate has an influence or effect on the interest rate as a target. Interest rates tend to increase when inflation is also expected to increase.

Inflation and Money Supply. The value of money is determined by the supply and demand for that money. The money supply is determined by the Central Bank, meanwhile, the amount of money demanded is determined by several factors, such as the average price level in the economy. The amount of money requested by the public to carry out transactions depends on the level of prices of goods and services available in the market. The higher the price level, the greater the amount of money demanded. The price increase then pushes up the amount of money demanded by the public. Eventually, the economy will reach a new equilibrium, when the amount of money demanded is back in balance with the amount of money circulated. The explanation that

illustrates how the price level is determined and changes along with changes in the money supply is called the quantity theory of money.

Based on this theory, the amount of money circulating in an economy determines the value of money, while the growth of the money supply is the main cause of inflation. In general, the quantity theory of money illustrates the effect of the money supply on the economy, related to price and output variables. The relationship between the money supply, output, and price can be written with a mathematical equation as follows:  $M \times V = P \times Y$ . Where P is the price level (GDP deflator), Y is the amount of output (real GDP), M is the money supply, PxY is nominal GDP, and V is the velocity of money. This equation is called the quantity equation.

Inflation and Exchange Rates. Changes in exchange rates need to be examined more closely on how exchange rate surprises will affect the economy and inflation. Changes in the exchange rate will certainly have implications for the characteristics of exchange rate fluctuations and their effects on the open economy. The Rupiah received enormous depressive pressures which were started with the exchange rate crisis. Simultaneously the rupiah exchange rate was under heavy pressure due to the large capital outflow resulting from the loss of foreign investor confidence in the prospects for the Indonesian economy. The pressure on the exchange rate was exacerbated by the increasingly widespread activity so that since the crisis occurred the exchange rate has depreciated to reach 75 percent.

Inflation and Inflation Expectations. Bank Indonesia (2013) states that inflation expectations are influenced by the behavior of people and economic actors in using inflation rate expectations in making decisions on their economic activities. Inflation expectations are more likely to be adaptive or forward-looking.



Figure 3. Inflation expectations for economic fundamentals in CIVI countries

The conceptual framework of the Panel aims to obtain estimates of each characteristic separately, provide more informative, more varied data, more efficient degrees of freedom, and avoid collinearity between variables. As well as to see the relationship of inflation expectations, the money supply, gross domestic product, the exchange rate and interest rates to inflation in China, India, Vietnam, and Indonesia.

## III. METHDOLOGY

In this study using panel data that is by using data between time and data between regions. ARDL panel regression is used to get the estimation results of each characteristic separately by assuming the cointegration in the long run lag of each variable. Autoregressive Distributed Lag (ARDL) introduced by Pesar et al. (2001). This technique examines each lag variable located at I (1) or I (0). In contrast, the ARDL regression results are test statistics that can compare with two asymptotic critical values.

Panel Regression Testing with the formula: **INFLATION**<sub>it</sub> = $\alpha+\beta 1IR_{it}+\beta 2ERS_{it}+\beta 3MS_{it}+\beta 4EINF_{it}+\beta 5GDP_{it} + e$ The following panel regression formula by country: **INFLATION**<sub>CHINAt</sub> = $\alpha+\beta 1IR_{it}+\beta 2ER_{it}+\beta 3MS_{it}+\beta 4EINF_{it}+\beta 5GDP_{it} + e_1$  **INFLATION**<sub>INDIAt</sub> = $\alpha+\beta 1IR_{it}+\beta 2ER_{it}+\beta 3MS_{it}+\beta 4EINF_{it}+\beta 5GDP_{it} + e_1$  **INFLATION**<sub>VIETNAMt</sub> = $\alpha+\beta 1IR_{it}+\beta 2ER_{it}+\beta 3MS_{it}+\beta 4EINF_{it}+\beta 5GDP_{it} + e_1$ **INFLATION**<sub>INDONESIAt</sub> = $\alpha+\beta 1IR_{it}+\beta 2ER_{it}+\beta 3MS_{it}+\beta 4EINF_{it}+\beta 5GDP_{it} + e_1$ 

# IV. RESULT AND DISCUSSION

Panel analysis with Auto-Regressive Distribution Lag (ARDL) tests the pooled data that is a combination of cross-section data (country) with time-series data (annual), ARDL panel results are better compared to ordinary panels, because they are able to co-integrated long term and have the most lag distribution according to the theory, using Eviews 10 software, the following results were obtained.

Variable	Coefficient Std. Erro		t-Statistic	Prob.*				
	Long Run Equation							
OGDP	4.667431	1.526554	3.057495	0.0080				
INTEREST	-1.019133	0.164611	-6.191172	0.0000				
OER	-2.588605	3.271315	-0.791304	0.4411				
MS	3.921318	0.843635	4.648119	0.0003				
OEINF	32.13049	8.233768	3.902283	0.0014				
	Short Run	Equation						
COINTEQ01	-0.139881	0.051571	-2.712383	0.0161				
D(INF(-1))	-0.115180	0.134410	-0.856934	0.4050				
D(OGDP)	71.89595	47.85399	1.502402	0.1538				
D(OGDP(-1))	15.57058	81.89246	0.190134	0.8518				
D(INTEREST)	-0.500372	0.388872	-1.286727	0.2177				
D(INTEREST(-1))	-0.590200	0.291054	-2.027804	0.0607				
D(OER)	-2866.161	3152.541	-0.909159	0.3776				
D(OER(-1))	485.4393	899.1002	0.539917	0.5972				
D(MS)	-0.100493	0.607187	-0.165507	0.8708				
D(MS(-1))	0.234342	0.248590	0.942684	0.3608				
D(OEINF)	2819.933	3192.908	0.883186	0.3911				
D(OEINF(-1))	-532.6804	915.2558	-0.582002	0.5692				
С	-45.19663	16.31298	-2.770593	0.0143				

#### Table1.ARDLPanelOutput

The accepted ARDL Panel Model is a cointegrated lag model, where the main assumption is that the coefficient has a negative slope of 5%. ARDL Panel Model Requirements: the value is negative (-0.13) and significant (0.01 < 0.05), then the model is accepted. Based on the acceptance of the model, the data analysis is done by panel per country.

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Table 2. Panel ARDLOutputin China							
Variable	Coefficient	Std. Error	t-Statistic	Prob. *			
COINTEQ01	0.004512	0.000309	14.59018	0.0007			
D(INF(-1))	-0.312752	0.353549	-0.884607	0.4415			
D(OGDP)	96.53039	105772.9	0.000913	0.9993			
D(OGDP(-1))	190.9485	71117.10	0.002685	0.9980			
D(INTEREST)	-0.050130	0.121147	-0.413798	0.7068			
D(INTEREST(-1))	-0.028852	0.021444	-1.345458	0.2711			
D(OER)	22.71591	324.7660	0.069945	0.9486			
D(OER(-1))	-7.835592	278.9961	-0.028085	0.9794			
D(MS)	-0.092870	0.006454	-14.38918	0.0007			
D(MS(-1))	-0.113662	0.007546	-15.06339	0.0006			
D(OEINF)	-72.64080	106153.9	-0.000684	0.9995			
D(OEINF(-1))	-194.7547	77265.34	-0.002521	0.9981			
С	-0.973916	36.83009	-0.026443	0.9806			

ARDL panel test results show GDP does not have a significant effect on inflation. Interest Rates have no significant effect on inflation. The exchange rate has no significant effect on inflation. Money supply has a significant effect on inflation. Inflation Expectation has no significant effect on inflation.

Coefficient	Std. Error	t-Statistic	Prob. *
-0.147311	0.000977	-150.8222	0.0000
0.241848	0.000591	408.9720	0.0000
196.9540	56.92540	3.459862	0.0406
116.8716	26.35831	4.433957	0.0213
-0.422299	0.000582	-726.0580	0.0000
-0.500857	0.000423	-1184.424	0.0000
58.10061	4.363703	13.31452	0.0009
88.06993	6.725875	13.09420	0.0010
-0.321468	0.000237	-1355.533	0.0000
-0.028718	0.000349	-82.37460	0.0000
-200.8417	58.52541	-3.431700	0.0415
-77.76121	17.23195	-4.512619	0.0203
-48.05876	13.24779	-3.627681	0.0361
	Coefficient -0.147311 0.241848 196.9540 116.8716 -0.422299 -0.500857 58.10061 88.06993 -0.321468 -0.028718 -200.8417 -77.76121 -48.05876	CoefficientStd. Error-0.1473110.0009770.2418480.000591196.954056.92540116.871626.35831-0.4222990.000582-0.5008570.00042358.100614.36370388.069936.725875-0.3214680.000237-0.0287180.000349-200.841758.52541-77.7612117.23195-48.0587613.24779	CoefficientStd. Errort-Statistic-0.1473110.000977-150.82220.2418480.000591408.9720196.954056.925403.459862116.871626.358314.433957-0.4222990.000582-726.0580-0.5008570.000423-1184.42458.100614.36370313.3145288.069936.72587513.09420-0.3214680.000237-1355.533-0.0287180.000349-82.37460-200.841758.52541-3.431700-77.7612117.23195-4.512619-48.0587613.24779-3.627681

Table 3. ARDL Parallel	anel Outputin	India
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The ARDL panel test results show that GDP has a significant effect on inflation. Interest Rates have a significant effect on inflation. Exchange rates have a significant effect on inflation. MS has a significant effect on inflation. Inflation Expectation has a significant effect on inflation.

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.236921	0.001974	-120.0092	0.0000
D(INF(-1))	-0.057840	0.000336	-172.2795	0.0000
D(OGDP)	-6.807701	10.32094	-0.659601	0.5566
D(OGDP(-1))	-147.0746	39.32478	-3.739998	0.0333
D(INTEREST)	0.091708	0.002563	35.77913	0.0000
D(INTEREST(-1))	-0.424754	0.003598	-118.0481	0.0000
D(OER)	-12309.89	77325.83	-0.159195	0.8836
D(OER(-1))	3040.587	480714.9	0.006325	0.9954
D(MS)	-1.469023	0.000964	-1523.567	0.0000
D(MS(-1))	0.112932	0.001914	59.00419	0.0000
D(OEINF)	12385.69	78632.80	0.157513	0.8848
D(OEINF(-1))	-3098.996	489534.6	-0.006330	0.9953
C	-79.55484	195.4120	-0.407113	0.7112

Table 4.ARDL Panel Outputin Vietnam

The ARDL panel test results showed GDP, a significant effect on inflation. Interest has a significant effect on inflation. The exchange rate has no significant effect on inflation. MS has a significant effect on inflation. Inflation Expectation has no significant effect on inflation.

Table 5.ARDL Panel	Outputin Indonesia
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	Variable	Coefficient	Std. Error	t-Statistic	Prob. *
-	COINTEQ01	-0.179803	0.003044	-59.06268	0.0000
	D(INF(-1))	-0.331977	0.011964	-27.74717	0.0001
	D(OGDP)	0.907105	159.3533	0.005692	0.9958
	D(OGDP(-1))	-98.46323	255.6070	-0.385213	0.7258
	D(INTEREST)	-1.620768	0.229259	-7.069590	0.0058
	D(INTEREST(-1))	-1.406337	0.046725	-30.09791	0.0001
	D(OER)	764.4331	11459.33	0.066708	0.9510
	D(OER(-1))	-1179.064	51110.64	-0.023069	0.9830
	D(MS)	1.481387	0.110820	13.36747	0.0009
	D(MS(-1))	0.966816	0.018673	51.77713	0.0000
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D(OEINF)	-832.4789	14686.59	-0.056683	0.9584
D(OEINF(-1))	1240.790	55726.89	0.022266	0.9836
С	-52.19900	167.3357	-0.311942	0.7755

The ARDLpanel test results show that GDP has no significant effect on inflation. Interest Rates have a significant effect on inflation. The exchange rate does not have a significant effect on inflation, it does not have a significant effect on inflation. MS has a significant effect on inflation. Inflation Expectation has no significant effect on Inflation.

Based on overall results it is known that what is significant in the long run affects the stability of CIVI inflation, such as interest rates, money supply, inflation expectations, and GDP. Then in the short term, only interest will affect inflation stability. The leading indicator of the effectiveness of variables in controlling the stability of CIVI countries such as Interest (India, Vietnam, and Indonesia) is seen from the stability of short-run and long-run, where the variable of interest both in the short and long term significantly controls economic stability. Leading indicators of country effectiveness in controlling the stability of CIVI countries, such as India (Interest, Exchange Rates, Amount of money supply, Inflation and GDP Expectations) and Vietnam (Interest, Amount of money in circulation and GDP). Other countries such as Indonesia controlling economic stability is carried out by interest and the money supply, while China is carried out through the money supply. The panel turned out the money supply was also able to be a leading indicator for controlling China, India, Vietnam, and Indonesia, but its position was not stable in the long run.

Based on the overall results, it is known that what is significant in the long run affects the stability of CIVI inflation, such as Interest, Money Supply, Inflation Expectations, and GDP. Then in the short term, only interest will affect inflation stability. The following is a summary table of the ARDL panel:

Table 0.711212 Table Summary						
					Short	Long
	CHINA	INDIA	VIETNAM	INDONESIA	Run	Run
Interest	0	1	1	1	1	1
Exchange Rate	0	1	0	0	0	0
Money Supply	1	1	1	1	0	1
Inflation	0	1	0	0	0	1
Expectation						
GDP	0	1	1	0	0	1

Fable	6.ARDL	Panel	Summary
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The following is a summary of the long-term stability of CIVI countries



Gambar 4.1 Stabilitas Jangka Waktu Pengendalian Ekonomi CIVI Country

The ARDL panel analysis results prove:

1. Leading indicators of country effectiveness in controlling the stability of CIVI countries, such as India (Interest, Exchange Rates, Amount of money supply, Inflation and GDP Expectations) and Vietnam (Interest, Amount of money circulating and GDP). Indonesia controls economic stability by (interest rates and money supply), while China through (the money supply). The Indian state is still strong in controlling price stability through maintaining stability (exchange rate). The Chinese state is still strong in controlling price stability by maintaining the stability of the money supply. The Indonesian state is still strong in

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controlling price stability through maintaining the stability of the money supply (Nguyen, 2015), (Karimiyan, 2016).

- 2. In the panel, it turns out that the money supply is also able to be a leading indicator for controlling China, India, Vietnam, and Indonesia, but its position is not stable in the long run.
- 3. The leading indicator of the effectiveness of variables in controlling the stability of CIVI countries, such as Interest (India, Vietnam and Indonesia), seen from the stability of short-run and long run, where the variable of interest both in the long and short term significantly controls economic stability. The determination of interest as a leading indicator of CIVI countries is also supported by the opinion of Marseto (2012) which states that the SBI interest rate has a significant (significant) effect on economic growth and inflation. SBI Interest Rate is the most dominant variable to influence the economic growth rate variable. The mechanism in which the BI Rate changes works to affect inflation is often referred to as the monetary policy transmission mechanism. This mechanism describes the actions of Bank Indonesia through changes in monetary instruments and operational targets affecting various economic and financial variables before finally influencing the ultimate goal of inflation. Then research belonging to Nuri et al (2017) which states that interest rates have a positive and significant effect on inflation in Indonesia. The positive effect between interest rates and inflation suggests that monetary policy tends to follow the movement of inflation.

# V. CONCLUSION

In the panel, the money supply is the leading indicator (China, India, Vietnam, and Indonesia), but its position is not stable in the long run. Leading indicators are the effectiveness of variables in controlling the stability of CIVI countries such as interest (India, Vietnam, and Indonesia) seen from the stability of short-run and long-run, where the variable of interest both in the short and long term significantly controls economic stability. Leading indicators of country effectiveness in controlling the stability of CIVI countries, such as India (Interest, Exchange Rates, Amount of money supply, Inflation and GDP Expectations) and Vietnam (Interest, Amount of money in circulation and GDP). Other countries such as Indonesia controlling economic stability is carried out by interest and the money supply, while China is carried out through the money supply. The Indian state is still strong in controlling price stability by maintaining the stability of the money supply. The Indonesian state is still strong in controlling price stability by maintaining the stability of the money supply.

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