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The global inflation cycle and the dollarisation system with the interlink with commodities: an application of the Bayesian network analysis

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Abstract: This paper investigates the dollarisation of the international monetary system within the catalyst of global inflation using the commodities under the connectedness of the selected aggregates as an intermediary within the Bayesian network model and over a time horizon during the period Q1 1984 to Q4 2020. The Bayesian network approach results reveal that energy and gold act as hedges for the financialisation of the economy and therefore for stabilising global inflation. Our findings also indicate that the capital market and cryptocurrencies do not have significant impacts on the dollarisation of the monetary system. Moreover, the findings of the study show that the significant impact of commodities stabilising the global inflation cycle seems to be significant for the dollarisation of the monetary system.

Keywords: global inflation; dollarisation; oil; gold; Bayesian network.

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1 Introduction

Within the ominence of the successive financial and non-financial crisis, the international monetary system is facing new challenges toward the general equilibrium of the economy. Dollarisation as an international monetary policy focusing on the substitution of currencies to absorb any potential crisis might arise due to macroeconomic instability. Targeting the economic system toward dollarisation might present some challenges, as it influences the volatility of exchange rates and the stability of money demand. Moreover, the dollarisation policy simultaneously references different channels for monetary policy: a high level of dollarisation brings more volatile exchange rates and a stronger pass-through from exchange rates to prices, and the interest rate channel might become weaker as holding foreign currency denominated assets makes local economic agents less sensitive to changes in interest rates on domestic currency assets (Horváth and Maino, 2006).

From the perspective of public finance, the dollarisation policy might be an effective instrument for inflation: while power spending is limited by the willingness of domestic residents to hold domestic currency, the dollarisation system precludes a government from using an inflationary tax to finance its expenditure programs (Harrison and Vymyatina, 2007). The authors find that foreign currency cash transactions can encourage tax evasion and shift the economy to underground activities.

Currency substitution allows an inflation-targeting regime to be implemented (Leiderman et al., 2006). Within that study, we focused on the impact of the dollarisation system as a policy for targeting inflation. The economic agent sticks to using the foreign currency in all its roles after inflation is bought down even to the point of sustained price stability (Calvo and Vegh, 1995). The authors explain that the lack of reversibility is known as hysteresis since the end of inflation does not necessarily ensure the end of dollarisation. According to Adenutsi and Yartey (2007), the high demand for foreign currency is a major challenge for policymakers. Although other currencies are used as store value, as units of accounts or for medium exchange, this is followed by macroeconomic instability within the volatility of inflation. Ongena et al. (2021) find that dollarisation – the widespread holding of assets and liabilities in a foreign currency – is considered a constraint on monetary policy and a source of financial stability. According to the same perspective (García-Escribano and Sosa, 2010), after the global financial crisis, policy makers emphasised the need to dedollarise deposits and loans, and monetary policy involving low and stable consumer price inflation is often considered a key ingredient in kick-start dedollarisation. Rossini et al. (2016) argue that the existence of an extended practice of keeping prices in dollars generates important complications for the objective of price stability, given the greater uncertainty about the pass-through of depreciation to inflation and about the feedback loops of these variables with inflation expectations. Within the global financial crisis of 2008, there was reconversion toward dollarisation as a policy for targeting inflation to recommend dedollarisation. However, as documented in many studies, the start of the dollarisation system within the 1990s was an optimum policy for keeping inflation down and even for sustainability. Introducing key parameters to absorb any eventual crisis that can influence the exchange rate and inflation is one of the instruments for resolving this dilemma.

We use the inflation cycle as a reference for determining its cyclical effect on the economy. The long cycle theory recommends that the trade gaps between standardised and innovative products follow a deteriorating trend (Singer, 1998). The application of this theory to commodities has produced important literature with different approaches.

The fluctuations in the long cycle and in commodities have played important roles in the variations in the intensity of use of productive inputs, where commodities such as precious metals and energy have played relevant roles. For the case of precious metals such as gold, in the expansion phase, the demand for gold increases, while in the stagnation phase, the intensity of demand and prices decrease. The same is true for the case of energy and the financial market.

The link between oil, as a main key for the financial sphere, and the real sphere has been documented in several studies on the impact of the volatility of pricing oil on the business cycle. The commodity prices are considered from the same perspective as demand. Within the expansion phase, competition for commodity products such as gold and energy tends to increase prices compared to manufacturing goods, and the introduction of innovation as an imitation reduces opportunities for investment in obtaining economic rents, decreasing demand for commodities.

A boom in commodity prices has an increasing effect in the short run on real GDP by increasing value and production and increasing demand for ancillary goods and services. An increase in investment in resources, such as metal or energy, may increase potential output, which in turn boosts financial resources for investment in other sectors. In Corden (1984), the positive term trade and income shock associated with the commodity boom shifted production out of non-commodity tradable sectors and into non-tradable service sectors with lower productivity. The global economic crisis starting in 2012 was the result of a boom in commodity prices characterised by unprecedented magnitude and duration; as the price reached the highest level in history, this phase was characterised as a phase of mineral boom. Gold is a traded asset globally as an alternative investment class to the ordinary portfolio comprising stocks and bonds. Baur and McDermott (2010) argue that gold is a stabilising factor for the financial system since it minimises losses for market participants and portfolio managers in the event of negative market shocks. Apergis and Eleftheriou (2016) found that the business cycle asymmetrically affects gold returns, while these returns respond more strongly during the recessionary than during the booming phases of the cycle.

Within the last decade, after the oil shocks petroleum crisis, the constraint of adjustment within the capital market has probably had less influence on the size and level of stock trading, which, for some countries, targeted their policies for the optimum arrangements for their portfolios. Policy economic makers must make decisions on the volume and pricing of oil with the desired level of oil revenues and their use (consumer goods, investment goods, and financial investments). Schumpeter is among the economists who reject the frame that the decline in prices might be a result of a slow-down in terms of output and growth, as he explains within the Great Recession (1878–1896) for the case of a decrease in price due to a decrease in the production of gold, which results in a profit squeeze and a decrease in investment. From the same perspective as Schumpeter, for the economic phase of commodities and manufactured goods in the business cycle, we find Prebisch (1950), Singer (1950), Ocampo (1986) and Ocampo and Parra (2003) as prominent studies of commodity prices and business cycles. Basically, we are referring to sorting out this dilemma of the cyclicity of inflation within the context of the dollarisation system.

Within this paper, we look to examine how inflation can be indexed for the pricing of oil and gold within a dollarisation system to ensure its sustainability. The international comovement of inflation can be caused by global prices for commodities, a global business cycle, or the high importance of the US dollar (Ciccarelli and Mojon, 2010). Therefore, 'global inflation' is determined to be a common factor in the dynamics of the domestic inflation process in different countries (Kiselev and Zhivaykina, 2020). Using the Bayesian network methodology, this paper aims to provide a framework for studying the interaction effects of energy, gold and the stock market on global inflation to ensure a sustainable level of inflation in the dollarisation era.

The rest of the paper is organised as follows: in Section 2, we discuss how the paper fits into the literature. In Section 3, we describe the dataset used in this paper and examine the cyclicity of global inflation within shock impulsions on selected commodities, such as oil, gold, global assets and cryptocurrencies. In Section 4, we introduce the main model used in this study, namely, the Bayesian network. The calibration techniques and inference methodology used are briefly presented. Section 5 reports the obtained results, including the calibrated model and the inference-based analysis. Section 6 is devoted to the implications of the model for global inflation. Section 7 contains concluding remarks.

2 Related literature

A literature review examining the relationships between global inflation and commodities and between the synchronisation of the global inflation cycle and the business cycle is quite extensive. Determining that dollarisation is a solution for ensuring the stability of global inflation through the pricing of commodities is a dilemma that has been resolved differently through the literature.

Ongena et al. (2021) find that the supply of bank credit in a foreign currency is less sensitive to exchanges in domestic monetary conditions than to the equivalent supply in domestic currency. From the same perspective, Keefe and Rengifo (2019) study the currency option price as a powerful tool for determining market expectations of volatility in currencies using the implied volatility measure. The author determined that the option price can provide insight into market expectations of interest rates and that the adoption of inflation targeting strengthens the relationship between market expectations and inflation and that shocks in interest rates and inflation lead to higher interest rates. The antagonistic point about dollarisation in emerging countries proved that the dollarisation of deposits has a consistent and negative impact on financial deepening except in high-inflation economies (Court et al., 2022).

Conversely, Harrison and Vymyatina (2007) find an ongoing decline in currency substitution, a shift that has important implications for Russian monetary policy, such as the rate of inflation and the rate of output change. Accordingly, Contreras et al. (2019) determine via data for Peru that credit dollarisation in the banking system creates systemic exposure to risk that materialises due to a currency mismatch of borrowers when the exchange rate depreciates. The authors find that a heterogeneous impact of dedollarisation is identified by loan size, where banks prefer to substitute larger loans from foreign to domestic currency. By examining the dollarisation of prices in the retail markets of emerging inflationary economies, Drenik and Perez (2021) find that price

dollarisation is positively correlated with asset dollarisation and inflation and negatively correlated with exchange rate volatility.

Sorting out this dilemma of dollarisation through maintaining a sustainable inflation target through pricing commodities might lead to very important studies treating this topic. Thai-Ha and Youngho (2011) investigate the relationship between oil and gold and financial variables such as interest rate exchange rate and stock price and find that the price of gold and stock, among others, can help form expectations of higher inflation over time. Orlowski (2017) shows the strong causal impact of shocks on breakeven inflation and Brent crude oil, and the prices of Brent crude oil and gold futures move in the opposite direction to the market, implying inflation. Oil and gold are interlinked through the inflationary channel, and an increase in oil prices is often linked to greater transportation and production costs, greater inflationary pressure on oil importing countries and consequently positive pressure on gold prices to hedge against oil-originating inflation. Semeyutin et al. (2021) examine the effect of systematic and idiosyncratic jumps on intraday correlation portfolio allocation decisions and diversification benefits. The authors find that risk-averse investors' gold portfolio allocations are not affected by cojumps and are free from non-diversifiable risk in the oil and copper markets. Gokmenoglu and Fazlollahi (2015) find that in the long run, between gold oil and the SP500, the results reveal that the SP500 price index converges to its long-run equilibrium level, which is a 1.2% speed of daily adjustment by the contribution of oil and gold market prices and their volatilities.

The gold price has the highest impact on stock prices in the long run and short run. Gold can substitute for stocks for investors as much as it is more available, and they can hedge themselves against inflation. In that paper, I determine that the pricing of commodities is a way for dollarisation to maintain a sustainable inflation level. Numerous studies have studied the problem differently, directly and indirectly, using different approaches. Our contribution in this paper is to use the Bayesian network to differentiate the interconnections among the commodities that influence the global inflation cycle and maintain synchronisation with the global business cycle. In this context, the Bayesian network is a suitable framework for our research question since it accounts for the interdependence between variables using a graphical representation of a probabilistic model that encodes a set of conditional independence relationships.

3 The data

The dataset is composed of quarterly observations of the following variables from Q1 1984 to Q4 2020: the global GDP, global consumption, global investment, global inflation, the gold price in dollars, the oil WTI, global assets and cryptocurrencies.

All the variables are normalised using the log transformation. Table 1 displays the statistical summary of each variable.

Table 1 Descriptive analysis of the data

	Min	*1st Q*	*Median*	*3rd Q*	*Max*
GlobalConsumption	15.24	15.52	15.82	15.80	16.08
GlobalInvestment	14.19	14.53	14.87	15.23	15.57
GlobalGDP	14.90	15.67	15.97	16.73	16.94
GlobalCPI	2.028	3.396	4.291	4.661	4.951
Gold	5.552	5.852	6.031	7.080	7.543
WTIcrudeOil	2.415	2.935	3.380	4.131	4.799
GlobalAssets	3.579	4.512	5.353	5.750	6.774
Crypto	4.089	5.143	6.479	7.677	8.396
Crisis	Count 148	Unique 2	Top 0	Freq 130	

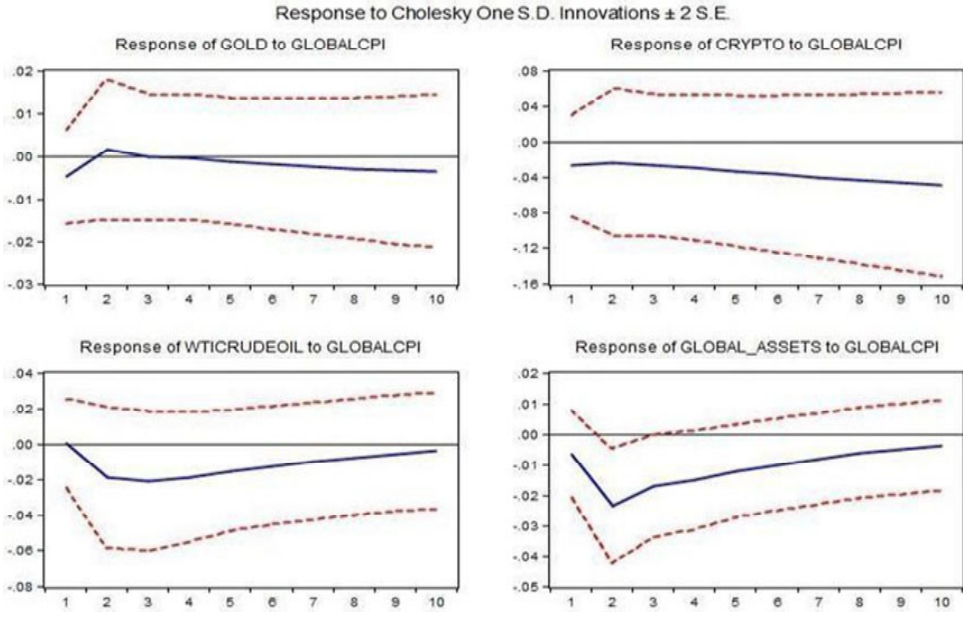
Source: Estimated authors based on the data from Datastream

The discrete Bayesian network was built to examine the inflation global system in a dollarised era using hidden components of commodities such as oil, gold and stock market assets within the ominence of cryptocurrencies. This approach is a statistical method and not an econometric approach, for which we do not need to present several econometric tests, such as the unit root test. This method is innovative for macroeconomic studies on the global business cycle and the global inflation cycle. The SAMLAM program will be used for the manipulation of this model. The abovementioned measured datasets contain continuous variables that were discretised as follows:

- global GDP: (low: <14.95232), (medium: >15.00666, <15.97845) and (high: >16.01575)
- global consumption: (low: <15.59588), (medium: >15.60681, <15.99872) and (high:16.00575)
- global investment: (low: <14.63072), (medium: >14.64433, <15.06266) and (high: 15.0993)
- global CPI: (low: <3.988614), (medium: >4.010514, <4.376812) and (high: >4.41432)
- gold: (low: <5.962293), (medium: >6.36647, <6.991637) and (high: >7.017058)
- WTI crude oil: (low: <2.999874), (medium: >3.025922, <3.953357) and (high: >4.001132)
- global assets: (low: <4.568175), (medium: >4.607477, <5.558588), and (high: >5.608388).

The discretisation of the variable is a primary and fundamental step in the application of the Bayesian network methodology. The choice of the value for each discretised variable is based on the comparison of the variables over time, as it is time-date data. We compare each variable and found that the lowest value was the lowest state, the highest value was the highest state, and the same was true for the medium state.

Figure 1 Accumulated response of commodity prices to a shock in global inflation (see online version for colours)



Source: Author's calculation

4 The interaction between global inflation and commodities

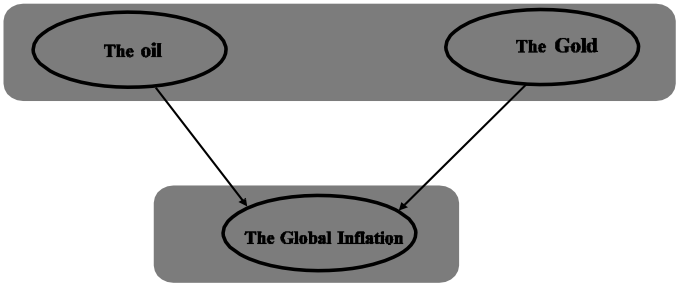
With the aim of assisting the proper design of our analytical model reflecting the comovement between global inflation and commodities, the purpose of this study is to provide a new framework for macroeconomic theory in which energy plays a catalyst role as well as other commodities in commanding macroeconomic cyclicity, even though we start our analysis of causal interactions between these variables. For this purpose, from the BVAR5[1] system, we derive an impulse response function that shows the diffusion of lagged responses of individual variables to a Cholesky one-standard-deviation shock[2] in each of these variables. We choose ten lagged terms in the BVAR system. IRFs are calculated by first simulating the model with a series of draws of zero shocks for ten periods. We then introduce a single shock and let the model gradually return to the stochastic steady state conditional on the series of draws of zero shocks. In Figure 1, we show the accumulated response of commodity prices to a shock in global inflation. The accumulated impulse responses shown in the graph are for crude oil, gold, global assets, and cryptocurrencies. Within the graph, there is clear evidence that changes in commodities respond to shocks in the selected commodities, and causal reactions are pronounced. Our analysis revealed opposite trends in the response of oil and gold throughout the study period. Crude oil has a strong negative response to global inflation, which tends to be positive. This means that one positive standard deviation shock in global inflation tends to drive down crude oil prices with a decreasing trend over time until neutrality is reached. However, for the case of gold, one positive standard

deviation shock in global inflation tends to drive gold prices down, with a trend toward a greater decrease over time. Our analysis proves that there is an opposite relationship between oil and gold when commanding the monetary system. The reaction of the global asset is strong and similar to that of crude oil. This finding confirms our reasonable ability to use the proposed model to test the interactions between commodities and global inflation as the main dilemma for a monetary system sorting through cryptocurrencies or digital money.

5 Methodology

Probabilistic graphical models are widely used to model real-world issues. They were implemented in several fields to measure risk uncertainty, systemic risk, reasoning, etc. The Bayesian network is a probabilistic graphical model that consists of a given set of random variables in a probability distribution and directed acyclic graph (DAG). The Bayesian network has been introduced for several complex phenomena as a suitable tool for analysing dilemmas. Within our study, we propose to address the dilemma of dollarisation within the global inflation system through commodities as well as digital money. Before proceeding to the theory of the model formally as well as to the application of the model in our study through the calculation of several probabilities, we will statistically illustrate a small part of the studied dilemma.

Figure 2 The interlink between the global inflation, the oil and the gold



Within the global inflation cycle, we have a cyclicity that contradicts the cyclicity of an inflation per country. We would like to know what the reasons for such cyclicity could be. On a submodel, we assume that there are only two causes, namely, the oil energy cyclicity, O, and the gold cyclicity, G, to the observation of the global inflation cyclicity 'I'. Figure 1 is a representation of the graphical structure of the causal model we have assumed. Referring to the explaining example (Cowell et al., 2001), we assume that O occurs with probability ($O = true$) = 0.1, and G, occurs with probability ($G = true$) = 0.2. We assume that (O, G) = (O). (G) holds (O and G are independent). Also assume that there is neutrality of the volatility of oil and gold towards the global inflation cycle, then with ($I = true|O = false$, G = *false*). We assume that if there is a dependence between the volatility of the oil and gold and the global inflation cycle, i.e., ($I = true|O = true$, $G = false$) = 1 and ($I = true|O = true$, $G = true$) = 1.

Given the below assumption we can calculate the priori probability ($Inf = true$) using marginalisation.

$$P(I = True) = \sum_{O,G} P[Inf = true, O, G] = \sum_{O,G} P(Inf = true | O, G) \cdot P(O) \cdot P(G)$$

Based on this result we can calculate the probability distribution of the unobserved causes given observed evidence. For calculating that there has been oil volatility dependence (unobserved cause) given that global inflation cycle keep their trend.

$$(O = true | Inf = true) = \sum_{O} (O = true, G | Inf = true) \quad \text{Marginalisation}$$

$$= \sum \frac{P(O = true | Inf = true, G) \cdot P(O = true) \cdot (G)}{P(Inf = true)} \quad \text{Bayes theorem}$$

To determine whether there is a gold volatility dependence (unobserved cause), given that global inflation cycle maintain their trend.

$$(G = true | Inf = true) = \sum_{G} (G = true, O | Inf = true) \quad \text{Marginalisation}$$

$$= \sum \frac{P(O = true | Inf = true, G) \cdot P(O = true) \cdot (G)}{P(Inf = true)} \quad \text{Bayes theorem}$$

Within the same explanation, we apply it to the case of on a submodel of global inflation cycle, as shown in Figure 2, we assume that there are only two causes – the global assets cyclicity A and the cryptocurrencies cyclicity C – for the observation of the global inflation cyclicity.

- *Observed causes*

$$P(Inf = true) = \sum_{A,C} P[Inf = true, A, C] = \sum_{O,G} P(Inf = true | A, C) \cdot P(A) \cdot P(C)$$

- *Unobserved causes*

  Global asset volatility dependence (unobserved cause) exists given that the global inflation cycle maintains its trend.

$$(A = true | Inf = true) = \sum_{C} (A = true, C | Inf = true) \quad \text{Marginalisation}$$

$$= \sum \frac{P(Inf = true | A, C = true) \cdot P(A = true) \cdot (C)}{P(Inf = true)} \quad \text{Bayes theorem}$$

  For calculating that there has been cryptocurrencies, volatility dependence (unobserved cause) given that global inflation cycle keep their trend.

$$(C = true | Inf = true) = \sum_{A} (A, C = true | Inf = true) \quad \text{Marginalisation}$$

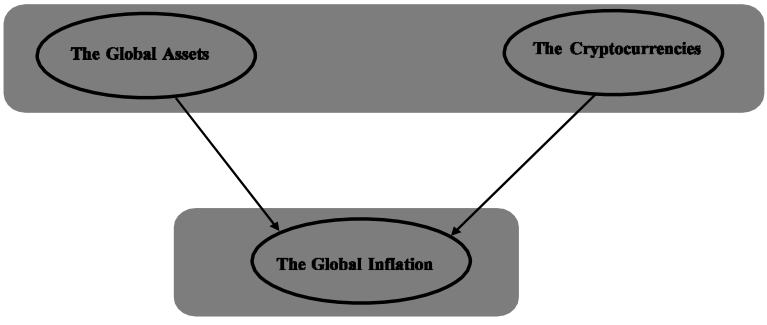
$$= \sum \frac{P(Inf = true | A, C = true) \cdot P(C = true) \cdot (A)}{P(Inf = true)} \quad \text{Bayes theorem}$$

Formally, the Bayesian network is a pair $B = (G, P)$ here

- $G = (X, E)$ is directed a cyclic graph with nodes set $X = (X_1, \ldots, X_d)$.
- P is joint probability distribution over the random variable in X, given by:

$$(X_1, \ldots, X_d) = \prod_{i=1}^{d} \left[X_i \left| (X_i) \right. \right] \tag{1}$$

Figure 3 The interlink between the global inflation, the financial market and the cryptocurrencies



A discrete Bayesian network $B = (G, P)$ is a Bayesian network whose nodes are discrete random variables taking a finite number of values. Each node of X_i of the graph structure takes r_i possible value encoded a 1, 2, …, r_i and $\theta_{ijk} = P(X_i = k|(X_i) = j)$ is the probability of observing the node X_i in the state k given that it parent are in the state j. The main challenge when using a Bayesian network with real datasets is to calibrate the model by identifying the most appropriate directed acyclic graph and the most likely parameters. Using the calibrated Bayesian network, one can perform the inference task to answer several questions related to the studied phenomena. Learning a Bayesian network from data consists of two tasks: structure learning, i.e., finding the directed acyclic graph that best fits the conditional independence relationships induced by the data, and parameter learning, i.e., estimating the set of conditional probabilities θ_{ijk}.

In practice, we rely on learning algorithms for which we use both available data and expert's ability to construct the Bayesian network. Within this paper, we use the phase restricted maximisation for structure learning, whereas a likelihood-based approach is used for parameter learning, namely, maximum a posteriori (MAP) estimation. Within this approach, the estimation relies on the dataset D and a prior distribution of the parameters. In fact, denoting by N_{ijk} the number of times X_i is observed in the state k and its parents with configuration j in the considered dataset D and introducing a set of prior parameters $a = (a_{ijk})$. Each parameter a_{ijk} can be seen as the number of times X_i is observed in the state k and its parents having the configuration j in an imaginary sample. Thu, the MAP estimator is given by the following formula:

$$\theta_{ijk} = \frac{N_{ijk} + \alpha_{ijk} - 1}{\sum_{k=1}^{\hat{n}} \left(N_{ijk} + \alpha_{ijk} - 1 \right)} \tag{2}$$

Within our study, we consider the following graph with nine nodes X_1 referred to crisis, X_2 referred to global GDP, X_3 referred to global CPI, X_4 referred global consumption, X_5 referred to global investment, X_6 referred to oil, X_7 referred to gold, X_8 referred to global assets and X_9 referred to cryptocurrencies.

The inference task in a Bayesian network consist in computing the conditional probability here $(X|E = e)$ here E is a subset of observed variables taking the value e.

6 Results

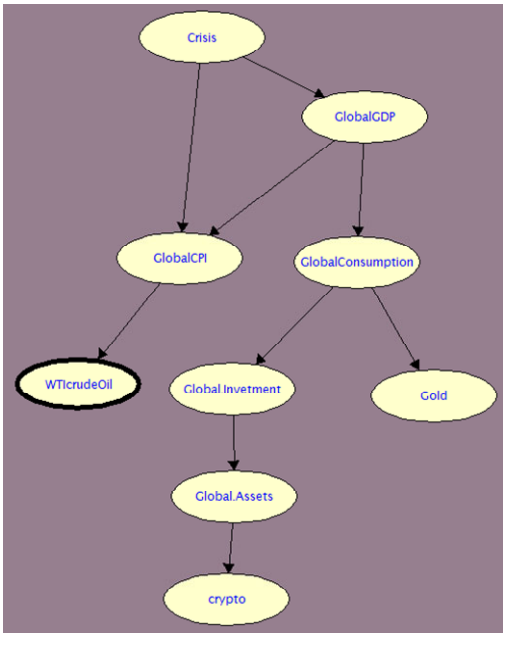
Using the dataset described in Section. We are going to make the analysis of the result basic on the Bayesian Network methodology for the selected variables to treat the impact of the cyclicity of the global inflation on the commodities and the transfer effect to the other marco-aggregates such as the global GDP, the global consumption and the global investment.

6.1 Structure learning

6.1.1 Algorithm hill-climbing

The estimated structure is displayed in Figure 1. The figure was generated by the algorithm constructed by SAMIAM. According to this algorithm, the CPI is connected directly to the oil price, and gold is connected to the CPI through the nodes connecting consumption and the CPI; from the same perspective, stock market assets are connected to the CPI through the node connecting global GDP, global consumption and global investment. In the second step, which relies on the adopted structure of the algorithm, discrete data were used to estimate the Bayesian network parameters by applying the Bayesian method with a uniform prior. Figure 1 displays the conditional probabilities for each node. These conditional probabilities were used to perform several inference tasks.

Figure 4 Calibrated Bayesian network structure for modelling global inflation cyclicity in a dollarised environment (see online version for colours)



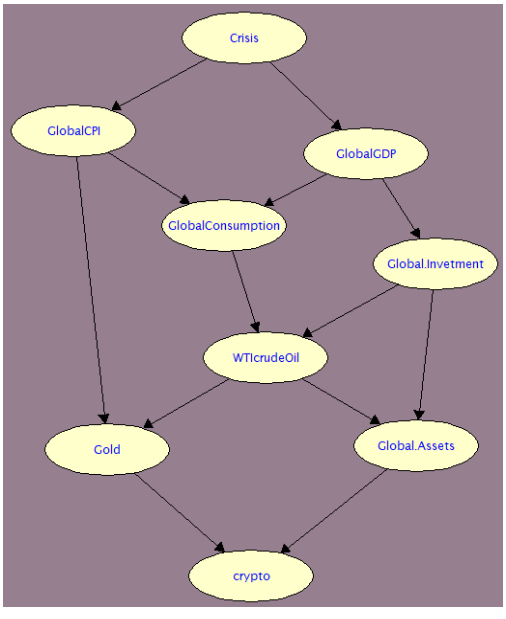
Note: The graph connects the eight selected factors and expresses marginal probabilities given the model.

Source: Author's calculation

The sorting out of the hill-climbing algorithm has given results that contradict economic theories, as some nodes are not compatible with the economic cycle.

Within the model, crude oil directly influences inflation, and inflation is the intermediary between crude oil and other aggregates, such as GDP, consumption and investment. This proves that the energy sector is financialised and is acting as a catalyst for stabilising the economy. However, gold is interlinked directly with consumption, confirming that gold is used as a hedge funding for goods and services within the economic cycle within the realm of the economy, with gold serving as the value of the money. The cryptocurrencies acted directly on the investment through the financial market. Cryptocurrencies and gold acted directly on the economic cycle motif of investment and consumption, which entered the economy within the digitalisation of the economic system era. The conditional probabilities were computed using the Samlam program. These probabilities were used to perform several inference tasks. The marginal probability distributions induced by the calibrated Bayesian network are displayed in Figure 4.

Figure 5 Calibrated Bayesian network structure for modelling global inflation cyclicity in a dollarised environment (see online version for colours)



Note: The graph connects the eight selected factors and expresses marginal probabilities given the model.

Source: Author's calculation

6.1.2 The knowledge-based structure

The estimated structure in Figure 5, it displayed based on the different basic economic theories treating the relation between the selected variables in the knowledge-based structure diagram. Within that model, oil directly influences investment and consumption, as shown in the studies of Yin and Feng (2019). The relation between gold

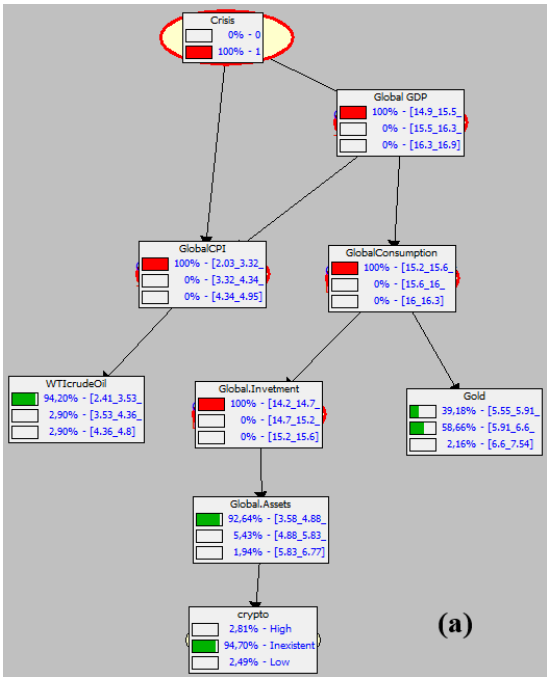
and inflation was studied by Hoang et al. (2016). The nodes between gold, the financial market and cryptocurrencies are studied by Saleuddin and Coffman (2018). The conditional probability was computed for each node using the Samlam program, as shown in Figure 5.

6.2 Inference and scenarios analysis

6.2.1 Result given by the algorithm-based graph

Using the calibrated Bayesian network, the main aim was to provide answers to various commodity inflation-related questions. This is achieved using the Samlam program, which provides a user-friendly interface and allows inference to be made. Within that study, we chose five scenarios, as shown in Figure 6. The first question is given in Figure 6: what is the impact of the slowdown economy resulting from all the selected macroaggregates on the cyclicity of the commodities? [Figure 6(a)]. In response, the oil is resistant to the peak economy by assimilating all the systems compared to the other commodities, with a probability of 0.6324. The second question is as follows: what is the impact of the expansion economy resulting from all the selected macroaggregates on the cyclicity of the commodities? [Figure 6(b)]. In response, the oil and the financial markets had a deep positive impact on and integration, with values of 0.942 and 0.9264, respectively. The gold is marked by 0.399, however, with a neutral impact on the crypto. This is explained by the embryonic phasis of digital money in front of any high peak economy, which might be directly influenced by main commodities such as oil, gold and the financial market. To perform a more in-depth analysis of the dollarisation system, we address different scenarios with different questions. The third question is what is the impact of consumption and global GDP when there is a high peak in investment, the financial market and cryptocurrencies? [Figure 6(c)]. As a response, the global investment and the financial market are interacting with a probability medium of 0.3075 and 0.463, respectively, and cryptocurrencies register a high probability of 0.228. This finding confirms that the global system tends to financialise the economy through the financial market and through cryptocurrencies, but this trend has occurred very slowly, which means that the economy relies on other commodities to dollarise its economy. The fourth question is useful because the scenario deals with the impact of gold and oil on the GDP, consumption and investment [Figure 6(d)]. We determine a very good response toward a slowdown economy by a probability of medium 0.632; however, gold did not realise a good interaction for that case by making a 0.104 probability medium. This confirms that the size and power of the oil are greater than those of the energy sector and that the oil is the main driver of economic systems and assimilators for any peak. The fifth question concerns the impact on GDP, investment and consumption when inflation and all commodities are in the medium case [Figure 6(e)]. A response confirms the result of the previous scenarios, as all the macroeconomic aggregates react with medium cases within a probability ranging between 0.91 and 0.84. Commodities control the economic system and manage the ability to target any economic policy toward any peak from any macroeconomic aggregate, whether during a crisis or no crisis. Inflation is one of the main instruments of monetary policy used to manage other aggregates. The dollarisation of the economic system through inflation and gold, as it is directly related to the other commodities, might lead to a policy that controls the value of money and manages the capacity to assimilate any recession.

Figure 6 Different scenarios for global inflation and different selected commodities, (a, b) emphasise the effect of commodities on macroaggregates (c, d, e) forecast the impact on macroaggregates under gathered-ort conditions at different commodity levels (see online version for colours)



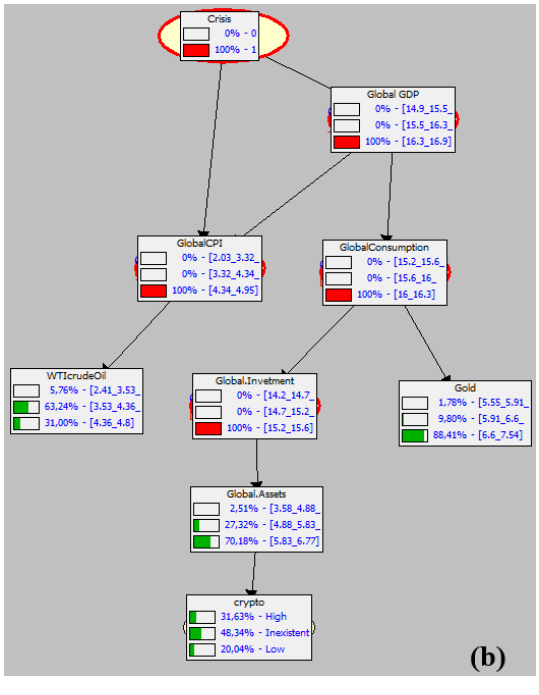
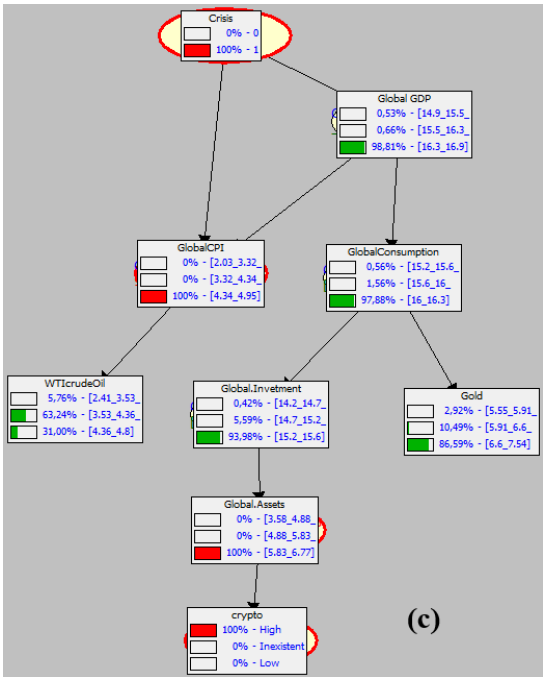


Figure 6 Different scenarios for global inflation and different selected commodities, (a, b) emphasise the effect of commodities on macroaggregates (c, d, e) forecast the impact on macroaggregates under gathered-ort conditions at different commodity levels (continued) (see online version for colours)



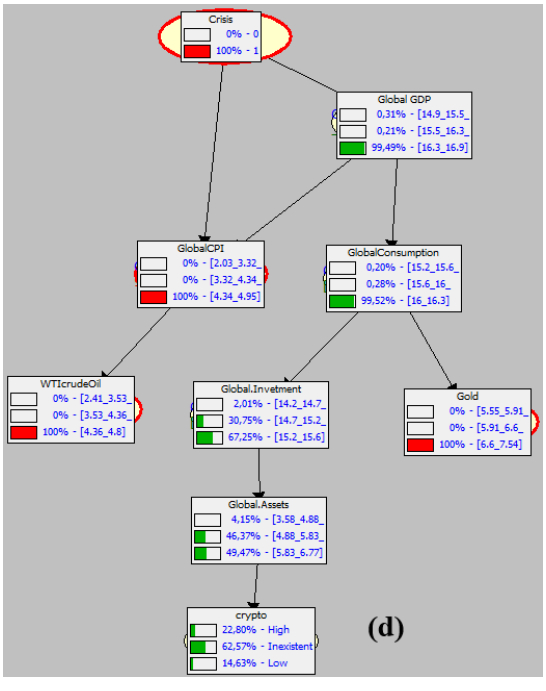
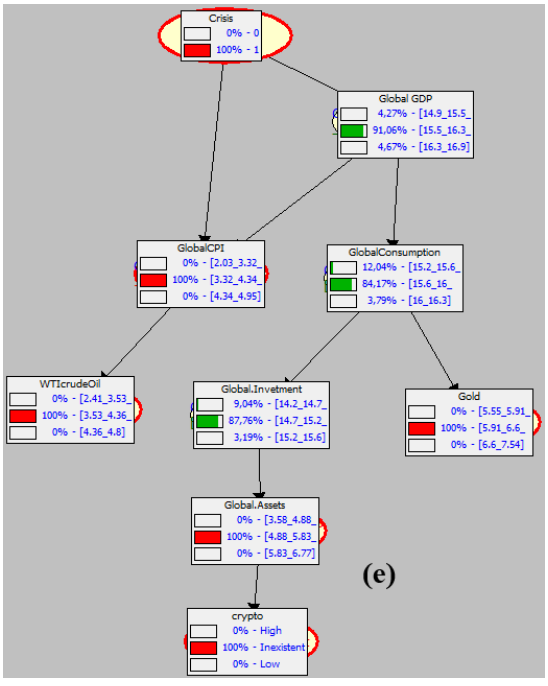


Figure 6 Different scenarios for global inflation and different selected commodities, (a, b) emphasise the effect of commodities on macroaggregates (c, d, e) forecast the impact on macroaggregates under gathered-ort conditions at different commodity levels (continued) (see online version for colours)



Source: Author calculation

6.2.2 Knowledge-based structure

Within the knowledge-based structure, we use five scenarios with the calibrated Bayesian network to answer other questions different from those of the scenarios of the hill climbing algorithm. We investigate the five scenarios given in Figure 7, which are chosen for answering the main problems that we are looking for to provide insights into. The first scenario concerns the impact of the slowdown economy for the selected commodities [Figure 7(a)]. As a response, we find similar resistances between the oil and cryptocurrencies with medium levels and probabilities of 0.55 and 0.5, respectively. However, gold and the financial market interact toward this circumstance, as shown by the medium case, with probabilities of 0.18 and 0.27, respectively. This provides a new understanding of our results when comparing previous algorithm scenarios, as the knowledge-based structure more closely aligns with economic theory standards because financial integration within the real sphere tends to be more accentuated than previous standard economic policies by tending to target the economy to rely on digital money as a way to finance the energy sector to absorb any peak. The second question addresses the impact of the high level of macroagregates on commodities [Figure 7(b)]. As a response, the commodities react at a high level, with the exception of cryptocurrencies, which do not show any response. The energy, gold and financial markets have high probabilities of 0.984, 0.451, and 0.941, respectively. This finding confirms that within such a status of

development of digital money, the economic system relies on digital money just within the peak or down cycle, as it is in the embryonic phases. The third question addresses the following: what is the impact on the macroagregates when inflation, the oil, and the gold are in low status? [Figure 7(c)]. As a response, the GDP, investment and consumption exhibit a slowdown cycle with probabilities of 0.772, 0.6, and 0.788, respectively. The financial market and the cryptocurrencies reacting with a low level are 0.253 and 0.112, respectively, as probabilities. In the economy, I rely on gold as a hedge fund for money to protect its value. Moreover, energy is playing a catalyst role in the financialisation of the economy. The fourth question is as follows: Hat I, what is the impact of inflation and the financial market at a low level and cryptocurrencies at a high level on macroaggregates and commodities? [Figure 7(d)]. As a response, the economy is reacting at a deeper downward level (probability 0.8, 0.78, 0.75, 0.24, and 0.92, respectively), demonstrating the importance of the money and the importance of the financial market within the economy and confirming that the real sphere is connected to the monetary sphere and relies on the hedge fund to absorb any uncertainties. The fifth question addresses the impact on GDP, consumption and investment when inflation and commodities are at a medium level [Figure 7(e)]. As a response, the GDP and consumption are reacting at a deep low level with probabilities of 0.629 and 0.383, respectively, while investment is reacting at a medium level with a probability of 0.923. This confirms the previous results that inflation is a catalyst for the economic system through the use of commodities for the dollarisation of the economic system.

Figure 7 Different scenarios for global inflation and different selected commodities, (a, b) emphasise the effect of commodities on macroaggregates (c, d, e) forecast the impact on macroaggregates under gathered conditions at different commodity levels (see online version for colours)

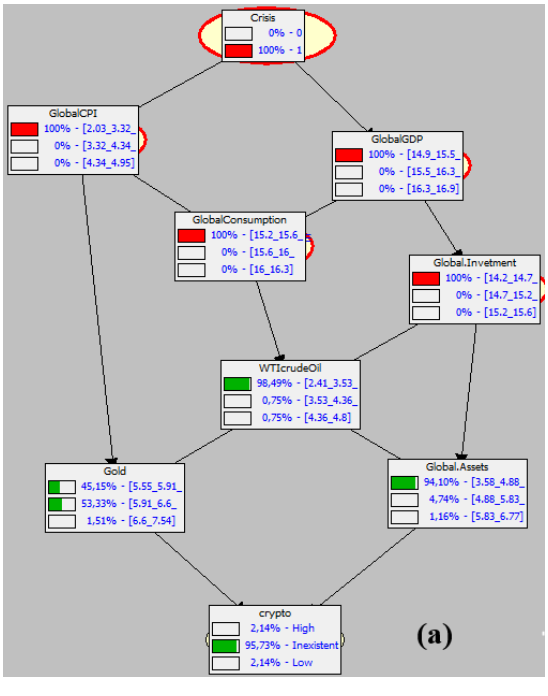
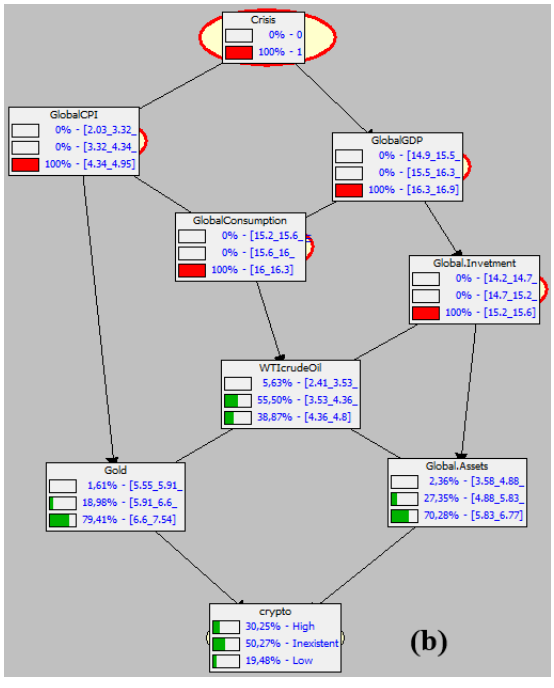


Figure 7 Different scenarios for global inflation and different selected commodities, (a, b) emphasise the effect of commodities on macroaggregates (c, d, e) forecast the impact on macroaggregates under gathered conditions at different commodity levels (continued) (see online version for colours)



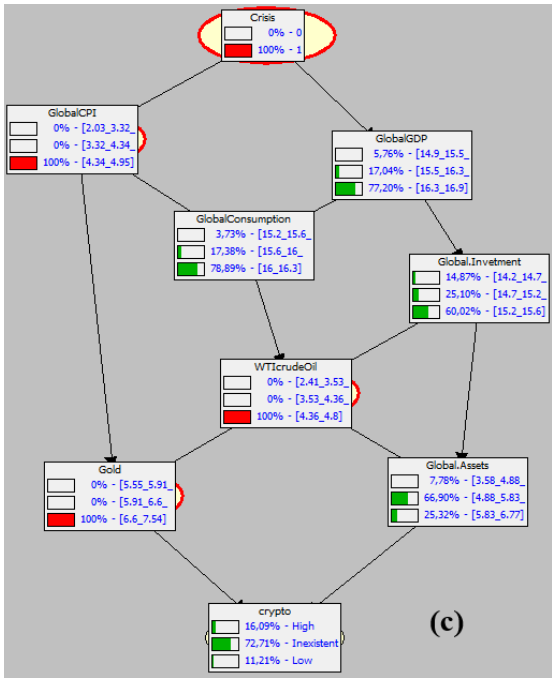
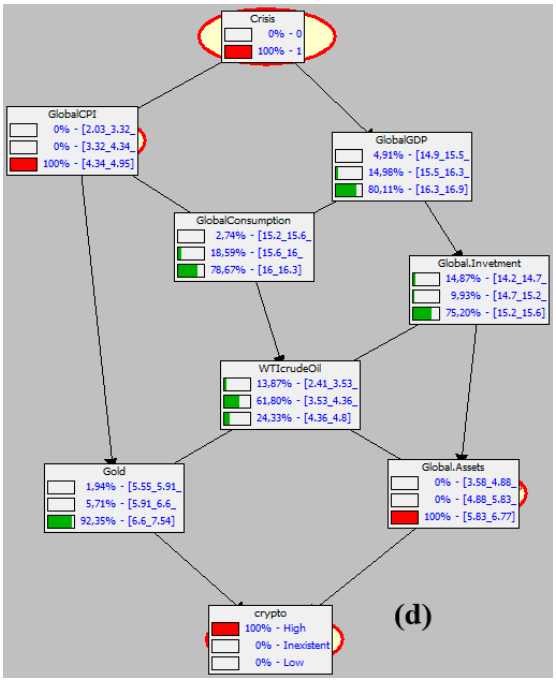
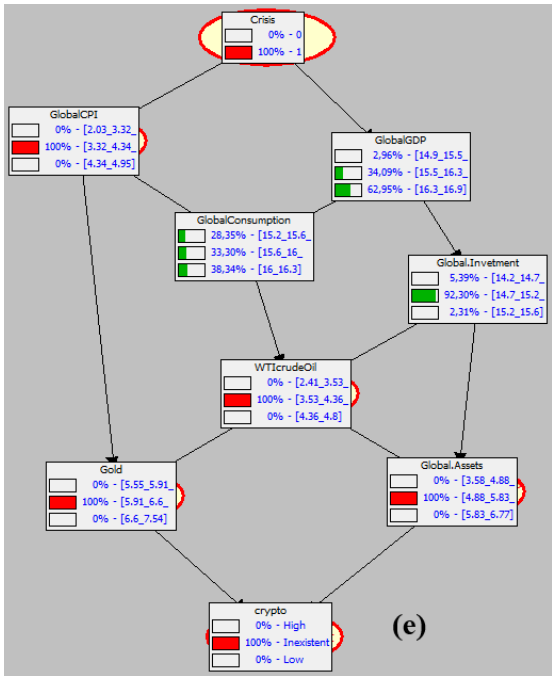


Figure 7 Different scenarios for global inflation and different selected commodities, (a, b) emphasise the effect of commodities on macroaggregates (c, d, e) forecast the impact on macroaggregates under gathered conditions at different commodity levels (continued) (see online version for colours)





7 Conclusions

The dollarisation system is a policy that is targeted by the majority of policy makers, as it is one of the currencies that can stabilise the monetary system. The stabilisation of the monetary system might lead to stabilised inflation, which can also benefit the economy through other rules, such as economic growth. To bring that to the realm of the economic system, the hedging of commodities might be an intermediary between the monetary system and the targeted policy, such as dollarisation. In this study, the Bayesian network is used to detect the interconnectedness between the selected commodities and the macroeconomic aggregates. We constructed an algorithm structure and a proposed structure by the expert. The different scenarios applied for both structures result in results that can be interpreted as significant. The introduction of cryptocurrencies has a non-significant impact on dollarisation, as it has on embryonic phasis. Cryptocurrencies might have a clear influence on the cyclicity of the global inflation cycle; however, within the present, our method and analysis prove that cryptocurrencies do not have a clear influence on managing a combined impact on inflation. At the same time, the international financial market cannot have a similar impact as much as might the important impact of inflation per country. However, our model highlights gold and energy as catalysts for the stabilisation of the monetary system through hedging. Therefore, the financialisation of commodities such as gold and oil can target monetary policy toward the dollarisation of the international monetary system. The recognition of these findings might shed light on monetary policy in the new era, as these new instruments are commodities that play a definite role in the inflation cycle and the dollarisation of the system. To this end, there are many options, as shown in the results of the model, but all of these options are based on the same requirements, such as reactions to shocks. This is perhaps the most immediate challenge facing a monetary policy targeted toward dollarisation. Our results are new compared to those of the literature and reveal new features within macroeconomic theory in which macroeconomic aggregates might be analysed through another frame to develop more effective targeted macroeconomic policies.

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Notes

1 *BVAR5:* BVAR allows one to construct a response when disturbances are identified with a number of schemes. The e baseline function for generating the impulse response function is [*BVAR*] = *bvar* – (*y*, *lags*, *options*).

2 *Cholesky one-standard-deviation shock:* the Cholesky decomposition assumes a recursive ordering so that the disturbance to the first variable is predetermined relative to the disturbance to the variable following in the order.