Modeling the Impact of Pandemic-Induced Shocks and Support Measures with an Emerging Market Economy: A GUI-Model Approach

Md. Al-Amin Parvez[1][*], Mashrura Kabir Shaeba[2], Md. Sajjad Hossain[2], & Evanta Hashem Katha[2]

[1]Assistant Director (Research), Chief Economist's Unit, Bangladesh Bank, Dhaka, Bangladesh
[2]Assistant Director (Research), Research Department, Bangladesh Bank, Dhaka, Bangladesh
[*]*Corresponding Author:* alamin.parvez@bb.org.bd

Research Article

Abstract

Purpose: *This paper analyzes the impacts of COVID-19 shocks on an emerging market economy using a Graphical User Interface (GUI) model.*

Methods: *Event study analysis has been adopted using secondary data for measuring the impacts and impulse responses of different shocks.*

Results: *The paper shows how the shocks affect the economy using graphical presentations of impulse responses of major macroeconomic indicators. The shapes and movements of the impulse response curves indicate how the effects pass through from one sector to another; how long the effects may persist in the economy, and how much time will be required for recovery. All these simulations suggest that immediate supportive measures from both fiscal and monetary sides help recover the economy, although marginally due to the required higher costs stemming mainly from the higher exchange rate volatility.*

Implications: *Several policy implications such as sector-specific support measures, prioritization of sectors, rationing of credit facilities, efficient exchange rate management, etc., can be followed by the countries regarding fiscal and monetary policy measures towards reducing COVID-19-induced similar shocks.*

Keywords: Graphical User Interface, Fiscal Policy, Macroeconomic Impacts, COVID-19, Exchange rate volatility, Bangladesh.

1. Introduction

It goes without saying that after the outbreak of the COVID-19 pandemic in 2019, the whole World has faced a drastic fall in the economy. Following the negative effects of the coronavirus pandemic, about 219 economies are still trying hard to restore their usual economic condition through various policy measures. Bangladesh–has also been thrashed by export growth and domestic output and faced many other socioeconomic crises during the lockdown period. Considering the Worldwide scenario, several countries have their different shocks in the economy and they have adopted various policies right after the first or second quarter of the pandemic. It is needless to say that Bangladesh held its cumulative GDP growth broadly in a better condition than that of other South Asian economies during the critical period (Hossain, 2021). It was only possible for the inflow of remittance, continuous bargaining for bringing the RMG

products deals, proper monetary policies, and of course, for the timely declaration and distribution of stimulus packages by the government.

Despite ensuring proper and necessary steps, many countries including Bangladesh are still struggling to achieve targeted growth along with price stability and employment generation. Moreover, the government infused many stimulus packages mostly targeted ~~to~~ the marginal people, trade, business, and other productive sectors to ensure a support system for the economy. Nevertheless, slow disbursement and unethical use of some packages have created fake growth in the stock market. Implementation of mass jabs for the coronavirus, a negative infection growth has been observed which has accelerated economic activity. Considering the recent year's pandemic-led crisis and observing different shocks and policy tools placed in the economies, this paper endeavors to unearth the impact of two different shocks using a generic model. It ~~has~~ also tried to show the mutual effect of the shocks and then the scenarios after taking some policy measures on the economy. The paper aims to observe the impact of pandemic-induced shocks and support measures with a generic emerging market economy based on the GUI- model. So far there is no such comprehensive study exploring the responses of the economic indicators amid the onslaught of the pandemic using the GUI model in the field of research. Hence this paper, as a beginning, strives to shed light and show a picture of such causal impacts of the COVID-19 pandemic.

The paper is divided into six sections. The first section discusses the overview of the pandemic condition and the possible shocks regarding the crisis. The second section covers the literature or related research works to support the paper. In the third part, the methodology of the paper depicts the analytical tools and methods briefly. Analysis, results, and discussion part comes after that, where the paper shows the impact of shocks and policy measures on the economy overall. Lastly, in the conclusion section recommendation and other necessary policy implications are discussed.

2. Literature Review
2.1 Economic Shock during Covid-19

Ozili (2020) revealed the shocks of COVID-19 on the Nigerian economy in his paper. He mentioned about five types of shocks including the oil demand shock which led to a decrease in oil prices. However, Nigeria was severely affected by the import shock since the international borders were closed and exporters halted their exports due to COVID-19 restrictions. The paper has also mentioned the depressing banks to control the non-performing loans along with the weak borrowers' capacity. The national budget and the stock market have also faced a shock which is more or less common to all economies during the pandemic.

According to Acikgoz and Gunay (2020), the economy of Turkey faced an increase in CPI due to the unemployment rate which caused low productivity in the economy. Although the main trading partner of Turkey is not China but the other trading partner countries have also been affected by the pandemic, so in turn, the trade balance and manufacturing sector were hampered in the end. Nevertheless, if the oil prices become low in the long term, Turkey's petroleum bill will decrease, and this might be life-saving for the Turkish economy as an energy importer country. Susilawati et al. (2020) also mentioned that with the increase in gold and food price during the COVID-19 pandemic, inflation stroke in the economy of Indonesia during March 2020. Following the tourism sector's contribution, a countrywide lockdown led to cancel the flights for an uncertain duration. Due to this reason, there was a decline in tourism foreign exchange in Indonesia.

Economic Policy Uncertainty (EPU) in China and Korea has a favorable and statistically significant impact as a result of the COVID-19 outbreak. A high level of EPU will show reductions in consumption, investment, employment, and production. Hence, the government should pursue expansionary economic policies (Iyke, 2020). Islam et al. (2020) have tried to find out the impact of COVID-19 on the economy of South Asian countries. The result shows that in contrast to the agriculture sector, the service and manufacturing sectors will be more severely impacted in all South Asian countries, according to the short

and long-term forecasted scenario. Proper government support and expansionary fiscal policies can help combat the downturn effect of the pandemic.

2.2 Shocks in Bangladesh Economy

Since the global economy got affected by the pandemic, G20 economies will also fall into low GDP growth and major markets of Bangladesh will also face challenges in case of the tradable goods such as readymade garments (Alam et al., 2020). They also mentioned the food supply chain disruptions and other tradable chain distractions which created a shock to the price overall level. Due to the COVID-19 outbreak, the remittance inflow was higher in the first quarter of the pandemic but later it gradually seemed to decline as a result of the massive layoffs in the international job market for the global effect of the COVID-19 pandemic. Barua (2020) has shed light on the effect of the pandemic on the banking sector of Bangladesh. She has observed the NPL condition with three different dimensions using the stress testing model. The paper concludes that the banks will face a fall in the three dimensions where the RMG sector and SME sector will be the victims, considering the major exposure of the shock. Islam et al. (2020) have also found, despite the fact that prior to the onset of this global pandemic, the patterns of the export trends for both woven and knit items were moderated but now those are declining since the commencement of the COVID-19 pandemic in Bangladesh.

Devastating effects have been noticed on the transportation system; food production, poultry and dairy, and textile sector which have accelerated the unprecedented price hike later (Mahmud et al., 2021). The paper also depicted the various sector including construction, small businesses, SMEs, banking and financial sectors, etc. faced the massive shocks of COVID-19. Using the partial equilibrium model, the food security of Bangladesh during and after the pandemic has been unearthed. Domestic pricing is less expensive in the near term. After COVID-19, the long-term outlook for rice supply, demand and trade points to worsened food security in Bangladesh. Domestic demand per person declines during the forecast period as a result of income shocks (Mobarok et al., 2021). Rahman et al. (2022) tried to observe the COVID-19-generated production gap which created food insecurity in Bangladesh. Because of the rising poverty level and rising food prices along with supply chain disruption, food consumption is becoming less affordable. This is how the COVID-19 pandemic is escalating food insecurity among households, dietary inactivity, and malnutrition.

2.3 Impact of Stimulus Packages

According to Prusty et. al. (2021), unlike Keynesian economic theory, the Indian economy did not recover in the short run during the COVID-19 pandemic considering the fiscal stimulus packages. However, in the long run in Q3 of FY20-21 or Q1 of FY21-22, it seemed to have a positive real GDP growth in the Indian economy. The paper also found a positive and insignificant relationship between taxation and subsidies related to stimulus packages and economic recovery and between employees and consumers related to the stimulus package and its effectiveness on economic recovery. This leads to a recommendation that unless the government monitor properly, the economy may not recover to the expected level.

As stated by Bayer et al. (2020), as proof of successful transfer payment in the economy, the consumption is stabilized along with a lower fall in output rather than the scenario without transfers in the economy. On the other hand, investment also seemed to rise after the transfers while the policy rate seemed to decline without the stimulus packages since the economy was in a deflationary face. This paper also shed light on the conditional and unconditional transfer multiplier which helped to observe the impact more vigilantly.

The paper of Narayan et al. (2021) tried to unearth the impact of government stimulus packages on the stock market return of G7 countries where the results were positive and significant. According to Siddik (2020), there is a positive significant relationship between GDP and stimulus packages during COVID-19 to

cushion the destruction of the pandemic. He introduced an index to observe the determinants of the economic stimulus packages and further used beta regression to analyze.

Giesecke & Schilling (2010) have found that fiscal package boosts employment in the short term but at the expense of actual consumption over the long term. We look at a different package that produces more employment in the short term for a comparable real consumption cost in the long term. Lalon (2020) has clearly described the government initiatives taken during the COVID-19 outbreak in Bangladesh. The paper has also said about the condition and policy response to sustain the economy during the pandemic. Islam et al. (2020) similarly highlighted the policy response of the Bangladesh government to tackle the pandemic. Starting from distributing USD 11.90 billion stimulus packages to social distancing and necessary precautionary measures have been seen during that time.

3. Methodology

Since the purpose of this paper is to focus on the transmission of shocks under a hybrid regime caused by the COVID-19 pandemic and some policy instruments to ease the troubled economic conditions, to pursue the objective, an event study analysis has been used which is a simple graphical approach that can provide some insights as to how variables behave around the time of an event, such as a pandemic induced economic crisis. We have used the graphical user interface (GUI) to observe the impacts of COVID-19 shocks and later the changes caused by stimulus packages in the economy.

3.1 Model Specification

The GUI application provides the privilege of starting a simulation from any year with available data on all the relevant variables of an economy. It uses the data from World Development Indicator and World Bank for the standard emerging economy. In our study, we have used ~~all~~ data from the fourth quarter of 2019, when the COVID-19 outbreak began, and projected the data from the first quarter of 2025. The GUI takes actual data from the current period and displays many future scenarios with various shocks and stimulus packages. Editing the values of the system's required parameters is possible. All of the appropriate changes in data are reported in the result tables after the simulation is completed. All data is kept in three formats: headline, quarterly adjusted and annually adjusted. Foreign variables are similarly a source of concern and are labeled with an "x_" prefix.

As we are considering an open economy, the aggregate spending equation will take the form like,

$$\hat{y}_t = a_1\hat{y}_{t-1} - a_2 mci_t + a_3\hat{y}_t^* + \varepsilon_t^y$$

Here,
$\hat{y}_t$ = the output gap,
mci_t = the real monetary condition index,
$\hat{y}_t^*$ = the foreign output gap (in log terms),
And ε_t^y = is an aggregate demand shock.
As aggregate supply equation, we include the equation:

$$\pi_t^{core} = b_t\, \pi_{t-1}^{core} + (1- b_t)(E_t\, \pi_{t+1} +\Delta^{r-core}\, p^t)E_t\, \pi_{t+1} + b_2\, rmc_t + \varepsilon_t$$

Where, $rmc_t = b_3\, \hat{y}_t + (1- b_3)(\hat{z}_t - {}^r\hat{p}_t^{core})$

In the equations,
π_t^{core} = core inflation,
π_{t-1}^{core} = past core inflation,
$E_t\, \pi_{t+1}$ = headline inflation expectations,
$\Delta^{r-core}\, p^t$ = long-term changes in the relative price of the core to headline inflation,
rmc_t = real marginal cost
$\hat{y}_t$ = output gap, and
$\hat{z}_t - {}^r\hat{p}_t^{core}$ = y the real ER gap for "core" items of the CPI basket.

Countries need to make a compatible choice between price stability and exchange rate (ER) stability in a hybrid regime. For price stability, it has to choose an intermediate target like- money growth targets or inflation targets, etc. while for exchange rate stability it has to choose an exchange rate target or simply smooth the ER path. The two choices must be compatible, respect fundamentals, and be well communicated. The graphical user interface, widely known as GUI, is a computer program that allows people to connect with computers using symbols, visual metaphors, and pointing devices. Alan Kay, Larry Tesler, Dan Ingalls, David Smith, Clarence Ellis, and a group of other researchers created the GUI at Xerox PARC by incorporating windows, icons, and menus to handle actions like opening files, deleting files, transferring files, and so on. It provides the privilege of considering economies with different regimes like monetary targeting regimes, inflation targeting regimes, fixed exchange rate regimes, hybrid regimes, etc.

In our effort, the GUI application will initially allow users to select a certain model and simulation for a particular dataset. Following that, there will be a tuning phase in which we can apply relative shocks and supportive stimulus packages using a variety of variables connected to an economy and then simulate the effects. The changes in numbers can be seen in the results table, whereas the changes in graphs can be seen in the other parts (main variables, inflations, foreign and commodity prices).

GUI software solves the situations or scenarios with Sirius solver. Sirius was created by RTE and released as an open-source solver. The Sirius solver is a C version of the dual simplex algorithm (for continuous problems) and the branch-and-bound approach (for binary variables problems), or, in other words, a fast tool for converting tandem mass spectra into metabolite structure information. The "Single mode" of SIRIUS corresponds to evaluating a single chemical with one or more mass spectra, whereas the "Batch mode" corresponds to investigating many compounds simultaneously, each with one or more mass spectra.

4. Empirical Analysis

This part of the paper contains the simulation analysis of different shocks and measures using the GUI model.

4.1 Domestic Demand Shock

Let's assume a demand-side shock in the form of an output gap shock by -10 percent in Q4FY19. This shock will lower GDP growth by 10 percent. Headline inflation will also go down by 1 percent. The economy will get slack with unemployment (Figure 1).
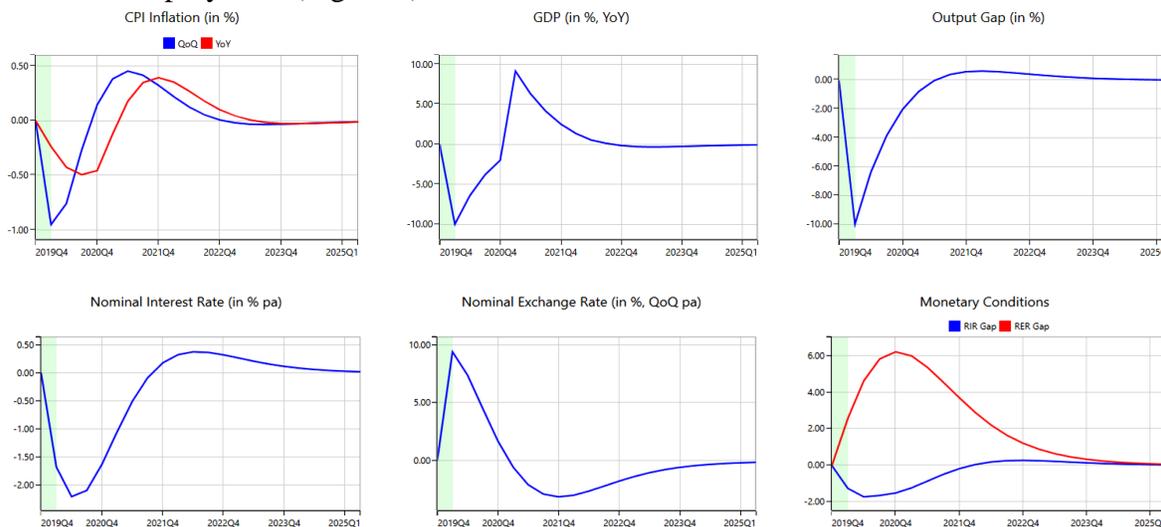
Fig. 1: COVID-19 Shocks – Domestic demand shock [-10% Output Gap]
Source: Author's Estimation (2022)

Let's assume a demand-side shock in the form of an output gap shock by -10 percent in Q4FY19. This shock will reduce GDP growth by 10 percent. Headline inflation will also go down by 1 percent. The economy will get slack with unemployment.

The central bank will jump in and cut down interest rates following the Taylor rule (Taylor, 1993), and hence nominal interest rate will go down by more than 2 percent. With lower interest rates and forward-looking expectations of the foreign exchange market, capital outflow will happen and local currency will depreciate sharply by almost 10 percent. The monetary conditions will indicate loose monetary policy with declined real interest rate gap and real exchange rate gap.

Consequently, the economy will start recovering from two channels; the interest rate channel and the exchange rate channel. In one hand, having a lower interest rate, the local investment will boost up and output will start increasing. On the other hand, having depreciated local currency export demand will go up and create a pull factor over the output. As a result, the output gap will start closing up and back to equilibrium by Q2FY21.

In these circumstances, however, as employment starts picking up and companies start producing more, slack starts to disappear as the economy is about to hit its full capacity. Therefore, it becomes difficult to find new employees, and producers need to raise wages to keep existing ones. As a result, sharper price increases can be expected. For the central bank, the Taylor rule suggests raising interest rates to keep prices stable. With the raised interest rate, capital inflow will start and the exchange rate will begin to appreciate. As a result, GDP growth will reach a stable path by Q4FY22.

4.2 Price Shock due to Supply Disruptions

Let's assume a supply-side shock in the form of a core inflation shock by +2 percent in Q4FY19. Due to supply chain disruptions, this shock will increase headline inflation by 1.5 basis points (bps). GDP growth will decline by 0.20 percent mainly due to a negative output gap (Figure 2).
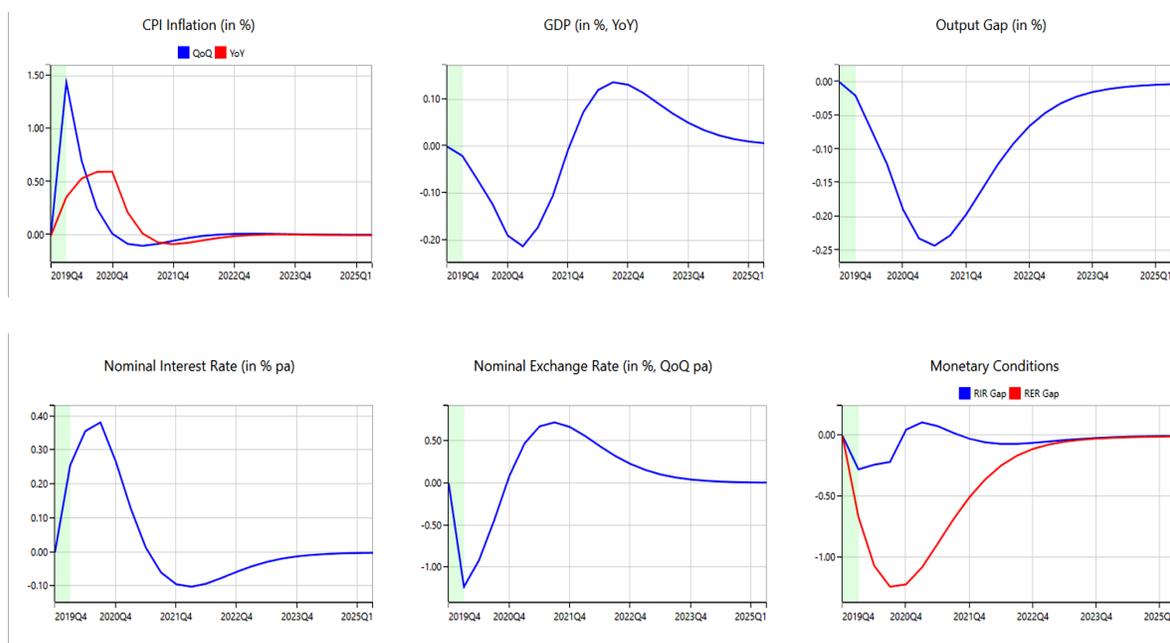
Fig. 2: COVID-19 Shocks – Price Shock due to Supply Disruptions [+2% Core Inflation]
Source: Author's Estimation (2022)

The central bank will jump in and raise the interest rate following the Taylor rule to stabilize the price. Hence nominal interest rate will increase. With higher interest rates and forward-looking expectations of the foreign exchange market, capital inflow will happen and local currency will appreciate sharply. The

monetary conditions will indicate tight monetary policy since the real interest rate gap moves up after the initial decline due to inflationary pressure and the real exchange rate gap shows appreciation.

Consequently, having a higher interest rate, the local investment will decrease and output will fall due to lower domestic and external demand. As a result, inflation will go down and the exchange rate will depreciate. Later on, external demand will go up. The output gap will close up and GDP growth will return back to equilibrium by Q1FY25.

4.3 Combined Shocks

Now, let's assume both the demand and supply side shocks together, output gap shock by -10 percent and core inflation shock by +2 percent, in Q4FY19. It is found that the output gap shock dominates indicating slacks in the economy. The combined shock will reduce GDP growth by 10 percent on the back of elevated headline inflation by more than 1.5 percent and declined GDP growth by 10 percent (Figure 3).
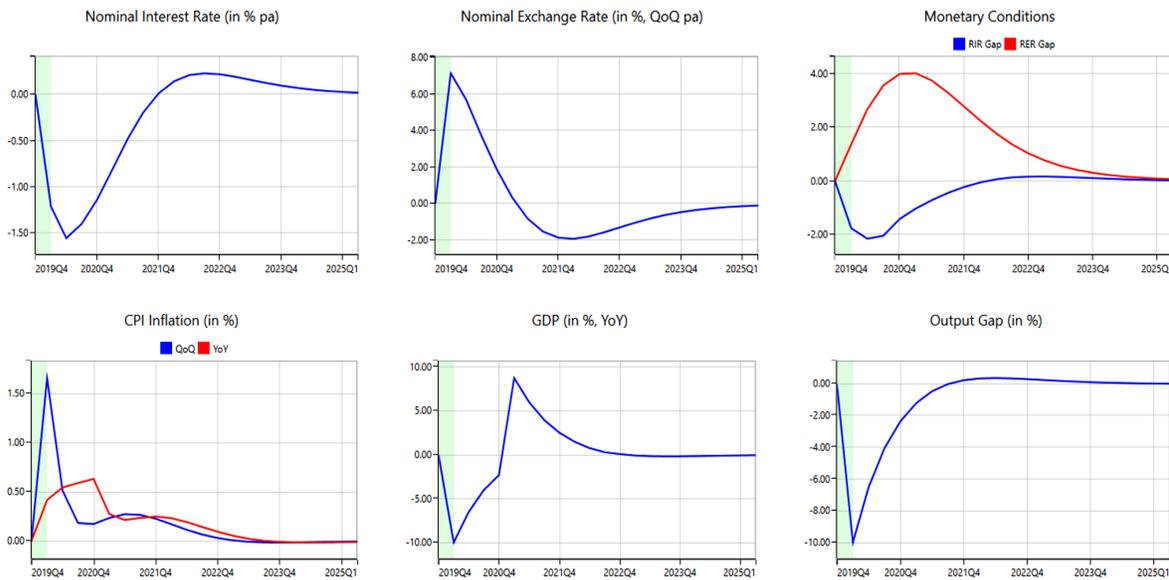
Fig. 3: COVID-19 Shocks – Combined Shocks (-10% Output Gap & +2% Core Inflation)
Source: Author's Estimation (2022)

The central bank will jump in and cut down interest rates following the Taylor rule and hence nominal interest rate will go down by more than 1.5 percent. With lower interest rates and forward-looking expectations of the foreign exchange market, capital outflow will happen and local currency will depreciate sharply by almost 7 percent. The monetary conditions will indicate loose monetary policy with declined real interest rate gap and depreciation of the real exchange rate.

Consequently, the economy will start recovering from two channels; the interest rate channel and the exchange rate channel. In one hand, having a lower interest rate, the local investment will boost up and output will start increasing. On the other hand, having depreciated local currency export demand will go up and create a pull factor over the output. As a result, the output gap will start closing up and back to equilibrium by Q4FY21, delayed by two more quarters than the single output gap shock.

Similar to the single output gap shock, as employment starts picking up and companies start producing more, slack starts to disappear as the economy is about to hit its full capacity. Therefore, producers need to raise wages to accommodate the increased real marginal cost. As a result, price increases can be expected. Taylor's rule suggests the central bank should raise interest rates to keep prices stable. With the raised

interest rate, capital inflow will start and the exchange rate will start appreciating. As a result, GDP growth will reach a stable path by Q4FY22.

4.4 Fiscal Stimulus Shocks

Now, let's introduce the fiscal stimulus considering the pandemic-induced economic fallout that started in Q4FY19. Let's assume the government introduced a fiscal stimulus after two quarters, the declining trend of the output gap somewhat moderated with the help of fiscal support and remained at -4 percent in Q2FY20. Headline inflation will decline following a similar path of the pandemic time against declined GDP growth by 4 percent (Figure 4).
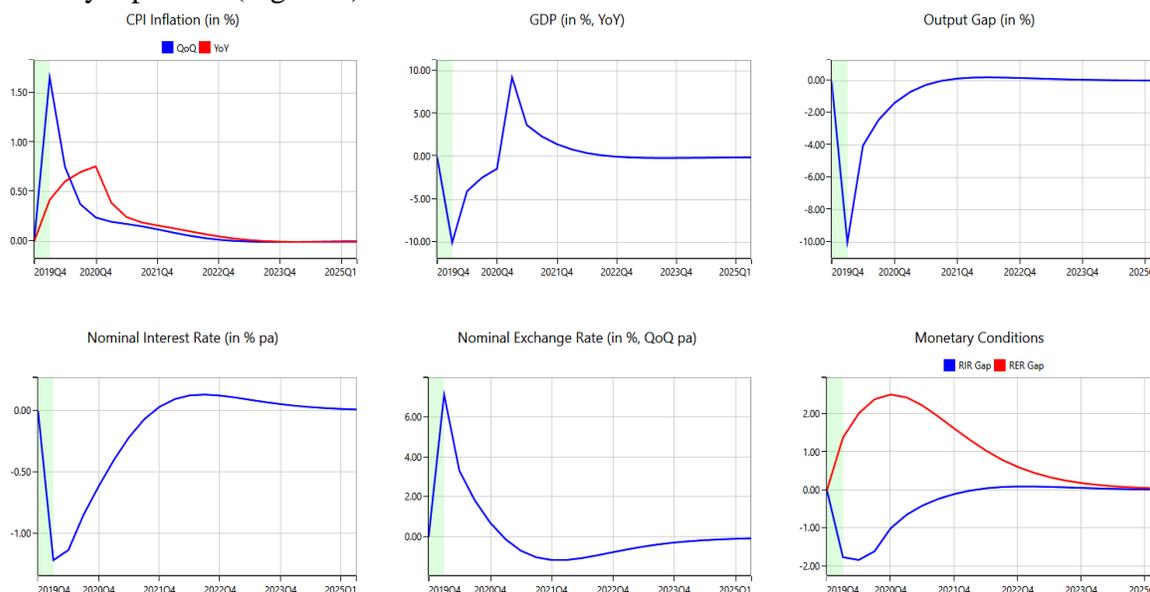
Fig. 4: Fiscal stimulus shock (-10% Output Gap & +2% Core Inflation. A fiscal stimulus shock reduces the Output Gap to -4%)

Source: Author's Estimation (2022)

The central bank will jump in and cut down interest rates which will be lower than the pandemic period following the Taylor rule and hence nominal interest rates will start picking up from the pandemic deep. The nominal exchange rate will start appreciating at a faster pace. The monetary conditions will still indicate loose monetary policy with declined real interest rate gap and depreciation of the real exchange rate.

Consequently, the economy will start recovering at a faster pace and the output gap will start closing up and back to equilibrium before Q4FY21 whereas GDP growth will return to equilibrium before Q4FY22. Hence, the economic recovery seems somewhat faster with the fiscal stimulus.

4.5 Interest Rate Smoothing Parameter

Now, let's introduce the monetary stimulus considering the pandemic-induced economic fallout that started in Q4FY19. Let's assume the central bank introduced a monetary stimulus after two quarters using the interest rate smoothing parameter. In this regard, the previously set value of the smoothing parameter, 0.7, has been cut down to 0.5 implying that the central bank will react more promptly believing that the economy needs more support. Due to this measure of the central bank, the real interest rate gap in the monetary conditions will return back to equilibrium faster than previous, earlier than Q4FY21 (Figure 5).

The central bank will jump in and cut down interest rates which will be lower than the pandemic period following the Taylor rule and hence nominal interest rates will start picking up from the pandemic deep. The nominal exchange rate will start appreciating at a faster pace. The monetary conditions will still indicate loose monetary policy with declined real interest rate gap and depreciation of the real exchange rate.
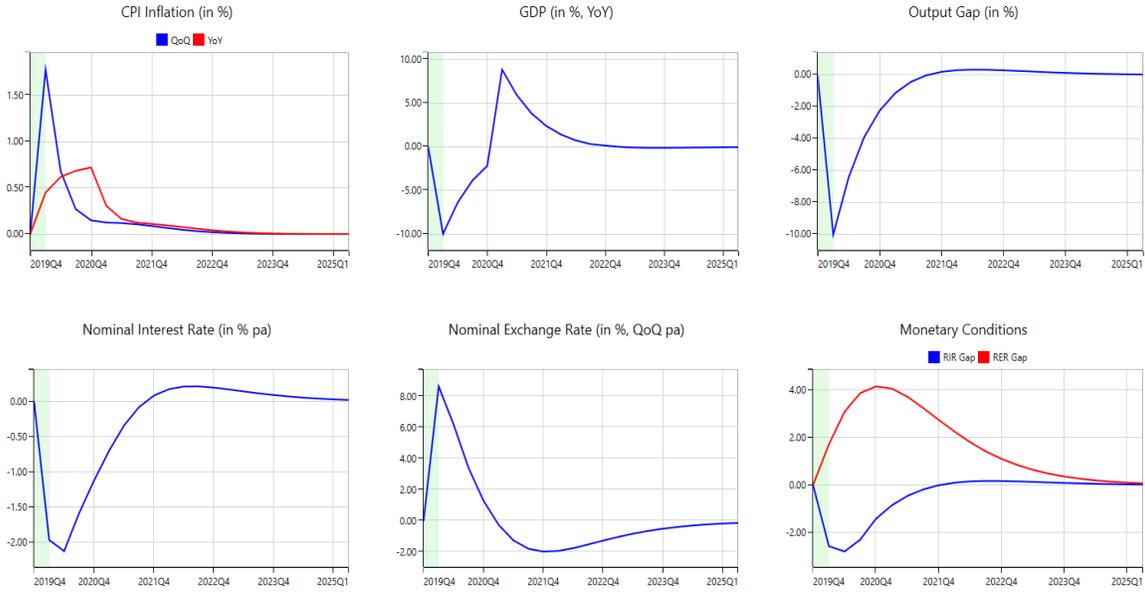
Fig. 5: Interest Rate Smoothing Parameter (f1, 0.5 from 0.7)
Source: Author's Estimation (2022)

Consequently, the economy will start recovering at a faster pace and the output gap will start closing up and back to equilibrium before Q4FY21 whereas GDP growth will return to equilibrium before Q4FY22. Hence, the economic recovery seems somewhat faster with the fiscal stimulus. Consequently, the economy will start recovering at a faster pace and the output gap will start closing up and back to equilibrium before Q4FY21 whereas GDP growth will return to equilibrium before Q4FY22. Hence, the economic recovery seems somewhat faster with the monetary stimulus.

4.6 Combined Support Measures
Now, let's assume that the support measures are introduced simultaneously, the moderated output gap shock -4 percent and the cut-down interest rate smoothing parameter 0.5, started from Q4FY19.
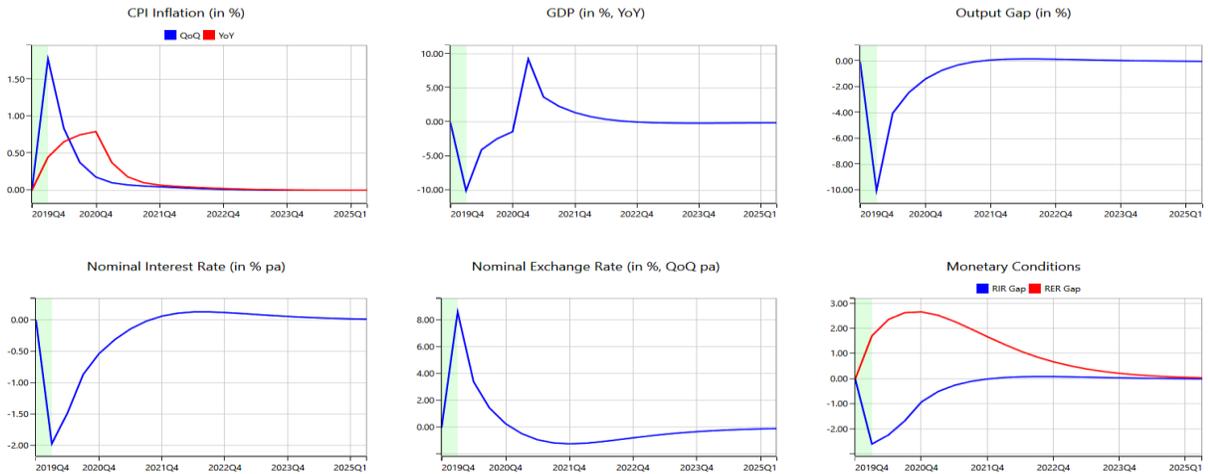
Fig. 6:

Combined Support Measures (-4% of Output Gap, Interest Rate Smoothing Parameter (f1, 0.5 from 0.7)
Source: Author's Estimation (2022)

Due to these measures of the government and the central bank, the real interest rate gap closes faster and the real interest rate gap will not depreciate much (Figure 6). As a result, the economy will start recovering at a faster pace and the output gap will start closing-up and back to equilibrium before Q4FY21 whereas GDP growth will return to equilibrium before Q4FY22. Hence, the economic recovery seems somewhat faster with the combined support measures. All these simulations suggest that support measures from both fiscal and monetary sides will not help much since costs become high on the economy due to higher exchange rate volatility. Monetary policy has limitations with too many targets with too few instruments.

5. Conclusion

The analysis of this paper somewhat indicates the nature of the movement of major macroeconomic indicators during a pandemic-induced economic crisis in a generic emerging market economy. It has been found that both the supply and demand side shocks cause significant vulnerabilities to the indicators. Furthermore, it has been found that the support measures in the form of fiscal and monetary stimulus help achieve the equilibrium states of the macroeconomic indicators faster although marginally while the costs of the measures could also be considered as a major trade-off. Therefore, the core strength of the economy, institutional and prudent policy implementation capabilities, may play a key role in the face of the onslaught of the pandemic towards rebounding. An emerging economy could also try building early warning indicators which might help predict future crises so that growing vulnerabilities could be managed in an efficient manner. This model could also be replicated for country-specific cases for simulation and analysis. However, we found the degree of vulnerabilities of different indicators differ mainly due to the nature of the economy and the indicators. Although our findings showed that a faster response from the government results in faster recovery, the question of 'How fast the government should response?' deserves further analysis.

Authors' Contribution: Md. Al-Amin Parvez, Md. Sajjad Hossain and Evanta Hashem Katha conceived the idea and planned for the experiments. Mashrura Kabir Shaeba reviewed the literature, formatted and compiled the references along with the sections. She also contributed to the proofreading. Evanta Hashem Katha contributed to sample preparation and writing the methodology. Md. Sajjad Hossain planned and carried out the simulations. Md. Al-Amin Parvez contributed to interpreting the results and took the lead in writing the manuscript. All authors provided critical feedback and helped shape the final version of the article.

Conflicts of Interest: The authors declare no conflict of interest.

Disclaimer: The views or opinions expressed in this paper are solely of the authors. The institution (Bangladesh Bank) is not responsible for this.

REFERENCES

Açikgöz, Ö. & Günay, A. (2020). The early impact of the Covid-19 pandemic on the global and Turkish economy. *Turkish Journal of Medical Sciences*, *50*(SI-1), 520-526.

Alam, M. S., Ali, M. J., Bhuiyan, A. B., Solaiman, M., & Rahman, M. A. (2020). The impact of the covid-19 pandemic on the economic growth in Bangladesh: a conceptual review. *American Economic & Social Review*, *6*(2), 1-12.

Barua, B. and Barua, S., (2021). COVID-19 implications for banks: evidence from an emerging economy. *SN Business & Economics*, 1(1), 1-28.

Bayer, C., Born, B., Luetticke, R., & Müller, G. J. (2020). The Coronavirus Stimulus Package: How large is the transfer multiplier?.CEPR Discussion Paper No. DP14600, https://ssrn.com/abstract=3594222

Giesecke, J. A., & Schilling, C. (2010). The economic impact of the New Zealand fiscal stimulus package. *New Zealand Economic Papers*, 44(3), 231-257.

Hossain, M. I. (2021). COVID-19 impacts on employment and livelihood of marginal people in Bangladesh: lessons learned and way forward. *South Asian Survey,* 28(1), 57-71.

Islam, M. M., Jannat, A., Al Rafi, D. A., & Aruga, K. (2020). Potential economic impacts of the COVID-19 pandemic on South Asian economies: A review. *World*, 1(3), 283-299.

Islam, M. R., Hassan, M. A., Hassan, M. S., Rahman, S., & Nargis, N. (2020). Impact of COVID-19 pandemic on the readymade garments (RMG) industry of Bangladesh. *International Journal of Management*, 11(7), 1125-1132.

Islam, T., Talukder, A. K., Siddiqui, N., & Islam, T. (2020). Tackling the COVID-19 pandemic: The Bangladesh perspective. *Journal of public health research*, 9(4), https://doi.org/10.4081/jphr.2020.1794

Iyke, B. N. (2020). Economic policy uncertainty in times of COVID-19 pandemic. *Asian Economics Letters*, 1(2), 17665.

Lalon, R. M. (2020). COVID-19 vs Bangladesh: is it possible to recover from the impending economic distress amid this pandemic? *Journal of Economics and Business*, 3 (2), 825-836.

Mahmud, Y. et al. (2021). Covid-19: Its Effect on Bangladesh's Economy. Bangladesh University of Engineering and Technology, Dhaka.

Mobarok, M. H., Thompson, W., & Skevas, T. (2021). COVID-19 and Policy Impacts on the Bangladesh Rice Market and Food Security. *Sustainability*, 13(11), 5981

Narayan, P. K., Phan, D. H. B., & Liu, G. (2021). COVID-19 lockdowns, stimulus packages, travel bans, and stock returns. *Finance research letters*, 38, 101732.

Ozili, P. K. (2020). Covid-19 pandemic and economic crisis: The Nigerian experience and structural causes. *Journal of Economic and Administrative Sciences*. Vol. 37 No. 4, pp. 401-418. https://doi.org/10.1108/JEAS-05-2020-0074

Prusty, S., Anubha, & Gupta, S. (2021). On the road to recovery: The role of the post-lockdown stimulus package. *FIIB Business Review*, 11 (2): 206-224. https://doi.org/10.1177/23197145211013691.

Rahman, M. T., Akter, S., Rana, M. R., Sabuz, A. A., & Jubayer, M. F. (2022). How COVID-19 pandemic is affecting achieved food security in Bangladesh: A perspective with required policy interventions. *Journal of Agriculture and Food Research*, 7, 100258.

Siddik, M. N. A. (2020). Economic stimulus for COVID-19 pandemic and its determinants: evidence from a cross-country analysis. *Heliyon*, 6(12): 1-10. https://doi.org/10.1016/j.heliyon.2020.e05634

Susilawati, S., Falefi, R., & Purwoko, A. (2020). Impact of COVID-19's Pandemic on the Economy of Indonesia. *Budapest International Research and Critics Institute (BIRCI-Journal 3*(2), 1147-1156.

Taylor, J. B. (1993, December). Discretion versus policy rules in practice. In Carnegie-Rochester conference series on public policy (Vol. 39, pp. 195-214). North-Holland.