COLLEGE OF FINANCE, MANAGEMENT, AND DEVELOPMENT

DEPARTMENT OF PUBLIC FINANCIAL MANAGEMENT

IMPACT OF COVID-19 ON THE ECONOMY OF ETHIOPIA AND GOVERNMENT'S RESPONSE

BY: GIZACHEW ALEKA T/HAIMANOT

ID NO. ECSU1900953

ADVISOR: TADEWOS MENTTA (Ph.D)

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A Thesis Submitted to the Department of Public Financial Management College of Finance, Management, And Development Ethiopian Civil Service University in Partial Fulfilment of the Requirement for the Award of Masters in Public Financial Management.

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Declaration

I declare that this thesis entitled Impact of Covid-19 on the Economy of Ethiopia and Government's Response. I have undertaken my research work independently with the guidance and support of the research advisor. All sources of materials used for this thesis have been duly acknowledged. I further confirm that the thesis has not been submitted to any other learning institution for the purpose of earning any degree.

Name of student: Gizachew Aleka T/Haimanot Signature ……

Date……....

Advisor: Tadewos Mentta (PhD) Signature……

Date……..

Board of Examiners Approval Sheet

Ethiopian Civil Service University

College of Finance, Management, and Development

Department of Public Financial Management

This is to certify that the thesis entitled **"**Impact of Covid-19 on the Economy of Ethiopia and Government's Response**."** has been submitted in partial fulfillment of the requirements for the Award of the Degree of Masters of Arts (MA) in Public Finance Management and complies with the regulations of the university and meets the accepted standards with respect to originality and quality with our approval as University supervisors.

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List of Acronyms and Abbreviations

ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criteria
ARDL	Auto Regressive Distributive Lag Model
BOP	Balance of Payment
COVID	Corona Virus I
CPI	Consumer Price Index
DF	Dickey-Fuller
ECM	Error Correction Model
EIU	Economist Intelligence Unit
EMP	Employment
EX	Exchange Rate
EXPO	Export
FDI	Foreign Direct Investment
FDRE	Federal Democratic Republic of Ethiopia
GDP	Gross Domestic Product
GOV	Government
GPI	General Price Index
IMF	International Monetary Fund
IMP	Import
PI	Policy Institute
PPI	Producer Price Index
SBC	Schwarz Bayesian Crit
UNCTAD	United Nations Conference on Trade and Development
WPUI	World Pandemic Uncertainty Index
LN	logarithm

Abstract

COVID-19 is a wide concern issue at present. It is rescuing and killing the lives of thousands of people in the world. Ethiopia is one of the countries in which the COVID-19 challenges significantly manifest in most circumstances since March 2020. This paper was concerned with the impact of Covid-19 on the economy of Ethiopia. The study was carried out by raising two economic indicators as dependent variables, the balance of payment (BOP), and the general price index (GPI), as the pandemic disrupts the circular flow of income and affects the national income and purchasing power of the people by increasing nationwide and worldwide uncertainty restrictions. To analyze the impact, quarterly time series data from 2005/6 to 2019/2020, which is a total of 60 observations were taken. Covid-19 was measured by the WPUI. The analysis was processed through an Auto Regressive Distributive Lag (ARDL) Model with a Bound Test for Co-integration and Error Correction Model (ECM). Other things remaining constant, the findings of the study indicated that COVID-19 has a negative impact on the economy showing a negative impact on both balances of payment and the general price index in the long run. It was recommended that it is better if the government work hard on the health of human resources; the governments is better to have a policy of buffer stock, which is the purchase of reserve commodities to be used in such situations; it is advisable to have adequate management of the distribution of compulsory goods supply in accordance with the consumers demand. Keeping the savings and investment balanced.

***Keywords**: COVID-19, Economy, Time Series, ARDL Model, Long-run, and Short-run*

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The world has been suffering from pandemic diseases for different periods. The creation of different medical technologies, medical drugs, the emergence of many doctors, and the establishment of different hospitals played and are yet playing the biggest roles in minimizing the death of a human being due to various infections. However, the appearance of different pandemic diseases killed millions of lives despite these human pearls of wisdom. As indicated in the world economy forum data, since 1965 several pandemic diseases have occurred and killed over 364,600,000 people all over the world (World Economic Forum, 2021).

On December 31, 2019, a group of unexplained pneumonia cases found in Wuhan, Hubei Province, China were reported to WHO. On January 7, the Chinese authorities identified the coronavirus disease (COVID2019) as the causative virus. As part of WHO's response to infectious diseases, a research and development program has been launched to speed up the diagnosis, vaccines and treatment of new types of coronavirus. COVID19 (specifically, coronavirus) is a disease identified as the cause of the first respiratory disease found in Wuhan, China. COVID19 is spread through respiratory droplets when an infected person coughs, sneezes or says. People can also get infected by touching the next eye, mouth, or nose that touches a contaminated surface. (WHO, 2020).

Initially, there was recognition that the COVID 19 infectious disease was limited to China only. Later, it spread all over the world through the movement of people. As financial distress intensifies as people are required to stay at home, travel bans that affect the aviation industry, cancellations of sporting events that affect the sports industry, and gatherings of groups that affect the event I felt serious in various sectors of the economy, such as bans. Entertainment industry (Horowit, 2020; Elliot, 2020).

Ethiopia announced the first case of coronavirus on March 13, 2020. Since then, the coronavirus has been the hottest topic in Ethiopian society. The Ethiopian government considers this issue to be the best national case in which some measures and measures are taken to prevent the spread of the disease (Africa News, REUTERS).

The global interaction in the cultural, economical, societal, and political situation of people living all over the world (globalization), which emerged as a result of technology advancement and market economy, encouraged pandemic diseases to reach from one destination of the world to the other destination of the world easily. Disruption of the links in any one of the interconnected actors such as workers, suppliers, consumers, banks, firms, and financial intermediaries due to the disease or control measures results in disruption both across the globe and within countries (Baldwin & Mauro, 2020).

COVID-19 impacts the economy in that government makes policies to prevent and mitigate the spread of the disease. Many countries' policymakers adopted strict mobility constraints, both at the national and local level, many cities enforced curfews' on their citizens.

Control measures that are taken by policymakers of every country over the world lead to the following three economic shocks (Baldwin & Mauro, 2020).

1. Loss of jobs (unemployment) shock caused by medical matters(Workers on sickbeds who are temporarily not working).
1. Demand, supply, and financial distress Shocks caused by control measures(travel bans, closure of shops, closure of factories, office closure, quarantine).
2. Expectation Shocks (consumers and firms all around the world putting off spending; they are in wait-and-see mode).

Ethiopia is one of the countries, who have a great global connection with the rest of the world in economic, socio-political, and cultural aspects. Consequently, Ethiopia became among the countries, who shared the victim of the infectious pandemic disease of coronavirus. To handle the spread of the virus, the policymakers have implemented various containment measures, such as restricted public gatherings, working from home for high-risk-works, shutting down of borders, etc., which may harm the economic activities of the country. Consequently, this research deals with the impact of COVID-19 on the economy of Ethiopia and the government response.

1.2 Statement of the Problem

The extreme and serious expansion of the coronavirus is having an impact on the global economy, which obliges policymakers to look for ways to respond. Success stories so far show that the right policies make a difference in fighting the disease and mitigating its impact, but some of these policies come with difficult economic costs. In many countries, policymakers implemented strict mobility constraints, both at the national and local levels, many cities enforced strict curfews on their citizens (FDRE Policy Institute, 2020).

The views of experts on Covid-19 dub the disease as an economic pandemic, to signify counting the cost of the cure is getting greater than the problem itself (Baldwin, 2020).

The steps taken to prevent large-scale contagion and restrict the region of spread would largely decide the size of the shock. As a result, the containment steps, disruption of work processes, meeting constraints, and travel restrictions would be a greater negative supply shock than the number of deaths, even though the latter may still be important. One of the most drastic steps, such as full or partial lockdown, as seen in China, may bring production and consumption to a halt. Such drastic steps are likely to be limited to specific areas and impossible to sustain for an extended period (Mckibbin & Fernando, 2020).

Many celebrity organizations or individual researcher of Ethiopia and other countries also investigated the impact of the disease and set their forecasted as follows:

According to the findings of AlemayehuGeda's report, the Macroeconomic and Social Impact of COVID-19 in Ethiopia and Suggested Direction for Policy Response, using partial equilibrium based model, a 10% rise in reported weekly cases in Ethiopia would result in a 1.1 and 6.8% reduction in hotel demand in the long and short term, respectively.

In the short run, the reductions are 8.5 percent and 3.7 percent for restaurants and air travel facilities, respectively. The study also predicted a decrease in demand for tourism-related services (Geda, 2020).

An exploratory study by FDRE Policy Institute (PI) on key policy alternatives to tackle the social and economic impacts of CIVID-19 in Ethiopia investigated factors determinants of effectiveness and implications of public health measures aimed at mitigating the effect of COVID-19. Duly, factors related to economic, social, and demographic settings are important in

determining the economic damages associated with the public health measures to contain or suppress the virus. The study recommended targeted and combined social and economic policy measures to overcome COVID – 19 effects on the economy (FDRE Policy Institute, 2020).

The short, medium, and long-term impact of COVID-19 on the Ethiopian economy was investigated using a complex Computable Equilibrium model in a study by EEA titled, the economy-wide impact of the COVID-19 in Ethiopia: Policy and Recovery options. The effect of the pandemic on labor and capital productivity growth, as well as international trade, were examined in the report through the impacts on remittances, export demand, import supply, foreign direct investments (FDI) transaction costs, and the anticipated government interventions. The research looked at the impact of a pandemic in both mild and severe scenarios. As a result, in the event of a serious pandemic, the gross economic loss as a result of the COVID-19 shock is expected to be 310 billion birrs in FY 2020/21, lowering the projected estimate for economic growth in 2020/21 to 0.6 percent (Mitik Beyene et al., 2020).

The studies didn't deeply discuss the impact on the economic indicators of the balance of payment and the general price index. Moreover, we observe that the predictions are made through different methodologies (modeling). However, none of them had used an ARDL model. Consequently, this research investigated the impact of COVID-19 on the Economy of Ethiopia and the Government's response using the ARDL Bound Test Model. And also, the study has concentrated on the balance of payment (BOP), and the general price index (GPI).

1.3 Research Questions

The research broadly investigated to answer the following questions:

1. What is the impact of COVID-19 uncertainty shock on the Economy of Ethiopia?
2. Is there any causal relationship between COVID-19 and the Economy?
3. What is the government's response to mitigate the economic impact?

1.4 Objective of the Study

1.4.1General Objective

The general objective of the study is to examine the impact of COVID-19 on the economy of Ethiopia and the government's response using the ARDL Bound Test model.

1.4.2 Specific Objective

To attain the general objectives, the researcher digs into achieving the following specific objectives

- To examine the impact of COVID-19 uncertainty shock on the Economy of Ethiopia;
- To analyze any causal relationship between COVID-19 and the Economy;
- To investigate the government response to mitigate the negative economic impact.

1.5 Significance of the Study

The research was done as partial fulfillment for graduation masters in Public Finnce Management, and also enables the researcher to develop thesis work capacity and economic know-how. The study enables us to identify the possible economic impact of COVID-19, what responses have the government provided to the economic impacts which would occur, and provides recommendation upon the results found. It benefits the country and policymakers in preparation for a future pandemic and other different catastrophes. The study also benefits in pointing out future study gaps.

1.6 Scope and Limitation of the Study

1.6.1 Scope of the Study

The scope of the study is bounded by its concept, geography, time, and methodology as mentioned below:

The study evolves with the economic impact of COVID-19, and the responses of the Government towards the impact. The geographical range of the study is delimited to the political jurisdiction of the Federal Republic of Ethiopia. The duration which is covered with this study is 2005/6-2019/20. 15 years of quarterly time-series data will be in use to analyze the cause and effect relationship and predict the impact of COVID-19 in the economy of Ethiopia.

The methodology to be applied in this study is delimited to the model ARDL Bound Test.

1.6.2 Limitation of the Study

The study analyzed 15 years of quarterly data, which are 60 observations to predict the impact of COVId-19 on the economy of Ethiopia. However, studies advise having more data; because as the time-series data available increase the impact prediction accuracy increase.

1.7 Organization of the Study

The paper was organized in the following manner: Chapter one was the introduction and background of the study. Chapter two was the theoretical, empirical literature, and conceptual framework. The third chapter involved a discussion about the research design, approach, techniques, model specification, and model estimation. The fourth chapter discussed the results and interpretations. Finally, the last chapter was the conclusion and recommendation.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Concepts, and Theoretical Literature

2.1.1 Concepts

Economics is the study of the human decision on goods and services to satisfy their needs and wants considering the scarcity of resources. Scarcity refers to when human demands for goods, services, and resources outnumber available resources. Labor, equipment, land, and raw materials are all needed to produce the products and services we want, but they are in limited supply (Economics, 2016).

An economy is a broad collection of interconnected output, consumption, and trade activities that help determine how scarce resources are distributed. The production, use, and distribution of goods and services are used to meet the needs of those who live and work in an economy, also known as an economic system (KENTON, 2020).

Macroeconomics examines the overall economy on a national and international scale, modeling it with highly aggregated economic data and variables. It can be based on a specific geographical area, a nation, a continent, or even the entire globe. It focuses on recurrent economic cycles as well as large economic growth and development.

2.1.2 Economic Indicators

Gross Domestic Product (GDP): is known as the most detailed predictor of a country's economic performance. It is the overall market value of all finished products and services produced in a country during a specific year or time (HAYES, 2020b). GDP refers to the overall value of all finished products, and services produced in a country over a given period, in a monetary term and includes all goods and services produced within the country's jurisdiction by both residents and foreigners. It is mainly used to determine a country's economic health. When the economy is stable, unemployment is generally lower, and salaries begin to rise as businesses recruit more employees to meet the economy's rising demand. Economists measure positive GDP growth over time (usually year-to-year) to decide how well an economy is doing.

However, negative GDP growth, on the other hand, may imply that an economy is in or approaching a recession or economic downturn. It is calculated by adding the following figures together: personal consumption; private investment; government spending; and exports minus imports (C+G+I+NX) (KRAMER, 2020).

Consumer Price Index: The target set of goods and services evaluated in the Consumer Price Index (CPI) are expenditures of domestic and internationally imported consumer-related services for residents of urban or metropolitan areas, including professionals, the self-employed, the poor, the unemployed, the retired, as well as urban wage earners and clerical workers. The CPI does not include rural or non-metropolitan areas, farm families, people in the armed forces, and those in institutions, such as prisons and mental hospitals. The CPI measures food and beverages, housing, apparel, transportation, medical care, recreation, education, communication, and other personal goods and services such as tobacco and smoking products, haircuts, and funerals (SHAH, 2020).

Producer Price Index: In contrast to the consumer price index, the producer price index (PPI) measures the average change in the sale prices for the entire domestic market of raw goods and services. These goods and services are bought by consumers from their primary producers, bought indirectly from retail sellers, or purchased by producers themselves. The industries that comprise the PPI include mining, manufacturing, agriculture, fishing, forestry, natural gas, electricity, construction, waste, and scrap materials (SHAH, 2020).

Unemployment rate: measures the share of workers in the labor force who do not currently have a job but are actively looking for work. People who have not looked for work in the past four weeks are not included in this measure. It is important to keep in mind that the rate measures the percent of unemployed job seekers in the labor force, the sum of employed and unemployed persons, and not the entire population. Underemployment includes three groups of people: unemployed workers who are actively looking for work; involuntarily part-time workers who want full-time work but have had to settle for part-time hours; and so-called marginally attached workers who want and are available to work, but have given up actively looking. The Employment-to-Population Ratio is a useful, broad-brush measure. It simply shows the number of people currently employed as a share of the total working-age population, which is the number of civilian, non-institutionalized persons, age 16 and over (E. P. Institute, 2021).

Balance of Payment: A country's balance of payments (also known as balance of international payments and abbreviated B.O.P. or BoP) refers to the difference between all money coming into a country in a given period (e.g., a quarter or a year) and money flowing out to the rest of the world. It consists of two components: the current account and the capital account. The current account reflects a country's net income, while the capital account reflects the net change in ownership of national assets (Cheol S. Eun, 2013).

The current account: represents the net amount of a country's income or spending, depending on whether it is in surplus or deficit. The balance of trade (net earnings on exports minus payments for imports), factor income (earnings on foreign investments minus payments to foreign investors), and unilateral transfers make up the sum. Transfers of goods and services, as well as financial assets, between the home country and the rest of the world, are among these items. Individuals and non-governmental organizations make donations to foreigners known as private transfer payments. The transfers are gifts or grants made by one government to foreign nationals or foreign governments. The current account balance is determined by adding investment profits and unilateral payments to the balance on goods and services (Robert J. Carbaugh, 2005, p.237).

The capital account: records the net change in ownership of foreign assets. It includes the reserve account (the foreign exchange market operations of a nation's central bank), along with loans and investments between the country and the rest of the world (but not the future interest payments and dividends that the loans and investments yield; those are earnings and will be recorded in the current account). If a country purchases more foreign assets for cash than the assets it sells for cash to other countries, the capital account is said to be negative or in deficit (Orlin, 1996).

Components of the Current Account include the balance of trade: which refers to the net earnings on exports minus payments for imports, factor income (earnings on foreign investments minus payments made to foreign investors), and unilateral transfers. These items include transfers of goods and services or financial assets between the home country and the rest of the world. Private transfer payments refer to gifts made by individuals and nongovernmental institutions to foreigners. Governmental transfers refer to gifts or grants made by one government to foreign residents or foreign governments.

When investment income and unilateral transfers are combined with the balance on goods and services, we arrive at the current account balance (Carbaugh, 2021).

2.1.3 Corona Virus (COVID-19)

In December 2019, new pneumonia of unknown cause appeared in Wuhan pro, People‘s Republic of China (PRC). Days after, lots of laboratory studies had been undertaken on the cause of the newer pneumonia. On 11 February 2020, WHO officiate the outbreak of the coronavirus disease from China, naming the disease COVID-19 (Demissie, 2020).

According to UNICEF (2020), COVID-19 is a disease caused by a new coronavirus strain; the letters CO, VI, and D stand for corona, virus, and disease, respectively. The disease was previously known as the ‘2019-novel coronavirus,' or ‘2019-nCoV.’’It is linked to the same family of viruses as Severe Acute Respiratory Syndrome (SARS) and some types of common cold, in that the symptoms are similar to the flu (influenza) or the common cold, which include fever, cough, and shortness of breath. According to the study, the virus is spread by direct contact with an infected person's respiratory droplets (created by coughing and sneezing), touching contaminated surfaces, and touching their face (e.g., eyes, nose, and mouth). It also claims that those who are with chronic medical conditions like diabetes and heart disease as well as, people over the age are more likely to experience serious symptoms.

The COVID-19 pandemic is the most strong and unparalleled indicator of catastrophe in the history of what happens when uncontrolled human activity collides with the planet's realities and boundaries. This will undoubtedly not be the last crisis (UN, 2020).

The virus is yet to continue to spread around the world. As of 22 Feb 2021, the total deaths reached 2.4 million, and over 111 million confirmed cases (see table 2.1).

Table 2.1: Coronavirus spread over the world as of 22 Feb. 2021

Source: Johns Hopkins University, national public health agency, 22 Feb.2021

2.1.4 Economic Theories

2.1.4.1 The Theory of Demand and Supply

Demand is an economic term that indicates the ability and willingness of the consumer to buy a commodity at a given price in a given period. Hence, the theory of demand is about the relation between price and demand. The concept is about to what extent do people need the product and it tells about the satisfaction (utility) of the consumer with a given product. The theory of supply is an economic theory concerned with the price and quantity of products. It deals with the willingness of the seller to sell his/her quantity supply at a given price (HAYES, 2020a).

Both theory of supply and theory of demand work with the low of demand and low of supply. The low of demand states that there is an inverse relationship between price and demand. Other things remained the same, the principle puts that when the price of goods and service raise, the demand for the commodity decrease. The graph for the demand curve has a negative slope showing an inverse relation (HAYES, 2020a).

On the other hand, the low supply states that as the price increase, the seller/supplier offers more products or increases more supplies; and when the price of goods and services decreases, the seller decreases his/her supply. In this theory, we understand that the relation between price and supply is directly related. The graph direction of the supply curve slopes upward(KENTON, 2020b).

2.1.4.2 Circular Flow of Income Model

According to Muthuseshan (2017)**,** and Nelson (2009), modern complex economies involve five economic sectors. These are:

Business sector: are the primary (producing raw materials), secondary (carrying out manufacturing) the tertiary (providing sales and services) private, profit-seeking macroeconomic sectors that participating in the form of proprietorship, partnership, and corporation in the economy (Muthuseshan, 2017).

Households: We, the family groups that make up society, are the ones that absorb the economy's goods and services. This sector encompasses the entire economy's wants-and-needs-satisfying, feeding, breathing, and consuming society. In a nutshell, it refers to all, including consumers, individuals, and society as a whole. The economy exists so that we can profit from it.

Consumption expenditures refer to the portion of the gross domestic product spent by the household sector. The household sector provides labor for production in exchange for wages and salaries; the business sector receives financial resources in the form of loans, direct ownership, or stock purchases. Households can invest directly in businesses by buying stock or bonds, but they usually do so through financial intermediaries including pension funds, insurance companies, banks, and mutual funds. The firms are owned by the households, and they are entitled to all of the income generated by the business sector, including salaries, interest, and profits (Nelson, 2009).

Government

There are four basic economic roles that the government performs: It defines the legal structure under which the economy functions in the first place. As economists named, this system is often referred to as the game rules. Commercial law is a dynamic body of law that governs relationships between buyers and sellers, employers and staff, and parties to private contracts. The corporation, an integral component of modern economies, is a legal construct. Second, the government collects taxes from individuals and businesses. Individual income taxes provide the majority of the federal government's revenue. It also collects payroll taxes, levies sales taxes on the value of certain commodities, and imposes tariffs on imports from other countries. Sales taxes on retail transactions and/or income taxes on individuals and businesses are also collected by state governments. County and municipal governments charge a tax on the valuation of real estate, and they also collect sales tax and income tax revenues. Third, some of these tax revenues are used by the government to provide products and services by organizations that function similarly to businesses, such as the Navy, which produces national defense. These firms manufacture public goods, which we consume as a group rather than as individuals. Fourth, the government distributes transfer payments to those who are legally entitled to them. People may be eligible for Social Security payments depending on their age or disability, for example. Transfer payments redistribute income among society's classes and account for a greater portion of the federal government's overall expenses than the purchase of goods and services, including defense. Private choices are influenced by transfer payments as well. For example, the rise in the number of people opting for early retirement is undoubtedly linked to rising Social Security benefits as well as penalties imposed by the rules on those who continue to work after reaching retirement age (Nelson 2009; Pretoria, n.d.).

The Rest-of-the-World (Foreign Sectors)

Since government plays such an important role in economic life and since economic interactions are mostly concentrated within political borders, we naturally focus on our country's economy. However, the cross-national movement of goods and services, as well as development factors, is a significant feature of economic activity. Households in one country consume products produced in another, and businesses in another country buy goods and services produced in another. Foreign airlines operate planes built in the United States and serve food imported from the United States to their passengers. Aside from trading with the ROW, American businesses, governments, and households borrow and lend to it. Major lenders to both companies and the government in the United States are Japanese, Chinese, and European investors, while American firms and households have made significant investments in Europe and Asia (Muthuseshan (2017).

Financial Sectors

These sectors include banks, micro finances, and other financial institutions. Since they lend or invest the household savings they earn in equity and debt securities issued by companies, these entities are also known as financial intermediaries. The financial institutions market includes both life and general insurance providers. They are critical in channeling household surplus funds to various productive enterprises (Muthuseshan, 2017).

In general, land, labor, capital, and entrepreneurship are the factors of development, as discussed above. Rent, wages, and benefits are the prices associated with these output factors. Households purchase products and services from companies to meet their almost endless needs and desires. Businesses generate sales and income by selling products and services to households. In exchange for the use of their factors of production, businesses often pay wages, interest, and income to households. Taxes are levied on individuals and corporations by governments to offer such services to all citizens. Financial intermediaries are essential for transferring financial resources and capital from surplus (savers, buyers, lenders) units/components of the circular flow (a nation's economy) to deficit units (those who require it). Finally, the foreign sector (rest of the world) connects households, firms, governments, and financial institutions of the circular flow (hence any nation's economy).

The three basic economic activities of an economy that go on indefinitely and are referred to as the circular flow of income are production, consumer spending, and income generation. Production generates revenue, which in turn generates demand for goods and services; this demand generates expenditure, which in turn generates more production. Production, revenue, and expenditure are known as phases or stages of the circular flow of income, and they form the foundation for the circular flow of income and related activities (figure 2.1 below).

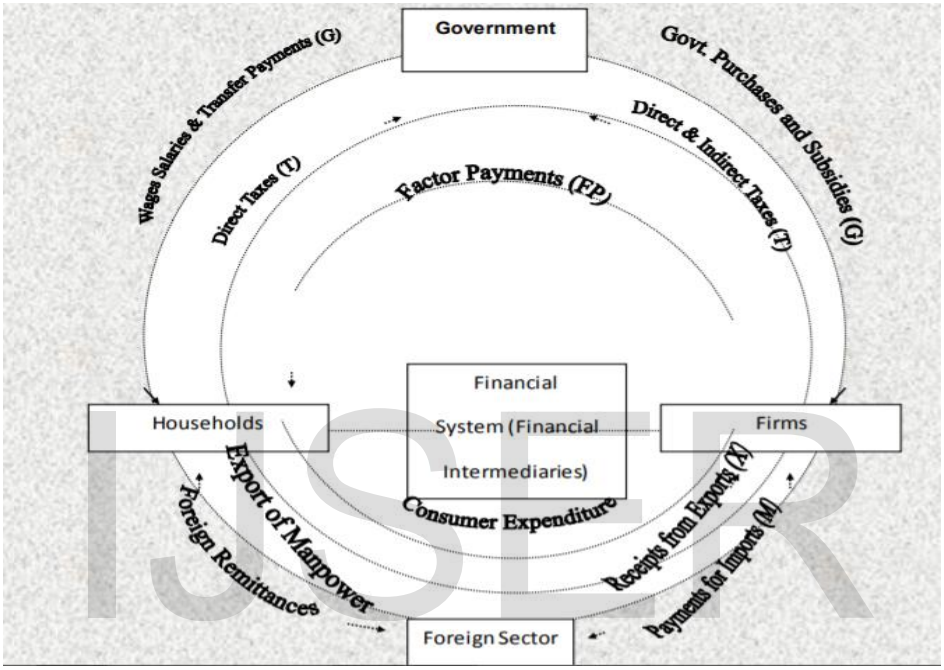


Figure 2.2: Circular flow of income Source: Muthuseshan (2017)

A financial crisis, an external trade shock, an adverse supply shock, the bursting of an economic bubble, or a large-scale anthropogenic or natural catastrophe (e.g., a pandemic) can all trigger economic recession by disrupting the circular income flow (Wikipedia, 2021).

2.1.4.3 Economic Recession

According to Wikipedia (2021), A recession is a business cycle downturn that occurs when there is a general decrease in economic activity, which means recessions happen when people stop spending (an adverse demand shock). In the study, it is also described as "a substantial decline in economic activity spread across the economy, lasting more than a few months, normally noticeable in real GDP, real income, jobs, industrial production, and wholesale-retail sales" in the United States, and as "negative economic growth for two consecutive quarters" in the UK.

A recession is a drop in economic activity that occurs when people avoid purchasing goods for a while, resulting in a drop in GDP following a period of economic expansion (a time where products become popular and the income profit of a business becomes large). This results in inflation (the rise of product prices). Inflation slows, ceases, or even goes negative during a recession (Shiskin, 1974).

According to economist Richard C. Koo, in ideal circumstances, a country's economy should have net savers in the household sector and net borrowers in the corporate sector, with the government budget nearly balanced and net exports near zero. When these relationships become unbalanced, a recession may occur within the country or put pressure on another country to experience one (R. Koo, 2009; R. C. Koo, 2013).

Recessions affect people's psychological well-being and trust. Companies, for example, can reduce job levels and save money rather than invest if they expect economic activity to slow. Such expectations can feed into a self-fulfilling downward spiral, causing or exacerbating a recession (Samuelson, 2010).

According to Shiller (2009), The psychological factors that underpin economic activity have been referred to as animal spirits. "...also applies to our sense of confidence in one another, our perception of justice in business transactions, and our perception of the level of corruption and bad faith." Consumers do not want to spend when animal spirits are down, and companies do not want to make capital investments or recruit employees."

According to behavioral economics, the availability heuristic, money illusion, and non-regressive projection are some of the psychological biases that can trigger a recession (Bubble, 2020).

During a recession, unemployment is especially high. Many neoclassical economists claim that there is a normal rate of unemployment that can be used to measure the negative GDP deficit during a recession as it is subtracted from the real rate of unemployment. In other words, unemployment never hits 0%, and it is not a negative measure of an economy's wellbeing unless it exceeds the "normal rate," in which case it directly leads to a decrease in GDP(Saylor.org, 2012).

A recession's maximum jobs effect may not be felt for many quarters. Low-skilled, low-educated jobs, as well as the young, are the most vulnerable to unemployment in a downturn, according to British research (John_Mauldin, 2008).

Keynes argued that Consumption, spending, government purchases, and net exports are the four elements that make up the economy's production of goods and services (the difference between what a country sells to and buys from foreign countries). Any demand rise must come from one of these four factors. However, strong forces dampen demand during a recession, as investment falls. Uncertainty, for example, erodes consumer trust during economic downturns, causing them to cut back on spending, especially on discretionary purchases such as a home or car. As businesses respond to weakened demand for their goods, this reduction in consumer spending will result in less investment spending by businesses. This places the burden of raising output squarely on the government's shoulders. According to Keynes, insufficient overall demand could lead to prolonged periods of high unemployment (Sarwat Jahan et al., 2014).

2.1.5 Potential Impact of COVID-19 on Economy

The global spread of the COVID-19 pandemic could have a significant economic impact (Haruhiko, 2020).

COVID-19, according to many experts, is dismantling not only the economy but also the way all kinds of human transactions take place, both locally and internationally. Furthermore, COVID-19 has enormous implications for reforming the way political business is conducted, as well as for reshaping intra-personal and interpersonal interactions. Scholars also expect that it would affect restructuring the global order by spurring global action, which the world has lacked in recent decades (Politico, March 19/2020).

Citizens from all over the world are uniting together to cope with the economic downturn. Simultaneously, we are witnessing a worldwide determination to solve the current crisis and transform it into a chance for future development (Haruhiko, 2020).

According to Carlsson-Szlezak et al. (2020a) and Carlsson-Szlezak et al. (2020b), There are three primary channels for transmission. The first is the direct impact, which is associated with the lower consumption of goods and services. Longer pandemics and social distancing measures can erode consumer trust by keeping people at home, wary of discretionary spending, and

pessimistic about the economy's long-term prospects. The second one is the indirect impact of working through financial market shocks and their effects on the real economy. Household wealth will likely fall, savings will increase, and consumer spending will decrease further. The third consists of supply-side disruptions; as COVID-19 keeps production halted, it will negatively impact supply chains, labor demand, and employment, leading to prolonged periods of lay-offs and rising unemployment.

Under normal circumstances without a containment policy for the spread of the virus, the number of new cases increases, which in turn overwhelms the hospital's capacity. Applying different policies such as controlling the epidemic means ‘flattening the epidemiologic curve’. This is accomplished by slowing the rate of infection by minimizing overall person-to-person interaction by work and school closures, as well as travel bans (‘social distancing'), and finding and eliminating infectious individuals from the population through quarantining them to reduce disease transmission and flatten the epidemic curve. It means fewer people end up in the hospital and fewer people die. (see figure 1).

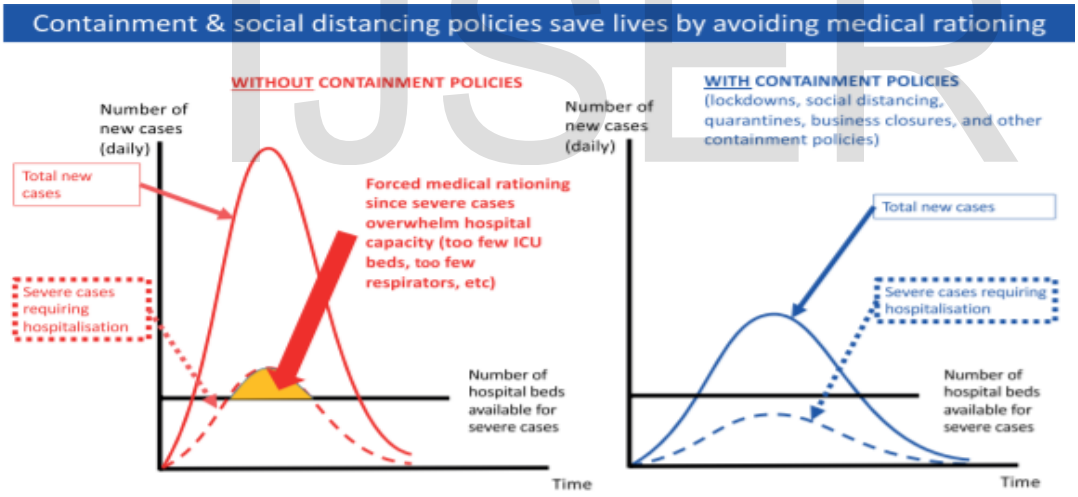


Figure 2.3: Epidemic curve flattening Source: Baldwin & Mauro (2020a)

The deliberate and rational measurements of the government taken to reduce the spread of the disease, COVID-19, and flatten the epic-curve slows the economy and causes a disruption on the circular flow income in the economy (figure 2.2 below).

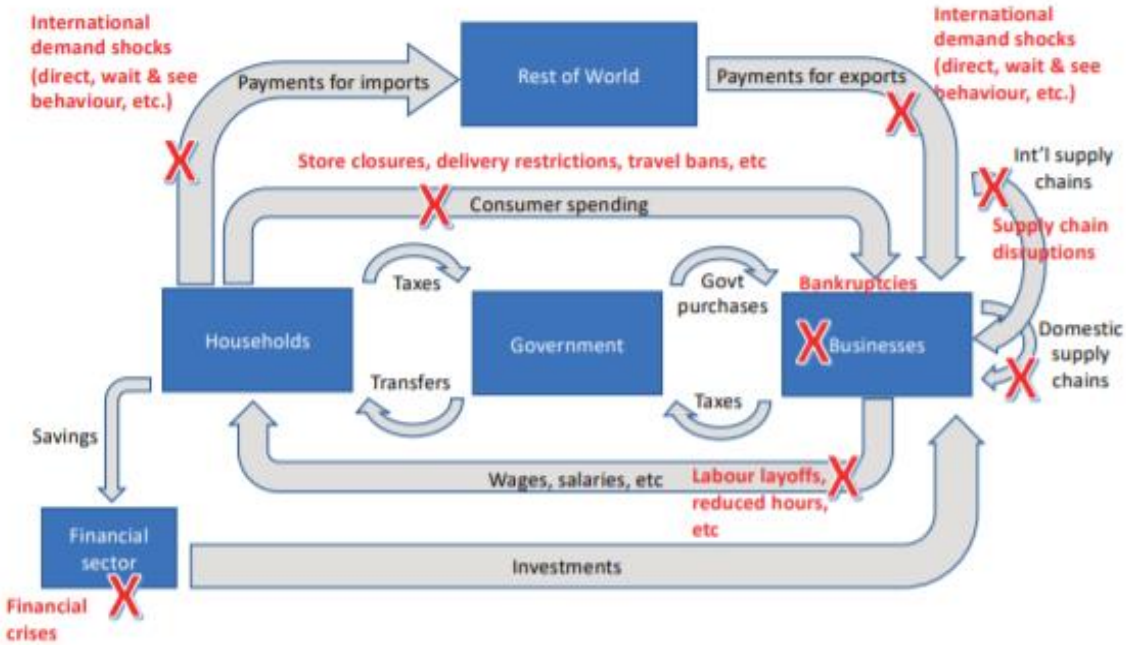


Figure 2.4: COVID19's multiple strikes in the circular flow of income diagram

Source: Baldwin & Mauro (2020b)

"A modern economy is a complicated network of interconnected actors, including workers, businesses, vendors, customers, and financial intermediaries. Everywhere there is a flow interruption, there is a slowdown" (Gourinchas, 2020).

The red crosses indicate that the economy is being disrupted by the three forms of shocks. First, we see households that do not get paid experiencing financial distress and thus slowing their spending, starting at the far left and heading clockwise. Second, domestic demand shocks affect the country's imports and, as a result, the flow of money to foreigners. While this doesn't reduce domestic demand directly, it does reduce foreign incomes and thus their spending on the nation's exports (the cross in the top-right corner). Reduced demand and/or direct supply shocks may cause supply chain disruptions both internationally and domestically (the two crosses on the right). Both result in more production reductions, especially in the manufacturing sector. The impact on manufacturing can be exaggerated by people and businesses waiting to see what happens(wait-and-see). Manufacturing is particularly vulnerable since many finished products can be postponed (the cross in the bottom-right corner (*Figure 2.3, above*).

2.1.6 Government Response

According to Keynesian economics, state intervention is needed to moderate the booms and busts in economic activity, also known as the business cycle. Policy responses are often aimed at restoring the economy to its ideal state of equilibrium (R. Koo, 2009; R. C. Koo, 2013).

Keynes argued that governments should fix problems in the short run rather than waiting for market forces to solve them in the long run because, as he said, "in the long run, we are all dead." This isn't to suggest that Keynesians are in favor of changing policies every few months to keep full jobs. “Keynes demonstrated that if aggregate demand could be triggered in any way, such as by the government printing currency notes to hiring people to dig holes and fill them in, the salaries paid out will resuscitate the economy by creating successive rounds of demand via the multiplier process”(Nayak, 2009).

According to Krugman (2010), Different methods for taking an economy out of a recession are favored depending on which economic school policymakers adopt: Monetarists advocate for the use of expansionary monetary policy, whereas Keynesian economists may advocate for increased government spending to boost the economy; supply-side economists may advocate for tax cuts to promote business capital investment. When interest rates cross the zero percent interest rate boundary (zero-interest-rate policy), conventional monetary policy can no longer be used to stimulate recovery, and the government must rely on other steps. Keynesians argue that fiscal policy—tax cuts or increased government spending—works when monetary policy fails. Because of the greater multiplier, spending is more efficient, but tax cuts are more immediate. Consequently, governments usually respond to recessions by adopting expansionary macroeconomic policies, such as increasing money supply or increasing government spending and decreasing taxation (Krugman, 2010)

2.2 Empirical Literature

2.2.1Global impact of Early Pandemic Diseases

Historical records of pandemic disease impact on the world economy, and human crisis, stated by various scholars and/or studies indicated that millions of lives and billions of dollars had been lost through different periods.

Table 3.1: A Timeline of Historical Pandemics and the Death Toll

Name	Period	Type/Pre-human host	Estimated Death Toll
Antonine Plague	165-180	Believed to be either smallpox or measles	5 million
Japanese smallpox epidemic	735-737	Variola major virus	1 million
Plague of Justinian	541-542	Yersinia pestis bacteria/rats, fleas	30 to 50 million
Black Death	1347-1351	Yersinia pestis bacteria/rats, fleas	200 million
New World Smallpox	1520-onwards	Variola major virus	56 million
Great Plague of London	1665	Yersinia pestis bacteria/rats, fleas	100,000
Italian Plague	1629-1631	Yersinia pestis bacteria/rats, fleas	1 million
Cholera Pandemics 1-6	1817-1923	V. cholerae bacteria	1 million+
Third Plague	1885	Yersinia pestis bacteria/rats, fleas	12 million (China & India)
Yellow Fever	Late 1800s	Virus/Mosquitoes	100,000-150,000 (US)
Russian Flu	1889-1890	H2N2 (avian origin)	1 million
Spanish Flu	1918-1919	H1N1 virus/pigs	40 to 50 million
Asian Flu	1957-1958	H2N2 virus	1.1 million
Hong Kong Flu	1968-1970	H3N2 virus	1 million
HIV/AIDS	1981-present	Virus/chimpanzees	25 to 35 million
Swine Flu	2009-2010	H1N1 virus/pigs	200,000
SARS	2002-2003	Corona virus/bats, civets	770
Ebola	2014-2016	Ebola virus/ wild animals	11,000
MERS	2015-present	Corona virus/ bats, camels	850

Source: World Economic Forum (2020)

An analysis conducted by the World Bank indicates that the estimated economic losses from six major outbreaks of highly fatal zoonoses between 1997 and 2009 amounted to at least US $80 billion. If these outbreaks had been prevented, the avoided losses would have averaged a US $6.7 billion per year (World Bank, 2012, p.15). A large decline in the world price of iron ore and other commodities, and specifically for Sierra Leone, corporate governance issues in mining that had occurred due to the outbreak of Ebola has cost Guinea, Liberia, and Sierra Leone a total of $2.8 billion ($600 million for Guinea, $300 million for Liberia, and $1.9 billion for Sierra

Leone). This includes the 2014 and 2015 shocks, as well as predictions for 2016 (World Bank, 2016).

In 2009, the H1N1 influenza disease resulted in a US $2.8 billion economic impact on the tourism sector of Mexico, its largest service sector, with a loss of one million tourists over five months due to contagion fears (D. Rassy and D.S.Richard, 2012, as cited in Smith, et al., 2019).

Table 2.2: Examples of financial impacts due to zoonotic infectious disease events beyond the public health sector

Sectorsimpacted	Period	Geographic scope	Disease	Metrics	Economicestimate
Tourism	2009	Mexico	H1N1	Tourism	2.8billion
Agriculture	1998–2002	Somalia	SARS	Livestockexportlosses	435million
Government	1998–1999	Malaysia	RVF	lost tax revenue	105million
Financial	2013–2015	Ghana, Liberia, Sierra, and Leone	Nipah	lossofinvestorconfidence	600million
Travel	2003	Global	Ebola	airline losses	+ 7billion

Source: Smith et al., (2019)

Khan, Muhammad Azizullah & Malik (2020), in their study of the impact of COVID-19 on the global economy, concluded that COVID-19 worsened the economy of an oil-producing country such as Venezuela, Angola, and Nigeria by affecting to shift the price of oil down. Thus, such progress affected the balance of payment (BOP) by encountering a decrease in the current account. However, despite the oil-producing countries, the other countries over the world, who import more products, will be affected by an increase in the price of products.

The International Monetary Fund (IMF) foresees a contraction of the global economy by –3% in 2020 (IMF 2020). estimates of the study by UNCTAD also states that COVID-19's economic impact and revisions of earnings of the largest multinational enterprises (MNEs) now suggest that the downward pressure on FDI flows could range from -30% to -40% during 2020-2021 (UNCTAD, 2020).

Analyses and commentary have also highlighted the potentially significant impact of Covid-19 on remittances, as the pandemic hits jobs and wages in many sectors that depend on migrants and mobility restrictions prevent people from meeting intermediaries and money transfer service

providers in remittance sending and receiving countries (African Union, 2020; The Economist, 2020; World Bank, 2020).

Falling remittances would remove a major source of income for many African countries. Remittance inflows have outstripped Foreign Direct Investment for SubSaharan Africa since 2015 and did for North Africa and the Middle East from 2013 to 2018. In seven African countries, remittance inflows were valued at more than 10% of GDP in 2019 (Kalantaryan, S. and McMahon, 2020).

According to Demiessie (2020), the forecast on price indicates that in the upcoming three years, COVID-19 will shock the macroeconomic affecting price of products. The study added that COVID-19 will affect both food and prices; at first, affects the supply chain, but later on, it will affect the demand of the country, which will increase the price.

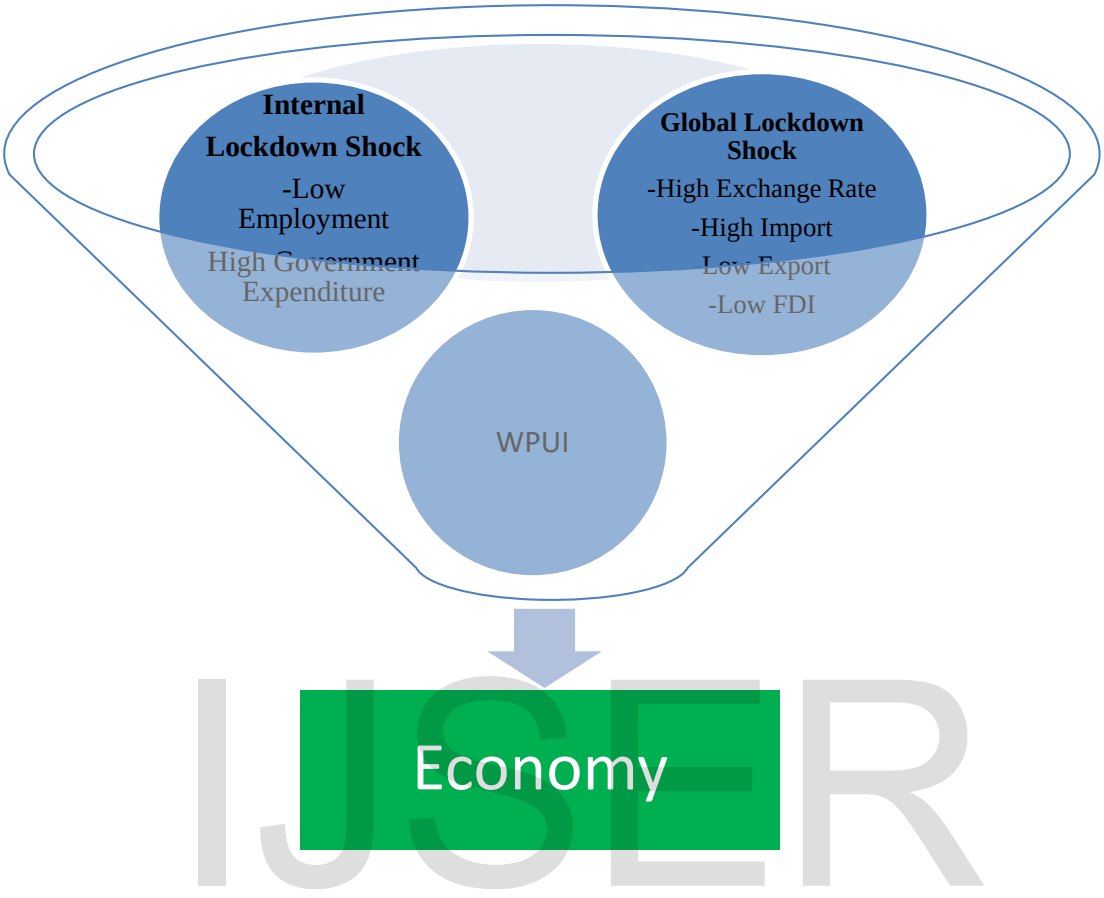
"The size of the Ethiopian economy would remain well below the no-COVID-19 baseline level. The recovery would have a V shape (i.e. quick recovery) in the mild case and a U shape in the severe case; not all sectors are equally affected by the crisis rather the pandemic is likely to have adverse effects on a key sector of the Ethiopian economy; employment is likely to be hit hard. The employment level is between 8.6 percent and 16.5 percent lower than the baseline. Job losses would be severe in all the export-oriented sectors. Rural employment is slightly more affected than urban employment and the unskilled workers are negatively affected more than the skilled and semi-skilled, the COVID-19 pandemic is likely to have a substantial effect on public finance. The fiscal deficit is likely to widen in absolute terms and percentage of GDP. Government revenue would decline. At the same time, the expenditure would increase to deliver emergency health care services and food assistance, and increase containment efforts, all of which will widen the fiscal deficit; the crisis will have a huge negative effect on household welfare. In the short term, real consumption expenditures may be between 4.6 and 12 percent lower than in the reference scenario. The most vulnerable people are likely to be harmed more seriously if adequate steps are not taken. The bottom 20%'s welfare loss is between 1.6 and 2.5 times greater than the top 20%'s"(Mitik Beyene et al., 2020).

A study by the FDRE jobs creation commission indicates that the activities of lodging, food, and personal services will experience the greatest demand and supply shocks. Hotel cancellations are at an all-time high, with some experts predicting a decrease of up to 95 percent in the coming

months. Restaurants have also been hit hard by the crisis, as the number of visitors visiting has plummeted. The study also indicated the jobs loss as low, medium, and high, as a result, the low model - estimate suggests a loss of 175,000 jobs within 3 months, and 323,000 within 6 months, representing respectively 21% and 38% of wage-employment of these activities; the medium model estimate indicates that an average of 307 K jb losses will exist within 3 months, and 473,000 for 6 months, representing respectively 36% and 56% of wage-employment in these segments; the high model, resulted in an average of 483 K jobs lost for 3 months, and 628 K for 6 months, representing respectively 57% and 74% of wage-employment in these segments in urban areas (FDRE J. C. Commission, 2020).

The government response plan is of paramount importance for the medium- and long-term perspectives, especially if the impact of the pandemic is to be more severe. The adverse impact of the pandemic on investment would be even larger without government intervention. Household welfare would fall more sharply without relief and recovery measures. Furthermore, without the assistance of development partners, deficit financing would result in the deterioration of the fiscal framework with a risk of jeopardizing macroeconomic stability and debt sustainability. The anticipated 3.4 billion USD government response plan meant for emergency responses, to support businesses and protect jobs would certainly contribute to protecting the livelihoods of workers and businesses. However, it is not enough to put the economy on a higher growth path that would reduce that gap with preCOVID-19 situations (Mitik Beyene et al., 2020).

2.3 Conceptual Framework



CHAPTER THREE

RESEARCH METHODS AND PROCEDURES

3.1 Research Design

The research was an explanatory type of research, which was designed to attain its objective by explaining the dependent variable economy through its different independent variables that are disrupted by COVID-19 in the circular flow of the economy.

3.2 Data Type, Source, and Method

The researcher used secondary data/ archival data collected from different national and international sources such as different internet websites, and the National Bank of Ethiopia, the World Bank, Plan, and Development Commission of Ethiopia (PDCE), Ministry of Health of Ethiopia (MOHE) to analyze the impact of COVID-19 on Ethiopia's economy and the government response.

3.3 Research Approach

The study employed both qualitative and quantitative approaches to examine the economic impact of COVID-19 and the government response in Ethiopia.

3.4 Method of Data Analysis

This study used both descriptive and econometric analysis. The descriptive analysis was used to analyze the trends of the economy, the trends of pandemic uncertainty, and trends of COVID-19 through the different periods. Moreover, the government's response towards mitigating the economic impact was analyzed. On the other hand long-run and short-run relationship; the causal relationship and impacts of COVID-19 on the economy will be investigated with econometric modeling. Methods like statical tables, line graphs, and percentages were used as their necessity. The analysis was computed using E-views software.

The econometric analysis was made by Auto-Regressive Distributed Lag bound testing Model. Using the model the long-run relationship, and short-run speed of adjustment of the variables, the balance of payment, general price index, export, import, foreign direct investment, exchange rate, employment, government expenditure, and the world pandemic uncertainty index has been analyzed.

The ARDL bounds testing model had been introduced by Pesaran and Shin (1999), and later modified by Pesaran et al., (2001). The reason for choosing ARDL is that it is advantageous in working irrespective of the stationarity being in the same order. This implies that the ARDL enables us to work on the cointegration without considering whether the variables are purely at a level, I (0), purely at the first difference, I(1), or at both (Emeka and Kelvin, 2016, cited in Abebe, 2019). When we look to some of the other cointegration methods, OLS needs all the data to be cointegrated at a level, I (0); VECM and VAR need the data to be all at the first difference, I (1) (Juselius, 2006) Veligenthart 2014). Furthermore, the change in the dependent variable that comes due to the change in the explanatory variables is not immediate, rather it is distributed into future periods; the ARDL plays a vital role in this regard (Chetty, 2018). She also states that the model considers the assumptions of the absence of Heteroskedasticity, autocorrelation, and presence normally distribution, and stationarity at either I (0), I(1), or both.

3.5 Model Specification

In the neo-classical, the production function is stated as follows:

$Y_t = f(K_t, H_t)$.....(1)

Where $Y_t \Rightarrow$ Output, $K_t \Rightarrow$Physical Capital, $H_t \Rightarrow$ Human Capital. However, in many studies researchers have included different exogenous independent variables to the neo-classical model of production to investigate the impacts, contributions, relations of the variables to the output or production in economic growth, for example: (Abebe, 2019; Haile, 2020; Yakubu et al., 2015).

The circular flow of income is the economic model, which shows the flow of the factors of production, income, produced goods and services among households, firms, government, foreign sectors, and financial intermediaries in the market of supply and demand. In the flow the economic activities are interdependent. The income gained from the sales of goods and services is equal to the costs of production; as a result GDP=Income = Production = Spending (Gutierrez et al., 2009; Saylordotorg.github.io, 2021). However, COVID-19 is expected to disrupt the circular flow of the economy by having demand and supply shocks as a result of the lockdown. Consequently, we incorporate COVID-19 as a variable that has an impact on the economy. Then we set the equation as follows:

$Y_i = f(K_i, H_i, C_i)$..... (2)

Economic impacts resulting from the COVID-19 crisis are expected to have differentiated impacts on a wide range of economic indicators. It is therefore important to apply a methodology that allows capturing the impact of the shock through its multiple dimensions. These viruses are expected to create external lockdown shocks and internal lockdown includes, (low import, low export, low FDI), (high government expenditure, low employment, and low total consumption) in the economy respectively. Consequently, the researcher will examine the impact through these economic determinants. Hence, the economic function to determine the impact will be:

BOP= f (EXPO, IMP, FDI, EX, EMP, GOV, WPUI)..... (3)

GPI= f (EXPO, IMP, FDI, EX, EMP, GOV, WPUI)..... (4)

Where, BOP= Balance of payment

GPI= General price index

EXP= Export

IMP= Import

FDI= Foreign Direct Investment

EX= Exchange Rate

EMP= Employment

GOV= Government Expenditure

WPUI= world pandemic uncertainity index

According to Lutkepohl and Xu (2009), in estimating economic variables the use of log transformation is important to become stable the variance of a series and to avoid heteroscedasticity. To show the elasticity of the variables and the use of logged values can reduce the problem of outliers (Gujarti, 2004). Consequently, we can set model (3) and (4) in logarithm form in the model (5) and (6) as follows:

$$lnBOP_t = \beta_0 + \beta_1 lnEXP_t + \beta_2 lnIMP_t + \beta_3 lnFDI_t + \beta_4 lnEMP_t + \beta_5 lnEX_t + \beta_4 lnEMP_t + \beta_7 lnGOV_t + \beta_6 lnWPUI_t + \varepsilon_t \quad (5)$$

$$lnGPI_t = \beta_0 + \beta_1 lnEXP_t + \beta_2 lnIMP_t + \beta_3 lnFDI_t + \beta_5 lnEX_t + \beta_4 lnEMP_t + \beta_7 lnGOV_t + \beta_6 lnWPUI_t + \varepsilon_t \quad (6)$$

ln(GPI)t and ln (BOP) is the logarithm of the working variables for the economy. They are the logarithm of the General price index and the logarithm of the balance of payment at a time t; ln(EXP)t is the logarithm of export is the logarithm of the government expenditure index at a time t; ln(IMP)t is the logarithm of the import Balance of payment at a time t; ln(FDI)t is the logarithm of the Sectors index at a time t; ln(EMP)t is the logarithm of the employment at a time t; ln(EX)t is the logarithm of the exchange rate at a time t; WPUI is the logarithm of the World pandemic uncertainty index at a time t. Then β_1,β_2,β_3. . .β_6, are elasticities to be estimated and β_0 is a constant parameter.

3.6 Short and Long-Run Relationship of the Model

To examine the long term and the short term relationship of the dependent and the independent variables on a time series basis, in the above we observed the statistic model, the dynamic model will be based on its lagged variable as well as the explanatory variables and their lags, for this, we use the ARDL model. We find a long-term relationship from Eqs (3). The ARDL model (p, q1, q2. . . q9), with a lag, the Eqs (5 and 6) remain as follows:

$$lnBOP_t = \beta_0 + \beta_1 lnBOP_t - 1 + \beta_2 lnEXPO_t t - 1 + \beta_3 lnIMP_t - 1 + \beta_4 lnFDI_t - 1 + \beta_5 lnEX_t - 1 + \beta_6 lnEMP_t - 1 + \beta_7 lnGOVt - 1 + \beta_8 lnWPUI_t - 1 + \sum_{i=0}^{a} \theta_1 \Delta lnGPI_t - i + \sum_{i=0}^{b} \theta_2 \Delta lnEXPO_t - i + \sum_{i=0}^{c} \theta_3 \Delta lnIMP_t - i + \sum_{i=0}^{d} \theta_4 \Delta lnFDI_t - i + \sum_{i=0}^{f} \theta_5 \Delta lnEX_t - i + \sum_{i=0}^{e} \theta_6 \Delta lnEMP_t - i + \sum_{i=0}^{e} \theta_7 \Delta lnGOV_t - i \sum_{i=0}^{g} \theta_8 \Delta lnWPUI_t - i + \varepsilon t \quad \text{.....(7)}$$

$$lnGPI_t = \beta_0 + \beta_1 lnGPI_t - 1 + \beta_2 lnEXPO_t t - 1 + \beta_3 lnIMP_t - 1 + \beta_4 lnFDI_t - 1 + \beta_5 lnEX_t - 1 + \beta_6 lnEMP_t - 1 + \beta_7 lnGOVt - 1 + \beta_8 lnWPUI_t - 1 + \sum_{i=0}^{a} \theta_1 \Delta lnGPI_t - i + \sum_{i=0}^{b} \theta_2 \Delta lnEXPO_t - i + \sum_{i=0}^{c} \theta_3 \Delta lnIMP_t - i + \sum_{i=0}^{d} \theta_4 \Delta lnFDI_t - i + \sum_{i=0}^{f} \theta_5 \Delta lnEX_t - i + \sum_{i=0}^{e} \theta_6 \Delta lnEMP_t - i + \sum_{i=0}^{e} \theta_7 \Delta lnGOV_t - i \sum_{i=0}^{g} \theta_8 \Delta lnWPUI_t - i + \varepsilon t... \quad \text{.....(8)}$$

Where, Δ is the first difference operator a, b, c, d, f, g, and h are the optimal lag length for each incorporated series and parameters *θ1, θ2, θ3, θ4, θ5, θ6, θ7, θ8 are the short-run parameters and* β_1,β_2,β_3. . .β_9 are the long-run multipliers respectively in the equation. Then εt is the error term that will be distributed identically, independently, and normally. $\varepsilon t \sim$ iid $N(0, \sigma^2)$

For the long-run relationship, the Co-integration test is to be used.

The hypothesis will be as follows:

H_0: $\beta_1=\beta_2=\beta_3=\beta_4=\beta_5=\beta_6=\beta_7=\beta_8=0$

H1: $\beta_1\neq\beta_2\neq\beta_3\neq\beta_4\neq\beta_5\neq\beta_6\neq\beta_7\neq\beta_8\neq0$

3.6.1 Order of Lags in ARDL

In ARDL determining the optimal lag, length is very necessary because it supports us in saving the degree of freedom. Among others, the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC) are useful in the selection of the lag orders in the ARDL model. In this study, the Akaike Information Criterion (AIC) will be used in the selection of the lags due to its simplicity, in which it doesn't require any table lookup. Moreover, it avoids the subjective specification of an arbitrary level of significance (Takane and Bozdogan, 1987).

3.7 Definition and measurement of Variables

General Price Index (GPI): a measure of the average change over time in the prices paid by consumers for a market basket of consumer goods and services (Wikipedia, 2021b). The general price index (GPI) as a proxy for the economy is considered the dependent variable.

Balance of Payment (BOP): is the other dependent variable, which is used as a proxy of the economy. As the value of imports and exports are expected to decrease, the balance of payment is also expected to decrease accordingly.

Export (EXPO): refers to a product or service produced in one country but sold to a buyer abroad. The researcher will consider the export in terms of the total export in birr.

Import (IMP): Imports are goods and services purchased by residents of a country from other parts of the world. It is not domestically produced. It lets funds flow out because when we purchase, we pay money.

Foreign Direct Investment (FDI): Foreign direct investment is measured by the inflow as a proxy of foreign capital.

Exchange Rate (EX): is the weighted average exchange rate of USD to birr.

Government Expenditure (GOV): is the Total expenditure (money spent) made by the Government of the country (Ethiopia).

Note: in all variables, except EX and WPUI, the change rate +(growth rate) from quarter to quarter is taken as the measurement amount.

World Pandemic Uncertainty Index (WPUI): As an exogenous variable of the COVID-19 pandemic, World Pandemic Uncertainty Index (WPUI) will be considered.

The index is constructed by counting the number of times a word related to pandemics is mentioned in the Economist Intelligence Unit country reports. Specifically, the index is the percent of the words related to pandemic episodes in EIU country reports, multiplied by 1,000. A higher number means higher discussion about pandemics and vice versa and adapted to the case of Ethiopia. In Ethiopia, this measurement was used by the study of Demiessie (2020), the effect of covid-19 on macroeconomic stability, a quarterly time-series study using the VAR model.

3.8 The Unit Root Test

Ahead of making a regression analysis, we should have to check for stationarity of the time series data. A stochastic process is assumed to be stationary if its mean and variance have no regular change over a particular period and covariance between two time periods depends on lags between these periods. "Unfortunately, most of the economic time series is non-stationary and this fact is often neglected by students and beginning researchers. The consequence leads to inaccurate results or so-called spurious regression problem" (B.Eduard, and L. Štefan, 2009, P.4). Accordingly, we need to test it. Most time-series data have a stochastic trend. If a given variable has a stochastic trend, it needs to be differenced to gain stationarity. This process is called difference stationarity (Gujarati, 2004). In this study, the Augmented Dickey-Fuller (ADF), will be used to test the unit root (non-stationarity) of both the dependent and independent variables.

If the ADF equation contains both no intercept and trend the equation can be written as:

$$\Delta Y_t = \beta Y_t - 1 + \sum_{t=1}^{p} @i\Delta Y_t - i + \varepsilon_t$$

If the ADF equation containing intercept:

$$\Delta Y_t = a0 + \beta Y_t - 1 + \sum_{t=1}^{p} @i\Delta Y_t - i + \varepsilon_t$$

If the ADF equation containing both intercept and trend:

$$\Delta Y_t = a_0 + \beta_t - 1 + \beta \sum_{t=1}^{p} y_t - 1 + \sum_{t=1}^{p} @\Delta Y_t - i + \varepsilon_t$$

3.9 Granger Causality Test

The Granger causality test is a statistical hypothesis test for determining whether one-time series is useful in forecasting another, first proposed in 1969(Granger, 1969). He argued that causality in economics could be tested by measuring the ability to predict the future values of a time series using prior values of another time series. Granger defined the causality relationship based on two principles:

1. The cause happens before its effect.
2. The cause has unique information about the future values of its effect (Eichler, 2011, p. 5).

A time series *X* is said to Granger-cause *Y* if it can be shown, usually through a series of t-tests and F-tests or lagged values of *X* (and with lagged values of *Y* also included), that those *X* values provide statistically significant information about future values of *Y* (Granger, 1969).

$$\Delta Y_t + a_0 + \sum_{i=1}^{n} \alpha_1, i\, \Delta Y_t - 1 + \sum_{i=0}^{n} \alpha_2, i\, \Delta x_t - i + \sigma ECM_t - 1 + \varphi_t \quad \text{.....(9)}$$

$$\Delta X_t + \beta_0 + \sum_{i=1}^{n} \beta_1, i\, \Delta X_t - 1 + \sum_{i=0}^{n} \beta_2, i\, \Delta Y_t - i + \gamma ECM_t - 1 + \varepsilon_t \quad \text{.....(10)}$$

Where, $\varphi t\ and\ \varepsilon t$ are the error terms (normally and independently distributed), n is the number of lags necessary to induce the error terms in the residuals, and ECM_t-1 is the error correction term from the long-run relationship. Xt is to Granger-cause Yt if one or more α_t, i (i=1,2,3.....n), and σ are statistically different from zero. On the other hand, Yt is said to be Granger-cause of X_t if one or more of β_2, i (i=1,2,3.....n), and γ are statically different from zero. Two direction Granger-causality exists if both α_2, i (i=1,2,3.....n) and β_2, i (i=1,2,3.....n) are statistically different from zero. We can also say that there is an instantaneous causal relation between Y_t and X_t if $a_0\ and\ \beta_0$ are statistically significant.

3.10 The Error Correction Model

If there is the existence of cointegration between variables of the short run and the long run, the short-run elasticity can be driven by constructing an error correction model. The error correction model (ECM)is very fundamental in the cointegration test as it drives by the fact that macroeconomic variables are integrated in the order of zero, I (0)., which means they are

cointegrated and can be modeled as they are generated by the ECM. The ECM formulated as follows:

$$\Delta Y_t + a + \sum_{i=1}^{p} \Theta_i \, \Delta Y_t - 1 + \sum_{i=1}^{p} \sigma_i \Delta x_t - i + \gamma ECT_t - 1 + \varphi_t \quad \text{.....(11)}$$

Where ECTt-1 is a one-period lag of the residual term (disequilibrium) from the long-run relationship, φt is a white noise error term, and $a, \Theta i, \sigma i, \gamma$ are the parameters. Then it can be rewritten as follows:

$$lnBOP_t = a + \sum_{i=0}^{a} \theta_i \Delta lnBOP_t + \sum_{i=0}^{b} \beta_i \Delta lnEXPO_t - i + \sum_{i=0}^{c} \beta_i \Delta lnIMP_t - 1 + \sum_{i=0}^{d} \beta_i \Delta lnFDI_t - 1 + \sum_{i=0}^{d} \beta_i \Delta lnEX_t - 1 + \sum_{i=0}^{h} \beta_i \Delta lnEMP_t - 1 + \sum_{i=0}^{h} \beta_i \Delta lnGOV_t - 1 \sum_{i=0}^{d} \beta_i \Delta lnWPUI_t - 1 + \gamma ECT_t - 1 + \varphi_t \text{.....(12)}$$

$$lnGPIt = a + \sum_{i=0}^{a} \theta_i \Delta lnBOP_t + \sum_{i=0}^{b} \beta_i \Delta lnEXPO_t - i + \sum_{i=0}^{c} \beta_i \Delta lnIMP_t - 1 + \sum_{i=0}^{d} \beta_i \Delta lnFDI_t - 1 + \sum_{i=0}^{d} \beta_i \Delta lnEX_t - 1 + \sum_{i=0}^{h} \beta_i \Delta lnEMP_t - 1 + \sum_{i=0}^{h} \beta_i \Delta lnGOV_t - 1 \sum_{i=0}^{d} \beta_i \Delta lnWPUI_t - 1 + \gamma ECT_t - 1 + \varphi_t \text{.....(13)}$$

Where: Δ is the first difference operator; the β's are the coefficients relating to the short-run dynamics model convergence to equilibrium, and γ is the error-correction coefficient and is also called the adjustment coefficient. γ tells us how much of the adjustment to equilibrium takes place in each period, or how much of the equilibrium error is correct.

3.11 Ethical Consideration

The research is purely for academic purposes only. Hence, the data that are collected from different national and international sources have been used for academic purposes only. The researcher does not make any inappropriate personalization in analyzing and interpreting the data. Moreover, the research was conducted with the consent of the organization, the university, and my respected advisor.

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

Introduction

This chapter contains the analysis of data and interpretation in two categories - the descriptive and econometric part.

4.1 Macroeconomic, Pandemic Uncertainty, and COVID-19 Trends of Ethiopia

4.1.1. Macro Trend of Ethiopia

Ethiopia is a land-locked country located in Eastern Africa stretching from the upper Nile River to the highlands of the region in an area of 426,400 square miles. Ethiopia shares its border with Somalia, Sudan, South Sudan, Kenya, Eritrea, and Djibouti. These borders are borders with high Petty and large trade agreements. Major products traded at these borders are agricultural products, livestock, sanitary and beauty products, medicines, footwear and textiles, cereals, processed and semi-processed foodstuffs (such as pasta, sugar, wheat flour, and tea), kerosene, charcoal, and chat. And also, the women are, who highly participate in the petty trade around these borders (African, 2021).

The Ethiopian economy is mostly agriculture-dependent. Agriculture contributes about percentage, which is about 80% to the economy compared to the others followed by the service and industry sectors. According to the observatory of the economic complexity (OEC) data record of 2019, Ethiopia was ranked the world number 62 in the economy in terms of GDP, the world number 168 in terms of GDP/capita. As per the information of the Ethiopian plan and development commission stated in Figures 4.1 and 4.2 below, the annual RGDP growth rate and the annual GNI of Ethiopia have fluctuating progress every year. However, during the period of 2001, up to 2003 a consistent decrease had been observed. Specifically, during the year 2003, the lowest GDP growth rate of the periods listed had been recorded. In the year 2020, the GDP growth rate has decreased by 3% from the annual growth rate of 109% observed in the year 2019. To the reverse, the GNI showed little increase (3%), which is similar to the decrease in GDP growth rate. The highest GNI rate of 44.84 and 45.15 had been seen in the period of 2008 and 2012. On the contrary, a negative GNI that is -1.95 had been obtained in 2001.

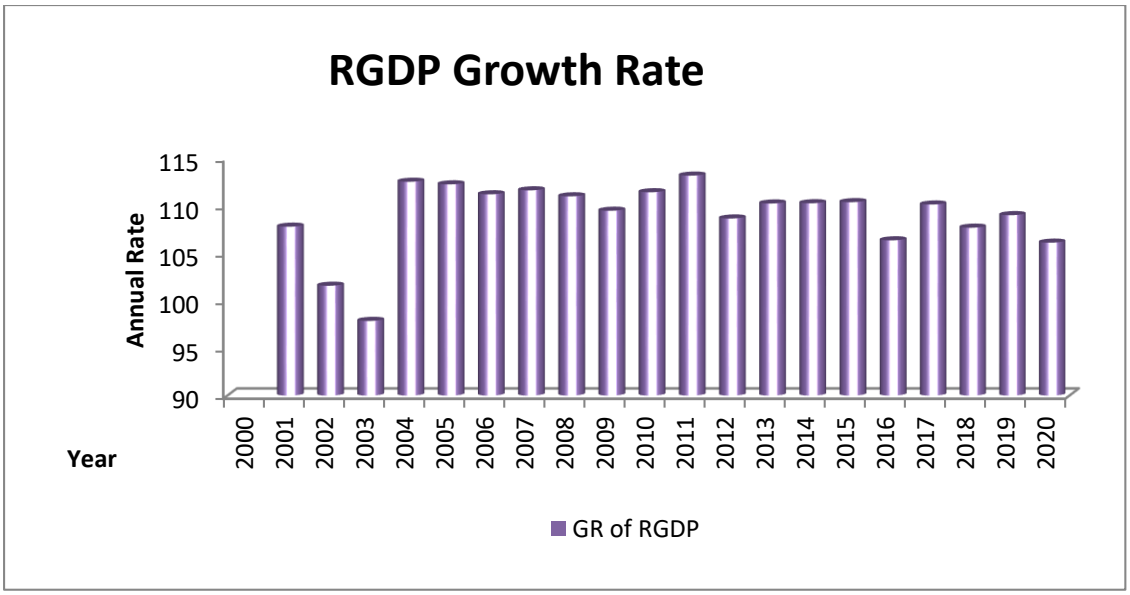


Figure 4.1: Ethiopian RGDP Growth Rate

Source: Own competition using excel from the data of PDCE (2021)

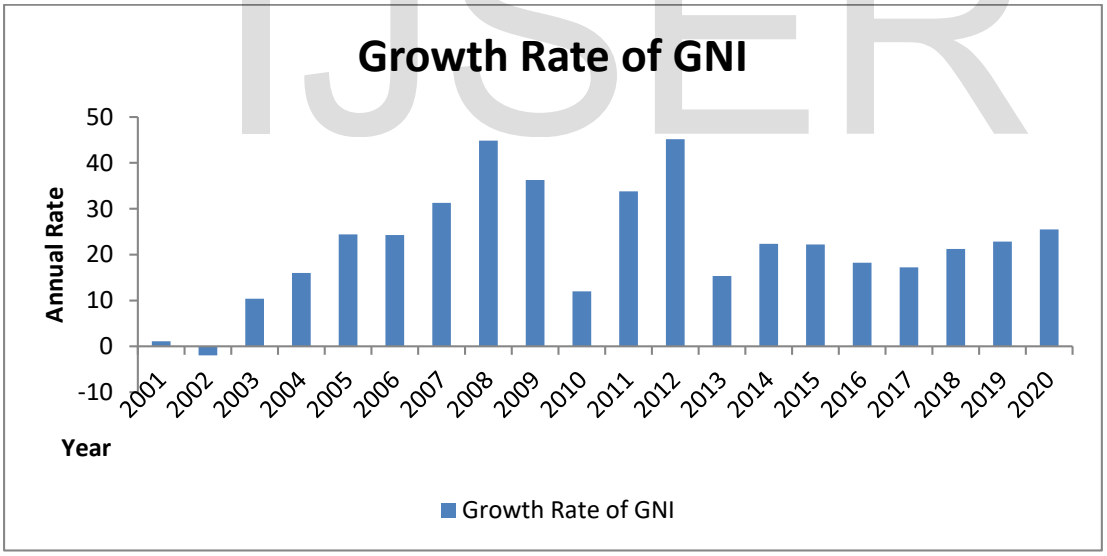


Figure 4.2: Ethiopian Growth Rate of GNI

Source: Own competition using excel from the data of PDC (2021)

Ethiopia is ranked as the second-most populous country in Africa with a population size of 117,876,227 in the current period of 2021, which has a huge growth rate of 2.53% from the 2020 population size of 114,963,588 (United Nations - World Population Prospects, 2021).

As per the data of the World Bank in Figure 4.3 below, both the GDP per capita and GNI per capita of the country have been grown in 2019. While GDP/ capita has been grown from 772 in 2018 to 850 in 2019, the growth rate also simultaneously increased from 0.39% to 10.92%. In the case of GNI, the Growth rate has shown a decrease to 6.25 in 2019 from the growth rate of 8.11 in 2018, the GNI/ capita has grown from 800 to 850 though.

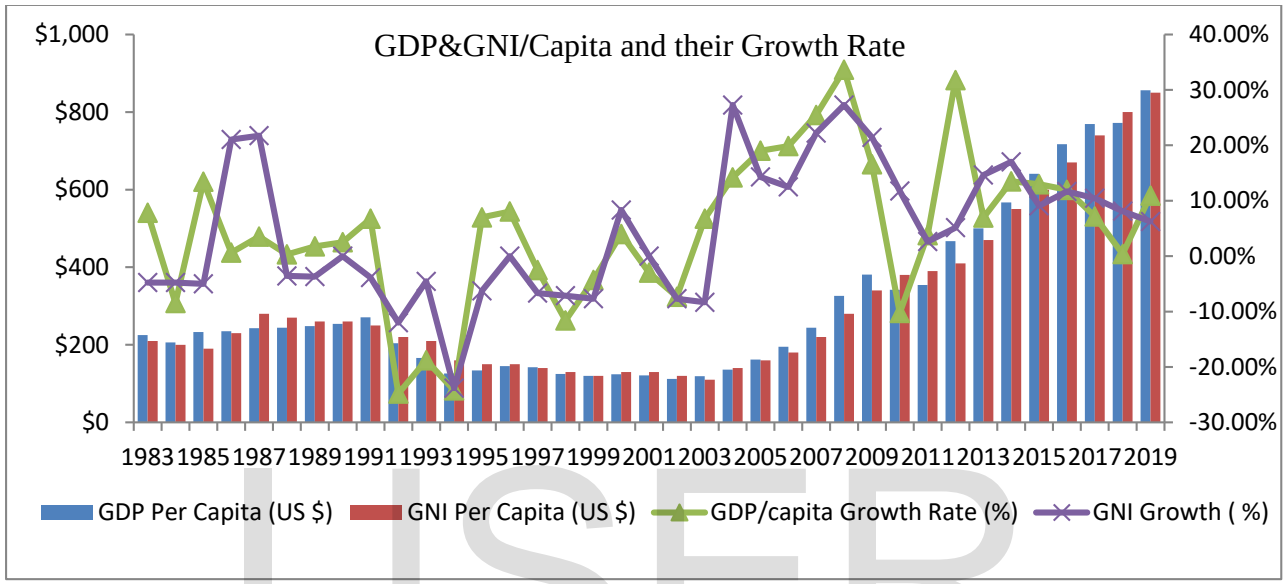


Figure 4.3: GDP/ capita &GNI/ capita of Ethiopia, and their Growth Rate

Source: Own Competition from the World Bank Data using Excel (2021)

Data from the National Bank of Ethiopia indicates that inflation in Ethiopia has shown fluctuating behavior. As indicated in the depicted figure 4.4 below, the inflation rate of Ethiopia in 1991 and 2008 had been highly increased. The inflation rate with these periods had been 45% and 55% respectively. According to Mambo (2005), cited by Abebe, (2020), an increase in inflation due to political instability may cause uncertainty on foreign investors. Having said that, the periods of 1991 and 2008 periods had been the periods where EPRDF came to power, the Ethio-Eritrea fight took place, political and economical instability had been in existence. On the contrary, ceteris paribus, a very little rate of -10.2, -11.8, -9.0, and -1.2 had been recorded in the year 1973,1986, 1996, and 2002.

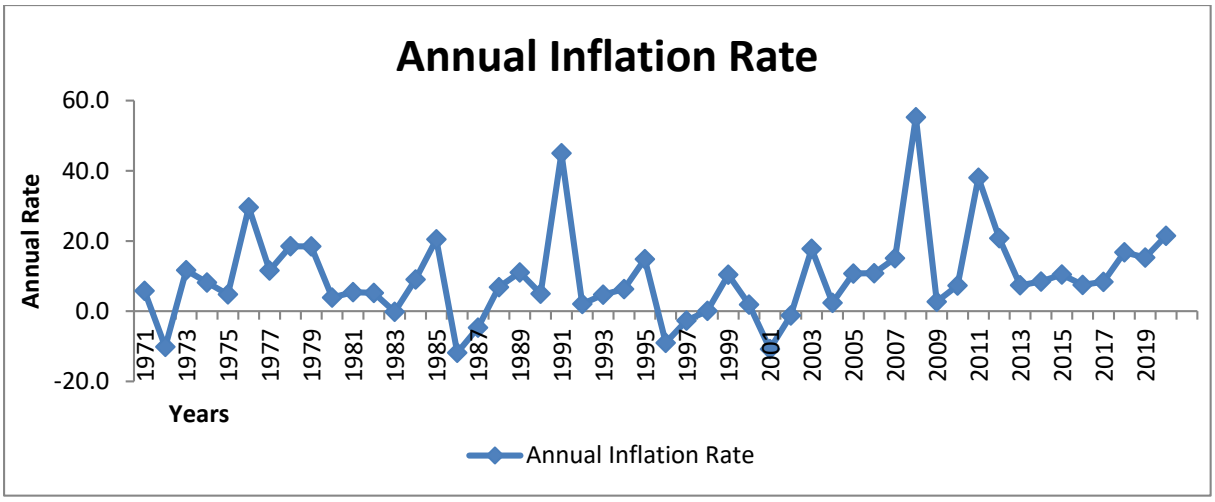


Figure 4.4: Inflation Rate of Ethiopia

Source: Own competition using NBE Data (2021)

According to the observatory of the economic complexity (OEC) data of 2019, Ethiopia has been placed as the world number 132 in export, number 110 in total import, and the world's number 116 most complex economy in terms of economic complexity index. According to the data, the most trade partners of Ethiopia are China, which has taken about $518 million exports of Ethiopia, United States of America, taking $484 million of the export, United Arab Emirate invested $251 million to purchase the Ethiopian export products, Saudi Arabia, costing $197, and South Korea, having $159 of the export of Ethiopia. The most Import partners of Ethiopia are China, $2.37 billion, India, $828 million, UAE, $788 million, France, $787 million, UK, $622 million. Meanwhile, the main imports are Planes, Helicopters, and /or Spacecraft $717 million, Gas Turbines, $608 million, Packaged Medicaments $402 million, Electric Filaments, $266 million, and Cars $225 million. The main export products are Coffee holding $837 million, Other Oil Seeds $347 million, Gold $256 million, Cut Flowers consisting of $238 million, and Zinc Ore $199.

The information of NBE indicates that the export and import trend of Ethiopia in most quarters through the period of 2010 up to 2020 as indicated in figure 4.5 below, the growth rate of the import and export have been going in an almost similar range of growth (-10 up to 58), except the periods of 2015 up to 2018, where, relatively huge up and down (growth and slow) has been recorded. The largest growth rate of import had been seen in the third quarter of 2017, which was 320.46, but later decreased to 11.61% in the fourth quarter within the same period.

A relatively large negative percentage of decrease of -78.20 in imports had been seen in the fourth quarter of 2015. In the case of export, relatively larger percentage fluctuations of the growth had been seen in the Qtr I of 2016, Qtr I, Qtr II, and Qtr IV of 2016 had been observed. These are 100.91% in Qtr I, 2016, -86% in Qtr II, 2016, and 152.93% in the Qtr IV of 2016.

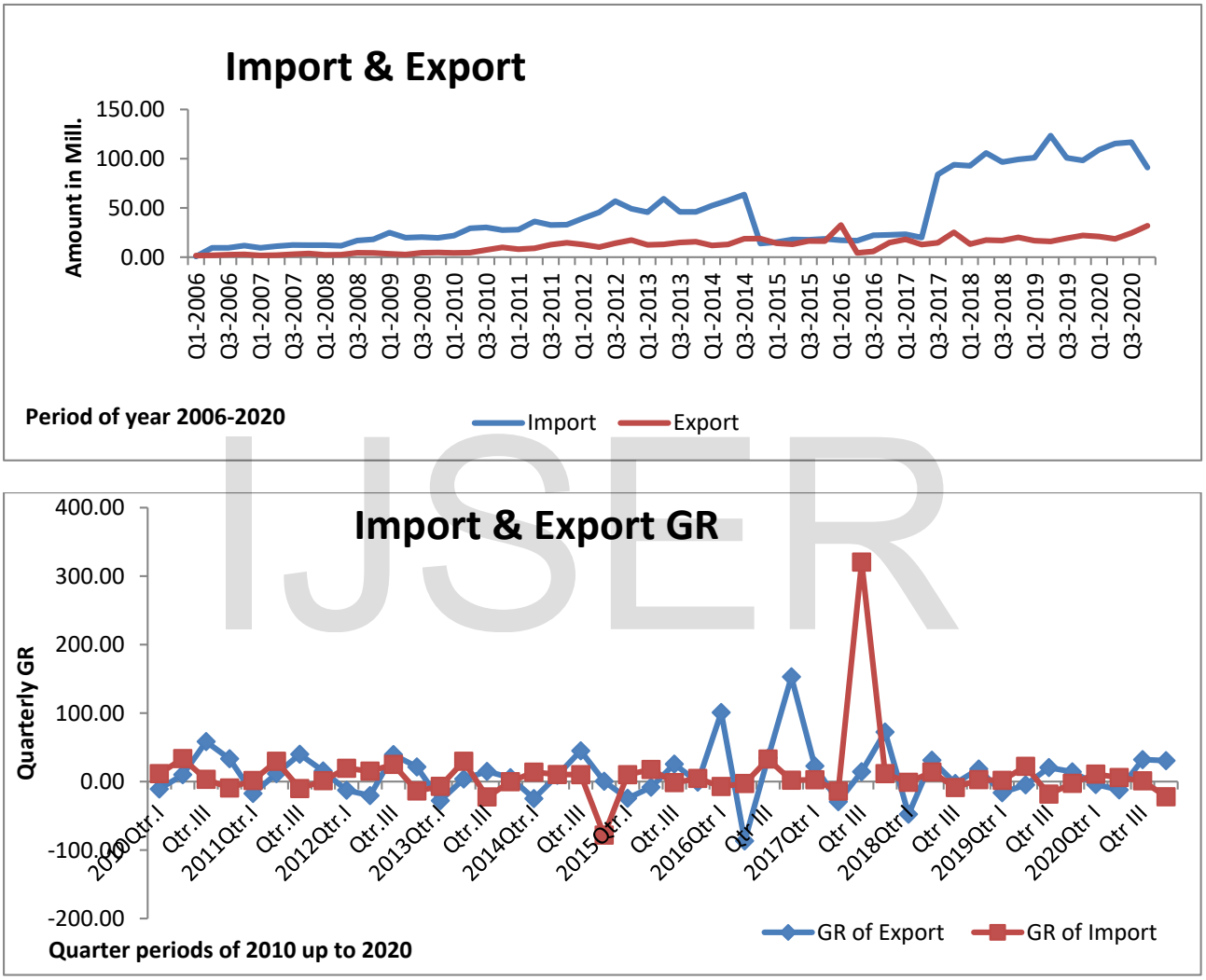


Figure 4.5: Import and Export of Ethiopia, and its GR from 2010 to 2020

Source: Own competition using NBE Data (2021)

The employment status of Ethiopia has shown a consistent down growth like a carrot from Q3 2009 onward. During the periods of 2006 up to 2008 the employment had shown consistent growth.

In 2006, the number of employed counted 101,148; since then an upward flow has been observed, and then in 2008 the total employed (temporary and permanent) reached 672,489, which has been the highest record of all as observed in figure 4.6 below. However, in 2009, the amount of total employed dropped from its peak and reached 391,994, which implies a percent change of negative 41.71 from the last quarter of 2008.

Employment reached the worst stage during the fiscal period of 2020. In all quarters of this period, the number of employment indicates the lowest amount of all periods. The figures have been 152, 1047, 152, 80 in the quarter I, II, III, IV respectively. This can be justified that the reason has been COVID-19 uncertainty increment. The data of the world pandemic uncertainty index during these quarters indicates that the uncertainty has amounted to 385.02, 604.86, 363.25 in quarters II, III, IV respectively. Consequently, during these periods companies, firms, organizations, have been reducing their employees; government organizations made their employees work at home or work by shift. As a result, other things remaining constant, the indicated number of employment has been observed.

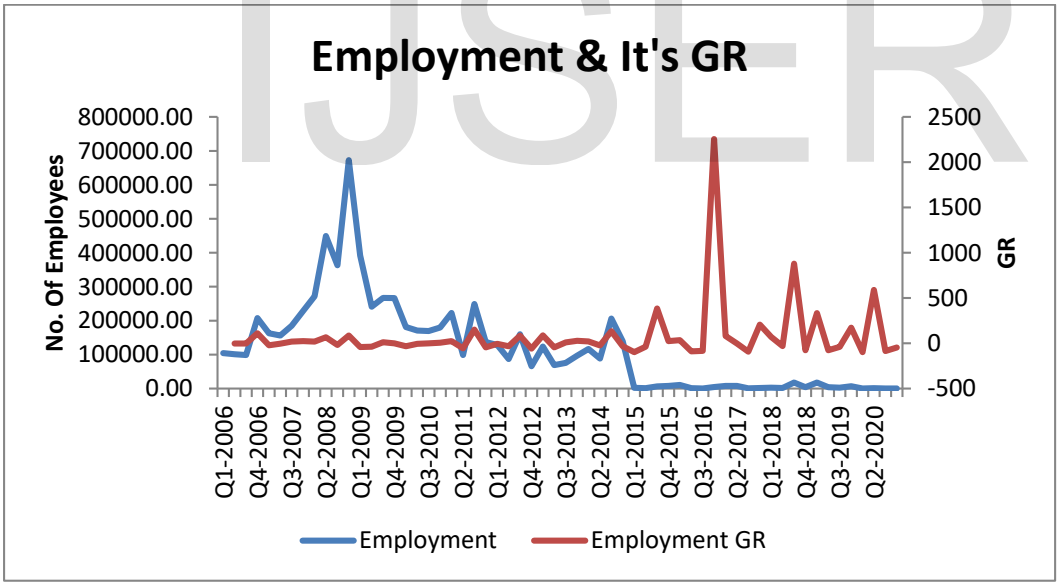


Figure 4.6: Employment of Ethiopia, and Its GR

Source Own Competition using Excel from the NBE data (2021)

The government is one of the stakeholders on the track of the circular flow of income model. The government possesses different transactions with the firms, the household, and the rest of the world by making purchases, transfers, and subsidies, and so on.

The data from the National Bank of Ethiopia as depicted in figure 4.11below, the expenditure of the government come up with a raising flow.

At our starting point in this study, 2006, the government spent birr 5983 million in its first quarter. Afterward, the spending has been increasing, there is a fluctuation though. The government made the highest expenditure, birr 178,762.90 million, in the fourth quarter of 2020, which was the highest of all the periods indicated in figure 4.7.

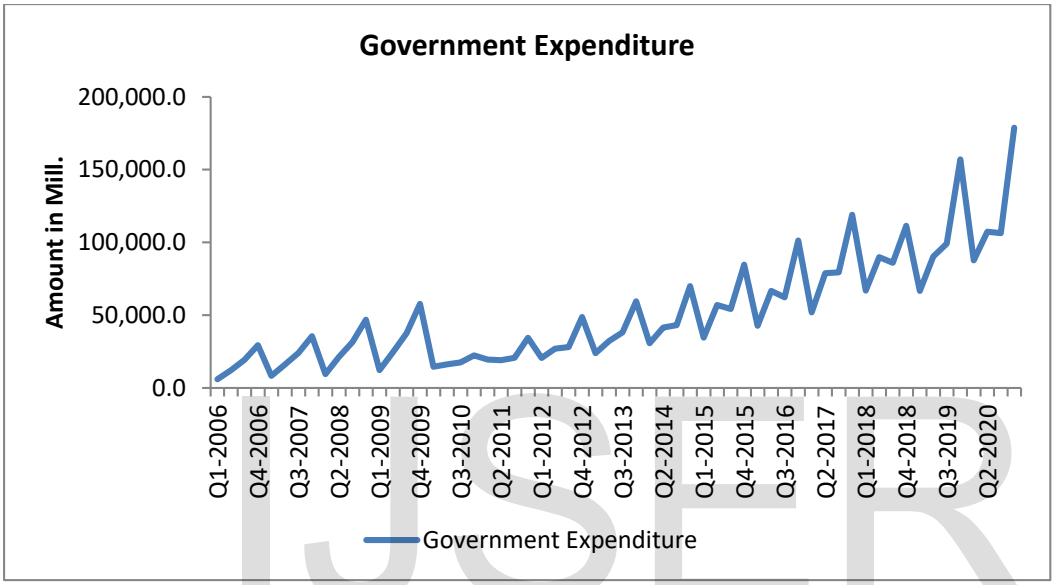


Figure 4.7: Government Expenditure

Source: Own Competition in Excel using the NBE data (2021)

As the chart figured in 4.8 below indicates, the balance of payment has in most cases a negative record for over a year. This is due to the dominance of the import beyond the export, having other things remained constant. during the fiscal period of 2019/20, where the uncertainty of the world for COVID-19 reached its peak, the balance of payment incurred a deficit balance for successive three quarters (Quarter I= -870.5 million, Quarter II= -91.1 million, Quarter III=420.9 million), which was followed by a surplus record of birr 275.3 million on the fourth quarter. Compared to the quarters for the fiscal period of 2018/19, the first quarter, January-March/2019/20 balance of payment increased its deficit movement with -870.5 million, which is higher than the same quarter of the past year. In the second and the third quarter, even though a few decreases have been observed from the record of -258.6 million and -572.7 million of the last year, but yet there has been a continued deficit amount of 91.1 million, and 420.9 million.

Despite the political instability and disruptions over the country, it can be said that COVID-19 might have played its role in the continuity of the downflow of the balance of payment.

In General, the balance of payment most of the quarters, and the years has a negative balance. The balance of payment during the period of 2010-2011 showed a better movement of the quarters of the other periods. The balance of payment during the peak period of uncertainty of the pandemic, Q1-4, 2019/20, continued its deficit movement except for the fourth quarter, which was relatively better than the record of the same quarter of the previous fiscal period.

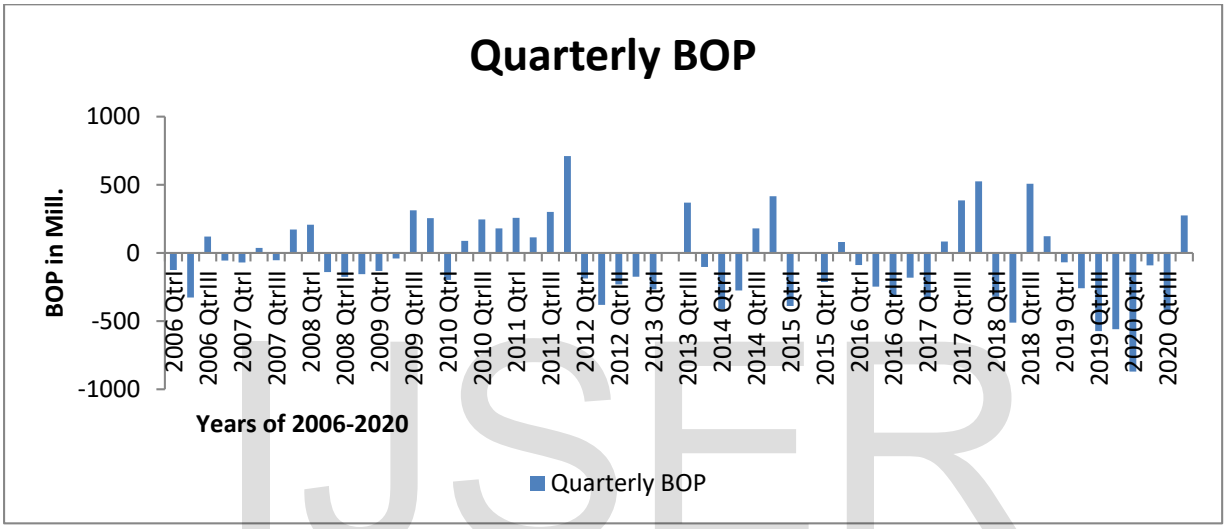


Figure 4.8: Trend of the balance of payment in Ethiopia

Source: Own competition using excel from the NBE Data (2021)

4.1.2. Pandemic Uncertainty

According to the information stated in Figure 4.9 below, the world pandemic uncertainty has been seen in Ethiopia about 12 times between the periods of 1996 to 2020. According to (Ahir, Hites, Bloom, Nick, and Furceri, 2021), the data has been built by counting the moments of uncertainty that have been expressed with the word pandemic and approximate to the pandemic in the Economist Intelligence Unit country reports and multiplied by one thousand. The study indicated that the SARS (2002-03), Avian flu (2003-09), Swine flu (2009-10), Bird flu (2013-17), Ebola (2014-16), MERS (2014-20), and COVID-19 since Dec. 2019 are the sources of the uncertainty to the world. Consequently, the uncertainty has been observed in Ethiopia with the amount of 14.71 in the third quarter of 1998, in which Cholera and Influenza have been seen in neighbor Somalia and Kenya respectively, as per the data of WHO; the uncertainty of 11.85 has

been seen 2003; 34.46 in the third quarter of 2014; 24.22,14.55, and 8.11 in the first, second, and third quarter of 2015; 7.26, and 7.80 in the first, and fourth quarter of 2016; 8.04

in the first quarter of 2017; and the year 2020, from quarter two up to the fourth quarter, the large size of 385.08, 604.86, 363.25 uncertainty, which have never been seen ever before.

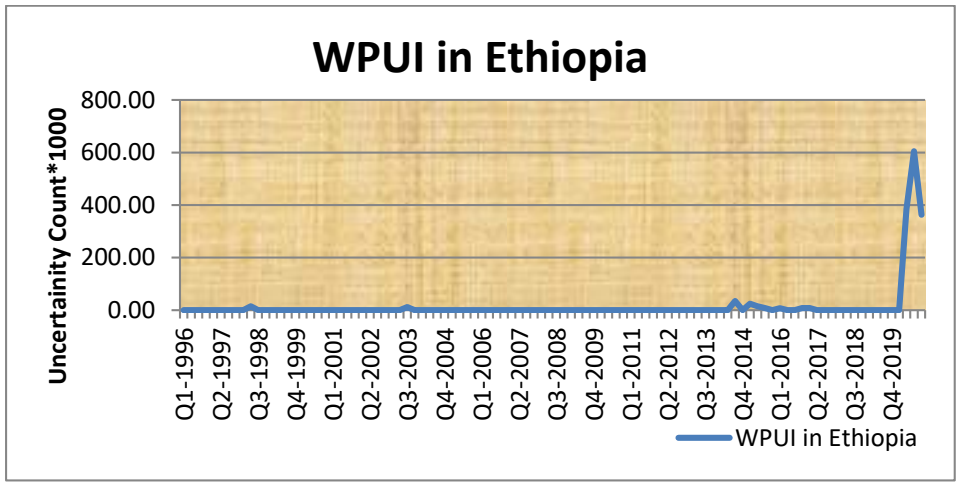


Figure 4.9: WPUI of Ethiopia from 1996-2020

Source: Own competition Using the data of Ahir, Hites, Bloom, Nick, and Furceri, (2021)

4.1.3. Trends of COVID-19

The reason for the increase of the uncertainty, which is discussed in the above table 4.9 is perfectly what is being observed in table 4.10 below. As it is visible, the virus spreads and attacks human beings within a short period. This is because it is easily transmittable and is invisible as a ghost. Moreover, the living standards, the societal interaction tradition of Ethiopia are vulnerable to the disease, it didn't happen though. Ceteris paribus, the quarterly data in figure 4.10 that have been compiled from the MOHE indicates that in the first quarter 26 people were captured, of them, 2 persons recovered, and no death has been recorded. However, later on, within the month April-June, 5820 new cases have been found replacing 2428 recovered. This means the infection started to grow double of the recovery, and also the death amount increased from null to 95 people. From this moment onward, the cases, and deaths continued to increase with a huge number of cases beyond the recovery, and have become unstoppable.

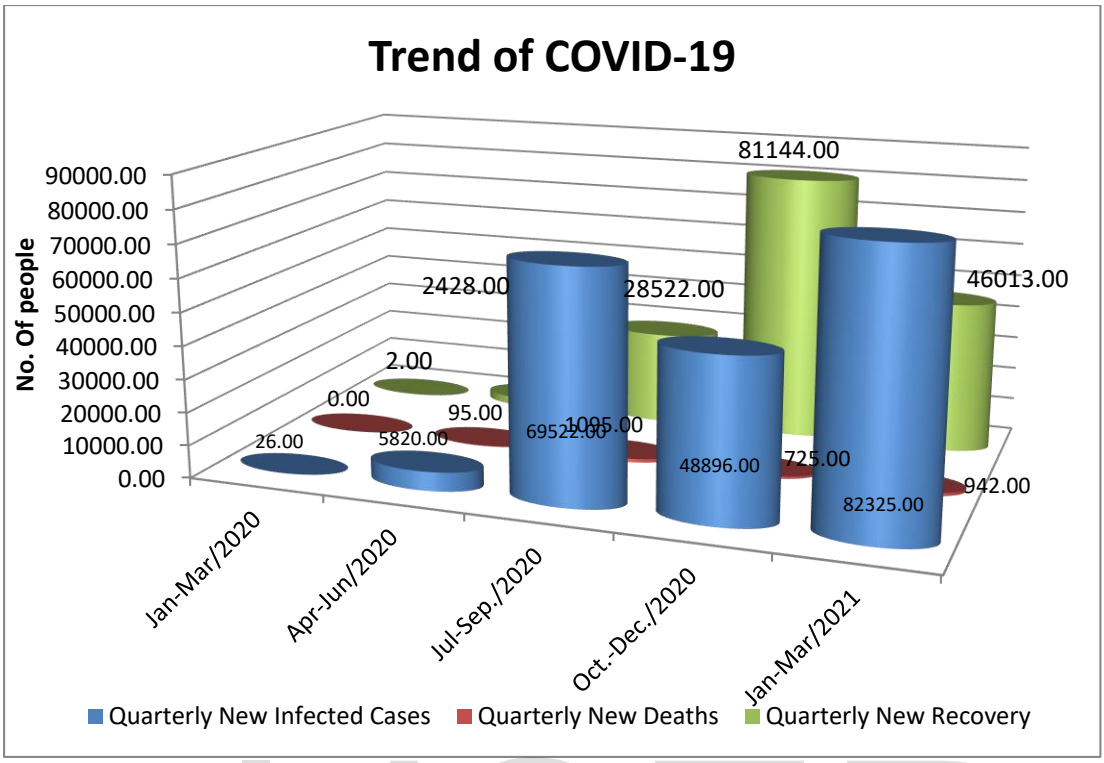


Figure 4.10: Trend of COVID-19 in Ethiopia

Source: Own competition using the MOHE Data (2021)

4.2. Econometrics Analysis

4.2.1. The Unit Root Test

The source of non-stationary is the unit root. In practice, the presence of unit root shows that the time series under consideration is non-stationary unless the reverse is the case. On the other hand, a series with a unit root does not tend to return to a long-run deterministic path and the variance of the series is time-dependent. A series with unit root suffers permanent effects from random shocks, thus, follow a random walk. That is, using (dependent and independent) time series that contain unit root in regression analysis, the classical results of the regression may be misleading. However, I (1) variables that exhibit a random walk without drift may have a mean that is constant over time, the expected value of zero and, with trending variance; hence making the series with unit root tend to return to the long-run path after removing deterministic trend Before making any analysis to use the ARDL model, the unit root test must precede. It also helps in avoiding spuriousness.

There are various methods of testing unit roots. These are Durbin-Watson (DW) test, the Dickey-Fuller (DF) test (1979), the Augmented Dickey-Fuller(1981)(ADF) test, Philip-Perron(1988) (PP) test, among others. It is of the view that before pursuing formal tests to plot the time series under consideration, to determine the likely features of the series and; run the classical regression. If the series is trending upwards it shows that the mean of the series has been changing with time. In the case of the classical regression, if Durbin– Watson statistics is very low and a high R2 (Granger–Newbold, 1974), this perhaps reveals that the series is not stationary. This is the initial step for a more formal test of stationarity. The most popular strategy for testing the stationary property of a single time series involves using the Dickey-Fuller or Augmented Dickey-Fuller test respectively. In this study, to check all these, the Augmented Dickey-Fuller (ADF) test statistic is used. by first identifying the lag length.

On the subject of lag length, there is no hard and fast law. It's essentially an empirical problem. There is no prior guidance as to what the maximum lag length should be, as stated in Damondar Gujarati Basic Econometrics (Ngozi Adeleye, 2018).

In addition, Jeffery Wooldridge's Introductory Econometrics: modern approach mentioned that having sufficient data points, the lag length for yearly data should be small, 1 to 2 in order not to lose a degree of freedom; in quarterly data, the lag length should be 1 up to 8; and for monthly data, the length of lag should be 12 up to 24 (Ngozi Adeleye, 2018).

Accordingly, since the data used in this study are quarterly data from 1975 up to 2020, the researcher found a lag length of 3 as indicated in Table 4.1 below that is computed through the order of lag structure in Eview's.

Table 4.1: Lag Order Selection Criteria

Lag	LogL	LR	FPF	AIC	SC	HQ
0	-5537.44	NA	4.40e+74	194.58	194.86	194.689
1	-5296.04	406.57	8.91e+71	188.35	190.93	189.35
2	-5152.67	201.21	6.25e+70	185.57	190.44*	187.46*
3	-5067.97	95.10*	4.34e+70*	184.84*	192.01	187.63

Source: Own competition using Eviews (2021)

After defining the lag length, we can check the unit root test for stationarity with the recommended lag length.

An ADF value with less than its critical value shows that the underlying series is non-stationary. Contrarily, when an ADF value that is greater than its critical value shows that the underlying series is stationary. In conjunction, the hypothesis should be:

Ho: There is a unit root (non-stationary)

H1: there is no unit root (stationary)

Therefore, based on the decision criteria stated above Table 4.1 shows that the test of the Augmented Dickey-Fuller shows that there is stationarity with the order of both 0 and 1 at 1% and 5% level of significance. The variables lnEXPO, lnIMPO, lnFDI, and lnEX are stationary at first difference with intercept (constant) while the remaining variables with the constant are stationary at level. The stationarity of the variables with the status of trend and constant indicates that lnBOP, lnEMP, lnFDI, and lnWPUI are stationary at a level while the remaining variables are stationary at first difference.

Table 4.2: Unit root test using Augmented Dickey-Fuller

Augmented Dickey-Fuller (ADF) Test Statistic						
	With Intercept			With Intercept and Trend		
Variables	At Level I(0)	At First Difference I(1)	Order Of Difference	At Level I(0)	At First Difference I(1)	Order Of Difference
lnBOP	-6.25**	-7.57	I [0]	-6.20**	-7.51	I [0]
lnGPI	-3.57*	-1.14	I [0]	-0.89	-6.48**	I [1]
lnEXPO	-0.27	-9.07**	I [1]	-2.32	-9.01**	I [1]
lnIMPO	-1.51	-8.54**	I [1]	-2.44	-8.47**	I [1]
lnEMP	-1.63	-10.84**	I [1]	-4.05*	-10.77*	I [0]
lnFDI	-2.52	-6.15**	I [1]	-3.53*	-6.13*	I [0]
lnGOV	1.53	-3.82**	I [1]	-0.74	-4.42**	I [1]
lnEX	-1.69	-8.81**	I [1]	-1.55	-8.99**	I [1]
lnWPUI	-5.86**	-9.01	I [0]	-6.18**	-9.24	I [0]

The (**) indicates that the 1% level of significance and (*) indicates the 5% level of significance

Critical Values

	Augmented Dickey-Fuller (ADF) Test Statistic	
Levels	With Intercept	With Intercept and Trend
Levels 1%	3.54	4.12
Levels 5%	2.94	3.48
Levels 10%	2.59	3.17

Source: Own computation using Eviews (2021)

4.2.2. Bounds Test for Cointegration

Co-integration makes it viable to retrieve the relevant long-run data of the relationship among the considered variables that had been lost on differencing because it integrates short-run dynamics with long-run equilibrium. that is the basis for obtaining realistic estimates of a model, which is the driving force of a significant forecast and policy implementation. Co-integration is a favored step for modeling empirically meaningful relationships of DSP. Cointegration focuses on the evaluation of long-run relations among integrated variables and re-parameterizing the connection between the taken into consideration variables into an errors Correction model (ECM). According to the traditional Granger (1981) and, Engle and Granger (1987), co-integration analysis cannot be applied in cases of variables that are included of different orders of I(1) and I(0) whilst in Johansen and Juselius(1990), and ARDL co-integration method made it applicable. The ARDL co-integration technique is used in determining the long-run courting between series with a different order of integration (Pesaran and Shin, 1999, and Pesaran et al. 2001). The re-parameterized result gives the short-run dynamics and long-run relationship of the taken into consideration variables.

The ARDL bounds testing approach was developed by Pesaran et al. (2001) as a co-integration tool to measure the existence of a long-run relationship between the variables. This technique, which is still relatively new, has several advantages over traditional co-integration tests. To begin, the approach is used concerning the series I(0) or I**(1).** Second, using a simple linear transformation, the ARDL bounds testing can be transformed into an unrestricted error correction model (UECM). Both short and long-run dynamics are present in this model. Finally, the empirical findings demonstrate that the method is superior and consistently produces stable

results for a small sample. In the bound test, there are three decision criteria. These three options of the decision criteria are as follows: the first is that there is cointegration in a long-run relationship if there is a calculated F-statistic that is greater than the critical value of the upper bound I(1). Second, we say that there is no cointegration, hence, no long-run relationship If the calculated *F*-statistic falls below the critical value for the lower bound *I(0)* bound. The third decision criteria are if the *F*-statistic falls between the lower bound *I(0)* and the upper bound *I(1),* the test is considered inconclusive.

Accordingly, the researcher made the bound test on both dependent variables. The first bound test was with the dependent variable of lnBOP (logarithm of the balance of payment). And the result shows that the F-value 12.35of lnBOP is greater than the upper bounds critical value at 1%. Consequently, we reject the null hypothesis that says that there is no long-run relationship between lnBOP and the explanatory variables. Meanwhile, the F-value with the other independent variable that is lnGPI is 9.36 which exceeds the upper bound at the 1%level of significance. This also indicates that there is a long rn relationship between the dependent variable lnGPI and the explanatory variables lnEXPO, lnIMP, lnFDI, lnEX, lnEMP, lnGOV, and lnWPUI.

Table 4.3: Bounds Test

Test Statistic (F-statistic)	Value	K	Significance	Lower Bound Test I0	Upper Bound Test I1
When lnBOP is dependent	12.35**	7	10% 5% 1%	2.03 2.32 2.6	3.13 3.5 3.84
When lnGPI is dependent	9.36**	7	10% 5% 1%	2.03 2.32 2.6	3.13 3.5 3.84

The (**) indicates that the 1% level of significance and (*) indicates the 5% level of significance

Source: Own competition using Eviews (2021)

4.2.3 Long Run ARDL Model Estimation

I. The Balance of Payment

The Regression Coefficient is the constant 'β' in the regression equation that tells about the change in the value of the dependent variable corresponding to the unit change in the independent variable. The result of the analysis in Table 4.4 below shows that all variables significantly affect the balance of payment (BOP) in two directions (signs). While the variables WPUI, IMP, and EX cause a negative impact on the economy, the remaining variables of EXPO, FDI, EMP, and GOV have a positive contribution to the economic growth by affecting the BOP positively with their respective coefficients. Ceteris paribus, if the explanatory variables have been with zero coefficients, the dependent variable could have remained with the value of -0.65.

$$lnBOP_t = -0.65 + 0.49lnEXPO_t - 0.59lnIMP_t + 0.66lnFDI_t + 0.003lnEX_t + 0.35lnEMP_t - 0.3lnWPUI_t$$

The explanatory variables' message indicates that the COVID-19 shock has a negative impact on the economy in Ethiopia with an elasticity of -0.3 in the long run, statistically significant at 5%. This implies that in the long run, a 1% increase in uncertainty of the pandemic in the society in Ethiopia and the rest of the world would result in a 29% decrease in the economic activity of the balance of payment (BOP).

This could be due to the internal and international restrictions that the governments' implement to eradicate the containment, which results in the disruption of the circular flow of income as mentioned by Baldwin & Mauro (2020). In other words, the percentage increase in cases, quarantine, and deaths of the people in Ethiopia and the rest of the world, in the long run, results in the closure of borders, restriction working movements, stoppage of flights, financial institutions, and else. This minimizes the import, export flow by minimizing the interaction among the firms, financial intermediaries, and the rest of the world, which implies a decrease in the balance of payment. A study by Dong & Xia, (2020), on the impact of COVID-19 on BOP, supports and consolidates the finding of this study by concluding their study that "COVID-19, after becoming a pandemic, will have two-way effects on most of the BOP components."

In the case of export, the long-run coefficient indicates a positive coefficient of 0.49 at a 5% level of significance.

This implies that ceteris paribus a percent increase in export could bring a 0.49 increase on the economic activity of balance of payment. We also reject our null hypothesis that states that there is no long relationship between the export and the balance of payment.

On the contrary to the export long-run relation with the balance of payment, the variable import indicates a negative impact having a coefficient amounting to -0.59 at 0.037 level of significance. This means that we conclude that there is an inverse long-run relationship between import and balance of payment. The coefficient implies that a 1% increase in imported products has a 0.59 negative impact (decrease) on the balance of payment in the long run.

A positive long-run relation has been met by the variable FDI. With this variable, the coefficient consisted of 0.65 at a significance level of below 0.05. This suggests that in the long run, a 0.65 positive change in the balance of payment could exist as a result of a positive percent change in foreign direct investment. In other words, we can say that foreign direct investment has a positive impact on the economic growth of the country. A study conducted by Tade (2019), the impact of foreign direct investment on the economic growth of Ethiopia, found that a 1% increase in foreign direct investment has a positive impact of 0.057 on the economic growth in Ethiopia.

Similar to the variable import, the exchange rate resulted in negative or inverse relation with the balance of payment by having a coefficient of -0.003 at a 5%level of significance.

From the study result on the exchange rate, we understand that a 1% increase in the exchange rate of hard currency results in a decrease in the economy by affecting the balance of payment downward by 0.003. This could be due to the reason that increases in inflation as a result of an increase in the exchange rate.

On the other hand, the variables employment and government expenditure have both positive impacts on the growth of the balance of payment (BOP). As per the analysis result, both have a coefficient of 0.35 and 0.0007 respectively. As per the sign and amount of the coefficients, there is a 0.35 and 0.0007 positive increase on the balance of payment in the long run caused by a 1% increase in employment and an optimal % increase in government spending in the economy. This indicates a consolidating concept to the circular flow of income model by Baldwin & Mauro (2020), which says that firms need employees from the household to carry out, speed up, and manage their works and pay wages and salaries to the household in return.

Simultaneously, in the case of the government, the government spends money to purchase from firms, to transfer to the household, and obtain revenues in return.

Table 4.4: Long Run Coefficients Estimated using ARDL Approach (4, 4, 0, 0, 0, 3, 1, 0) based on Akaike Information Criterion.

	Dependent Variable lnBOP			
Variables	**Coefficients**	**Standard Errors**	**T-statistics**	**P-Value**
lnExpo	0.491733*	0.344502	2.427373	0.0162
lnImp	-0.597387*	0.461202	-2.162584	0.0373
lnFDI	0.656086*	0.399993	2.140255	0.0392
lnEX	-0.003339*	0.044876	-2.074416	0.0411
lnEmpo	0.353579**	0.996769	3.966394	0.0003
lnGOV	0.000712	0.000731	3.975194	0.3360
lnWPUI	-0.297256**	0.401460	-3.231347	0.0026
Coneq	-0.651120*	45.264552	-5.334459	0.0400

The (**) indicates that the 1% level of significance and (*) indicates the 5% level of significance
Source: Own competition using Eviews (2021)

II. The General Price Index

In the case of GPI, the result of the analysis indicates that while the variables exchange rate and world pandemic uncertainty index, Export, and import, are significant at a 5% level of significance, the other variables are insignificant consisting of a probability value above 0.05. And also, the constant is -15.51. The equation can be stated as:

$$lnGPI_t = -15.51 - 0.26lnEXPO_t - 0.005lnIMP_t - 0.11lnFDI_t + 0.67lnEX_t + 0.0003lnEMP_t - 0.48lnWPUI_t$$

The covid-19 pandemic has also a similar impact as it does on the balance of payment. In this analysis, the WPUI coefficient became 0.48 at a 5% level of significance, which means the % increase in the uncertainty of the stakeholders in the economy due to percentage increase in cases, and deaths by the pandemic raise the general price by 0.48 in the long run. This could be due to the reason that restrictions and lockdowns reduce transportation and movement, which has an implication on decreasing the flow of products from one area to the other.

Contineouingly, the export, and import variables also showed significant coefficients of -0.26, and 0.005.

In the case of export, the existence of a negative coefficient indicates that an increase in the supply of export, in the long run, would result in a decrease in the price of the products. On the contrary, the coefficient of imports indicates that a percentage increase in imports results in an increase in the general price of products. This is due to an increase in purchase indicates an increase in demand leads to the rise of price.

The other economic activity which showed a significant impact on the economy by inflating the general price is the exchange rate. It indicates a 0.67 large coefficient at a significance level of 1%. This implies, ceteris paribus, as the percentage exchange rate of hard currency to Ethiopian birr increases, in the long run, the price of goods and services will inflate by 67%. This is due to the reason that the purchasing power of Ethiopian currency decreases simultaneously as it didn't become competent to the other currency (Table 4.5). Similarly, Geda (2020), Suports the idea of exchange rate by saying, that devaluation affects the import of Ethiopia, which mostly imprts the capital goods and consumer goods at most. In addition, Demiessie (2020), stated that during Covid-19 the food and nonfood price will rise.

Table 4.5: Long Run coefficients estimated using ARDL Approach (2, 4, 0, 4, 2, 0, 4, 3) based on Akaike Information Criterion.

	Dependent Variable lnGPI			
Variables	**Coefficients**	**St. Errors**	**T-statistics**	**P-Value**
lnExpo	-0.263506	0.148768	-1.771249	0.0370
lnImp	0.005167	0.041821	0.123548	0.0025
lnFDI	-0.115300	0.139137	-0.828681	0.4141
lnEX	0.669251**	0.606745	7.695571	0.0000
lnEmp	0.000303	0.003604	0.084132	0.9335
lnGOV	0.000135	0.000146	0.920563	0.3649
lnWPUI	0.476640*	0.274782	5.734613	0.0234
Coneq	-15.509067**	5.137890	-3.018567	0.0052

The (**) indicates that the 1% level of significance and (*) indicates the 5% level of significance

Source: Own competition using Eview's

4.2.4 Short Run Error Correction Model

I. The Balance of Payment as Dependent Variable

Following the attainment of the long-run coefficients of an ARDL model, the rule of thumb is to estimate the short-run error correction model. Accordingly, the error correction model is estimated as indicated in Table 4.6 below.

The speed of adjustment is the other term of calling for a short-run error correction model as it restores the equilibrium in the dynamic model.

The coefficient for the speed of adjustment indicates how quickly the dependent variable converges to equilibrium, and the sign of the coefficient should be negative and statistically significant (statistically significant means that the probability value should be less than 0.05). Accordingly, the study result indicated in Table 4.6 below shows that the speed of adjustment is -0.197, which implies that the previous period deviation from the long run is corrected in the current period at a speed of adjustment of 19.7%.

In the short run, the WPUI showed the same negative impact as it did in the long run. The coefficient of the WPUI indicates -0.04 at a 1% level of significance, which is lower than the negative impact in the long run. This implies, other things remain constant, the balance of payment in the short run has been significantly impacted by 4% due to the percentage increase in the uncertainty of Ethiopia and the world by the increase of the spread of the pandemic COVID-19. Even though the pandemic impacted the balance of payment in the short run with a 4% decrease, it was better than the two lag periods by scoring a significant appreciation at the second lag. The coefficient of the balance of payment in the second lag consists of 0.46 positive growths at a 1% level of significance, which is a high amount from all lags in the short run.

At the same time, both employment and import significantly affected the economy negatively by reducing the balance of payment in their respective lag period. In the case of employment, the analyzed result shows us that employment has a coefficient of -0.02 in the second period of lag at a 5% level of significance. This implies, a percentage decrease in employment in the second lagged period brought a significant decrease in the economy by deteriorating the balance of payment by 2%.

However, later on, as the percentage of employment increased in the zero lagged period, by contributing a positive (8%) increase to the growth rate of the balance of payment. Meanwhile, the percentage increase in imports affected the economy by decreasing the balance of payment by 8%.

On the other hand, foreign direct investment indicated a positive impact on the economy by contributing a significant raise to the quarterly growth of the balance of payment in the short run. Numerically, it consists of a coefficient of 0.016 at a 5% level of significance, which has a meaning of percentage increase in the foreign direct investment lead to a 1.6% increase in the balance of payment growth.

Table 4.6: Short Run Error correction Model at (4, 4, 0, 0, 0, 3, 1, 0) based on AIC

	Short Run Error Correction Model (ECM)_BOP			
Variables	**Coefficients**	**Standard Errors**	**T-statistics**	**P-Value**
D(LNBOP(-1))	0.333040	0.171481	1.942145	0.0600
D(LNBOP(-2))	0.462439**	0.154906	2.985294	0.0051
D(LNBOP(-3))	0.198574	0.113362	1.751682	0.0883
D(LNEMP)	0.081547*	0.422739	2.085323	0.0442
D(LNEMP(-1))	-0.003163	0.658945	-1.507201	0.1405
D(LNEMP(-2))	-0.029960*	0.667059	-2.668370	0.0114
D(LNEMP(-3))	-0.00268178	0.645216	-1.965508	0.0571
D(LNEX)	0.003963	0.053291	0.074369	0.9411
D(LNEXPO)	0.583577	0.365637	1.596057	0.1192
D(LNFDI)	0.015983*	0.488292	2.080685	0.0446
D(LNGOV)	-0.000117	0.000959	-0.121926	0.9036
D(LNGOV(-1))	0.002099	0.001100	1.908740	0.0643
D(LNGOV(-2))	-0.002413	0.001260	-1.915054	0.0635
D(LNIMP)	-0.080244*	0.409948	-0.195743	0.0459
D(LNWPUI)	-0.039551**	0.405497	-3.796707	0.0005
ECM(-1)	-0.196776**	0.204180	-5.812402	0.0000

The (**) indicates that the 1% level of significance and (*) indicates the 5% level of significance

Source: Own competition using Eviews (2021)

II. The General Price Index

As it is visible in Table 4.6 below, COVID-19 didn't show a significant impact in all lags. However, it shows a negative influence. In the short run, the analysis indicated that foreign direct investment, government expenditure, and general price itself showed significant change, the remaining variables were insignificant. The general price raised on its first lagged period by dominating the other lag periods. It consists of a 0.46 coefficient at a 1% level of significance.

This implies that the general price rose by 46% in the first lagged period of the short run. In other words, the economy was impacted due to the rise of the general price, which implies the purchasing power of the Ethiopian birr has decreased by 46% in the first lag period in the short run.

Foreign direct investment has shown a rise in the period of lags zero and three. This implies that the percentage rise in foreign direct investment contributed to the rise of the general price in the short run both by 1% and 1.5% at a 5% and 1% level of significance respectively. Meanwhile, the government spending contributed to the rise of the general price with little percentage as indicated consisting a coefficient of 0.000054 in table 4.6 below.

Table 4.7: Short Run Error correction Model at (4, 4, 0, 0, 0, 3, 1, 0) based on AIC

	Short Run Error Correction Model (ECM)			
Variables	**Coefficients**	**Standard Errors**	**T-statistics**	**P-Value**
D(LNGPI(-1))	0.458991**	0.122372	3.750800	0.0008
D(LNEXPO)	0.000687	0.006572	0.104597	0.9174
D(LNEXPO(-1))	0.005993	0.007821	0.766187	0.4498
D(LNEXPO(-2))	0.008235	0.008865	0.928918	0.3606
D(LNEXPO(-3))	0.013285	0.006640	2.000745	0.0549
D(LNIMP)	0.000701	0.005669	0.123613	0.9025
D(LNFDI)	0.010411*	0.004982	2.089700	0.0455
D(LNFDI(-1))	0.002906	0.005518	0.526712	0.6024
D(LNFDI(-2))	0.009536	0.005453	1.748694	0.0909
D(LNFDI(-3))	0.015288**	0.006044	2.529429	0.0171
D(LNEX)	0.067702	0.247298	0.273769	0.7862
D(LNEX(-1))	-0.496158	0.247754	-2.002623	0.0546
D(LNEMP)	0.000041	0.000490	0.083936	0.9337
D(LNGOV)	0.000054**	0.000021	2.532658	0.0170
D(LNGOV(-1))	0.000030	0.000023	1.308484	0.2010
D(LNGOV(-2))	0.000031	0.000015	2.026158	0.0520
D(LNGOV(-3))	0.000027	0.000025	1.093167	0.2833
D(LNWPUI)	-0.002736	0.004268	-0.641104	0.5265
D(LNWPUI(-1))	0.006920	0.008758	0.790080	0.4359
D(LNWPUI(-2))	-0.062581	0.036368	-1.720766	0.0959
ECM(-1)	-0.135618	0.031622	-4.288703	0.0002

The (**) indicates that the 1% level of significance and (*) indicates the 5% level of significance
Source: Own competition using Eview's (2021)

4.2.5 Granger Causality Test

The rule of thumb in the granger causality test is that if the P-value is less than 0.05, we reject the null hypothesis that there is no granger causality. Accordingly, when we observe the result of the causality test in Table 4.8, the causal relationship among the world pandemic uncertainty index and balance of payment indicates that LNWPUI granger causes LNBOP at a 1% level of significance.

And also, the causal relation of the world pandemic uncertainty index (LNWPUI) and general price index (LNGPI) shows that LNWPUI granger causes LNGPI at a 1% level of significance. On the contrary, both the balance of payment and the general price index failed to reject the null hypothesis that they granger cause the world pandemic uncertainty index.

Generally, we can conclude that the increase in the uncertainty of the society caused by the increase in the pandemic highly/ significantly causes an impact on the economy of Ethiopia by causing an impact on the balance of payment and the general price index. Additionally, we can also say that there is only a one-direction granger causality effect as indicated in Table 4.8 below.

Table 4.8 Granger Causality Test

Null Hypothesis:	F-Statistic	Prob.
LNWPUI does not Granger Cause LNBOP	18.1689**	4.E-09
LNWPUI does not Granger Cause LNGPI	4.87771**	0.0023
LNBOP does not Granger Cause LNWPUI	0.17717	0.9491
LNGPI does not Granger Cause LNWPUI	1.35880	0.2625

The (**) indicates that the 1% level of significance and (*) indicates the 5% level of significance
Source: Own competition using Eviews (2021)

4.2.6 Diagnostic Test and Model Stability

Some diagnostic test has been taken to address the checking for the feasibility of the model. These taken diagnostic tests were the Serial Correlation test (Brush, and Godfrey LM Test), Normality test (Jaque-Bera Test), Hetroskedasticity Test (Breusch-Pagan-Godfrey Test), and Functional Form test (Ramsey's RESET test). Moreover, we conduct parameter stability test as Hansen (1992) as cited in Tade (2019), states that test of parameters stability is crucial as the parameters of estimated time series data may vary through time.

The Breusch-Godfrey Serial Correlation LM Test tests the relationship between a given variable and a lagged version of itself over various time intervals. The null hypothesis is that there is no serial correlation. The result in table 4.9 below shows that the p-value of both (BOP and GPI) dependent variables is greater than the significance value of 0.05. Thus, we failed to reject the null hypothesis by proving that the current value of the variables has differed from their lagged values.

Heteroskedasticity Test: Breusch-Pagan-Godfrey is the test for the standard errors of a variable, monitored over a specific amount of time, are whether or not constant. The null hypothesis is there is no heteroskedasticity. Accordingly, the result of the analysis in table 4.9 below, in both (BOP and GPI) cases, failed to reject the null hypothesis by scoring a p-value greater than 0.05 in both the LM and the F-version of the statistics.

The Jeque-Bera Normality test is a goodness-of-fit test of whether sample data have the skewness and kurtosis matching a normal distribution. The null hypothesis is that there is normality. In our case, in both events, BOP and GPI, the probability a significant value of 0.42 and 0.53 respectively, which is greater than the alpha value 0.05. This implies that we assured that there is a normal distribution in the residuals.

Functionality Form or Ramsey Equation Specification Error Test (Ramsey RESET Test) is a test for a general specification test for the linear regression model. More specifically, it tests whether non-linear combinations of the fitted values help explain the response variable. In other words, we are checking whether the model suffers from omitted variables or not. The null hypothesis is that there is no miss-specification in the model. Having said that, the tested result, in both BOP and GPI indicates that, the P-value is greater than the 0.05 level of significance. This implies that we failed to reject the null hypothesis that there is no miss specification in the model.

Table 4.9 Diagnostic tests for the long run ARDL

Test Statistics	LM-Version	F-Version
Breusch-Godfrey Serial Correlation LM Test (LNBOP)	CHSQ(4)=3.82 [0.43]^2	F(4-30)= 0.55 P. [0.70]
Breusch-Godfrey Serial Correlation LM Test (LNGPI)	CHSQ(4)=7.92 [0.09]^2	F(4,19)= 1.36 P. [0.27]
Heteroskedasticity Test: Breusch-Pagan-Godfrey (LNBOP)	CHSQ(32)=25.79 [0.77]	F(32,23)= 0.61 p. [0.90]
Heteroskedasticity Test: Breusch-Pagan-Godfrey (LNGPI)	CHSQ(21)=18.14 [0.64]	F(21,34)= 0.78 p. [0.73]
Jeque-Bera Normality Test (LNBOP)	J-B 1.71 [0.42]	Not Applicable
Jeque-Bera Normality Test (LNGPI)	J-B 1.26 [0.53]	Not Applicable
Functionality Form (Ramsey RESET Test) LNBOP	T-stat(22)= 1.75 [0.094]	F(1-22)=3.064 [0.094]
Functionality Form (Ramsey RESET Test) LNGPI	T-stat (36)= 1.22 [0.23]	F(1-36)= 1.50 [0.23]
For LNBOP, R^2 =0.978203 R^2 –Adjusted = 0.967141 F-stat. = 720.87875 [0.000000]		
For LNGPI, R^2 =0.999507 R^2 –Adjusted = 0.999065 F-stat. = 2262.429 [0.000000]		

Source: Own competition using Eviews (2021)

According to Pesran (1997), cited in Abebe (2019), mentions that the parameters of time series data may vary over time. To check that, he said, that we should use the cumulative sum of recursive residuals (CUSM) and the cumulative sum of the square of recursive residual (CUSMQ). The null hypothesis is that all the coefficients in the error correction model are stable if the statistic result shows in between the two-dot lines (in between the two 5% level of significance). Accordingly, the result of the analysis in Figures 4.1, 4.2, 4.3, and 4.4 indicate that we failed to reject the null hypothesis.

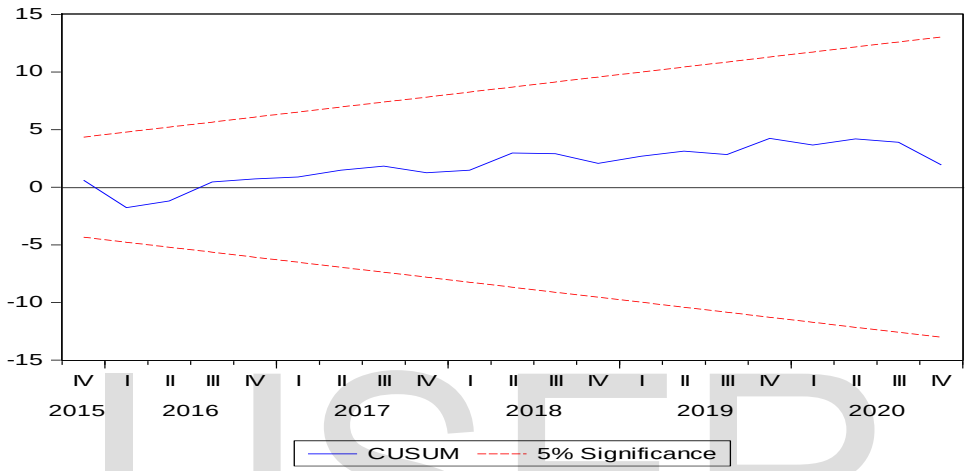


Figure 4.11: Plot of the cumulative sum of recursive residuals for BOP as a dependent variable

Source: own competition using Eviews (2021)

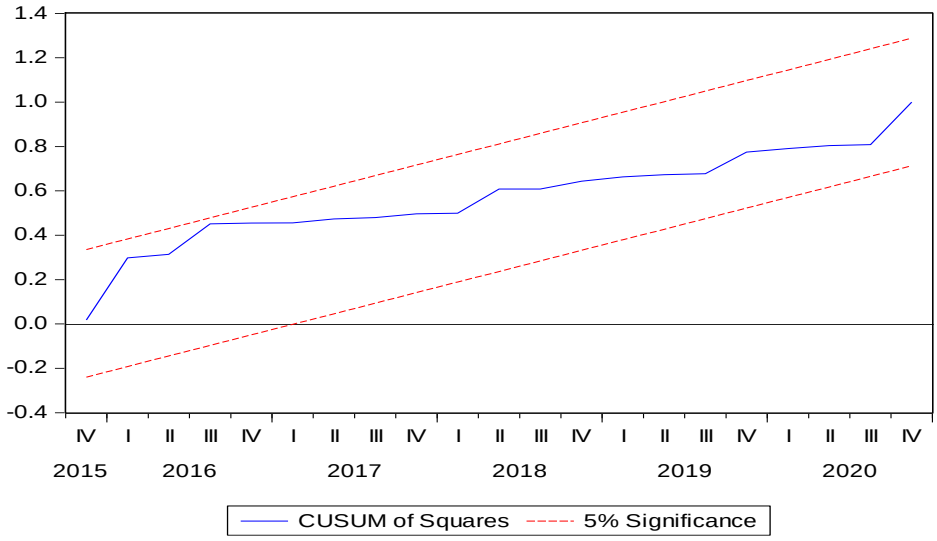


Figure 4.12: Plot of the cumulative sum of squares of recursive residuals for BOP as a dependent variable

Source: own competition using Eviews (2021)

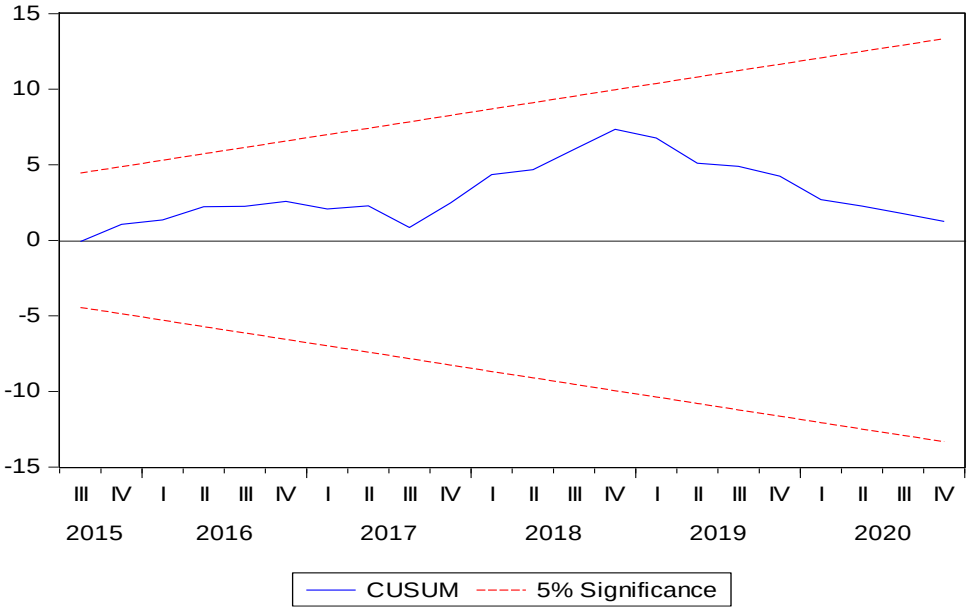


Figure 4.13: Plot of the cumulative sum of recursive residuals for GPI as a dependent variable

Source: own competition using Eviews (2021)

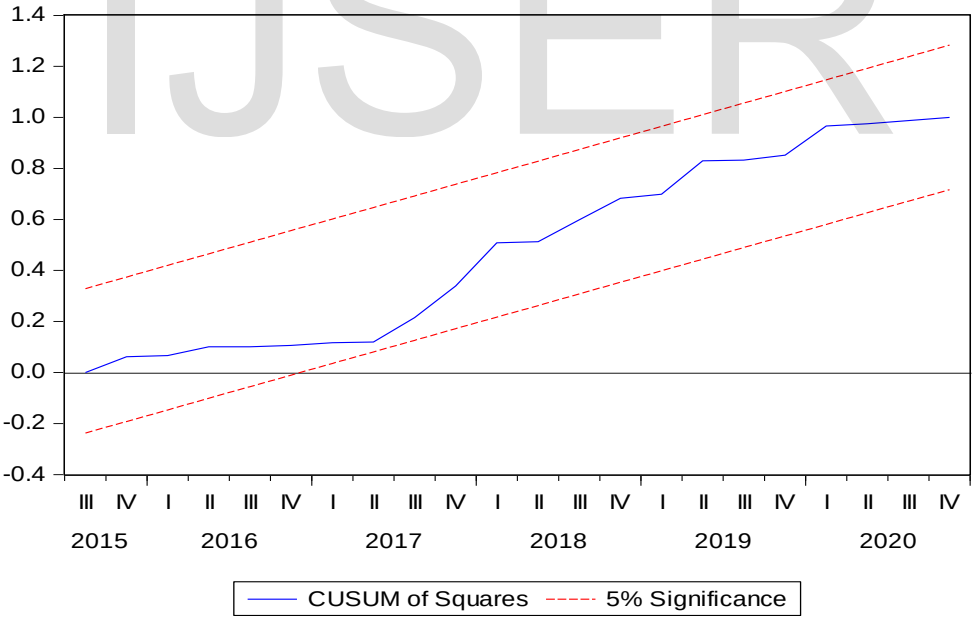


Figure 4.14: Plot of the cumulative sum of squares of recursive residuals for GPI as a dependent variable

Source: own competition using Eview (2021)

4.3. Government Response

To handle the disease and keep the economy on its track the government proposed different plans and distributed a budget among the planned works, took different measures. The prime minister's office announced and ordered the national bank of Ethiopia, which is in charge of regulating the financial sectors of the country to liquidate birr four hundred fifty-nine million (459 million) to the private banks in order to capacitate the banks to give debt relief to customers in need. In addition, as per the information in table 4.1, the government took actions to prevent the disease by budgeting a total amount of 84 million dollars that were distributed $43.57 million for the fulfillment of medical supplies, for preparing the professionals, capacity building training the government took about 22.20 million, to disseminate and outreach information to the society a US $9.30 million, for the establishment of quarantine $ 6.93, and dollar two million (2 million) was budgeted to those who follow and monitor the implementation of the projects.

Table 4.10: Budget Allocated to the Emergence of COVID-19

	Budgets Allocated to Respond to the Emergency of COVID-19				
Actions	Medical Supplies and Equipment	Preparedness, Capacity Building, and Training	Community discussions and information outreach	Quarantine, Isolation, and Treatment Centers establishment	Project Implementation and Monitoring
Budgets Allocated	$43.57 million	$22.20 million	$9.30 million	$ 6.93	$2.00 million
Total	**$84 Million**				

Source: Own competition in Excel Using MOH Data

According to the data of the Ethiopian Investment Commission information, the following directives has been decided by the government after the virtual discussion of the Prime Minister with the Ministerial Committee on March 27/2020:

- ✓ Tax exemptions for the import of materials and equipment to be used for the prevention and containment of COVID-19.
- ✓ Ministry of Revenue to expedite VAT returns to support companies with cash flow.
- ✓ Taxpayers who are required to file a tax return and pay the tax every month shall file tax that shall be due in the month of March, April, May, and June 2020, without interest and penalty.
- ✓ If the taxpayers incur losses in 2020, it shall be carried out to the next fiscal year.
- ✓ Organizations are permitted to pay pensions of the month March, April, May, and June 2020.
- ✓ Donations to the government are deductible from the 2020 fiscal year taxable income
- ✓ Banks to avail foreign currency for importers by prioritizing the importers, who import goods and input materials for the prevention of the disease.
- ✓ National Bank of Ethiopia to release the minimum price set for the export of Horticulture.
- ✓ To raise the minimum cash transfer set by Commercial Bank for mobile banking users so that to decrease in-person cash handling.
- ✓ The Ministry of Trade and Industry, to consolidate its measures on control of price increment and supply shortage of consumer goods.

The information from the Ministry of Transport indicates that the Ministry of Transport, Ethiopian Shipping, and Logistics Services Enterprise, and Ethio-Djibouti Railway declared a transport discount on May 1/2020. The announcement discusses that a free transport to Djibouti for about three to five months, as their need, is allowed for all Industrial Park and export product manufacturing companies; 50% transport cost reduction for inland transports from Industrial Parks to Mojo; 73% reduction on shipping prices of all export products, who use Ethiopian Shipping, and Logistics Services Enterprise (ESLSE) for the duration of the state of emergency; 50% reduction on dry port service for the state emergency period; 50% freight service and transport discount for the exporters to Djibouti, who do not use the railway service due to their distance of their location; and the entrance get payment was waived for exporters passing through mojo to Djibouti.

The government has obtained millions of money from donors and creditors to mitigate the socio-economic impact of the COVID-19. As the information of the European Union indicates that the government was donated €50 million as support for job creation, and food security.

CHAPTER FIVE

CONCLUSIONS AND POLICY RECOMMENDATION

5.1. Conclusion

It is doubtless that COVID-19 is a universal issue that has infected, quarantined, and killed many lives. Beyond these rescues, it constrained the world's individual, social, economical, and political movements. Ceteris paribus, the constraint on economic movements brought huge uncertainty on investment decision of societies over the world, which leads to the disruption of the income flow among stakeholders of the circular flow model. Having said that, the author, tried to contribute to his country by investigating the impact of COVID-19 on the economy of Ethiopia and the government's response using the time series data from 2006-2020.

The paper used both descriptive and econometric tools of analysis.

In the descriptive statistics, the trend of the Ethiopian Economy in 2019/20 has shown a slowdown from the economic status of 2018/19 in most economic variables. The balance of payment has increased its deficit balance; the export has decreased; the import kept on its peak even though it was less than the period of 2018/19. The government expenditure has been increased, the employment rate has extremely decreased from its previous status. Other things remain constant, these things have happened due to the increase in the uncertainty of the society of Ethiopia as well as the world as a result of the pandemic cases, deaths increase.

Epidemic disease and pandemic diseases have been observed in Ethiopia and the neighboring countries, which indicated the existence of uncertainty in the society as the world pandemic uncertainty index study indicated. Accordingly, the descriptive analysis on the trend of the pandemic uncertainty and the COVID-19 has examined the trend of the Pandemic uncertainty from 1996 to 2020, and the COVID-19 trend from the first quarter of 2020 to the first quarter of 2021. The pandemic uncertainty has been observed in different periods such as in 1998, 2014, 2015, 2016, 2017, and the current issue period of 2020. However, the uncertainty during all quarters of 2020 has been the largest of all previous periods. This has been proved by trend analysis made on the cases, deaths, and recovered. In the analysis, it is examined that the diseases spread, infect and kill thousands within a short time. The number of cases per quarter was double the number of recovered.

This indicates that the speed of the spread of the diseases is very high while it takes time to recover. This lead to national emergency restrictions, which brought a huge uncertainty record on the society of Ethiopia, Africa, and the whole world.

In the econometrics part, the Auto Regressive Distributive Lag (ARDL) Bound Testing Model was used to estimate the relationship between COVID-19 and the Economy (BOP, and GPI).

The assumptions of Stationary, Autocorrelation, Heteroskedasticity, Normality, Functionality Form, and Recursive test were checked. The stationarity was checked by Augmented Dickey-Fuller (ADK-Fuller) test was used and found that some variables were stationary at level I(0) and the other variables were stationary at the first difference I (1); the serial correlation was checked by Breusch-Godfrey Serial Correlation LM test, and found that there was no serial correlation; The Hetroskedasticity test was employed by the Breush-Pagan-Godefry test, and found that there was no Heteroskedasticity; the Jaque-Berra test of normality found that the residual data are normally distributed; the Ramsey Equation Specification Error Test (RESET), which checks the functionality form, which means checking for the suffering from the model from omitted variables bias, found that there is no misspecification. Moreover, the check for the variation of the parameters of the time series data over a year (CUSUM & CUCUMQ) found that the long-run estimated parameters are stable.

The bound testing result indicates that there is a long-run co-integration among variables in both cases (BOP and GPI). The short-run error correction model (ECM) found that the disequilibrium variables will return to equilibrium with 19.67% speed of adjustment in the case of BOP, and 13.56 % speed of adjustment in the case of GPI.

The Angel Granger Causality test indicates that there is a one-way causal relation between WPUI, which is a proxy variable of COVID-19, and the Economy (BOP, and GPI). That is the WPUI granger causes the economic impact, by having a causal effect on both proxy variables of the economy.

The findings of the thesis indicate that COVID-19 has a significant negative impact on the balance of payment both in the long run and in the short run. In the case of the general price index, while COVID-19 indicated that it has a significant positive impact in the long run, the short-run relation indicates that COVID-19 didn’t have a significant impact on the general price.

The finding also indicates that the control variables FDI and Government expenditure showed a significant effect on General Price Index in the short-run, whereas the other variables, employment, export, import, exchange rate show an insignificant impact in the short-run. Similarly, in the long run of GPI, while export indicated a negative impact, import and exchange rate indicated that their percentage increase raises the general price.

In the long-run and short-run relation of BOP, the export, foreign direct investment, and employment showed a positive significant impact, and the import, exchange rate showed a negative impact on the BOP. However, the government expenditure indicated that it doesn't impact significantly the balance of payment in the long run. Similarly, the short-run analysis indicated that FDI, employment, and import have a significant impact in the short run, while the remaining variable has no significant impact on the balance of payment in the short run.

5.2. Recommendations

In the conclusion, we have seen that the COVID-19 negatively impacts the balance of payment both in the long run and in the short run. This means that the BOP would show a deficit balance as a result of COVID-19. The main source of the transaction in and outflow of income are human capital. To keep it on track, it is better if the government works hard on the health of human resources. This can be done by working on the health institutions. the government is taking encouragement of the medical drug importers as a response to the impact of COVID-19. This might benefit in the short run. However, to eradicate the long-run impact, the government could be better capacitate the internal chemists and be able to produce drugs within the country. This needs further issues such as working on technology advancement, and practical laboratory increment. It was also concluded that the COVID-19 has a direct impact on the general price of the country in the long run. This means the rise in price causes a rise in the price of products in the long run. The government made a directive to the Ministry of Trade to consolidate its control on the price of consumable goods and services. Even though this is a good step forward to handle the inflation, but this is not enough.

Consequently, the study recommends to the government that the governments are better have a policy of buffer stock, which is the purchase of reserve commodities to be used in such situations; it is advisable to have adequate management of the distribution of compulsory goods supply in accordance with the consumers demand. Keeping the savings and investment balanced.

According to Baldwin & Mauro (2020), during COVID-19, the uncertainty increase results in a decrease in investments, due to the wait and see perception. This results in a decrease in the production of supplies, which causes a price change. Hence, the government is recommended to encourage investment in the production of supplies to balance the investment and saving in balance and stabilize the price.

The other issue concluded was that there is a causal relationship between COVID-19 and the economy (BOP and GPI). The WPUI granger causes the balance of payment and the general price. To resist the causal impact, the researcher recommends to the government develop very strong policies on both the economy and the health of the country. Adequate awareness should be disseminated to all parts of the country. The good habits adopted as a result of the disease are better to be kept to be continued. Moreover, this is not the first and the only pandemic disease that has occurred in Ethiopia. Influenza, HIV AIDS, EBOLA, TB are viral pandemic diseases that have been occurred and killed a lot of people in Ethiopia and the rest of the world. Hence, Investigative health institutions, which can run ahead of the spread of the severity of the diseases, have to be established; hard work is needed on proportionating the number of Doctors, and Hospitals to the number of patients.

In the case of the economy, it is recommended the government to have policies that proportionate the income of the consumer with the supply outputs; hard work is needed on building creative a society of job creation; the high exchange rate is one factor that exaggerates the price of products, which is inflationary for countries whose import is higher than their export. Having an appropriate policy of the exchange rate, which considers the living standard of the society and changing the import into local production is recommended.

Finally, the study examined that the government has shown appreciable movements in facing the disease and its consequences. However, different circumstances might cause uncertainty and crisis in a given country. Consequently, it is recommended to have sustainable and consistent policies that can await ahead of the cause. In other words, the government should have ready-made policies, and works that can resist the potential crisis of the country.

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Appendix
Descriptive Statistics

	LNGPI	LNEXPO	LNIMP	LNFDI	LNEX	LNEMP	LNWPUI	LNBOP	LNGOV
Mean	74.56300	11.21350	34.64700	7.968500	20.42350	86.57950	24.29383	43.83583	51683.00
Median	74.41500	10.64000	3.600000	3.690000	19.18000	0.000000	0.000000	-32.62500	39856.15
Maximum	171.2000	152.9300	1472.850	190.8100	38.70000	2644.140	604.8600	4003.850	178762.9
Minimum	20.00000	-86.69000	-78.20000	-85.80000	8.690000	-100.0000	0.000000	-805.9200	5983.000
Std. Dev.	40.56551	37.18870	194.0294	41.26738	8.499570	408.9456	101.9231	566.0100	37480.61
Skewness	0.446377	0.925469	7.006632	1.486619	0.558210	5.069627	4.533785	5.823900	1.196144
Kurtosis	2.313155	5.899454	52.11484	8.289742	2.525969	29.63648	22.96255	41.48131	4.277362
Jarque-Bera	3.171917	29.58200	6521.598	92.05377	3.677745	2030.766	1201.811	4041.207	18.38675
Probability	0.204751	0.000000	0.000000	0.000000	0.158997	0.000000	0.000000	0.000000	0.000102
Sum	4473.780	672.8100	2078.820	478.1100	1225.410	5194.770	1457.630	2630.150	3100980.
Sum Sq. Dev.	97088.08	81596.98	2221196.	100476.8	4262.318	9866955.	612911.1	18901672	8.29E+10
Observations	60	60	60	60	60	60	60	60	60

APPENDIX I
LAG LENGTH CRITERIA AND UNIT ROOT TEST

Lag Length Criteria

VAR Lag Order Selection Criteria
Endogenous variables: LNBOP LNEXPO LNIMP LNFDI LNEX LNEMP LNGOV LNWPUI
Exogenous variables: C
Date: 05/15/21 Time: 21:56
Sample: 2006Q1 2020Q4
Included observations: 55

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2495.011	NA	4.67e+29	91.01859	91.31057	91.13150
1	-2370.971	207.4847	5.39e+28	88.83533	91.46311	89.85151
2	-2242.299	177.8025	5.92e+27	86.48359	91.44717	88.40305
3	-2119.551	133.9064	1.05e+27	84.34731	91.64670	87.17005
4	-1964.803	123.7986	9.68e+25	81.04737	90.68257	84.77338
5	-1771.880	98.21522*	6.48e+24*	76.35927*	88.33028*	80.98856*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Lag Order Selection Criteria
Endogenous variables: LNGPI LNEXPO LNIMP LNFDI LNGEX LNEMP LNGOV LNWPUI
Exogenous variables: C
Date: 05/20/21 Time: 13:39
Sample: 2006Q1 2020Q4
Included observations: 56

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1903.601	NA	6.17e+19	68.27145	68.56078	68.38362
1	-1686.413	364.5640	2.65e+17	62.80048	65.40450*	63.81006
2	-1602.386	117.0383	1.49e+17	62.08521	67.00392	63.99219
3	-1533.795	75.93997	1.85e+17	61.92125	69.15465	64.72562
4	-1392.084	116.4053*	2.71e+16*	59.14587*	68.69395	62.84764*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Unit Root Test

Augmented Dickey-Fuller (ADK) test, at Level with Intercept

Null Hypothesis: LNBOP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.973791	0.0000
Test critical values:	1% level	-3.546099	
	5% level	-2.911730	
	10% level	-2.593551	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNBOP)
Method: Least Squares
Date: 05/17/21 Time: 13:05
Sample (adjusted): 2006Q2 2020Q4
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNBOP(-1)	-1.054570	0.132255	-7.973791	0.0000
C	46.64115	75.08348	0.621191	0.5370

R-squared	0.527290	Mean dependent var	0.176271
Adjusted R-squared	0.518997	S.D. dependent var	829.0574
S.E. of regression	574.9877	Akaike info criterion	15.57988
Sum squared resid	18844816	Schwarz criterion	15.65031
Log likelihood	-457.6066	Hannan-Quinn criter.	15.60738
F-statistic	63.58135	Durbin-Watson stat	2.005369
Prob(F-statistic)	0.000000		

Null Hypothesis: LNGPI has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.941368	0.9998
Test critical values:	1% level	-3.552666	
	5% level	-2.914517	
	10% level	-2.595033	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNGPI)
Method: Least Squares
Date: 05/17/21 Time: 22:38
Sample (adjusted): 2007Q1 2020Q4
Included observations: 56 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGPI(-1)	0.016686	0.008595	1.941368	0.0577
D(LNGPI(-1))	0.737688	0.139205	5.299277	0.0000
D(LNGPI(-2))	-0.621123	0.150053	-4.139360	0.0001
D(LNGPI(-3))	0.462016	0.141592	3.263021	0.0020
C	-0.013455	0.558378	-0.024097	0.9809

R-squared	0.536987	Mean dependent var	2.677857
Adjusted R-squared	0.500672	S.D. dependent var	2.616484
S.E. of regression	1.848889	Akaike info criterion	4.152092
Sum squared resid	174.3380	Schwarz criterion	4.332927
Log likelihood	-111.2586	Hannan-Quinn criter.	4.222202
F-statistic	14.78703	Durbin-Watson stat	2.000709
Prob(F-statistic)	0.000000		

Null Hypothesis: LNEXPO has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.466511	0.1291
Test critical values:	1% level	-3.555023	
	5% level	-2.915522	
	10% level	-2.595565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEXPO)
Method: Least Squares
Date: 05/17/21 Time: 18:45
Sample (adjusted): 2007Q2 2020Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXPO(-1)	-1.108523	0.449430	-2.466511	0.0172
D(LNEXPO(-1))	-0.232046	0.405054	-0.572878	0.5693
D(LNEXPO(-2))	-0.587797	0.325194	-1.807524	0.0768
D(LNEXPO(-3))	-0.544860	0.225819	-2.412817	0.0196
D(LNEXPO(-4))	-0.194104	0.140448	-1.382038	0.1732
C	12.22736	6.786881	1.801617	0.0778

R-squared	0.734143	Mean dependent var	0.274909
Adjusted R-squared	0.707015	S.D. dependent var	58.87581
S.E. of regression	31.86836	Akaike info criterion	9.863773
Sum squared resid	49764.02	Schwarz criterion	10.08275
Log likelihood	-265.2538	Hannan-Quinn criter.	9.948455
F-statistic	27.06193	Durbin-Watson stat	1.988264
Prob(F-statistic)	0.000000		

Null Hypothesis: LNIMP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

	t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-7.748041	0.0000
Test critical values:	1% level	-3.546099	
	5% level	-2.911730	
	10% level	-2.593551	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNIMP)
Method: Least Squares
Date: 05/17/21 Time: 22:18
Sample (adjusted): 2006Q2 2020Q4
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNIMP(-1)	-1.025807	0.132396	-7.748041	0.0000
C	35.92218	26.09752	1.376460	0.1741

R-squared	0.512954	Mean dependent var	0.255932
Adjusted R-squared	0.504410	S.D. dependent var	280.2854
S.E. of regression	197.3158	Akaike info criterion	13.44080
Sum squared resid	2219211.	Schwarz criterion	13.51122
Log likelihood	-394.5036	Hannan-Quinn criter.	13.46829
F-statistic	60.03213	Durbin-Watson stat	1.039485
Prob(F-statistic)	0.000000		

Null Hypothesis: LNFDI has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.757106	0.0000
Test critical values:	1% level	-3.548208	
	5% level	-2.912631	
	10% level	-2.594027	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNFDI)
Method: Least Squares
Date: 05/17/21 Time: 22:48
Sample (adjusted): 2006Q3 2020Q4
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFDI(-1)	-1.647448	0.212379	-7.757106	0.0000
D(LNFDI(-1))	0.247002	0.130842	1.887790	0.0643
C	12.83695	5.415517	2.370401	0.0213

R-squared	0.681386	Mean dependent var	0.022759
Adjusted R-squared	0.669801	S.D. dependent var	68.21931
S.E. of regression	39.20085	Akaike info criterion	10.22561
Sum squared resid	84518.87	Schwarz criterion	10.33219
Log likelihood	-293.5428	Hannan-Quinn criter.	10.26713
F-statistic	58.81147	Durbin-Watson stat	2.079524

Prob(F-statistic)	0.000000

Null Hypothesis: LNEX has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.208466	0.9979
Test critical values:	1% level	-3.555023	
	5% level	-2.915522	
	10% level	-2.595565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEX)
Method: Least Squares
Date: 05/17/21 Time: 22:49
Sample (adjusted): 2007Q2 2020Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEX(-1)	0.028674	0.023728	1.208466	0.2327
D(LNEX(-1))	-0.202373	0.145892	-1.387149	0.1717
D(LNEX(-2))	-0.254071	0.145091	-1.751115	0.0862
D(LNEX(-3))	-0.223110	0.144157	-1.547688	0.1281
D(LNEX(-4))	0.364130	0.144395	2.521765	0.0150
C	0.112570	0.426575	0.263892	0.7930

R-squared	0.294416	Mean dependent var	0.522000
Adjusted R-squared	0.222418	S.D. dependent var	1.231699
S.E. of regression	1.086120	Akaike info criterion	3.105769
Sum squared resid	57.80318	Schwarz criterion	3.324751
Log likelihood	-79.40866	Hannan-Quinn criter.	3.190452
F-statistic	4.089207	Durbin-Watson stat	1.875843
Prob(F-statistic)	0.003507		

Null Hypothesis: LNEMP has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.306544	0.1736
Test critical values:	1% level	-3.555023	
	5% level	-2.915522	
	10% level	-2.595565	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEMP)
Method: Least Squares
Date: 05/17/21 Time: 22:50
Sample (adjusted): 2007Q2 2020Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEMP(-1)	-0.792254	0.343481	-2.306544	0.0253
D(LNEMP(-1))	-0.289857	0.298738	-0.970270	0.3367
D(LNEMP(-2))	-0.299065	0.250756	-1.192654	0.2387
D(LNEMP(-3))	-0.366464	0.198169	-1.849243	0.0705
D(LNEMP(-4))	-0.399922	0.134418	-2.975219	0.0045
C	79.06060	61.62292	1.282974	0.2055

R-squared	0.621258	Mean dependent var	7.015818
Adjusted R-squared	0.582611	S.D. dependent var	630.9733
S.E. of regression	407.6445	Akaike info criterion	14.96134
Sum squared resid	8142527.	Schwarz criterion	15.18032
Log likelihood	-405.4368	Hannan-Quinn criter.	15.04602
F-statistic	16.07514	Durbin-Watson stat	2.024280
Prob(F-statistic)	0.000000		

Null Hypothesis: LNGOV has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.532404	0.9992
Test critical values:	1% level	-3.555023	
	5% level	-2.915522	
	10% level	-2.595565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNGOV)
Method: Least Squares
Date: 05/17/21 Time: 22:51
Sample (adjusted): 2007Q2 2020Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGOV(-1)	0.073196	0.047765	1.532404	0.1319
D(LNGOV(-1))	-0.590839	0.156000	-3.787438	0.0004
D(LNGOV(-2))	-0.563120	0.149463	-3.767620	0.0004
D(LNGOV(-3))	-0.638569	0.147160	-4.339269	0.0001
D(LNGOV(-4))	0.445842	0.151691	2.939142	0.0050
C	679.1871	2424.333	0.280154	0.7805

R-squared	0.901000	Mean dependent var	3099.595
Adjusted R-squared	0.890898	S.D. dependent var	27247.70
S.E. of regression	9000.090	Akaike info criterion	21.15053
Sum squared resid	3.97E+09	Schwarz criterion	21.36951
Log likelihood	-575.6395	Hannan-Quinn criter.	21.23521
F-statistic	89.18961	Durbin-Watson stat	1.942920
Prob(F-statistic)	0.000000		

Null Hypothesis: LNWPUI has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.864338	0.0000
Test critical values:	1% level	-3.548208	
	5% level	-2.912631	
	10% level	-2.594027	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNWPUI)
Method: Least Squares
Date: 05/17/21 Time: 22:51
Sample (adjusted): 2006Q3 2020Q4
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNWPUI(-1)	-0.919072	0.156722	-5.864338	0.0000
D(LNWPUI(-1))	1.420027	0.250734	5.663488	0.0000
C	8.795625	7.125775	1.234339	0.2223

R-squared	0.392782	Mean dependent var	6.262931
Adjusted R-squared	0.370702	S.D. dependent var	67.02756
S.E. of regression	53.17184	Akaike info criterion	10.83527
Sum squared resid	155498.5	Schwarz criterion	10.94185
Log likelihood	-311.2229	Hannan-Quinn criter.	10.87679
F-statistic	17.78854	Durbin-Watson stat	2.020927
Prob(F-statistic)	0.000001		

Augmented Dickey-Fuller (ADF) Unit Root Test at First Difference with Intercept

Null Hypothesis: D(LNBOP) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.573393	0.0000
Test critical values:	1% level	-3.550396	
	5% level	-2.913549	
	10% level	-2.594521	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNBOP,2)
Method: Least Squares
Date: 05/06/21 Time: 14:02
Sample (adjusted): 2006Q4 2020Q4
Included observations: 57 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNBOP(-1))	-1.828144	0.241390	-7.573393	0.0000
D(LNBOP(-1),2)	0.243153	0.143054	1.699721	0.0949
C	8372838.	45224586	0.185139	0.8538

R-squared	0.717048	Mean dependent var	18840351
Adjusted R-squared	0.706569	S.D. dependent var	6.30E+08
S.E. of regression	3.41E+08	Akaike info criterion	42.18597
Sum squared resid	6.29E+18	Schwarz criterion	42.29350
Log likelihood	-1199.300	Hannan-Quinn criter.	42.22776
F-statistic	68.42263	Durbin-Watson stat	1.880178
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LNGPI) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.142050	0.6928
Test critical values:	1% level	-3.555023	
	5% level	-2.915522	
	10% level	-2.595565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNGPI,2)
Method: Least Squares
Date: 05/06/21 Time: 14:19

Sample (adjusted): 2007Q2 2020Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGPI(-1))	-0.286353	0.250736	-1.142050	0.2589
D(LNGPI(-1),2)	-0.540673	0.231050	-2.340075	0.0233
D(LNGPI(-2),2)	-0.549987	0.190133	-2.892644	0.0056
D(LNGPI(-3),2)	-0.346545	0.147678	-2.346624	0.0229
C	1.043487	0.715922	1.457542	0.1512

R-squared	0.447637	Mean dependent var	0.167091
Adjusted R-squared	0.403448	S.D. dependent var	3.839103
S.E. of regression	2.965201	Akaike info criterion	5.098274
Sum squared resid	439.6207	Schwarz criterion	5.280759
Log likelihood	-135.2025	Hannan-Quinn criter.	5.168843
F-statistic	10.13003	Durbin-Watson stat	1.935439
Prob(F-statistic)	0.000004		

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.077426	0.0000
Test critical values:	1% level	-3.552666	
	5% level	-2.914517	
	10% level	-2.595033	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEXPO,2)
Method: Least Squares
Date: 05/06/21 Time: 14:25
Sample (adjusted): 2007Q1 2020Q4
Included observations: 56 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNEXPO(-1))	-2.944145	0.324337	-9.077426	0.0000
D(LNEXPO(-1),2)	1.187592	0.233559	5.084756	0.0000
D(LNEXPO(-2),2)	0.461692	0.129626	3.561717	0.0008
C	1192192.	595524.0	2.001921	0.0505

R-squared	0.792050	Mean dependent var	125917.2
Adjusted R-squared	0.780053	S.D. dependent var	9333841.
S.E. of regression	4377429.	Akaike info criterion	33.49057
Sum squared resid	9.96E+14	Schwarz criterion	33.63524
Log likelihood	-933.7360	Hannan-Quinn criter.	33.54666
F-statistic	66.02021	Durbin-Watson stat	2.053751
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LNIMP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.542587	0.0000
Test critical values:	1% level	-3.548208	
	5% level	-2.912631	
	10% level	-2.594027	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNIMP,2)
Method: Least Squares
Date: 05/06/21 Time: 14:27
Sample (adjusted): 2006Q3 2020Q4
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNIMP(-1))	-1.162876	0.136127	-8.542587	0.0000
C	1734752.	1879455.	0.923008	0.3600

R-squared	0.565810	Mean dependent var	-606199.8
Adjusted R-squared	0.558057	S.D. dependent var	21300834
S.E. of regression	14160544	Akaike info criterion	35.80369
Sum squared resid	1.12E+16	Schwarz criterion	35.87474
Log likelihood	-1036.307	Hannan-Quinn criter.	35.83137
F-statistic	72.97580	Durbin-Watson stat	1.972863
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LNEMP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.84638	0.0000
Test critical values:	1% level	-3.548208	
	5% level	-2.912631	
	10% level	-2.594027	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEMP,2)
Method: Least Squares
Date: 05/06/21 Time: 14:33
Sample (adjusted): 2006Q3 2020Q4
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNEMP(-1))	-1.354563	0.124886	-10.84638	0.0000
C	-1076.930	3661.919	-0.294089	0.7698

R-squared	0.677501	Mean dependent var	-103.0690
Adjusted R-squared	0.671742	S.D. dependent var	48661.40

S.E. of regression	27879.96	Akaike info criterion	23.34308
Sum squared resid	4.35E+10	Schwarz criterion	23.41413
Log-likelihood	-674.9493	Hannan-Quinn criter.	23.37075
F-statistic	117.6440	Durbin-Watson stat	2.049075
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LNGOV) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.816508	0.0048
Test critical values:	1% level	-3.555023	
	5% level	-2.915522	
	10% level	-2.595565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNGOV,2)
Method: Least Squares
Date: 05/30/21 Time: 23:39
Sample (adjusted): 2007Q2 2020Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGOV(-1))	-1.848496	0.484342	-3.816508	0.0004
D(LNGOV(-1),2)	0.405718	0.370223	1.095876	0.2784
D(LNGOV(-2),2)	-0.030352	0.256042	-0.118544	0.9061
D(LNGOV(-3),2)	-0.555081	0.135690	-4.090793	0.0002
C	3612.297	1507.802	2.395737	0.0204

R-squared	0.965173	Mean dependent var	1700.398
Adjusted R-squared	0.962387	S.D. dependent var	47028.03
S.E. of regression	9120.628	Akaike info criterion	21.16097
Sum squared resid	4.16E+09	Schwarz criterion	21.34346
Log likelihood	-576.9268	Hannan-Quinn criter.	21.23154
F-statistic	346.4203	Durbin-Watson stat	1.998424
Prob(F-statistic)	0.000000		

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.153390	0.0000
Test critical values:	1% level	-3.552666	
	5% level	-2.914517	
	10% level	-2.595033	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNFDI,2)
Method: Least Squares
Date: 05/06/21 Time: 14:40

Sample (adjusted): 2007Q1 2020Q4
Included observations: 56 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNFDI(-1))	-1.874100	0.304564	-6.153390	0.0000
D(LNFDI(-1),2)	0.444671	0.232947	1.908891	0.0618
D(LNFDI(-2),2)	0.209969	0.136213	1.541475	0.1293
C	-6595135.	31754305	-0.207693	0.8363

R-squared	0.693367	Mean dependent var	2430357.
Adjusted R-squared	0.675677	S.D. dependent var	4.17E+08
S.E. of regression	2.37E+08	Akaike info criterion	41.47756
Sum squared resid	2.93E+18	Schwarz criterion	41.62223
Log likelihood	-1157.372	Hannan-Quinn criter.	41.53365
F-statistic	39.19465	Durbin-Watson stat	1.921215
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LNEX) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.806143	0.0000
Test critical values:	1% level	-3.548208	
	5% level	-2.912631	
	10% level	-2.594027	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEX,2)
Method: Least Squares
Date: 05/06/21 Time: 14:45
Sample (adjusted): 2006Q3 2020Q4
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNEX(-1))	-1.162137	0.131969	-8.806143	0.0000
C	0.191850	0.283520	0.676671	0.5014

R-squared	0.580676	Mean dependent var	-0.008621
Adjusted R-squared	0.573188	S.D. dependent var	3.294391
S.E. of regression	2.152254	Akaike info criterion	4.404783
Sum squared resid	259.4032	Schwarz criterion	4.475833
Log likelihood	-125.7387	Hannan-Quinn criter.	4.432458
F-statistic	77.54816	Durbin-Watson stat	1.981200
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LNWPUI) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.013455	0.0000
Test critical values:	1% level	-3.550396	
	5% level	-2.913549	

	10% level	-2.594521

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNWPUI,2)
Method: Least Squares
Date: 05/06/21 Time: 14:49
Sample (adjusted): 2006Q4 2020Q4
Included observations: 57 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNWPUI(-1))	-1.400181	0.155343	-9.013455	0.0000
D(LNWPUI(-1),2)	0.892541	0.158447	5.633069	0.0000
C	7.177906	7.319829	0.980611	0.3312

R-squared	0.600834	Mean dependent var	-4.238772
Adjusted R-squared	0.586050	S.D. dependent var	84.38441
S.E. of regression	54.29205	Akaike info criterion	10.87783
Sum squared resid	159171.8	Schwarz criterion	10.98536
Log likelihood	-307.0181	Hannan-Quinn criter.	10.91962
F-statistic	40.64100	Durbin-Watson stat	2.030296
Prob(F-statistic)	0.000000		

Augmented Dickey-Fuller (ADK) test, at Level with Intercept and Trend

Null Hypothesis: LNBOP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.204286	0.0000
Test critical values:	1% level	-4.121303	
	5% level	-3.487845	
	10% level	-3.172314	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNBOP)
Method: Least Squares
Date: 05/06/21 Time: 14:53
Sample (adjusted): 2006Q2 2020Q4
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNBOP(-1)	-0.890063	0.143459	-6.204286	0.0000
C	-54260802	77955534	-0.696048	0.4893
@TREND("2006Q1")	-1307089.	2299765.	-0.568357	0.5721

R-squared	0.409858	Mean dependent var	11926554
Adjusted R-squared	0.388782	S.D. dependent var	3.78E+08
S.E. of regression	2.95E+08	Akaike info criterion	41.89405
Sum squared resid	4.88E+18	Schwarz criterion	41.99969
Log likelihood	-1232.875	Hannan-Quinn criter.	41.93529
F-statistic	19.44623	Durbin-Watson stat	1.868584
Prob(F-statistic)	0.000000		

Null Hypothesis: LNGPI has a unit root
Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.896674	0.9998
Test critical values:	1% level	-4.121303	
	5% level	-3.487845	
	10% level	-3.172314	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNGPI)
Method: Least Squares
Date: 05/06/21 Time: 14:56
Sample (adjusted): 2006Q2 2020Q4
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGPI(-1)	0.048925	0.054562	0.896674	0.3737
C	0.048867	0.806201	0.060613	0.9519
@TREND("2006Q1")	-0.034470	0.124210	-0.277511	0.7824

R-squared	0.184497	Mean dependent var	2.562712
Adjusted R-squared	0.155372	S.D. dependent var	3.106126
S.E. of regression	2.854643	Akaike info criterion	4.985280
Sum squared resid	456.3434	Schwarz criterion	5.090918
Log likelihood	-144.0658	Hannan-Quinn criter.	5.026517
F-statistic	6.334636	Durbin-Watson stat	1.867952
Prob(F-statistic)	0.003311		

Null Hypothesis: LNEXPO has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.325652	0.4135
Test critical values:	1% level	-4.130526	
	5% level	-3.492149	
	10% level	-3.174802	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEXPO)
Method: Least Squares
Date: 05/06/21 Time: 15:12
Sample (adjusted): 2007Q1 2020Q4
Included observations: 56 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXPO(-1)	-0.633993	0.272609	-2.325652	0.0241
D(LNEXPO(-1))	-0.278790	0.240237	-1.160476	0.2514
D(LNEXPO(-2))	-0.407643	0.190008	-2.145403	0.0368
D(LNEXPO(-3))	-0.304552	0.142277	-2.140561	0.0372
C	1006500.	1256252.	0.801192	0.4268

@TREND("2006Q1")	239214.7	100734.1	2.374713	0.0214

R-squared	0.498704	Mean dependent var	518854.0
Adjusted R-squared	0.448575	S.D. dependent var	5694715.
S.E. of regression	4228782.	Akaike info criterion	33.45368
Sum squared resid	8.94E+14	Schwarz criterion	33.67069
Log likelihood	-930.7031	Hannan-Quinn criter.	33.53781
F-statistic	9.948308	Durbin-Watson stat	1.951492
Prob(F-statistic)	0.000001		

Null Hypothesis: LNIMP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.443662	0.3542
Test critical values:	1% level	-4.121303	
	5% level	-3.487845	
	10% level	-3.172314	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNIMP)
Method: Least Squares
Date: 05/06/21 Time: 15:16
Sample (adjusted): 2006Q2 2020Q4
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNIMP(-1)	-0.192603	0.078817	-2.443662	0.0177
C	584049.5	3619498.	0.161362	0.8724
@TREND("2006Q1")	309100.0	162374.1	1.903629	0.0621

R-squared	0.096398	Mean dependent var	1542421.
Adjusted R-squared	0.064126	S.D. dependent var	14129402
S.E. of regression	13668866	Akaike info criterion	35.74865
Sum squared resid	1.05E+16	Schwarz criterion	35.85429
Log likelihood	-1051.585	Hannan-Quinn criter.	35.78989
F-statistic	2.987078	Durbin-Watson stat	2.048437
Prob(F-statistic)	0.058529		

Null Hypothesis: LNEMP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.050292	0.0121
Test critical values:	1% level	-4.121303	
	5% level	-3.487845	
	10% level	-3.172314	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEMP)
Method: Least Squares
Date: 05/06/21 Time: 15:20
Sample (adjusted): 2006Q2 2020Q4
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEMP(-1)	-0.427040	0.105434	-4.050292	0.0002
C	43867.90	12546.31	3.496478	0.0009
@TREND("2006Q1")	-884.1871	283.4368	-3.119521	0.0029

R-squared	0.227960	Mean dependent var	-708.4915
Adjusted R-squared	0.200387	S.D. dependent var	29313.34
S.E. of regression	26212.31	Akaike info criterion	23.23535
Sum squared resid	3.85E+10	Schwarz criterion	23.34099
Log likelihood	-682.4430	Hannan-Quinn criter.	23.27659
F-statistic	8.267544	Durbin-Watson stat	2.245939
Prob(F-statistic)	0.000714		

Null Hypothesis: D(LNGOV) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.420367	0.0045
Test critical values:	1% level	-4.133838	
	5% level	-3.493692	
	10% level	-3.175693	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNGOV,2)
Method: Least Squares
Date: 05/31/21 Time: 00:24
Sample (adjusted): 2007Q2 2020Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGOV(-1))	-2.295281	0.519251	-4.420367	0.0001
D(LNGOV(-1),2)	0.743405	0.396106	1.876782	0.0665
D(LNGOV(-2),2)	0.201486	0.273589	0.736453	0.4650
D(LNGOV(-3),2)	-0.431910	0.145053	-2.977592	0.0045
C	-968.0997	2694.671	-0.359265	0.7209
@TREND("2006Q1")	168.4357	83.21148	2.024189	0.0484

R-squared	0.967861	Mean dependent var	1700.398
Adjusted R-squared	0.964581	S.D. dependent var	47028.03
S.E. of regression	8850.613	Akaike info criterion	21.11703
Sum squared resid	3.84E+09	Schwarz criterion	21.33601
Log likelihood	-574.7183	Hannan-Quinn criter.	21.20171
F-statistic	295.1234	Durbin-Watson stat	1.942472
Prob(F-statistic)	0.000000		

Null Hypothesis: LNFDI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.534773	0.0448
Test critical values:	1% level	-4.121303	
	5% level	-3.487845	
	10% level	-3.172314	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNFDI)
Method: Least Squares
Date: 05/06/21 Time: 15:23
Sample (adjusted): 2006Q2 2020Q4
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFDI(-1)	-0.353807	0.100093	-3.534773	0.0008
C	1.46E+08	76055083	1.922631	0.0596
@TREND("2006Q1")	1652373.	1771354.	0.932831	0.3549

R-squared	0.183503	Mean dependent var	-2717937.
Adjusted R-squared	0.154342	S.D. dependent var	2.48E+08
S.E. of regression	2.28E+08	Akaike info criterion	41.37640
Sum squared resid	2.91E+18	Schwarz criterion	41.48204
Log likelihood	-1217.604	Hannan-Quinn criter.	41.41764
F-statistic	6.292822	Durbin-Watson stat	2.278802
Prob(F-statistic)	0.003426		

Null Hypothesis: LNEX has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.556181	0.7982
Test critical values:	1% level	-4.121303	
	5% level	-3.487845	
	10% level	-3.172314	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEX)
Method: Least Squares
Date: 05/06/21 Time: 15:25
Sample (adjusted): 2006Q2 2020Q4
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEX(-1)	-0.162656	0.104523	-1.556181	0.1253
C	2.013907	0.994330	2.025391	0.0476

@TREND("2006Q1")	0.040619	0.041582	0.976844	0.3328

R-squared	0.063721	Mean dependent var	0.161103
Adjusted R-squared	0.030283	S.D. dependent var	2.143240
S.E. of regression	2.110539	Akaike info criterion	4.381273
Sum squared resid	249.4450	Schwarz criterion	4.486910
Log likelihood	-126.2476	Hannan-Quinn criter.	4.422510
F-statistic	1.905619	Durbin-Watson stat	2.105194
Prob(F-statistic)	0.158251		

Null Hypothesis: LNWPUI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.183901	0.0000
Test critical values:	1% level	-4.124265	
	5% level	-3.489228	
	10% level	-3.173114	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNWPUI)
Method: Least Squares
Date: 05/06/21 Time: 15:28
Sample (adjusted): 2006Q3 2020Q4
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNWPUI(-1)	-0.955123	0.154453	-6.183901	0.0000
D(LNWPUI(-1))	1.400707	0.245399	5.707871	0.0000
C	-14.96069	14.45520	-1.034970	0.3053
@TREND("2006Q1")	0.807804	0.430654	1.875762	0.0661

R-squared	0.429927	Mean dependent var	6.262931
Adjusted R-squared	0.398256	S.D. dependent var	67.02756
S.E. of regression	51.99473	Akaike info criterion	10.80663
Sum squared resid	145986.4	Schwarz criterion	10.94873
Log likelihood	-309.3924	Hannan-Quinn criter.	10.86198
F-statistic	13.57488	Durbin-Watson stat	2.039261
Prob(F-statistic)	0.000001		

Augmented Dickey-Fuller (ADK) test, at First Difference with Intercept and Trend

Null Hypothesis: D(LNBOP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.512712	0.0000
Test critical values:	1% level	-4.127338	
	5% level	-3.490662	
	10% level	-3.173943	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNBOP,2)
Method: Least Squares
Date: 05/06/21 Time: 15:57
Sample (adjusted): 2006Q4 2020Q4
Included observations: 57 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNBOP(-1))	-1.826746	0.243154	-7.512712	0.0000
D(LNBOP(-1),2)	0.243048	0.144089	1.686788	0.0975
C	-32534418	97152913	-0.334878	0.7390
@TREND("2006Q1")	1319862.	2768709.	0.476707	0.6355

R-squared	0.718256	Mean dependent var	18840351
Adjusted R-squared	0.702309	S.D. dependent var	6.30E+08
S.E. of regression	3.44E+08	Akaike info criterion	42.21678
Sum squared resid	6.27E+18	Schwarz criterion	42.36015
Log likelihood	-1199.178	Hannan-Quinn criter.	42.27249
F-statistic	45.03808	Durbin-Watson stat	1.889803
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LNGPI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.483004	0.0000
Test critical values:	1% level	-4.124265	
	5% level	-3.489228	
	10% level	-3.173114	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNGPI,2)
Method: Least Squares
Date: 05/06/21 Time: 16:01
Sample (adjusted): 2006Q3 2020Q4
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

D(LNGPI(-1))	-0.923429	0.142438	-6.483004	0.0000
C	0.294580	0.792637	0.371645	0.7116
@TREND("2006Q1")	0.069749	0.024388	2.859966	0.0060

R-squared	0.434743	Mean dependent var	0.199310
Adjusted R-squared	0.414188	S.D. dependent var	3.779932
S.E. of regression	2.893098	Akaike info criterion	5.012871
Sum squared resid	460.3509	Schwarz criterion	5.119446
Log likelihood	-142.3733	Hannan-Quinn criter.	5.054384
F-statistic	21.15041	Durbin-Watson stat	1.884608
Prob(F-statistic)	0.000000		

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.014643	0.0000
Test critical values:	1% level	-4.130526	
	5% level	-3.492149	
	10% level	-3.174802	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEXPO,2)
Method: Least Squares
Date: 05/06/21 Time: 16:03
Sample (adjusted): 2007Q1 2020Q4
Included observations: 56 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNEXPO(-1))	-2.944050	0.326585	-9.014643	0.0000
D(LNEXPO(-1),2)	1.186840	0.235183	5.046466	0.0000
D(LNEXPO(-2),2)	0.461623	0.130525	3.536666	0.0009
C	577646.7	1295241.	0.445976	0.6575
@TREND("2006Q1")	19510.35	36448.52	0.535285	0.5948

R-squared	0.793212	Mean dependent var	125917.2
Adjusted R-squared	0.776994	S.D. dependent var	9333841.
S.E. of regression	4407772.	Akaike info criterion	33.52068
Sum squared resid	9.91E+14	Schwarz criterion	33.70152
Log likelihood	-933.5791	Hannan-Quinn criter.	33.59079
F-statistic	48.90741	Durbin-Watson stat	2.063507
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LNIMP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.469241	0.0000
Test critical values:	1% level	-4.124265	
	5% level	-3.489228	

	10% level	-3.173114

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNIMP,2)
Method: Least Squares
Date: 05/06/21 Time: 16:04
Sample (adjusted): 2006Q3 2020Q4
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNIMP(-1))	-1.165289	0.137591	-8.469241	0.0000
C	852581.8	3897199.	0.218768	0.8276
@TREND("2006Q1")	29082.87	112263.4	0.259059	0.7966

R-squared	0.566339	Mean dependent var	-606199.8
Adjusted R-squared	0.550570	S.D. dependent var	21300834
S.E. of regression	14279986	Akaike info criterion	35.83695
Sum squared resid	1.12E+16	Schwarz criterion	35.94353
Log likelihood	-1036.272	Hannan-Quinn criter.	35.87847
F-statistic	35.91361	Durbin-Watson stat	1.971500
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LNEMP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.77387	0.0000
Test critical values:	1% level	-4.124265	
	5% level	-3.489228	
	10% level	-3.173114	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEMP,2)
Method: Least Squares
Date: 05/06/21 Time: 16:06
Sample (adjusted): 2006Q3 2020Q4
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNEMP(-1))	-1.356874	0.125941	-10.77387	0.0000
C	1719.065	7667.879	0.224190	0.8234
@TREND("2006Q1")	-91.72641	220.5254	-0.415945	0.6791

R-squared	0.678512	Mean dependent var	-103.0690
Adjusted R-squared	0.666822	S.D. dependent var	48661.40
S.E. of regression	28088.13	Akaike info criterion	23.37442
Sum squared resid	4.34E+10	Schwarz criterion	23.48099
Log likelihood	-674.8582	Hannan-Quinn criter.	23.41593
F-statistic	58.03986	Durbin-Watson stat	2.051271

Prob(F-statistic)	0.000000

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.132018	0.0000
Test critical values:	1% level	-4.130526	
	5% level	-3.492149	
	10% level	-3.174802	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNFDI,2)
Method: Least Squares
Date: 05/06/21 Time: 16:10
Sample (adjusted): 2007Q1 2020Q4
Included observations: 56 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNFDI(-1))	-1.886159	0.307592	-6.132018	0.0000
D(LNFDI(-1),2)	0.453600	0.235221	1.928394	0.0594
D(LNFDI(-2),2)	0.214333	0.137433	1.559551	0.1251
C	-39184619	70247569	-0.557807	0.5794
@TREND("2006Q1")	1033140.	1982824.	0.521045	0.6046

R-squared	0.694991	Mean dependent var	2430357.
Adjusted R-squared	0.671069	S.D. dependent var	4.17E+08
S.E. of regression	2.39E+08	Akaike info criterion	41.50797
Sum squared resid	2.92E+18	Schwarz criterion	41.68880
Log likelihood	-1157.223	Hannan-Quinn criter.	41.57808
F-statistic	29.05203	Durbin-Watson stat	1.924726
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LNEX) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on AIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.994865	0.0000
Test critical values:	1% level	-4.124265	
	5% level	-3.489228	
	10% level	-3.173114	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEX,2)
Method: Least Squares

Date: 05/06/21 Time: 16:13
Sample (adjusted): 2006Q3 2020Q4
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNEX(-1))	-1.189605	0.132254	-8.994865	0.0000
C	0.924979	0.590514	1.566396	0.1230
@TREND("2006Q1")	-0.023882	0.016918	-1.411631	0.1637

R-squared	0.595337	Mean dependent var	-0.008621
Adjusted R-squared	0.580622	S.D. dependent var	3.294391
S.E. of regression	2.133428	Akaike info criterion	4.403676
Sum squared resid	250.3334	Schwarz criterion	4.510250
Log likelihood	-124.7066	Hannan-Quinn criter.	4.445189
F-statistic	40.45777	Durbin-Watson stat	1.994793
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LNWPUI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on AIC, maxlag=4)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-9.242206	0.0000
Test critical values: 1% level	-4.127338	
5% level	-3.490662	
10% level	-3.173943	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNWPUI,2)
Method: Least Squares
Date: 05/06/21 Time: 16:17
Sample (adjusted): 2006Q4 2020Q4
Included observations: 57 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNWPUI(-1))	-1.479901	0.160124	-9.242206	0.0000
D(LNWPUI(-1),2)	0.918477	0.156662	5.862808	0.0000
C	-15.52681	15.39080	-1.008837	0.3176
@TREND("2006Q1")	0.756473	0.455187	1.669228	0.1010

R-squared	0.620771	Mean dependent var	-4.238772
Adjusted R-squared	0.599305	S.D. dependent var	84.38441
S.E. of regression	53.41574	Akaike info criterion	10.86168
Sum squared resid	151221.8	Schwarz criterion	11.00505
Log likelihood	-305.5579	Hannan-Quinn criter.	10.91740
F-statistic	28.91905	Durbin-Watson stat	2.032880
Prob(F-statistic)	0.000000		

Null Hypothesis: LNGOV has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=4)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	0.743066	0.9644
Test critical values: 1% level	-4.133838	
5% level	-3.493692	
10% level	-3.175693	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNGOV)
Method: Least Squares
Date: 05/31/21 Time: 00:32
Sample (adjusted): 2007Q2 2020Q4
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGOV(-1)	0.087886	0.118275	0.743066	0.4611
D(LNGOV(-1))	-0.466570	0.175361	-2.660622	0.0106
D(LNGOV(-2))	-0.479086	0.158126	-3.029778	0.0039
D(LNGOV(-3))	-0.588813	0.149192	-3.946678	0.0003
D(LNGOV(-4))	0.458676	0.150107	3.055661	0.0037
C	-1328.587	2750.197	-0.483088	0.6312
@TREND("2006Q1")	311.1996	209.5260	1.485255	0.1440

R-squared	0.905350	Mean dependent var	3099.595
Adjusted R-squared	0.893518	S.D. dependent var	27247.70
S.E. of regression	8891.339	Akaike info criterion	21.14196
Sum squared resid	3.79E+09	Schwarz criterion	21.39743

APPENDIX II
Short Run Error Correction and Long Run ARDL Form

ARDL Bounds Test
Date: 05/20/21 Time: 15:54
Sample: 2007Q1 2020Q4
Included observations: 56
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	12.35583	7

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.03	3.13
5%	2.32	3.5
2.5%	2.6	3.84
1%	2.96	4.26

Test Equation:
Dependent Variable: D(LNBOP)
Method: Least Squares
Date: 05/20/21 Time: 15:54
Sample: 2007Q1 2020Q4
Included observations: 56

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNBOP(-1))	0.948940	0.176063	5.389792	0.0000
D(LNBOP(-2))	0.565072	0.131509	4.296819	0.0002
D(LNBOP(-3))	0.218467	0.099991	2.184875	0.0371
D(LNEXPO)	-3.978038	1.915600	-2.076653	0.0468
D(LNEXPO(-1))	2.928743	2.887920	1.014136	0.3189
D(LNEXPO(-2))	1.015818	1.885018	0.538890	0.5941
D(LNIMP)	0.053831	1.286948	0.041829	0.9669
D(LNIMP(-1))	3.936467	1.259153	3.126281	0.0040
D(LNIMP(-2))	-0.117086	0.363789	-0.321850	0.7499
D(LNIMP(-3))	-0.307001	0.244086	-1.257759	0.2185
D(LNFDI)	0.023959	1.298976	0.018444	0.9854
D(LNFDI(-1))	3.201092	2.208514	1.449433	0.1579
D(LNFDI(-2))	2.015651	1.295440	1.555958	0.1306
D(LNEX)	-95.79846	61.02300	-1.569875	0.1273
D(LNWPUI)	-0.184753	0.944187	-0.195674	0.8462
D(LNWPUI(-1))	-72.98564	12.52392	-5.827702	0.0000
D(LNWPUI(-2))	-76.33784	12.64787	-6.035626	0.0000
D(LNWPUI(-3))	-100.9247	9.632091	-10.47796	0.0000
C	160.3316	184.8111	0.867543	0.3928
LNEXPO(-1)	-7.882830	5.180823	-1.521540	0.1390
LNIMP(-1)	-6.849715	2.247260	-3.048029	0.0049
LNFDI(-1)	-1.836761	3.771318	-0.487034	0.6299
LNEX(-1)	2.092957	14.54457	0.143900	0.8866
LNEMP(-1)	-0.099995	0.262141	-0.381457	0.7056
LNGOV(-1)	-0.000754	0.003719	-0.202710	0.8408
LNWPUI(-1)	74.56441	12.63299	5.902356	0.0000
LNBOP(-1)	-1.825501	0.229281	-7.961840	0.0000

R-squared	0.970602	Mean dependent var	0.375714

Adjusted R-squared	0.969418	S.D. dependent var	851.3274
S.E. of regression	330.3565	Akaike info criterion	14.74445
Sum squared resid	3164928.	Schwarz criterion	15.72096
Log likelihood	-385.8447	Hannan-Quinn criter.	15.12304
F-statistic	12.93269	Durbin-Watson stat	2.184508
Prob(F-statistic)	0.000000		

ARDL Bounds Test
Date: 05/20/21 Time: 15:46
Sample: 2007Q1 2020Q4
Included observations: 56
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	9.356948	7

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.03	3.13
5%	2.32	3.5
2.5%	2.6	3.84
1%	2.96	4.26

Test Equation:
Dependent Variable: D(LNGPI)
Method: Least Squares
Date: 05/20/21 Time: 15:46
Sample: 2007Q1 2020Q4
Included observations: 56

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGPI(-1))	0.474467	0.101970	4.652988	0.0000
D(LNEXPO)	0.010309	0.006606	1.560536	0.1276
D(LNEXPO(-1))	0.044636	0.016178	2.759091	0.0092
D(LNEXPO(-2))	0.029347	0.012594	2.330297	0.0257
D(LNEXPO(-3))	0.011836	0.007821	1.513504	0.1391
D(LNEX)	0.120250	0.204951	0.586727	0.5612
D(LNEX(-1))	-0.810321	0.224271	-3.613129	0.0009
D(LNGOV)	2.715367	0.970967	2.796561	0.0083
D(LNGOV(-1))	1.986843	1.153759	1.722061	0.0939
D(LNGOV(-2))	3.092210	0.955160	3.237374	0.0026
D(LNGOV(-3))	2.572710	0.898059	2.864744	0.0070
D(LNWPUI)	-0.006766	0.002824	-2.396082	0.0221
C	-29.60059	13.02161	-2.273190	0.0293
LNEXPO(-1)	-0.041724	0.021264	-1.962255	0.0577
LNIMP(-1)	-0.000932	0.005504	-0.169358	0.8665
LNFDI(-1)	-0.002692	0.004427	-0.608079	0.5471
LNEX(-1)	0.930208	0.144613	6.432405	0.0000
LNEMP(-1)	0.000131	0.000454	0.288094	0.7750
LNGOV(-1)	2.690429	1.365241	1.970662	0.0567
LNWPUI(-1)	0.006492	0.002238	2.901265	0.0064
LNGPI(-1)	-0.216037	0.043212	-4.999406	0.0000

R-squared	0.99902	Mean dependent var	2.677857

Adjusted R-squared	0.998014	S.D. dependent var	2.616484
S.E. of regression	1.237285	Akaike info criterion	3.543712
Sum squared resid	53.58058	Schwarz criterion	4.303219
Log likelihood	-78.22394	Hannan-Quinn criter.	3.838171
F-statistic	10.54786	Durbin-Watson stat	1.904135
Prob(F-statistic)	0.000000		

ARDL Cointegrating And Long Run Form
Dependent Variable: LNBOP
Selected Model: ARDL(4, 4, 0, 0, 0, 3, 1, 0)
Date: 05/19/21 Time: 16:26
Sample: 2006Q1 2020Q4
Included observations: 56

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNBOP(-1))	0.333040	0.171481	1.942145	0.0600
D(LNBOP(-2))	0.462439	0.154906	2.985294	0.0051
D(LNBOP(-3))	0.198574	0.113362	1.751682	0.0883
D(LNEMP)	0.081547	0.422739	2.085323	0.0442
D(LNEMP(-1))	-0.003163	0.658945	-1.507201	0.1405
D(LNEMP(-2))	-0.029960	0.667059	-2.668370	0.0114
D(LNEMP(-3))	-0.0268178	0.645216	-1.965508	0.0571
D(LNEX)	0.003963	0.053291	0.074369	0.9411
D(LNEXPO)	0.583577	0.365637	1.596057	0.1192
D(LNFDI)	1.015983	0.488292	2.080685	0.0446
D(LNGOV)	-0.000117	0.000959	-0.121926	0.9036
D(LNGOV(-1))	0.002099	0.001100	1.908740	0.0643
D(LNGOV(-2))	-0.002413	0.001260	-1.915054	0.0635
D(LNIMP)	-0.080244	0.409948	-0.195743	0.0459
D(LNWPUI)	-0.039551	0.405497	-3.796707	0.0005
CointEq(-1)	-0.196776	0.204180	-5.812402	0.0000

Cointeq = LNBOP - (0.3536*LNEMP - 0.0033*LNEX + 0.4917*LNEXPO
+ 0.6561*LNFDI +0.0007*LNGOV - 0.5974*LNIMP -0.2973*LNWPUI
-0.6511)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEMP	0.353579	0.996769	3.966394	0.0003
LNEX	-0.003339	0.044876	-2.074416	0.0411
LNEXPO	0.491733	0.344502	2.427373	0.0162
LNFDI	0.656086	0.399993	2.140255	0.0392
LNGOV	0.000712	0.000731	3.975194	0.3360
LNIMP	-0.597387	0.461202	-2.162584	0.0373
LNWPUI	-0.297256	0.401460	-3.231347	0.0026
C	-0.651120	45.264552	-5.334459	0.0400

ARDL Cointegrating And Long Run Form
Dependent Variable: LNGPI
Selected Model: ARDL(2, 4, 0, 4, 2, 0, 4, 3)
Date: 05/20/21 Time: 15:14
Sample: 2006Q1 2020Q4
Included observations: 56

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGPI(-1))	0.458991	0.122372	3.750800	0.0008
D(LNEXPO)	0.000687	0.006572	0.104597	0.9174
D(LNEXPO(-1))	0.005993	0.007821	0.766187	0.4498
D(LNEXPO(-2))	0.008235	0.008865	0.928918	0.3606
D(LNEXPO(-3))	0.013285	0.006640	2.000745	0.0549
D(LNIMP)	0.000701	0.005669	0.123613	0.9025
D(LNFDI)	0.010411	0.004982	2.089700	0.0455
D(LNFDI(-1))	0.002906	0.005518	0.526712	0.6024
D(LNFDI(-2))	0.009536	0.005453	1.748694	0.0909
D(LNFDI(-3))	0.015288	0.006044	2.529429	0.0171
D(LNEX)	0.067702	0.247298	0.273769	0.7862
D(LNEX(-1))	-0.496158	0.247754	-2.002623	0.0546
D(LNEMP)	0.000041	0.000490	0.083936	0.9337
D(LNGOV)	0.000054	0.000021	2.532658	0.0170
D(LNGOV(-1))	0.000030	0.000023	1.308484	0.2010
D(LNGOV(-2))	0.000031	0.000015	2.026158	0.0520
D(LNGOV(-3))	0.000027	0.000025	1.093167	0.2833
D(LNWPUI)	-0.002736	0.004268	-0.641104	0.5265
D(LNWPUI(-1))	0.006920	0.008758	0.790080	0.4359
D(LNWPUI(-2))	-0.062581	0.036368	-1.720766	0.0959
CointEq(-1)	-0.135618	0.031622	-4.288703	0.0002

Cointeq = LNGPI - (-0.2635*LNEXPO + 0.0052*LNIMP -0.1153*LNFDI + 0.6693*LNEX + 0.0003*LNEMP + 0.0001*LNGOV + 0.4766*LNWPUI -15.5091)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXPO	-0.263506	0.148768	-1.771249	0.0370
LNIMP	0.005167	0.041821	0.123548	0.0025
LNFDI	-0.115300	0.139137	-0.828681	0.4141
LNEX	0.669251	0.606745	7.695571	0.0000
LNEMP	0.000303	0.003604	0.084132	0.9335
LNGOV	0.000135	0.000146	0.920563	0.3649
LNWPUI	0.476640	0.274782	5.734613	0.0234
C	-15.509067	5.137890	-3.018567	0.0052

Granger Causality Test

Pairwise Granger Causality Tests
Date: 05/20/21 Time: 22:32
Sample: 2006Q1 2020Q4
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
LNWPUI does not Granger Cause LNBOP	56	18.1689	4.E-09
LNBOP does not Granger Cause LNWPUI		0.17717	0.9491
LNGPI does not Granger Cause LNBOP	56	2.66470	0.0438
LNBOP does not Granger Cause LNGPI		3.87915	0.0084
LNGPI does not Granger Cause LNWPUI	56	1.35880	0.2625
LNWPUI does not Granger Cause LNGPI		4.87771	0.0023

APPENDIX III
DIAGNOSTIC TESTS WHEN DEPENDENT VARIABLE LNBOP

Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.703977	Prob. F(4,19)	0.5989
Obs*R-squared	7.228248	Prob. Chi-Square(4)	0.1243

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 05/16/21 Time: 10:57
Sample: 2007Q1 2020Q4
Included observations: 56
Pre sample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNBOP(-1)	0.064231	0.120873	0.531394	0.6013
LNBOP(-2)	-0.046691	0.138551	-0.336997	0.7398
LNBOP(-3)	0.015755	0.192608	0.081800	0.9357
LNBOP(-4)	0.052841	0.194734	0.271350	0.7890
LNEXPO	1.062830	1.760306	0.603776	0.5531
LNIMP	0.382605	1.569195	0.243822	0.8100
LNIMP(-1)	-0.057525	1.488411	-0.038648	0.9696
LNIMP(-2)	-0.228418	0.911396	-0.250624	0.8048
LNIMP(-3)	0.036517	0.175414	0.208178	0.8373
LNIMP(-4)	0.015067	0.166175	0.090667	0.9287
LNFDI	-0.356322	1.020967	-0.349005	0.7309
LNFDI(-1)	0.205947	1.105458	0.186300	0.8542
LNFDI(-2)	0.296169	1.067228	0.277513	0.7844
LNFDI(-3)	0.142376	0.959851	0.148331	0.8836
LNEX	10.21098	23.52121	0.434118	0.6691
LNEX(-1)	1.260615	30.89651	0.040801	0.9679
LNEX(-2)	-26.06806	49.70211	-0.524486	0.6060
LNEX(-3)	13.08261	38.86672	0.336602	0.7401
LNEX(-4)	-0.922094	40.73539	-0.022636	0.9822
LNEMP	-0.109168	0.179708	-0.607472	0.5507
LNEMP(-1)	-0.099653	0.168167	-0.592581	0.5604
LNEMP(-2)	-0.022259	0.162316	-0.137136	0.8924
LNEMP(-3)	-0.025729	0.304030	-0.084628	0.9334
LNEMP(-4)	-0.108017	0.318219	-0.339444	0.7380
LNGOV	0.000889	0.003711	0.239510	0.8133
LNGOV(-1)	0.000434	0.002409	0.180336	0.8588
LNGOV(-2)	-0.000502	0.003856	-0.130070	0.8979
WPUI	0.608893	1.544078	0.394341	0.6977
WPUI(-1)	-1.212798	2.391756	-0.507074	0.6179
WPUI(-2)	1.467831	2.946123	0.498225	0.6240
WPUI(-3)	1.077385	6.825817	0.157840	0.8762
WPUI(-4)	5.811411	13.24219	0.438856	0.6657
C	-6.967109	140.2632	-0.049672	0.9609
RESID(-1)	-0.230237	0.256134	-0.898892	0.3800
RESID(-2)	0.267286	0.291845	0.915847	0.3712
RESID(-3)	0.119574	0.287703	0.415617	0.6823
RESID(-4)	-0.309695	0.311869	-0.993027	0.3332

R-squared	0.129076	Mean dependent var	2.35E-13
Adjusted R-squared	-1.521096	S.D. dependent var	137.8776
S.E. of regression	218.9215	Akaike info criterion	13.85582
Sum squared resid	910605.8	Schwarz criterion	15.19400
Log likelihood	-350.9629	Hannan-Quinn criter.	14.37463
F-statistic	0.078220	Durbin-Watson stat	2.120860
Prob(F-statistic)	1.000000		

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

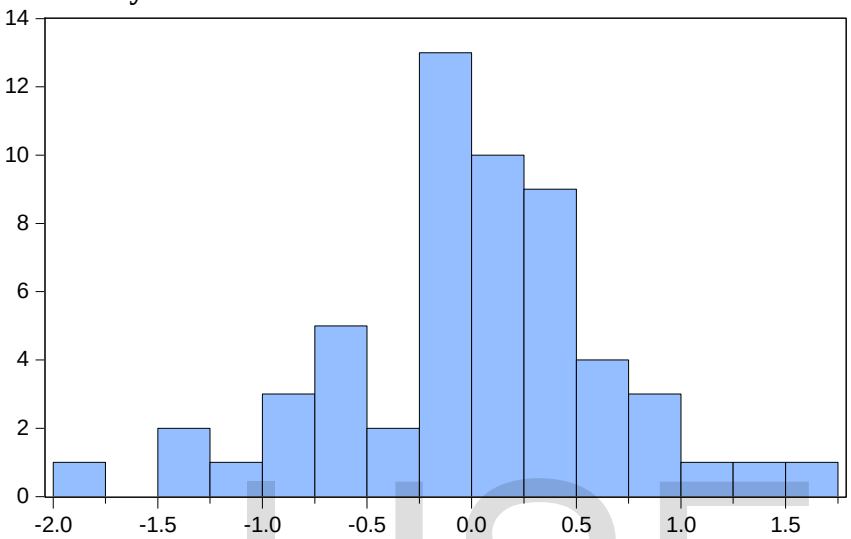
F-statistic	0.613879	Prob. F(32,23)	0.9002
Obs*R-squared	25.79653	Prob. Chi-Square(32)	0.7725
Scaled explained SS	6.235145	Prob. Chi-Square(32)	1.0000

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/16/21 Time: 10:59
Sample: 2007Q1 2020Q4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	25532.38	22279.69	1.145994	0.2636
LNBOP(-1)	-17.56613	18.10585	-0.970191	0.3420
LNBOP(-2)	-3.655259	19.99873	-0.182775	0.8566
LNBOP(-3)	5.066789	30.92706	0.163830	0.8713
LNBOP(-4)	-10.10698	30.60168	-0.330275	0.7442
LNEXPO	89.75654	261.2326	0.343589	0.7343
LNIMP	-1.700539	253.4281	-0.006710	0.9947
LNIMP(-1)	-131.7217	239.6592	-0.549621	0.5879
LNIMP(-2)	83.73759	147.5703	0.567442	0.5759
LNIMP(-3)	-3.164231	28.67161	-0.110361	0.9131
LNIMP(-4)	-15.42451	27.32306	-0.564524	0.5779
LNFDI	-269.0927	152.2157	-1.767838	0.0904
LNFDI(-1)	-215.5371	179.5166	-1.200653	0.2421
LNFDI(-2)	-287.0470	170.4370	-1.684183	0.1057
LNFDI(-3)	-107.3593	156.7072	-0.685095	0.5001
LNEX	-541.3443	3651.305	-0.148260	0.8834
LNEX(-1)	-1907.994	5095.480	-0.374448	0.7115
LNEX(-2)	3386.470	7763.565	0.436200	0.6668
LNEX(-3)	-1613.505	6102.918	-0.264382	0.7938
LNEX(-4)	3528.819	6702.698	0.526477	0.6036
LNEMP	-10.01694	27.38082	-0.365838	0.7178
LNEMP(-1)	19.32614	25.40902	0.760601	0.4546
LNEMP(-2)	0.945432	24.77569	0.038160	0.9699
LNEMP(-3)	-9.898205	48.71164	-0.203200	0.8408
LNEMP(-4)	7.478876	50.28185	0.148739	0.8831
LNGOV	0.129732	0.584565	0.221929	0.8263
LNGOV(-1)	-0.489977	0.387245	-1.265289	0.2184
LNGOV(-2)	-0.642340	0.630614	-1.018595	0.3190
WPUI	-22.01416	243.9338	-0.090246	0.9289
WPUI(-1)	-37.03267	366.6737	-0.100996	0.9204
WPUI(-2)	19.41776	443.5164	0.043781	0.9655
WPUI(-3)	-400.0133	1115.753	-0.358514	0.7232
WPUI(-4)	-152.6301	2105.817	-0.072480	0.9428

R-squared	0.460652	Mean dependent var	18670.76
Adjusted R-squared	-0.289744	S.D. dependent var	31892.79
S.E. of regression	36219.65	Akaike info criterion	24.12131
Sum squared resid	3.02E+10	Schwarz criterion	25.31482
Log likelihood	-642.3966	Hannan-Quinn criter.	24.58403
F-statistic	0.613879	Durbin-Watson stat	1.234784
Prob(F-statistic)	0.900153		

Normality Test



Series: Residuals
Sample 2007Q1 2020Q4
Observations 56

Mean	-3.91e-14
Median	0.015610
Maximum	1.647738
Minimum	-1.906885
Std. Dev.	0.670920
Skewness	-0.281622
Kurtosis	3.643428
Jarque-Bera	1.706231
Probability	0.426085

Ramsey RESET Test

Ramsey RESET Test
Equation: UNTITLED
Specification: LNBOP LNBOP(-1) LNBOP(-2) LNBOP(-3) LNBOP(-4) LNEXPO LNEXPO(-1) LNEXPO(-2) LNEXPO(-3) LNEXPO(-4) LNIMP LNIMP(-1) LNIMP(-2) LNIMP(-3) LNIMP(-4) LNFDI LNFDI(-1) LNFDI(-2) LNFDI(-3) LNFDI(-4) LNEX LNEX(-1) LNEMP LNEMP(-1) LNEMP(-2) LNGOV LNGOV(-1) LNGOV(-2) LNWPUI LNWPUI(-1) LNWPUI(-2) LNWPUI(-3) LNWPUI(-4) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.750530	22	0.0940
F-statistic	3.064356	(1, 22)	0.0940

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	130103.3	1	130103.3
Restricted SSR	1064157.	23	46267.68
Unrestricted SSR	934053.3	22	42456.97

Unrestricted Test Equation:
Dependent Variable: LNBOP
Method: ARDL
Date: 05/20/21 Time: 15:01
Sample: 2007Q1 2020Q4
Included observations: 56
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic):
Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNBOP(-1)	-0.230248	0.144960	-1.588357	0.1265
LNBOP(-2)	0.155267	0.144926	1.071355	0.2956
LNBOP(-3)	0.002738	0.127738	0.021435	0.9831
LNBOP(-4)	0.011529	0.121785	0.094666	0.9254
LNEXPO	-3.311689	2.851750	-1.161283	0.2580
LNEXPO(-1)	-1.468594	2.295518	-0.639766	0.5289
LNEXPO(-2)	-0.512732	2.422680	-0.211639	0.8343
LNEXPO(-3)	-1.708219	2.261498	-0.755348	0.4581
LNEXPO(-4)	-2.291559	1.706046	-1.343199	0.1929
LNIMP	0.052643	1.286295	0.040926	0.9677
LNIMP(-1)	0.328629	1.031282	0.318660	0.7530
LNIMP(-2)	-0.633255	1.321997	-0.479014	0.6367
LNIMP(-3)	-0.152300	0.167371	-0.909957	0.3727
LNIMP(-4)	0.442264	0.163499	2.704990	0.0129
LNFDI	0.399681	0.873598	0.457511	0.6518
LNFDI(-1)	0.136661	1.231894	0.110936	0.9127
LNFDI(-2)	-2.389096	1.035232	-2.307788	0.0308
LNFDI(-3)	-3.132593	0.979905	-3.196832	0.0042
LNFDI(-4)	-2.435688	1.245081	-1.956248	0.0632
LNEX	-94.55354	41.62278	-2.271678	0.0332
LNEX(-1)	127.9627	43.34554	2.952155	0.0074
LNEMP	0.309862	0.328011	0.944668	0.3551
LNEMP(-1)	0.297610	0.210453	1.414144	0.1713
LNEMP(-2)	-0.168400	0.235553	-0.714915	0.4822
LNGGOV	-117.8317	161.2220	-0.730866	0.4726
LNGOV(-1)	-28.53229	116.8853	-0.244105	0.8094
LNGOV(-2)	-221.4637	167.3600	-1.323277	0.1993
LNWPUI	-1.389160	0.801178	-1.733897	0.0969
LNWPUI(-1)	1.815348	1.376684	1.318638	0.2009
LNWPUI(-2)	-2.156839	2.127678	-1.013705	0.3217
LNWPUI(-3)	8.697779	11.22990	0.774519	0.4469
LNWPUI(-4)	-4.891726	33.77220	-0.144845	0.8862
C	3380.359	1563.217	2.162437	0.0417
FITTED^2	0.000208	0.000119	1.750530	0.0940

R-squared	0.970567	Mean dependent var	46.34964
Adjusted R-squared	0.966416	S.D. dependent var	586.1301
S.E. of regression	206.0509	Akaike info criterion	13.77410
Sum squared resid	934053.3	Schwarz criterion	15.00378
Log likelihood	-351.6748	Hannan-Quinn criter.	14.25084
F-statistic	720.81948	Durbin-Watson stat	1.993648
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model

APPENDIX IV
DIAGNOSTIC TESTS WHEN DEPENDENT VARIABLE LNGPI

Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.549636	Prob. F(4,30)	0.7007
Obs*R-squared	3.823727	Prob. Chi-Square(4)	0.4304

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 05/20/21 Time: 14:08
Sample: 2007Q1 2020Q4
Included observations: 56
Pre sample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGPI(-1)	0.071271	0.323008	0.220646	0.8269
LNGPI(-2)	0.070905	0.602928	0.117602	0.9072
LNGPI(-3)	-0.139520	0.330198	-0.422535	0.6756
LNEXPO	0.000774	0.008744	0.088492	0.9301
LNEXPO(-1)	0.000583	0.009237	0.063117	0.9501
LNIMP	6.37E-05	0.005640	0.011303	0.9911
LNIMP(-1)	0.001405	0.005596	0.251135	0.8034
LNIMP(-2)	0.000319	0.005593	0.057070	0.9549
LNFDI	-0.002434	0.006666	-0.365115	0.7176
LNFDI(-1)	-0.001414	0.007260	-0.194831	0.8468
LNFDI(-2)	-0.001506	0.008514	-0.176886	0.8608
LNFDI(-3)	0.000515	0.007097	0.072545	0.9426
LNFDI(-4)	0.001549	0.007026	0.220532	0.8270
LNGEX	-0.282325	1.352650	-0.208720	0.8361
LNEMP	0.000169	0.000609	0.277665	0.7832
LNGOV	-0.095822	1.023661	-0.093608	0.9260
LNGOV(-1)	0.124734	0.751272	0.166031	0.8692
LNGOV(-2)	-0.123621	0.991634	-0.124664	0.9016
LNGOV(-3)	-0.263976	1.036607	-0.254654	0.8007
LNWPUI	-0.000528	0.004870	-0.108357	0.9144
LNWPUI(-1)	9.12E-05	0.005034	0.018115	0.9857
C	3.912390	18.28124	0.214011	0.8320
RESID(-1)	-0.065656	0.369422	-0.177725	0.8601
RESID(-2)	-0.389242	0.323928	-1.201633	0.2389
RESID(-3)	-0.002024	0.294684	-0.006870	0.9946
RESID(-4)	-0.140410	0.241592	-0.581188	0.5655

R-squared	0.068281	Mean dependent var	8.42E-15
Adjusted R-squared	-0.708152	S.D. dependent var	1.257055
S.E. of regression	1.642924	Akaike info criterion	4.135249
Sum squared resid	80.97594	Schwarz criterion	5.075591
Log-likelihood	-89.78697	Hannan-Quinn criter.	4.499817
F-statistic	0.087942	Durbin-Watson stat	2.027666
Prob(F-statistic)	1.000000		

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

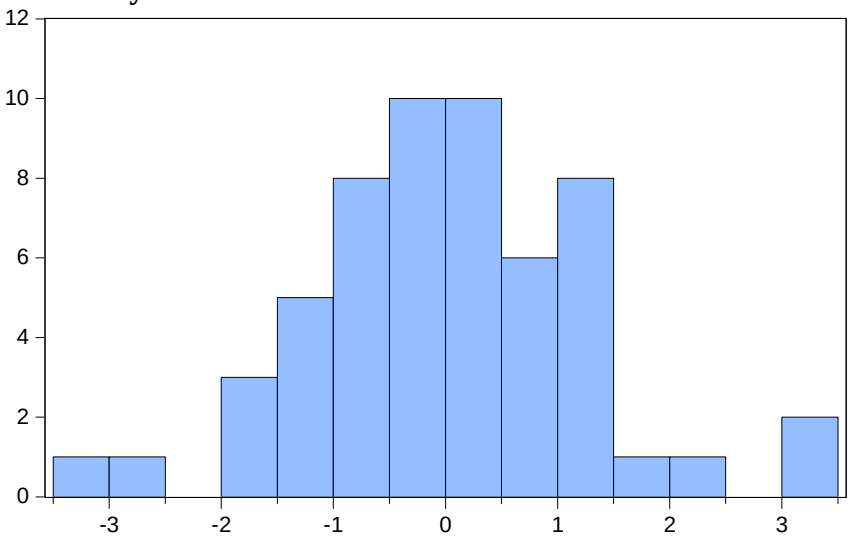
F-statistic	0.775916	Prob. F(21,34)	0.7265
Obs*R-squared	18.14278	Prob. Chi-Square(21)	0.6400
Scaled explained SS	9.032115	Prob. Chi-Square(21)	0.9890

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/20/21 Time: 14:14
Sample: 2007Q1 2020Q4
Included observations: 56

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-10.09447	28.97932	-0.348334	0.7297
LNGPI(-1)	0.483623	0.247024	1.957794	0.0585
LNGPI(-2)	-0.668164	0.474881	-1.407013	0.1685
LNGPI(-3)	0.160142	0.289907	0.552391	0.5843
LNEXPO	-0.002963	0.014040	-0.211009	0.8341
LNEXPO(-1)	-0.019856	0.013977	-1.420664	0.1645
LNIMP	-0.005222	0.008856	-0.589605	0.5594
LNIMP(-1)	-0.004320	0.008906	-0.485027	0.6308
LNIMP(-2)	0.002493	0.008772	0.284196	0.7780
LNFDI	0.007262	0.010122	0.717478	0.4780
LNFDI(-1)	0.003262	0.011028	0.295782	0.7692
LNFDI(-2)	-0.001536	0.011487	-0.133698	0.8944
LNFDI(-3)	-0.009577	0.010959	-0.873895	0.3883
LNFDI(-4)	-0.022399	0.010457	-2.142000	0.0394
LNEX	0.517261	2.175141	0.237806	0.8135
LNEMP	-0.000840	0.000954	-0.880633	0.3847
LNGOV	1.425819	1.522564	0.936459	0.3556
LNGOV(-1)	-0.511881	1.212905	-0.422029	0.6757
LNGOV(-2)	0.075026	1.267451	0.059194	0.9531
LNGOV(-3)	0.117715	1.281533	0.091855	0.9274
LNWPUI	-0.004736	0.007232	-0.654865	0.5170
LNWPUI(-1)	0.001087	0.006824	0.159299	0.8744

R-squared	0.323978	Mean dependent var	1.551969
Adjusted R-squared	-0.093565	S.D. dependent var	2.573727
S.E. of regression	2.691441	Akaike info criterion	5.104753
Sum squared resid	246.2910	Schwarz criterion	5.900427
Log-likelihood	-120.9331	Hannan-Quinn criter.	5.413234
F-statistic	0.775916	Durbin-Watson stat	1.731449
Prob(F-statistic)	0.726485		

Normality Test



Series: Residuals
Sample 2007Q1 2020Q4
Observations 56

Mean	8.42e-15
Median	0.008832
Maximum	3.330135
Minimum	-3.195475
Std. Dev.	1.257055
Skewness	0.110530
Kurtosis	3.701058
Jarque-Bera	1.260815
Probability	0.532375

Ramsey RESET Test
Equation: UNTITLED
Specification: LNGPI LNGPI(-1) LNGPI(-2) LNGPI(-3) LNGPI(-4) LNEXPO LNEXPO(-1) LNEXPO(-2) LNEXPO(-3) LNEXPO(-4) LNIMP LNIMP(-1) LNFDI LNEX LNEX(-1) LNEX(-2) LNEMP LNWPUI LNWPUI(-1) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.220219	36	0.2303
F-statistic	1.488935	(1, 36)	0.2303

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	2.871180	1	2.871180
Restricted SSR	72.29158	37	1.953827
Unrestricted SSR	69.42040	36	1.928345

Unrestricted Test Equation:
Dependent Variable: LNGPI
Method: ARDL
Date: 05/22/21 Time: 22:50
Sample: 2007Q1 2020Q4
Included observations: 56
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic):
Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNGPI(-1)	1.421534	0.135422	10.49705	0.0000
LNGPI(-2)	-0.814942	0.239605	-3.401197	0.0017
LNGPI(-3)	0.437995	0.241070	1.816878	0.0776
LNGPI(-4)	-0.178676	0.135181	-1.321752	0.1946
LNEXPO	0.005084	0.006799	0.747797	0.4594
LNEXPO(-1)	-0.002352	0.006998	-0.336170	0.7387
LNEXPO(-2)	-0.005286	0.008298	-0.637013	0.5281
LNEXPO(-3)	-0.021161	0.009547	-2.216435	0.0331

LNEXPO(-4)	-0.021070	0.009034	-2.332347	0.0254
LNIMP	0.009156	0.006113	1.497792	0.1429
LNIMP(-1)	0.009115	0.005746	1.586280	0.1214
LNFDI	0.007700	0.004749	1.621313	0.1137
LNEX	0.080267	0.226266	0.354748	0.7248
LNEX(-1)	-0.407403	0.259911	-1.567469	0.1258
LNEX(-2)	0.889911	0.206935	4.300431	0.0001
LNEMP	0.000437	0.000506	0.865040	0.3927
LNWPUI	-0.004375	0.003582	-1.221362	0.2299
LNWPUI(-1)	0.005959	0.003911	1.523766	0.1363
C	-1.032131	1.499281	-0.688417	0.4956
FITTED^2	0.000223	0.000183	1.220219	0.2303

R-squared	0.999179	Mean dependent var	78.43179
Adjusted R-squared	0.998745	S.D. dependent var	39.19981
S.E. of regression	1.388648	Akaike info criterion	3.766992
Sum squared resid	69.42040	Schwarz criterion	4.490332
Log-likelihood	-85.47577	Hannan-Quinn criter.	4.047429
F-statistic	2304.812	Durbin-Watson stat	1.719795
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.