The Implications of a Global Rise in Equity Risk Premium

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Abstract

Policy uncertainty increases due to the COVID-19 pandemic and U.S.-China trade war. The consumer and business confidence index in response to the increasing uncertainty indicates an overall pessimistic attitude towards future economic development. The uncertainty further causes the equity risk premium to rise. This paper explores the impact of a permanent increase in the global equity risk premium. A permanent 1 percent increase in equity risk premium in all six sectors across the United States and China are stimulated using the G-Cubed model, and the shock starts in 2020. The results show that the shock has various impacts on different macroeconomic variables over time. In the short run, as risk premium increases, capital outflows from China and the United States. Varies macroeconomic variables change in response to the outflow. Several variables gradually adjust back to the baseline level, while the others permanently decrease from the baseline over time. Moreover, the risk premium shock impacts China differently compared to the United States. The real GDP falls by more percent deviation from the baseline in China compared to in the United States in the long run. The real interest rate of China starts to increase from 2021 while the real interest rate continues to fall in the United States as monetary policy in China targets the exchange rate. In the short run, the investment of China decreases by less percent deviation from the baseline compared to the United States in response to the differences in real interest rate movement.

Keywords: China, COVID-19 pandemic, G-Cubed model, Macroeconomic variables, The United States.

1. Introduction

The COVID-19 pandemic poses a challenge to health, economic growth and financial stability across countries. It is believed that the overall impact of this pandemic on the global economy is uncertain, and it is difficult to estimate the timing of a recovery (IMF 2020a, p. ix). The financial markets in both developed and developing countries have been performing badly since the outbreak. For example, as shown in Figure 1, the market value of S&P 500 in the United States had lost 34 percent of its value during the COVID-19 pandemic.

The major funding markets emerge 'signs of strain', leading to large capital outflows and exacerbated domestic shocks in emerging countries (IMF 2020, p. ix). The borrowers in emerging economies face the inability to service their debts, which may pressure financial institutions 'and cause credit markets to freeze up' (IMF 2020, p. ix).

The uncertainty causes the equity risk premium to rise. Firstly, the pandemic hurt consumer and business confidence. Many small businesses had temporarily closed across countries which caused a reduction in labour demand in the first six months of 2020, unemployment rate increases consequently. Based on OECD (2020, A), the consumer confidence index falls below 100, which indicate a pessimistic attitude towards future economic development.

Similarly, the business confidence index remains lower than 100, indicating pessimism towards future output growth and economic performance (OECD 2020, B). Secondly, U.S.-China trade war lower returns to capital and increase policy uncertainty. Amiti and colleagues prove that the tariff policy causes a decrease in return and an increase in uncertainty (2020, p. 31). It is argued that 'uncertainty about expected GDP growth and expected consumption growth is significantly positively related to the expected market risk premium' (Berkman et al. 2017, p. 370). Thus, given the high uncertainty and the low confidence during this pandemic and other political issues, equity risk premium may increase across countries.

This paper explores the impact on economies of a permanent increase in the global equity risk premium and uses the G-Cubed model (version GGG6G_v155) to answer the question: whether the implication for China is different from the implication for the United States?

This paper is structured as follows. Section 2 is a literature review on the implications of a permanent rise in the equity risk premium on investment and employment. Section 3 includes an introduction of the G-Cubed model, policy responses in the model, and a discussion of the results. Section 4 is the conclusion.

2. Literature Review

The increase in equity risk premium influences investment negatively. Cochrane uses data of government and corporate yields with regression results to show that the investment demand decreases as risk premium increases (2011, p. 39). Moreover, McKibbin and Stoeckel argue that 'the higher equity risk premium implies that the existing capital stock is too high to generate the marginal product required from the financial arbitrage condition' and thus investment falls, the capital stock decreases. Potential output is permanently reduced over time (2009, p. 593). Similarly, it is argued that 'the rise in real interest rate, the decline in wealth, and the sharp reduction in expected future incomes lead to a sharp fall in domestic demand', which is shown as a reduction in investment (McKibbin 1998, p. 234). Additionally, it is demonstrated that the cost of equity and capital increase as equity risk premium increases, 'leading to less overall investment in the economy' (Damodaran 2009, p. 293).

An increase in equity risk premium decreases employment. Hall treats employment as an employer's investment in job creation incentive and argues that investment in job creation falls as risk premium rises (2017, p. 306). In addition, Tella and Hall argue that a business cycle caused by 'spikes in risk premium' hinders demand for labour (2020, p. 1). Moreover, Mckibbin and Vines stimulate a permanent OECD wide risk premium shock and conclude that there is a reduction of employment in response to the increase in risk premium using the G-Cubed model. It is assumed that sticky wages are set one period in advance in the model. In response to an increase in global risk, 'unemployment is removed by a fall in the real wage' over time (2003, p. 11).

3. The Model

The shock is evaluated using the G-Cubed model (version GGG6G_v155), which is 'a multi-country, multi-sector, intertemporal general equilibrium model' (McKibbin & Wilcoxen 1999, p.124). It is assumed that saving and investment levels are calculated using forward-looking intertemporal optimisation problems. Households 'maximize an intertemporal utility function subject to a lifetime budget constraint' in order to find the optimal level of saving, and 'firm choose investment to maximize the stock market value of their equity' (McKibbin & Wilcoxen 1999, p.125). Governments impose intertemporal budget constraints and 'the response of the monetary and fiscal authorities in different countries can have important effects in the short to medium run (McKibbin 1998, p. 230).

In the G-Cubed model, 'aggregate investment is a weighted average of investment based on Tobin's Q' and investment based on a backward looking version of Q', where Tobin's Q is 'a market valuation of the expected future change in the marginal product of capital relative to the cost' (McKibbin & Stoeckel 2009, p. 584).

Countries are linked through trade and financial markets in this model (McKibbin 1998, p. 229). Moreover, the G-Cubed model considers the fact that physical capital is sector- and country-specific for significant periods, but financial capital can flow across countries more flexibly (McKibbin 1998, p. 229). The model 'allows for short-run nominal wage rigidity' which allows unemployment to appear for long periods (McKibbin & Stoeckel 2009, p. 584). Although the G-Cubed (version GGG6G_v155) model has fewer sectors compared to G-Cubed, they have the same theoretical structure. The model used in this paper consists of twenty-four economic regions, with six sectors in each region. The regions and sectors are summarised in Table 1.

3.1 Policy Responses

There is an endogenous fiscal policy in the model, and the rule is targeting of fiscal deficits as a percentage of GDP. The fiscal deficit is a function of variables including government spending on goods and services, lump sum tax and real interest rate. In this model, government spending and lump sum tax are exogenous.

The monetary responses in the model for each economy following a New Modified Henderson-Mckibbin-Taylor Rule shown in Equation (1) and (2).

$$i_t^d = \beta_1 i_{t-1}^d + \beta_2(\pi_t - \pi_t^T) + \beta_3(\Delta y_t - \Delta y_t^T) + \beta_4(\Delta e_t - \Delta e_t^T) + \beta_5(ny_t - ny_t^T) \quad (1)$$

$$i_t = i_{t-1} + \alpha_1\left[i_t^d - i_t\right] + i_t^x \quad (2)$$

Each economy has different weights on inflation (π) relative to target (π^T), output growth (Δy) relative to potential growth (Δy^T), the change in the exchange rate (Δe) relative to target exchange rate (Δe^T), and nominal output (ny) relative to target (ny^T). i_t^d represents the desired interest rate. The lagged desired interest rate is represented by i_{t-1}^d. The different weights on money rule are represented by the values of α_1 of each country. The actual policy interest rate (i_t) adjusts gradually to the desired policy rate (i_t^d) and can be shifted exogenously in the short term by changing i_t^x, which is the exogenous component.

The assumed parameter values are shown in Table 2. In contrast to the United States, China has a non-zero weight on the change in exchange rate relative to the US dollar which is shown by the value of β_4.

3.2 A Global Rise in Equity Risk Premium

The equity risk premium increases permanently by 1 percent in the six sectors across countries starting from 2020. The implications of a global rise in the equity risk premium for the United States and China are shown in Figure 2 through 11. These figures show the deviations from the baseline of the key variables. USA represents the United States and CHI represents China.

The increase in equity risk premium leads to capital outflow from China and the United States. This increase is consistent with the findings of previous studies which

are discussed in section 2. As shown in Figure 2, investment of the United States decreases in response to the shock and reaches a maximum of 26 percent deviation from the baseline in 2023. On the other hand, investment of China decreases by less than 5 percent deviation from the baseline over time. In the long run, the reductions in investment are less than 1 percent deviation from the baseline in both countries.

As shown in figure 3, in the long run, the reduction in the real interest rate of both countries is around 0.1 percent from the baseline. One year after the shock, the reduction in the real interest rate reaches a maximum of close to 0.59 percent in China. The reduction in the real interest rate of the United States reaches a maximum of close to 0.3 percent from the baseline in 2022. In China, monetary policy targets the exchange rate. While as the real interest rate continues to fall in the United States, the real interest rate of China starts to increase in 2021. Investment of China starts to increase, while investment of the United States continues to fall in 2021.

The capital outflow and the fall in real interest rate in China lead Chinese currency to depreciate. This effect is shown in figure 4, the real exchange rate of Chinese currency falls immediately after the shock. The fall in the real exchange rate reaches a maximum of 1.5 percent deviation relative to the baseline in 2021. With monetary policy targeting the exchange rate, real exchange rate returns to the baseline level over time.

In the long run, as real interest rate increases in both countries, inflation rate decreases and there is approximately no change in inflation rate relative to the baseline over time in both countries. Figure 5 shows the fluctuations in inflation rate. Inflation rate of China is more volatile compared to the United States. In China, the reduction in inflation reaches a maximum of 0.47 in 2020. Inflation rate increases in between 2020 and 2022 and then fall.

Figure 6 shows that, in response to the shock, the real GDP of the United States reduced by close to 0.2 percent deviation from the baseline in 2020 and reached a minimum of 0.02 percent lower than the baseline in 2022. In the long run, the reduction in real GDP is approximately 0.11 percent deviation from the baseline. Similarly, the real GDP of China decrease by 0.25 percent deviation from the baseline in 2020 and reaches a minimum of 0.23 percent lower than the baseline in 2022. In the long run, the reduction in real GDP is close to 0.27 percent deviation from the baseline.

Figure 7 shows that fiscal deficit initially decreases, then increases in both countries. Fiscal deficit is a function of real interest rate. In China and the United States, as real interest rates decrease in the short run, fiscal deficits fall. Over the long run, as real interest rates increase, fiscal deficits increase.

Figure 8 shows that wage rates in both countries are lower than the baseline over time. One possible reason for the wage rate decline is the demand shock for labour. As

mentioned in section 2, a higher risk premium may reduce employment, and the unemployment is eventually removed by the decrease in wage rate.

Figure 9 shows the national account consumption. It is argued that, in the short run, as real interest rate falls, consumption rises 'to limiting the reduction in investment' (Mckibbin & Vines 2003, p. 9). As shown in figure 9, consumption in both countries increases relative to the baseline in the short run. It is assumed that consumers are forward looking, and consumption will be adjusted based on their expectation of future income. As real wage rate falls over time in both countries, consumption eventually rises about 0.1 percent deviation relative to baseline in both countries.

Tobin's Q for durable manufacturing sector decreases as risk premium increases and investment falls. As shown in Table 2 and 3, durable goods are the most important input into investment compared to the other five sectors. Thus the variations in investment influence the demand for durable goods. As risk premium increases in sector 4, higher return is needed to compensate for the high risk of investing in sector 4. It is argued that the fall in the interest rates and the rise in risk premium tends to increase the demand for durable goods (Cagliarini & McKibbin 2009, p. 23). Therefore, as shown in figure 10, Tobin's Q for the durable manufacturing sector decreases in both countries immediately in response to the shock.

Mining output decreases as durable goods production decreases. It is argued that mining output is 'a large input into durable goods production' (Cagliarini & McKibbin 2009, p. 23), supported by the input-output tables (Table 2 and 3). In China, as shown in figure 10 and 11, as Tobin's Q for sector 4 decreases by more than 8 percent in 2020 from the baseline, Tobin's Q for mining sector decreases by nearly 16 percent relative to the baseline. Similarly, in the United States, in 2020, Tobin's Q for sector 4 falls by 7 percent, Tobin's Q for mining sector falls by more than 13 percent from the baseline.

4. Conclusion

In this paper I stimulated an equity risk premium shock a permanent 1 percent increase in equity risk premium in all the six sectors across countries, and the shock starts in 2020. As shown in section 2, the previous studies prove that investment and employment would fall in response to the shock.

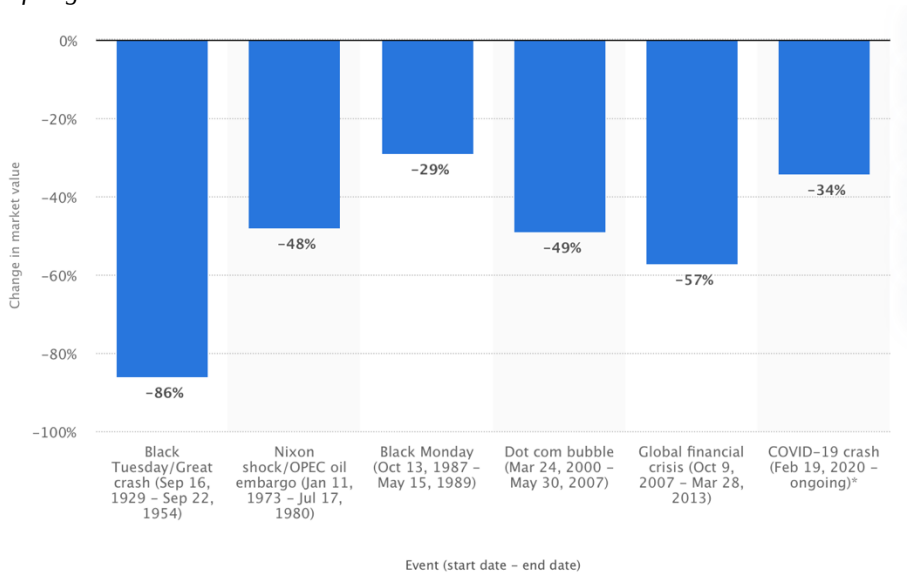
The model used in the paper is the G-Cubed model (version GGG6G_v155) which consists of twenty-four economic regions, with six sectors in each region. There is an endogenous fiscal policy response and a monetary response in the model. In the model, government spending and lump sum tax are exogenous. The monetary responses in the model for each economy follow a New Modified Henderson-Mckibbin-Taylor Rule. As shown by the assumed parameter values, China's monetary policy targets the exchange rate. Part 2 of section 3 summarises the short run and long run impacts of this shock and compares the shock's implication for China and the implication for the United States.

The results show that the shock has various impacts on different macroeconomic variables over time. In the short run, as risk premium increases, capital outflows from China and the United States, which causes investment to fall in both countries. As investment falls, demand for durable goods and Tobin's Q for mining output decrease. Real interest rate decreases and leads consumption to increase and inflation rate to fall. Chinese currency depreciates relative to the US dollar. Real GDP decreases and fiscal deficit decreases in response to the shock. In the long run, inflation rate, the real exchange rate of Chinese currency and Tobin's Q for durable manufacturing sector gradually adjust back to the baseline level. In the contrast, real GDP, real interest rate, investment, fiscal deficit, wage rate and Tobin's Q for mining sector permanently decrease from the baseline over time in both countries.

The risk premium shock impacts China differently compared to the United States. Firstly, the real GDP falls by more percent deviation from the baseline in China compared to in the United States in the long run. Secondly, the real interest rate of China starts to increase from 2021 while the real interest rate continues to fall in the United States as monetary policy in China targets the exchange rate. Thirdly, in the short run, the investment of China decreases by less percent deviation from the baseline compared to the United States in response to the differences in real interest rate movement.

Appendix

Figure 1: Change in performance of S&P 500 during COVID-19 pandemic and previous major crashes as of August 2020



Source: Statista (2020)

Table 1: Overview of the G-Cubed (version GGG6G_v155) model

Regions	Sectors
United States	Sector 1: Energy
Japan	Sector 2:Mining
Germany	Sector 3: Agriculture
United Kingdom	Sector 4: Durable Manufacturing
France	Sector 5: Non-Durable Manufacturing
Italy	Sector 6: Services
Rest of Euro Zone	
Canada	
Australia	
Rest of Advanced Economies	
Korea	
Turkey	
China	
India	
Indonesia	
Other Asia	
Mexico	
Argentina	
Brazil	
Russia	
Saudi Arabia	
South Africa	
Rest of World	
Oil-exporting and the Middle East	

Table 2: Coefficients in each economy

Economy	Money rule (α_1)	Lag interest rate (β_1)	Inflation (β_2)	Output growth (β_3)	US$ exchange rate (β_4)	Nominal output (β_5)
United States	0.2	1	1.5	1.5	0	0
China	0.2	1	1.5	1.5	-1	0

Figure 2

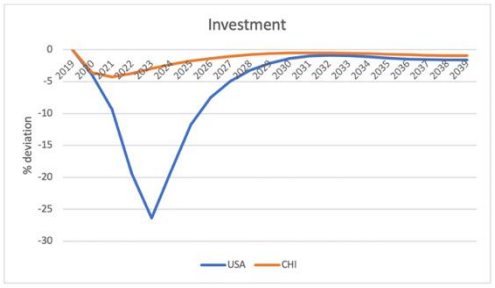


Figure 3

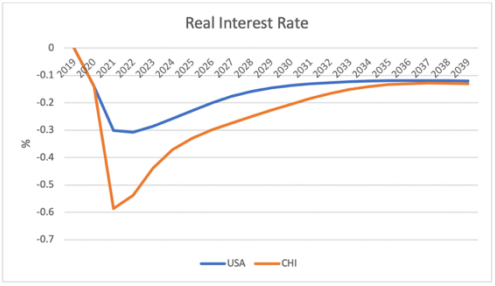


Figure 4

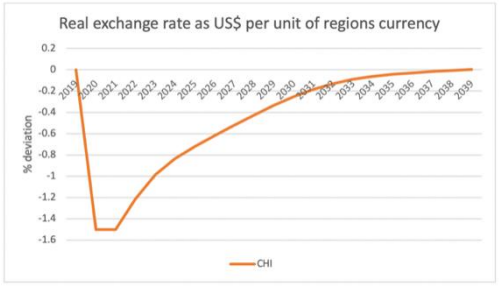


Figure 5

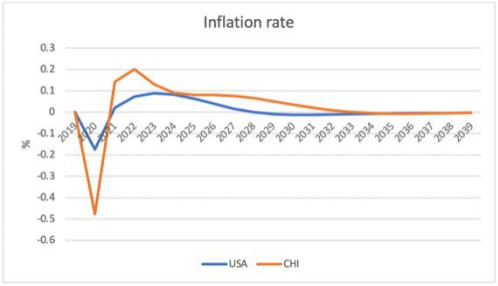


Figure 6

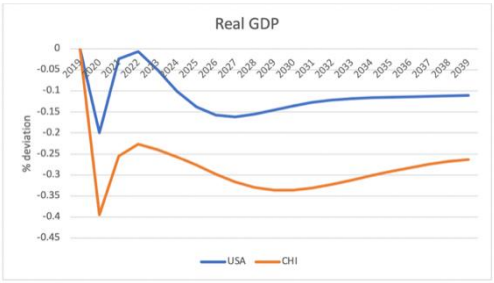


Figure 7

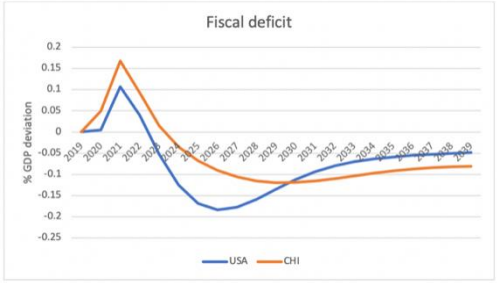


Figure 8

Figure 9

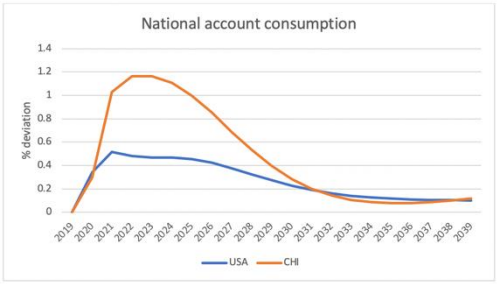


Figure 10

Figure 11

Table 3: Input-Output Table for the United States

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Sector 6	C	I	G	X	M
Sector 1	754.56	3.56	21.25	43.63	136.23	500.99	381.33	3.84	0.00	166.19	-438.98
Sector 2	1.10	3.22	0.71	15.67	8.35	3.34	0.67	5.82	0.00	11.10	-10.86
Sector 3	3.40	0.10	113.17	12.52	200.17	57.05	139.01	89.57	0.17	111.26	-100.50
Sector 4	39.66	4.42	25.94	933.96	78.73	558.28	0.00	1255.87	0.19	853.92	-1194.60
Sector 5	15.56	1.60	76.91	135.61	776.30	641.14	1208.07	28.80	3.84	451.07	-561.58
Sector 6	154.73	5.10	121.18	486.69	490.87	4312.17	6555.33	410.23	3164.39	516.47	-383.48
R	123.05	11.02	142.17	669.03	619.09	7633.07	414.22	348.15	0.00	0.00	0.00
K	314.73	8.39	114.17	185.66	335.74	1818.57	1782.43	48.78	0.00	0.00	0.00
L	165.81	1.72	10.41	73.58	131.87	309.06	246.34	4.61	0.00	0.00	0.00

Table 4: Input-Output Table for China

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Sector 6	C	I	G	X	M
Sector 1	3614.55	43.94	131.26	1148.45	922.60	1334.89	839.10	44.72	0.00	283.38	-1874.35
Sector 2	1.89	133.54	0.78	1856.65	216.65	13.35	1.77	90.29	0.00	29.49	-1326.03
Sector 3	14.27	3.48	1410.25	423.17	3702.77	594.57	1136.04	404.68	1.10	484.82	-608.77
Sector 4	464.39	199.86	161.28	17016.60	1095.00	2387.53	0.00	10440.13	0.43	7536.10	-4879.46
Sector 5	114.18	85.73	1175.93	2408.23	10206.20	3454.49	4619.34	328.82	12.05	3653.60	-2239.44
Sector 6	413.20	150.63	554.60	3608.78	2441.21	6775.50	6822.73	2822.02	11159.86	1012.62	-871.95
R	456.04	159.78	2378.26	3551.95	2422.96	11606.88	670.95	1655.38	0.00	0.00	0.00
K	904.46	239.55	1723.79	3428.83	2075.28	7582.08	2555.64	615.43	0.01	0.00	0.00
L	505.57	1.87	30.22	979.19	736.47	1139.92	192.20	342.64	0.00	0.00	0.00

References

Amiti, M, Kong, SH & Weinstein, D (2020). 'The effect of the U.S.-China trade war on U.S. investment', NBER Working Paper No. 27114, National Bureau of Economic Research, Cambridge. Available: https://www.nber.org/system/files/working_papers/w27114/w27114.pdf

Berkman, H, Jacobsen, B & Lee, JB (2017). 'Rare disaster risk and the expected equity risk premium', *Accounting & Finance*, vol. 57, pp. 351-372.

Cagliarini, A & McKibbin, WJ 2009, 'Global relative price shocks: the role of macroeconomic policies', Research Discussion Paper 2009-10, Reserve Bank of Australia, Sydney. Available:

https://www.rba.gov.au/publications/rdp/2009/pdf/rdp2009-10.pdf

Cochrane, JH 2011, 'Discount rates', NBER Working Paper No. 16972, National Bureau of Economic Research, Cambridge. Available: https://www.nber.org/system/files/working_papers/w16972/w16972.pdf

Damodaran, A 2009, 'Equity risk premiums (ERP): determinants, estimation and implications – a post-crisis update', *Financial Markets, Institutions & Instruments*, vol. 18, pp. 289-370.

Hall, RE 2017, 'High discounts and high unemployment', *American Economic Review*, vol. 107, no. 2, pp. 305-330.

IMF, see International Monetary Fund

International Monetary Fund 2020, *Global financial stability report: markets in the time of COVID-19*, International Monetary Fund, Washington.

McKibbin, WJ 1998, 'Internationally mobile capital and the global economy', in RH Mcleod & R Garnaut (eds), *East Asia in crisis: from being a miracle to needing one?* Routledge, London, pp. 227-244.

—— & Wilcoxen, PJ 1999, 'The theoretical and empirical structure of the G-Cubed model', *Economic Modelling*, vol. 16, pp. 123-148.

—— & Vines, D 2003, 'Changes in equity risk perceptions: global consequences and policy responses', Working Paper No. 2003/15, Research School of Pacific and Asian Studies, Australian National University, Canberra. Available:

https://openresearch-repository.anu.edu.au/handle/1885/40410

—— & Stoeckel, A 2009, 'Modelling the global financial crisis', *Oxford Review of Economic Policy*, vol. 25, no. 4, pp. 581-607.

OECD, see Organisation for Economic Co-Operation and Development

Organisation for Economic Co-Operation and Development

Organisation for Economic Co-Operation and Development 2020a, *Consumer confidence index*, Organisation for Economic Co-Operation and Development. Available: https://data.oecd.org/leadind/consumer-confidence-index-cci.htm

—— 2020b, *Business confidence index*, Organisation for Economic Co-Operation and Development. Available:

https://data.oecd.org/leadind/business-confidence-index-bci.htm

Statista 2020, 'Change in performance of S&P 500 during COVID-19 pandemic vs previous major crashes as of August 2020'. Available:

https://www.statista.com/statistics/1175227/s-and-p-500-major-crashes-change/

Tella, SD & Hall, R 2020, 'Risk premium shocks can create inefficient recessions', NBER Working Paper No. 26721, National Bureau of Economic Research, Cambridge. Available: https://www.nber.org/papers/w26721