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## Working Paper

# Policy responses to cope with COVID-19 in Viet Nam: An empirical stock-flow-consistent approach

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**ADB Working Paper Series**

**POLICY RESPONSES TO COPE  
WITH COVID-19 IN VIET NAM:  
AN EMPIRICAL STOCK-FLOW-  
CONSISTENT APPROACH**

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No. 1359  
February 2023

**Asian Development Bank Institute**

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**Abstract**

The COVID-19 pandemic has had systemic macroeconomic impacts due to the different lockdowns and the induced shocks to both supply and demand. A global recession of a magnitude probably worse than the 2008 global financial crisis is already underway. Like every country in the world, the Vietnamese Government has taken several measures to compensate for the economic damage of the COVID-19 crisis and promote the economic recovery. However, public intervention in the form of fiscal and monetary policies raises a crucial question about public debt and fiscal sustainability challenges. Hence, this study aims to analyze the different consequences of this public intervention not only on the real side of the economy but also on the financial side.

We use a consistent empirical stock-flow model for the Vietnamese economy, integrating its real and financial aspects. We find that stimulus packages can be effective in the short run, even if they increase the government deficit and public debt. In the short term, the main source of financing is borrowing. However, in the medium to long term, policymakers need to think more about taxation to raise government revenues and spending policies after recovery to promote resilient and inclusive economic growth and to support fiscal sustainability.

**Keywords:** fiscal policy, monetary policy, post-Keynesian economics, stock-flow-consistent modeling

**JEL Classification:** E62, E12, E17

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## 1. INTRODUCTION

Viet Nam has been deeply affected by the COVID-19 pandemic and is facing unprecedented challenges. As of April 2022, the Ministry of Health confirmed around 10.45 million cases and more than 42,000 deaths. The COVID-19 pandemic has had significant multidimensional impacts on the country. Not only is it a public health crisis but also there are several substantial economic consequences resulting from business closures to control the spread of COVID-19. The sudden closure of businesses around the world interrupted production and shocked the supply, but it caused an even bigger shock to the demand side and the global financial market. A recession of the same magnitude as or worse than the global financial crisis is expected (IMF 2021). In 2020, Viet Nam was one of the few countries to experience GDP growth when the pandemic hit. The Vietnamese growth rate was well above the average of the ASEAN region and the world due to the effectiveness of the fight against COVID-19. However, according to the General Statistics Office (GSO), Viet Nam's real GDP grew by 2.91% in 2020, the lowest growth rate in the last decade. More importantly, in 2021, due to the wave of COVID-19 infections, which was much more severe than before, the GDP was expected to grow by only 2.58%, that is, four percentage points lower than the estimated world growth rate. In addition, the unemployment rate has increased since 2020 and reached 3.72% in the third quarter of 2021, the highest value in three decades.

To mitigate the negative impact of the COVID-19 pandemic on businesses and households and promote economic recovery after the pandemic, the government took several measures. The targeted discretionary fiscal stimulus supported the healthcare sector and affected workers. Businesses received support from the government through tax breaks, tax deferrals, and reductions in land rental fees. The State Bank of Viet Nam (SBV) has adopted monetary policies to support liquidity and financing conditions for households, enterprises, and commercial banks, which will take over the credit provided to the economy. Since the financing of the COVID-19 stimulus package mainly comes from the government's debt in the short term, it raises the critical issue of public debt sustainability. Thus, it has revealed the critical need to pay more attention to the integration of the financial sector (i.e., money, debt, and assets/liabilities) within the same framework to understand properly the dynamic behaviors observed in the real economy sector. Comprehensive macroeconomic analysis and forecasting are crucial for policy-making decisions contributing to economic growth and macroeconomic stability in Viet Nam. Hence, this paper aims to analyze the different consequences of this public intervention for the real and financial sides of the economy by using an empirical stock-flow-consistent (SFC) model for the Vietnamese economy developed by Nguyen et al. (2021), which is based on theoretical SFC models but also represents different features considered relevant to the Vietnamese economy.

Although they were marginalized during the golden age of the Great Moderation and monetarism, SFC models are based on the principle that financial and real variables should be put together and analyzed as a whole in the same model; they are therefore best suited to meeting the challenges posed by the recent crisis. The SFC literature emerges from the post-Keynesian school, a product of the discussion around Nobel Prize winner Tobin (Tobin 1969). Indeed, with the rapid development of the financial system in the economy, it is crucial when analyzing economic growth to understand the behavior of the financial side, which includes money, debt, and asset markets.

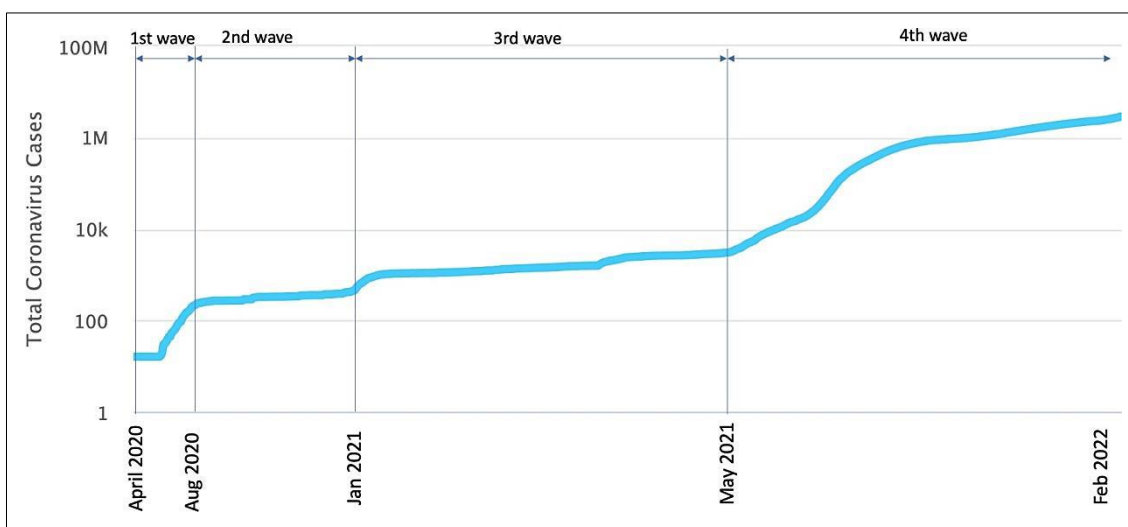
This paper is organized as follows. Following this introduction, Section 2 overviews the situation of the COVID-19 pandemic in Viet Nam and its economic impacts. Section 3 summarizes the government policy responses to this crisis and the problem of public finance. Section 4 presents the main features of the empirical SFC model for Viet Nam. Section 5 discusses the simulation results of our study and provides key insights.

## 2. COVID-19 PANDEMIC AND ITS ECONOMIC IMPACTS

### 2.1 COVID-19 Pandemic in Viet Nam

Sharing a border of more than 1200 km with the People’s Republic of China (PRC), where the epidemic originated, Viet Nam is one of the first countries after the PRC where COVID-19 cases were confirmed. By the end of 2021, this country had been hit by four waves of COVID-19 (Figure 1).

**Figure 1: Total Number of Cases of COVID-19 in Viet Nam**



Source: Worldometer COVID-19.

The first two cases in Viet Nam were identified on 23 January 2020. During this first wave, Viet Nam recorded 16 cases with no direct casualties related to Wuhan, the PRC. After the first record of local transmission on 1 February, the Prime Minister announced the outbreak and imposed tight measures against the pandemic, including travel restrictions and bans, visa suspensions, mandatory quarantines, and health declarations for heavily affected countries (the PRC, the Republic of Korea, Iran, and Italy). After the 17th case was registered on 6 March 2020, the pandemic spread worldwide. The number of infected people increased sharply, which led to the suspension of entry for all foreigners from 22 March 2020. When returning to Viet Nam, Vietnamese people coming from abroad had to spend 14 days in full quarantine. From 1 April 2020, all of Viet Nam applied social distancing (people stayed at home except for essential and emergency outings and non-essential businesses were closed) for 15 days. No new cases of community transmission were detected in Viet Nam for 99 days, until 25 July. This allowed economic activities to continue in part.

Viet Nam entered the second wave of infection when the COVID-19 community transmission was detected in Da Nang, including the country's first deaths from the virus, which mainly involved patients with severe underlying diseases, in the Da Nang Hospital cluster. By 31 August 2020, Viet Nam had reported 1,040 cases, with 32 deaths. Globally, Viet Nam continues to be commended for its early response, which involved a low budget, contact tracing, strategic and targeted testing, isolation, and treatment, leading to a relatively low number of cases compared with most other countries. With the reintroduction of physical distancing measures throughout areas deemed high risk, Viet Nam underwent a period of 3 months without any infection cases in the community. After 6 months of suspension, commercial flights resumed between Viet Nam, Japan, and the Republic of Korea. Economic activities recommenced.

The third wave of infection began on 28 January 2021, when Viet Nam recorded community transmission cases in Hai Duong and Quang Ninh provinces. In this new phase, the government only quarantined the areas directly related to the infected people to limit the economic impact. However, the number of cases still increased; on 15 February 2021, Hai Duong province was locked down for 15 days, and other big cities, such as Hanoi and Ho Chi Minh City, stopped all entertainment activities. From March 2021, the situation in the northern provinces was under control, with the number of new cases falling to single digits. At the same time, Viet Nam launched its mass vaccination campaign against COVID-19.

From the end of April 2021, Viet Nam experienced "a fast-spreading outbreak." Numerous cases were detected in industrial parks in Bac Giang province and then in other prominent hospitals. This time, it was almost impossible to use tracing management and cut the infection chain due to the virus's spread in many provinces of Viet Nam. The situation worsened after the 4-day holiday for Reunification Day and International Workers' Day, and, on 26 July 2021, Ho Chi Minh City imposed a daily night curfew. This meant that people could not leave the city except in an emergency. The government also mobilized 10,000 soldiers to the city to enforce the lockdown and deliver food supplies. After several months, in November 2021, COVID-19 was brought under control nationwide.

One of the contributions to controlling the COVID-19 pandemic is vaccination. As mentioned above, vaccinations began on 8 March 2021, with approximately 203 million administered doses of vaccine reported by April 2022. Different vaccines have been approved, including the Oxford–AstraZeneca vaccine, Sputnik V, the Sinopharm BIBP vaccine, the Pfizer–BioNTech vaccine, the Moderna vaccine, the Janssen vaccine, and Abdala.

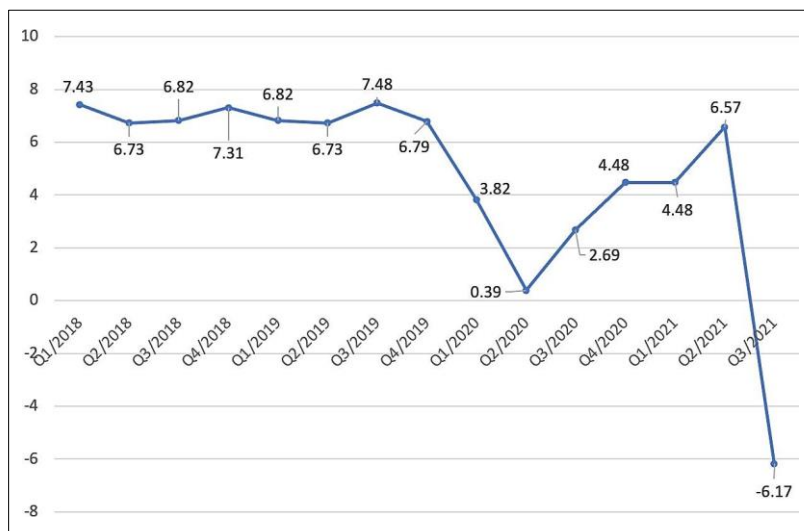
## **2.2 COVID-19's Economic Impacts on the Economy**

The COVID-19 pandemic has had several significant impacts on Viet Nam's economic growth. According to the GSO, the real GDP increased by 2.91% in 2020, the lowest growth rate since Doi Moi in 1986 (when the second-quarter growth was 0.39%, which corresponded to the period of lockdown). However, in 2020, Viet Nam's economic growth rate was still higher than the average of ASEAN countries and the world. The fourth wave of the COVID-19 pandemic has aggravated the negative impact on economic growth since May 2021. The third-quarter growth in 2021 was –6.17%. The Vietnamese economy is expected to achieve annual growth of 5.5% in 2021. However, this is still uncertain due to the extent and duration of the current wave of new COVID-19 cases hitting the country. The spread of COVID-19 poses a significant risk for the domestic demand and the risk of disruption to the manufacturing output since COVID-



19 cases are detected in substantial manufacturing facilities or logistics supply chains. In addition, as of September 2021, the country's overall vaccination rate remains low, at about 28%, and only 4% of the population has been fully vaccinated with two injections. The country therefore remains vulnerable to new waves of COVID-19.

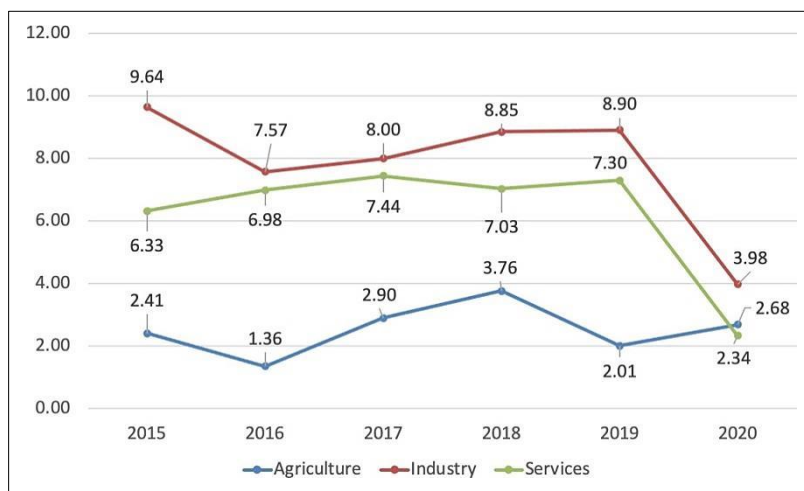
**Figure 2: Quarterly GDP Growth Rate (y-o-y, %)**



Source: GSO.

The COVID-19 pandemic has had a negative impact on all economic activities. The economic impact is due to the implementation of Directive No. 15 and Directive No. 16 about social distancing at the national level. Several business sectors, including restaurants, shops, cinemas, and entertainment venues, have been affected by the collapse in demand. Although social distancing measures have been relaxed, non-essential businesses remain closed. Restrictions on the entry of foreigners have negatively affected the air transport and tourism sectors. The education and training sector has been affected by the closure of schools.

**Figure 3: Growth Rate of Economic Activities (%)**

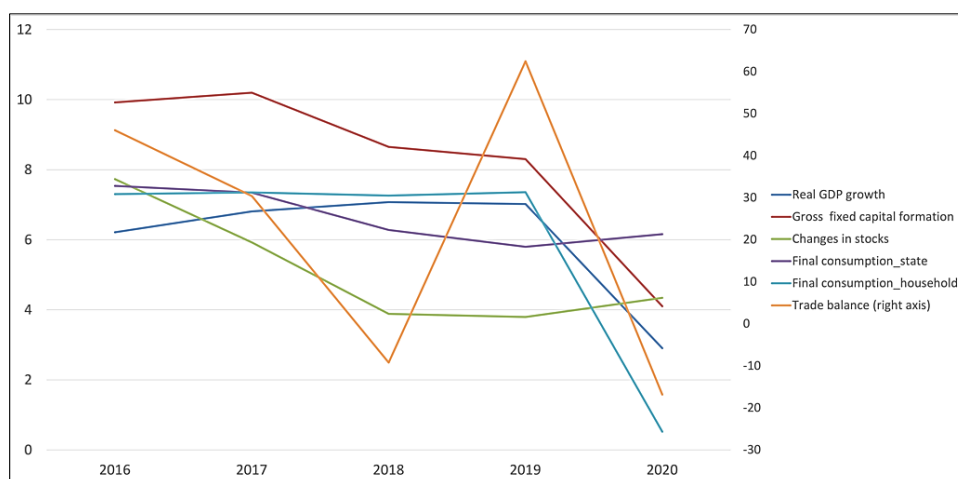


Source: GSO.

Figure 3 shows that agriculture had an increased growth rate (2.68%) but the industry and service sectors suffered a decline in their growth rate in 2020 mainly due to social distancing (3.98% compared with 8.9% in 2019 and 2.34% compared with 7.3% in 2019, respectively).

Looking at the demand side of the GDP, all the components except the government's final consumption experienced a decline in their growth rate (Figure 4). The household's final consumption increased only by 0.6% in 2020 (compared with 7.23% in 2019) due to the decline in personal income and the social distancing measures. Exports are one of the significant drivers of Vietnamese economic growth. More than 50% of Viet Nam's exports are sent to the United States, the PRC, the European Union, and the United Kingdom. The fact that these countries' imports were also strongly affected by the COVID-19 pandemic in 2020 (UN 2021) has contributed to the substantial reduction of Vietnamese exports compared with 2019. The fiscal stimulus explains the slight increase in public consumption (6.16% in 2020 compared with 5.8% in 2019). The capital accumulation has increased by 4.12% (compared with 8.28% in 2019).

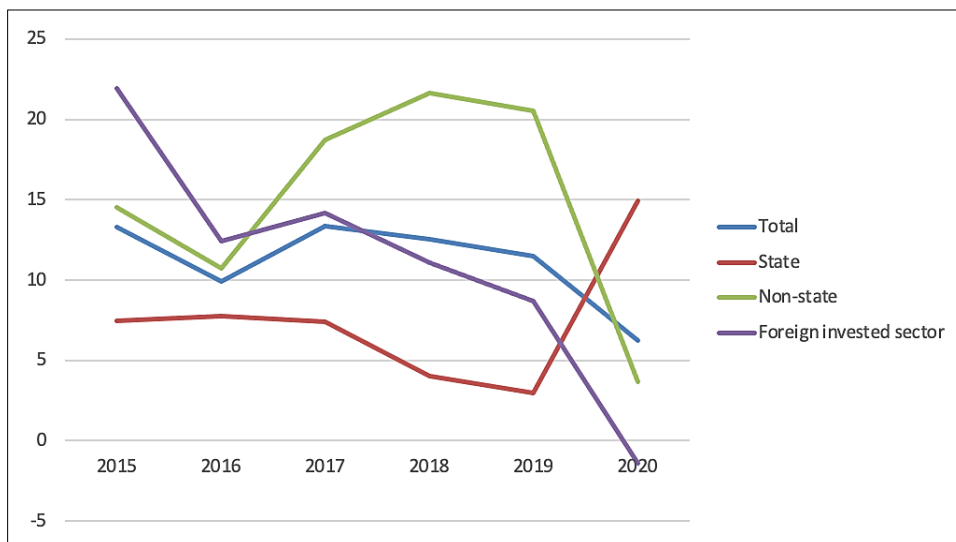
**Figure 4: Growth Rate of GDP Components (%)**



Source: GSO.

Lockdown policies harm FDI inflows (OECD 2020). In 2020, the growth rate of the non-state and FDI sectors was significantly reduced compared with the previous year, 2019 (Figure 5). However, to compensate for this reduction, the government had to increase the scale and the intensity of public investment with a growth rate that reached 14.5% (compared with the low growth rate of only 2.6% in 2019).

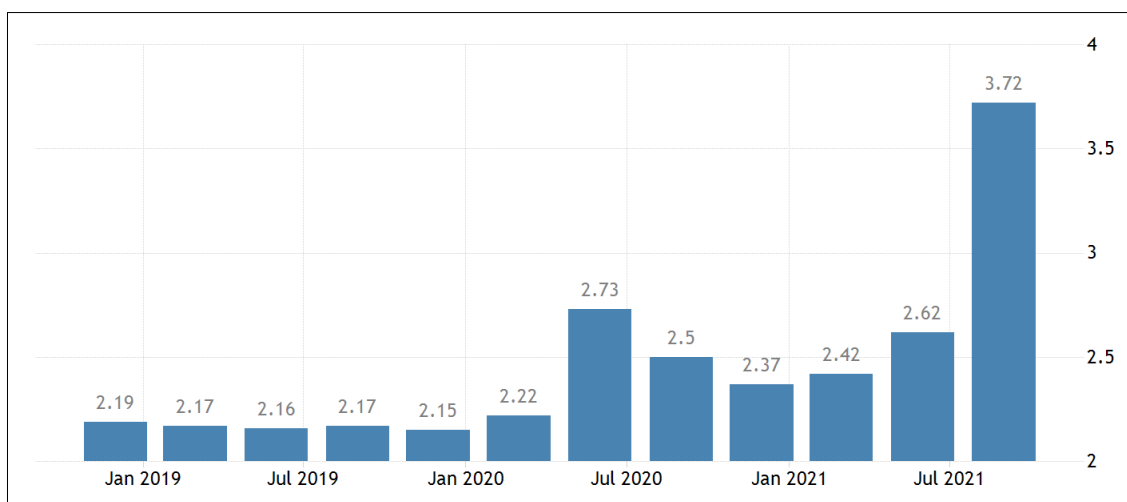
**Figure 5: Growth Rate of Investment by Economic Sectors (%)**



Source: GSO.

The COVID-19 pandemic had a powerful impact on the labor market (ILO 2020). Social distancing, self-isolation, and travel restrictions caused a reduction in the workforce in the economy, and many jobs were lost. According to the GSO, more than 1.8 million working-age people were underemployed in the third quarter of 2021. This is the highest level in the past 10 years. The underemployment rate of working-age people in urban areas was higher than that in rural areas, reaching 5.33% and 3.94%, respectively. In addition, the prolonged social distancing period in many localities pushed the unemployment rate in the third quarter of 2021 far beyond the usual level of 2%, reaching 3.72%, the highest level in three decades (Figure 6). The increase in underemployment and the unemployment rate reduced workers' incomes.

**Figure 6: Unemployment Rate (%)**



Source: tradingeconomics.com, GSO.

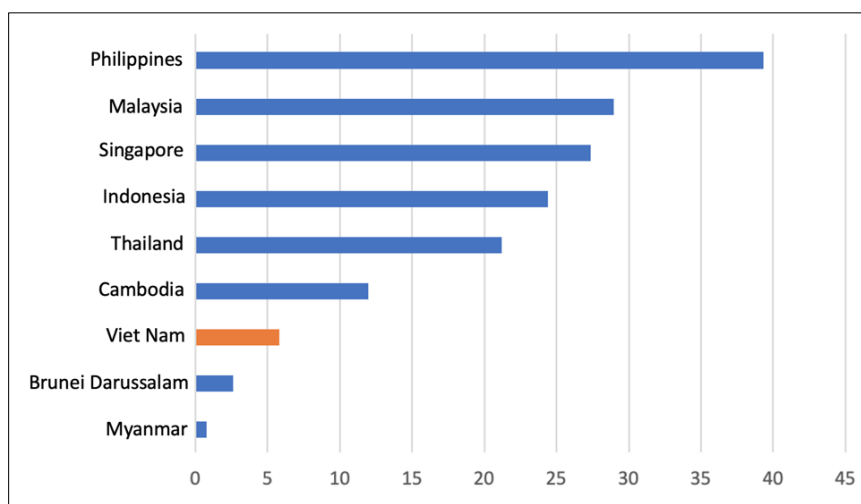
### 3. GOVERNMENT RESPONSES AND PUBLIC FINANCE

#### 3.1 Vietnamese Government’s Responses to the Pandemic

The Vietnamese Government provided strong leadership in response to COVID-19 by establishing the National Steering Committee (NSC) led by the Deputy Prime Minister, Vu Duc Dam, immediately after detecting the first new cases. The NSC is a multi-ministerial and multi-sectoral committee to facilitate decision making and coordinate measures’ implementation. Sixty-three provincial and 707 district steering committees at the local level were established, illustrating the multi-sectoral approach and systemic response of the government to the COVID-19 pandemic.

To mitigate the negative impact of the COVID-19 pandemic on the economy, the government decided to introduce stimulus packages to support the most affected firms and people. According to the ISEAS – YUSOF ISHAK Institute (2021), by collecting information from various data sets, including the IMF, ILO, ADB, media outlets, and finance ministries/departments, as of May 2021, compared with other COVID-19 stimulus packages of ASEAN countries, that of Viet Nam remains at a modest level (Figure 7). However, it is vital in the very short run to reduce the impact of the COVID-19 pandemic. Besides these counter-cyclical fiscal policies, the government has implemented expansionary monetary policies.

**Figure 7: Estimated COVID-19 Stimulus Packages among ASEAN Member States (as of 31 May 2021)**



Source: ISEAS – YUSOF ISHAK Institute (2021).

Fiscal policies include tax measures to support enterprises and consist of the extension of tax payments (Decree No. 41/2020/ND-CP on 8 April 2020), rental fees with a reduction of 15% (Decision 22/2020/QD-TTg on 10 August 2020), and a 30% decrease in corporate income tax in 2020 for enterprises, co-operative societies, and other institutions with total revenue under 200 billion VND (Resolution 116/2020/QH14 on 19 June 2020 and Decree 114/2020/ND-CP on 25 September 2020). They were applied to roughly 740,000 active enterprises (accounting for 98% of all enterprises) and most of the suspended business households. The expected support package amounted to 180 billion VND.

One of the public policies to promote economic growth in the context of COVID-19 is to accelerate public investment. The total approved public investment from the government budget in 2020 was nearly 700 thousand billion VND, 2.2 times more than that in 2019 (312 thousand billion VND), which includes 470.6 thousand billion VND in government budget estimation in 2020 and 225.2 thousand billion transferred from 2019. The policy was reflected in different government legal documents to remove difficulties in production and business activities, accelerate the disbursement of public investment capital, and guide ministries, central and local authorities, and agencies to implement solutions to accelerate public investment disbursement drastically. Thus, the realized capital growth rate from the government budget in 2020 reached the highest level from 2016 to 2020.

Targeting the people who are affected by the COVID-19 pandemic, according to Resolution No. 42/NQ-CP on 9 April 2020 and Decision No. 15/2020/QĐ-TTg, social security policy provided guides for assistance and the implementation of policies to support people facing difficulties caused by the COVID-19 pandemic, respectively. Accordingly, about 62,000 billion VND (around 0.96% of the GDP) would be disbursed to roughly 20 million workers who had lost their jobs due to the impact of the pandemic.

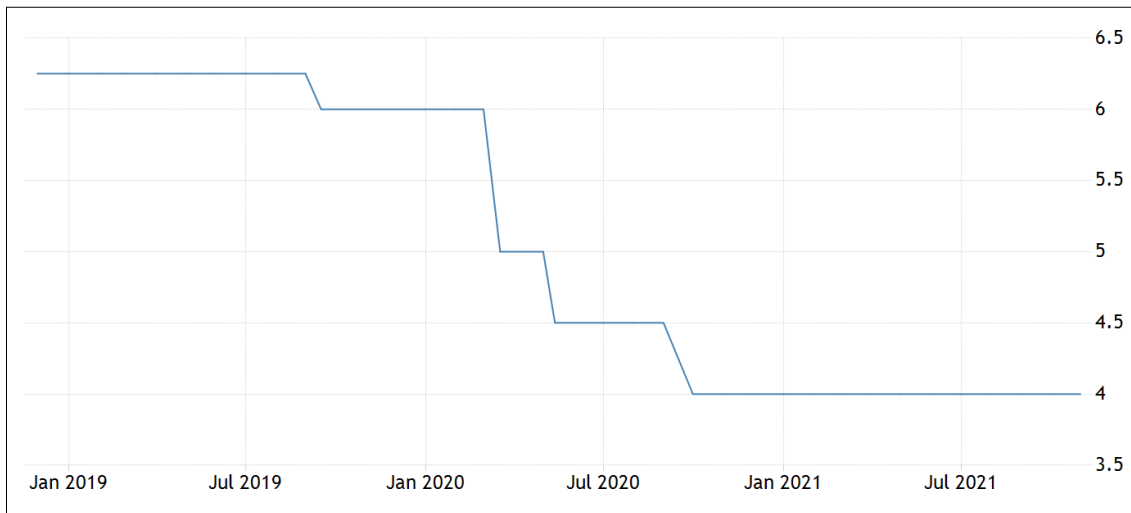
However, the people who received support were mainly from the group of workers belonging to the insured sector, workers who have merit, and poor households. Meanwhile, the workers who were significantly affected are freelance ones, and workers in the informal sector have no access to this support. The implementation of direct support policies has faced a significant barrier because there is no database to manage information about beneficiaries, leading to a complicated application-for-support procedure, bringing inconvenience to people.

In 2021, facing the fourth wave of the pandemic, Viet Nam issued Resolution 68, unveiling financial incentives for employers and employees affected by COVID-19. The support package was worth around 1.13 billion USD.

According to the information released by the government about the results of the implementation of the state budget in 2020 and the estimated state budget in 2021, which has just been sent to the National Assembly, to offset the overspending mainly due to the COVID-19 pandemic, in 2020, the Government actively issued government bonds. Around VND 333,000 billion government bonds were issued to cover the overspending and repay the principal. In 2020, the government extended the maturity of government bonds by more than 3.5 times that in 2011. From 3.9 years (in 2011) to an average of 13.94 years (in 2020), the average debt maturity of the government bond portfolio at the end of 2020 increased to 8.42 years. Moreover, the government mobilized medium- and long-term capital. It did not borrow more from international financial institutions, such as the World Bank and Asian Development Bank, contributing to strengthening the country's credit rating.

Regarding monetary policies, the SBV decided to reduce the operating interest rate, which allows liquidity support for credit institutions and reduces the cost of borrowing capital for businesses and households.

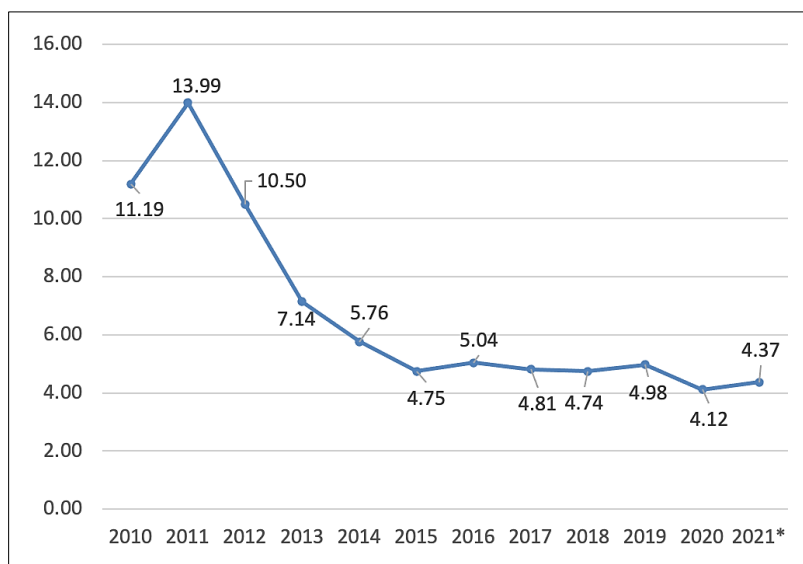
**Figure 8: Operating Interest Rate**



Source: tradingeconomics.com, the State Bank of Viet Nam.

Since December 2019, the SBV has adjusted the operating rate four times, in March, May, and October 2020 (Figure 8). Consequently, the deposit interest rate in VND and the lending rate decreased in 2020 (Figures 9 and 10).

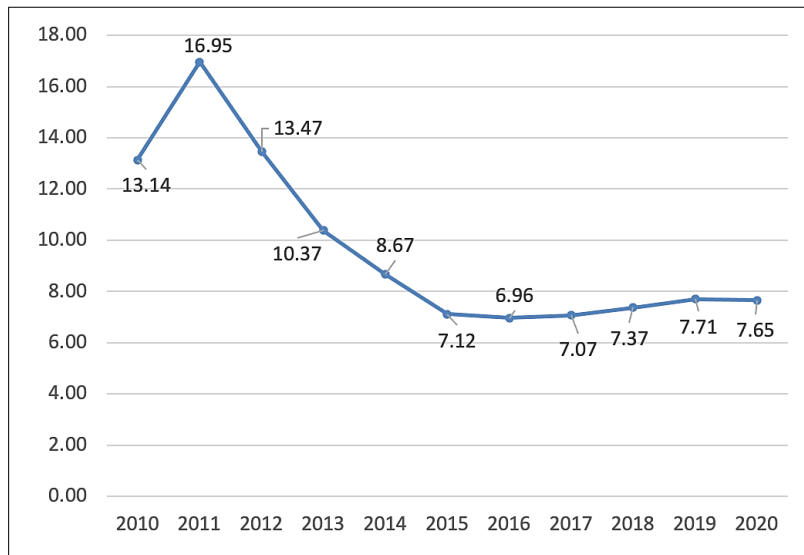
**Figure 9: Deposit Rate, %**



\*: expected.

Source: World Bank.

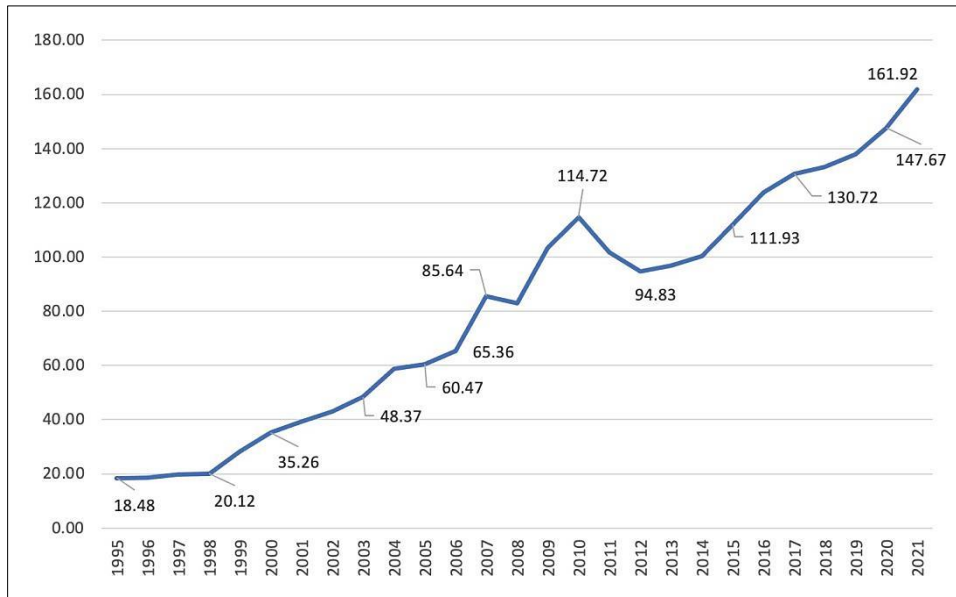
**Figure 10: Lending Rate, %**



Source: World Bank.

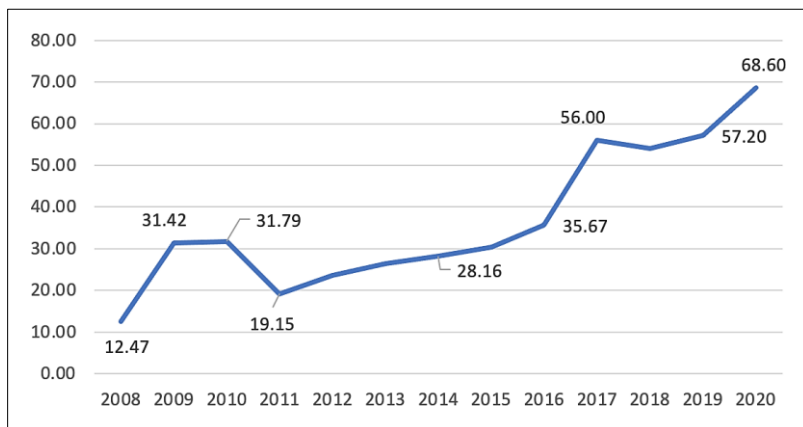
The decline in lending and deposit rates has an impact on the credit and stock markets. Figures 11 and 12 show that the domestic credit and the market capitalization increased strongly at the end of 2020.

**Figure 11: Domestic Credit, %GDP**



Source: World Bank.

**Figure 12: Market Capitalization, %GDP**



Source: World Bank.

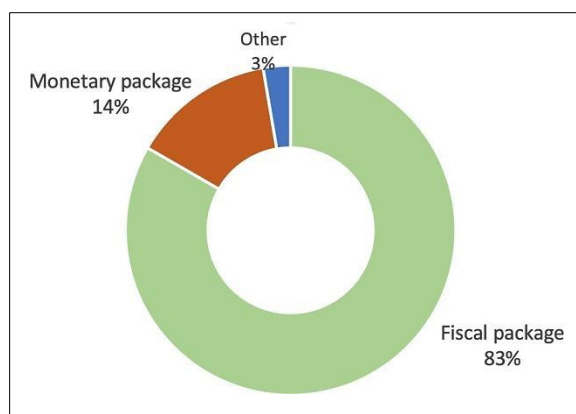
Another monetary policy to support enterprises affected by the COVID-19 pandemic is related to the debt term restructure and loan interest exemption (Circular No. 01/2020/TT-NHNN on 13 March 2020). This policy contributed to controlling bad debts during this period. In addition, the SBV had the credit support policy for the banking sector to balance its capital sources, save operating costs to restructure debt, exempt or reduce loan interests and payment fees, and consider new lending for the production and business of enterprises and households; regularly monitor and evaluate the situation of borrowers to implement support measures promptly and effectively; stabilize deposit and lending interest rates; and respond promptly to people’s payment needs. The credit support package of commercial banks was worth 250,000 trillion VND, according to which banks were committed to implementing credit support packages with per-year interest rates that were 2% lower than before COVID-19. The support package from the Social Policy Bank was worth 16,000 trillion VND and aimed to extend the debt for customers, adjust repayment terms, and issue new loans.

Recently, in January 2022, Viet Nam’s National Assembly approved Resolution 43, which is the post-COVID recovery plan for the Vietnamese economy and focuses on six pillars to revive the economy after the pandemic: (1) circulation of goods and smooth production of enterprises; (2) promotion of manufacturing to restore economic growth; (3) large-scale investment (inter-regional transport infrastructure, green energy, and national digital infrastructure); (4) address the difficulties confronting businesses; (5) institutional reforms; and (6) human resources. This recovery plan sets several policies to support the country in achieving GDP growth of 6.5 to 7% between 2021 and 2025. Under Resolution 43, around US\$15 billion has been approved. It consists of both fiscal and monetary policies (Figure 13). In terms of fiscal policies (Figure 14), a 2% reduction in VAT (from 10% to 8% in 2022 and 2023), as well as CIT deduction for businesses, has been announced. There are different incentive measures. The government has committed VND 14 trillion (US\$620 million) to the health sector, including funds to improve facilities, disease control, hospitals, and human resources related to COVID-19. A fund of around VND 5 trillion (US\$220 million) has been allocated to the Viet Nam Bank for Social Policies for preferential loans, including investments in job training, vocational education, and social security. A package of VND 40 trillion (US\$1.76 billion) takes the form of loans with a rate of 2% a year through commercial banks for various industries to support business households and cooperatives. Furthermore, more than 30% of the recovery package has been allocated to public investment (infrastructure projects in transportation, IT, digitalization,



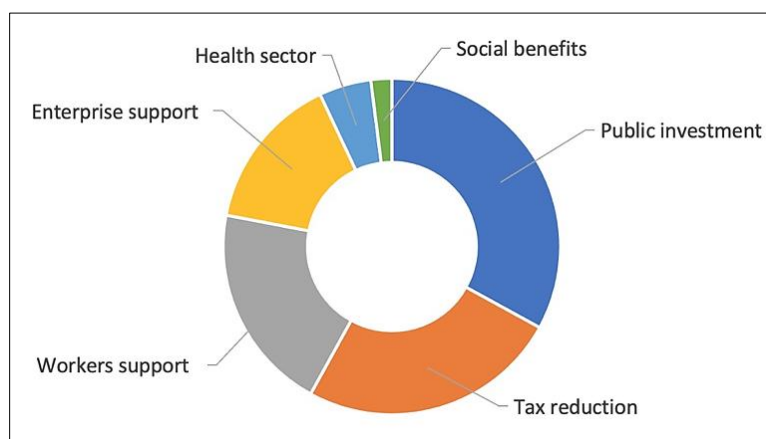
water security, climate change, and natural disasters). Another package of VND 6.6 trillion (US\$2.9 million) for employee housing for those working in industrial zones, export processing zones, and key economic areas has been introduced. The government plans to increase the spending on the healthcare sector, importing of COVID-19 vaccines, and spending on social security. Regarding the monetary policy, the interest rate will be reduced by 0.5–1% in 2022 and 2023 to stimulate investment.

**Figure 13: Total Recovery Package**



Source: MOF.

**Figure 14: Fiscal Package**



Source: MOF.

However, during the COVID-19 pandemic, the government is not only collecting fewer revenues due to the economic slowdown but also spending considerably more to cope with its negative consequences. This public intervention will raise a crucial question about how to finance it. Resolution 43 specifies different financing methods, including government bonds, ODA, and other official loans, meaning that this public financing need is mainly financed by debt. The National Assembly made another Resolution, Resolution 23, in 2021, which fixed the public deficit, public debt, and external debt limit.

The country’s annual public debt ceiling will not exceed 60% of the GDP. The national foreign debt will not be over 50% of the GDP, with a warning level of 45% of the GDP.

### 3.2 Public Debt and Fiscal Sustainability

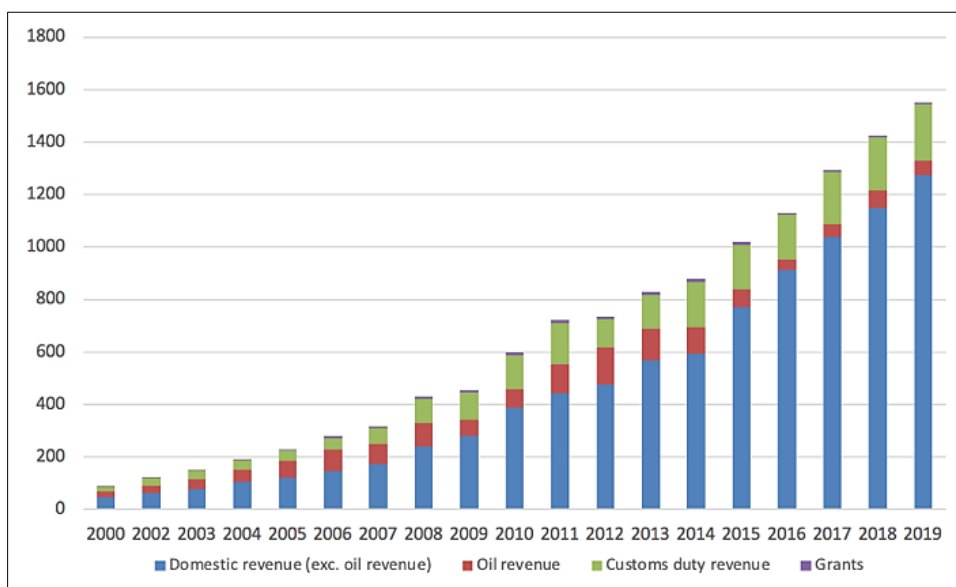
As mentioned above, the COVID-19 crisis has exacerbated the pressure on the country's financing challenges due to significant unexpected public spending. The various measures taken by the government to bring the Vietnamese economy back to its pre-COVID level have raised the concern about public debt management, one of the macroeconomic fundamentals. Hence, it justifies our study examining the effects of the government's responses to cope with COVID-19 on the economy, public debt, and fiscal sustainability. In other words, the pandemic will have a substantial impact on public finances.

The notion of public debt sustainability refers to the fact that public debt cannot continue to increase relative to national income. When public debt increases over several periods, the government must increase future primary surpluses to repay the debt or face default (Oviedo and Mendoza 2004). This means that the government has to increase its revenues (mainly taxes) and/or reduce its spending. This is linked to the government's fiscal policies. However, the government can also rely on the monetary policies implemented by the central bank. The central bank increases the money supply, which leads to higher inflation, and then the real value of public debt declines. However, suppose that the stock of public debt is too large. In that case, it will have a negative impact on the financial markets due to the loss of confidence in/expectations about the government's financial capacity.

Moreover, public debt tends to increase very rapidly after each crisis. Several international organizations have decided to increase loans and provide more financial resources for developing countries to avoid sovereign debt defaults. However, Arquié, Héricourt, and Tripier (2020) insisted that Domestic Resources Mobilization (DRM) is an underused instrument to build the recovery from the pandemic and the road to sustainable development, especially in low- and middle-income countries. For developing countries, due to the difficulties of mobilizing domestic resources for social and investment purposes, it is inevitable that they will rely on foreign aid or other external financing resources. However, to avoid inconsistency with the country's development goals/priorities, DRM is a critical "anchor" for country-led development strategies and contributes to reducing the country's fiscal vulnerability (Napo 2022).

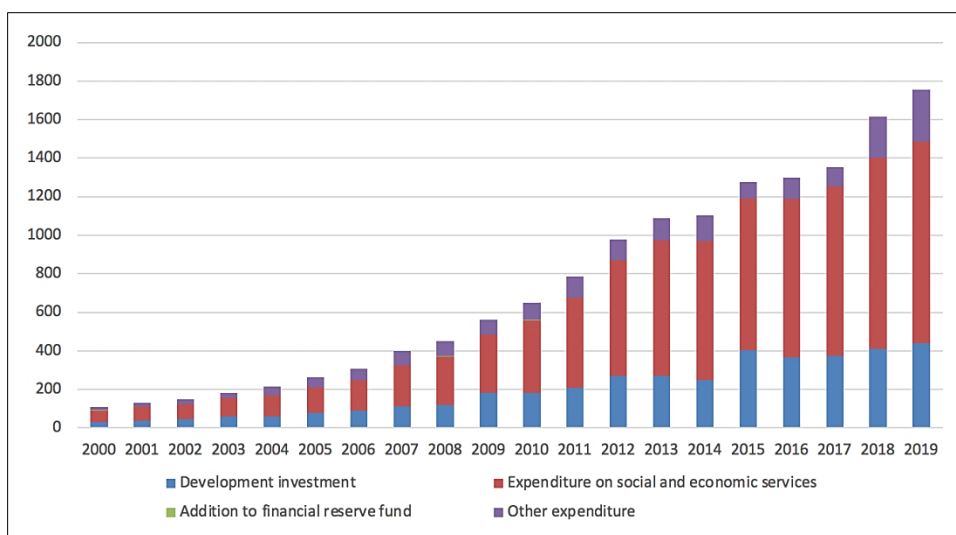
We will now look at the Vietnamese Government's revenues and spending. Figure 15 shows the evolution and composition of the Vietnamese Government's revenue from 2000 to 2019; the state revenue has increased by an average of 17% per year. The state revenue consists of domestic revenue (excluding oil revenue) and external revenue (oil, customs duty, and grants). Domestic revenue accounts for the most significant part of the state budget revenue, contributing to government revenue stability. Value-added tax and corporate income tax are the two most important contributing sources among tax earnings. However, the Vietnamese Government's adoption of the expansionary countercyclical fiscal policy due to slowing economic growth in recent years has led to a lower tax and tariff rate, reducing the state revenue. Personal income tax is increasing, but its part in the total is still moderate due to difficulties in tracking personal earnings in the private sector, and the informal sector remains essential. From 2008 to the present, oil revenue has decreased due to the lower oil price and stagnant crude oil production. It is notable that the recovery plan with a reduction in taxes for businesses will reduce the government's revenues and, thus, affect its fiscal balance.

**Figure 15: Government Revenues**



Source: GSO, MOF.

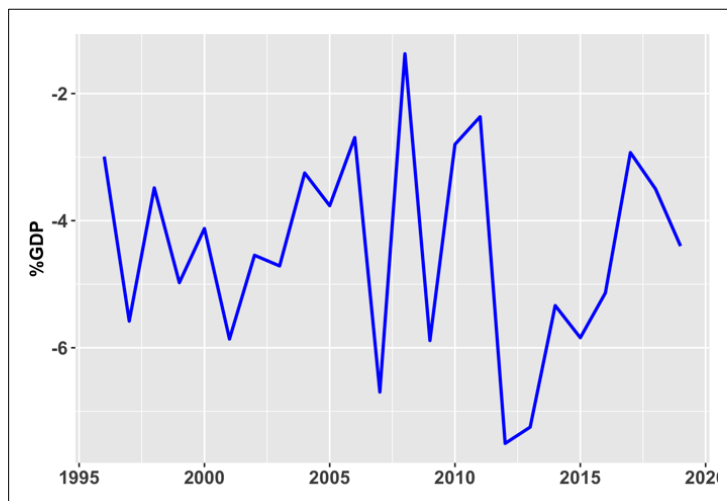
**Figure 16: Government Expenditures**



Source: GSO, MOF.

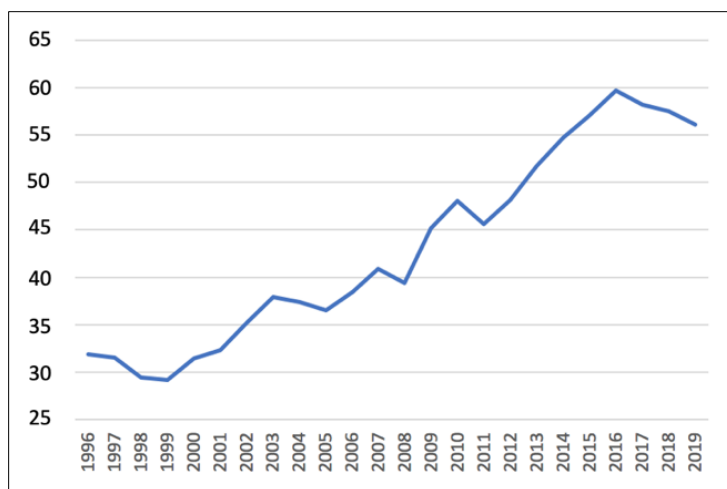
The government’s expenditure grew annually by roughly 17% from 2000 to 2019 (Figure 16). We distinguish between development investment, current spending, additions to the financial reserves fund, and other expenditure. Public investment accounts for 27% of the total expenditure on average but has decreased in recent years. Current spending, which includes social and economic activities (education, health, society, welfare, etc.) and administration, remains the most significant part of the total public spending.

**Figure 17: Public Deficit, %GDP**



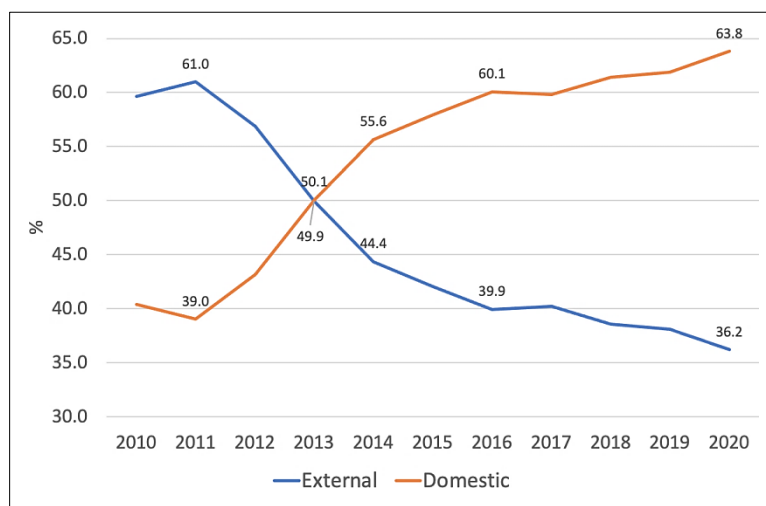
Source: MOF.

**Figure 18: Public Debt**



Source: MOF.

Viet Nam’s fiscal position worsened between 2003 and 2016 due to cyclical and structural factors (Figure 17). The State budget deficit remained at a high level, which caused a rise in public debt and became one of the most significant macro-economic risks facing Viet Nam. Moreover, the public debt ratio is one of the critical indicators of fiscal sustainability. According to the 2009 Law on Public Debt Management, public debt includes government debt, government-guaranteed debt, and debt owed by local authorities. There was a considerable increase in public debt in 2008 and 2012, which corresponded to two stimulus packages of 8 billion dollars in 2009 to deal with the negative impacts of the global financial crisis in 2008 and 1.4 billion dollars in 2013 to deal with the Vietnamese banking crisis in 2011–2012 (Figure 18). Since 2016, the government has improved the budget deficit with a target of under 4% from 2016 to 2020. However, this target is difficult to achieve due to the unexpected adverse shock of the pandemic.

**Figure 19: Structure of Public Debt**

Source: MOF.

Both domestic and international sources can finance the budget deficit. Figure 19 shows that the public domestic debt has sharply increased since the 2010s with the development of the domestic bond market, while the proportion of external debt has gradually decreased. Before 2013, the government financed its deficit mainly by borrowing from abroad. There was considerable currency risk. This led to more prudent policies that reduce external debt rather than domestic debt. Nowadays, domestic debt accounts for more than 60% of public debt.

## 4. MODEL AND SIMULATION

To examine the different consequences of the Vietnamese public intervention to cope with COVID-19 not only for the real side of the economy but also for the financial side, that is, the public deficit and public debt, we rely on the first empirical SFC model for the Vietnamese economy (Nguyen et al. 2021). This model allows the integration of both financial and real variables, unlike existing macroeconomic models of Viet Nam. We will describe only the main variables and equations that are relevant to the objectives of this paper.<sup>1</sup>

### 4.1 Model

The empirical stock-flow-consistent model for the Vietnamese economy employed in this paper contains six sectors: (1) firms; (2) the central bank; (3) commercial banks; (4) the government; (5) households; and (6) the rest of the world. Due to the availability, it includes relevant financial instruments: (i) international reserves; (ii) cash; (iii) dong deposits; (iv) foreign deposits; (v) bonds; (vi) loans; (vii) foreign loans; (viii) equity; and (ix) foreign direct investment. The model was developed based on the accounting framework, including the balance sheet and the transaction flow matrix. These two matrices were built by relying on the 2008 International Guidelines of System National Accounting (UN 2009) and collecting data from different sources (Appendix B).

<sup>1</sup> A full description of the model can be found in Nguyen et al. (2021).

The balance sheet (Table A1) represents the economy's financial structure by displaying each institutional sector's financial stocks and liabilities. A positive sign means an asset, and a negative one means a liability of the sector holder. The difference between assets and liabilities gives the net worth of the institutional sector. According to the stock consistency principle, for each financial instrument, the sum of the value of assets should be equal to that of liabilities. Consequently, the total net worth of the economy is equal to the value of the non-financial assets.

All flows can be represented in table form, as shown in Table A2. Firstly, each sector's net lending/borrowing position must correspond to the investment flows and, hence, the stock (holdings) of net financial assets/liabilities. Secondly, the financial liabilities for one sector must imply (interest or dividend) payments to the sector holding the corresponding assets. These accounting consistencies allow us to see how agents' decisions in the real economy will affect their assets/liabilities and how these changes in the balance sheet will provide feedback on their decisions above. In the TFM, the plus sign denotes the sources of funds (inflows), and the minus one is for uses of funds (outflows). The horizontal flow consistency implies that the sources have to correspond to the uses of funds for each type of transaction. In other words, the sum of each transaction row is equal to zero. In addition, the vertical flow consistency requires that the sum of each column of the table is equal to zero. This means that the net financing capacity/need leads to changes in the different financial assets held by each institutional sector.

The economy is demand led. The real GDP ( $y_t$ ) is defined as the sum of household consumption ( $c_t$ ), government current expenditures ( $g_t$ ), private and public investment ( $i_t^f, i_t^g, i_t^h$ ), net exports ( $x_t - im_t$ ), and changes in inventories ( $i_{12t}$ ).

$$y_t = c_t + g_t + i_t^f + i_t^g + i_t^h + i_{12t} + x_t - im_t \quad (1)$$

## Households

Vietnamese households use their disposable income to consume, invest, and accumulate financial assets in the form of deposits, government bonds, firm equity, or other financial assets. Households can also borrow from commercial banks to meet their financing needs.

The gross disposable income of households ( $YD_t^h$ ) consists of mixed income from production, domestic and foreign wages, government transfers, remittances, and received interest on assets, less their social contribution and income taxes, which are a proportion of their income, profit taxes, which are levied on a proportion of households' profit, interest paid on loans, and transfers abroad.

Following Kalecki (1971), household consumption is partially induced and includes two components: consumption out of wages and consumption out of profits. Thus, in our model, we propose one consumption that consists of three parts. The first term corresponds to the autonomous component. The two others represent induced elements that depend on the current real disposable income ( $\frac{YD_{t-1}^h}{p_{C_{t-1}}}$ ) and the accumulated wealth of households over time ( $\frac{NW_{t-1}^h}{p_{C_{t-1}}}$ ).

$$\Delta \ln(c_t) = \delta_1 * \Delta \ln\left(\frac{NW_{t-1}^h}{p_{C_{t-1}}}\right) + \delta_2 * \Delta \ln\left(\frac{YD_{t-1}^h}{p_{C_{t-1}}}\right) + \delta_3 * v_{C_{t-1}} \quad (2)$$

$$vc_{-1} = \ln(c_{t-1}) - \delta_0^c - \delta_1^c * \ln\left(\frac{YD_{t-2}^h}{p_{c_{t-2}}}\right) - \delta_2^c * \ln\left(\frac{NW_{t-2}^h}{p_{c_{t-2}}}\right)$$

where  $p_{c_t}$  is the price of consumption.

Households' investment is modeled as a function of their net wealth ( $\frac{NW_{t-1}^h}{p_{c_{t-1}}}$ ) and the real interest rate ( $r_{l_{t-1}} - r_{l_{t-1}}$ ), which represents the cost of borrowing. We expect that higher net wealth will increase households' investment. Following an increase in the real lending rate, households will reduce their investment.

$$\frac{\Delta k^h}{k_{t-1}^h} = \zeta_0^h * \frac{\Delta k_{t-1}^h}{k_{t-2}^h} + \zeta_1^h * \Delta \ln\left(\frac{YD_{t-1}^h}{p_{c_{t-1}}}\right) + \zeta_2^h * r_{l_t} + \zeta_3^h * \frac{F_{t-1}^h}{K_{t-2}^h} \quad (3)$$

If a household's investment is larger (smaller) than its savings ( $S^h$ ) after consumption, it represents a financing need (capacity), which is one of the factors driving the household's financial asset allocation. Households can hold cash, dong deposits, foreign deposits, government bonds, and equities as assets. Households' financing capacity is given by:

$$NFC_t^h = S_t^h - p_{c_t} c_t - p_{K_t} i_t^h \quad (4)$$

Commercial banks impose credit rationing on households' loan demand ( $\Delta L^h$ ), which is a function of their investment, and the lending rate ( $r_{l_{t-1}}$ ), which represents the cost of borrowing to meet their financing need.

$$\Delta \ln(L_t^h) = \chi_0 + \chi_1 * \Delta \ln(L_{t-1}^h) + \chi_2 * \Delta \ln(r_{l_{t-1}}) + \chi_3 * \frac{\Delta k_{t-1}^h}{k_{t-2}^h} \quad (5)$$

The level of credit rationing depends on the debt-to-income (DTI) ratio, calculated as the ratio of the interest payments and the new debt to the primary income. In our model, we suppose that banks will not provide loans to households if the DTI is higher than 0.4, which means 40% of the household's primary income.

Households' demand for different financial assets is based on the portfolio theory, which argues that households are faced with the choice of allocating their savings. Vietnamese households mainly use cash ( $\Delta H$ ) for their consumption ( $C$ ). They also have the choice to deposit in commercial banks and receive interest instead of holding cash. The changes in cash are thus determined by:

$$\ln(H_t) = \delta_0^h + \delta_1^h * \ln(C_t) + \delta_2^h * \ln(r_{m_t}) \quad (6)$$

where  $r_{m_t}$  is the deposit rate.

We suppose that households hold an exogenous part of the total bonds issued by the government ( $\Delta B^h$ ). The change in other financial accounts ( $\Delta OTA^h$ ) is exogenously determined. In addition, households absorb the supply of equity from firms and banks in excess of demand by the rest of the world ( $\Delta E^h$ ). The change in dong deposits ( $\Delta DM^h$ ) held by households is determined as the residual.

$$\Delta DM_t^h = \Delta L_t^h - \Delta H_t - \Delta B_t^h - p_{E_t} \Delta E_t^h - \Delta OTA_t^h - NFC_t^h \quad (7)$$

A household's net wealth is defined as:

$$NW_t^h = p_K k_t^h - L_t^h + H_t + B_t^h + p_{E_t} E_t^h + OTA_t^h \quad (8)$$

### Firms

Firms' gross operating surplus (i.e., profits) ( $F_t^f$ ) is the difference between the value added from the production and the wages and labor contributions. To calculate this, we have to deduct indirect taxes.

Firms' net investment is represented here as a fixed capital accumulation rate ( $\frac{\Delta k^f}{k_{t-1}^h}$ ). It is modeled as a function of a constant that reflects animal spirits, the real lending rate ( $r_{l_t} - \pi_t$ ), representing the financial condition or cost of borrowing, and the capacity utilization rate (Bhaduri and Marglin 1990), which is proxied by the ratio of the actual GDP to the potential GDP. A high capacity utilization rate will lead firms to raise their capital stock by increasing their investment. The cost of financing investment by bank loans has a negative impact on capital accumulation. The accumulation of capital also depends on the rate of profit (Kalecki 1971), which is defined as the gross operating surplus divided by the previous stock of capital ( $\frac{F_{t-1}^f}{K_{t-2}^f}$ ), and the financial profitability is represented as the change in the equity price ( $\frac{\Delta p_{E_t}}{p_{E_{t-1}}}$ ).

On the one hand, the profit rate is essential for capital accumulation, given that profit is the primary objective of firms' investment. On the other hand, the Kaleckian concept of macroeconomic demand emphasizes the period of financialization of modern capitalism. Financialization has had effects on (1) income distribution, (2) investment in capital stock, (3) consumption, and (4) current account imbalances (Hein 2012). Financialization has coincided with lower investment in capital stock. Investors tend to shift from long-run growth objectives to short-term profitability through financial activities. Thus, financialization has decreased investment.

$$\frac{\Delta k^f}{k_{t-1}^h} = \varsigma_0 * \frac{\Delta k_{t-1}^f}{k_{t-2}^f} + \varsigma_1 * \frac{y_{t-1}}{y_{t-1}^*} + \varsigma_2 * (r_{l_t} - \pi_t) + \varsigma_3 * \frac{F_{t-1}^f}{K_{t-2}^f} + \varsigma_4 * \frac{\Delta p_{E_t}}{p_{E_{t-1}}} \quad (9)$$

In our model, we suppose that firms can finance their investment by issuing equities ( $e^f$ ) held by households and the rest of the world (ROW), borrowing from domestic banks or abroad, and via FDI. The foreign debt of firms is a function of the interest rate differential corrected by the exchange rate variation. It also depends on the firms' investment. Thus, firms' demand for foreign debt can be written as follows:

$$\Delta \ln(FL_t^f) = \tau_1^{f lf} * (r_{l_t} - r_{l_t}^{us} - \frac{\Delta x r_t}{x r_{t-1}}) + \tau_2^{f lf} * (r_{l_{t-1}} - r_{l_{t-1}}^{us} - \frac{\Delta x r_{t-1}}{x r_{t-2}}) + \tau_3^{f lf} * \frac{\Delta y_{t-1}}{y_{t-2}} \quad (10)$$

Firms can also finance their investment needs by borrowing from commercial banks. The demand for loans from banks depends mainly on the cost of borrowing, which is the lending rate ( $r_{l_t}$ ). It also depends on the degree of indebtedness, which is represented by the ratio between the loan amount and the firm's net wealth ( $\frac{L_{t-1}^f}{NW_{t-1}^f}$ ).

$$\Delta \ln(L_t^{fD}) = \tau_0^{lf} + \tau_1^{lf} * \frac{L_{t-1}^f}{NW_{t-1}^f} + \tau_2^{lf} * \Delta \ln(L_{t-1}^f) + \tau_3^{lf} * \Delta \ln(r_{l_t}) \quad (11)$$



As commercial banks impose credit rationing on firms' loans, they decide the level of the lending amount to firms based on the loan-to-value (LTV) ratio. This measures the relationship between the loan amount and the value of the non-financial and financial assets securing the loan. As the LTV increases, it creates more risks for the firms. In our model, we suppose that the LTV ratio is calculated by dividing the amount borrowed by the firm's net wealth value. According to several commercial banks in Viet Nam, the LTV ratio for firms ( $LTV^f$ ) is limited to 70%. Commercial banks will satisfy firms' demand for loans if their  $LTV^f$  is under 70%.

The newly issued equities of firms depend on the financing need from their investment and the lending rate, which is the borrowing cost.

$$\Delta E_t^f = \tau_0^{ef} + \tau_1^{ef} * \Delta E_{t-1}^f + \tau_2^{ef} * i_t^f + \tau_3^{ef} * r_{t-1} \quad (12)$$

We can note that the lending rate plays a crucial role in firms' financing decision. It represents one of the mechanism transmission channels of the monetary policy.

### Central Bank and Commercial Banks

According to the Law on the State Bank of Viet Nam in 2010, the State Bank of Viet Nam (SBV) (i) performs the state management of monetary and banking activities and foreign exchange; (ii) issues money, acts as the bank of credit institutions, and provides monetary services for the government; and (iii) carries out the state management of public services under the jurisdiction of the State Bank. The objectives of the SBV are inflation control, stabilizing the macro-economy, supporting economic growth, and ensuring the liquidity of credit institutions. The SBV can use a set of tools to achieve these objectives, including interest rates tools, exchange rates, reserve requirements, open market operations, and other tools. Depending on the macroeconomic conditions, the SBV will use different tools. In our model, we suppose that the central bank determines the refinancing rate as a monetary policy tool and the bank's reserves.

The refinancing rate or the interest rate of credit from the central bank to commercial banks is considered as one of the monetary policy tools. Indeed, the State Bank of Viet Nam determined the objectives and the significant measures on monetary policy management as follows: "manage the monetary policy in a proactive and flexible manner in close association with the fiscal policy to control inflation, stabilize macro-economy, support economic growth at a reasonable level, and ensure the liquidity of credit institutions. Flexibly manage the reasonable interest and exchange rates by macro-economic and monetary developments, especially inflation; and ensure the value of Viet Nam dong, continue to restrict the dollarization and goldarization." Therefore, the refinancing rate is a function of inflation and the exchange rate. Moreover, the United States' interest rate affects developing countries' interest rates. When the Fed raises interest rates, investors tend to sell assets denominated in foreign currencies and buy dollar-denominated assets. The wider the spread between US interest rates and interest rates in other countries, the more investors are likely to move from foreign-denominated to dollar-denominated assets. This increased demand for dollars raises the dollar exchange rate, and other countries' currency exchange rates tend to weaken. This raises the prices of imports to those countries, pushing up inflation. A falling exchange rate can make it difficult for companies and governments to service dollar-denominated debt. The central bank may decide to support their currency exchange rates by raising interest rates to solve this problem.

$$\Delta \ln(r_t^{cb}) = \beta_0 * \Delta \ln(xr_t) + \beta_1 * (r_t^{us} - r_t^{cb}) + \beta_2 * vc_{-1} + \beta_3 * \Delta \ln(r_{t-1}^{cb}) \quad (13)$$

$$vc_{-1} = \ln(r_{t-1}^{cb}) - \beta_0^l - \beta_1^l * \pi_{t-1}$$

The Vietnamese financial system has developed since the 1990s with the transformation of the banking system from one tier to two tiers, consisting of the SBV as a central bank and commercial banks, and the development of equity and bond markets to facilitate access to finance for firms in the economy. The deposit to GDP and credit to GDP have increased sharply since 1999. The market capitalization rose dramatically in 2007. However, there was a reduction during the global financial crisis in 2008–2009 and the Vietnamese banking crisis in 2011, but it has recovered rapidly since 2012. Commercial banks finance the economy by offering credit to firms and households in our model. We also try to model the credit rationing for firm and household loans, representing a financial constraint on the sectors. The lending and deposit rates are determined based on the central bank's interest rates. In other words, the refinancing rate is a monetary policy mechanism via commercial banks. The banks determine the lending rate based on it. Indeed, the lending rate will affect the investment of sectors and then the global demand of the economy.

$$\Delta \ln(r_t) = \varpi_0 * \Delta \ln(r_{t-1}) + \varpi_1 * \Delta \ln(r_t^{cb}) + \varpi_2 * vc_{-1} \quad (14)$$

$$vc_{-1} = \ln(r_{t-1}) - \varpi_0^{rl} - \varpi_1^{rl} * \ln(r_{t-1}^{cb})$$

The deposit rate also depends on the central bank's refinancing rate.

$$\Delta \ln(r_m) = \omega_0 * \Delta \ln(r_t^{cb}) + \omega_1 * \Delta \ln(r_{t-1}^{cb}) + \omega_2 * vc_{-1} \quad (15)$$

$$vc_{-1} = \ln(r_{m,t-1}) - \omega_0^{rm} - \omega_1^{rm} * \ln(r_{t-1}^{cb})$$

The central bank plays the role of a lender of last resort by purchasing all the remaining government bonds. In reality, the State Bank of Viet Nam purchases government bonds not directly but indirectly from commercial banks (mainly in repo contracts). However, our model simplifies this in that the central bank buys the remaining government bonds. In other words, the central bank absorbs the remaining supply of government bonds in excess of the demand from banks and households.

$$\Delta B_t^{cb} = \Delta B_t - \Delta B_t^b - \Delta B_t^h \quad (16)$$

The central bank intervenes in the foreign exchange market to respond to the changes in the exchange rate. Following ILO (2018), the change in international reserves will be a function of the nominal exchange rate and the ratio between the previous level of international reserves and the level of nominal GDP.

$$\Delta \ln(RES_t) = \gamma_0 + \gamma_1 * \Delta \ln(RES_{t-1}) + \gamma_2 * \Delta \ln(xr_t) + \gamma_3 * \frac{RES_{t-2}}{Y_{t-2}} \quad (17)$$

The central bank plays the role of a lender of last resort via refinancing for commercial banks.

$$\begin{aligned} \Delta LB_t^{cb} = & -(NFC_t^b - \Delta MB_t^{cb} + \Delta DM_t + \Delta GM_t^b - \Delta B_t^b - \Delta L_t + \Delta FL_t^b \\ & + p_{E_t} \Delta E_t^b - \Delta OTA_t^b) \end{aligned} \quad (18)$$

where  $NFC_t^b$  is the bank's financing needs.

### Government

The government collects taxes, receives other transfers or payments, and then consumes and invests. The public deficit is the difference between the government's revenues and the total expenditures in the model.

$$NFC_t^g = GOV_{REV_t} - GOV_{EXP_t} \quad (19)$$

Following the uses–resources table (see the Appendix), the total government revenues are determined by the government value added from the production ( $VA_t^g$ ), social contributions ( $SOC_t$ ), tax revenues (taxes on production ( $TOP_t$ ), taxes on imports ( $TIM_t$ ), profit taxes ( $TP_t$ ), and personal income taxes ( $DT_t$ )), property incomes ( $ITGM_t$ ), and the central bank's profit ( $F_t^{cb}$ ).

$$GOV_{REV_t} = VA_t^g + SOC_t + TOP_t + TIM_t + TP_t + DT_t + ITGM_t + F_t^{cb} \quad (20)$$

The total government expenditures are the sum of the government current spending ( $GOV_{CE_t}$ ), public investment ( $p_K i_t^g$ ), and interest payments ( $ITB_t, r_{fl_t} FL_t^g$ ).

$$GOV_{EXP_t} = GOV_{CE_t} + ITB_t + r_{fl_t} FL_{t-1}^g + p_K i_t^g \quad (21)$$

The government's current spending consists of government wages ( $WB_t^g$ ), labor contributions ( $\alpha^g WB_t^g$ ), and social benefits for households ( $SBE_t$ ) and public consumption.

$$GOV_{CE_t} = WB_t^g + \alpha^g WB_t^g + SBE_t + p_{G_t} * g_t \quad (22)$$

The change in public debt is determined by the government's net borrowing/lending position. Given the financing need of the government, the new public debt is determined by:

$$\Delta DEBT_{G_t} = NFC_t^g - \Delta OTA_t^g - \Delta GM_t^{cb} - \Delta GM_t^b - \Delta FM_{us_t}^g x r_t \quad (23)$$

For simplicity, we assume that the government can finance the public deficit by issuing bonds (representing the domestic debt) or borrowing from abroad (the external debt). The government can borrow from abroad or issue bonds to meet its financing need. We assume that the government's foreign loans are exogenous, representing part of the public debt. Thus, the government's stock of foreign loans is expressed as a function of the public debt of the past period.

In terms of modeling implications, we assume that external debt represents an exogenous part of public debt. Hence, when we perform a simulation, we can limit the percentage of external public debt in the total public debt.

$$FL_t^g = \gamma_{FLG} * DEBT_{G_{t-1}} \quad (24)$$

The newly issued bonds of the government are given by:

$$\Delta B_t = \Delta DEBT_{G_t} - \Delta FL_t^g \quad (25)$$

The public debt stock is calculated by cumulating the net flows to the previous period's value and adjusting for the exchange rate variation in the external debt.

$$DEBT_{G_t} = DEBT_{G_{t-1}} + \Delta DEBT_{G_t} + FL_{us_t}^g \Delta xr_t \quad (26)$$

The rate of return of bonds is a function of inflation and the ratio of bonds to the GDP. It depends positively on the inflation rate and the public deficit (Peiris 2013).

$$\Delta \ln(r_{b_t}) = \varphi_0 * \Delta \ln(r_{b_{t-1}}) + \varphi_1 * \Delta \ln(r_t^{cb}) + \varphi_2 * \Delta \ln(r_{t-1}^{cb}) + \varphi_3 * \frac{NFC_{t-1}^g}{Y_{t-1}} \quad (27)$$

### Rest of the World

The external imbalances reflect the financing need of the economy to fund domestic consumption and investment through different forms of financial flows. Before 2005–2006, Viet Nam registered a negative current account, mainly driven by a deficit in the trade balance. The high domestic demand was satisfied by imports. Moreover, the global financial crisis of 2007–2008 caused a reduction in the world demand, which decreased Vietnamese exports and led to a more significant trade deficit. However, since 2012, the current account has become positive, resulting from a trade balance and a secondary income surplus offsetting the deficit in the primary income balance.

The volume of exports is assumed to be determined by the total volume of imports of Viet Nam's main commercial partners, the level of domestic production, and the FDI.

$$\begin{aligned} \Delta \ln(x_t) = & \theta_0^x + \theta_1^x * \Delta \ln(x_{t-1}) + \theta_2^x * \Delta \ln(im_t^{PTN}) + \theta_3^x * \Delta \ln(FDI_{t-2}) \quad (28) \\ & + \theta_4^x * \Delta \ln\left(\frac{p_{x_t}}{p_{x_t}^*}\right) + \theta_5^x * \Delta \ln(xr_{t-1}) \end{aligned}$$

The volume of imports is defined by the domestic demand, the FDI, and the ratio between the import price and the domestic price ( $\frac{p_{IM_{t-2}}}{p_{Y_{t-2}}}$ ). In the long run, the domestic demand exerts a positive impact on imports. However, the fall in consumption prices relative to import prices will reduce Vietnamese imports.

$$\Delta \ln(im_t) = \iota_0 + \iota_1 * \Delta \ln(im_{t-1}) + \iota_2 * vc_{-1} \quad (29)$$

$$vc_{-1} = \ln(im_{t-1}) - \iota_0^{im} - \iota_1^{im} * \ln(DMD_{t-2}) - \iota_2^{im} * \ln\left(\frac{p_{IM_{t-2}}}{p_{Y_{t-2}}}\right) - \iota_3^{im} * \ln\left(\frac{FDI_{t-2}}{Y_{t-2}}\right)$$

The domestic demand is the sum of intermediate consumption and final consumption.

$$DMD_t = ic_t + c_t + i_t^f + i_t^g + i_t^h + g_t \quad (30)$$

The net financing capacity of the rest of the world, which corresponds to the current account balance in the balance of payments, is the sum of the three balance items above (trade balance, primary income, and secondary income). Moreover, the rest of the world's net financing capacity (needs) should equal the net domestic financing capacity (needs).

$$NFC_t^r = -(NFC_t^f + NFC_t^p + NFC_t^g + NFC_t^h) \quad (31)$$

The financial account represents the financial side of the current account. A large deficit current account can face the critical question of external debt sustainability and can be exposed to the risk of sudden stops. In Viet Nam, capital mainly flows into the country in the form of foreign direct investment and portfolio equity investment.

The primary income account records the compensation of employees paid by the rest of the world ( $WB_t^r$ ) and net property income from abroad, which include interest on foreign loans ( $ITFL_t$ ) and dividends ( $DIV$ ). The secondary income account registers all transfers of both private and public sectors with the rest of the world ( $TR_{gt}^r, TR_{rt}^p, TR_{pt}^r$ ).

The nominal exchange rate is determined mainly by the disequilibrium of foreign exchange demand and supply (Charpe et al. 2011). When the demand is higher than the supply, the nominal exchange rate will increase and vice versa.

$$\Delta \ln(xr_t) = \alpha_0 + \alpha_1 * \Delta \ln(xr_{t-1}) + \alpha_2 * (r_t^{us} - r_t^{cb}) + \alpha_3 * \frac{D_{t-1}^{FX} - S_{t-1}^{FX}}{S_{t-1}^{FX}} \quad (32)$$

The foreign exchange demand is given by:

$$D_{t-1}^{FX} = im_t * p_{IM_t} + ITFL_t + DIV_t + TR_{pt}^r + \Delta FM_t - \Delta RES_t \quad (33)$$

The foreign exchange supply is given by:

$$S_{t-1}^{FX} = x_t * p_{X_t} + WB_t^r + TR_{rt}^g + TR_{rt}^p + \Delta FL_t + p_{E_t} \Delta E_t^r + \Delta FDI_t \quad (34)$$

## Prices and Wage Rate

The GDP deflator is a function of the wage rate and the price of imports. In other words, inflation incorporates the cost push determinants, such as the wage rate and the price of imports, representing the cost of imported goods used for intermediate consumption. Moreover, it allows the prices of both locally produced and imported goods and services to be taken into account (World Bank 2019).

$$\begin{aligned} \Delta \ln(p_{Y_t}) &= \xi_1 * \Delta \ln(p_{Y_{t-1}}) + \xi_2 * \Delta \ln(p_{IM_t}) + \xi_3 * \Delta \ln(w_{t-1}) \\ &+ \xi_4 * vc_{-1} + \xi_5 * \frac{y_{t-1}}{y_{t-1}^*} \end{aligned} \quad (35)$$

$$vc_{-1} = \Delta \ln(p_{Y_{t-1}}) - \xi_0^{py} - \xi_0^{py} * \Delta \ln(w_{t-2}) - \xi_0^{py} * \Delta \ln(p_{IM_{t-1}})$$

Given that Viet Nam is the price taker, the price of imports depends on the import prices of the world and the exchange rate.

$$\begin{aligned} \Delta \ln(p_{IM_t}) &= v_1 + v_2 * \Delta \ln(p_{IM_{t-1}}) + v_3 * \Delta \ln(p_{IM_t}^*) + v_4 * \Delta \ln(p_{IM_{t-1}}^*) \\ &+ v_5 * vc_{-1} \end{aligned} \quad (36)$$

$$vc_{-1} = \ln(p_{IM_{t-1}}) - v_1^{pim} * \ln(xr_{t-2}) - v_2^{pim} * \Delta \ln(p_{IM_{t-2}}^*)$$

The wage rate depends on the unemployment rate, the price of consumption, and labor productivity. Given the important share of the informal sector and self-employment, the unemployment rate is assumed to be exogenous.

$$\Delta \ln(w_t) = \vartheta_1^w * \Delta \ln(p_{c_{t-1}}) + \vartheta_2^w * \Delta \ln\left(\frac{y_t}{NBW_t}\right) + \vartheta_3^w * vc_{-1} \quad (37)$$

$$vc_{-1} = \ln(w_{t-1}) - \vartheta_0 - \vartheta_1 * \Delta \ln(p_{c_{t-2}}) - \vartheta_2 * \ln(U_{t-2}) - \vartheta_3 * \ln\left(\frac{y_{t-1}}{NBW_{t-1}}\right)$$

## 4.2 Simulation

### Data

We use the annual data from 1996 to 2019 to estimate the behavioral equations to simulate the model. Most behavioral equations are based on OLS estimations or vector error correction models (VECMs), leading to the corresponding error correction mechanisms (ECMs) for each specification. VECM estimates and ECM estimates represent long-run and short-run interpretations, respectively. We choose explicative variables in each equation based on theoretical and empirical arguments to avoid fallacious models. However, they should also verify the statistical validity condition. Some significant structural breaks are also considered in the model by adding dummy variables. The estimation results of the main variables will be presented in Appendix C.

### Baseline Scenario

To simulate different scenarios, we define the baseline scenario by projecting our exogenous variables into the future, representing the socio-economic development trends of Viet Nam and the world. For the sake of simplicity, all the estimated parameters remain constant during the period of projection. Table 1 represents the key features of the baseline scenario.

The population growth rate is taken from the United Nations population projections for Viet Nam. The capital depreciation rates are taken from the IMF Investment and Capital Stock Dataset 2019. As mentioned above, due to the large share of informal and self-employment in the Vietnamese economy and the low unemployment rate in the past, we assume that the unemployment rate remains constant at 2%. However, to capture the impact of the COVID-19 pandemic without public intervention, we take the value of unemployment in 2020 and 2021 of the GSO. We take the projection of the share of public investment and public expenditures from the Debt Sustainability Analysis of the IMF (2019) for Viet Nam.

**Table 1: Main Assumptions for Exogenous Variables**

Variables	Projections
Population in 2040	United Nation's population projections for Viet Nam (downward trend)
Unemployment rate	2.39% in 2020; 3.72% in 2021; and 2% for the remaining period
Capital depreciation	Value in 2019
Share of public expenditures	Value in 2019
Share of public investment	Value in 2019
Growth rate of world GDP	-3.27% in 2020; 6.03% in 2021; and SSP projections
Demand for real imports of trading partners	OECD's projections
US interest rate	FED's forecasts for the interest rate

In our model, we have several variables reflecting the behavior of the foreign markets. For the growth rate of the world GDP, we take the World Economic Outlook for 2020 and 2021 to consider the reduction of world demand during the COVID-19 pandemic and the quantitative projections of the so-called shared socioeconomic pathways (SSPs) for the remaining period of simulation. The demand for real imports from trading partners is based on the OECD's projections. The US interest rate is taken from the FED's interest rate forecasts.

### **Public Intervention Simulation**

To address our main research question on the effects of the policy responses to cope with the COVID-19 pandemic, we implement a simultaneous shock representing the stimulus package and recovery plan. In other words, the effects of the public intervention will be simulated by changing the parameters related to the policy variables. The baseline scenario is the scenario without public intervention, and the alternative scenario considers the stimulus package and recovery plan. It consists of both fiscal and monetary policies. In terms of modeling implications, we integrate an increase in the government's final consumption, an increase in public investment, an increase in transfers from the government to households, and the reduction of the central bank's interest rate during the period 2020–2023. The values of these shocks are taken based on the actual value of the fiscal stimulus and the government's recovery plan to replicate reality as far as possible.

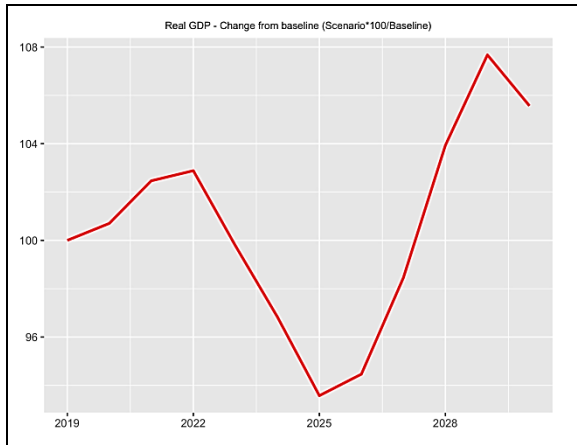
We will examine the effects of these public interventions on the COVID-19 pandemic. We will present the impact first on the variables of the demand side, such as the GDP, consumption, and investment, and then on the variables of the financial side, which are the public deficit and public debt.

## **5. FINDINGS AND DISCUSSION**

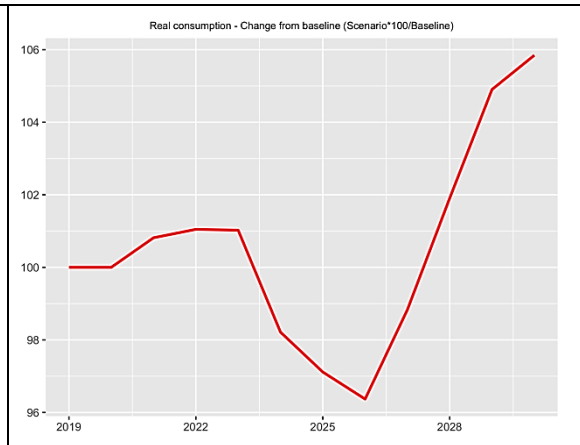
We present the relevant results of these public interventions in the COVID-19 pandemic and then provide key insights from the study. On the demand side, firstly, an increase in public consumption and public investment can contribute directly to the GDP but with a slight delay due to the adaptive expectations in the production decision (Figure 20). Secondly, the fiscal expansion will increase the transfers to households, stimulating their disposable incomes, which in turn results in a relative increase in their consumption (Figure 21) and investment (Figure 23). Thirdly, reducing the central bank's interest rate will reduce the lending rate (Figure 26) and the cost of borrowing for firms and households. This explains the increase in firms' investment (Figure 22).

After the public intervention during 2020–2023, the real GDP returns to the baseline scenario and declines during the next period, which can mainly be explained by the negative impact on the country's trade balance. By 2025, the economy can enter a new cycle.

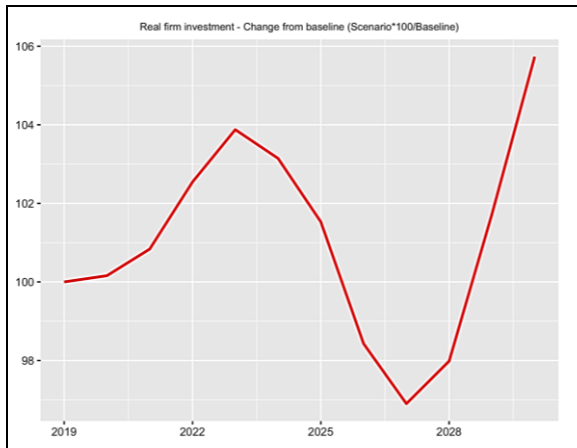
**Figure 20: Real GDP**



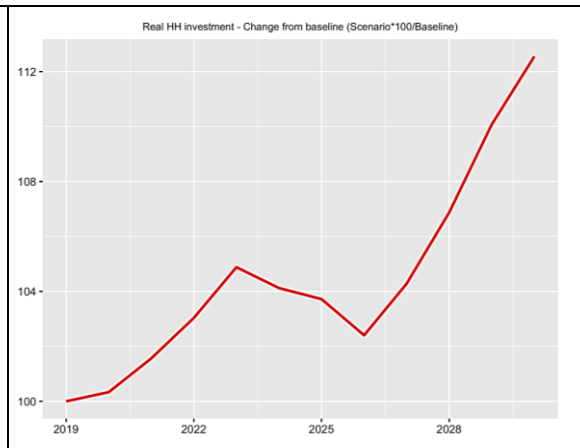
**Figure 21: Real Consumption**



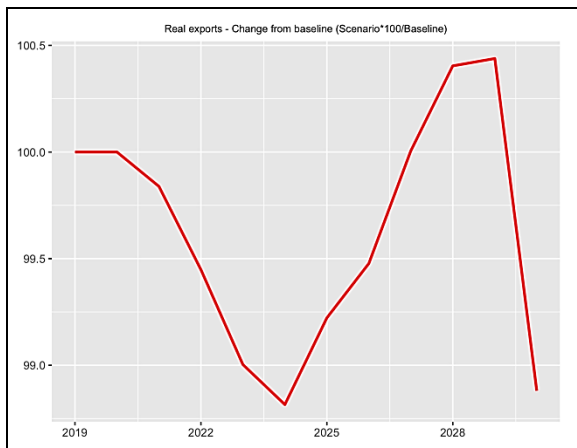
**Figure 22: Firms' Real Investment**



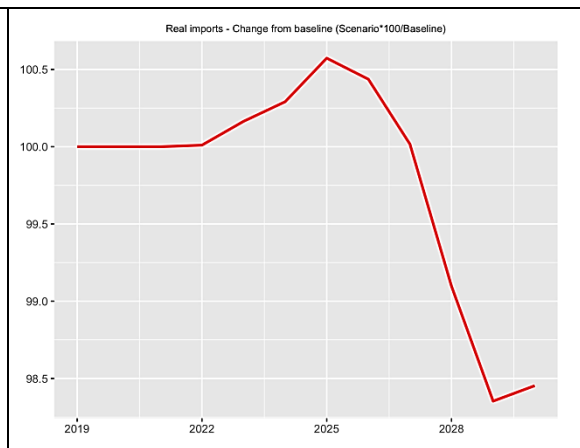
**Figure 23: Households' Real Investment**



**Figure 24: Real Exports**



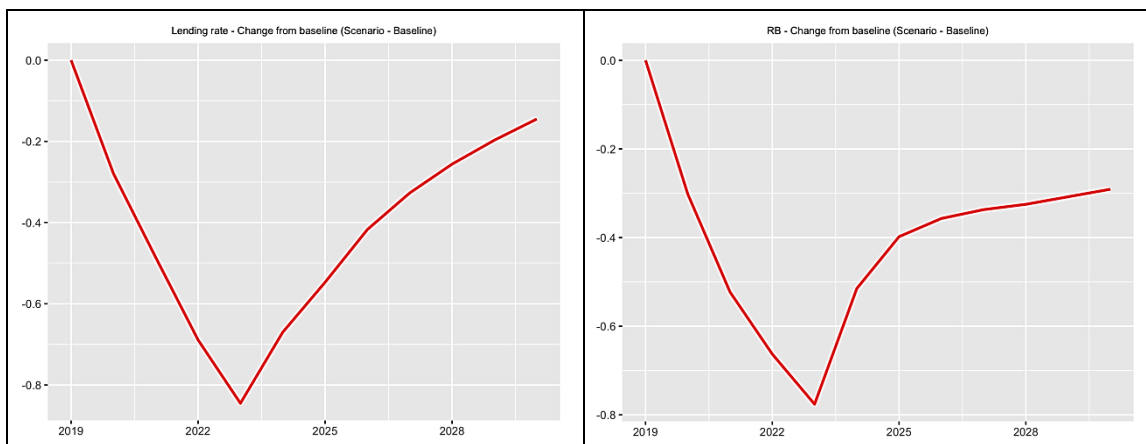
**Figure 25: Real Imports**





**Figure 26: Lending Rate**

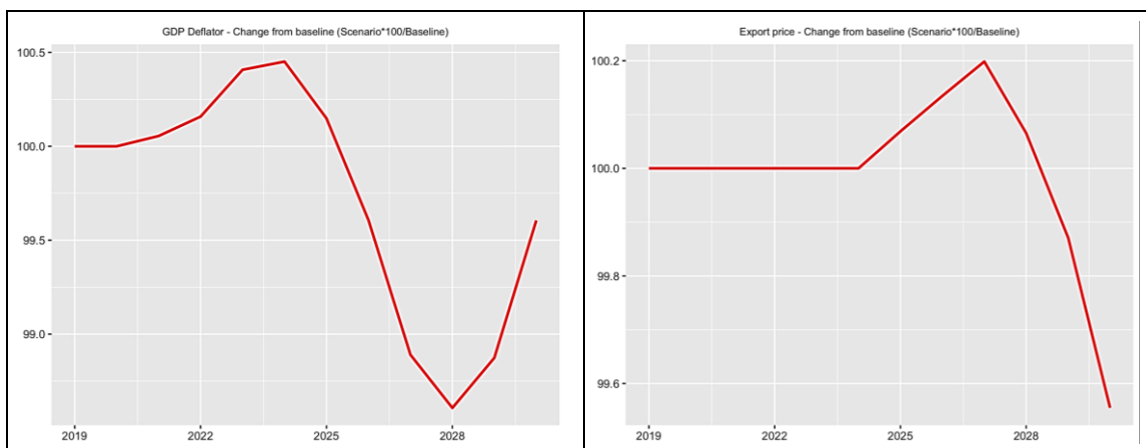
**Figure 27: Bond Rate of Return**



The overall increase in the aggregate demand, however, has a negative impact on the current account. Imports increase due to the higher domestic demand (Figure 25). On the contrary, exports decrease (Figure 24) because the inflation (Figure 28) resulting from the stimulus package implies a reduction in the country’s competitiveness (Figure 29).

**Figure 28: GDP Deflator**

**Figure 29: Price of Exports**



Looking at the government’s account, the red line represents the results of the fiscal expansion scenario compared with the baseline scenario (the blue line). The increase in public spending, public investment, and household transfers will increase the government’s total expenditures. In the meantime, reducing tax revenues will cut back the government’s revenue. Overall, it negatively affects the public deficit compared with the baseline scenario. This deterioration of the fiscal balance (Figure 30) increases the public debt in the medium term as the government finances its public deficit by debt. From 2026, the positive effect on economic growth can slightly improve the public deficit and bring the public debt closer to the baseline value. In addition, until 2025, the public debt is still lower than the public debt limit of 60% fixed in Resolution 23 of the National Assembly. Thus, it still poses a potential risk to the government’s financial stability during the period 2025–2027 (Figure 31). This corresponds to the period in which the real GDP decreases compared with the baseline scenario. The reduction of

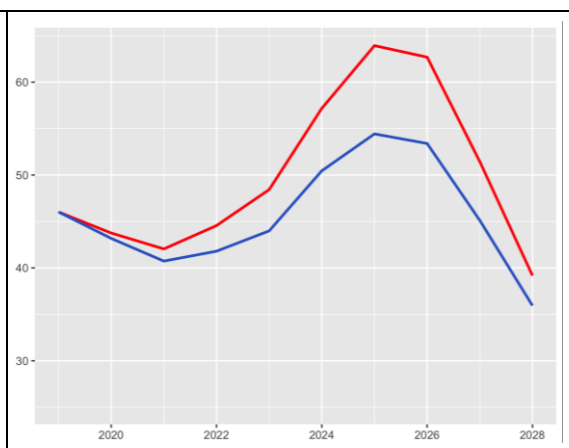
the GDP will lead to a decline in government revenue, affecting the public deficit and increasing the public debt.

During the pandemic, the government can meet its financing needs through domestic debt (issuing bonds) with a lower interest rate. Indeed, a bond's rate of return declines (Figure 27) with the central bank's interest rate. Thus, it reduces the risk of debt burden. In addition, according to the Ministry of Finance (MOF), the public external debt has been controlled at the safe limits approved by the National Assembly to ensure national financial security.

**Figure 30: Public Deficit (%GDP)**



**Figure 31: Public Debt (%GDP)**



In summary, the COVID-19 pandemic has led to an unprecedented decline in economic activity. A global economic crisis is expected, with a contraction in the global GDP far greater than the global financial crisis of 2008. It requires policy actions to support the economic sectors and the economic recovery post-COVID-19. Thus, our results show that the policy responses to coping with the pandemic seem to affect economic growth positively in the short term. They show that stimulus packages increase the financing need of the government and then cause a deterioration in the public deficit and an increase in public debt. However, in reality, there will be several conditions to ensure these stimulus packages' effects. In addition, the results arouse the concern of policymakers about the rise in public debt and its management after the pandemic.

The Vietnamese Government has demonstrated its strong commitment to coping with COVID-19 from the beginning. The effectiveness of the stimulus package and the recovery plan depends on their implementation, monitoring, and evaluation. In other words, to ensure the rapid and efficient absorption of stimulus funds for productive public expenditure, it is essential to strengthen the administrative capacity and reduce implementation delays. Additional public investment could help to offset the possible short-term adverse effects of the pandemic on the private sector. Viet Nam aims to accelerate the disbursement of public investment, which can contribute to stimulating private investment, thereby amplifying the impact of the stimulus and recovery package. For the household sector, local authorities ensure the fastest disbursement of support packages for pandemic-hit workers. Delayed disbursement will hinder the effect of the stimulus and recovery package on economic growth.

The banking system plays a critical role in financing businesses and household investments to contribute to economic recovery. Indeed, the monetary policy of the recovery plan will ease the lending conditions for financial institutions, debt repayment delays for households and firms, and credit guarantee schemes. These policies aim to reduce the pandemic's adverse economic outcomes in the short run. However, the study also revealed several potential economic fragilities and financial risks for the economic recovery. Thus, they can have an adverse impact on economic growth and worsen the government revenue and then the public deficit and public debt.

As the stock of public debt could be problematic for its sustainability, which is its capacity to repay the debt, the government should not keep expansionary fiscal policies for too long. Debt payments may lead to reduced economic activities. The government should try to relax the containment measures gradually after the recovery. This will contribute to alleviating the debt burden and keeping the debt ratio under the public debt limit.

The fact that the government mobilizes domestic debt rather than external debt helps to avoid the country's debt burden. Thus, this stimulus is an effective policy intervention to cope with the COVID-19 pandemic. In the short term, the primary source of financing is borrowing. Still, in the medium and long terms, policymakers need to consider tax to increase the government's revenues and spending policies after the recovery. The COVID-19 crisis amplified and exposed several pre-existing structural weaknesses of the economy and society. The Vietnamese recovery after COVID-19 also faces several long-term structural challenges, such as climate change, population ageing, the acceleration of digitalization, and rising inequalities. A sustainable post-COVID recovery could be achieved when the government has to ensure that the investments undertaken today will be consistent with the development priorities of Viet Nam. This requires the government to introduce a policy mix to promote resilient and inclusive economic growth, compensate for the costs of public debt due to COVID-19-induced budget deficits, and support the sustainability of public finances.

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## APPENDIX

### A. Accounting Structure

**Table A1: Theoretical Balance Sheet of Viet Nam**

	<b>Firms</b>	<b>Central Bank</b>	<b>Banks</b>	<b>Government</b>	<b>Households</b>	<b>RoW</b>	<b>Total</b>
Non-financial assets	$pKk^f$			$pKk^g$	$pKk^h$		$pKk$
Inventories	$pK_{12} k_{12}$						$pK_{12} k_{12}$
International reserves		$RES_{usXr}$				$-RES_{usXr}$	0
Cash		$-H$			$H$		0
Bank's reserves		$-MB^{cb}$	$-MB^{cb}$				0
Government's deposits		$-GM^{cb}$	$-GM^b$	$GM$			0
Dong deposits	$DM^f FM^f_{usXr}$		$-DM$		$DM^h FM^h_{usXr}$		0
Foreign deposits				$FM^g_{usXr}$		$-FM_{usXr}$	0
Bonds		$B^{cb}$	$B^b$	$-B$	$B^h$		0
Advances		$LB^{cb}$	$-LB^{cb}$				0
Loans	$-L^f$		$L$		$-L^h$		0
Foreign loans	$-FL^f_{usXr}$		$-FL^b_{usXr}$	$-FL^g_{usXr}$		$FL_{usXr}$	0
Equity	$-pEE^f$		$-pEE^b$		$pEE^h$	$pEE^r$	0
Foreign direct investment	$-pFDI$ $FDI_{usXr}$					$pFDI$ $FDI_{usXr}$	0
Other accounts r/p	$OTA^f$	$OTA^{cb}$	$OTA^b$	$OTA^g$	$OTA^h$	$OTA^r$	0
<b>Net Wealth</b>	<b>NW<sup>f</sup></b>	<b>NW<sup>cb</sup></b>	<b>NW<sup>b</sup></b>	<b>NW<sup>g</sup></b>	<b>NW<sup>h</sup></b>	<b>NW<sup>r</sup></b>	<b>pKk + pK<sub>12</sub> k<sub>12</sub></b>

#### Perpetual Inventory Methods

In our model, the value of non-financial assets should evolve according to the perpetual inventory method. This means that the current period's worth is defined by cumulating flows to the previous period's value and adjusting for the depreciation of capital and the variation of capital prices.

**Table A2: Theoretical Uses–Resources Table + Flow of Funds**

	Firms	Central Bank	Banks	Government	Households	RoW	Total
Imports						$pIMim$	$pIMim$
Exports						$-pXx$	$-pXx$
<b>Trade balance (X – IM)</b>							$-TB$
Production	$pYq^f$		$pYq^b$	$pYq^g$	$pYq^h$		$pYq$
Intermediate consumption	$-\theta^f pY va^f$		$-\theta^b pY va^b$	$-\theta^g pY va^g$	$-\theta^h pY va^h$		$-pY ic$
<b>Value added</b>	<b><math>pYva^f</math></b>		<b><math>pYva^b</math></b>	<b><math>pYva^g</math></b>	<b><math>pYva^h</math></b>		<b><math>pYva</math></b>
Wages + compensation from abroad	$-\lambda^f wN$		$-\lambda^b wN$	$-\lambda^g wN$	$-\lambda^h wN$	$-WB^r$	0
Labor/social contributions	$-\alpha^f WB^f$		$-\alpha^b WB^b$	$-\alpha^g WB^g + SOC$	$+wN + WB^r$		0
Indirect taxes (VAT included)	$-\tau^f pIMim$			$\tau^g pIMim + TOP$	$-\alpha^h WB^h$		$TOP$
<b>Gross operating surplus</b>	<b><math>F^f</math></b>		<b><math>F^b</math></b>	<b><math>F^g</math></b>	<b><math>F^h</math></b>		<b><math>FT</math></b>
Interest on gov. deposits		$-r_m GM^{cb}_{-1}$	$-r_m GM^{cb}_{-1}$	$r_m GM_{-1}$			0
Interest on deposits	$r_m DM^f_{-1}$		$-r_m DM_{-1}$		$r_m DM^h_{-1}$		0
Interest on bonds		$r_b B^{cb}_{-1}$	$r_b B^{cb}_{-1}$	$-r_b B_{-1}$	$r_b B^h$		0
Interest on advances		$r_{cb} LB^{cb}_{-1}$	$-r_{cb} LB^{cb}_{-1}$				0
Interest on loans	$-r_l L^f_{-1}$		$r_l L^b_{-1}$		$-r_l L^h_{-1}$		0
Interest on foreign loans	$-r_{il} FL^f_{us-1} X_{f-1}$		$-r_{il} FL^b_{us-1} X_{f-1}$	$-r_{il} FL^g_{us-1} X_{f-1}$		$r_{il} FL^h_{us-1} X_{f-1}$	0
Dividends	$-\phi F_{-1}$					$\phi F^f_{-1}$	0
Central Bank's profits		$-F^{cb}$		$F^{cb}$			0
<b>Primary income balance</b>	<b><math>YP^f</math></b>		<b><math>YP^b</math></b>	<b><math>YP^g</math></b>	<b><math>YP^h</math></b>		<b><math>YP</math></b>
Income taxes	$-\tau^f Y^f P_{-1}$		$-\tau^b Y^b P_{-1}$	$DT$	$-\tau^h Y^h P^h_{-1}$	$-T_{wYICT} WB$	0
Social benefits				$-\gamma SBEY P^h$	$-\gamma SBEY P^h$		0
Cur. tr. from abroad (public)				$TR^g_r$		$-TR^g_r$	0
Cur. tr. to abroad (private)					$-TR^p_r$	$TR^p_r$	0
Cur. tr. from abroad (private)					$TR^p_r$	$-TR^p_r$	0
<b>Gross disposable income</b>	<b><math>YD^f</math></b>		<b><math>YD^b</math></b>	<b><math>YD^g</math></b>	<b><math>YD^h</math></b>		<b><math>YD</math></b>
Consumption					$-pC^c$		$-pC^c$
Public current expenditure				$-pG^g$			$-pG^g$
<b>Gross savings</b>	<b><math>S^f</math></b>		<b><math>S^b</math></b>	<b><math>S^g</math></b>	<b><math>S^h</math></b>		<b><math>S</math></b>
Gross fixed capital formation	$-pK^f \dot{f}$			$-pK^g \dot{g}$	$-pK^h \dot{h}$		$-pK \dot{i}$
Changes in inventories	$-pK_{12} \dot{h}_{12}$						$-pK_{12} \dot{h}_{12}$
<b>Net fin. capacity</b>	<b><math>NFC^f</math></b>	<b>0</b>	<b><math>NFC^b</math></b>	<b><math>NFC^g</math></b>	<b><math>NFC^h</math></b>	<b><math>NFC^r</math></b>	<b>0</b>

## B. DATA SOURCES

*International reserves* are taken from the International Financial Statistics. The central bank is supposed to hold all international reserves.

*Cash* is taken from the International Financial Statistics as currency outside banking institutions. We suppose that households hold cash provided by the central bank.

*Banks' reserves* come from the International Financial Statistics. It means the reserves that commercial banks must hold in the form of deposits in the central bank.

*Government's deposits* are taken from the International Financial Statistics. The government can have deposits at the central bank and commercial banks.

*Dong deposits* are reported in the database of the State Bank of Viet Nam. In the Vietnamese economy, firms and households hold deposits in domestic currency in commercial banks.

*Foreign deposits* are obtained from the International Financial Statistics. The data show that both firms and the government have foreign currency deposits in commercial banks.

*Bonds* are derived from the International Financial Statistics. For simplicity, we suppose that commercial banks and the central bank mainly hold government bonds.

*Advances* are taken from the International Financial Statistics—Banking Institutions Accounts. It means the credit from monetary authorities to commercial banks.

*Loans* come from the International Financial Statistics—Account of Banking Institutions. It corresponds to the variable “Claims on Private Sector.” We suppose that Vietnamese commercial banks provide loans for private sectors. However, households’ debt is obtained from the report of South East Asian Central Banks.

*Foreign loans* are derived from three primary sources: the Bank for International Settlements (BIS), World Development Indicators, World Economic Outlook, and Lane–Milesi–Ferretti database (LMF).

*Equity* is taken from several sources. Equity issued by firms is reported on the Ho Chi Minh Stock Exchange. Banks’ equity is derived from the International Financial Statistics. We suppose that all equity in the economy is held by households and the foreign sector and is considered as the portfolio investment.

*Foreign direct investment* stock and flow are obtained from the United Nations Conference for Trade and Development.

### C. ESTIMATION RESULTS

**Table A3: Estimated Parameters**

Eq.	Variables	Results
Eq. 2	Consumption	$\delta_0^c = 1.142; \delta_1^c = 0.657; \delta_2^c = 0.176; \delta_1 = -0.061; \delta_2 = 1.129; \delta_3 = -0.594$
Eq. 3	HHS’ investment	$\zeta_0^h = 0.958; \zeta_1^h = 0.098; \zeta_2^h = -0.001; \zeta_3^h = -0.006$
Eq. 5	HHS’ debt	$\chi_0 = 0.059; \chi_1 = 0.267; \chi_2 = -0.296; \chi_3 = 0.615$
Eq. 6	Cash	$\delta_0^h = -2.251; \delta_1^h = 1.185; \delta_2^h = -0.209$
Eq. 9	Firms’ investment	$\varsigma_0 = 0.502; \varsigma_1 = 0.054; \varsigma_2 = -0.001; \varsigma_3 = 0.001; \varsigma_4 = -0.015$
Eq. 10	Firms’ foreign loans	$\tau_1^{fLf} = -0.021; \tau_2^{fLf} = 0.025; \tau_3^{fLf} = 0.015$
Eq. 11	Firms’ debt	$\tau_0^{Lf} = 0.288; \tau_1^{Lf} = -0.075; \tau_2^{Lf} = 0.522; \tau_3^{Lf} = -0.015$
Eq. 12	Firms’ equity	$\tau_0^{ef} = -229.164; \tau_1^{ef} = -0.3; \tau_2^{ef} = 0.662; \tau_3^{ef} = 13.608$
Eq. 13	Refinancing rate	$\beta_0^l = 1.856; \beta_1^l = 0.019; \beta_0 = 1.852; \beta_1 = 0.025; \beta_2 = -0.291; \beta_3 = -0.26$
Eq. 14	Lending rate	$\omega_0^{rl} = 0.802; \omega_1^{rl} = 0.785; \omega_0 = 0.24; \omega_1 = 0.398; \omega_2 = -0.173$
Eq. 15	Deposit rate	$\omega_0^{rm} = 0.967; \omega_0 = 0.801; \omega_1 = 0.48; \omega_2 = -0.308$
Eq. 17	Int. reserves	$\gamma_0 = 0.809; \gamma_1 = -0.485; \gamma_2 = -3.223; \gamma_3 = -2.946$
Eq. 27	Bond’s rate of return	$\varphi_0 = -0.308; \varphi_1 = 0.614; \varphi_2 = 0.372; \varphi_3 = 0.015$
Eq. 28	Exports	$\theta_0^x = 0.079; \theta_1^x = 0.147; \theta_2^x = 0.044; \theta_3^x = 0.196; \theta_4^x = -0.359; \theta_5^x = 0.291$
Eq. 29	Imports	$t_0^{im} = -2.739; t_1^{im} = 1.222; t_2^{im} = -0.906; t_3^{im} = 0.35; t_0 = 0.097; t_1 = 0.28; t_2 = -0.124$
Eq. 32	Exchange rate	$\alpha_0 = 0.024; \alpha_1 = 0.316; \alpha_2 = 0.003; \alpha_3 = 0.048$
Eq. 35	GDP deflator	$\xi_0^{py} = -1.895; \xi_1^{py} = 0.512; \xi_2^{py} = 0.51; \xi_1 = 0.183; \xi_2 = 0.438; \xi_3 = 0.185; \xi_4 = -0.205; \xi_5 = 0.025$
Eq. 36	Price of imports	$v_1^{pim} = -2.739; v_2^{pim} = 1.222; v_1 = 0.026; v_2 = -0.278; v_3 = 0.43; v_4 = 0.537; v_5 = -0.145$
Eq. 37	Wage rate	$\vartheta_1^\omega = 8.655; \vartheta_2^\omega = 0.699; \vartheta_3^\omega = -0.188; \vartheta_1 = 0.366; \vartheta_2 = 0.773; \vartheta_3 = -0.633$