

Global Evidence of the COVID-19 Shock on Real Equity Prices and Real Exchange Rates: A Counterfactual Analysis with a Threshold-Augmented GVAR Model

Afees A. Salisu^{*}, Taofeek O. Ayinde^{**}, Rangan Gupta^{***} and Mark E. Wohar^{****}

Abstract

In this study, we offer a global perspective to the macroeconomic impacts of the COVID-19 pandemic using the multi-country Threshold-Augmented Global Vector Autoregressive Model of Chudik et al. (2020) with focus on real equity prices and real exchange rates. We document, with the generalized impulse responses that the impact of the pandemic on real equity prices is generally negative across the country groupings and the highest negative impact recorded in 2020Q2. The biggest losers among the advanced countries are the advanced Asia Pacific stock markets, while the overall losers are the emerging countries which are compensated with domestic currency appreciation. Our results appear to support the relative policy effectiveness in the emerging economies where the counterfactual analysis shows that the equity markets exhibit reversal to pre-pandemic equilibrium.

Keywords: Threshold-GVAR, financial markets, COVID-19

JEL codes: C33, G15, I18

1.0 Introduction

This study contributes to the existing knowledge with a multi-country analysis of the impacts of COVID-19 pandemic shock on the global financial markets such as the global equity and foreign exchange markets. The addition to knowledge transcends the existing sectoral, countrywide, or regional analysis where the pandemic has been shown to affect financial assets chiefly by raising financial market risks, volatility, and uncertainty (see Dutillo et al. 2020; Harjoto et al. 2020; Ji et al., 2020; Narayan 2020a&b; Narayan et al. 2020a&b; Salisu et al. 2020; Seven and Yilmaz 2020; Stephanos et al. 2020; Zhang et al. 2020; Haldar and Sethi 2021; Milcheva, 2021; Ozkan 2021; Salisu et al. 2021; Scherf et al. 2021). The major conclusion from these studies is that the global financial markets experience significant dip and that the negative effects of the

^{*} Centre for Econometric & Allied Research, University of Ibadan, Ibadan, Nigeria; Department of Economics, University of Pretoria, Private Bag X20, Hatfield 0028, South Africa. Email: adebare1@yahoo.com.

^{**} Department of Economics, Fountain University, Osogbo, Nigeria. Email: olusolaat@gmail.com.

^{***} Department of Economics, University of Pretoria, Private Bag X20, Hatfield 0028, South Africa. Email: rangan.gupta@up.ac.za.

^{****} Corresponding author. College of Business Administration, University of Nebraska at Omaha, 6708 Pine Street, Omaha, NE 68182, USA. Email: mwohar@unomaha.edu.

pandemic vary among markets in developing and advanced economies. The striking finding from Scherf et al. (2021) indicates that lockdown restrictions lead to negative but dissimilar impacts on stock markets in OECD and BRICS countries. Ozkan (2021) show differences in departures from market efficiency due to the pandemic among the US, UK, France, Italy, Spain, and Germany.

We however differ from the extant literature on the impact analysis of the COVID-19 pandemic in two ways. First, we consider a multi-country study where we highlight the impacts of the pandemic for both real equity prices and real exchange rates from a global perspective covering both the emerging and developed economies including the Euro Area, Advanced Economies, Emerging Economies, and Asia Pacific Economies. This attempt offers a broader perspective that allows for meaningful comparisons of financial markets' response to the pandemic across the globe and thus investors, particularly intentional portfolio investors, gain better insights into how vulnerable financial markets have been amidst the pandemic and identify where safe investments can be made during this period. Note that investors tend to diversify their investment portfolio from countries with lower stock returns to countries with higher stock returns, which, in effect, would lead to high demand for the currencies of the countries with higher stock return at the expense of the countries with lower stock returns implying that countries with higher stock returns are more likely to experience exchange rate appreciation while countries with lower stock returns may be susceptible to exchange rate depreciation (Salisu and Oloko, 2015).

The second contribution lies in the counterfactual analysis based on the Threshold Global Autoregressive (TGVAR) model of Chudik et al. (2020) which is considered ideal to explore the impact of a one-off policy or emergency events like the pandemic (Feng and Li, 2021).¹ Interestingly, this contribution allows us to assess the effectiveness of policy responses put in place by countries to combat the pandemic. We follow this section with the methodology in Section 2. Section 3 discusses the findings and Section 4 presents the conclusion.

¹ Feng and Li (2021) also adopt counterfactual analysis for a single country analysis of the impact of COVID-19 and SARS on Chinese stocks and finds that the negative impact of COVID-19 exceeds that of SARS.

2.0 Methodology

We employ the global vector autoregression model with threshold effects (TGVAR) proposed in Chudik et al. (2020) given the global nature of the study on the counterfactual analysis of the cross-country impacts of the COVID-19 pandemic on financial markets.² In this study, we focus the analysis on stock markets and foreign exchange markets among the four observables in the global model (gross domestic product (y_{it}), real equity prices (eq_{it}), interest rate (r_{it}) and real exchange rates ep_{it}). The TGVAR framework allows for our multi-country wide analysis of advanced economies, the European Union, emerging economies, Asia Pacific countries, among the thirty-three (33) countries nicely connected by trade linkages. We further the contribution of this study on the counterfactual impact of the pandemic with data between 1979Q2 to 2020Q1 using the GVAR database updated by Mohaddes and Raissi (2020) to cover 1979Q2 to 2019Q4 and the 2020Q1 data involves the growth forecast revisions of IMF in order to identify the COVID-19 shock for the counterfactual analysis (see Chudik et al. 2020).

The global model specifies country-specific VAR models of the logged observables captured in their first differences to eliminate undesirable unit root properties in the data as follows:

$$\begin{aligned} z_{it} &= \alpha_{y,i} + \Phi_i z_{i,t-1} + B_i z_{i,t-1}^* + A_{0,i} g_t + A_{1,i} g_{t-1} + u_{it}; \\ i &= 0, 1, 2, \dots, n; t = 1, 2, \dots, T \end{aligned} \quad (1)$$

where z_{it} is the vector of observables with dimension k_i across the n countries, $z_{it} = (\Delta y_{it}, \Delta r_{it}, \Delta eq_{it}, \Delta ep_{it})'$; Δ represents first differences in the variables, the United States is the reference country and it is indexed as $i = 0$; z_{it}^* is the vector of weakly exogenous foreign variables constructed as trade-weighted counterparts of the domestic variables: $z_{it}^* = (\Delta y_{it}^*, \Delta r_{it}^*, \Delta eq_{it}^*, \Delta ep_{it}^*)'$; such that: $y_{it}^* = \sum_{j=1}^n w_{ij} y_{jt}$, w_{ij} [$w_{ii} = 0$, $\sum_{j=0}^n w_{ij} = 1$] is the weighting matrix obtained from the IMF Direction of Trade flows data; g_t , which are not country-specific, are the global variables that capture observed external factors.³

² This framework is rooted in the conventional global vector autoregression (GVAR) approach of Pesaran et al. (2004), Chudik and Pesaran (2016), Chudik et al. (2016), Mohaddes and Raissi (2020), and others. The conventional GVAR toolbox (see Smith and Galesi 2014) fits together several country specific VAR models containing domestic, foreign and weakly exogenous global factors.

³ The observable global factors are international crude oil prices (expressed in first differences) (Δoil_t) and the measure of global stock markets volatility (grv_t).

In order to capture the intent of this study, we augment the model with unobserved global factor, $\mathbf{f}_t = (\mathbf{g}'_t, \tilde{\mathbf{z}}'_t)'$ and threshold effect, $h_{t-1}(\gamma_i)$, which represent structural shift due to the COVID-19 pandemic as follows:

$$z_{it} = \alpha_{y,i} + \Phi_i z_{i,t-1} + \mathbf{B}_i z_{i,t-1}^* + \mathbf{A}_{0,i} \mathbf{f}_t + \mathbf{A}_{1,i} \mathbf{f}_{t-1} + \lambda_i h_{t-1}(\gamma_i) + \mathbf{u}_{it} \quad (2)$$

where $\tilde{\mathbf{z}}'_t$ are the unobserved vector of global factors captured as $\tilde{\mathbf{z}}_t = (\Delta \tilde{y}_t, \Delta \tilde{r}_t, \Delta \tilde{eq}_t, \Delta \tilde{ep}_t)'$, which are obtained by weighting the observables $z_{it} = (\Delta y_{it}, \Delta r_{it}, \Delta eq_{it}, \Delta ep_{it})'$ with the GDP purchasing power parity weights (\tilde{w}_i) across the countries of the domestic variables [$\tilde{y}_t = \sum_{i=0}^n \tilde{w}_i y_{it}$, for instance]; $\lambda_i h_{t-1}(\gamma_i)$ indicates the threshold effect where $h_{t-1}(\gamma_i) = I[(0,1)' \mathbf{g}_{t-1} > \gamma_i] = I(\text{grv}_{t-1} > \gamma_i)$; grv_t , the measure of global stock market volatility is the threshold variable.

In the specification of Equation (2), between 1979Q2 and 2019Q4, the reduced form shock (\mathbf{u}_t) can be decomposed as in Equation 3 while shock between 2020Q1 and 2020Q4 split in Equation (4) as follows:

$$\mathbf{u}_t = \Psi \varepsilon_t + \eta_t \quad (3)$$

$$\mathbf{u}_{T+q} = \varpi_{T+q} + \Psi \varepsilon_{T+q} + \eta_{T+q} \quad (4)$$

where ε_t is the global shock, η_t represent the idiosyncratic shock, ϖ_{T+q} is the COVID-19 pandemic shock over the 2020Q1 to 2020Q4.

3.0 Results and Discussion

We structure our multi-country study in line with the TGVAR framework of Chudik et al. (2020)⁴ and report generalized impulse response functions (GIRFs) in Figure 1a for the World, Advanced Economies, Euro Area and Advanced Asian-Pacific Countries (see Figure 1a). In order to account for the effects of outliers, we also produce impulse responses for Emerging Economies (less China) and Emerging Asia Economies (less China). As expected, the pandemic has a negative effect on the global real equity prices throughout the forecast horizon and the decline became most severe in the second period (h=2) equivalent to 2020q2 to the tune of about 60% decline. The

⁴ The results of the threshold effects are available in Chudik et al. (2020).

impacts on the Advanced Economies and the Euro Area mimic the global case but the negative impact is greater in the Euro Area (the biggest decline is about 45% in 2020Q2) than Advanced Economies (with largest decline of about 70% in 2020Q2). It appears the Asian-Pacific countries are the hardest hit among the advanced economies. The equity market of the Advanced Asia-Pacific suffered its biggest decline in 2020Q2 by about 110%. Comparatively, the emerging countries are the worst hit compared with advanced economies. The real stocks declined the most in the second horizon in Emerging Economies (less China) by about 140% and by about 150% in Emerging Asia (less China).

Figure 1a: Counterfactual analysis of the Impact of COVID-19 on real equity prices (percent deviation from baseline)



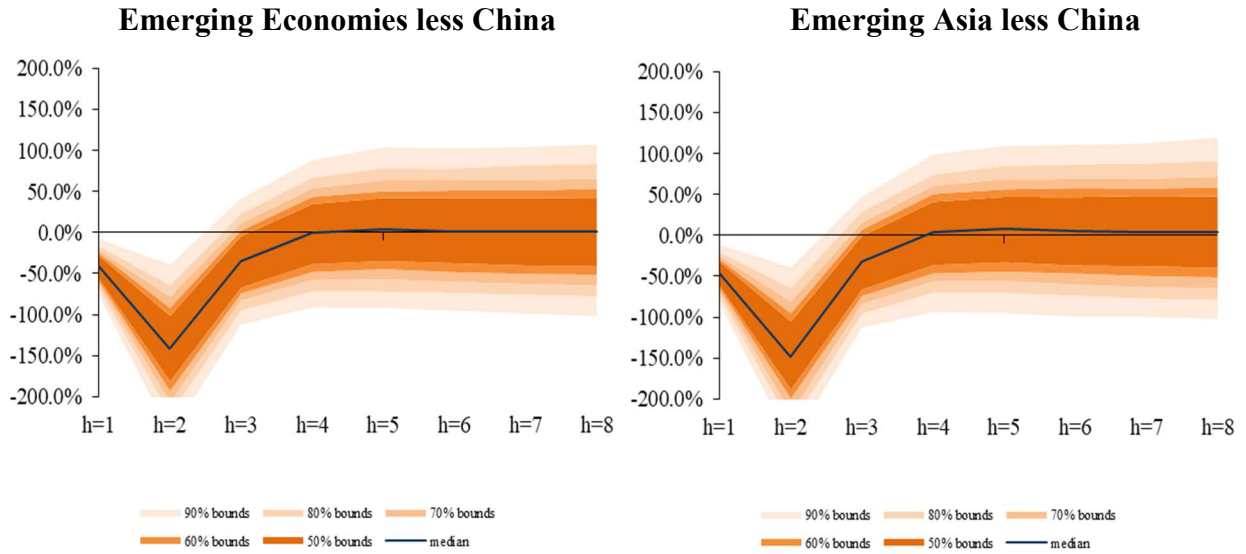
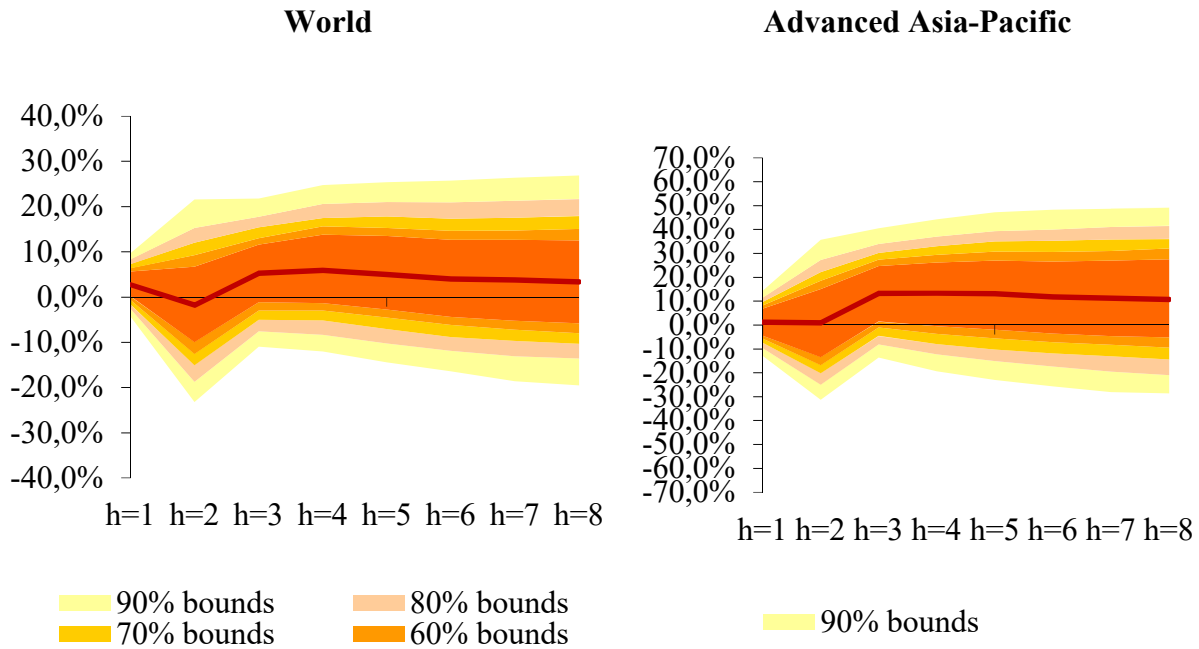
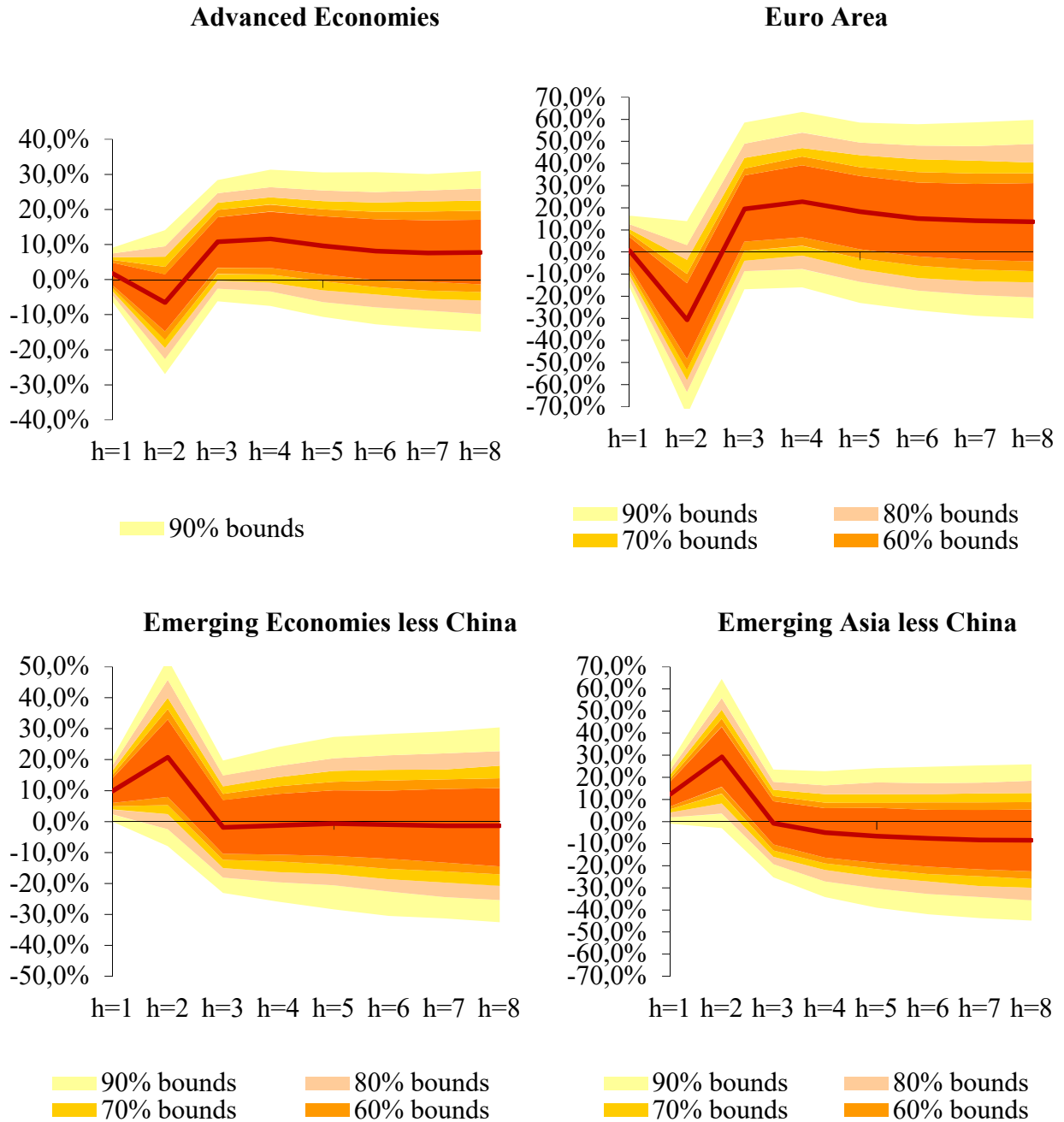


Figure 1b: Counterfactual analysis of the Impact of COVID-19 on real exchange rates (percent deviation from baseline)



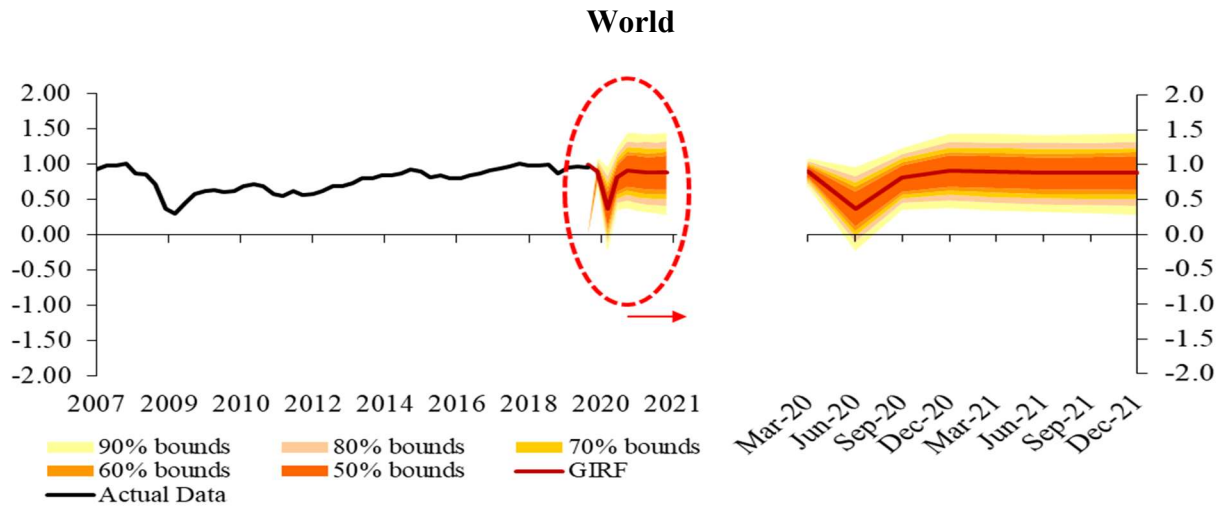


In Figure 1b, we substantiate the earlier theoretical proposition of real exchange rate appreciation when investors reduce their domestic stock holdings in economies where the negative effect of the COVID-19 pandemic is more prevalent (see Hoshikawa and Yoshimi 2021). This is shown to be the case for the World (i.e. the global panel). However, for advanced economies, it took up to 2020Q3 before the Euro Area, Advanced Economies and Advanced Asia-Pacific to experience domestic currency depreciation (exchange rate appreciation). The emerging countries

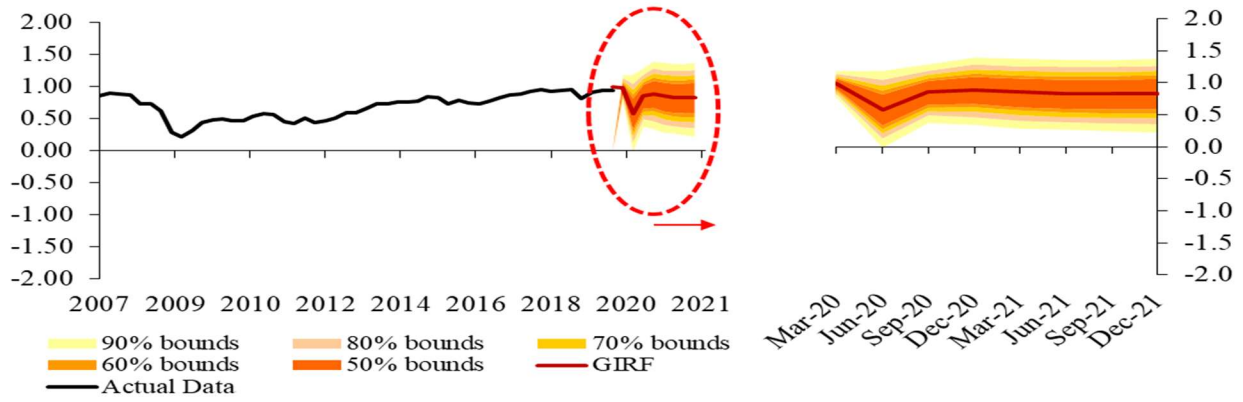
appeared to be the beneficiaries as the Emerging Economies (less China) and Emerging Asia (less China) experienced currency appreciation from the third quarter (2020Q3).

In Figures 2a&b, we explore the possibility of the target variables to revert to pre-COVID-19 equilibrium during the eight-period ahead forecast horizon between 2020Q1 and 2021Q4. The counterfactual analyses show that only the emerging equity markets would be expected to recover from the pandemic shock during the forecast horizon. We do not expect full recovery to pre-pandemic stock returns levels for the rest of the countries (Advanced Economies, Advanced Asia-Pacific, Euro Area) during the forecast horizon. On the contrary, real exchange rates in all the country groups showed potentials for recovery from the COVID-19 pandemic shock. However, there appears to be a new equilibrium established for real exchange rates in the Euro Area with figures significantly higher than the pre-2019Q4 levels.

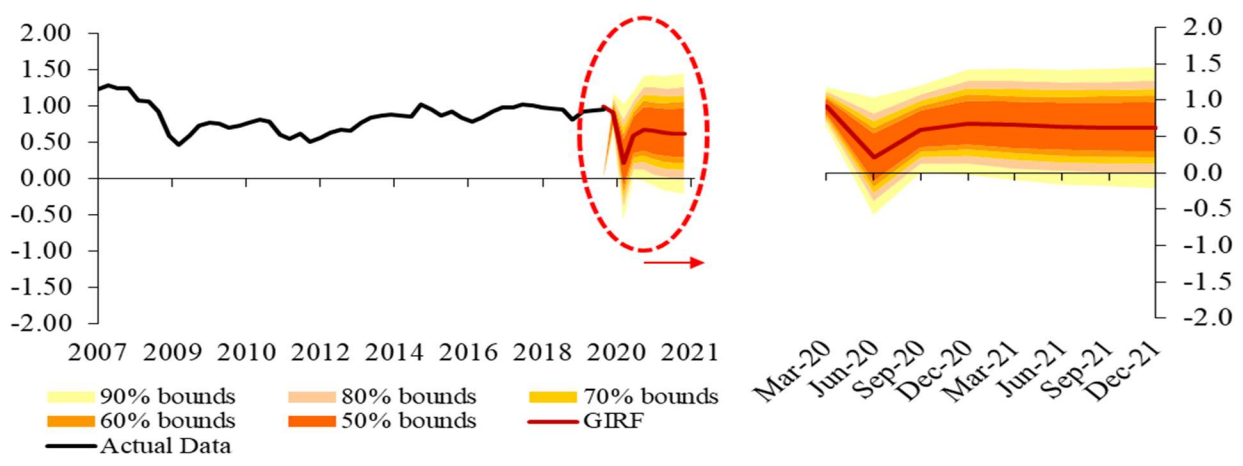
Figure 2a: Dynamics of Real Equity Prices Following the COVID-19 Shock (in logs; 2019Q4=1)



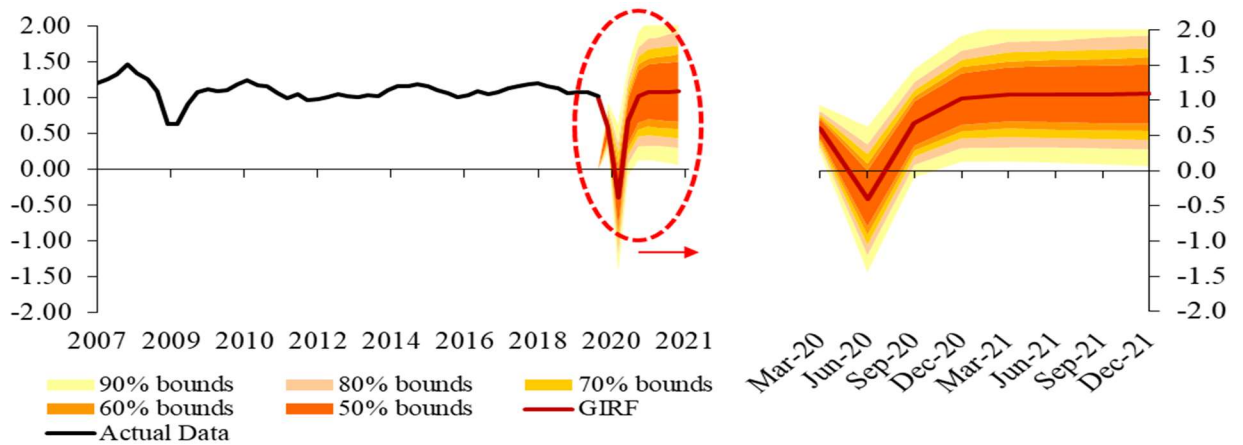
Advanced Economies



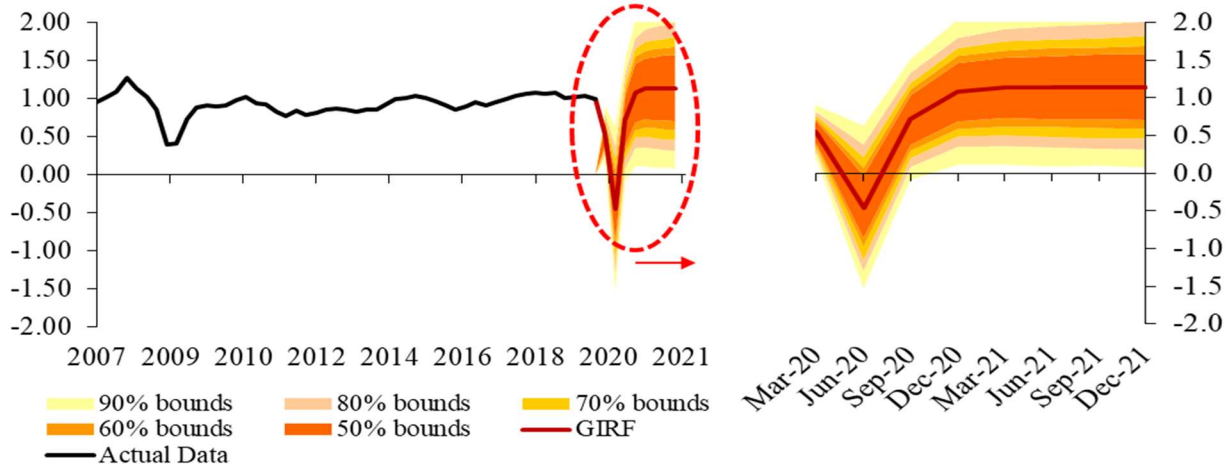
Euro Area



Emerging Economies less China



Emerging Asia less China



Advanced Asia-Pacific

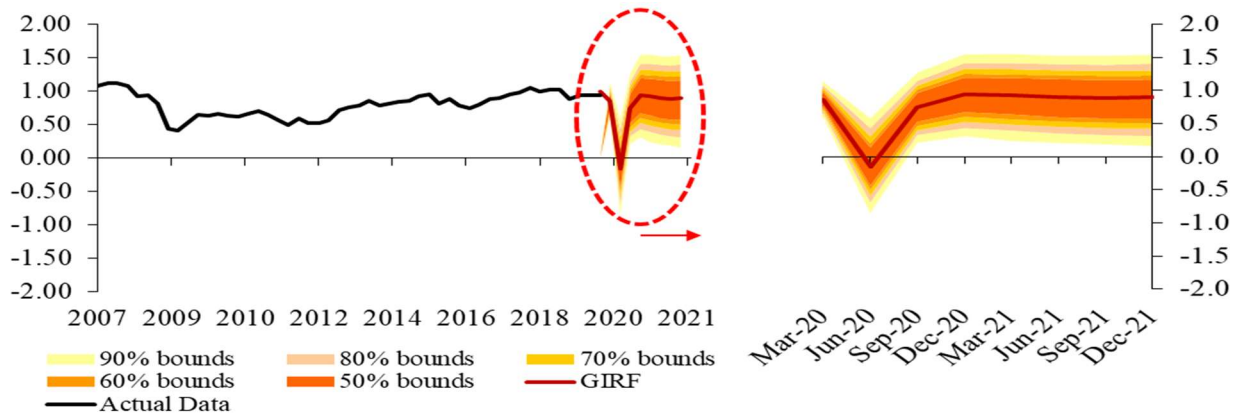
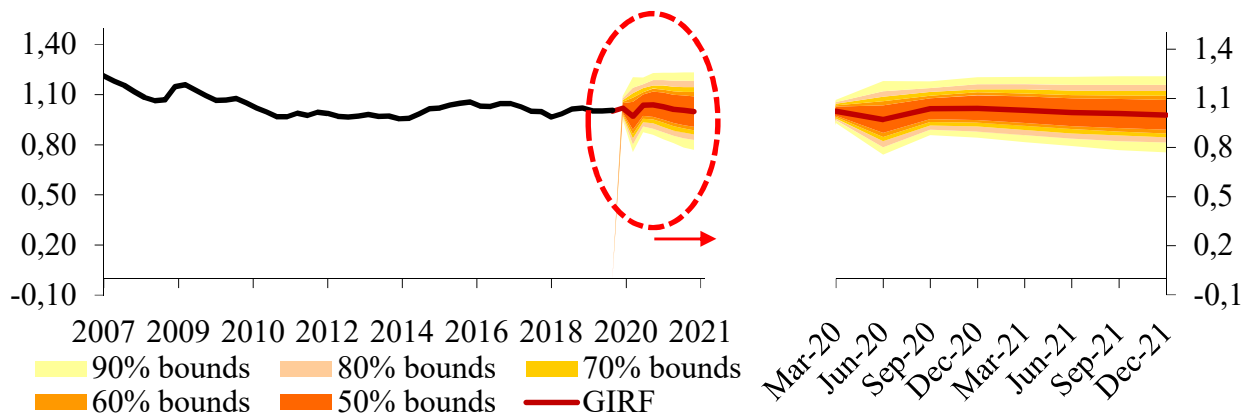
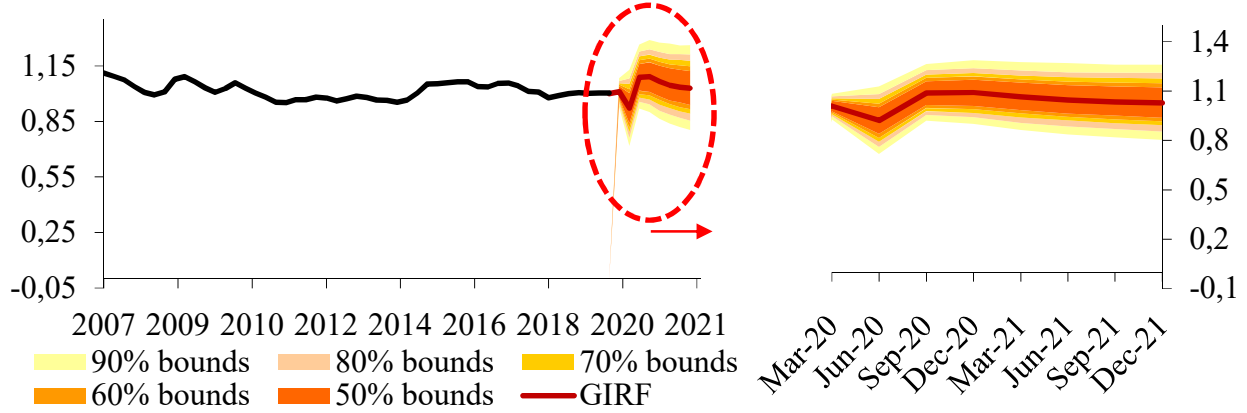


Figure 2b: Dynamics of Real Exchange Rates Following the COVID-19 Shock (in logs; 2019Q4=1)

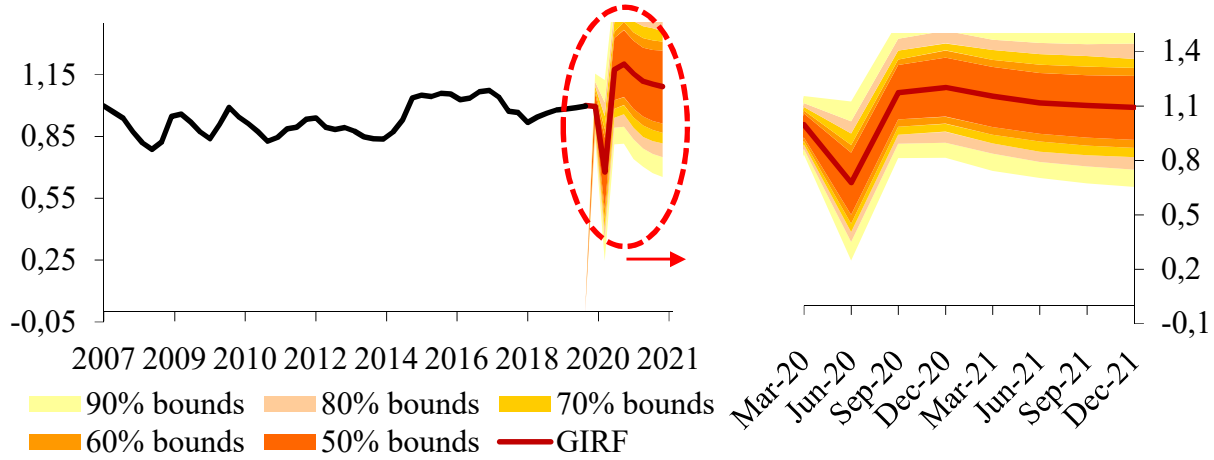
World



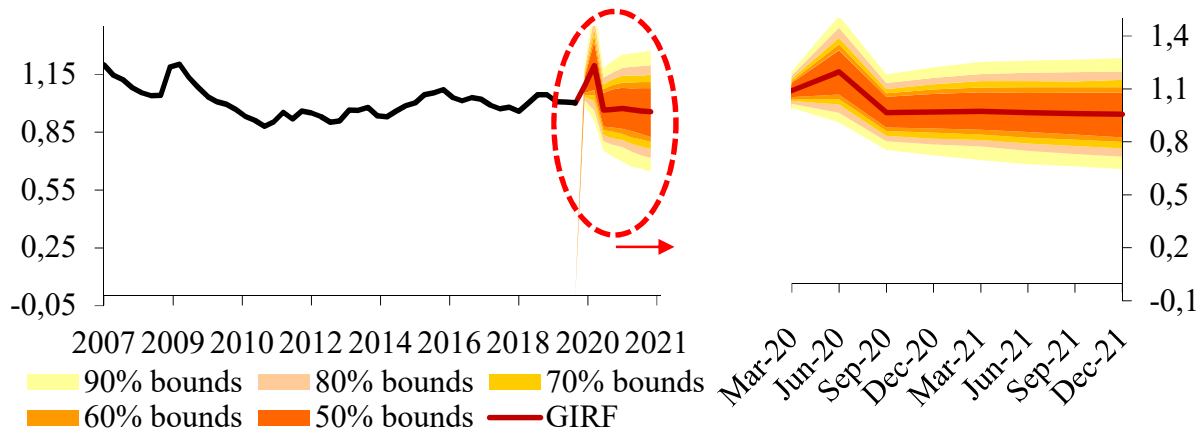
Advanced Economies



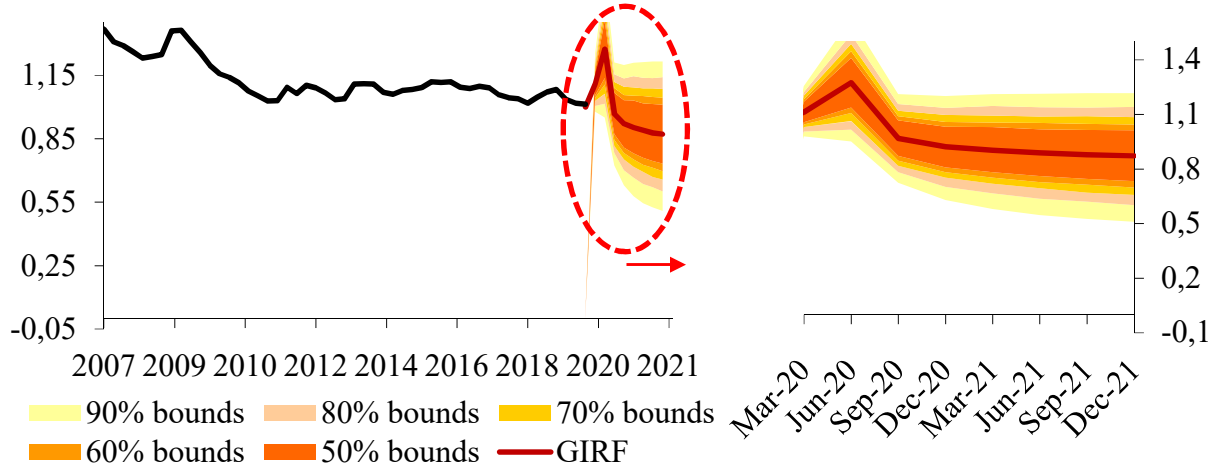
Euro Area



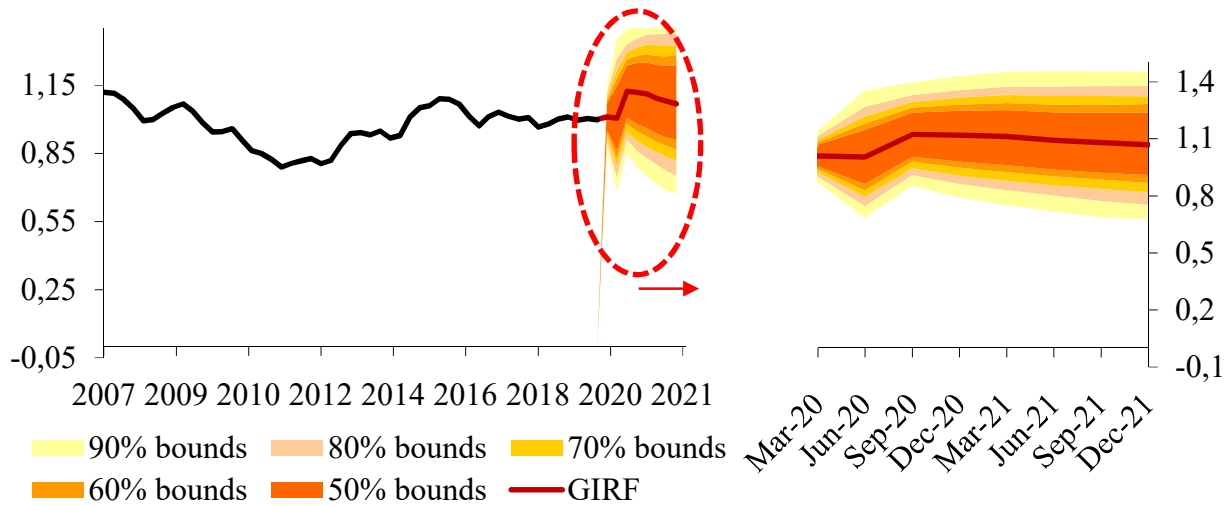
Emerging Economies less China



Emerging Asia less China



Advanced Asia-Pacific



4.0 Conclusion

This study investigates the impact of the COVID-19 pandemic, occasioned by the spike in global financial market volatility, on the real equity prices and real exchange rates globally with evidences teased out for series of sub-samples that seek to capture the pandemic effects on several large country and large region cases. The large country and large regional cases considered comprise the Euro area, advanced economies, emerging economies excluding China, emerging Asia without China and the Asia-Pacific economies. Using the TGVAR framework of Chudik et al. (2020), we produce generalized impulse responses to trace the impact of the pandemic and

assess the possibility or otherwise for the variables to revert to their pre-2019Q4 (i.e. pre-Covid) equilibrium.

We show that the pandemic has widespread negative impacts on the global real equity prices across the different country groupings. A striking finding from the analysis is that the greatest negative impact of the pandemic on the stock markets was experienced in 2020Q2. The advanced Asia-Pacific countries are the worst hit among advanced economies with 110% decline in 2020Q2 while the overall losers are the emerging countries with Emerging Economies (less China) suffering by 140% and Emerging Asia (less China) decline by 150%. The advanced economies (Euro Area, Advanced Economies panel and Advanced Asia-Pacific) experience domestic currency depreciation due to the pandemic around the 2020Q3. On the other hand, the emerging countries [Emerging Economies (less China) and Emerging Asia (less China)] appeared to be the gainers with currency appreciation experienced around the same period (2020Q3).

From the counter-factual analyses of the real equity prices, the path to recovery can be categorized into two categories: countries whose real equity prices would revert to their pre-COVID-19 values within the eight-quarter forecast horizon and countries whose real equity prices would not revert to their pre-Covid levels during the forecast horizon. Our findings show that the Emerging Economies (less China) and Emerging Asia (less China) belong to the first category. The Advanced Economies, Advanced Asia-Pacific, Euro Area belong to the second category where we don't expect the countries to experience full recovery to pre-pandemic real equity prices. The real exchange rates in all the countries would likely slide back to the pre-COVID-19 pandemic equilibrium. We however expect the Euro Area to establish higher equilibrium above the pre-2019Q4 levels.

A multi-country impact analysis of the COVID-19 shock subject to data availability, would further enrich the outcome of this study and in particular offer greater insights into how individual countries responded differently to the pandemic.

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