How did Covid 19 Affect Strategic Goods? A Study using the Scenario Method

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Abstract: - Based on a review of literature dealing with the impact of the Covid-19 pandemic on international transactions, it should be noted that this pandemic in the world has led to a radical change in several areas. In this article, we have chosen to focus on the sectors that are strongly affected by this pandemic, namely the oil sector and not forgetting to study fluctuations related to the metals sector (gold). Indeed, the oil sector is a market that is well affected by this pandemic, which has caused significant price fluctuations. That is why this study is trying to identify the impact of this pandemic on this sector. Similarly, due to the lack of stability in the prices of metals (particularly gold), this leads us to analyze and process these fluctuations in order to determine the effect caused by the pandemic.
Finally, to clarify our research questions, a study based on the scenario model is retained to identify the impact of Covid-19 on each of these variables, at the beginning and to verify the effect between all these variables, thereafter. The obtained results demonstrate that the pandemic affects negatively Oil prices. On the contrary, the high number of infected people leads to the rise in gold price during the forecast period.

Key-Words: - Covid-19 pandemic, strategic goods, oil price, gold price, scenario method, Var model.

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1 Introduction

Since the Second World War, the Covid 19 pandemic constitutes the global crisis and the biggest challenge we have lived. Nevertheless, the pandemic is much more than a health crisis. It is an unprecedented crisis putting pressure on each countries it affects.

COVID-19 pandemic is having a considerable effect on all states around the world. It is engendering the loss of many lives, affecting people's way of life and work, and bringing about socio-economic changes that have a considerable impact during the coming years. The measures taken by States to deal with the pandemic are changing all aspects of the economy and life. As a result, the oil sector and the metals sector are under-going dramatic changes.

Thus, according to the literature, many studies tried to identify the impact of this pandemic in these variables. At first, according to [10], the Covid 19 pandemic has an impact on the fluctuation of the oil price. [9] who noted that the change in the oil price remains to the Covid 19 outbreak approves this idea. The prices of metals, especially, the precious metals (gold) has seen a significant fluctuation and movement during this pandemic [2], [7].

Therefore, to deal with these propositions, this study aims to answer the following questions:

- Is there an effect of Covid 19 on oil price and the precious metals (gold) price?
- Is there a relationship between the effects of the Covid 19 on these variables?

2 Literature Review

Since the end of 2019, the world has been in a critical situation following the appearance of the COVID-19 pandemic. This pandemic has caused many problems for countries including the strategic changes that have affected the global economy and international transactions. Beyond this crisis, the Coronavirus pandemic triggered an economic crisis that had dramatic effects on the financial markets. An economic slowdown has been caused by the COVID-19 pandemic that affects the oil demand [1], [9], [10]. Not only the oil sector has been affected by the pandemic but also the prices of precious metals (especially gold) has seen a significant fluctuation during the pandemic [2], [7].

Starting with the oil sector, the COVID-19 pandemic has affected oil prices [2], [5]. An imbalance has characterised the oil market in 2020. The procedures taken by the while world to deal with this pandemic has led to fluctuations in the demand and supply of the oil market. Since March 2020, the oil market has undergone a radical change in the oil prices. [10] states that an unprecedented collapse in oil prices has been distinguished because of this pandemic. The authors add that the crude oil price fell by 85 percent from the date of 22 January 2020 when the first case of COVID-19 was detected. It means that the crude oil price experienced a sever fall of two-thirds since January 2020 to April 2020. According to a recent OPEC report, it appears that in 2018 the price per barrel was practicing the same as in 2017 (53.12 dollars) to fall in 2019 up to 40.23 dollars the barrel. This price will see an increase of up to 49.12 a barrel during the year 2020. This is primarily related to the current COVID 19 health crisis, which is causing patterns energy consumption has changed. (OPEC, 2020, p145). Similarly, according to the World Bank, as a result to this pandemic, the oil price fell to 30 dollars in March and to 25 dollars in April 2020. Therefore, to summarize, the COVID-19 pandemic is negatively related to the oil prices, which means that a negative relationship exists between the oil prices and Qin et al. (2020) note the COVID-19 pandemic as it.

Concerning the precious metals, we find that the gold prices have increased 8 percent during COVID-19 pandemic exactly from January 2020. Similarly, [6] provide that gold prices has experienced a slight fall at the beginning of the crisis. Nevertheless, subsequently from February 2020, gold prices presented a considerable increase. [3] indicate even with the pandemic the demand for gold continues to increase, which causes a continuous increase in its price. In addition, the study presented by [11] provides that a pushing in the price of the gold can be seen during the period from 1-Jan to 9-Mar, from 1.517 dollar to 1.680 dollar. Although, a simple fall in the prices was seen during March but this for a short period. Regarding the relationship between oil prices and gold prices, [4] indicated that the increase of gold prices is related to crude oil prices. This relationship is linked to the role of oil as a principal input for several goods. In this way, it is important in this study to demonstrate if the oil prices affect gold prices during the COVID-19 pandemic.

3 The Standard Study (Knowing the Behavior /Movement of the Internal Variables during the Year 2022 by using Scenarios)

3.1 Analyzing the Sensitivity between a Set of Variables by using the Vector Autoregression (VAR):

In order to recognize how both oil and gold prices are sensitive and closely related in the context of the coronavirus disease 2019 (COVID-19), we estimate the VAR model to highlight the relationship between variables in the price of oil, the price of gold and the number of people infected by the pandemic in the world.

The aim is to determine the direction in which the two variables will move, especially when changes and innovations occur in the number of infected people, taking into consideration, the renewed global changes. This can be done through, on the one hand, the analysis of both response functions variance and, on the other hand, analyzing the possible scenarios provided by the VAR model between the variables in order to know the size and direction of the change of these two variables by causing any value change in the global number of infected people.

However, before considering and estimating the VAR model, the following important steps must be taken into consideration:

3.2 Studying the Stability of Study Variables

Based on the evolution curve of the study variables during the period of study, it appears that the series initially contain a general trend, which firstly suggests the instability of the time series. In order to do this, the stability of the study variables is tested by using the developed Dickey Fuller test ADF and Philips Peron (PP). However, before that, since we include monthly-frequency variables, it is necessary to remove the Compounding Quarterly Formula (in case it exists) before the test that cares about the general trend.

With regard to the results, which includes parameter values of the seasonal component and the partial correlation coefficient (correlogram) that we got directly through EViews program 12.0, it is worth noting that the variables are free from the Quarterly Compounding, where the coefficients values were almost closer to 1. Therefore, there is no significant difference between the sample variables and the variables that are compounded by the seasonality coefficients. It shows uniform rotundity in the autocorrelation coefficient during the study period.

Relying on the Stability Testing software prepared in the Eviews 12.0[22] program for ADF test, we obtained the following results in the following Figure.

Variables	Augmented Dickey–Fuller test results						Phillips–Perron test results				
	ADF with trend			ADF without trend			PP with trend			PP without trend	
	Level	1st Difference		Level	1st Difference		Level	1st Difference		Level	1st Difference
NCM	-2.934	-6.139***		-2.899	-6.064***		-2.156	-6.227***		-3.125	-6.122***
GP	-4.764***	-		-4.709***	-		-3.257**	-		-3.212*	-
COP											

*,**,*** Show that the variables are significant at1%, 5% and 10% levels, respectively.

Fig. 1: ADF Test results for the Stationality (stability) in series
Source: Authors

The present Fig. 1 shows us that, concerning the two series NCM_t GP_t , the values of the calculated statistics $\tau_{\hat{\phi}_1}$ related to ADF and PP tests are smaller (in absolute value) than the tabulated statistics $\tau_{tabulè}$ in the three models at the 5% level of significance, that's why we accept the hypothesis $(H_0 : \lambda = 0)$ ro $(H_0 : \phi_1 = 1)$
Also, the non- significance of the general trend in the third model for both series shows that the two series are of type DS. Nevertheless, after the first difference is made, he calculated statistics values $\tau_{\hat{\phi}_1}$ become greater (in absolute value) than the tabulated statistics $\tau_{tabulè}$ in the three models at the level of significance 5%. Hence, the two series NCM_t GP_t are stationary (stable), whereas the series COP_t of type TS are unstable and can be made stationary by using regression. Whereas the equation of a trend line that is subtracted from the original series to become stable takes the following form: $\hat{COP}_t = 39{,}31 + 2{,}13 \cdot t$ where we get the stable series $COPS_t$. In addition, the instability resulting from the presence of a significant structural change in all series, has been tested by knowing the significance of the coefficient of the endemic variable that represents the time of occurrence of the structural change in the series.
Therefore, based on Eviews 12.0 program, we note that the probabilities corresponding to the statistic t_c of the two parameters BREAKDUM in the two series NCM_t ، GP_t ، COP_t that are $p(t_{cncm} = 0{,}17 \rangle 0{,}05)$ ، $p(t_{cgp} = 0{,}42 \rangle 0{,}05)$ ، $p(t_{ccop} = 0{,}37 \rangle 0{,}05)$ proves that the chains are free from the problem of structural change, which may lead to its instability.

3.3 Test of the Co-integration Relationship

Until now, we found that the two series GP_t ، COP_t are unstable, but they are not homogeneous in terms of instability as the series GP_t is of type DS but the series COP_t is of type TS. Therefore, we can say that there is no room for joint integration (a long-term relationship) between these two variables according to the conditions of the Cointegration test .Also, given that these two variables represent the internal variables of the VAR model that we want to estimate, there is no need to use the VECM error correction model in the estimation.

3.4 Estimated Results of VAR Model

The VAR model is successfully applied on identifying the size and nature of the relationship between the variables NCM_t ، GP_t ، COP_t. However, before doing this, it is necessary to determine the optimum delay. So, with regard to figure 02, we note that the optimal degree of delay according to most of the statistical criteria is $p = 2$ (Based on Eviews 12.0 program).

VAR Lag Order Selection Criteria
Endogenous variables: COPS DGP
Exogenous variables: C DNCM DNCM(-1)
Date: 02/22/22 Time: 14:45
Sample: 2020M01 2021M11
Included observations: 20

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-168.7590	NA	133880.8	17.47590	17.77462	17.53421
1	-162.5571	9.302749	109273.8	17.25571	17.75358	17.35290
2	-150.7849	15.30398*	52287.16*	16.47849*	17.17550*	16.61455*

Fig. 2: Optimum Delay degree, Source: Authors

In addition, one of the conditions for estimating the VAR model is using stable series. We can summarize the estimated results of VAR model according to the following equation after removing the insignificant variables at the 10% level of significance[1].

Estimated results of oil price model

$$DGP_t = \underset{(1,62)^*}{0,47} \cdot DGP_{t-1} + \underset{(-1,43)^*}{5,04} \cdot DNCM_{t-1}$$

$$R^2 = 0,34 \quad Loglikelih \quad ood = -104,78 \quad F - statitic = 1,85 \quad n = 23 \quad (.) = t_{statistic}$$

BN :* Significant at 10%، ** Significant at 5%، *** Significant at 1%، Source: Authors

The results of the estimation can be analysed as follows:

- There is a proportional relationship between the oil price a month ago and now. Therefore, if the price of oil rose by 1 dollar last month this would also lead to an increase by $ 0.73 in today's price.
- There is an inverse relationship between the oil price of two month-late period and now. In that, if the oil price rose by $1, this would lead to a decrease by $ 0.45 in today's price.
- There is a significant and inverse relationship between the gold price of two-month late period and the current price. Therefore, if the price of gold rose by $1, this would lead to a decrease in today's price by $0.03. Because oil and gold constitute two alternative articles, so when demand of one increases, the other's price decrease.
- There is an inverse relationship between the numbers of people infected by *the coronavirus disease in one or two- month late period* and the price of oil since an increase of 1 million in the number of infected people would lead to today's oil prices drop by-0.46 and -0.45 dollars, respectively. In this way, the increase spread of the epidemic leads to increased closure that means a significant drop in demand.
- In general, the fluctuation of the oil price is related to its dynamism based on its current price that depends on the past price of oil. Therefore, this proportional relationship is due to the high demand for the oil in the short term. In addition, on the one hand, the transactions of oil sales, are forward contracts with relatively long period. On the other hand, there is an inverse relationship between the current price of oil and the two periods of delay, which makes economic sense. In this way, the rise of the oil price leads to the lower demand, which in turn reduces the price to increase demand. Therefore, generally speaking, economic interpretations of oil prices are limited due to its attachment to the international policies, security, and based on cartel decisions such as OPEC.

The results of Gold price estimation

$$DGP_t = \underset{(1,62)^*}{0,47} \cdot DGP_{t-1} + \underset{(-1,43)^*}{5,04} \cdot DNCM_{t-1}$$

$$R^2 = 0,34 \quad Loglikelih \quad ood = -104,78 \quad F - statitic = 1,85 \quad n = 23 \quad (.) = t_{statistic}$$

The results of the estimation can be analysed as follows :

- There is a proportional relationship between the price of gold last month and the current price .If the gold price rose by 1 dollar the last month , this would lead to an increase in the current price of gold by 0.47 dollars. This result leads to a reduction in the counties' imports, their trade balance and the overall product cost. It leads, also, to an improvement in country's crude domestic output, which increases national income and increases the demand for gold as a strategic commodity. In this regards, there is a rise in

[1] We can find the Fisher and Student values by using eviews program @qtdist(0.95,20)=1,66 ،@qtdist(0.90,20)=1,29 ، 2,37@qtdist(0.99,20)=،=2,58@qfdist(0.90,2,20)

the price of gold by producing countries due to the increased demand and urgency by most countries.

- There is an inverse relationship between the number of people who had been infected by the coronavirus disease in one month late period and the price of gold. In fact, the one-million infected people will lead to an increase in the current gold price by $5.04. In this way, the rise in the number of people infected by the epidemic forces countries to pursue a policy of total closure, resulting in a sharp decline in domestic and global demand for most goods and a halt in the production of most enterprises. This will contribute to the decline in dollar prices, which will lead to a rise in the price of gold as an alternative commodity to the price of the dollar.

4 Model Validation

Many tests should be done to verify the validity of the results of the var (2) model and, most importantly, to demonstrate that all the residuals resulting from the model are Noise trade (stable)[2]. This is confirmed by the partial and autocorrelation functions of the residual series. Therefore, by looking at the graphic representation of the partial autocorrelation function for the residuals of the var model, we notice that all the simple and partial autocorrelation coefficients are located inside the Confidence Interval. This indicates that these Correlation Coefficients do not differ from zero at the 5% level of significance. Therefore, the residual walkways of the var model can be considered as white noise. It can be confirmed by the Ljung-Box test, where we find that A significant P-value in The Ljung-Box Test statistic is $prob(LB) = 0,3$ and $prob(LB) = 0,51$ respectively, which completely greater than 5%. Therefore, we accept the null hypothesis, that is, the residual walkways of the Var model is white noise and therefore these residual *series* can be considered as stable.

[2] If the residuals are white noise (noise trade), that is, they are stable and this will avoid the most important problems of estimation. There is no problem of correlation of residuals of the first degree or degree p, there is no problem of heterogeneity of residual variance

4.1 Testing the Stationary VAR Model (Testing the Stability of the VAR Model)

We can say that the radial path X_t with dimension (n, 1) subject to a representation from the form VAR (p) is stable. If all the values of the roots of the polynomial Inverse time delay parameters are less than one in absolute value, by using the 12.0 Eviews program directly, we get the following figure.

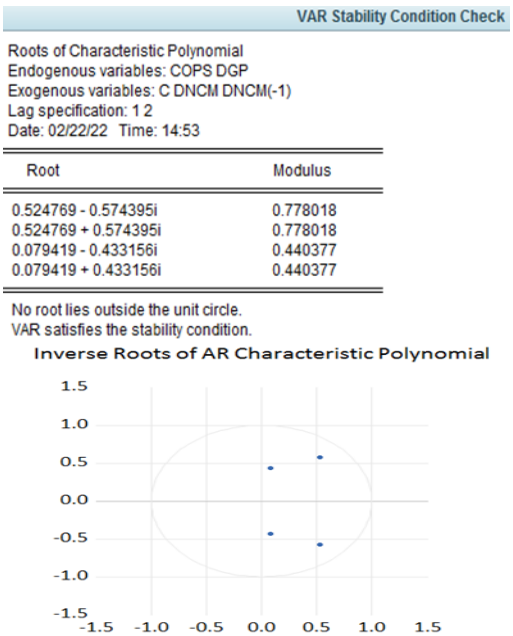

Fig. 3: VAR model stability conditions, Source: Authors

This figure shows that the estimated model fulfills the requirements for stability as all coefficients are less than one, and all roots are located within the unit circle, which indicates the structural stability of the Var model as a whole and that this model is valid for forecasting.

4.2 Scenario Analysis: Forecasting the Future Values between COVID-19 Pandemic, Oil Price and COVID-19 Deaths Cases shocks

The main advantage of these scenarios that are extracted from the results of the previous Var (2) model and obtained directly using Eviews 12.0 program, is to know the size and direction of the impact of any change in any internal variable of the VAR model on the future values of the same variable and other variables in the model. However, in the Shock Analysis, the results are obtained automatically, and the standard deviation value of the variable is often taken as a percentage change in its value without changing this shock size.

It is of a great importance now to present forecasting results by using different scenarios. However, before that, we need to predict and forecast an exogenous[3] variable $DNCM_t$ according to the Box-Jenkins method for ARIMA linear time series models, where we find that the optimal model for this series $DNCM_t \rightarrow ARMA(2,0) = \underset{(1,63)}{0,71} - \underset{(-3,78)}{0,66} \cdot AR(2)$, is where the series $DNCMF_t$, that represents the forecasted values until the end of 2022, is used in the events of different scenarios.

An important first step is to forecast the future values of the internal variables (the baseline) based on the outcomes and results of the previous Var (2) model.

The results of this prediction are called Baseline and in order to make this baseline prediction in Eviews 12.0 we should:

- First, we extend the sample size until the period in which we want to predict its future values. We want to predict the future values of the price of gold and oil for the next year (until 12/2022).
- Then, The VAR (2) model should be re-estimated.
- After that, based on the results of the Var model, we create a simple prediction by developing a model, which includes the prediction period (from 12/2021 to 12/2022).
- After activating it, its formula is as follows :

Model: Untitled
Date: 02/26/22 Time: 18:12
Sample: 2021M12 2022M12
Solve Options:
Dynamic-Deterministic Simulation
Solver: Broyden
Max iterations = 5000, Convergence = 1e-08
Parsing Analytic Jacobian:
0 derivatives kept, 0 derivatives discarded
Scenario: Baseline
Solve begin 18:12:39
Solve complete 18:12:39

[3] The prediction of the future values of the internal variables (the baseline) is done according to the Box-Jenkis method for ARIMA linear time series models, where we find that the VAR models are nothing but a generalization of the latter, and there are two types of this simple initial prediction: dynamic (DYNAMYQUE SOLUTION) as in Our case, which takes past values into account while making a forecast, and STATIC SOLUTION, which depends only on current values in forecasting

EVIEWS 12.0 allows us to obtain the predictive values (baseline) shown in the figure 4.

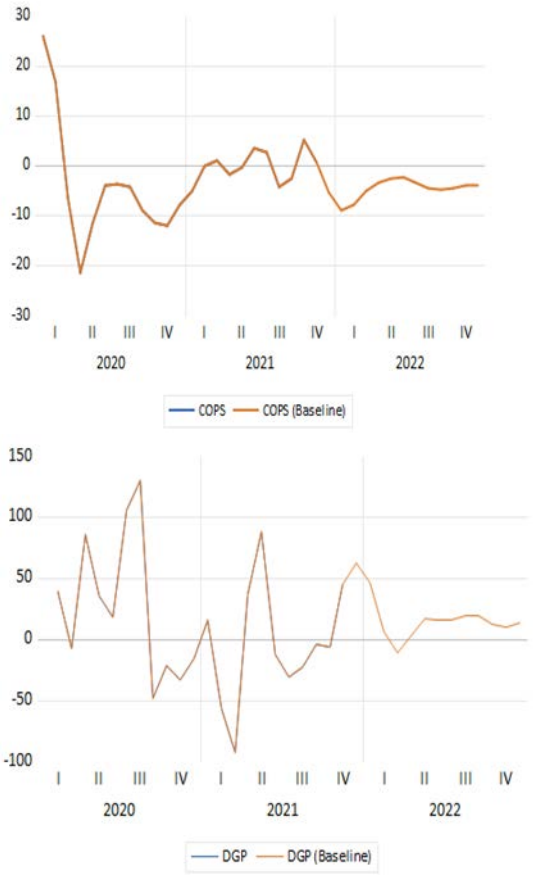

Fig. 4 : The baseline predictive values of monthly prices for gold and oil from December2021 to December 2022, Source : Authors

Generally speaking, we notice that the predictive values during the relevant period (from 12/2021 to 12/2022) with an average of -2,96 and 14.16 for oil and gold prices are stable and these are the simple predictive values (baseline).

However, during the forecast period, the values of the oil price are all negative because the predictive values are less than zero whereas the values of the gold price is positive (greater than0).

Oil prices went negative due to the effect of the Coronavirus pandemic worldwide. On the contrary, the rise in gold price during the forecast period can be attributed to the high number of infected people.

Scenario 1

A scenario can be created by making a specific change in the number of *infected* people to see its impact on the predictive values of the two internal variables (oil and gold price). For example, if we suppose that the number of infected people increased by 30% (which represents the average growth during the study period) during the forecast

period. By using the Eviews output, we can obtain the following results.

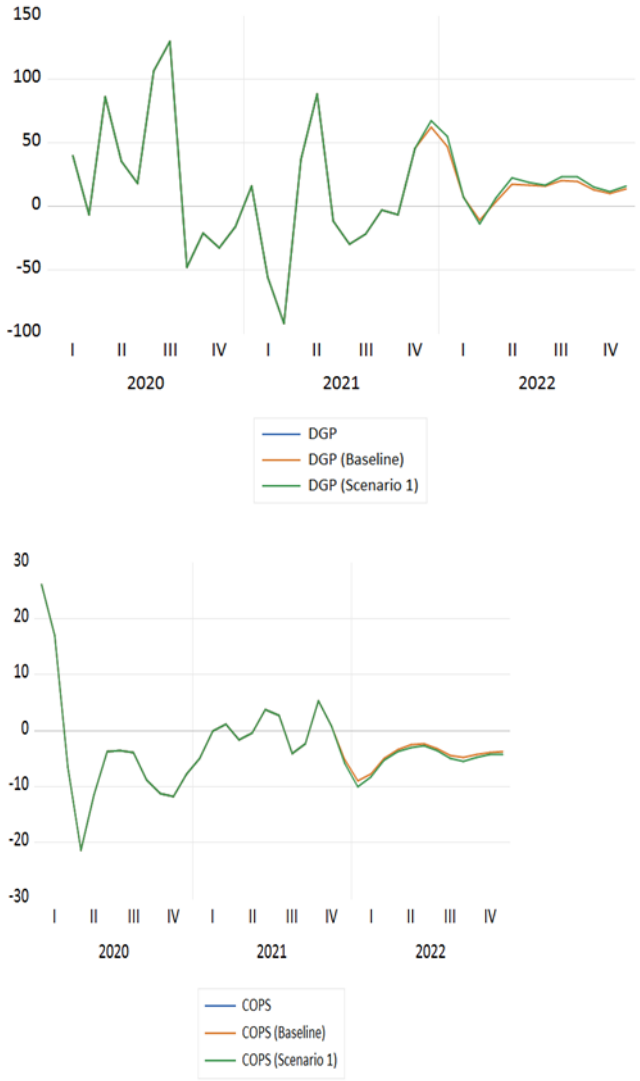

Fig. 5: Predictive values for the price of gold and oil as a result of the increase (30%) in the number of monthly-infected people. Scenario Results (Scenario 1), Source: Authors

We note that there is an increase of 30% in the number of *people with coronavirus* over the predictive values (i.e. the baseline), which will lead to a slight decrease in the monthly oil price (-3.45 dollars on average), but a small increase in the price of gold during the forecast period.

Scenario 2 : This will be totally different from the previous one. In that, it is possible to reduce the number of infected people by 30% (which represents an average growth during the study period) to see its impact on the predictive values of the two internal variables (oil and gold price).

During the same period (from 12/2021 to 12/2022) and by using the outputs of eviews, the results can be as follows.

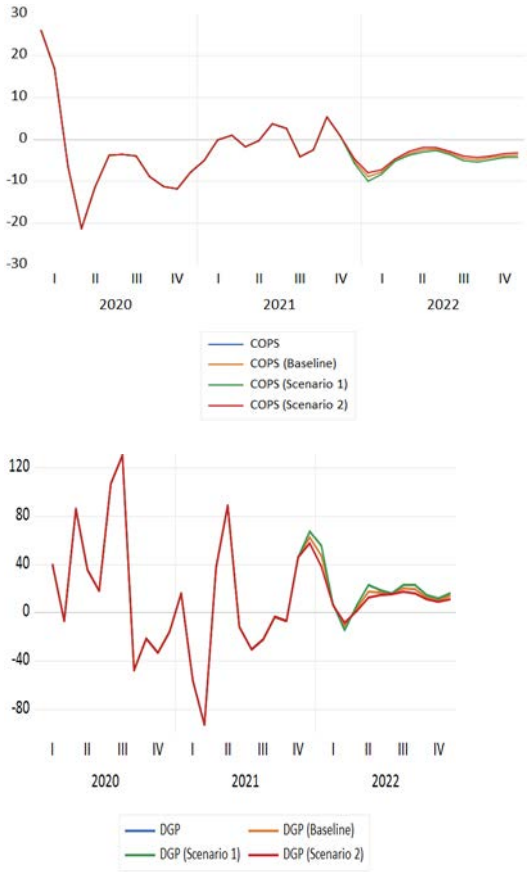

Fig. 6 : Predictive values for the price of gold and oil as a result of the decrease (30%) in the number of monthly infected people. Scenario Results (Scenario 2), Source: Authors

It is worth mentioning that, on the one hand, the decrease of 30% in the number of infected people from 12/2021 to 12/2022 will to a slight increase in the price of oil (-2, 94), which is slightly greater than the forecast standards. On the other hand, the decrease in the number of infected people will lead to a decrease in the price of gold (-2.94 on average) during the relevant period.

5 Conclusion

In this paper, we investigate the relationship between the price of gold and oil during the Covid-19 pandemic. We find that, in general, the decrease or changes in the price of gold and oil when the number of infected people changes in the different scenarios can be explained to the form of the estimated Var model, as most of the variables are not explanatory. In this regards and according to our

results, it is clear that Oil prices went negative due to the effect of the Coronavirus pandemic worldwide. On the contrary, the rise in gold price during the forecast period can be attributed to the high number of infected people.

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Annex: Vector autoregression (VAR)

Vector Autoregression Estimates
Date: 02/22/22 Time: 12:46
Sample (adjusted): 2020M04 2021M11
Included observations: 20 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	COPS	DGP
COPS(-1)	0.731285	1.112642
	(0.13340)	(2.52203)
	[5.48178]	[0.44117]
COPS(-2)	-0.458079	1.202949
	(0.09947)	(1.88054)
	[-4.60514]	[0.63968]
DGP(-1)	0.002450	0.477092
	(0.01552)	(0.29338)
	[0.15798]	[1.62620]
DGP(-2)	-0.036007	-0.161708
	(0.01560)	(0.29484)
	[-2.30881]	[-0.54847]
C	-1.686917	12.75272
	(0.86203)	(16.2969)
	[-1.95692]	[0.78252]
DNCM	-0.467063	4.131783
	(0.20274)	(3.83279)
	[-2.30381]	[1.07801]
DNCM(-1)	-0.459809	5.040837
	(0.21542)	(3.50608)
	[-2.13448]	[1.43774]
R-squared	0.851127	0.347095
Adj. R-squared	0.782416	0.045755
Sum sq. resids	116.4776	41630.61
S.E. equation	2.993296	56.58935
F-statistic	12.38708	1.151837
Log likelihood	-45.99844	-104.7874
Akaike AIC	5.299844	11.17874
Schwarz SC	5.648350	11.52724
Mean dependent	-4.185118	11.32648
S.D. dependent	6.417056	57.93016
Determinant resid covariance (dof adj.)		28689.80
Determinant resid covariance		12121.44
Log likelihood		-150.7849
Akaike information criterion		16.47849
Schwarz criterion		17.17550
Number of coefficients		14