The Influence of Gold Price, World Oil Price, and Unemployment on Inflation

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Abstract

This research examines the gold price, world oil price, and unemployment on inflation The data is from 2002 to 2022. The model are used ARIMA, ARCH, and GARCH. Type of data are time series. Gold price is stationary in data level. World oil price is stationary in first difference. Unemployment is stationary data in second difference. Gold price has not affected on difference inflation. Difference world oil price has not affected on difference inflation. Double difference unemployment has not affected on difference inflation. Gold price, difference oil price, and double difference unemployment have not affected on difference inflation simultaneously.

Keywords *: Gold Price; World Oil Price; Unemployment; Inflation; ARIMA; ARCH; GARCH*

JEL Classification : G20

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Introduction

Inflation is an increase in the price of goods and services in general and continuously within a certain period of time. Deflation is the opposite of inflation, namely a decrease in the price of goods in general and continuously. According to the Central Bureau of Statistics (BPS), an increase in the price of one or two goods that does not cause an increase in the price of other goods cannot be called inflation.

Unemployment is the workforce, namely 15-64 years who do not work at all, are looking for work, are waiting for the next project, have received a job but have not started working or are looking for a decent job.

Gold prices in Indonesia are based on international gold prices converted into rupiah. The price used is the fixed gold price (gold fix) and the spot gold price (spot price). Gold prices remain referenced daily at 10.30 GMT (London Gold AM Fix) and also 15.00 (London Gold PM Fix) in London. Exchanges most of the world's gold trading occurs. The price of gold is determined by the London Bullion Market Association (LBMA). The fixed gold price set daily is a guide to the spot price.

The price of gold at spot prices is usually used by the prices at local gold shops or gold dealers. The spot gold price is also used as a reference for ANTAM's gold price. The price of gold on the spot gold market in America uses the dollar and the unit is troy ounces (t oz). 1 troy ounce = 31.1035 grams/$.

Crude oil prices come from WTI (West Texas Intermediate) and Brent. Brent is the result of mining from the North Sea (Europe) in mining lands in the North Sea. About 40% of world oil use refers to Brent. WTI is petroleum that originates and is produced in North America. WTI is usually used as an ingredient in gasoline products. Many countries that produce crude oil are members of OPEC but spot prices are referred to WTI and Brent.

The relationship between unemployment and inflation is that the greater the unemployment, the lower the inflation, and the smaller the unemployment, the greater the inflation. The relationship between the two is inversely proportional to unemployment and inflation. Philip's curve is the relationship between inflation and unemployment or the long-run relationship between inflation and unemployment.

Philip's curve that connects inflation and unemployment has no relationship in Indonesia. Surahman, et al. (Surahman et al., 2023) tests the effect of unemployment and inflation. They stated that the relationship between unemployment and inflation was negative but not significant from 2002 - 2022. In contrast (Afriandi & Triani, 2019) stated that unemployment had a significant positive effect from 1986 to 2017. According to Lestari (Lestari, 2023) inflation affects unemployment in a significant way. positive and significant in the short term and not in the long term. The relationship between

unemployment and inflation is not in accordance with the Phillips curve, both in the short and long term. The influence of world crude oil prices, gold prices, the money supply and exchange rates do not partially affect inflation, but the four variables affect inflation simultaneously (UMIYATUL HALIM, n.d.).

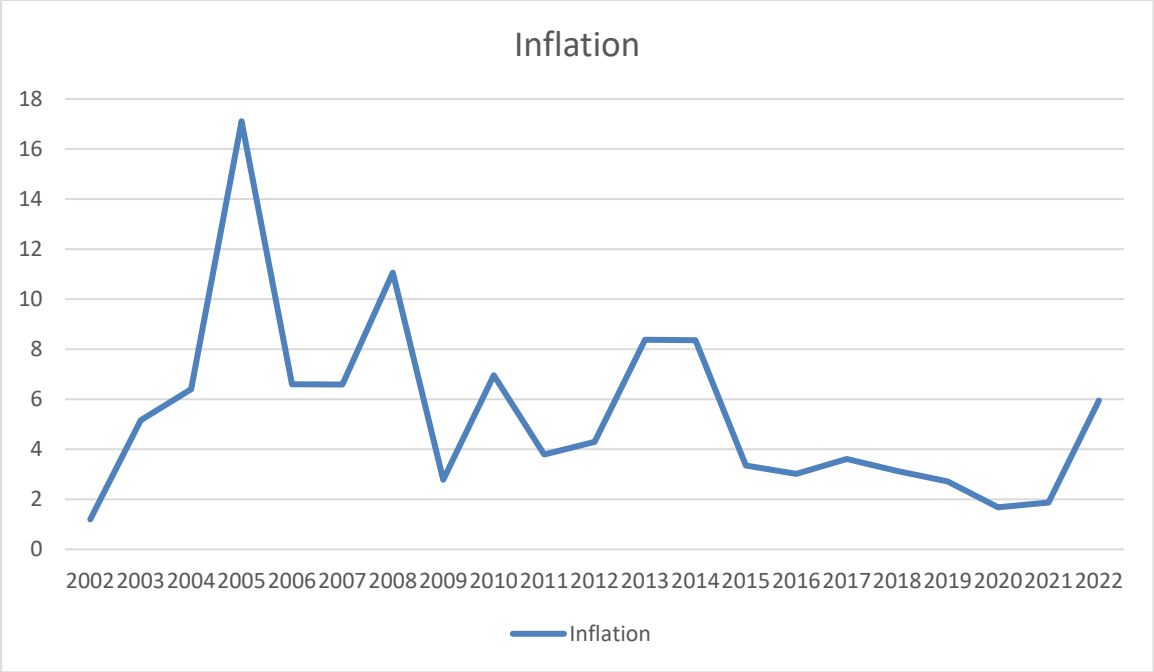

Figure 1. Inflation between 2002 and 2022

In figure 1 that for inflation in 2002 was 1.2% and 2022 was 5.95%. The highest inflation in 2008 was 11.06% and the lowest in 2002 was 1.2%

According to Blanchard (Blanchard, 2006), the relationship between oil prices and inflation is seen from the supply or company side. An increase in oil prices will increase fuel or production factors that are affected. Then, it will increase the cost of production and will increase the price. The increase in oil prices is directly proportional to the increase in prices.

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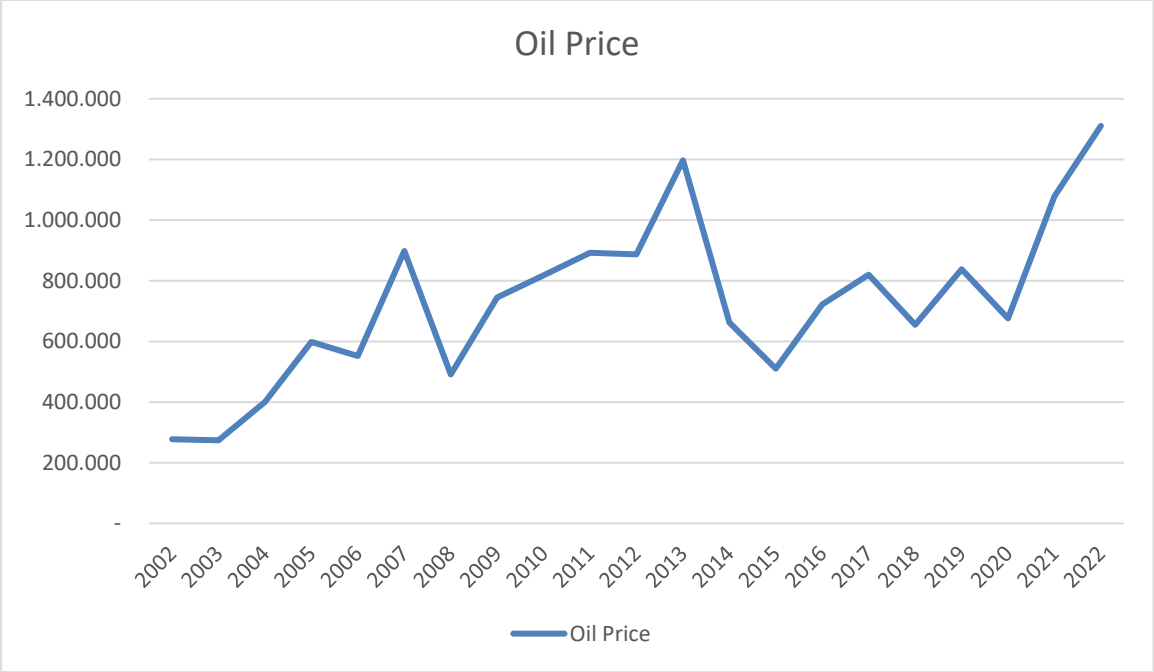


Figure 2. Oil Price between 2002 and 2022

The price of petroleum after being converted from dollars to Rupiah in 2002 was Rp. 277,614 per barrel and in 2022 Rp. 1,310,755. The highest oil price in 2022 and the lowest in 2003 was Rp. 273,995.

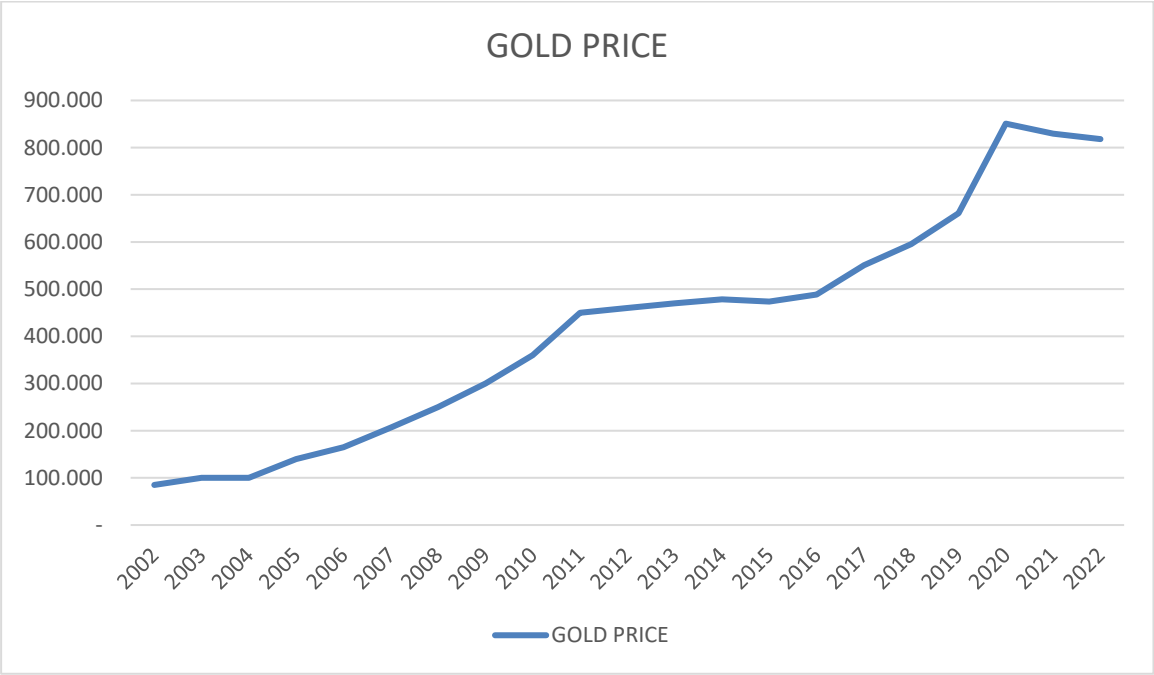


Figure 3. Gold Price between 2002 and 2022

The price of gold that has been converted from dollars multiplied by troy ounces. In 2002 the gold price was Rp. 85,000 and in 2022 it will be 817,988. The lowest price in 2002 and the highest price in 2020 was Rp. 859,874.

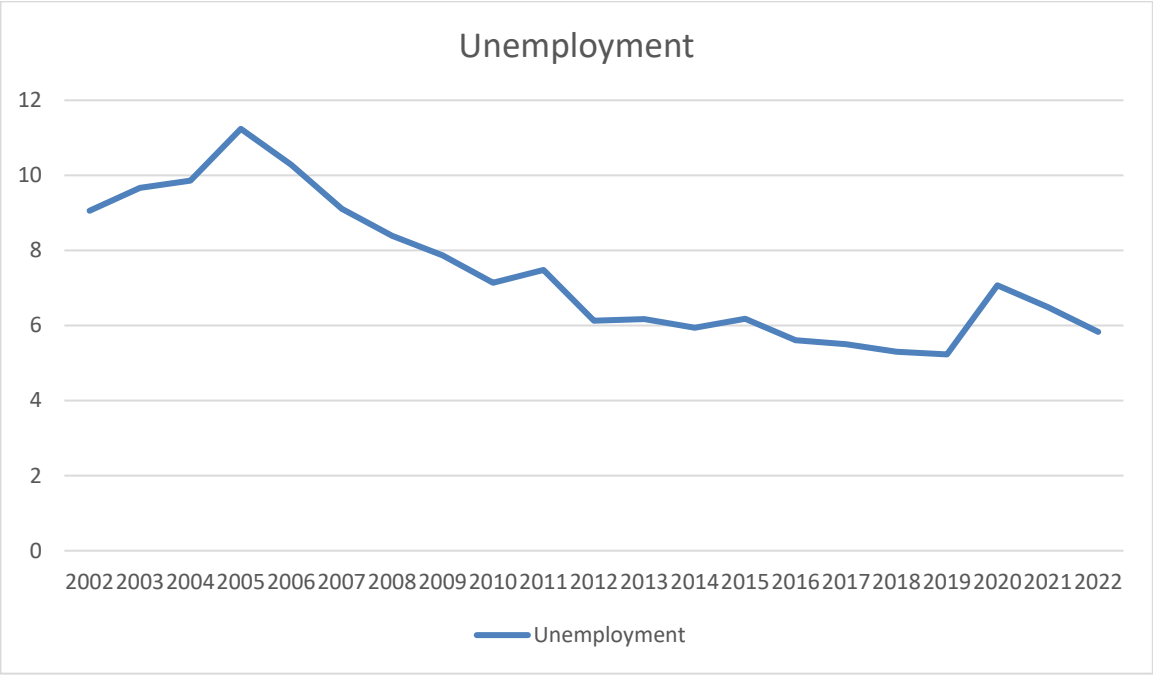


Figure. 4 Unemployment between 2002 and 2022

Unemployment from 2002 was 9.06% and from 2022 it was 5.38%. The highest unemployment in 2005 was 11.24%.

The relationship between gold prices and inflation, the greater the inflation, the greater the price of gold. In theory, the higher the inflation, the higher the price of gold because people prefer to have gold whose price is stable and increases during a crisis or when inflation is high. This attitude of the people makes the price of gold increase continuously. Surahman's research, et al. (2023) tested the effect of gold on inflation, not the effect of inflation on gold. They found that there was an effect of gold prices on inflation of below 10%. According to Isep, inflation and unemployment have cointegration but do not have a causal relationship from the Granger causality test.

Monthly inflation data from 1979 to 2021 states that inflation has high heteroscedasticity so that Garch (0.1) is the best predictor of inflation. This model can be seen from the smallest Akaike Information Criteria values at both constant and non-constant AIC (Akaike Information Criteria) of 1366.07 and 1364.04 (Salsabila et al., n.d.).

Inflation data in Gorontalo 2008-2020 uses the ARIMA-RBF and ARIMA GARCH models. Both models can explain inflation of 7.5% and 11.8% (Emiro et al., 2023). The effect of inflation on unemployment according to the GARCH model (2.1) that inflation has a positive and significant relationship to unemployment (Rafika, 2021). The results of the ARCH/GARCH analysis for North Maluku inflation for the 2013-2022 period the GARCH (1.0) or ARCH (1) models are the best models.

The three studies above have not tested the nonlinear relationship or unemployment volatility on inflation. This research will see how much the volatility of world oil prices, gold prices and unemployment affect inflation.

Literature Review

Inflation Theory

In his book, Boediono says that what is meant by inflation is the tendency of prices to rise in general and continuously. This means that the prices of all common goods rise by the same percentage and simultaneously. The important thing is that there is a continuous increase in the general price of goods during a certain period. An increase in the price of just one or two goods is not called inflation, unless the increase extends to (results in an increase in) most of the prices of other goods (Boediono, 1998).

First, Keynesian theory is a theory that explains that the process of inflation occurs because a society wants to live beyond the limits of its economic capacity. This process translates into a situation where people's demand for goods always exceeds the amount of goods available. This is known as the inflationary gap. This limited supply of goods (aggregate supply) occurs because in the short term production capacity cannot be developed to offset the increase in aggregate demand. Therefore, just like the monetarist view, the Keynesian model is more widely used in the short term. With the condition that the purchasing power between groups in society is not the same, then there will be a reallocation of available goods from groups of people who have relatively low purchasing power to groups of people who have large purchasing power. This event will continue to occur in society, so that the inflation rate will stop when one group of people no longer has the purchasing power to finance the purchase of goods at the prevailing price level, so that the effective demand for society as a whole does not exceed the supply of goods (the inflationary gap disappears).

Second, Inflation based on its nature Boediono classifies several types of inflation based on severe or not, namely: a. Mild inflation (below 10% a year), usually known as creeping

inflation b. Moderate inflation (between 10-30% a year), usually known as glloping inflation or medium inflation c. Heavy inflation (between 30-100% a year). d. Hyperinflation (above 100% a year). (Boediono, 1998)

Third, Inflation according to the cause of its occurrence Nopirin states that inflation is divided into two based on the factors that cause inflation, namely:

1. Inflation that arises because people's demand for various goods is too strong. Between the number of goods with the amount of demand is not balanced, as a result the price of goods becomes higher or increases in inflation of this kind is called demand full inflation.
2. Inflation that arises due to rising prices and falling production costs, which has an impact on producers who will reduce their desire to sell their products at the previous prevailing price level. A decrease in supply that is not followed by an equal reduction in demand will cause a price increase. This is called cost push inflation (Nopirin, 1998).

Factors causing inflation are that:

1. Money supply (money supply) An imbalance between the supply and demand for money will cause inflation. If the money supply (money supply) is too much, then inflation will increase, and conversely if the money supply is too little, then deflation will occur.
2. National Income Long-term economic development will be disrupted if inflation is not controlled. Increasingly serious inflation tends to reduce productive investment, reduce exports and increase imports.
3. Rupiah Exchange Rate The exchange rate of a country's currency can fluctuate. Fluctuations in the exchange rate of a country's currency can affect the value of the country's currency. If the country imports raw materials for products from other countries, because the value of its currency fluctuates, the prices of goods using imported raw materials will increase.

Unemployment Theory

The working age population is the population aged over 15 years. The working age population is divided into two groups, namely the labor force and the non-labor force. Labor or man power consists of the workforce and not the workforce. The labor force or labor force consists of those who are working and those who are unemployed and looking for work (Bellante, 1990)

Types of unemployment:

1. Open unemployment (open unemployment)

   Open unemployment is a workforce that really does not have a job. This unemployment occurs because there are those who have not been able to get a job even though they have tried their best and there are also those who are lazy to look for work or are lazy to work.
2. Disguised unemployment (disguised unemployment)

   Disguised unemployment that occurs because there is too much labor for one unit of work even though reducing the workforce to a certain amount will not reduce the amount of production.
3. Underemployment

   Underemployment is a workforce that does not work optimally because there is no temporary work. Some say that underemployed workers are workers who work less than 35 hours a week or less than 7 hours a day (Sadono Sukirno 2019).

World Oil Prices

According to Kimberly Amadeo in her article on USEconomy (thebalance.com July/23/2017) crude oil is a source of liquid fuel that is underground. Created when the remains of prehistoric algae were heated under pressure by the earth itself over millions of years. That's why crude oil is considered non-renewable energy. According to Dimas in his article which was published in an online newspaper (monexnews.com 16/juli/2015) crude oil is the most traded natural commodity in the international market. The movement of world crude oil prices fluctuate rapidly every day, following the dynamics of the economy and industry. According to the investment information provider SeputarForex.com/data/harga_minya k) there are currently two reference prices for petroleum that are most widely used in the world, namely the price of Brent oil and WTI (West Texas Intermediate): Brent Brent is the designation for oil mining products from the North Sea (Europe), under the name Brent derived from mining lands in the north sea, which were opened in 1970. Brent oil prices have been the basis for price formation since 1971 for nearly 40% of the value of oil worldwide, and continue to be used until recently.

WTI (West Texas Intermediate) is petroleum produced in North America, and in its application it is mostly used for gasoline products. This type of oil is lighter and easier to process, so it is in great demand, especially in the US and China. Besides Brent and WTI, there are other types of oil that are widely traded in the world, such as Dubai Crude (petroleum from Dubai), Oman Crude (petroleum from Oman), Urals Oil (reference oil price for Russia's exports), OPEC Reference Basket (the average price of oil exported by OPEC countries) and Shale Oil (oil from America produced with the latest technology from certain stones). However, the general benchmark in determining the price of petroleum is oriented towards Brent or WTI.

Gold Prices

Gold is a metal that has a very high value in all cultures in the world, even in its raw form. Gold is often referred to as the "Barometer of fear" when people with an economic situation, they tend to buy gold to protect the value of their wealth. Two kinds of economic situations that often make people anxious are inflation and deflation. Gold has proven to be a means of storing wealth that is resistant to both inflation and deflation. Gold has a limited supply and is not easy to obtain, while the demand for gold never decreases, as a result the price of gold tends to increase from year to year.

Research Methods

This research is quantitative. The data used is secondary data. Data sources come from:

Dollar Price Data:

1. https://www.bps.go.id/linkTableDinamis/view/id/952
2. https://id.investing.com/currencies/usd-idr-historical-data

Gold Price Data :

1. https://www.bps.go.id/linkTableDinamis/view/id/952
2. https://www.gold.org/goldhub/data/gold-prices

Unemployment Data :

1. https://www.bps.go.id/indicator/6/543/11/tingkat-pengangguran-terbuka-menurut-provinsi.html

Crude Oil Price Data Per Barrel:

1. https://tradingeconomics.com/commodity/crude-oil

Infllation Data :

1. https://www.bi.go.id/id/statistik/indikator/data-inflasi.aspx

Table 1. Operational Variables

Variables	Names	Formulas	Scalas
X1	Oil Price	$ x Rp	Nominal
X2	Gold Price	$ x Rp	Nominal
X3	Unemployment	$= \frac{Unemployed\ People}{Labor\ Force} \times 100\%$	Ratio
Y	Inflation	$= \frac{(CPI_t - CPI_{t-1})}{CPI_{t-1}}$	Ratio

ARCH-GARCH time series analysis research model. The steps for applying the GARCH model in this study are:

1. Test the stationarity of the data
2. Determine the ARIMA model
3. ARIMA Model Estimation
4. ARIMA model diagnostic test
5. Identify the ARCH-GARCH effect (Heteroscedasticity)
6. Evaluation of the GARCH Model
7. Evaluation of the model

Results and Discussions

Results

This results are showing the ARIMA, ARCH (1), and GARCH (1,1). Table 1, 2, and 3 are showing unit root test.

Table 2. Independent Unit Root Test Data LeveInflation, Gold Price, Oil Price, and Unemployment between 2002 and 2022

Method	Statistic	Prob.**
ADF - Fisher Chi-square	13.9291	0.0836
ADF - Choi Z-stat	-1.51551	0.0648

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results UNTITLED

Series	Prob.	Lag	Max Lag	Obs
INFLATION	0.2567	3	4	17
GOLDPRICE	0.0306	4	4	15
OILPRICE	0.1838	0	4	20
UNEMPLOYMENT	0.6536	0	4	20

Source: *Self-processed in Eviews 9.0*

Table 2 showing inflation, gold price, oil price and unemployment is not stationary data except goldprice. The probabilitas having 0.2567, 0.0306, 0.1838, and 0.6536 are above 0.05 consecutively except goldprice.

Table 3. Individual Unit Root Test Data Difference Inflation, Oil Price, and Unemployment between 2002 and 2022

Method	Statistic	Prob.**
ADF - Fisher Chi-square	25.6908	0.0003
ADF - Choi Z-stat	-3.53818	0.0002

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results D(UNTITLED)

Series	Prob.	Lag	Max Lag	Obs
D(INFLATION)	0.0159	1	3	18
D(OILPRICE)	0.0008	0	3	19
D(UNEMPLOYMENT)	0.2027	1	3	18

Source: Self-Processed in Eviews 9.0

Table 3 showing individual unit root test difference data is the difference of inflation, oil price, and unemployment. The difference inflation and oilprice are stationary data about 0.0159 and 0.0008. The difference unemployment is not stationary data because of the probability above 0.05.

Table 4. Individual Unit Root Test Difference Data Difference Unemployment between 2002 and 2022

Null Hypothesis: D(UNEMPLOYMENT) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.167272	0.0224
Test critical values:	1% level	-4.616209	
	5% level	-3.710482	
	10% level	-3.297799	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 17

Table 4 showing the Difference data differencing of unemployment is stationary data about 0.0224.

Table 5. Model ARMA before Evaluation

Dependent Variable: D(INFLATION)
Method: Least Squares
Date: 07/29/23 Time: 16:50
Sample (adjusted): 2004 2022
Included observations: 19 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

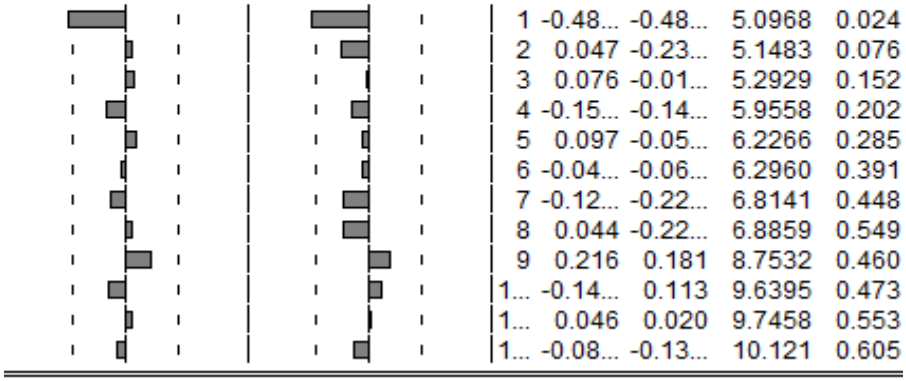
C	0.130059	2.522050	0.051569	0.9596
GOLDPRICE	-3.06E-07	4.97E-06	-0.061545	0.9517
D(OILPRICE)	2.72E-06	4.59E-06	0.592577	0.5623
D(D(UNEMPLOYMENT))	1.463553	0.995929	1.469535	0.1623

R-squared	0.134265	Mean dependent var	0.041579
Adjusted R-squared	-0.038881	S.D. dependent var	4.733781
S.E. of regression	4.824931	Akaike info criterion	6.170134
Sum squared resid	349.1994	Schwarz criterion	6.368963
Log likelihood	-54.61627	Hannan-Quinn criter.	6.203784
F-statistic	0.775442	Durbin-Watson stat	2.914421
Prob(F-statistic)	0.525684		

Source: Self-processed in Eviews 9.0

Table 5 showing the model ARMA before evaluation is not significant. Gold price, differencing oil price and differencing twice unemployent do not signify on difference inflation.

Date: 07/29/23 Time: 16:51
Sample: 2002 2022
Included observations: 19
Q-statistic probabilities adjusted for 3 dynamic regressors



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob...
		1	-0.48...	-0.48...	5.0968	0.024
		2	0.047	-0.23...	5.1483	0.076
		3	0.076	-0.01...	5.2929	0.152
		4	-0.15...	-0.14...	5.9558	0.202
		5	0.097	-0.05...	6.2266	0.285
		6	-0.04...	-0.06...	6.2960	0.391
		7	-0.12...	-0.22...	6.8141	0.448
		8	0.044	-0.22...	6.8859	0.549
		9	0.216	0.181	8.7532	0.460
		1...	-0.14...	0.113	9.6395	0.473
		1...	0.046	0.020	9.7458	0.553
		1...	-0.08...	-0.13...	10.121	0.605

*Probabilities may not be valid for this equation specification.

Figure 5. ACF and PACF Model ARMA before Evaluation

Figure 5 is showing Autocorrelation and partial correlation model before evaluation. On lag 1, autocorrelation and partial correlation have passed dotted lines.The probability on lag 1 is 0.024 under 0.05.

Table 6. Model ARMA with AR (1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.041132	1.049992	0.039174	0.9693
GOLDPRICE	-8.05E-07	2.35E-06	-0.343200	0.7369
D(OILPRICE)	7.76E-06	3.90E-06	1.986659	0.0685
D(D(UNEMPLOYMENT))	2.058592	1.032567	1.993665	0.0676
AR(1)	-0.577275	0.227904	-2.532970	0.0250
SIGMASQ	12.92088	5.621305	2.298555	0.0388

R-squared	0.391365	Mean dependent var	0.041579
Adjusted R-squared	0.157275	S.D. dependent var	4.733781
S.E. of regression	4.345614	Akaike info criterion	6.049634
Sum squared resid	245.4967	Schwarz criterion	6.347878
Log likelihood	-51.47152	Hannan-Quinn criter.	6.100109
F-statistic	1.671855	Durbin-Watson stat	2.219588
Prob(F-statistic)	0.210501		

Inverted AR Roots	-.58

Table 6 shows that goldprice has a probability about 0.7369. The probabilities of first difference oil price and second difference of unemployment are 0.0685 and 0.0676. Both are between 0.05 and 0.1. AR(1) has a probability about 0.0250 that is under 0.05. This model can explain 39, 14% that shown by R-squared. Prob. F-statistics is 0.21 above 0.05. Prob. F-statistic shows the independent variables cannot be together.

Date: 07/29/23 Time: 17:00
Sample: 2002 2022
Included observations: 19
Q-statistic probabilities adjusted for 1 ARMA term and 3 dynamic regressors

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob...
		1	-0.15...	-0.15...	0.5283	
		2	-0.17...	-0.20...	1.2488	0.264
		3	0.017	-0.05...	1.2559	0.534
		4	-0.06...	-0.11...	1.3717	0.712
		5	-0.13...	-0.18...	1.8535	0.763
		6	-0.09...	-0.22...	2.1563	0.827
		7	-0.10...	-0.29...	2.5092	0.867
		8	0.099	-0.13...	2.8644	0.897
		9	0.255	0.122	5.4674	0.707
		1...	0.080	0.142	5.7524	0.764
		1...	-0.07...	0.010	6.0504	0.811
		1...	-0.16...	-0.23...	7.6527	0.744

*Probabilities may not be valid for this equation specification.

Figure 6. ACF and PACF Model AR(1)

Figure 6 shows that there is no bar through the dotted line. It is meaning that the model should not add more AR.

Table 7 . Heteroskedasticity test ARCH AR (1) Models

Heteroskedasticity Test: ARCH

F-statistic	0.082910	Prob. F(1,16)	0.7771
Obs*R-squared	0.092792	Prob. Chi-Square(1)	0.7607

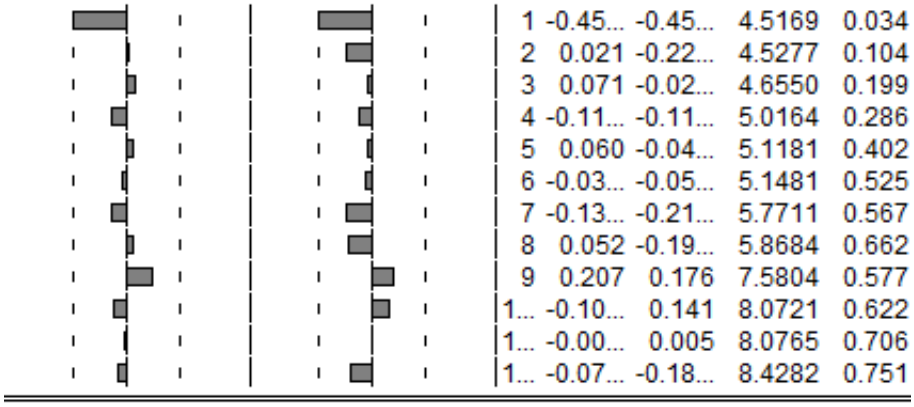
Table 7 shows that t model in table 6 is good. The prob. Chi-Square(1) is 0.7607.

Table 8. Difference Inflation Data as Dependent Variable in ARCH (1) Models

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.109838	2.689523	0.040839	0.9674
GOLDPRICE	-6.58E-07	5.85E-06	-0.112373	0.9105
D(OILPRICE)	4.26E-06	4.43E-06	0.959930	0.3371
D(D(UNEMPLOYMENT))	1.191596	1.197882	0.994753	0.3199
Variance Equation				
C	13.74359	10.46398	1.313419	0.1890
RESID(-1)^2	0.255264	0.654012	0.390305	0.6963
R-squared	0.121382	Mean dependent var		0.041579
Adjusted R-squared	-0.054342	S.D. dependent var		4.733781
S.E. of regression	4.860701	Akaike info criterion		6.351646
Sum squared resid	354.3962	Schwarz criterion		6.649889
Log likelihood	-54.34063	Hannan-Quinn criter.		6.402120
Durbin-Watson stat	2.974260			

Table 8 shows that all independent probabilities do not significant. It is shown by the prob. above 0.05.

Date: 07/29/23 Time: 17:06
Sample: 2002 2022
Included observations: 19
Q-statistic probabilities adjusted for 3 dynamic regressors



Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob...
		1	-0.45...	-0.45...	4.5169	0.034
		2	0.021	-0.22...	4.5277	0.104
		3	0.071	-0.02...	4.6550	0.199
		4	-0.11...	-0.11...	5.0164	0.286
		5	0.060	-0.04...	5.1181	0.402
		6	-0.03...	-0.05...	5.1481	0.525
		7	-0.13...	-0.21...	5.7711	0.567
		8	0.052	-0.19...	5.8684	0.662
		9	0.207	0.176	7.5804	0.577
		1...	-0.10...	0.141	8.0721	0.622
		1...	-0.00...	0.005	8.0765	0.706
		1...	-0.07...	-0.18...	8.4282	0.751

*Probabilities may not be valid for this equation specification.

Figure 7. ACF and PACF AR(1) Models

Figure 7 evaluates AR (1) Model. AR(1) Models show autocorrelation and partial correlation in lag 1. It is about 0.034 under 0.05.

Table 9. Heteroscedasticity Test ARCH (1) Model

Heteroskedasticity Test: ARCH

F-statistic	0.207780	Prob. F(1,16)	0.6546
Obs*R-squared	0.230756	Prob. Chi-Square(1)	0.6310

Table 9 evaluates ARCH (1) Model. It shows from Prob. Chi-Square (1) 0.6310. It is meaning that the ARCH (1) model does not has heteroskedasticity.

Table 10. Differencing Inflation as Dependent Variable in GARCH (1,1) Models

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.009689	2.584394	-0.003749	0.9970
GOLDPRICE	3.22E-08	5.40E-06	0.005958	0.9952
D(OILPRICE)	2.39E-06	3.10E-06	0.770031	0.4413
D(D(UNEMPLOYMENT))	0.193286	0.768568	0.251489	0.8014
Variance Equation				
C	0.192722	0.528019	0.364991	0.7151
RESID(-1)^2	-0.151301	0.137240	-1.102460	0.2703
GARCH(-1)	1.074796	0.215613	4.984846	0.0000
R-squared	0.039568	Mean dependent var		0.041579
Adjusted R-squared	-0.152519	S.D. dependent var		4.733781
S.E. of regression	5.081970	Akaike info criterion		5.914726

Sum squared resid	387.3963	Schwarz criterion	6.262677
Log likelihood	-49.18990	Hannan-Quinn criter.	5.973613
Durbin-Watson stat	2.911487		

Table 10 shows GARCH Model gold price, differencing data oilprice, and differencing and differencing data unemployment to Differencing inflation. All independent variables have no influence on dependent.

Date: 07/29/23 Time: 17:16
Sample: 2002 2022
Included observations: 19
Q-statistic probabilities adjusted for 3 dynamic regressors

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob...
		1 -0.32...	-0.32...	2.3238	0.127
		2 -0.14...	-0.28...	2.8421	0.241
		3 0.035	-0.14...	2.8731	0.412
		4 -0.06...	-0.17...	2.9680	0.563
		5 0.131	0.035	3.4602	0.629
		6 -0.02...	0.011	3.4801	0.747
		7 -0.32...	-0.36...	7.0011	0.429
		8 0.069	-0.31...	7.1723	0.518
		9 0.301	0.091	10.787	0.291
		1... -0.03...	0.121	10.852	0.369
		1... -0.15...	-0.11...	12.038	0.361
		1... 0.109	0.098	12.713	0.390

*Probabilities may not be valid for this equation specification.

Figure 8. ACF and PACF GARCH Models

Figure 8 has shown ACF and PACF in GARCH model. For all lag have above 0.05.

Table 11. Heteroskedasticity Test ARCH in GARCH Model

Heteroskedasticity Test: ARCH

F-statistic	0.214258	Prob. F(1,16)	0.6497
Obs*R-squared	0.237856	Prob. Chi-Square(1)	0.6258

Table 11 shows that GARCH (1,1) model is no heteroscedasticity. The Prob. Chi-Square (1) ia about 0.6258. It is above 0.05.

Discussions

Table 12. Choosing the Best Model from ARIMA AR (1), ARCH (1) Model, and GARCH (1,1) Model

Tools Evaluations	AR(1)	ARCH (1) Models	GARCH (1,1) Models	The Best Models
Akaike info criterion	6.049634	6.351646	5.392975	ARCH (1) Model
Schwarz criterion	6.347878	6.649889	5.740926	ARCH (1) Model
Hannan-Quinn criterion.	6.100109	6.402120	5.451862	ARCH (1) Model

Table 12 show that ARCH Model has the best model. The measurements are used Akaike info criterion, Sachwarz criterion, and Hannan-Quin Crierion.

Conclusions

In this study it can be concluded that the price of gold has no effect on inflation partially. Oil prices have no effect on inflation partially. Unemployment has no effect on inflation partially. Gold prices, oil prices and unemployment do not have a simultaneous effect on inflation.

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