

## Relationship between USA Inflation and Indonesian Inflation with Causality and Independent Sample T-Test

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### Abstract:

*This research aims to see how the relationship between the inflation that occurred in the United States with the inflation that occurred in Indonesia. This study uses a model of causal relationships and independent samples in relation, in the two countries.*

*Data for inflation were made by the authors from various sources on the Internet such as web bps, bi, and from some government Web sites in the United States. This study uses data inflation in Indonesia and the USA starting from March 2002 until December 2012, quarterly data. Results of research conducted inflation seen how the relationship of the two countries have only one-way relationship and only inflation in the United States only if there is a change could affect inflation in Indonesia with a significance level of 5% alpha used.*

**Key Words:** Indonesian Inflation, Inflation USA and Independent sample t-test.

### INTRODUCTION

Inflation is a rise in prices (a decrease in the value of goods and services) are continuous and prolonged or in the long term. Which generally will result in the value of money will go down.

Before explaining the other things, the first author will put forward the theories discussed about inflation.

## **Quantity Theory**

This theory is the oldest theory discuss about inflation, but in the development of this theory had been developed from the University of Chicago economists, so this theory is also known as the meneteris (monetarist models) .Theory this emphasis on the role of the money supply and expectations (expectations) community regarding the price increases on the onset of inflation.

The essence of this theory is as follows:

- 1) Inflation can only happen if there are additional volume of money in circulation, both currency and demand deposits.
- 2) The rate of inflation is also determined by the rate of the money supply, and by expectations (expectations of) the public regarding future price increases.

## **Keynesian Model**

The rationale for the inflation model of Keynes, that inflation occurs because people want to live beyond the limits of economic, resulting in effective demand of society for goods (aggregate demand) exceeds the amount of goods available (aggregate supply), the result would be inflationary gap. The limited number of inventory (aggregate supply) happens because in the short term production capacity can not be developed to offset the increase in aggregate demand. Therefore, the same as the views of the monetarist, Keynesian models more widely used to describe the phenomenon of inflation in the short term.

With the state's purchasing power among groups in society are not the same (heterogenic), then the next will occur reallocation of goods available from community groups who have relatively low purchasing power of the social groups that have greater purchasing power. These events will continue to occur in the community. Thus, the inflation rate can stop only if one of the segments of society can no longer obtain funding (no longer have the purchasing power) to finance the purchase of goods at the rate prevailing price, so the effective demand of society as a whole no longer exceeds the supply of goods (inflationary gap disappears).

### **Mark Up Model**

On the premise of this theory model of inflation is determined by two components, namely the cost of production and profit margins. The relation between these two components changes with price changes can be formulated as follows:

$$\text{Price} = \text{Cost} + \text{Profit Margin}$$

Due to the large profit margin is usually specified as a certain percentage of total cost of production, then the formula can be translated into:

$$\text{Price} = \text{Cost} + (a\% \times \text{Cost})$$

Thus, in case of price increases on the components that make up the cost of production and or rise in profit margins will lead to an increase in the selling price of the commodity in the market.

### **LITERATURE REVIEW**

Broadly Inflation can be regarded as continuous price increases resulting from the public's purchasing power had to be decreased, this is because the amount of money in the hands of people are not comparable with the level of price increases that occurred. In various literature can be found sense Inflation is:

"Inflation is a monetary event one that shows a tendency to rise in price of goods in general. Which mean a decline in value for money". (Rimsky K. Judisseno, 2002; 16)

The notion of clearly revealed that with rising prices / inflation may result in the value of money that is to be down (devaluation), so the impact on the level of consumption. In addition to the understanding of the Rimsky also note that the definition of inflation according to a well-known economist in Indonesia, which states that "Inflation is a process of increasing prices prevailing in an economy". (Sadono Sukirno, 2002; 15). In his book, the macroeconomic, Sadono Sukirno mention briefly and clearly that the so-called Inflation is a process of increasing prices. Meanwhile, according to Gerald J. Thuesen and W.J. Fabrycky are quoted in Investment Analysis in the perspective of Economic and Political mention that "Inflation is a state that describes changes in the price level in an economy". (Irham Fahmi, 2006; 79).

And another meaning of inflation is also found in a book entitled The Theory of Macroeconomic bouquet Dwi Eko Waluyo in 2002 which states that "Inflation is one form of economic disease that often arise and affect all countries, the tendency of increase in general prices continuously constantly".

Definitions are very much in line with the definition of inflation is also mentioned by Bank Indonesia, the central bank defines inflation as follows: "Inflation is the tendency of prices to rise in general and continuous". (Bank Indonesia in Inflation Targeting Framework). Bank Indonesia of understanding, it can be concluded that the price increase of one or two items alone can not be regarded as inflation unless the increase is widespread (or resulted in an increase to other items).

Based on notions such, there is a common perception about inflation, that the so-called inflation is a rise in prices that occurred in general, meaning that occurs in all types of goods and also widespread, which means that the rise in prices

has not only occur in an area, but impact the entire region in the country.

## **Types of Inflation**

### **Viewed from Severe Presence of an inflation**

When the scale of severe or absence of inflation, it can be seen as follows: Inflation light to the scale of <10 percent / year. Inflation was the scale of inflation of 10-30 percent / year. Inflasi weight with inflation scale of 30-100 percent / year. Hiperinflasi with inflation scale of > 100 percent / year. (Dwi Eko Waluyo, 2003; 122)

### **Inflation in terms of origin**

Judging from the origin of inflation it can be seen that the inflation is coming from within the country and also from abroad, or better known as imported Inflation. Inflation originating from within the country or is called Domestic Inflation is "Inflation occurs because of the price increase due to the conditions "shock" (surprise) from within the country either because the behavior of the people and the government which resulted in price increases ". (Dwi Eko Waluyo, 2003; 125).

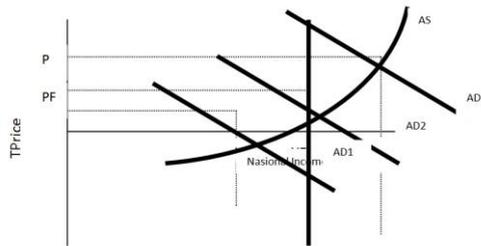
As for the inflation that comes from abroad or the so-called Imported Inflation is a rise in prices caused by rising prices of imported goods, which will lead to pressure on domestic prices.

### **Causes of occurrence of inflation**

Based on some of the books that discussed the macroeconomic mentioned that inflation can occur for several reasons, as a which include is mentioned in the book by Sadono Sukirno. Effect of Inflation: 1) Demand full Inflation pull.2) Inflation insistence cost.3) imported inflation (Sadono Sukirno 2004; 333)

### **Demand pull inflation**

"Inflation is the case during the growing economy with high employment rapid. Opportunities create a high level of income and further raise expenditures that exceed the economic capacity of issuing goods and services giving rise to inflation". (Sadono Sukirno, 2004; 333)

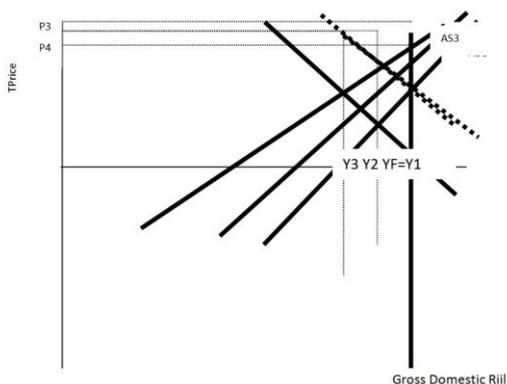


**Figure 1: Supply and demand curves**

The AS is the aggregate supply curve in the economy, while AD1, AD2 and AD3 is aggregate demand. Suppose initially aggregate demand is AD1, the national income is Y1 and the price level is P1. Per economic rapidly growing push to the rise in demand agregat. Yaitu be AD2. Therefore national income reaches the level of full employment, the YF and the price level rises from P1 to PF. This means that inflation has wujud. If public still add their spending then aggregate demand becomes AD3. To meet the growing demand, companies to increase production and cause real national income increased from YF to Y2. The increase in national production exceeds the full employment will lead to a more rapid rise in prices, from P1 to P2.

### **Cost inflation pressure**

Inflation insistence costs occur in the future with a rapidly developing economy when the unemployment rate is very low. (Sadono Sukirno, 2004; 334)



**Figure 2: Inflation Due to insistence Costs**

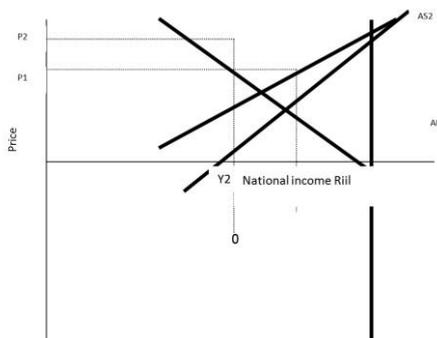
Curve AS1, AS2 and AS3 is the aggregate supply curve, while the aggregate demands curve AD for example. Suppose initially AS1. Dengan aggregate supply curve is thus initially achieved in the country's economic balance national income  $Y1$ , ie national income at full employment, and price levels are at  $P1$ . At high level of employment that the companies are in need of labor, This situation tends to result in increase in wages and salaries due to: the Company will try to prevent movement of workers by raising wages and salaries. Attempts to obtain additional workers will only be successful if companies offer wages and salaries higher.

Wage increases will increase costs, and the cost increases aggregate supply function will move upwards, ie from AS1 to AS2. As a result the price level rises from  $P1$  into  $P2$ . The high price of goods is pushing the workers demanded wage increases again, the production cost will be higher. This will eventually lead to the aggregate supply curve shifts from AS2 into AS3. This displacement raises the price from  $P2$  to  $P3$ . In the process of price increases caused by the increase in wages and the increase in aggregate supply is the real national income continued to decline, from  $YF$  or  $Y1$  to  $Y2$  and  $Y3$ . Means the result of the wage increase in economic activity will decline below the level of full employment.

In the above curve assumed wage increases do not lead to a rise in demand agregat. In practice, wage increases may also be followed by a rise in real aggregate demand. If this situation applies, the price increase will be faster and employment does not decline. Suppose after becoming AS2 AS1, aggregate demand AD turned into AD1. Akibar from this change in use full employment, but the price level is higher than P2. If the new prevailing wage increases, aggregate supply will move from AS2 to AS3. Had this been followed by a rise in aggregate demand into AD2 the full employment level was still achieved, but the prices will reach a higher level than P3 is P4.

### ***Imported inflation***

Inflation imported or Imported Inflation is an increase in the price which is strongly influenced by the level of prices that occurred on imported goods, so the rise in prices of these items will greatly impact on the increase in the prices of goods in the country. One example that has ever happened, namely the increase in world oil prices in the 1970s which led to the increase in production costs, and increased production costs resulting in price increases-price. Increase the high oil prices (from US \$ 3.00 in 1973 to US \$ 12.00 in 1974) causing the problem of stagflation. "Stagflation is describing a state where economic activity has declined, unemployment higher and at the same time the process of rising prices is increasing rapidly". (Sadono Sukirno, 2004; 336)



**Figure 3 : Imported inflation**

Aggregate demand in the economy is AD while initially there AS1. Thus it aggregate supply in the beginning of national income is Y1. Figure above shows this revenue achieved under the full employment income (YF), the number of unemployed is high. The increase in the price of imported goods is essential in many industries resulting in rising production costs, and this is so will result in the displacement of the aggregate supply curve becomes AS2 AS1. Revenues decreased from Y1 to Y2 while the price level rises from P1 into P2. This means simultaneously economy facing problems of inflation and unemployment bad. Expert in economists call this circuitry designation stagflation, which is an acronym of stagnation and inflation.

When a company is still experiencing growing demand, the company will seek to increase production with fig give higher wages to their employees and to hire new ones, with the offer of a higher payment has resulted in increased production costs that ultimately led to increases in the prices of various goods.

Meanwhile, based on Bank Indonesia in The New Monetary Policy Framework states that "Inflation occurs because of pressure from the supply side (cost push Inflation), on the demand side (demand pull Inflation), and also of inflation expectations". (Bank Indonesia in Inflation Targeting Framework). "Cost Push Inflation or inflation stemming from the supply side can be caused by the depreciation of the exchange rate, the impact of inflation abroad, especially countries trading partner, increased commodity prices were regulated by the government (administered prices), and the case of negative supply shocks due to natural disasters and disruption of distribution channels ". (Bank Indonesia in Inflation Targeting Framework). For inflation from the supply side, it is usually can not directly "touched" by the Bank's monetary policy Indonesia. This is because the supply side is influenced by external factors that can not be controlled by Bank Indonesia.

"Demand pull inflation or derived from the demand side is the high demand for goods and services relative to availability. In the macroeconomic context, this condition is illustrated by real output exceeds potential output or total demand (aggregate demand) is greater than the capacity of the economy ". (Bank Indonesia in Inflation Targeting Framework).

Inflation comes from the demand side can be controlled by the policy of Bank Indonesia, by controlling the level of demand for goods by using monetary policy instruments, and which are by the way interest rate or BI Rate. The latter factors causing inflation according to Bank Indonesia is due to inflation expectations, "Expectations Inflation is inflation arising from people's behavior and economic behavior are more likely to be adaptive or forward looking". (Bank Indonesia in the Inflation Targeting Framework)

Inflation expectation is reflected in the behavior of price formation at the level of producers and traders, especially on the eve of the religious holidays (Eid, Christmas and New Year) and determination of Minimum Wage (UMR).

### **Measurement of Inflation**

Many ways are used to measure the rate of inflation, such as by use: General Price, figures GNP deflator, CPI (Consumer Price Index), Over The Expected price, and the price index of the Interior and Foreign Affairs. (Dwi Eko Waluyo, 2003; 120-122)

### **Measurements Using the General Price**

Common ways used to calculate inflation is the general price figures (general price). With the formulation as follows:

$$LI_t = \frac{HU_t - HU_{t-1}}{HU_{t-1}}$$

LI<sub>t</sub> = Inflation in year t

However, in many empirical studies, especially in developing countries, economic analysts are often faced with a difficulty to get figures common price. Different ways to get the estimated price of the public and the inflation rate has been widely tested, although sometimes the interpretations with each other and produce a number of different influences.

Calculation using deflator figures Gross National Product (GNP deflator).

This method uses the following formula:

$$AD = \frac{Yb}{Yk}$$

NO = figures GNP deflator

Yk = GNP according to current prices.

Yk = GNP according to consumer prices.

Then to calculate the rate of inflation is to use a formulation as follows:

$$LI_t = \frac{AD_t - AD_{t-1}}{AD_{t-1}}$$

Lit = Inflation in period t.

ADT = figures GNP deflator in period t.

ADT-1 = figures GNP deflator period t-1.

The downside of this method is the difficulty of GNP deflator figures obtained monthly, quarterly, semiannual. So we only have figures deflator and the rate of annual inflation.

### **Calculation Method with the Consumer Price Index**

This approach is most widely used in calculating inflation. This is due to the Consumer Price Index data can be obtained in the form of monthly, quarterly or yearly. For Indonesia CPI data

quite easily be obtained either from the BPS report, the central bank or other institution.

Model of the Consumer Price Index (CPI) is as follows:

$$LI_t = \frac{IHK_t - IHK_{t-1}}{IHK_{t-1}} \times 100$$

$LI_t$  = Inflation in period t.

CPI = Consumer Price Index period t.

$IHK_{t-1}$  = Consumer Price Index period t-1

### ***Calculation Method Based Upon Prices Expected***

This method focuses on the calculation of prices and the rate of inflation in the period that applies, and which highlighted the role of prices is expected in the coming period.

To calculate it is the following formula :

$$LI_t^e = \frac{H_{t+1}^e - H_t}{H_t} \times 100$$

$LI_t^e$  = The inflation rate expected in year t.

$H_{t+1}^e$  = Expectations on price in year t + 1.

$H_t$  = On the prices prevailing at year t.

Gurley has tried to calculate the price expectations with the inflation rate in Indonesia. Problems encountered in the determination on the price expectations is difficult to observe the behavior of the public and the government in the economy.

### **Calculation with Price Index of the Interior and Foreign Affairs**

The formula used is:

$$IHDN - IHU = a + (1-a) IHLN$$

IHU = General Price Index.

IHDN = Index of the Interior

IHLN = Foreign Price Index.

A = The amount of donations influence the domestic price index of the general price index.

Difficulties encountered in this case is to determine the price index of the Interior and its proportion of the General Price Index. So far cost Export Price Index is used as an approach to the Overseas Price Index, but we too do not know the proportion of the General Price Index.

## **RESEARCH METHODOLOGY**

### *Research Data*

The research data were primarily used by the authors is the inflation data from countries USA and Indonesia during the period with the combination  $N_1 = 44$  (4x10 yr) that the data began in March 2002 s / d in December 2012,  $N_2 = 32$  (4x8 years) Data from 1999 s / d 2012 and  $N_3 = 22$  (4x5 yr + 2) Data from 2006 s / d in 2012.

### *Research Data Analysis Techniques*

This study used a technique or an independent test sample t-test using an alpha level of 5%, before in doing data analysis, data in advance can be processed by the author. But the first test conducted by the authors to determine the effects of both the inflation rate is used granger causality test, that is for the relationship between the two variables that will be examined.

### *Research Hypothesis*

From the explanation above we can blind study hypothesis as follows :

$$H_0 : \mu_1 = \mu_2$$

$$H_a : \mu_1 \neq \mu_2$$

The next step is to make decisions by looking at the hypothesis formulated by two-sided test for different test average variance is unknown and the average difference test variance is unknown but considered equal. The decision is to accept  $H_0$  if  $t$  table is greater than  $t$  or  $t$  is smaller than  $t$  table and reject otherwise.

## **RESULTS AND DISCUSSION**

The following will be carried out a study on the granger causality to see the causality between inflation USA and Indonesia, to quarterly data as given them know.

**Table : 1 Result Causality Granger test**

Pairwise Granger Causality Tests

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Null Hypothesis:	Obs	F-Statistic	Probability
INF__IND_ does not Granger Cause			
INF__USA_	100	1.33013	0.19376
INF__USA_ does not Granger Cause INF__IND_		2.02098	0.01764

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### **Sources : Proceed by author**

Visible value granger cause for both variables were not significant, only one variable granger cause significant variable US inflation does not granger cause significant, while granger cause the other to the variable Indonesia's inflation is not significant, it is certain that, two-way relationship does not happen, because the only relationship that affects the direction, in other words it can be concluded granger USA Cause Inflation Indonesia. By assuming an alpha level of 5% were used.

In some studies we can obtain data on the variance of the population due to lack of data. For problems like this type of testing that is done is t test that does not require knowledge of the population variance or the sample size is smaller than 30. Tests on the average difference in population by using the t test using the assumption that we do not know the variance of the population. This type of testing at variance between the two populations are assumed equal or can be assumed to be different. If the variance is assumed to be equal, testing is done with the assumption that each population tested had the same variance. Sedangkan on test assuming unequal variances, testing was conducted on the assumption that each population has unequal variances. Here we see the results for both types of different test average variance by using  $N_1 = 44$ ,  $N_2$  and  $N_3 = 32 = 22$

**Table: 2 Result Independent t-test two sample**

t-Test: Two-Sample Assuming Equal Variances

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.527272727	0.565909091
Variance	0.70577316	0.355101515
Observations	22	22
Pooled Variance	0.530437338	
Hypothesized Mean Difference	0	
Df	42	
t Stat	4.377911623	
P(T<=t) one-tail	3.89654E-05	
t Critical one-tail	1.681952358	
P(T<=t) two-tail	7.79308E-05	
t Critical two-tail	2.018081679	

t-Test: Two-Sample Assuming Unequal Variances

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.527272727	0.565909091
Variance	0.70577316	0.355101515
Observations	22	22
Hypothesized Mean Difference	0	
Df	38	

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t Stat	4.377911623
P(T<=t) one-tail	4.53187E-05
t Critical one-tail	1.685954461
P(T<=t) two-tail	9.06374E-05
t Critical two-tail	2.024394147

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**Sources : Proceed by author**

We can see the results of these two types of display models of different test average is, assuming that first considered the same variance, while the next one is not considered equal variance assumption. Looks mean and variance for both types of different test looks the same as the average of the mean for each variable 1 and 2 and 0.56 {1.52} and for variance variable 1 and 2 and 0:35 {0.70}. The calculation result t is the same for both types of different test average variance is used that is equal to 4.37. And visible differences occurrence results for both types of different test average is in one tail and two tail. It can be concluded reject the hypothesis H0 that t is greater than t table. The conclusion that we can take by using N = 44 that there was an effect of inflation in the United States against inflation in Indonesia.

**Table: 3 Result Independent t-test two sample**

t-Test: Two-Sample Assuming Equal Variances

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	Variable 1	Variable 2
Mean	1.72	0.521333333
Variance	0.630282759	0.301694713
Observations	30	30
Pooled Variance	0.465988736	
Hypothesized Mean Difference	0	
Df	58	
t Stat	6.800742771	
P(T<=t) one-tail	3.16475E-09	
t Critical one-tail	1.671552763	
P(T<=t) two-tail	6.32951E-09	
t Critical two-tail	2.001717468	

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t-Test: Two-Sample Assuming Unequal Variances

	Variable 1	Variable 2
Mean	1.72	0.521333333
Variance	0.630282759	0.301694713
Observations	30	30
Hypothesized Mean Difference	0	
df	52	
t Stat	6.800742771	
P(T<=t) one-tail	5.14316E-09	
t Critical one-tail	1.674689154	
P(T<=t) two-tail	1.02863E-08	
t Critical two-tail	2.006646761	

**Sources : Proceed by author**

By using different N we can see the results of these two types of display models of different test average is, assuming that first considered the same variance, while the next one is not considered equal variance assumption. Looks mean and variance for both types of different test average looks the same for each variable 1st and 2nd {0.52} 1.72 and this value is lower than using N = 44 and for variance variable 1 and 2 {0.63 and 0.30} The same is lower than using N = 32. The calculation result t is the same for both types of different test average variance is used that is equal to 6,80. And seen the results of the differences for both types of different test average is in one tail and two tailnya. But the number one tail and two tailnya lower than using N = 44. It can be concluded reject the hypothesis H0 that t is greater than t table. The conclusion that we can take by using N = 32 that there was an effect of inflation in the United States against inflation in Indonesia.

**Table : 4 Result Independent t-test two sample**

t-Test: Two-Sample Assuming Equal Variances

	Variable 1	Variable 2
Mean	1.737727273	0.526818182
Variance	0.624710994	0.301310571
Observations	44	44

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Pooled Variance	0.463010782
Hypothesized Mean Difference	0
Df	86
t Stat	8.346940693
P(T<=t) one-tail	5.2424E-13
t Critical one-tail	1.66276545
P(T<=t) two-tail	1.04848E-12
t Critical two-tail	1.987934166

t-Test: Two-Sample Assuming Unequal Variances

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.737727273	0.526818182
Variance	0.624710994	0.301310571
Observations	44	44
Hypothesized Mean Difference	0	
df	77	
t Stat	8.346940693	
P(T<=t) one-tail	1.09046E-12	
t Critical one-tail	1.664884538	
P(T<=t) two-tail	2.18092E-12	
t Critical two-tail	1.991254363	

**Sources : Proceed by author**

Now we see the results of these two types of display models of different test average is, assuming that first considered the same variance, while the next one is not considered equal variance assumption. By using a smaller N N = 22. Assumptions for the same mean and variance analysis with N = 32 and N = 44. It can thus be concluded reject the hypothesis H0 that t is greater than t table. The conclusion that we can take by using N = 22 that there was an effect of inflation in the United States against inflation in Indonesia.

**CONCLUSION**

From the data analysis has been conducted shows that the rate of inflation that occurred in the US or effect on or affect inflation in Indonesia. By using an alpha level of 5% and the

amount of data that is different for each different test average is done seen the results that reject the hypothesis H0. If we review of the theoretical basis or a literature review, the authors categorize events or causes of American inflation could affect the inflation that occurred in Indonesia due to inflation imported or Imported Inflation.

Imported Inflation is an increase in the price which was strongly influenced by the level of prices that occurred on goods imported (such as the increase in the value or the rate of inflation in the United States which led to), so the rise in prices of these items will greatly impact on the increase in the prices of goods in the country (increase in inflation that occurred in Indonesia). One such example that is mentioned in the literature is or ever there was an increase in world oil prices in the decade of the 1970s, causing all components to be increased. The increase in oil prices are high (of US \$ 3.00 in 1973 to US \$ 12.00 in 1974) led to stagflation problem. "Stagflation is describing a state where economic activity has declined, unemployment higher and at the same time the process of rising prices is increasing rapidly". (Sadono Sukirno, 2004; 336)

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