Monetary policy, uncertainty and COVID-19

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Abstract

The COVID-19 pandemic is influencing the management of monetary policy in its role as regulator of aggregate demand and guarantor of macroeconomic stability. We use a Bayesian VAR framework (BVAR) to provide an analysis of the COVID-19 uncertainty shock on the economy and monetary policy response. This analysis shows important conclusions. The uncertainty effect of COVID-19 hits unprecedented aggregate demand and the economy. In addition, it undermines monetary policy action to soften this fall in aggregate demand and curb inflation impacted by the exchange rate effect. We suggest a development of unconventional devices for a gradual recovery of the economy.

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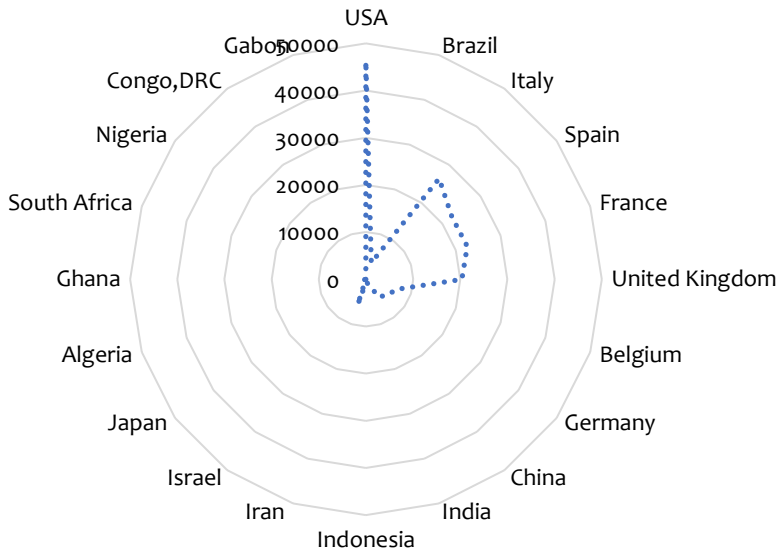
1. Introduction

The COVID-19 pandemic has heightened doubt, devastated economies with a click or just like with a magic wand and above all increased uncertainty in this uncertain world. Many events throughout history have sparked uncertainty in the global economy. More than fair in the past decade, uncertainty has increased in response to the spillover effects of the Great Recession, European sovereign debt crisis, Ebola's epidemic, commodity prices collapse, to trade tensions between the United States and China, on Brexit and the Asian conflicts, tensions between the United States and Iran ... The last wave of uncertainty arose from the rapid global spread COVID-19 disease (figure 2 and 3), and this pandemic has redefined the global economic and monetary landscape (Liu, 2020). The virus has spread worldwide and infected nearly 2,810,325 peoples as of April 27, 2020, causing thousands of deaths (figure 1). In this pandemic, infrastructure is disrupted, such as health systems, transport, trade and public services. To slow the rate of spread of the virus, the authorities have adopted containment measures, in particular, the isolation of confirmed patients, the quarantine for two weeks of those who have been exposed to these patients, social distancing (including the closing of schools, the cancellation of large gatherings, teleworking and travel restrictions) and the total containment of certain cities[2].

Figure 1.a. COVID-19 death case (April 27, 2020)



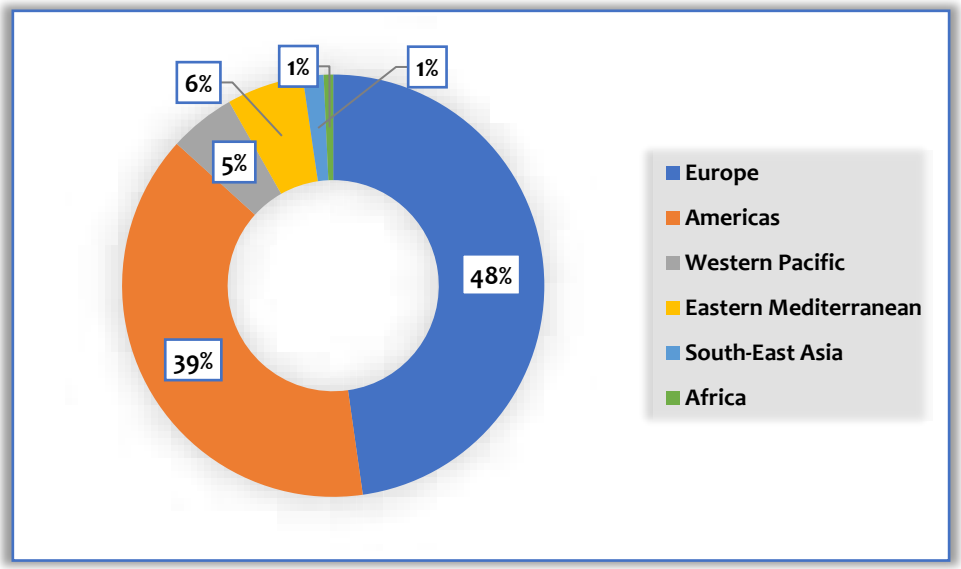
Source : World Health Organization, COVID-19 Global data

Underestimation of the uncertainty risks giving rise to strategies which will prove just as powerless to protect the national economy against the dangers which threaten it as to make it take advantage of the opportunities and challenges possibly generated by higher levels of uncertainty (Courtney and al., 2000). This unpredictable situation should shake up

[2] These measures could slow transmission, and make it possible to buy up time by easing the pressure on hospitals and researchers to potentially develop best treatment practices and even less, make a vaccine.

monetary policy, which we believe is the essential tool if we want to reach systematically valid strategic decisions in an uncertain environment of COVID-19.

Figure 1.b. Regional confirmation cases from CIVID-19 to April 27, 2020



Source : World Health Organization, COVID-19 Global data

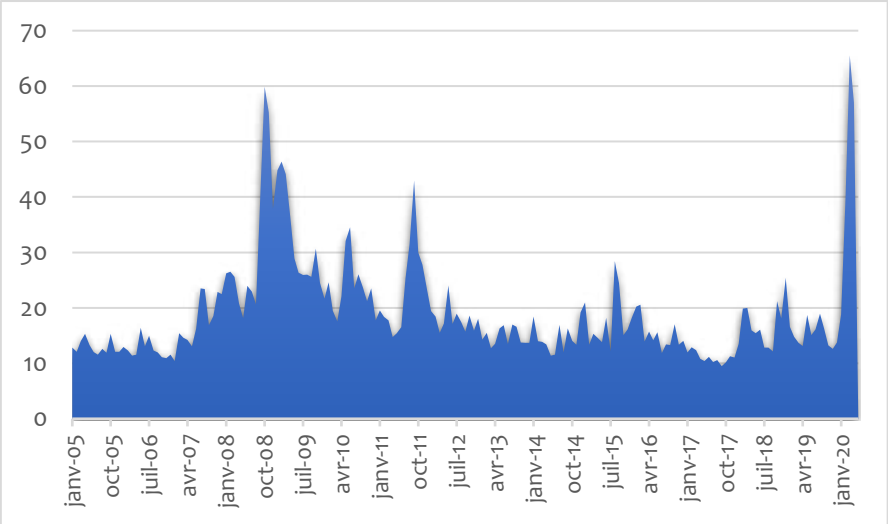
It is not easy to predict the economic impact of the virus, given the uncertainty about the spread of the virus and the scarcity of similar events that could provide useful empirical evidence. The blow to economic growth is deep, countries will have to enter a recessionary whirlwind but its ultimate scale and duration are very uncertain and will depend on the capacity for vigorous measures, in principle a very accommodative monetary policy to support global demand and finance public health infrastructure to contain the spread of the pandemic.

The evidence suggests a clear landscape in which periods of increased uncertainty are followed by a persistent increase in the unemployment rate, price instability (inflation and / or deflation), lower confidence, a disruption in the exchange rate, and a slowdown or recession in economic activity (Leduc and Liu, 2020), despite monetary policy action, the spillover effects are even harder, which requires a strategy during and after the crisis. However, the best strategy to adopt in the future would be that of the conspirator, that is, to prepare adequately for crisis scenarios, even if it is difficult to predict crises accurately. However the development of Early Warning Indicators could still be useful. Public authorities often do not take these weak signals into account (the leading indicators), what Portal and Roux-Dufort (2013) call the cassanders. These cassandres are not often listened to by the public authorities and create disasters and economic and financial disasters. These indicators are very useful in crisis prevention and help to mitigate the disruptive effects of a major crisis.

Figures 2 and 3 measure economic fear and uncertainty by a frequently used indicator, the VIX (Volatility index) and the WUI (World uncertainty index). These indicators have climbed during this pandemic, reaching levels higher than that recorded during the 2008 financial crisis. Thus, by increasing uncertainty, the coronavirus affects economies in a similar way to a drop in demand overall, which central banks normally try to compensate by reducing policy rates and easing financial conditions and liquidity. The COVID-19 epidemic has

severely disrupted economic activity through various supply and demand channels. The pandemic can also be ubiquitous for 1 year and increasingly increase macroeconomic uncertainty and declining aggregate demand. Adaptation to monetary policy, such as interest rate cuts and unconventional measures, can help cushion the economy from such uncertainty shocks and stem this pandemic storm (Thomas, 2016).

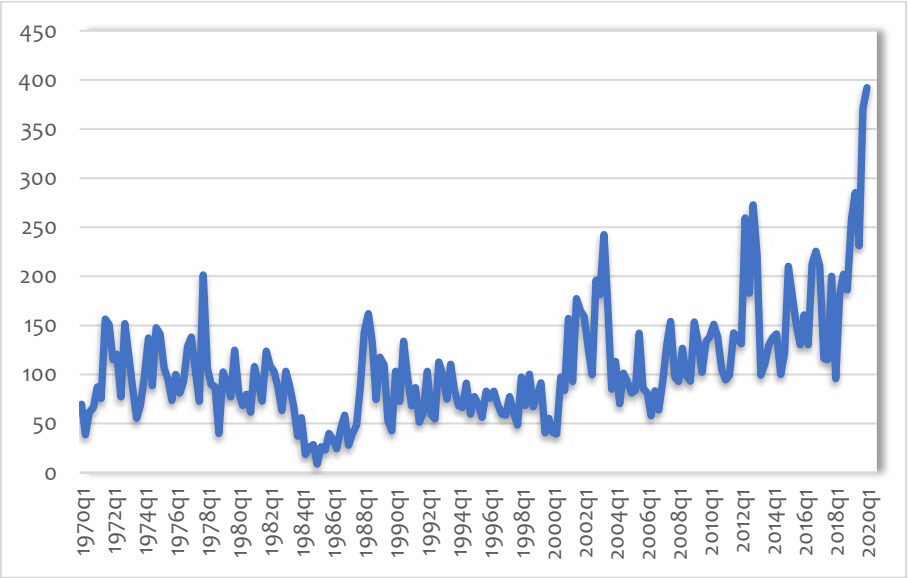
Figure 2. VIX



Source : Chicago Board Options Exchange Volatility Index.

Fear of COVID-19 illustrated by the VIX (figure 2) deeply threatens the economies, drags down all the forecasts expected in 2020. It should be noted that countries find themselves in another scenario that we must go with and deploy lax and intelligent measures to reduce this level of uncertainty via the coronavirus which dims economic hopes. At the same time, The WUI, world uncertainty index, shows that the level of uncertainty associated with COVID-19 is unprecedented. In addition, it is more important than the level caused by uncertainty during the 2002-2003 SARS epidemic and approximately 20 times greater than the Ebola epidemic (Ahir and al., 2020). The WUI illustrates the uncertainty effects linked to the various crises and imbalances causing fairly persistent ripple effects. The uncertainty of COVID-19 has greatly exceeded that of the financial crisis and goes beyond all the crises we have experienced since 1970 (figure 3), it is a whole new level. Central banks should react quickly because every minute counts and the spread continues to devastate. According to forecasts, the acceleration of the spread takes place exponentially (Kibala, 2020), hence the speed of the reaction of the central banks is essential to temporarily relax regulatory constraints and develop contingency plans and to be ready providing sufficient liquidity to financial institutions, especially those that lend to small and medium-sized enterprises, which may be less well-equipped to withstand this prolonged uncertainty (Berger and al., 2020).

Figure 3. WUI-COVID-19



Source : World uncertainty index, https://worlduncertaintyindex.com/

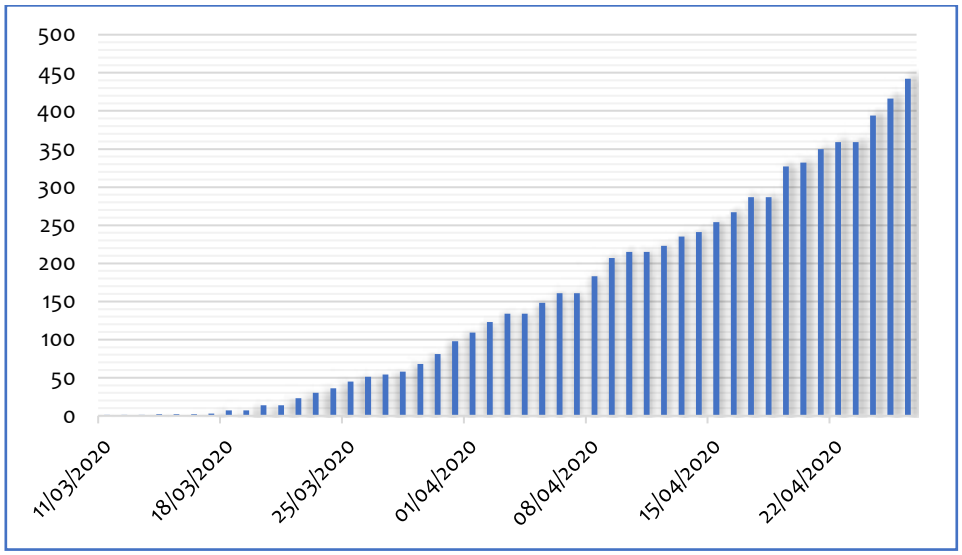
The Congolese economy, which is super dependent on world economic conditions, sees its economic apparatus mechanically degraded, following the uncertainty of COVID-19. Although cases of death and contamination in Africa are still lower (0.7% of contamination worldwide, figure 1.b), the Democratic Republic of Congo (DRC) has recorded 442 cases of contamination, and the progression is increasing more and more (figure 4). The public authorities have confined some cities, such as Kinshasa, and prohibit any gathering of people in public spaces. Passenger flights from abroad are not allowed and some border posts are closed. Other measures are taken such as the closure of schools, the suspension of all religious and sporting events and the closure of bars and restaurants.

The effects of the COVID-19 pandemic should reduce real GDP growth, as the mining sector is affected (Lever of the Congolese economy), increase consumer prices, reduce government revenues and increase government expenditures following the implementation of a response plan to COVID-19. To a large extent, this will affect net exports. In terms of imports, the DRC's dependence on China is enormous. Most of goods and services imported by the DRC come from China, which represents a notable supply in a large part of the Congolese economy, then the euro zone. The fall in commodity prices will weigh heavily on the Congolese economy and impact investments in this sector.

Table 1 shows the economic landscape of the DRC in recent years. It should be noted that the strong connection and integration of the DRC, with a degree of openness hovering around 75%, the effects of the epidemic are felt directly, businesses, whatever their size, dependent on global inputs and Chinese have started to experience production contractions, and must prepare for the worst scenario of a recession. The economy experienced a common disruption in 2015 following a sharp drop in commodities, which brutally affected all macroeconomic sectors in the country (Pinshi, 2018). At a time when the spillover effects are still scratching the economic landscape, COVID-19 shock drives the

point home and its uncertain effect will degrade the economy as a whole. Forecasts estimate a recession of 2.2%, an increase in consumer prices of 11%, a widening of the current account deficit of 5.4%.

Figure 4. DRC: Confirmed cases over time (March 11 to April 27)



Source : World Health Organization, COVID-19 Global data

Structural ruptures and experience over time make it clear that uncertainty is a pervasive feature of monetary policy landscape (Greespan, 2004). In practice, one is never quite sure of the type of uncertainty that one faces in real time, it would be preferable for monetary policy conduct to insert at its base, crucial elements of crisis management. In essence, risk and crisis management approach in monetary policy making is an application of Bayesian decision-making. The uncertainty of the COVID-19 pandemic poses unprecedented challenges for the conduct of monetary policy.

Table 1. Economic outlook in the DRC

	2014	2015	2016	2017	2018	2019	2020
Real GDP (%)	9,4	6,9	2,4	3,7	5,8	4,2	-2,2
Degree of openness (% GDP)	78,6	59,3	55,9	74,2	70,9	70,9	
Inflation (average)	1,24	0,7	3,1	35,7	29,2	5,5	11,0
General government net lending / borrowing (% GDP)	-0,02	-0,4	-0,5	1,3	0,4	-0,08	
Policy rate	2	2	7	20	14	9	7,5
Monetary base (%)	12,19	23,24	27,92	21,34	27,21	44,29	
Current account (% GDP)	-4,73	-3,85	-4,1	-3,22	-4,61	-3,45	-5,4
Exchange rate (End of period)	924,5	926,7	1215,5	1592,1	1635,6	1672,9	1900

Source : IMF, International Financial Statistics and world outlook economic ; BIS Statistics Explorer ; World Bank Group, World Development Indicators ; Central Bank of the Congo (BCC)

Structural ruptures and experience over time make it clear that uncertainty is a pervasive feature of the monetary policy landscape (Greespan, 2004). In practice, one is never quite sure of the type of uncertainty that one faces in real time, it would be preferable for the

conduct of monetary policy to insert at its base, crucial elements of crisis management. In essence, the risk and crisis management approach in monetary policy making is an application of Bayesian decision-making. The uncertainty of the COVID-19 pandemic poses unprecedented challenges for the conduct of monetary policy.

In the past, central banks have deployed abnormal (unconventional) and very accommodative measures to deal with the financial crisis. This time the threat is much more viscous, we should be more vigilant and reactive. The Congolese monetary policy framework suffers from an uncertain effect of the pass-through of its policy rate, the latter, the main operational framework of monetary policy, has difficulty influencing aggregate demand. This situation, combined with the uncertainty of COVID-19, should push Central Bank to develop strategic plans which would be abnormal and unconventional, because at present, the Central Bank is the institution which should play a major role in mitigating the COVID-19 Uncertainty Shock. The depreciation of the exchange rate and the anticipated price instability must alert the Bank to be more vigilant, because adjusting the economy is not like adjusting a light bulb, it is more like shutting down a reactor nuclear. It must be done slowly and carefully, otherwise it melts down (Cochrane, 2020).

To combat this uncertainty of COVID-19, which has contaminated the Congolese economy towards a recession which may prove to be lasting, Central Bank of Congo (BCC) has lowered its policy rate to 7.5% and its coefficient of the reserve requirement on sight deposits in national currency at 0%, followed by an increase in the monetary base of 50%. On the sidelines the BCC has planned to provide liquidity to banks so as to allow them to ease the financial conditions of access to credit; to set up a special refinancing window with a maturity ranging from 3 to 24 months.

This paper focuses on the economic impact of COVID-19 through its effect on uncertainty and the response of monetary policy, which is the quintessential strategy against a major crisis. This study would provide policy makers with strategies on the economic benefits of policy responses, particularly those of monetary policy. The article first summarizes the existing literature on the macroeconomic costs of diseases.

The article reviews in section 2 a review of the literature on macroeconomic costs following the various shocks, uncertainty and the COVID pandemic. Section 3 traces the balance sheet of the central bank of the Congo over the years. Section 4 describes the methodology used for the study. Section 5 presents the results using the model. Section 5 assesses monetary policy responses. Section 6 concludes the document.

2. Literature

Uncertainty is a fact which, given its magnitude, deserves much greater attention by decision-makers in the formulation of monetary policy and in crisis management (Brainard, 1967; Thiessen, 1995; Greespan, 2004; Walsh, 2003; Bloom, 2009; Brock and al., 2003; Svensson and Williams, 2005; D'Arvisenet, 2014). The coronavirus shock has increased the uncertainty surrounding the evolution of global demand, prices, confidence, fear,

investment, in short the economic and social apparatus. Drumetz and al., 2015 identify three key factors in understanding the uncertainty that central banks should take into account, uncertainty regarding the state of the economy, that relating to the structure of the economy and finally the more important for decision-makers in the intervention, strategic uncertainty. These factors are very difficult to determine by empirical methods (Baker and al., 2013; Bernanke, 1980), it must therefore be recognized that even with a better understanding of the macroeconomic and financial cogs, the impact of uncertainty on driving of monetary policy is important. Uncertainty is pervasive, it is important to understand how alternative policies fare when the central bank cannot accurately observe important macroeconomic variables or when it uses a model of the economy that is incorrectly unknown (Walsh, 2003). It is particularly important to look for strategies capable of delivering good macroeconomic results, even when structural changes and / or shock occur continuously, in this case COVID-19. The latter is evolving exponentially by sinking all forecasts and exacerbating the impact of uncertainty in all economic sectors and in the world (Ozili and Arun, 2020).

To measure the effect of uncertainty on the economy, Bloom (2009) uses the VAR model to estimate the impact of uncertainty. Its results show that uncertainty seems to surge after major shocks such as the Cuban missile crisis, the oil shock and the September 11th terrorist attacks. And its spillover effects are driving down production and investment. In the same vein, Baker and al, (2016) develops an index of economic policy uncertainty, with a VAR model, he concludes that uncertainty increases volatility in the financial system and prices at general levels, reduces investment and lowers employment.

Aastveity and al. (2013) examine the effect of uncertainty on changing the macroeconomic influence of monetary policy. They use an SVAR model to estimate the interactions of the uncertainty effect with the shock of monetary policy for the US economy and then for Canada, the United Kingdom and Norway. They find that monetary policy shocks affect considerably weaker economic activity when uncertainty is high. In addition, investment responds two to five times lower when the uncertainty is in its top decile instead of its bottom decile. The analysis by Caggiano and al., (2017), illustrates the role of monetary policy in countering the real effects of uncertainty shocks in US recessions and expansions. Using a VAR model, they find that the uncertainty shocks that hit recessions trigger a steeper decline. Counterfactual simulations suggest that the effectiveness of systematic monetary policy in stabilizing real activity is greater in expansions. Finally, they provide empirical and narrative evidence pointing to a risk management approach by the Federal Reserve. Assessing the macroeconomic impact of the COVID-19 pandemic is essential for policymakers, but difficult because the crisis is unfolding at an extreme speed. To better understand its impact, Baker and al. (2020). analyze the effect of COVID-19 uncertainty on the US economy, their results imply an annual contraction of US real GDP of nearly 11% in the fourth quarter of 2020, with a 90% confidence interval extending to a contraction of almost 20%. They indicate that approximately 60% of the expected contraction in production reflects a negative effect of the uncertainty induced by COVID-19. Likewise, Leduc and Liu (2020) study the channel of uncertainty of the coronavirus on the American economy and the Fed's responses. Using macroeconometric analysis of impulse response functions, he shows that uncertainty shock of COVID-19 has seriously disrupted economic activity through various supply and demand channels. They also show that the pandemic

could have a widespread economic impact by increasing uncertainty. And this leads to a large and prolonged increase in unemployment and a fall in inflation. This effect of uncertainty lowers overall demand. They suggest adaptable or accommodative monetary policy action, such as lower interest rates, can help cushion the economy from such uncertainty shocks.

In Japan, Watanabe (2020) compares consumption and price responses to the COVID-19 shock and another large-scale natural disaster that struck Japan, the Tohoku earthquake in 2011. The comparison shows that responses on a daily frequency during the two crises are quite similar: the rate of sales growth increased rapidly and peaked at 20% two weeks after the COVID-19 epidemic in Japan, which is quite similar to the response immediately after the earthquake; the annual consumer price inflation rate for goods increased by 0.6 percentage points in response to the coronavirus shock, compared to 2.2 percentage points following the earthquake. However, the findings suggest that if people expected higher inflation for goods and services following the earthquake, they would expect lower inflation in response to the coronavirus shock. This difference in inflation expectations suggests that the economic deterioration due to COVID-19 should be considered mainly due to an adverse shock in aggregate demand for face-to-face service industries such as hotels and entertainment, transportation and retail, rather than as induced by an overall supply shock.

Ozili (2020) illustrates the overall effect of the coronavirus on the Nigerian economy. It shows the drop in oil prices linked to coronavirus shock has significantly lowered economic growth. The Nigerian government has responded to the crisis by providing financial assistance to businesses that have been affected by the epidemic. The central bank adopted accommodative monetary policies and offered targeted support of 3.5 billion loans to certain sectors. These efforts should have prevented the economic crisis from happening, but it did not. Economic agents have refused to engage in economic activity for fear of contracting Covid-19 disease, which is spreading very quickly. He concludes that the structural weaknesses of Nigerian infrastructure are contributing to the persistence of the crisis and proposes a perspective for structural reform.

Some studies have been conducted in the DRC to measure the impact of the exogenous shock on the economy, such as Izu in 2016 and Ntungila and Pinshi in 2019. Their studies have shown that economic growth is not resilient and is super dependent on the shock of raw materials. They suggest an operational framework for the mining fund for economic adjustment and stabilization during periods of downturn and / or recession. Similarly, Pinshi (2018), using the VAR model, assesses the macroeconomic effects of falling commodity prices and finds an important channel for external shock, which undermines all macroeconomic frameworks of the country and leads to a systemic crisis.

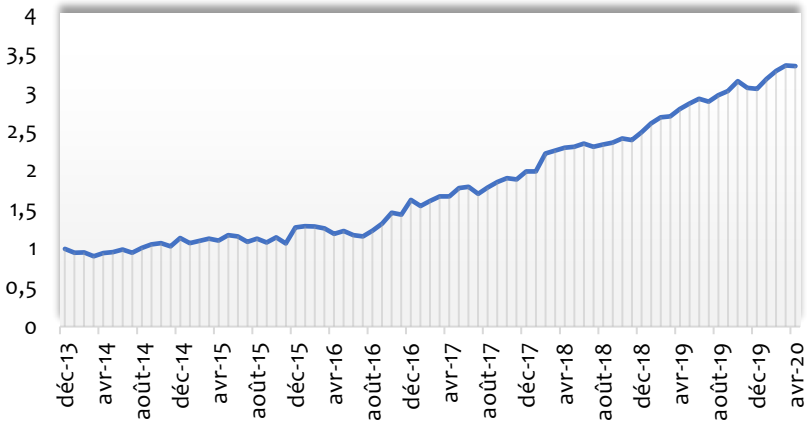
These analyzes have mounted the impact of uncertainty on economies, it turned out that this impact is disproportionate and has significant spillover effects. `` Unlike these studies, this article examines the impact of the COVID-19 uncertainty shock on the economy; the article then measures the impact of monetary policy during this period of COVID-19 uncertainty on aggregate demand and the response of the central bank to contain and reduce the effect of uncertainty on the economy.

3. Balance sheet of Congolese Central Bank (BCC)

The central bank's balance sheet plays an important role in managing liquidity and regulating aggregate demand (Zorn and Garcia, 2011; Bagus and Howden, 2016). In response to the crisis, many central banks are adopting policies which considerably increase the size and change the composition of their balance sheets, in particular by extending the scope of existing facilities, in particular the duration of usual refinancing operations and lower the collateral eligibility standards applied to banks. But central banks have also devised new mechanisms, expanding the availability of credit to financial institutions, reducing policy interest rates and purchasing money-financed assets from high-power money (monetary base), so-called monetary easing.

Over the past decade, many central bank balance sheets have grown to an unprecedented scale, and to levels significantly exceeding the minimum size generally determined by bank notes in circulation and other stand-alone liabilities. Analytical work has often focused on the channels through which the expansion of the central bank balance sheet affects policy transmission and financial conditions (BIS, 2019).

Figure 5. Monetary base (billion Cdf)



Source : BCC

The BCC's balance sheet has increased dramatically (figure 5), since the shock of commodity prices in 2015, the size of the balance sheet has increased by 162%. This increase is a response to the influence of monetary policy on financial and macroeconomic conditions, in order to increase the degree of monetary accommodation and support aggregate demand.

In response to this pandemic, there is a need to respond to financial tensions and ease the recession, in line with the traditional function of central banks as the ultimate provider of funding guarantees to the banking system. The BCC is called upon to improve the transmission of the envisaged orientation of monetary policy in the presence of COVID-19 and to further soften its balance sheet by exerting downward pressure on the policy rate

and developing an unconventional operating framework, in the event of the persistence of the shock.

4. Methodology

Our objective is to estimate how the uncertainty of COVID-19 influences on the one hand the economy and on the other hand, the transmission of monetary policy shocks in the DRC. We use monthly data covering the period from 2009 m1 to 2020 m4.

4.1. Measuring COVID uncertainty

As the main measure of uncertainty, we use the VIX index used by several researchers (Bloom, 2009; Bekaert and al., 2010; Aastveity and al., 2013; Leduc and Liu, 2020), these data are extracted from the Chicago Board Options Exchange. In addition, we use the World Pandemic Uncertainty Index (WPUI) constructed by Ahir and al. (2018), which is broader and takes into account the different crises, epidemics (SARS, Ebola, COVID-19,…), wars, shock of raw materials,… These data are extracted from the worlduncertaintyindex.com database. The special feature of this index is that its methodology was updated on April 4, 2020 and also measures discussions on the COVID-19 pandemic at global and national levels.

4.2. Measuring the economy, aggregate demand and monetary policy

To measure the economy and aggregate demand, we use real GDP, the consumer price index, aggregate consumption (summation of private and public consumption), investment, the degree of openness. The monetary base and the policy rate are used as the shock of monetary policy to act on the economy and aggregate demand. However, as we know, the Congolese economy is dollarized, the agents adapt their anticipations to the variations of the exchange rate and not only to the evolution of inflation. Pinshi and Sungani (2018) demonstrated this by analyzing the exchange rate pass-through and the monetary policy regime in the DRC, where they found the great influence of exchange rate variations on prices at the general level, with a more than proportional variation. Following the relevance of the exchange rate pass-through in the conduct of monetary policy, we will also use the nominal exchange rate (Congolese franc Cdf / dollar Usd).

4.3. Model

Recent research carried out in the specialized literature, based on dynamic stochastic general equilibrium models (DSGE) or on Bayesian vector autoregression models (BVAR) play an important role in the process of monetary policy implementation (Spulbăr and al., 2011). Bayesian techniques can be used to provide parameter estimates when the models include many variables. These methods can also be used to provide coefficient estimates that are not biased, when the variables contain unit roots. Increasingly, empirical evidence

suggests that Bayesian VAR produces macroeconomic forecasts and analyzes that establish a high level of comparison for most alternative macroeconometric methods (Kenny and al., 1998; Carare and Popescu, 2011). In addition, the BVAR solves the problem of over-parametrization by imposing parameter restrictions (Litterman, 1986; Sims and Zha, 1998; Koop and Korobilis, 2010).

To investigate how the uncertainty of COVID-19 affects the economy and the conduct of monetary policy, we estimate a BVAR model. The particularity of this approach is that the variation over time in the effect of monetary policy is directly linked to a specific determinant, uncertainty.
We will not provide a detailed framework on each type of Prior, leaving these details to the documentation (Doan and al., 1984; Bańbura and al., 2010; Litterman 1986; Sims and Zha 1998; Koop, 2003). However, we will provide a summary with sufficient detail to demonstrate how an initial covariance matrix influences a prior.

We estimate the impact of the COVID-19 uncertainty shock on the economy using a BVAR framework. It should be noted that in our exercise, we will also quantify to what extent the response of endogenous variables to monetary policy actions changes with the level of uncertainty. We use the following model :

$$X_t = \sum_{j=1}^{p} \Phi_j X_{t-j} + \Theta_j \zeta_t + \varepsilon_t \qquad \varepsilon_t \sim N(0, \sum) \qquad (1)$$

Where ε_t is a vector of residuals of reduced form at time t. The vector X_t contains, the uncertainty index WPUI, real GDP, the consumer price index, total consumption, investment, the degree of openness, monetary base, policy rate and exchange rate nominal. The VIX uncertainty index ζ_t is an uncertainty variable constructed specifically to monitor the behavior of the American market, given that it is the dominant economy with a systemic effect, the majority of economies, including the DRC, of this index instills uncertainty in the dynamism of other economies. Therefore, the VIX index is assumed to be exogenous in the model.

If we define $y = (X_t + \zeta_t)'$ (2), the multivariate normal assumption on ε_t gives us :

$$(y|\beta) \sim N(Y \otimes I_m)\beta, I_T \otimes \Sigma) \qquad (3)$$

The BVAR estimate will focus on the derivation of the posterior distributions of β and Σ based on the multivariate distribution above, and the earlier distribution hypotheses on β and Σ.

We use a Gaussian prior specific to our model, we opt for Litterman / Minnesota since it reduces the problem of specifying a priori distribution of high dimension to one of the two selection parameters by imposing an additional structure on the prior. We specify the prior and covariance prior matrix as follows :

$$\beta \sim N(\beta_n, v_{ij}) \quad with\ mean\ \beta = 0\ and\ covariance\ v \neq 0 \qquad (4)$$

ν is a diagonal matrix with the elements ν_ (ij, p) at delay p, the specification takes the following form :

$$\nu_{ij,p} = \begin{cases} \left(\lambda_1 / p^{\lambda_3}\right)^2 & for\ i = j \\ \left(\lambda_1 \lambda_2 \sigma_i / p^{\lambda_3} \sigma_j\right)^2 & for\ i \neq j \end{cases} \qquad (5)$$

Where λ_i are hyper-parameters, and σ_i is the square root of the ith diagonal element of Σ.

The Litterman / Minnesota prior assumes that Σ is fixed, not priorizing Σ, simply using the initial estimate given.

All data are expressed in logarithms (except policy rate), then the difference operator is applied.

5. Empirical results

We estimate how the uncertainty of COVID-19 affects the economy and how aggregate demand and the economy reacts to the shock of monetary policy.

5.1. COVID-19 uncertainty shock

Figure 6 plots the estimated dynamic responses of the economy to a COVID-19 uncertainty shock. The uncertainty of COVID-19 would lead to a lasting drop in production in the DRC, at least for 20 months. This drop is drastic and mechanical. This will plunge the economy back into recessions and depressions. This shock from COVID-19 would germinate macroeconomic instability, inflation rate from the 6th month would increase until reaching an unpleasant level, this would be sustainable, according to our estimates. The close relationship between the depreciation of the exchange rate and inflation supports this result, according to which, the chance rate would depreciate sharply from the 4th month following the shock of uncertainty. This would further lead to a major loss in the constitution of mattresses for international reserves.

The components of aggregate demand and the degree of openness respond passively and negatively due to the increased uncertainty of COVID-19. Investment drops drastically, around 22 months. This effect would paralyze the economy towards its path of emergence and hamper economic development. The response of the degree of openness is passive and incompressible. It would stagnate for at least 18 months, which would put the economy at a disastrous level, especially since the DRC is highly dependent on external demand. This would exacerbate the duration of the recession.

The overall consumption would suffer a different effect, certainly the decline would be felt at least for 4 months. However, the estimate shows an increase for overall consumption up to the 12th month. This is explained by the fact that public expenditure would not cease to increase in order to deal with the crisis and above all to meet the needs for health and

payment compensation for certain sectors, such as electricity, water, etc. This increase in consumption could perhaps in certain cases play a role in the economic recovery.

The combined reaction of all these macroeconomic variables suggests that the uncertainty affects the Congolese economy in a similar way to an economic brake and a systemic disturbance. Thus, due to uncertainty, the COVID-19 pandemic has important effects on demand such as confidence, in addition to effects on supply such as the closing of certain businesses, the disruption of supply chains. supply, labor shortage and reduced service provision.

5.2. Monetary policy shock taking into account uncertainty

Monetary policy acts on aggregate demand and curbs inflation. The uncertainty shock of COVID-19 had a terrible impact on them. Monetary policy should act flexibly as soon as possible. Figure 7 plots the average statistical effects of a monetary policy shock via the decline in the policy rate on aggregate demand and inflation. Production responds unfavorably to the drop in the policy rate. There followed an unprecedented recession, at least for 22 months. The situation turns out to be of an extreme dimension that the conventional operational framework of monetary policy has no effect on aggregate demand, since the uncertainty of COVID-19 is very threatening for the Congolese economy.

As for inflation, its control would pose a serious problem for the central bank, since the depreciation of the exchange rate would be lasting. Monetary policy action to curb inflation is expected to focus on defending the currency and smoothing exchange rate fluctuations. The investment does not react to the low of the policy rate, the drop in investment would be lasting. Likewise for consumption and the degree of openness, policy rate alone could not stimulate aggregate demand.

Like the policy rate, the response of monetary policy via the increase in its balance sheet, the monetary base (figure 8), still does not succeed in boosting the economy and controlling inflation. Using our estimated model, we can assess the likely magnitude and duration of the effects of uncertainty related to the COVID-19 pandemic. The central bank should quickly bring the policy rate down to the effective lower limit and gradually increase the size of its balance sheet in the hope of a clear effect. However, we think that we should rethink the unconventional operational framework for a rather formidable attack against the uncertainty of COVID-19. The following section attempts to suggest some strategic responses for monetary policy during this uncertain period.

6. Monetary policy responses

Central banks have powerful cards to remedy a major crisis by adopting new devices, mainly in response to instability (Smaghi, 2016). The BCC has implemented measures to ease liquidity conditions. However, these measures do not appear to affect aggregate demand and the economy.

Admittedly, this pandemic will hit the economy hard in a recession and even monetary policy could not stem this recession with certainty, but it can ease the peak of economic uncertainty and contribute to a gradual recovery of the economy. economy. To achieve this, targeted responses would be required, since the increase in aggregate demand would be undermined by the imbalance in aggregate supply (Kovanen, 2020), the objective rather consists in preserving, as much as possible, viable businesses and jobs until return to normal conditions. It should be mentioned that even when the short-term policy rate is very low, tending towards the zero point, central banks can still stimulate demand thanks to unconventional measures (Odendahl and al., 2020).

The Congolese treasury bill can serve as a useful framework for health care spending and support the economy. The massive issuance of this security could breach monetary policy to implement an emergency purchasing program in the face of the pandemic. Uncertainty over the term of COVID-19 could allow monetary policy to extend the maturity of these securities in the longer term. The BCC, which has non-payable liabilities, could create money which will then be fed back into the banking circuit and finance the economy.

The central bank, as the ultimate insurer of liquidity, should provide abundant liquidity to banks and encourage them more to pass on this contribution to small and medium-sized enterprises (SMEs). This measure could extend and reach the poor and very small businesses by widening the scope of refinancing via microfinance and other financial institutions that do not have the facilities for a direct refinancing window at the central bank (Goodfriend, 2014; Gopinath , 2020). These responses imply a relaxation of collateral to carry out these operations and allow the economy to adjust to the recovery.

The pass-through effect of the exchange rate is accentuated, the central bank must defend its currency and at the same time curb inflation. The variation in prices being dependent on fluctuations in the exchange rate, A flexible exchange policy would be necessary to reduce this instability. In addition, currency swap operations could be beneficial to build a reserve cushion and smooth the depreciation of the exchange rate, ultimately curbing inflation. During this pandemic period, a good communications policy to reduce the extent of the exchange rate pass-through and stabilize the economy would be important to mitigate the uncertain effect of COVID-19 (Pinshi, 2020). Moreover, the monetary authority should deploy written and televised speeches and statements to explain to the public its dedication and its ability to smooth depreciation and curb inflation. This serial frequency of communications would influence agents' expectations and could restore confidence and ensure stability (Pinshi, 2020).

7. Conclusion

This article estimates the effects of the COVID-19 uncertainty shock on the economy and examines the role that monetary policy plays in overcoming this COVID-19 uncertainty. Using a Bayesian VAR model, we show that the uncertainty effects of COVID-19 are much stronger and affect aggregate demand, prices, the exchange rate, the degree of openness and confuse monetary policy interventions. To regulate demand and curb inflation. Simulations conducted to assess monetary policy responses indicate that the policy is ineffective, and show that it would have no effect for at least 24 months. These empirical results have shown that uncertainty reduces the ability of the central bank to influence the economy and control inflation.

Knowing the limits of monetary policy in the face of the pandemic and supply shocks, we propose broader responses to combat the effect of uncertainty on aggregate demand and the economy, by deploying rather unconventional devices, such as than massive purchases of longer-term treasury bonds, excessive liquidity bailouts. However, the central bank should intervene in the foreign exchange markets by smoothing the depreciation to curb inflation, given the intimate relationship between changes in the exchange rate and inflation. These measures could gradually lead to an economic recovery.

8. Appendix

The results of the BVAR model using Minnesota / Litterman a priori on the basis of the following values of the hyperparameters ($\lambda_1 = 0{,}1$; $\lambda_2 = 0{,}99$; $\lambda_3 = 1$).

Figure 6. COVID-19 uncertainty shock

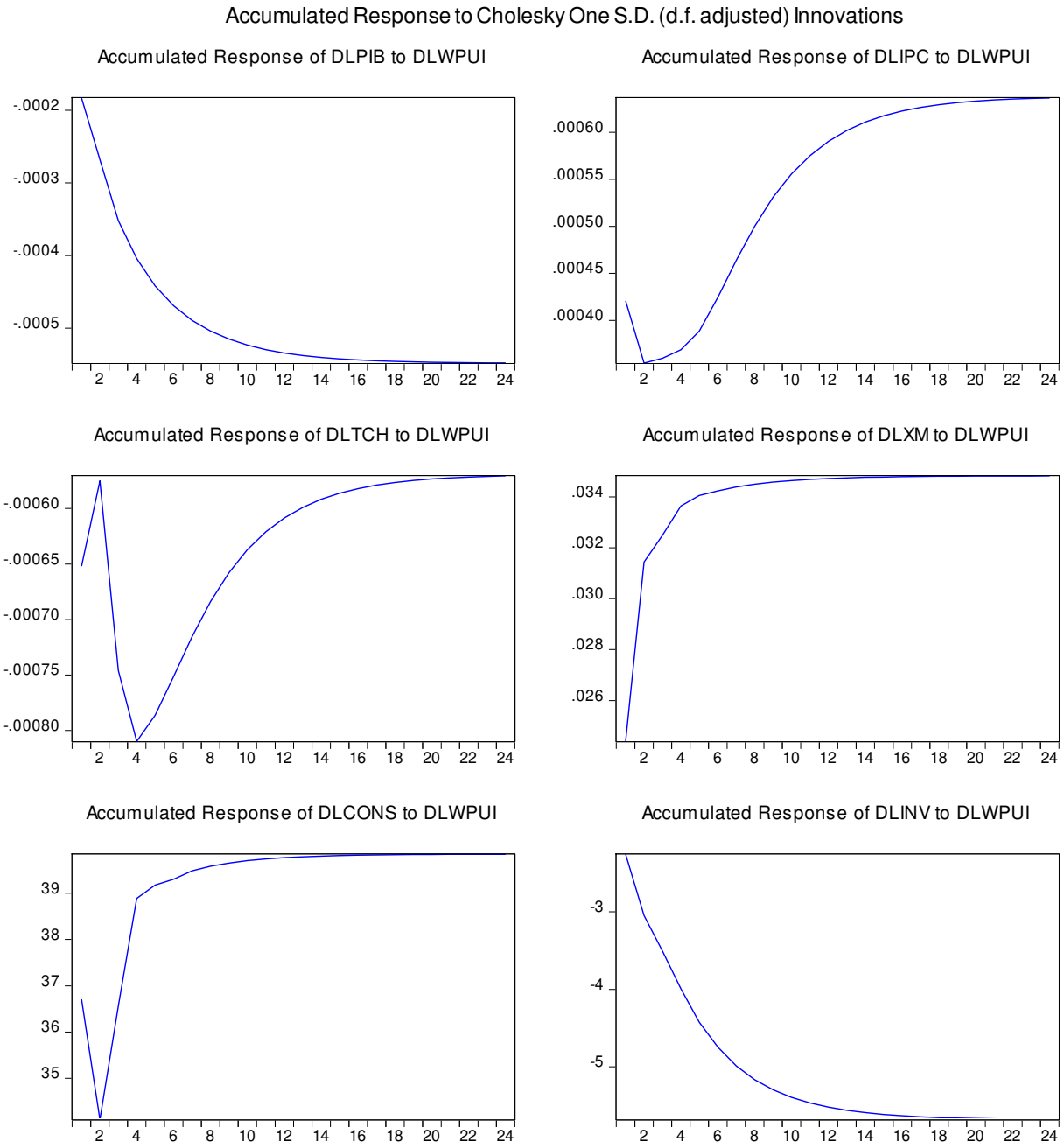


Figure 7. Policy rate shock

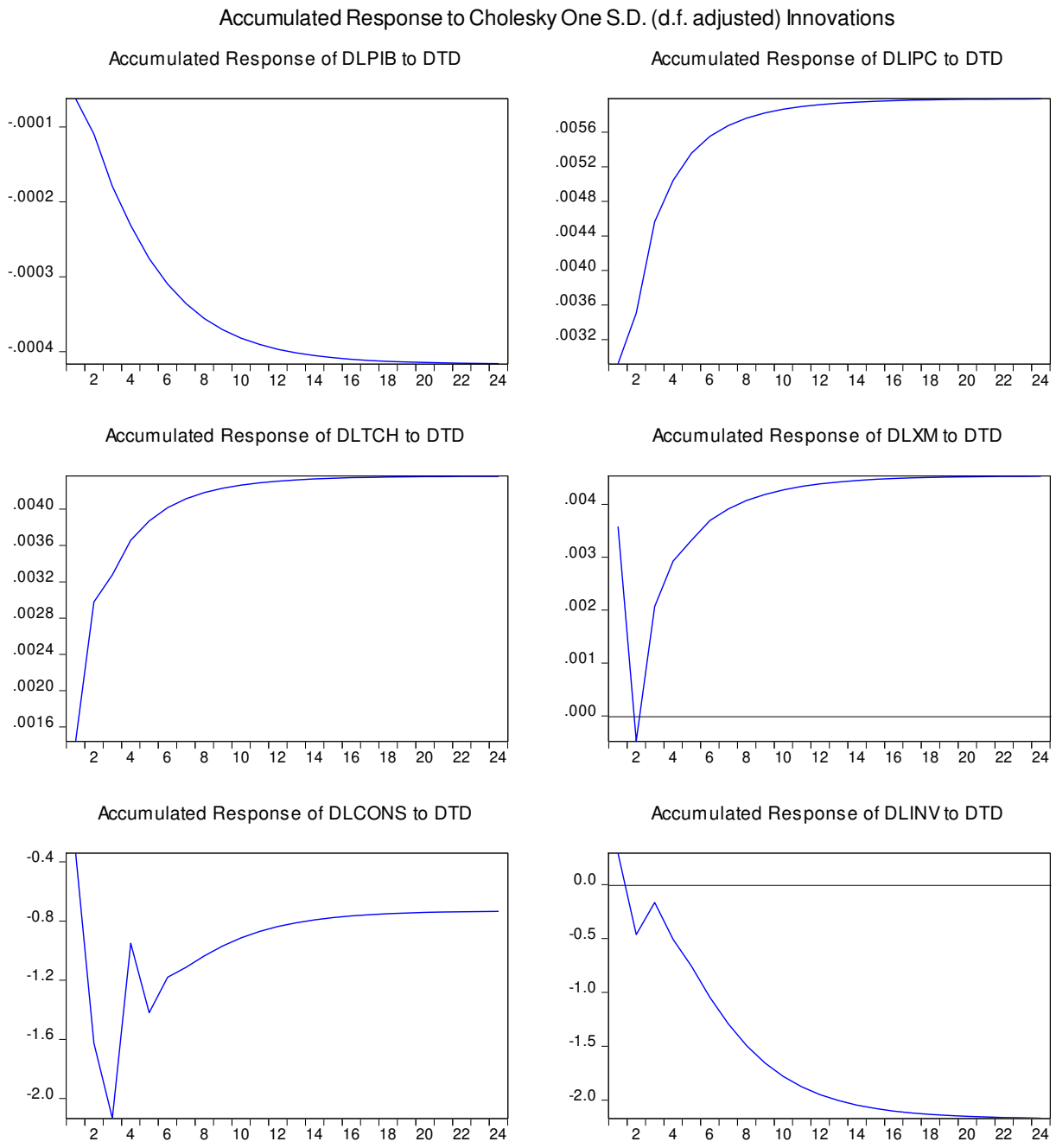
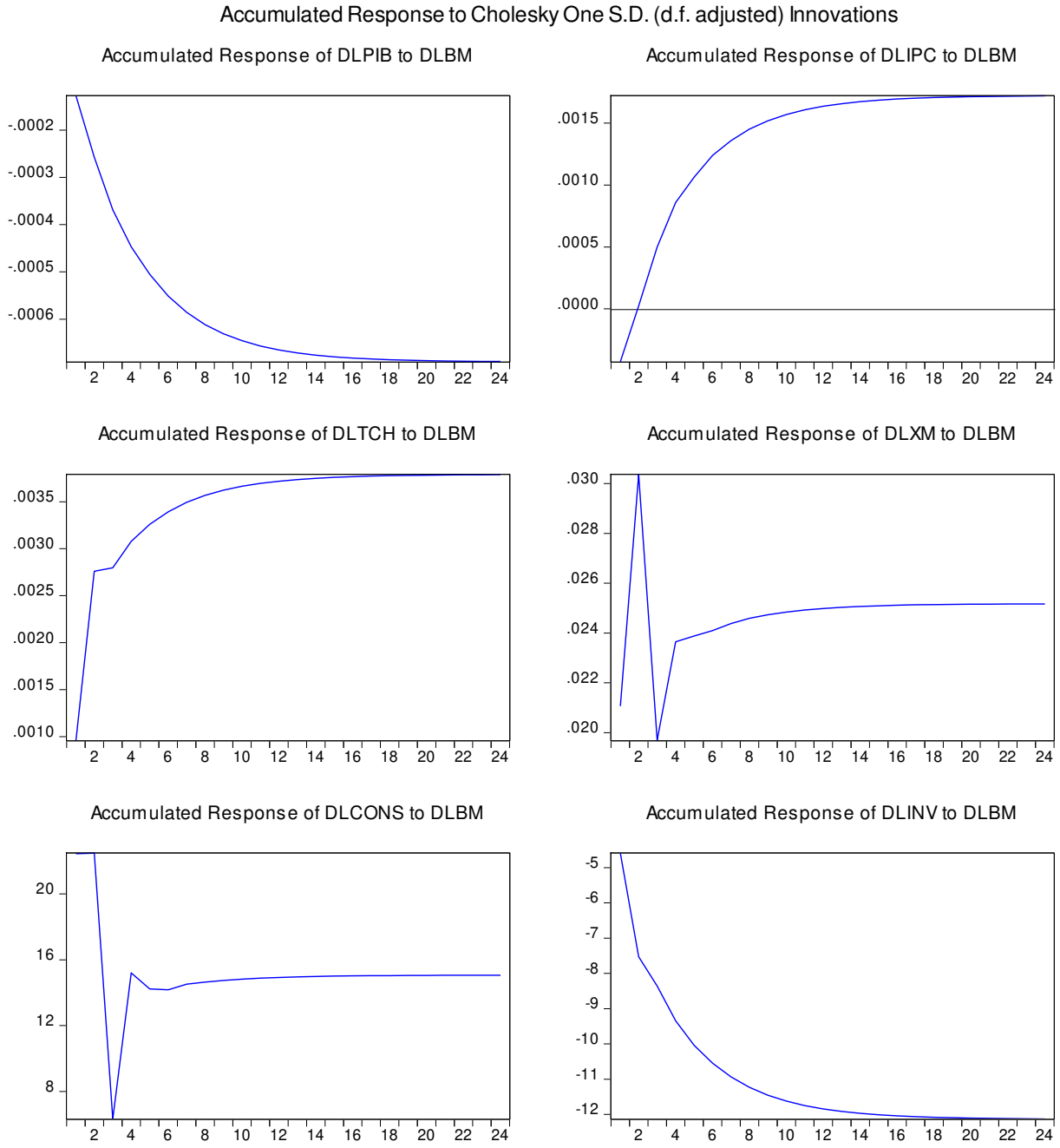


Figure 8. Shock of the monetary base



Reference

Aastveity, K., A., Natvikz, G., J., and Sola, S. 2013. Economic Uncertainty and the effectiveness of monetary Policy. *Working Paper 17, Norges Bank Research*, june.

Ahir, H., Bloom, N., and Furceri, D. 2018. The world uncertainty index. October.

Ahir, H., Bloom, N., and Furceri, D. 2020. Global uncertainty related to Coronavirus at Record High. *IMF Blog*, april.

Bagus, P., and Howden, D. 2016. Central bank balance sheet Analysis. *MPRA Paper* no. 79801, june.

Baker, S. R., Bloom, N., and Davis, S., J. 2013. Measuring economic policy uncertainty. *Working paper no.83, Chicago Booth Research Paper No. 13-02*, january.

Baker, S. R., Bloom, N., and Davis, S., J. 2016. Measuring economic policy uncertainty. March.

Baker, S. Bloom, N., Davis, S., J., and Terry, S., J. 2020. COVID-Induced economic uncertainty. April.

Bańbura, M., Giannone, D., and Reichlin, L. 2010. Large Bayesian vector auto regressions. *Journal of Applied Econometrics*, vol. 25, pages 71-92, January.

Bank for International Settlements (BIS), 2019. Large central bank balance sheets and market functioning. *Markets Committee*, October.

Bekaert, G., Hoerova, M., and Lo Duca, M. 2010. Risk, uncertainty and monetary policy. NBER Working paper 16397, september.

Berger, H., Kang, K., and Rhee, C. 2020. Atténuation des effets et choix délicats : premiers enseignements tirés de la situation en Chine. *IMF Blog*, march.

Bernanke, B., S. 1980 Irreversibility, uncertainty, and cyclical investment. *NBER working paper* series no. 502, july.

Bloom, N. 2009. The impact of uncertainty shocks. *Econometrica* , vol. 77, no. 3, 623–685, may.

Brainard, W., C. 1967. Uncertainty and the Effectiveness of Policy. *The American Economic Review*, vol. 57, no. 2, pp. 411-425, may.

Brock, W., A., Durlauf, S., N., and West, K., D. 2003. Policy evaluation in uncertain economic environments. *Brookings Papers on Economic Activity* no. 1

Caggiano, G., Castelnuovo, E., and Nodari, G. 2017. Uncertainty and Monetary Policy in Good and Bad Times. Bank of Finland Research *Discussion Paper* 8, march.

Carare, A., and Popescu, A. 2011. Monetary policy and risk-premium shocks in Hungary : results from a large Bayesian VAR. *IMF Working Paper* WP/11/259, november.

Cochrane, J., H. 2020. Coronavirus monetary policy. Economics in the time of COVID-19. *Centre for Economic Policy Research*.

Courtney, H., Kirkland, J., and Viguerie, P. 2000. Quelle stratégie dans un environnement incertain ? Les stratégies de l'incertain, *Harvard Business Review*, éditions d'organisation.

D'Arvisenet, P. 2014. *Les politiques monétaires dans la tempête*. First ed., Economica, Paris.

Doan, T., Litterman, R., and Sims, C. A. 1984. Forecasting and Conditional Projection Using Realistic Prior Distributions. *Econometric Reviews*, vol. 3, no.1, january.

Drumetz, F., Pfister, C., and Sahuc, J. 2015. *Politique monétaire*. 2e ed., Deboeck, Bruxelles.

Goodfriend, M. 2014. Lessons from a Century of Fed Policy : Why Monetary and Credit Policies Need Rules and Boundaries. *Frameworks for Central Banking in the Next Century" A Policy Conference*, may.

Gopinath, G. 2020. Limiting the economic fallout of the coronavirus with large targeted policies. Mitigating the COVID Economic Crisis : Act Fast and Do Whatever It Takes, *Centre for Economic Policy Research* (CEPR).

Greenspan, A. 2004. Risk and uncertainty in monetary policy. Innovations and issues in monetary policy: the last fifteen years. *Aea papers and proceedings,* may.

Izu, A., M. 2016. Volatilité des cours des produits miniers et vulnérabilité de l'économie : est-ce que la croissance économique va s'essouffler en RDC ? *MPRA Paper* no. 74751, july.

Kibala, J., K. 2020. Prévision de la propagation de la pandémie COVID-19 dans le monde. *Hall*, march.

Kenny, G., Meyler, A., and Quinn, T. 1998. Bayesian VAR models for forecasting Irish inflation. *MPRA Paper* no. 11360, december.

Koop, G. 2003. *Bayesian Econometrics*. John Wiley & Sons, Chichester.

Koop, G., and Korobilis, D. 2010. Bayesian multivariate time series methods for empirical macroeconomics. *Foundations and Trends in Econometrics* Vol.3, no.4 DOI: 10.1561/0800000013.

Kovanen, A. 2020. Fighting the unknown – An essay about the challenges in responding to the coronavirus epidemic, march.

Leduc, S., and Liu, Z. 2020. The Uncertainty Channel of the Coronavirus. *Research from Federal Reserve Bank of San Francisco.* March.

Litterman, R. 1986. Forecasting with Bayesian Vector Autoregressions – Five years of experience. *Journal of Business and Economic Statistics*, vol.4. no.1, january.

Liu, S. 2020. The Butterfly Effect : Coronavirus may Redefine the Global Currency Landscape. *Harvard Kennedy School.*

Ntungila, F., and Pinshi, C., P. 2019. Fluctuations de prix des matières premières et économie congolaise : manne d'espoir ou de malédiction. *MPRA Paper* no. 95409, august.

Odendahl, F., Penalver, A., and Szczerbowicz, U. 2020. L'action des banques centrales pour aider l'économie à survivre au Covid-19. Banque de France, *Bloc-note Éco – billet* n° 157, april.

Ozili, P., and Arun, T. 2020. Spillover of COVID-19 : impact on the Global Economy. *Researchgate*, march.

Ozili, P. 2020. Covid-19 pandemic and economic crisis : The Nigerian experience and structural causes. https://ssrn.com/abstract=3571085, april.

Pinshi, C., P., and Sungani, E. 2018. The relevance of pass-through effect : should we revisit monetary policy regime? *International Journal of Economics, Business and Management Research*, february.

Pinshi, C., P. 2018. Les effets macroéconomiques de la chute des cours de produits de base : Evaluation sur la République démocratique du Congo". *International Journal of Innovation and Applied Studies*, vol. 24, no. 1, august.

Pinshi, C., P. 2020. Monetary policy in DR. Congo : Learning about communication and expectations. *MPRA Paper* no. 100262, may.

Portal, T., and Roux-Dufort, C. 2013. *Prévenir les crises*. First ed., Armand colin, Paris.

Primiceri, G., E. 2005. Time Varying Structural Vector Autoregressions and Monetary Policy. *The Review of Economic Studies*, vol 72, issue 3, Pages 821–852, https://doi.org/10.1111/j.1467-937X.2005.00353.x, july.

Sims, C., A., and Zha, T. 1998. Bayesian Methods for Dynamic Multivariate Models' *International Economic Review*, vol. 39, no.4, 949-968.

Smaghi, L., B. 2016. Les banques centrales dans la crise. Le nouveau rôle des banques centrales. *Problèmes économiques* n°3126, february.

Spulbăr, C., Nițoi, M., and Stanciu, C. 2011. Monetary policy analysis in Romania : A Bayesian VAR approach. *African Journal of Business Management*, Vol.6 (36), DOI: 10.5897/AJBM11.1150, september.

Svensson, L., E., O., and Williams, N. 2005. Monetary policy with model uncertainty : Distribution forecast targeting. *Working Paper* 11733, http://www.nber.org/papers/w11733, november.

Thiessen, G. 2015. L'incertitude et la transmission de la politique monétaire au Canada. *Conférence HERMES-Glendon*, march.

Thomas, P.H. 2016. Banquiers centraux ou… apprentis sorciers ? Le nouveau rôle des Banques Centrales, *Problèmes économiques*, n°3126, february.

Walsh, C., E. 2003. Implications of a Changing Economic Structure for the Strategy of Monetary Policy. In monetary policy and uncertainty : Adapting to a changing economy, *Jackson Hole Symposium*, Fédéral Reserve of Kansas City, august.

Watanabe, T. 2020. The Responses of Consumption and Prices in Japan to the COVID-19 Crisis and the Tohoku Earthquake. *JSPS Grant-in-Aid for Scientific Research (S)*, Central Bank Communication Design, *working paper series* no.020, march.

Zorn, L., and García, A. 2011. Financial Markets Department Central Bank Collateral Policy : Insights from Recent Experience. *Bank of Canada review spring*.