

---

## Research Article

### Modelling the Impact of a Rise in Global Equity Risk Premium: The G-Cubed Simulation

Realita Eschachasthi\*

Badan Pusat Statistik, Indonesia

---

#### Article history:

Submission September 2022

Revised December 2022

Accepted December 2022

#### \*Corresponding author:

E-mail:

[escha@bps.go.id](mailto:escha@bps.go.id)

#### ABSTRACT

The global disruptions—the Covid-19 pandemic, financial crisis, trade tension, and geopolitical issues—led to uncertainty across the world economies. The impact either on individual emerging or advanced countries, however, remains unclear. To this end, this study is simulating a shock of a one percent increase in equity risk premium permanently in all sectors in all countries, and focusing on exploring its impact on the United States (US), the United Kingdom (UK), Australia, China, Indonesia, and India. The results reveal that no countries are immune from the short-lived synchronised nuisance. Investment plummeted massively following the profound drop in interest rate, while unemployment suddenly soars, and Gross Domestic Product (GDP) contracted dramatically. In the long run, all economies reverse and converge to the initial condition. Nevertheless, there would be persistent GDP loss and sluggish investment in all economies. Therefore, policy responses should be designed based on strong international cooperation, focusing on fiscal policy to limit the impact of global losing confidence.

**Keywords:** *Equity risk premium, General equilibrium model, Global disruption*

---

#### Introduction

The global economy has been experiencing several disruptions, from Global Financial Crisis (GFC) 2008-2009, trade tensions, and geopolitical issues to the current pandemic, Covid-19. Altogether, the unprecedented disruptions led to economic turmoil and financial system instability, reflecting the existence of global economic uncertainty. Even though growth reached 3.8% in 2017, the IMF (International Monetary Fund) predicted that global growth would suffer from a sharp contractionary up to

4.4% in 2020 (MIF 2020a). Meanwhile, market equity prices fell profoundly, capital outflow from emerging markets enormously, and there were dispersions of earnings forecasts in the first quarter of 2020, indicating the tightening of the financial market (IMF 2020b). Despite the sign of recovery since late March, the financial vulnerabilities have continued to increase (IMF 2020c). Furthermore, a simulation shows that global loss in 2020 would be around \$US17.3 trillion under a scenario no vaccine for coronavirus ever developed, and the global

---

#### How to cite:

Eschachasthi, R. (2022). Modelling the Impact of a Rise in Global Equity Risk Premium: The G-Cubed Simulation. *Jurnal Ekonomi dan Statistik Indonesia*. 2(3), 270 – 281. doi: 10.11594/jesi.02.03.04

equity risk premium increases permanently (McKibbin & Fernando 2020a).

Given the current condition, the question of how global uncertainty affects short-run and long-run individual economies is not well examined. Against this backdrop, this study aims to show how the global rising of equity risk premium undermines the economy of emerging and developed countries. The equity risk premium refer to a greater rate of return that one possibly gained from taking on riskier investments in the equity market, i.e. stocks. This rate is generally over the risk-free investments, i.e. bonds.

This paper employs the G-Cubed multi-country model version 155 simulation. In particular, this paper focuses on examining the impact in three developed countries and three emerging economies, i.e. the US, the UK, Australia, China, Indonesia, and India. The idea of selecting six countries is in order to enrich the analysis by exploring how different countries would respond to the shock. The US, China, and Australia were selected as subjects of trade tensions. Besides, Australia opted as this country recorded the lowest Covid-19 cases in the present. The UK, India, and Indonesia represent countries with higher recent positive cases of Covid-19.

Views are divided on the type of policy response relevant to global disruptions to recovery. Prior to GFC, fiscal policy and international cooperation received less attention as options to manage the economy. Obsdfeld and Rogoff (2002) argue that domestic monetary rule appears to bring optimal national gain and render superfluous effects; thus, coordination can be put as a second-order need. On the other hand, Oudiz and Sachs (1984) agreed that policy coordination would bring benefits and welfare spillover in response to the global shock. The recent study conducted by McKibbin and Vines (2020) found that international cooperation based on fiscal policy is essential. They show that both countries with and less extra fiscal support would benefit by enjoying a higher GDP levels in the first year and lower unemployment.

This paper contributes to the policy debate by providing a view of current state and future path of various economies. This study shows

that simultaneous losing confidence in holding equity would cause profound economic deterioration in six countries. The impact includes the decline in all capital market sectors, investment, interest rate, employment, and national output. Although the effect appears to be short-lived, the GDP across six economies are hardly reverse to the initial condition. There would be permanent national output loss due to weaker investments. Given the fact that the impact is synchronised, strong international cooperation focusing on fiscal policy is needed to alleviate this impact.

This paper is structured as follows. The next section discussed the features, assumptions, and parameters used in the G-cubed model. Discussion of the results is presented in Section 3. Finally, in Section 4, a summary of the findings is discussed.

## Methods

### *G-Cubed Model Overview*

G-Cubed, developed by Warwick McKibbin and Peter J. Wilcoxon, is an intertemporal general equilibrium model with multi-country, and multi-sector modelling of the world economy, consisting of households, firms, and government as economic agents (McKibbin & Wilcoxon 1995). The idea of the model is to provide a reliable framework, bridging three research areas: the econometric general equilibrium model, international trade theory, and modern macroeconomics. The model has been through continuous improvements throughout the years, and the G-Cubed (G20) model appears to be the latest and the most comprehensive one. It is designed in a way to answer the urgency of G20 economies modelling, which requires high disaggregation and complexity levels (McKibbin & Triggs 2018).

The G-Cubed 155 version used in this study is the G20 version, consisting of 24 autonomous blocks: twenty countries (including the rest of the Euro Zone) and four regions. Each region embodies six sectors, i.e. energy, mining, agriculture, durable manufacturing, non-durable manufacturing, and services. There were also six markets in the model, i.e. equity, bond, goods and services, labour, energy and material, and foreign exchange. Financial capital is flexible to instantly flow from one economy to

another based on chasing high expected returns.

In each sector, there were two types of households and firms: forward and backward-looking behaviour. The households maximised their intertemporal utility as a function of consumption and government expenditure, subject to lifetime budget constraint, where the present value of all consumption is equal to the present value of expected lifetime after-tax income. Firms in the G-Cubed are producing output in a CES production function. In the six sectors model, there were six different firms; all are assumed to be price-taking. Firms are investing to maximise intertemporal share market value—the sum of dividends after-tax—subject to production technology and investment adjustment costs where their investment decisions are based on the valuation of Tobin’s q. In the steady-state condition, these two types of firms would exactly be the same; the same condition applies to two sets of households.

The monetary rules imposed in the G-Cubed, it based on Henderson-McKibbin-

Taylor (HMT) rule (Henderson & McKibbin 1993; Taylor 1993). In terms of utilisation, the earlier G-Cubed models have been useful in presenting modelling in several research areas, i.e. policy coordination, international trade, monetary and fiscal policies, tax regulation, and environmental rules. The G-Cubed model has been able to demonstrate a useful understanding of several historical macroeconomic issues from the 1980s (McKibbin & Vines 2000) to the financial crisis of 2008-2009 (McKibbin & Stoeckel 2009). Meanwhile, the G-Cubed (G20) model has proven in its ability to give insight on the recent crisis, Covid-19, through seven plausible scenarios (McKibbin & Fernando 2020b).

### Modelling Equity Risk Premium in the G-Cubed

This paper aims to explore the impact of global shocks represented by a permanent 1% increase on equity risk premium in all sectors across all countries relative to the 2019 baseline year, as provided in Table 1.

Table 1. Shock Scenario in 2020 onwards

	Increase from baseline (%)	Countries
<b>Equity risk premium by sector:</b>		
- Energy	1	All countries
- Mining	1	
- Agriculture	1	
- Durable manufacturing	1	
- Non-durable manufacturing	1	
- Services	1	

The equity risk premium is the arbitrage of asset allocation, i.e. equity relative to bonds, by compensating a higher rate of return. As the equity risk premium is rising, investors’ risk perceptions are higher, indicating that investors are becoming more risk-averse, and there is more significant uncertainty about future earn-

ings in equity markets. However, before modelling the shocks, it is necessary to understand how the simulation works in the model. G-Cubed accommodates three types of risks in the intertemporal model, and the equity risk premium is one of them. It could be explained using Tobin’s q equation as follows:

$$(1) \quad \lambda_{it} = \int_t^\infty \left( (1 - \tau_2) p_i^* \frac{dQ_i}{dk_i} \Big|_{j, \hat{k}} + (1 - \tau_4) p^I \frac{\varphi_i}{2} \left( \frac{\hat{J}_i}{\hat{k}_i} \right)^2 \right) e^{-(R(s) + \delta + \mu(s))(s-t)} ds$$

As presented in equation (1), Tobin’s q is the sum of the increment to the marginal productivity of capital from an additional unit of investment and the effects of adjustment

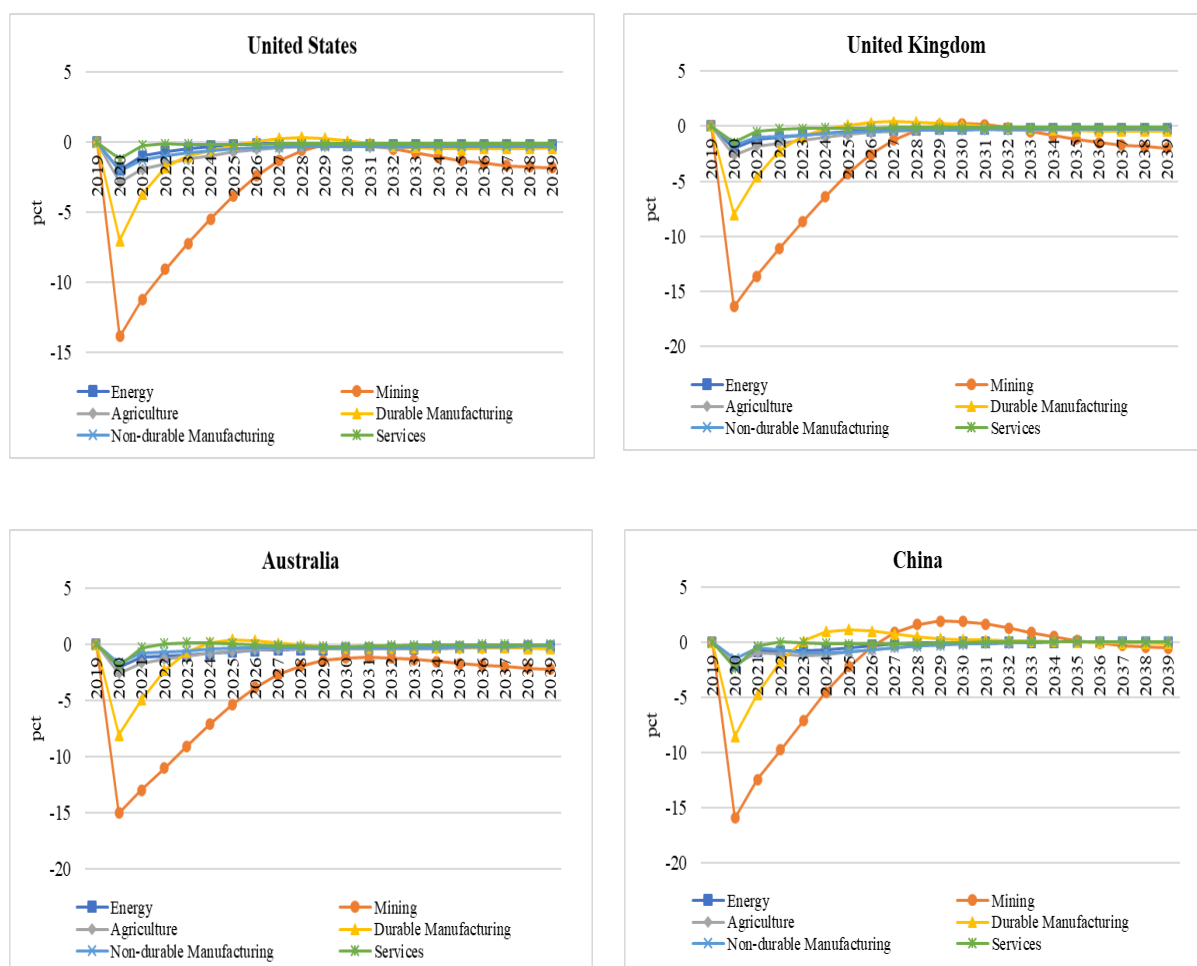
costs with taking into account the discounting factors. The equity risk premium ( $\mu$ ) is one determinant of the discount factor. A higher equity risk premium leads to a decrease in the

future value of additional marginal productivity gain from one unit of investment, then leads to the decline of Tobin's q value. It implies that investors would be less likely to invest since the future is riskier. Moreover, there would be a lower rate of return at a different time in the future as people discount the present.

### Result and Discussion

This section starts by providing the impact of the rising global equity risk premium on Tobin's q sectors. There are sudden plunges in all Tobin's q sectors across six countries in the short run, as shown in Figure 1, implying a

significant sell-off equity due to a higher required return of capital. In more detail, relatively capital-intensive sectors, i.e. mining, and durable manufacturing hit the hardest. Meanwhile, the rest of the sectors which are relatively labour-intensive was mildly affected. Table 2 shows the capital-labour ratio for each sector in every country. Interestingly, mining and durable manufacturing sectors in China and India appear to have a slight increase after a considerable drop before they back to the baseline condition. After a massive decline, capital-intensive sectors gradually reserve relative to the baseline.



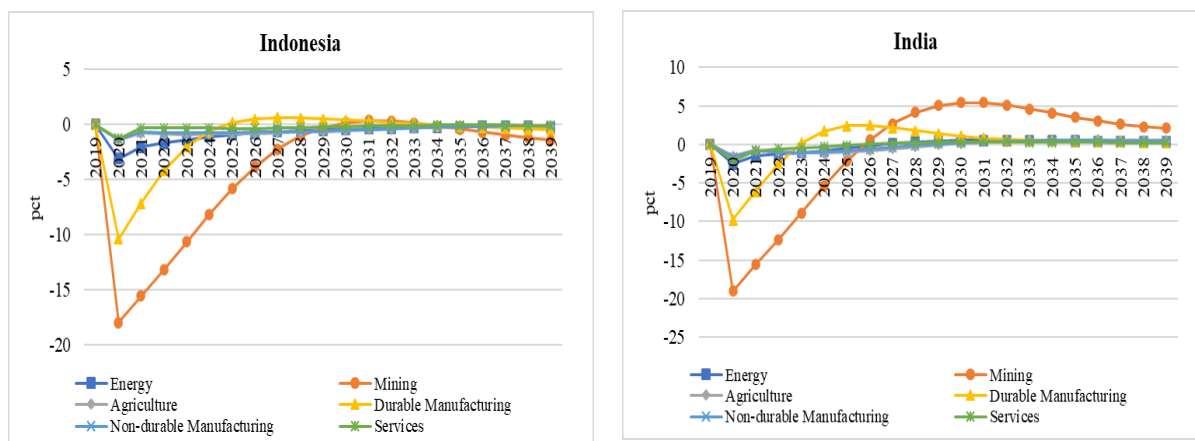


Figure 1. Impact on Tobin's q in six countries' capital market (TOB) 2019-2039

Table 2. Capital-labour (K/L) ratio

Country	Energy	Mining	Agriculture	Durable Manufacturing	Non-Durable Manufacturing	Services
(1)	(2)	(3)	(4)	(5)	(6)	(7)
US	2.558	0.761	0.803	0.277	0.542	0.238
UK	3.192	0.888	0.564	0.320	0.430	0.419
Australia	4.159	3.950	0.919	0.673	0.914	0.413
China	1.983	1.499	0.725	0.965	0.857	0.653
Indonesia	1.689	0.989	0.575	0.563	0.741	0.942
India	2.871	2.286	1.572	1.116	0.814	0.767

The impact on total capital goods demanded is presented in Figure 2. A high level of equity risk premium implies that the current capital stock is too high for the required marginal product of capital to offset financial assets. As a result, the investment quickly deteriorates in the short-run where all six economies suffer from substantial overshooting investment. In more detail, Australia hurt the most as its investment plummeted at around 4.2 percentage point lower in 2021 relative to baseline. After fluctuation, capital stock gradually converges due to adjustment cost and confidence gain. However, it stays permanently at a lower level relative to baseline across countries, indicating investment still sluggish. Interestingly, emerging economies, i.e. China, India, and Indonesia, seem to have faster convergence than advanced countries. Nevertheless, Australia suffers the most permanent drop compared to the other economies.

Losing confidence in holding equities in investment leads to various responses to the short-run real exchange rate as provided in Figure 3. The immediate currency depreciation takes place in China and Australia at around 0.6 percentage deviation, indicating capital outflow. Meanwhile, currency appreciation occurs in the US, Indonesia, and the UK, where the US is recorded as the highest level at 0.8 percentage deviation. It implies that those countries are enjoying a substantial amount of capital inflow. On the other hand, India's short-run real exchange rate is slightly affected. As confidence is restored, the real exchange rate is slowly stabilising. The US, UK, Australia, and China are predicted to have a lower level of real exchange rate relative to the baseline. Nevertheless, Indonesia and India would end up with a relatively higher real exchange rate, suggesting that there is a permanent capital inflow.

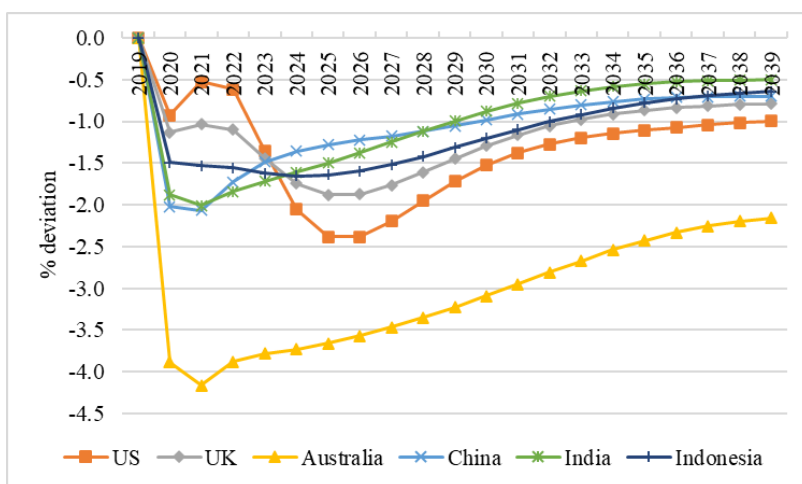


Figure 2. Impact on total capital goods demanded (INVT) 2019-2039

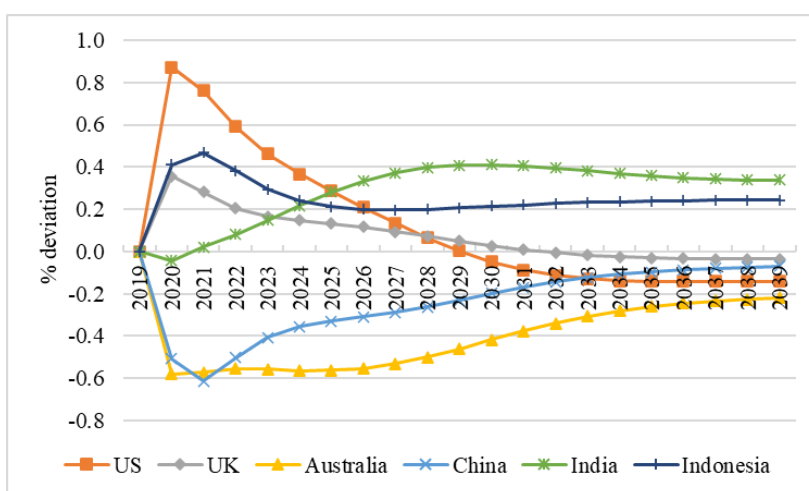


Figure 3. Impact on trade-weighted real exchange rate (REER) 2019-2039

Increasing global equity risk premium would cause investors to shift their assets from equities to domestic investments, i.e. government bonds, housing properties, and foreign assets. As a result, the price of those assets would be rising and drag down the real interest rate accordingly. Figure 4 shows the impact on the disaggregate level of interest rate: desired nominal interest rate in the short-run (INPN), short policy interest rate (INTN), and real risk-adjusted interest rate in the short-run (INTR). The graphs show that there was a substantial fall in the interest rate in the short run all-over the countries, implying that investments are less attractive. In the long-run, the interest rate would permanently stay at a lower level relative to the baseline as the marginal product of

capital remains low, indicating that risk aversion behaviour has not fully recovered. It is important to note that economic agents' expectation per se does not leverage the short-run interest rate as central banks also control the desired interest rate through Taylor monetary rule.

In response to the global rise of equity risk premium, there will be a sudden and profound GDP contraction in all six countries immediately after the shock occurs, as presented in Figure 5. Real GDP then quickly reversed in 2021 and keeps fluctuate before settling down at a lower level than the baseline. Australia's real GDP took the heaviest hit at around 0.5 percentage deviation, and will remain at the lowest level compared to other countries.

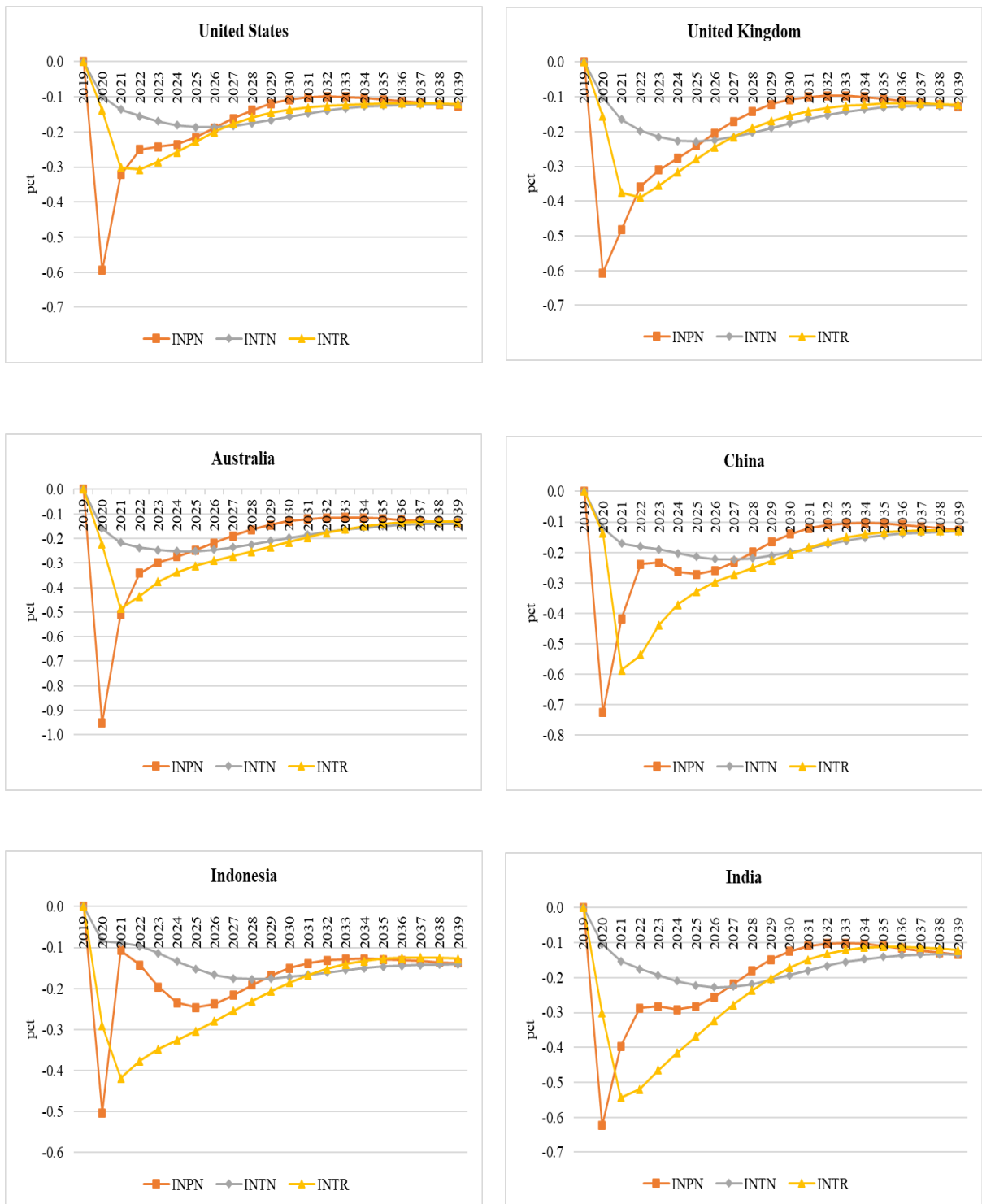


Figure 4. Impact on interest rate (INTN, INPN, INTR) 2019-2039

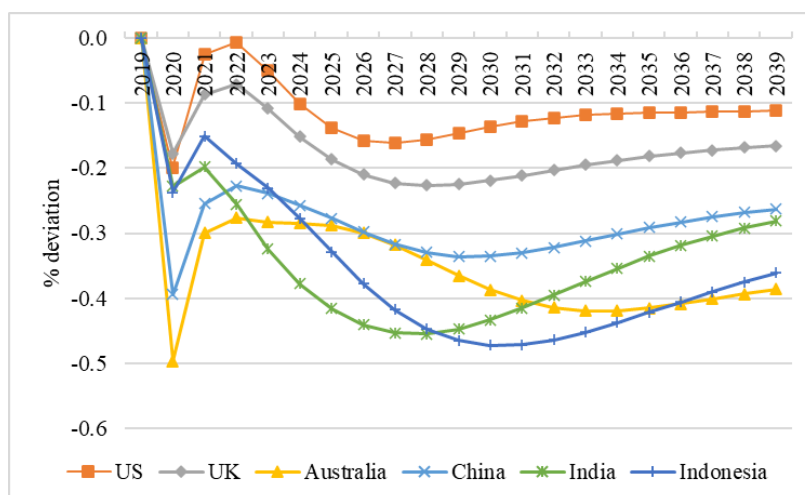


Figure 5. Impact on real GDP (GDPR) 2019-2039

The impact on inflation is provided in Figure 6. As we can see, inflation rate drags down immediately after the shock applied, with China appears to have the lowest inflation change at around 0.5 percent. This effect, however, would not be permanent as there would be “v” shape quick recovery. In about five years, all countries would have higher inflation before it eventually stables near the baseline. The rising price of consumer goods, the weighted prices of domestic goods, and the price of imports since a year after the shock—as presented in Figure 8—may contribute to the increasing inflation rate.

Furthermore, global uncertainty also affected employment, as shown in Figure 7. A massive increase in unemployment occurs in all countries due to disturbance in all six sectors. Unfortunately, Australia appears to be the most severely affected by around one percentage deviation. Similar to GDP, this impact would not last forever. Employment gradually increases relatively close to the baseline a year after the shock as real wages decrease over time due to less capital stock required for production. Lower level capital stocks mean that demand on labours increasing so that the real wages relatively low. As a result, employment started to converge across the countries.

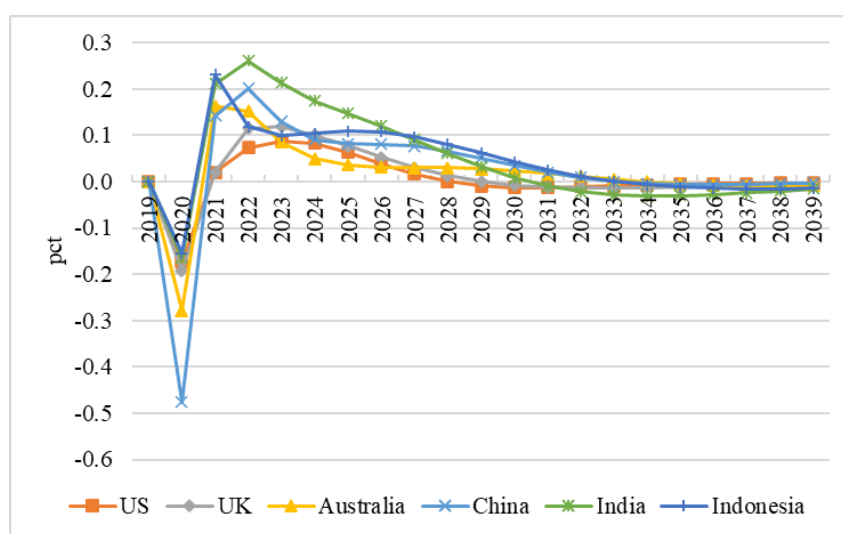


Figure 6. Impact on inflation rate (INFL) 2019-2039



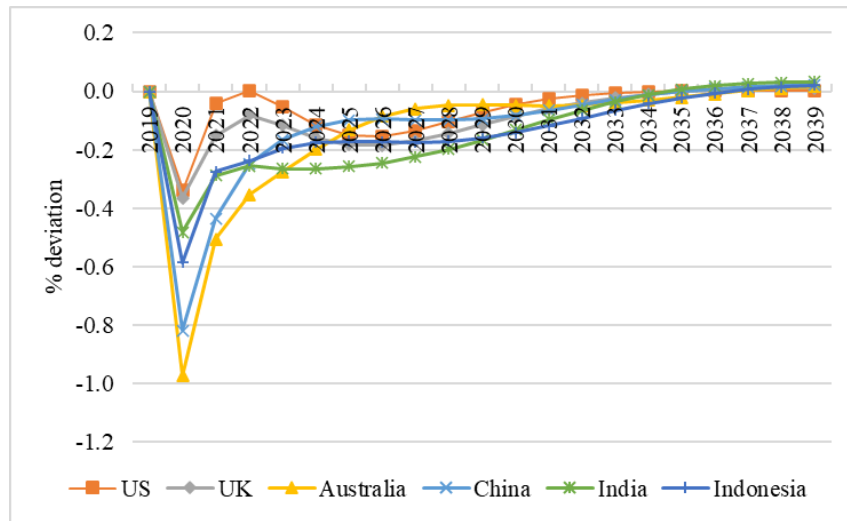
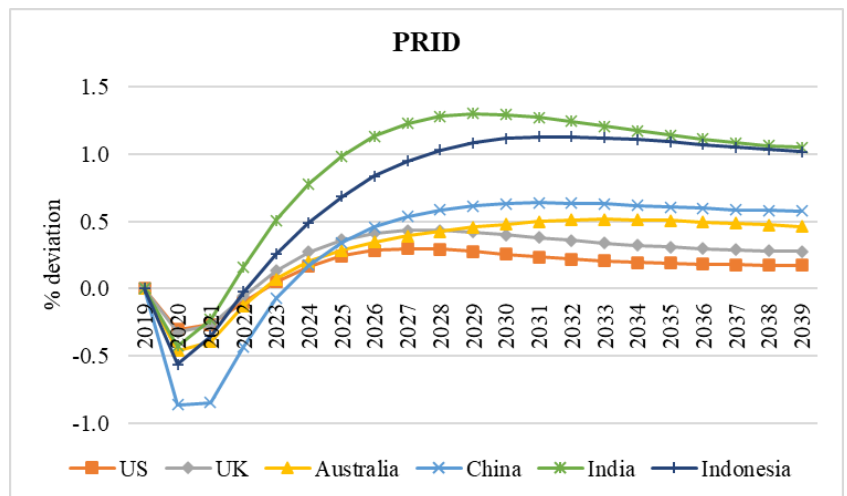
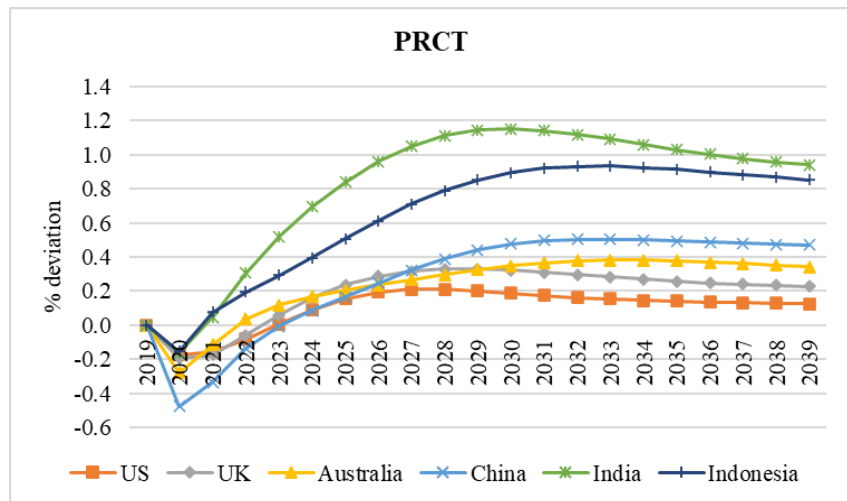


Figure 7. Impact on employment (LABO) 2019-2039



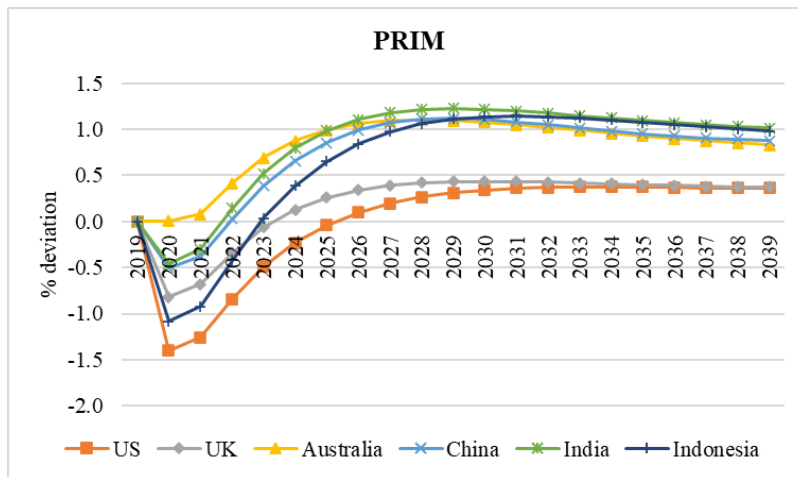


Figure 8. Impact on aggregate price of consumer goods (PRCT), weighted price of domestic output (PRID) and weighted price of imports (PRIM) 2019-2039

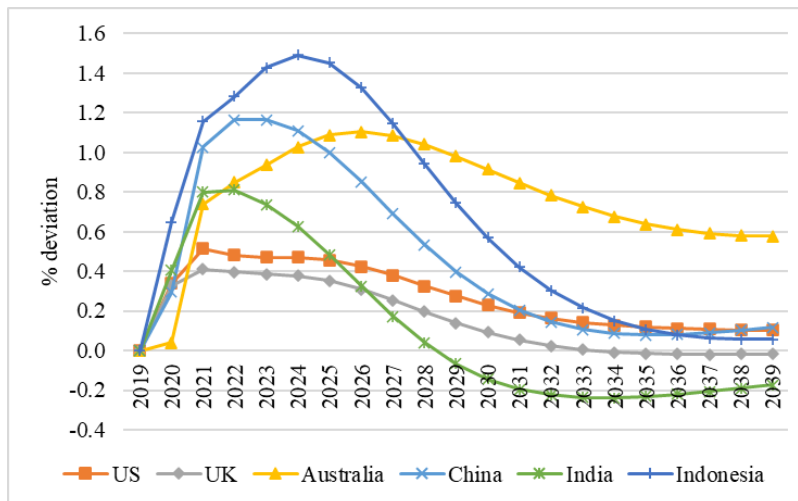


Figure 9. Impact on consumption (CONP) 2019-2039

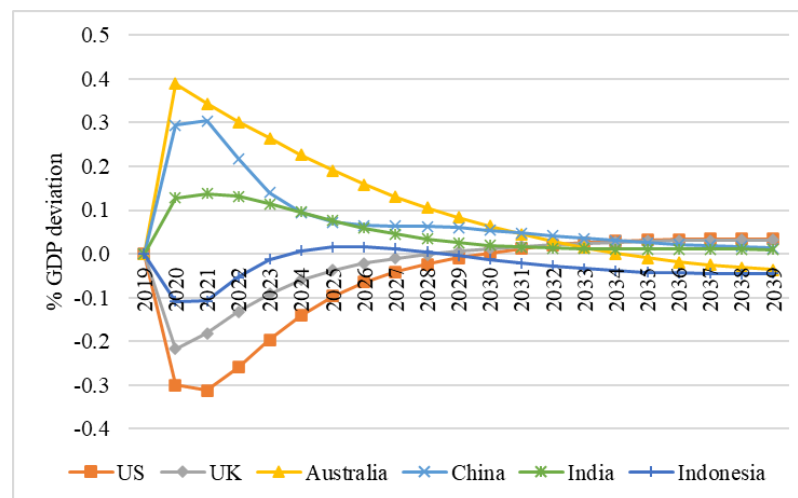


Figure 10. Impact on trade balance (TBAL) 2019-2039

From Figure 9, the increase in equity premium risk boost consumption in all six countries. Due to a considerable decline in interest rates, consumption must jump to offset the decline of investment in the economy. Indonesia appears to be the economy with the highest consumption level and reach its peak in 2024 at around 1.5 percentage deviation. Meanwhile, the lowest consumption jump occurs in the UK. Consumption will gradually converge close to the baseline in conjunction with the increasing interest rate.

Finally, the impact on the trade balance is presented in Figure 10. From the graph, China, Australia, and India appear to relish a trade surplus as a result of massive capital outflow due to real exchange rate depreciation. On the contrary, the US, the UK, and Indonesia experienced trade deficits as their exchange rates appreciated thus enjoying capital inflows. In the short-run, Australia seems to have the highest trade surplus of around 0.4 percentage GDP deviation, while the US has the lowest trade deficit by 0.3 percentage of GDP deviation. The trade balance of the six countries will eventually converge to the initial position within twenty years.

## Conclusions

Employing a global general equilibrium the G-Cubed model, this paper examines the impact of the permanent global loss of confidence and focuses on three emerging economies—Indonesia, India, and China—and three advanced countries—the US, the UK, and Australia. The simulation is carried out by incorporating a one percent increase in the equity risk premium in all sectors across countries since 2020 relative to the 2019 baseline permanently. The results reveal that neither emerging economies nor advanced countries enjoy the impact of synchronised confidence loss. Interest rate deteriorates in the six countries, and the negative deviation persisted over the long-run, implying that investment is sluggish as it loses traction. Furthermore, the six countries appear to experience substantial GDP contraction in the immediate aftermath of the shock. Although GDP is relatively stable in the long-run, all econo-

mies suffer from persistent output losses represented by the negative deviation. Indonesia and Australia appear to have the lowest GDP losses compared to other countries.

Overall, the result draws attention to the necessity of significant international cooperation to mitigate global uncertainty, as neither emerging nor advanced countries are immune to its effect. In more detail, fiscal policy coordination by involving an international organisation, i.e. IMF, might help in stabilising the case of short-lived turbulence and limiting the output loss toward sustainable recoveries. Multilateral cooperation is also necessary to soothe trade tensions and political uncertainty. Finally, the policy should be designed by considering its impact on all countries; national responses per se, however, are less likely to deliver optimal benefits.

## Acknowledgment

The author would like to express sincere gratitude to Prof. Warwick McKibbin, course convener of Modelling the Global Economy - Techniques and Policy Implications at the Australian National University (ANU), for valuable lectures and comments.

## Daftar Pustaka

- Henderson, DW & McKibbin, WJ 1993, 'A comparison of some basic monetary policy regimes for open economies: implications of different degrees of instrument adjustment and wage persistence', 458, International Finance Discussion Papers, Board of Governors of the Federal Reserve System (U.S.), viewed 14 November 2020, <https://ideas.repec.org/p/fip/fedgif/458.html>
- International Monetary Fund 2020a, *World economic outlook: global manufacturing downturn, rising trade barriers*, viewed 13 November 2020, <https://www.imf.org/en/Publications/WEO/Issues/2019/10/01/world-economic-outlook-october-2019>
- International Monetary Fund 2020b, *Global financial stability report: markets in the time of COVID -19*, viewed 13 November 2020, <https://www.imf.org/en/Publications/GFSR/Issues/2020/04/14/global-financial-stability-report-april-2020>

- International Monetary Fund 2020c, Global financial stability report: bridge to recovery, viewed 13 November 2020, <https://www.imf.org/en/Publications/GFSR/Issues/2020/10/13/global-financial-stability-report-october-2020>
- McKibbin, WJ & Wilcoxon, PJ 1999, 'The theoretical and empirical structure of the G-Cubed model', *Economic modelling*, vol. 16, no. 1, pp.123-148.
- McKibbin, WJ & Vines, D 2020, 'Modelling reality: the need for both inter-temporal optimization and stickiness in models for policy-making', *Oxford Review of Economic Policy*, vol. 16, no. 4, pp. 106-137.
- McKibbin, WJ & Stoeckel, A 2009, 'Modelling the global financial crisis', *Oxford Review of Economic Policy*, vol. 25, no. 4, pp. 581-607.
- McKibbin, WJ & Triggs, A 2018, 'Modelling the G20', CAMA Working Paper, No. 17, Australian National University, Canberra, viewed 13 November 2020, [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3167666](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3167666)
- McKibbin, WJ & Fernando, R 2020a, 'Global macroeconomic scenarios of the COVID -19 pandemic', *Covid Economics Vetted and Real-Time Papers*, vol. 39, pp. 1-58.
- McKibbin, WJ & Vines, D 2020, 'Global macroeconomic cooperation in response to the COVID-19 pandemic: a roadmap for the G20 and the IMF', *Oxford Review of Economic Policy*, vol. 36, no.S1, pp. S297-S337.
- McKibbin, WJ & Fernando, R 2020b, 'The global macroeconomic impacts of COVID-19: seven scenarios', CAMA Working Paper, No. 19, Australian National University, Canberra, viewed 13 November 2020, <https://cama.crawford.anu.edu.au/publication/cama-working-paper-series/16221/global-macroeconomic-impacts-covid-19-seven-scenarios>
- Obstfeld, M & Rogoff, K 2002, 'Global implications of self-oriented national monetary rules', *The Quarterly journal of economics*, vol. 117, no. 2, pp. 503-535.
- Oudiz, G & Sachs, J 1984, 'Macroeconomic policy coordination among the industrial economies', *Brookings Papers on Economic Activity*, vol. 1, pp. 1-75.
- Taylor, JB 1993, 'Discretion versus policy rules in practice', *Carnegie-Rochester Conference Series on Public Policy*, vol. 39, pp. 195-214.