

COVID-19 and the Nigeria Economy: Analyses of Impacts and Growth Projections

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1. Introduction

Since the debut of COVID-19 in Nigeria on 27th February 2020, the Nigerian economy appeared to have entered turbulence. Thirteen days after its importation from Italy, precisely March 11, the World Health Organisation (WHO) declared COVID-19 a global pandemic. As the spread of the virus continues internationally and locally at an unimaginable scale, the official responses appear to focus mainly on limiting the spread within the country through social isolation policies, which include shutting educational institutions, limiting work and restricting movement of people, providing palliatives to the “vulnerable and poorest of the poor”, imposition of night time curfews, and so on. Many observers believe that as much

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as the virus keeps spreading, assessment of the depth and the breadth of the impact of the pandemic on the social and economic life of the nation is difficult, if not impossible, until the situation returns to normal. But, how will the pandemic end? What will be the aftermath effect? This uncertainty is pervasive and have created a strong sense of foreboding among the general public, researchers and policy makers.

The uncertainty surrounding the emergence of the disease notwithstanding, even as the outbreak persists, several strands of studies have emerged to examine the macroeconomic impact of it at global, continental and country level. The study by McKibbin and Fernando (2020), which is an extension of McKibbin and Sidorenko (2006), explores seven different scenarios of how COVID-19 might evolve in the coming year. The paper alluded to the fact that the evolution of the disease and its economic impact is highly uncertain thereby making it difficult for policy makers to formulate appropriate macroeconomic policy response. The scenarios investigated in the study demonstrate that containment of the outbreak notwithstanding, its impact on the global economy in the short run would still be significant. Other recent studies with global concern include Barua (2020), OECD (2020), Orlik et al (2020), Maliszewska et al (2020) and Fernandes (2020). In Fernandes (2020), the economic impact of COVID-19 crisis across industries, and countries is investigated. The study shows that in the sample of 30 countries

covered, a median decline of -2.8% in GDP in 2020 is observed. In other scenarios, the study shows that GDP is expected to fall more than 10%, and in some countries, more than 15%. Orlik et al (2020) even predicted that coronavirus could cost the global economy US\$2.7 trillion. “A baseline global pandemic scenario sees gross domestic product fall by 2 percent below the benchmark for the world, 2.5 percent for developing countries, and 1.8 percent for industrial countries” (Maliszewska et al (2020)).

In what looks like a subtle criticism of the public media and academic writings for focusing mainly on global macroeconomic impact of COVID-19, Ataguba (2020) argues that it “is only one part of the bigger picture of economic impact”. Citing Africa in particular, with its high disease burden, poorly developed infrastructure and safety nets and weak health systems, the impact of the pandemic is expected to be severe in the continent. Using the same argument, a country level impact analysis is not only desirable but inevitable to guide the policy authorities. The likely exacerbating impact of the pandemic on the Nigerian economy is inevitable for several reasons. Firstly, the economy is yet to fully recover from the aftermath of the recession experienced in 2016. Secondly, the economy depends largely on crude oil whose price has plummeted in the international market. Thirdly, the foreign exchange reserves have been drawn down from US\$45.1bn at the end of 2019 to US\$35.3bn at the end of March 2020. Fourthly, the country’s debt burden has been mounting since 2015. Fifthly, inflation is still firmly in double digits and the naira

is under pressure. Finally, the health system capacity is abysmal. These and other factors have led to the growing concerns and uncertainties that COVID-19 will bring on the Nigerian economy. According to Ozoli (2020), “the economic downturn in Nigeria was triggered by a combination of declining oil price and spillovers from the COVID-19 outbreak”.

Sequel to the above, the plan of this paper is to analyse the impact of the emergence of COVID-19 on the macroeconomic fundamentals in Nigeria and make projections for economic growth. Specifically, the paper is set to achieve the following:

- i. Analyse the behaviour of macro aggregates such as oil price, exchange rate, and All Share Index (ASI) since the emergence of COVID-19.
- ii. Analyse the assumptions and estimates in the 2020 Appropriation Act and how they have been affected by the global pandemic.
- iii. Make projections for the quarterly gross domestic product (GDP) growth rate and the annual growth rate for the year 2020.

The rest of the paper is divided into four sections. The following section analyses the response of three macroeconomic fundamentals to the emergence of COVID-19 as at April 27, 2020. In section 3, the likely effect of the global pandemic on the assumptions and estimates contained in the 2020 Appropriation Act is analysed. In

section 4, a Monte Carlo experiment is conducted to simulate the likely path of real GDP and its growth rate. Finally, the concluding section, Section 5, summarizes the paper and gives some final remarks.

2. COVID-19 and Some Macroeconomic Fundamentals

While the imposition of some strict measures, as a means to curb the spread of the coronavirus, may have its merits; it also bears some burdens on several aspects of a nation's existence, especially, her economic activities. In addition to posing major challenges to the health sector (in terms of mortality at different levels), other impacts could be measurably observed from the performance of the economy's macroeconomic fundamentals such as economic growth, general price level (consumer price index (CPI) or inflation), exchange rate (strength of local currency), interest (bank lending) rate, private investments, among others; as well as stocks and global oil prices. These economic set-backs may consequently affect general economic activities, especially, given the non-consideration of the COVID-19 pandemic during the budgeting process. Therefore, it becomes necessary to examine the historic pattern of some of these fundamentals, since the WHO announcement of the pandemic, in a bid to ascertain its impact on the Nigerian economy through the relationship between the COVID-19 and these fundamentals. Three prominent fundamentals are therefore considered – global crude oil prices,

foreign exchange rate and all share index, and are discussed in subsections following.

2.1 COVID-19 Cases and Oil Price

The consideration of the global oil prices is hinged on two key points: first, Nigeria is globally ranked 11th largest crude oil producer³, 5th largest crude oil exporter⁴ and the largest in Africa, as at January 2020; second, her over dependence on oil is worrisome, with oil revenue accounting for above 90% of the country's foreign exchange earnings (Olubusoye et al. (2015) and [export.gov](https://www.export.gov)⁵). Consequently, shocks to global oil prices are likely to have significant impacts on the country's revenue, and trivially, her economic activities (Iwayemi and Fowowe (2011); Akinlo (2012); Asekunowo and Olaiya (2012); Ayoola (2013); Alley et al. (2014); Yusuf (2015); Olayungbo, (2019); among others). These shocks may be directly related with events that could alter the level of oil production globally. One of such events is the 2014-2015 global oil crash that ensued as a result of the shale oil revolution, bringing crude oil prices below 100 USD/barrel. Global oil prices remained within the range of 26.19 and 77.41 USD/barrel in the last four years, preceding the COVID-19 pandemic. Oil price movement vis-a-viz the COVID-19

³ Extracted from <https://worldpopulationreview.com/countries/oil-producing-countries/>

⁴ Extracted from <https://knoema.com/atlas/topics/Energy/Oil/Exports-of-crude-oil>

⁵ See <https://www.export.gov/apex/article2?id=Nigeria-Market-Overview>

confirmed cases is displayed in Figure 1 below. Global oil prices generally declined upon the announcement of COVID-19 as a pandemic by WHO, given the alarming increase in the number of confirmed COVID-19 cases and the rate of spread across countries that subsequently crumbled economic activities (partially or totally) in affected countries. Given that most countries of the world, including oil producing countries, are already ravaged by the pandemic, trade has been adversely affected as there is an excess supply of global crude oil without a commensurate demand for it, as well as lack of storage capacity. The crash has reached an unprecedented all-time low, with some global crude oil entering negative values⁶ (see West Texas Intermediate (WTI) in FRED Louis database).

⁶ Here, buyers of the global crude oil are effectively paid by sellers to buy off their crude oil, as against the conventional market stances, to avoid the cost of rentage of storage facilities.

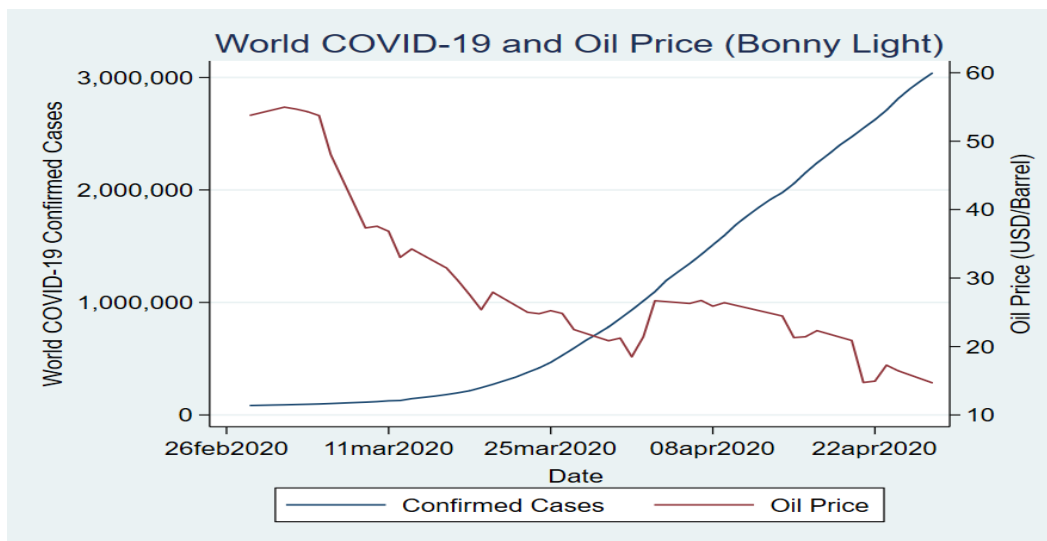


Figure 1: World confirmed COVID-19 Cases and oil price (Bonny Light)

Global oil prices, which is highly volatile, significantly affect Nigeria’s general price level, foreign exchange earnings and gross domestic product (GDP) given its dependence on crude oil exports (Olubusoye and Oyaromade (2008); Olofin et al. (2014); Olayungbo (2019)). Higher volatility is however expected during a pandemic. Since crude oil accounts for a significant proportion of the nation’s foreign earnings as well as federal government revenue, economic productivity may be undermined by the oil price shock (in this case, the announcement of the COVID-19 as a pandemic) that led to the crash in global oil prices. Consequently, the rise in COVID-19 cases are likely to impact economic growth negatively through oil price and government revenues. This is also coupled with the fact that several economic activities have been put on hold. On the general price level, there could be some form of imported inflation from bilateral partners given that Nigeria

is a small and open economy as well as being highly import dependent (Olofin et al. (2014)). While there are speculations that the pandemic may plunge the country into recession in the nearest future, general price levels are also not unaffected. These economic features and the associated uncertainties are examined in this study.

2.2 COVID-19 Cases and Exchange Rate

The exchange rate regime in Nigeria has, over the years, been a managed float, with official rates determined by the apex monetary authority rather than allowed to be determined by market forces of demand and supply. One main characteristic feature of the Nigerian foreign exchange market is the prominent existence of the parallel market (often referred to as the noisy five percent), which however dominates the official rates thereby reducing the control of the apex monetary authority in the determination of market rates. In this light, while there usually exists an official rate (often fixed at a value over a long period of time), the parallel market rates are prominently used by many foreign exchange dealers and their customers alike. The latter is usually driven by speculations, which could also include statements made about the official rate by the CBN. However, most business-inclined persons would prefer to patronize parallel market dealers, in a bid to avoid the large paper works that characterizes the formal banking practice (see Olofin et al. (2016)).

Consequently, the co-movement of the parallel market determined exchange rate and COVID-19 confirmed cases is examined (see Figure 2).

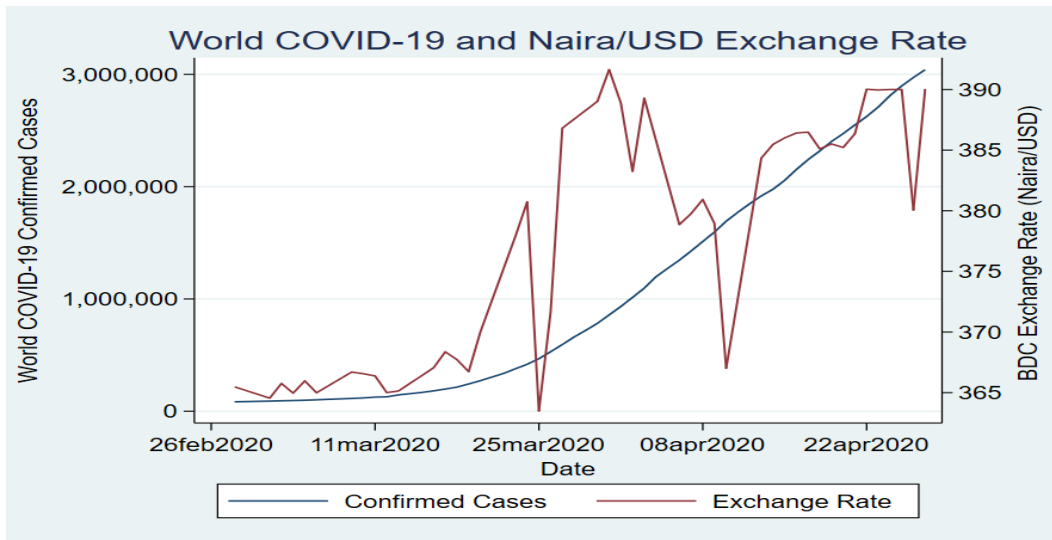


Figure 2: World Confirmed COVID-19 Cases and BDC Exchange Rate (Naira/USD)

It appears that exchange rate depreciates as the number of confirmed COVID-19 cases increases, with more erratic fluctuations as the number of confirmed cases increases further. This may be occasioned by the alternate surplus and deficit of the dollar cum speculations about the market. Imperatively, as the pandemic lingers, the naira value is likely to depreciate, causing the CBN to either maintain status quo by allowing the official rate to remain or attempt to close the premium gained by parallel market dealers. The former would require the CBN to pump in more dollars into the market, a move that may be quite overbearing given that the

country's source of foreign earnings – crude oil, already suffers a setback of crash in prices. On the other hand, closing the premium would entail further devaluing the naira. While maintaining the status quo could be expensive and possibly unaffordable during the pandemic, devaluation would be more likely, and may lead to increase in general price levels (see Olubusoye and Oyaromade (2008)). The CBN however chose the latter, devaluing the naira from N306.5 to N360.5 and thus contributing to the rise in general price level, with the inflation rate moving from 10.81% in December 2019 to 12.13% in January, 12.2% in February and 12.26% in March, 2020 (NBS CPI Report - March, 2020). Exchange rate is a direct channel through which foreign inflation could be imported into Nigeria. An immediate effect of depreciation would be reduced purchasing power of the domestic currency as the naira value of imports will increase since the inflation rate of the country's trade partners will migrate into the country, and subsequently lead to higher domestic prices of imported goods. Consequently, the pandemic may create some form of inflationary pressure.

2.3 COVID-19 Cases and All Share Index

The Nigeria stock market, just like every other stock market, is highly speculative. As a measure of the performance of listed companies and a form of investment, it has some significant impact on general economic activities. This is basically through the inter-relationships between market fluctuations - bull (rising stock

prices) and bear (falling stock prices) effects, sentiments (optimism or pessimism), and consumer and business spending, which all jointly determine the plausible direction of the nation's economic growth. Stock price movement amidst the COVID-19 pandemic generally exhibits a bear effect (see Figure 3), which is characterized majorly by fall in both investments and consumer spending, occasioned by pessimism. While investors are likely to hastily sell off their stocks to guard against losses, companies' performances (in terms of sales' volume and earned revenue) may be negatively affected. In addition to difficulties in sourcing funds externally, the dwindling sales and revenue figures are likely to cause reduction in companies' ability to pay existing debts, reduction of administrative costs, laying off workers (consequently increasing unemployment rate), and also, reduction in consumer spending. The reduction in investment and consumer spending would also affect economic activities, measurable through GDP growth, negatively.

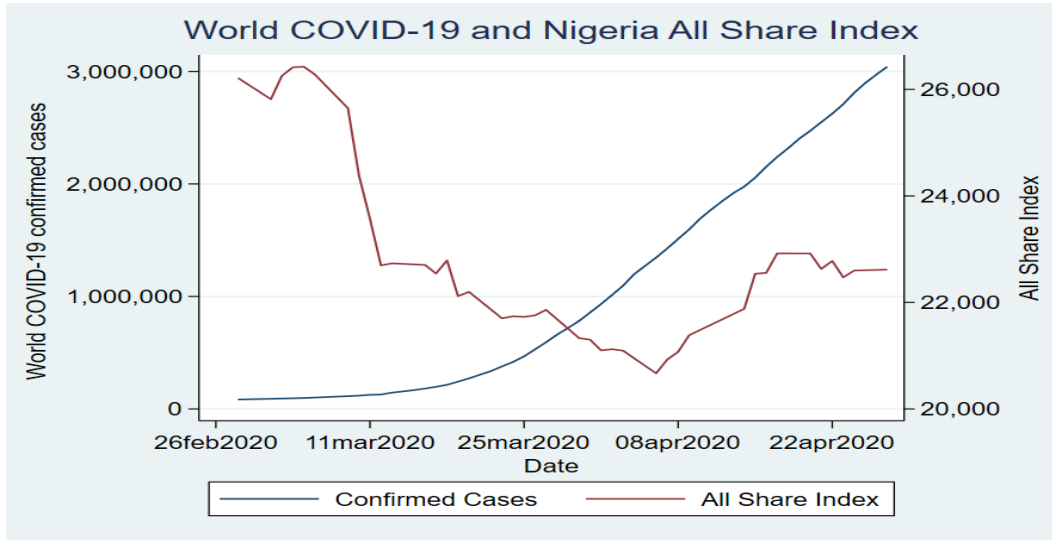


Figure 3: World Confirmed COVID-19 Cases and All Share Index (ASI)

3. COVID-19 and 2020 Budget

The 2020 budget assumptions and budget estimates before the COVID-19 pandemic, as well as the adjustments that were made by the Federal Government to reflect the prevailing economic stance, is presented here. This is to ascertain the level of distortions of budget assumptions and budget estimates that might have resulted from the COVID-19 pandemic. The COVID-19 pandemic has affected the budget negatively, as the key macroeconomic fundamentals that are considered in the budgeting process are observed to have been clearly overstated (see Table 1).

Table 1: 2020 Budget Assumptions and Estimates of Macroeconomic Fundamentals

S/N	Macro aggregate	2020 Budget	Cut/Increase by FG Due to COVID-19	COVID-19 Period	Percentage change
Budget Assumptions					
1	Oil Production (mbpd)	2.18	<u>1.7</u>	<u>2.0</u>	-8.26
2	Oil Price (\$/per barrel)	57	<u>30</u>	<u>\$12</u>	-78.95
3	Exchange Rate (Naira/\$)	305	<u>360</u>	360	18.03
4	Inflation Rate (%)	10.81		<u>12.26</u>	
5	GDP Growth Rate (%)	2.93		2.55	
Budget Estimates					
6	Budget (N trillion)	<u>10.59</u>	<u>10.27</u>		-3
7	Revenue (N trillion)	8.42	<u>5.08</u>		-40
	(a) Oil (N trillion)	2.63	<u>0.25</u>		-90
	(b) Non-oil (N trillion)	1.80	<u>1.53</u>		-15
8	Capital Expenditure (N trillion)	2.78	<u>2.62</u>		-6
9	Recurrent Expenditure (N trillion)	4.49	<u>4.46</u>		-1
10	Debt Service (N trillion)	2.45			
11	Budget Deficit (N trillion)	2.18	<u>5.18</u>		138

Source: compiled by the authors (from premium Times, Bloomberg and NBS)

Although the Federal government, in coming to terms with reality, adjusted the budget assumptions downwards, the statistics during the COVID-19 pandemic, in the first quarter of 2020, is observed to be much lower. Oil production and oil price dropped by approximately 8.26% and 78.95%, respectively; exchange rate depreciated by approximately 18.03%; inflation rate rose to approximately 12.2%; while GDP grew by 2.55%, slightly lower than was originally envisaged. The immediate consequence of the overstated key factors, especially with respect to oil

production, oil price and exchange rate, is a 40% shortage in the estimated revenue, resulting from the 90% estimated drop in oil revenue, and approximately 138% increase in budget deficit from N2.175 trillion to N5.18 trillion. Imperatively, about 50.44% of the estimated budget would have to be funded by borrowing, thus compounding the already existing debt burden of the country.

Also, with oil production possibly being put on hold, given that the global market is already overwhelmed by an unmatched demand for the excess crude oil, the crash in the oil price is likely to linger for a while, pending the end of the COVID-19 pandemic and subsequent return to normalcy. This would bear its consequence not only on the country's foreign reserve as her foreign earnings are majorly from crude oil earnings, but also on the purchasing power of her local currency as there are likely tendencies of further devaluations, whenever the apex monetary authority is not able to maintain the exchange rate at the current level. Therefore, further external borrowing seems inevitable given the move by the Nigerian government to borrow about \$7 billion from multilateral agencies such as the International Monetary Fund (IMF), the World Bank and African Development Bank (AFDB), while also maintaining the concession agreement with these agencies and the Islamic Development Bank Nigeria - ISDB (Financial Post (2020); theafricareport (2020)). Already, IMF has approved US\$3.4 billion in emergency financial assistance under the Rapid Financing Instrument (RFI) to support the authorities' efforts in addressing the severe economic impact of the COVID-19 shock and the

sharp fall in oil prices. Additional financial support of US\$2.5 billion loan from World Bank, US\$1 billion from AFDB and an undisclosed amount from the Islamic Development Bank are still being negotiated. Following this budgetary uncertainties, the next section attempts to provide the economic growth outlook of the Nigerian economy for 2020.

4. COVID-19 and Real GDP Growth Projection

In this section, we present the simulation analysis of the potential impact of COVID-19 on the Gross Domestic Product (GDP) and its growth rates. The underlying motive is to forecast the plausible trajectory of the economic growth for the four quarters of 2020.

4.1. GDP Growth Model

In this subsection, 46 sub-activities are classified into 6 sectors and the expression for computing the Gross domestic product (GDP)⁷ of each sector is formulated. The expressions for computing the quarterly GDP, annualized GDP, quarterly GDP growth and the annualized GDP growth used in the Monte Carlo simulation that follows are presented here.

⁷ GDP is computed as gross output minus intermediate consumption.

Agriculture Sector

The output of the agriculture sector (*agric*) is the aggregate of the output of four (4) sub-activities, namely: crop (*crp*); livestock (*lvstk*); forestry (*frtry*); and fishing (*fshg*). The equation is given as:

$$agric_q = crp_q + lvstk_q + frtry_q + fshg_q; \quad q = 1, 2, 3, 4 \quad (1)$$

Mining and Quarrying Sector

The output of mining and quarrying sector (*mqry*) is the aggregate of the output of four (4) sub-activities, namely: crude petroleum and natural gas (*cpng*); coal mining (*clmg*); metal ores (*mtlore*); and quarrying and other mining (*qrrymg*).

The equation is given as:

$$mqry_q = cpng_q + clmg_q + mtlore_q + qrrymg_q; \quad q = 1, 2, 3, 4 \quad (2)$$

Manufacturing, Construction and Trade Sectors

The overall output of manufacturing, construction and trade sectors (*manufg*) is the aggregate of the output of eighteen (18) sub-activities, namely: oil refining (*oilrfg*); cement (*cmt*); food, beverage and tobacco (*fdbvrgtbc*); textile, apparel and footwear (*txtappltfr*); wood and wood products (*wwpdt*); pulp, paper and paper products (*ppdpt*); chemical and pharmaceutical products (*chmph*); non-metallic products (*nmpdt*); plastic and rubber products (*pltrbb*); electrical and

electronics (*elecelec*); basic metal, iron and steel (*bmistl*); motor vehicles & assembly (*mtrvass*); other manufacturing (*omfg*); electricity, gas, steam and air conditioning supply (*egsacs*); water supply, sewerage, waste management and remediation (*wsswmr*); construction (*cstn*); trade (*trade*); and accommodation and food services (*accfs*). The equation is given as:

$$\begin{aligned}
 manufg_q = & oilrfg_q + cmt_q + fdbvrgtbc_q + txtapplftr_q + wwpdt_q \\
 & + ppdpt_q + chmph_q + nmpdt_q + pltrbb_q + elecelec_q \\
 & + bmirst_q + mtrvass_q + omfg_q + egsacs_q + wsswmr_q \\
 & + cstn_q + trade_q + accfs_q; \qquad q = 1, 2, 3, 4 \qquad (3)
 \end{aligned}$$

Transportation and Storage Sector

The output of transportation and storage sector (*trpsto*) is the aggregate output of six (6) sub-activities, namely: road transport (*rdtrpt*); rail transport and pipelines (*rtrptp*); water transport (*wtrpt*); air transport (*atrpt*); transport services (*trpts*); and post courier services (*pcss*). The equation is given as:

$$trpsto_q = rdtrpt_q + rtrptp_q + wtrpt_q + atrpt_q + trpts_q + pcss_q; \qquad q = 1, 2, 3, 4 \qquad (4)$$

Information and Communication Sector

The overall output of information and communication sector (*ict*) is the aggregate output of five (5) sub-activities, namely: telecommunications & information services (*tis*); publishing (*pbhg*); motion pictures, sound recording and music

production ($mpsrm_p$); broadcasting ($bdtg$); and arts, entertainment and recreation ($artentrec$). The equation is given as:

$$ict_q = tis_q + pbhg_q + mpsrmp_q + bdtg_q + artentrec_q; \quad q = 1, 2, 3, 4 \quad (5)$$

Financial and Insurance Sectors

The output of financial and insurance sectors ($finsur$) is the aggregate output of nine (9) sub-activities, namely: financial institutions ($finst$); insurance (ins); real estate ($rlst$); professional, scientific and technical services ($psts$); administrative and support services ($adsup$); public administration ($pubadm$); education (edu); human health and social services ($hhss$); and other services ($oths$). The equation is given as:

$$finsur_q = finst_q + ins_q + rlst_q + psts_q + adsup_q + pubadm_q + edu_q + hhss_q + oths_q; \quad q = 1, 2, 3, 4 \quad (6)$$

GDP at 2010 Constant Price (GDP^{2010CP})

Using equations (1) - (6), the GDP at 2010 constant price is given as follows:

$$GDP_q^{2010CP} = agric_q^{2010CP} + mqrry_q^{2010CP} + manufg_q^{2010CP} + trpsto_q^{2010CP} + ict_q^{2010CP} + finsur_q^{2010CP}; \quad q = 1, 2, 3, 4 \quad (7)$$

Annualized GDP Growth Rate

The annualized GDP growth rate ($GDPGR_n$) is obtained from the GDP for two consecutive years. Thus, for two consecutive years m and n ($m < n$). The annualized GDP growth rate is computed as follows:

$$GDPGR_n = \frac{GDP_n^{2010CP} - GDP_m^{2010CP}}{GDP_m^{2010CP}} \times 100 \quad (8)$$

Quarterly GDP Growth Rate

The quarterly GDP growth rate for quarter q year n ($QGDPGR_n^q$) measures the percentage increase in output from quarter q of year m to quarter q of year n .

This is computed as follows:

$$GDPGR_n^q = \frac{GDP_n^q - GDP_m^q}{GDP_m^q} \times 100 \quad (9)$$

4.2 The Monte Carlo Simulation

The simulation utilizes the actual Quarterly National Accounts (QNA) data for 2018 and 2019 published by the National Bureau of Statistics on its website (<http://nigerianstat.gov.ng/>). The dataset covers major aggregates of quarterly GDP under 46 economic activities at 2010 constant basic prices which are further classified into 6 sectors (See Appendix, Table 1).

The study employs the popular @Risk software (Version 7.6.0) which allows the user to conduct a Monte Carlo simulation within the Microsoft Excel environment. For the purpose of validation, the expressions in (1) - (9) were used to recompute and obtain the NBS published GDP at 2010 constant basic prices (₦ Million) and the growth rate for 2018 (Q1 to Q4) and 2019 (Q1 to Q4) (See Appendix, Table 2).

Thereafter, for each quarter (Q1 to Q4) in 2020, a probability distribution is specified for each economic activity based on its historical movement and the assumption made for its future path in view of the COVID-19 pandemic. The use of probability distribution helps to describe the uncertainty in each economic activity and to obtain the probability of different outcomes occurring. The PERT⁸ distribution is adopted due to the constraint of short time series data for each economic activity for fitting empirical distribution. Thus, three parameter values are defined for each economic activity for each quarter of year 2020 based on the knowledge of the Nigerian economy and the likely impact of the COVID-19 on the activity. The parameter values specified consist of minimum, most likely and maximum (see Appendix, Table 3). During the Monte Carlo simulation, values are sampled at random from the input probability distributions. The number of iterations used in the simulation is 10,000.

4.3 2020 Real GDP Growth Projection

The input variables in the simulation are the 46 economic activities, which according to the National Bureau of Statistics (NBS), are in line with the international standards outlined under the United Nations Statistics Division (UNSTATS). On the other hand, the output variables are the quarterly aggregate

⁸ PERT means Program Evaluation and Review Techniques

real GDP and their growth rates. The results of the output variables are presented in Table 2.

Table 2: Simulation Result for Quarterly Aggregate Real GPS and Growth Rates

(1)	Aggregate Real GDP at 2010 Constant Basic Prices			Real GDP Growth Rates		
	Year - 2019 (NBS value) (2)	Year 2020 (Simulated Value)		Year 2019 (NBS value) (5)	Year - 2020 (Simulated Value)	
		Mean (₦ Million) (3)	Probability of Value > 2019 (4)		Mean (%) (6)	Probability of negative growth (7)
Quarter 1	16,384,063.26	16,769,473.65	0.525	2.08	2.352	0.085
Quarter 2	16,892,756.91	16,951,142.52	0.541	2.12	0.346	0.479
Quarter 3	18,459,494.59	16,760,741.22	0.536	2.28	-9.203	1.000
Quarter 4	19,488,576.88	18,260,028.60	0.463	2.55	-6.304	1.000
Year Total	71,224,891.64	68,741,385.99	0.508	2.27	-3.487	1.000

The table presents both the NBS published values for the year-2019 (columns (2) and (5)) as well as the summary of the 10,000 simulated values for year-2020. The mean of the simulated values is given in column (3) and column (6) for real GDP and its growth rate, respectively. Table 3 presents the actual 2019 and projected 2020 aggregate real GDP/growth rates for comparison purpose.

Table 3: Actual 2019 and projected 2020 Aggregates Real GPS/Growth Rates

	Actual 2019 Real GDP		Projected 2020 Real GDP	
	Value (=N=Million)	Growth Rate	Value (=N=Million)	Growth Rate (%)
Quarter 1	16,384,063.26	2.08	16,769,469.09	2.35
Quarter 2	16,892,756.91	2.12	16,951,139.99	0.35
Quarter 3	18,459,494.59	2.28	16,760,748.54	-9.20
Quarter 4	19,488,576.88	2.55	18,260,026.88	-6.30
Annualized	71,224,891.64	2.27	68,741,384.50	-3.49

The probability densities of the simulated real GDP growth rates for each quarter and the entire year-2020 are shown in Figure 4. The descriptive summary; comprising the minimum, maximum, mean, standard deviation and number of values simulated (iterations), is in the Appendix, Table 4.

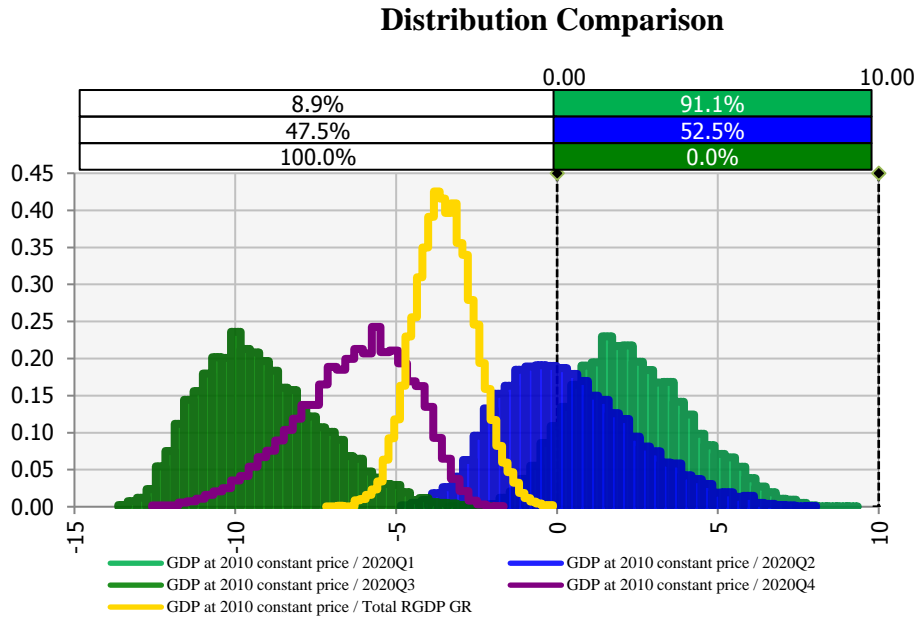


Figure 4: Probability Densities for Stimulated Quarterly real GDP and Growth Rates

The probability that the aggregate real GDP value of a given quarter in year-2020 will exceed the corresponding quarter in year-2019 is read from the density plot⁹ and given in column (4) of Table 2. It is equally likely that the aggregate real GDP value for any given quarter in year-2020 will exceed/fall below the value reported for the corresponding quarter in year-2019. Similarly, the total annual aggregate real GDP for the entire year-2020 is equally likely to exceed/fall below the value reported for the entire year-2019. On the other hand, the probability that the real GDP growth rate of a given quarter in year-2020 will be negative is read from the

⁹ The density plot for the aggregate real GDP is not shown here due to space constraint.

density plot in Figure 4 and given in the column (7) of Table 2 (see the expanded version in the Appendix, Table 4). It is expected that the country will record a mild growth rate of about 2.35% in the first quarter of year-2020 compared with the 2.08% reported for the corresponding period in year-2019. This is highly probable as the impact of COVID-19 was less pronounced during this period. In fact, the probability of recording a negative growth during the first quarter is very low, 0.085. In the second quarter, the impact of the pandemic may force growth rate to fall to as low as 0.346% and raise the probability of negative growth to 0.479. The full weight of the impact of COVID-19 is expected to manifest on the economic growth with a fall of -9.2% in the third quarter and a fall of -6.3% in the fourth quarter of year-2020. Indeed, the probability of negative growth in the last two quarters of year-2020 is one. Thus, the country will inevitably witness serious economic contraction in the last two quarters of the year and will certainly slide into full recession. An overall contraction of -3.5% is projected for the year-2020. This result concurs with Fernandes (2020) which already predicted that GDP growth would take a hit and could fall more than 10%, and in some countries, more than 15%. Also, this result is quite close to the 2020 projected real GDP growth of -3.4 for Nigeria by the International Monetary Fund (IMF) ¹⁰. Finally, sectoral aggregate real GDP and growth rates projections for 2020 is shown in Table 4. All

¹⁰ <https://www.imf.org/en/Countries/NGA>

the sectors are projected to record negative growth rate in 2020 except Financial and Insurance sector with an anticipated growth rate of 0.37 in 2020. The aggregate real GDP value for Agriculture is expected to be N16,720,206.81 while growth in the sector will decline from 2.36% in 2019 to -6.90% in 2020. Similarly, the aggregate real GDP value for Manufacturing sector is expected to be N21,569,287.43 while the sector will witness a minimal drop in growth rate from NBS figure 0.77 in 2019 to -0.09 figure projected for 2020 in our simulation.

Table 4: Sectoral Aggregate rate GDP and Growth Rates Projections for 2020

<i>S/N</i>	<i>Sector</i>	<i>2020 Projected Real GDP Value (=N=Million)</i>	<i>RGDP Growth Rate (%)</i>			<i>Probability of Negative Growth Rate</i>
			<i>2018</i>	<i>2019</i>	<i>Projected for 2020</i>	
1	Agriculture	16,720,206.81	2.12	2.36	-6.90	0.976
2	Mining and Quarrying	5,974,389.44	1.11	4.43	-6.10	1.000
3	Manufacturing	21,569,287.43	2.09	0.77	-0.09	0.548
4	Transportation and Storage	945,561.38	13.91	10.37	-10.74	1.000
5	Information and Communication	8,530,739.61	9.65	11.08	-8.37	1.000
6	Financial and Insurance	15,001,209.09	2.03	2.56	0.37	0.360

4.4 Expected Activity/Sector Impact on the Projected Real GDP Growth

To assess the impact of the sub-activities/sectors on the real GDP growth rate, the contribution to variance methodology is employed. The plot of the contributions to the projected real GDP growth rate by sub-activities is shown in Figure 5.

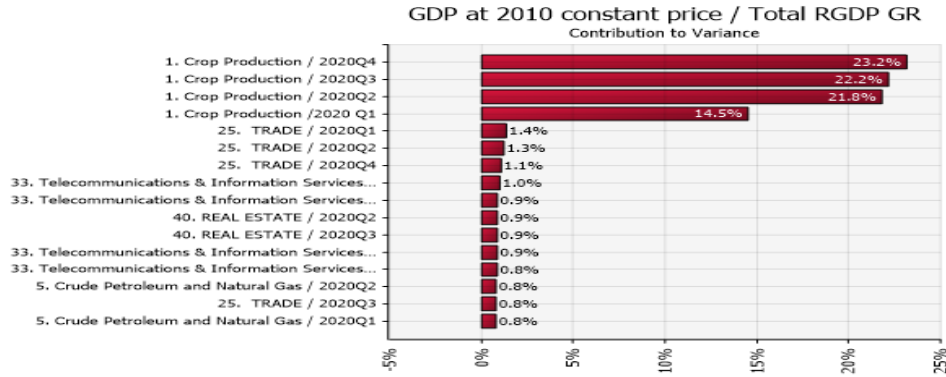


Figure 5: Contribution to Variance

It can easily be seen from the plot that crop production is expected to have greater effect on the variability of the real GDP growth rate than any other sub-activity. In fact, this effect is expected to increase steadily from quarter 1 to quarter 4. Precisely, crop production has 14.5%, 21.8%, 22.2% and 23.2% effect on the variability of real GDP growth rate in quarter 1, 2, 3 and 4, respectively. The other sub-activities with varying but very minimal effect include: Trade; Telecommunication and Information; Real Estate; and Crude Petroleum and Natural Gas.

Next, how the value of real GDP growth rate changes as the sampled crop production value changes is examined using a spider graph shown in Figure 6.

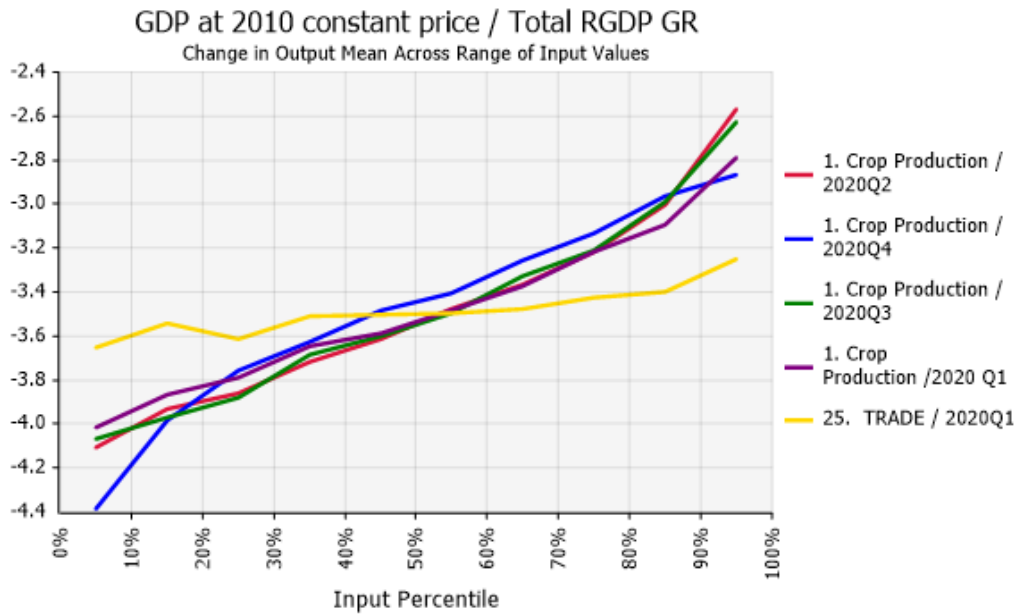


Figure 6: Change in Real GDP Growth Rate Across Range of Crop

Production values

The steeper the line, the greater the impact of crop production on the real GDP growth rate. The spider graph shows how real GDP growth rate changes as crop production increased from 10% to 90% in quarter 1, 2, 3, and 4. Indeed, as the percentage of crop production increases, the effect of economic contraction is moderated.

5. Summary and Conclusion

The study investigated the impact of the emergence of COVID-19 on some macroeconomic fundamentals (oil price, exchange rate, All Share Index (ASI), inflation and output growth), in a bid to make projections for Nigeria’s economic

growth. Specifically, three main objectives are targeted. Firstly, the behavioural patterns of selected macroeconomic fundamentals vis-a-viz COVID-19 globally confirmed cases are assessed, to ascertain the relationship between each macroeconomic fundamental and COVID-19 confirmed cases. Secondly, the impact of the global pandemic on the 2020 budget assumptions and estimates is also assessed, with focus on the percentage difference between the budget and current economic stance amidst the pandemic. Finally, projections of Nigeria's year 2020 quarterly growth rates are made, with statements of how likely the country is to record negative growth in the year 2020, as well as the sectoral contribution of the GDP components.

Basic statistical tools and a risk analytic tool were employed to assess the behaviour of the macroeconomic fundamentals, for periods starting from the announcement of the COVID-19 pandemic. On the risk analysis, we measure the plausible risk on the economic growth of Nigeria, occasioned by the pandemic and based on 46 economic activities. GDP component data for two consecutive years (2018 and 2019) were used, with specification of the minimum, most likely and maximum growth to simulate 10,000 values for each quarter. The average of these values formed the forecast of the quarterly GDP, its growth rate as well as the associated probability of recording a negative growth at any of the quarters of 2020.

Our results show COVID-19 to negatively impact global oil prices, Naira/USD exchange rate, Nigeria all share index, inflation and growth rate, with these impacts worsening as the pandemic lingers. The country's budget estimate is also negatively affected, given the large changes between the budget assumptions and stance during the COVID-19 pandemic. Consequently, more than 50% of the country's budget would have to be funded by external borrowing, hence increasing the debt burden of the country further. The budget deficit is alarmingly increased by approximately 138%. Economic growth in the first quarter was positive and its corresponding probability of recording a negative growth minute. The probability of recording negative growth is however projected to increase in subsequent quarters, with the third and fourth quarters having a sure probability of 1. Imperatively, Nigeria is most likely to experience negative growth in the third and fourth quarters of 2020 and may slide into recession by the end of the year 2020. Our projection of a -3.5% economic contraction aligns with the IMF's -3.4. Also, we find crop production under the agriculture sector to have greater impact on the variability of the real GDP growth rate; hence, its plausible preference as a tool for recovering from the impending recession.

Nigeria's macroeconomic fundamentals indicate that Nigeria, just like most developing countries, is at a risk of an impending recession. This may not be unconnected with the government's policy response to the pandemic; by way of

imposing movement restrictions in terms of partial or total lockdown, social distancing, providing citizenry with some palliatives, and also trying to contain the spread of the coronavirus by quarantining and treating infected individuals; as most economic activities are somewhat halted. Amidst low economic productivity and negatively affected foreign exchange earnings, the country has to commit large funds to provide necessary supplies that are required to combat the spread and attend to already infected persons. The already existing imbalance between revenue and expenditure will definitely increase, as the former will inevitably continue to dwindle except economic activities resume and return to normalcy. Also, accrued debts prior to and during this pandemic, and consequently, debt servicing will influence the country's economic recovery. Hence, given the inevitable slide into recession, necessary actions need to be taken to facilitate recovery. Provision of infrastructures that will encourage diversification of the economy from oil dependence cannot be overemphasized and should be pursued vigorously, with focus on the major contributing sectors to moderate variability in the real GDP growth rate.

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Appendix
Table A1: Gross Domestic Product at 2010 Constant Basic Prices (₦ Million)

	2018					2019				
	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total
ACTIVITY SECTOR										
AGRICULTURE										
1. Crop Production	3,045,163.11	3,378,030.03	4,877,078.38	4,486,166.16	15,786,437.68	3,144,587.69	3,443,607.45	4,994,729.88	4,599,067.95	16,181,992.98
2. Livestock	292,386.84	283,577.69	291,160.54	341,002.97	1,208,128.04	294,971.65	283,559.35	291,218.38	340,306.01	1,210,055.38
3. Forestry	41,360.26	48,008.51	43,341.10	50,038.06	182,747.93	42,265.37	49,559.78	44,980.39	50,669.33	187,474.87
4. Fishing	108,402.70	80,103.89	76,759.20	101,568.29	366,834.08	116,091.37	80,979.01	78,050.27	103,939.83	379,060.48
MINING AND QUARRYING										
5. Crude Petroleum and Natural Gas	1,537,038.44	1,418,073.13	1,696,606.69	1,344,156.80	5,995,875.07	1,514,641.29	1,519,802.94	1,806,746.96	1,429,667.98	6,270,859.17
6. Coal Mining	2,471.38	2,208.65	500.07	1,637.13	6,817.23	3,239.94	2,377.16	661.03	1,435.50	7,713.63
7. Metal Ores	3,944.57	1,557.58	1,313.01	887.74	7,702.90	3,012.08	1,498.87	1,215.28	869.04	6,595.27
8. Quarrying and Other Minerals	4,770.92	21,854.40	25,457.48	29,999.09	82,081.90	6,169.16	21,093.83	21,888.67	28,311.04	77,462.70
MANUFACTURING										
9. Oil Refining	29,128.31	37,205.77	36,639.22	40,030.06	143,003.37	14,673.75	28,338.82	25,365.06	29,738.31	98,115.94
10. Cement	148,250.54	137,468.62	144,935.65	145,972.51	576,627.31	152,413.88	139,646.42	154,895.44	147,619.72	594,575.45
11. Food, Beverage and Tobacco	723,935.98	702,369.81	718,419.37	755,419.86	2,900,145.02	736,653.78	710,910.06	739,803.77	775,708.42	2,963,076.02
12. Textile, Apparel and Footwear	355,922.43	339,763.03	359,355.44	387,988.95	1,443,029.85	359,513.71	334,927.71	355,317.85	391,916.74	1,441,676.01
13. Wood and Wood Products	52,485.21	47,750.80	49,514.43	51,598.09	201,348.53	53,216.94	48,320.14	51,185.53	52,503.56	205,226.17
14. Pulp, Paper and Paper Products	13,077.73	12,816.42	13,226.74	14,139.01	53,259.90	13,346.55	13,115.32	13,495.94	13,967.59	53,925.40
15. Chemical and Pharmaceutical Products	36,471.10	38,716.31	39,397.06	40,347.90	154,932.37	37,075.43	38,225.08	39,448.21	40,720.50	155,469.22
16. Non-Metallic Products	58,297.11	59,249.05	61,067.95	59,344.00	237,958.11	60,435.70	59,818.80	61,631.96	60,066.84	241,953.29
17. Plastic and Rubber Products	55,745.29	55,264.03	55,993.74	58,864.47	225,867.53	58,176.95	56,513.87	56,571.96	60,679.67	231,942.45
18. Electrical and Electronics	924.42	1,214.13	1,317.60	1,300.95	4,757.11	938.49	1,244.08	1,331.09	1,314.77	4,828.42
19. Basic Metal, Iron and Steel	40,114.96	39,731.73	42,371.80	46,198.52	168,417.01	40,712.62	38,515.23	40,229.67	46,717.54	166,175.05
20. Motor Vehicles & Assembly	7,671.82	7,506.68	6,276.92	7,144.72	28,600.15	8,693.62	7,394.15	6,181.66	6,992.71	29,262.14
21. Other Manufacturing	73,538.72	60,510.37	70,527.59	78,067.34	282,644.02	72,610.43	60,552.50	71,126.52	79,316.86	283,606.31
22. Electricity, Gas, Steam and Air Conditioning Supply	31,999.70	77,314.49	75,956.04	104,022.07	289,292.30	34,708.73	77,649.42	66,983.83	95,889.60	275,231.59
23. Water Supply, Sewerage, Waste Management and Remediation	29,027.55	34,491.52	28,554.64	23,706.39	115,780.10	30,116.67	39,442.02	28,011.32	24,542.03	122,112.04
24. Construction	650,767.19	747,860.30	544,228.74	662,431.53	2,605,287.77	671,448.37	752,833.66	557,147.53	671,110.60	2,652,540.16
25. Trade	2,747,170.57	2,728,125.96	2,857,370.77	3,141,123.70	11,473,791.00	2,770,454.69	2,721,316.70	2,815,887.74	3,122,887.95	11,430,547.07
26. Accommodation and Food Services	176,498.35	105,401.85	157,259.25	181,031.20	620,190.65	183,831.29	108,482.91	160,848.58	184,695.99	637,858.77

TRANSPORTATION AND STORAGE										
27.Road Transport	211,696.02	185,620.85	183,288.85	234,630.76	815,236.49	257,171.01	200,853.16	220,274.94	228,575.51	906,874.62
28.Rail Transport & Pipelines	20.52	56.91	37.53	66.75	181.70	19.28	57.06	39.05	69.48	184.86
29. Water Transport	793.35	1,413.58	1,552.08	1,122.36	4,881.37	796.81	1,397.98	1,570.49	1,143.30	4,908.58
30. Air Transport	16,484.02	15,748.09	20,155.77	21,425.56	73,813.44	17,982.42	17,687.34	23,226.12	24,635.96	83,531.84
31. Transport Services	6,547.26	11,272.45	14,214.40	15,564.07	47,598.18	6,685.19	11,483.47	14,550.41	16,146.11	48,865.19
32. Post and Courier Services	5,993.54	2,239.60	2,167.83	4,529.17	14,930.14	5,982.30	2,226.80	2,148.91	4,548.30	14,906.30
INFORMATION AND COMMUNICATION										
33. Telecommunications & Information Services	1,479,871.91	1,728,588.59	1,517,102.16	1,876,514.38	6,602,077.04	1,660,075.09	1,924,618.87	1,701,527.77	2,069,090.27	7,355,312.00
34.Publishing,	5,351.28	5,148.67	4,377.28	4,784.17	19,661.40	5,347.64	5,385.39	4,505.47	4,933.60	20,172.10
34. Motion Pictures, Sound recording and Music production	214,692.33	171,390.90	160,128.07	180,794.49	727,005.79	217,126.20	167,325.29	161,779.40	182,261.81	728,492.70
36. Broadcasting	299,293.60	354,436.58	226,278.02	298,906.90	1,178,915.10	306,261.49	365,783.47	228,506.26	305,396.83	1,205,948.05
37.ARTS, ENTERTAINMENT AND RECREATION	47,132.89	38,366.32	33,646.20	37,338.61	156,484.02	50,489.39	38,677.98	34,619.58	39,148.08	162,935.03
FINANCIAL AND INSURANCE										
38. Financial Institutions	492,748.00	461,422.17	393,669.38	459,594.73	1,807,434.28	447,344.63	445,195.51	396,060.18	562,235.25	1,850,835.57
39. Insurance	78,386.16	88,010.57	62,513.19	58,332.34	287,242.27	80,404.95	91,954.87	64,989.25	60,203.89	297,552.96
40. Real Estate	907,593.68	1,131,763.57	1,175,656.69	1,256,847.82	4,471,861.75	916,064.55	1,088,267.52	1,148,470.43	1,213,548.10	4,366,350.60
41. Professional, Scientific and Technical Services	564,694.65	594,967.30	677,860.50	706,613.23	2,544,135.68	574,481.80	602,156.45	660,127.24	710,530.76	2,547,296.25
42. Administrative & Support Services	3,307.92	3,324.81	3,870.51	3,937.63	14,440.88	3,355.32	3,392.34	3,988.47	3,987.57	14,723.69
43. Public Administration	358,496.20	380,006.76	365,540.65	427,538.21	1,531,581.82	307,550.32	367,112.43	367,755.38	427,802.26	1,470,220.39
44. Education	345,537.77	297,293.69	386,568.22	478,161.40	1,507,561.07	346,165.27	300,161.48	391,169.57	482,164.11	1,519,660.44
45. Human Health and Social Services	112,685.85	118,790.00	117,455.89	123,769.86	472,701.60	112,506.18	120,126.87	118,468.79	123,072.93	474,174.77
46. Other Services	678,761.98	524,471.89	460,629.46	696,777.64	2,360,640.98	694,742.66	537,845.35	465,381.99	707,574.74	2,405,544.75
GDP at 2010 constant price	16,096,654.19	16,580,508.07	18,081,342.10	19,041,437.59	69,799,941.95	16,434,552.65	16,931,434.89	18,494,114.17	19,527,724.96	71,387,826.67
Net Indirect Taxes on Products	138,300.77	138,117.21	223,784.30	236,204.40	736,406.67	135,182.08	144,665.83	203,209.65	223,209.76	706,267.32
GDP Constant Market Price	16,234,954.95	16,718,625.28	18,305,126.40	19,277,641.99	70,536,348.62	16,569,734.73	17,076,100.72	18,697,323.82	19,750,934.72	72,094,094.00


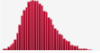



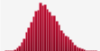




Table A2: Real Gross Domestic Product at 2010 Constant Basic Prices (%)

ACTIVITY SECTOR	2018					2019				
	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	TOTAL
AGRICULTURE	3.00	1.19	1.91	2.46	2.12	3.17	1.79	2.28	2.31	2.36
1. Crop Production	3.45	1.49	1.87	2.48	2.26	3.26	1.94	2.41	2.52	2.51
2. Livestock	-1.85	-1.95	2.56	2.35	0.33	0.88	-0.01	0.02	-0.20	0.16
3. Forestry	2.94	3.96	3.72	1.73	3.06	2.19	3.23	3.78	1.26	2.59
4. Fishing	4.25	-1.35	0.84	1.97	1.64	7.09	1.09	1.68	2.33	3.33
MINING AND QUARRYING	14.10	-3.84	-2.81	-1.23	1.11	-1.37	7.00	6.19	6.07	4.43
5. Crude Petroleum and Natural Gas	14.02	-3.95	-2.91	-1.62	0.97	-1.46	7.17	6.49	6.36	4.59
6. Coal Mining	2.46	-4.03	-1.74	-18.78	-5.81	31.10	7.63	32.19	-12.32	13.15
7. Metal Ores	45.94	7.16	17.04	8.41	26.34	-23.64	-3.77	-7.44	-2.11	-14.38
8. Quarrying and Other Minerals	27.45	3.31	3.08	20.95	10.33	29.31	-3.48	-14.02	-5.63	-5.63
MANUFACTURING	3.39	0.68	1.92	2.35	2.09	0.81	-0.13	1.10	1.24	0.77
9. Oil Refining	7.06	-21.49	-17.39	33.60	-3.97	-49.62	-23.83	-30.77	-25.71	-31.39
10. Cement	5.28	3.84	8.14	0.98	4.50	2.81	1.58	6.87	1.13	3.11
11. Food, Beverage and Tobacco	5.46	1.21	2.90	2.22	2.93	1.76	1.22	2.98	2.69	2.17
12. Textile, Apparel and Footwear	1.85	2.73	1.04	1.24	1.69	1.01	-1.42	-1.12	1.01	-0.09
13. Wood and Wood Products	1.53	2.23	1.47	1.62	1.70	1.39	1.19	3.37	1.75	1.93
14. Pulp, Paper and Paper Products	3.41	5.88	2.06	2.62	3.44	2.06	2.33	2.04	-1.21	1.25
15. Chemical and Pharmaceutical Products	1.36	-1.62	1.24	1.52	0.61	1.66	-1.27	0.13	0.92	0.35
16. Non-Metallic Products	-4.94	0.60	0.36	2.26	-0.48	3.67	0.96	0.92	1.22	1.68
17. Plastic and Rubber Products	0.43	1.28	0.95	3.44	1.54	4.36	2.26	1.03	3.08	2.69
18. Electrical and Electronics	10.14	3.71	3.06	0.33	3.75	1.52	2.47	1.02	1.06	1.50
19. Basic Metal, Iron and Steel	0.88	-4.01	-0.24	0.32	-0.75	1.49	-3.06	-5.06	1.12	-1.33
20. Motor Vehicles & Assembly	2.29	-2.88	-4.02	-5.70	-2.54	13.32	-1.50	-1.52	-2.13	2.31
21. Other Manufacturing	-0.63	-3.66	1.67	1.70	-0.11	-1.26	0.07	0.85	1.60	0.34
22. Electricity, Gas, Steam and Air Conditioning Supply	4.93	7.59	18.27	0.95	7.30	8.47	0.43	-11.81	-7.82	-4.86
23. Water Supply, Sewerage, Waste Management and Remediation	11.61	11.98	2.32	1.85	7.21	3.75	14.35	-1.90	3.52	5.47
24. Construction	-1.54	7.66	0.54	2.05	2.33	3.18	0.67	2.37	1.31	1.81
25. Trade	-2.57	-2.14	0.98	1.02	-0.63	0.85	-0.25	-1.45	-0.58	-0.38
26. Accommodation and Food Services	0.29	2.43	2.66	2.05	1.76	4.15	2.92	2.28	2.02	2.85
TRANSPORTATION AND STORAGE	14.45	21.76	11.95	9.48	13.91	19.50	8.02	18.24	-0.80	10.73
27. Road Transport	15.63	23.36	12.07	9.10	14.47	21.48	8.21	20.18	-2.58	11.24
28. Rail Transport & Pipelines	0.56	0.29	4.52	4.95	2.86	-6.04	0.25	4.05	4.09	1.74
29. Water Transport	2.43	4.33	2.45	1.96	2.87	0.44	-1.10	1.19	1.87	0.56
30. Air Transport	10.22	24.29	24.35	23.70	20.70	9.09	12.31	15.23	14.98	13.17
31. Transport Services	2.33	0.05	3.54	1.78	1.96	2.11	1.87	2.36	3.74	2.66
32. Post and Courier Services	3.14	19.24	-20.88	0.93	0.09	-0.19	-0.57	-0.87	0.42	-0.16
INFORMATION AND COMMUNICATION	1.58	11.81	12.09	13.20	9.65	9.48	9.01	9.88	10.16	11.08
33. Telecommunications & Information Services	1.88	11.54	14.97	16.67	11.33	12.18	11.34	12.16	10.26	11.41
34. Publishing	12.53	3.38	4.32	3.76	6.03	-0.07	4.60	2.93	3.12	2.60
34. Motion Pictures, Sound Recording and Music Production	0.26	-2.29	-0.45	0.55	-0.44	1.13	-2.37	1.03	0.81	0.20
36. Broadcasting	0.90	21.92	4.01	2.01	7.38	2.33	3.20	0.98	2.17	2.29
37. Arts, Entertainment and Recreation	0.30	3.48	2.83	4.18	2.53	7.12	0.81	2.89	4.85	4.12
FINANCIAL AND INSURANCE	13.30	1.28	-4.81	-1.76	2.03	-7.60	-2.24	1.07	20.18	2.56
38. Financial Institutions	12.58	0.81	-5.67	-2.13	1.41	-9.21	-3.52	0.61	22.33	2.40
39. Insurance	18.07	3.81	1.03	1.23	6.12	2.58	4.48	3.96	3.21	3.59
40. Real Estate	-9.40	-3.88	-2.68	-3.85	-4.74	0.93	-3.84	-2.31	-3.45	-2.36
41. Professional, Scientific and Technical Services	-2.35	2.07	1.93	0.46	0.57	1.73	1.21	-2.62	0.55	0.12
42. Administrative & Support Services	-0.52	-3.41	2.02	0.83	-0.18	1.43	2.03	3.05	1.27	1.96
43. Public Administration	-1.72	-5.21	-0.95	-0.32	-2.05	-14.21	-3.39	0.61	0.06	-4.01
44. Education	0.45	-0.67	-0.42	0.35	-0.03	0.18	0.96	1.19	0.84	0.80
45. Human Health and Social Services	-0.37	0.41	-0.68	-0.64	-0.32	-0.16	1.13	0.86	-0.56	0.31
46. Other Services	2.24	2.72	2.86	1.24	2.17	2.35	2.55	1.03	1.55	1.90
GDP at 2010 constant price	1.89	1.50	1.81	2.38	1.91	2.10	2.12	2.28	2.55	2.27

Table A3: Cross-section of the Input Probability Distributions

Name	Graph	Minimum	Maximum	Mean	Mode	Median	Std. Deviation	1%	99%
1. Crop Production /2020 Q1		3,047,261.81	4,391,373.55	3,507,241.03	3,378,472.63	3,476,973.99	254,215.43	3,086,537.10	4,149,881.39
1. Crop Production /2020 Q1		283,621.50	337,916.96	299,021.51	292,228.75	297,479.44	9,625.11	284,480.36	324,859.36
1. Crop Production /2020 Q1		41,362.05	49,423.08	44,127.10	43,271.15	43,942.94	1,528.54	41,605.40	48,002.64
1. Crop Production /2020 Q1		78,413.53	108,375.94	98,572.53	101,404.34	99,271.14	5,534.95	84,397.93	107,578.60
10. Cement /2020Q1		138,050.35	148,226.86	144,243.65	144,921.25	144,406.02	1,969.37	139,524.76	147,755.72
13. Wood and Wood Products /2020Q1		47,792.47	52,401.74	49,715.63	49,508.16	49,668.14	881.77	48,049.08	51,730.95
20. Motor vehicles & assembly /2020 Q1		6,400.62	7,671.32	7,329.25	7,506.69	7,370.15	226.94	6,701.22	7,656.02
21. Other Manufacturing /2020 Q1		60,851.52	77,891.99	70,114.67	70,537.37	70,211.78	3,303.44	62,859.50	76,645.16
24. CONSTRUCTION /2020 Q1		548,140.62	744,013.62	649,192.81	649,021.69	649,556.82	38,466.09	567,526.12	728,052.41
26. ACCOMMODATION AND FOOD SERVICES /2020 Q1		108,694.78	180,621.73	152,578.37	156,547.18	153,678.65	13,848.12	119,581.22	177,439.59
2020Q1		160,355.04	212,512.50	182,999.66	180,347.19	182,479.06	10,176.52	163,674.84	206,152.38
2020Q2		160,445.97	212,921.99	182,999.69	180,347.16	182,479.04	10,176.55	163,662.78	206,152.20
2020Q3		160,186.64	211,707.91	176,730.72	171,354.12	175,481.65	9,489.50	161,447.60	201,152.26
2020Q4		171,420.71	212,734.79	184,876.95	180,211.71	183,921.47	7,579.72	172,525.94	204,237.39
Category: 1. Crop Production									
1. Crop Production / 2020Q2		3,046,111.12	4,770,022.89	3,572,391.73	3,392,427.00	3,527,102.41	313,487.49	3,081,896.80	4,395,157.92
1. Crop Production / 2020Q3		3,046,173.03	4,813,876.76	3,572,399.25	3,360,665.36	3,527,108.67	313,512.07	3,081,791.22	4,394,731.45
1. Crop Production / 2020Q4		3,136,380.55	4,874,371.23	4,311,149.16	4,491,750.08	4,352,005.54	319,945.89	3,490,259.30	4,830,065.53
Category: 10. Cement									
10. Cement / 2020Q2		137,930.53	148,220.08	144,243.62	144,921.26	144,406.03	1,969.40	139,527.10	147,755.47
10. Cement / 2020Q3		137,995.73	148,233.10	144,243.62	145,028.86	144,406.28	1,969.41	139,522.97	147,756.19
10. Cement / 2020Q4		144,950.49	148,085.25	146,179.36	146,021.74	146,130.68	606.65	145,091.16	147,624.74
Category: 11. Food, Beverage and Tobacco									
11. Food, Beverage and Tobacco / 2020Q1		702,602.31	752,609.52	721,911.11	718,300.75	721,090.18	9,672.03	704,729.02	745,146.57
11. Food, Beverage and Tobacco / 2020Q2		702,646.12	754,159.20	725,588.91	722,826.29	725,198.34	9,947.87	706,256.67	747,777.41
11. Food, Beverage and Tobacco / 2020Q3		702,608.74	753,422.57	721,911.15	718,828.43	721,088.87	9,672.19	704,729.92	745,138.78
11. Food, Beverage and Tobacco / 2020Q4		718,443.33	751,880.15	728,263.80	724,200.04	727,259.05	6,179.95	718,980.57	744,905.36
Category: 12. Textile, Apparel and Footwear									
12. Textile, Apparel and Footwear / 2020Q1		339,986.33	386,698.00	358,573.74	355,855.27	357,947.07	8,891.56	342,308.78	379,445.50
12. Textile, Apparel and Footwear / 2020Q2		339,808.15	385,967.26	358,573.64	356,345.64	357,948.77	8,891.31	342,303.53	379,446.37
12. Textile, Apparel and Footwear / 2020Q3		339,911.52	386,529.96	358,573.61	355,610.06	357,948.42	8,891.27	342,299.76	379,438.22
12. Textile, Apparel and Footwear / 2020Q4		355,924.64	385,031.51	363,555.50	359,398.26	362,587.87	5,161.88	356,240.30	377,934.20
Category: 13. Wood and Wood Products									
13. Wood and Wood Products / 2020Q2		47,789.17	52,302.92	49,715.62	49,557.28	49,668.00	881.72	48,049.27	51,730.72
13. Wood and Wood Products / 2020Q3		47,783.22	52,398.75	49,715.63	49,532.71	49,668.11	881.77	48,049.04	51,729.89
13. Wood and Wood Products / 2020Q4		49,667.16	52,471.89	51,398.67	51,601.35	51,445.50	540.83	50,094.82	52,355.51
Category: 14. Pulp, Paper and Paper Products									
14. Pulp, Paper and Paper Products / 2020Q1		12,817.61	14,068.34	13,211.06	13,063.22	13,179.95	228.74	12,846.32	13,803.95
14. Pulp, Paper and Paper Products / 2020Q2		12,817.13	14,041.41	13,211.06	13,086.72	13,179.95	228.73	12,846.38	13,804.03
14. Pulp, Paper and Paper Products / 2020Q3		12,818.24	14,043.14	13,211.06	13,051.44	13,179.93	228.74	12,846.41	13,804.22
14. Pulp, Paper and Paper Products / 2020Q4		13,078.48	14,056.55	13,353.95	13,212.29	13,324.47	176.01	13,092.52	13,830.97

Table A4: Output

Quarter	Graph	Minimum	Maximum	Mean	Mode	Median	Std. Deviation	1%	99%
Real GDP									
2020Q1		15,831,357.89	17,915,305.93	16,769,469.09	16,665,664.25	16,742,406.09	296,846.83	16,182,014.02	17,490,861.15
2020Q2		16,072,946.54	18,253,241.18	16,951,139.99	16,803,324.79	16,914,128.69	350,112.39	16,282,039.18	17,865,087.82
2020Q3		15,941,947.21	18,100,506.93	16,760,748.54	16,699,118.63	16,719,904.26	343,365.74	16,137,936.95	17,642,882.43
2020Q4		17,035,511.10	19,164,903.31	18,260,026.88	18,477,153.37	18,295,363.01	345,363.59	17,377,967.74	18,892,409.51
Total RGDP		66,113,175.40	71,135,625.22	68,741,384.50	68,517,215.16	68,728,346.92	670,140.41	67,219,706.29	70,335,887.01
Real GDP Growth									
2020Q1		-3.37	9.35	2.35	1.72	2.19	1.81	-1.23	6.76
2020Q2		-4.85	8.05	0.35	-0.53	0.13	2.07	-3.62	5.76
2020Q3		-13.64	-1.94	-9.20	-9.54	-9.42	1.86	-12.58	-4.42
2020Q4		-12.59	-1.66	-6.30	-5.19	-6.12	1.77	-10.83	-3.06
Total RGDP GR		-7.18	-0.13	-3.49	-3.80	-3.51	0.94	-5.62	-1.25