COVID-19, Fiscal Stimulus, and Credit Ratings*

Anuragh Balajee[†] Shekhar Tomar[‡] Gautham Udupa[§]

CAFRAL ISB CAFRAL

April 23, 2020

Abstract

COVID-19 pandemic has rattled the global economy and has required governments to undertake massive fiscal stimulus to prevent the economic fallout of social distancing policies. In this paper, we compare the fiscal response of governments from around the world and its main determinants. We find sovereign credit ratings as one of the most critical factors determining their choice. First, the countries with one level worse rating announced 0.3 percentage points lower fiscal stimulus (as a percentage of their GDP). Second, these countries also delayed their fiscal stimulus by an average of 1.7 days. We identify 22 most vulnerable countries, based on their rating and stringency, and find that a stimulus equal to 1 percent of their GDP adds up to USD 87 billion. In order to fight the pandemic, long term loans from multilateral institutions can help these stimulus starved economies.

JEL Codes: E62, O23

Keywords: Fiscal Stimulus, Credit Rating, COVID-19, multilateral institutions

*We thank the editor Charles Wyplosz, one anonymous referee, and Viral Acharya for their valuable comments and feedback on the paper. This paper is preliminary. We have used the most updated data on fiscal stimulus, which might get updated over time, and some results can change. The views and opinions expressed in this paper are those of the authors and do not necessarily represent the views of CAFRAL or other affiliated institutions.

[†]Research Associate, CAFRAL. Email: anuragh.balajee@gmail.com

[‡]Assistant Professor, Indian School of Business, Hyderabad. Email: shekhar_tomar@isb.edu

[§]Research Director, CAFRAL. Email: gautham.udupa@cafral.org.in

1 Introduction

The new decade has started with weak economic growth due to the COVID-19 pandemic. The virus has hit advanced and emerging countries alike, and governments around the world are scrambling for funds to prevent a breakdown of their health infrastructure and economy. The enforced shutdown around the world is helping to contain the spread, but at substantial economic costs.[1]

In this paper, we evaluate the fiscal response of governments[2] around the world to COVID-19. Our exercise is motivated by the different constraints faced by rich and poor countries. These constraints determine their behavior. For instance, we find countries that are constrained by credit ratings are unable to spend. In contrast, others such as Saudi Arabia have already spent significant amounts, but may also face debt overhang problems in the future. To allay these concerns, the International Monetary Fund (IMF) has recently announced debt-relief to twenty-five member countries, most of them from the African continent, totaling about USD 500 billion (IMF [2020]).[3] We provide our analysis around this issue and identify countries that are under-spending due to macroeconomic concerns.[4]

We argue that credit rating downgrade is a critical macroeconomic concern faced by countries at the border of the investment-grade rating category. The risk of credit rating downgrade can have a significant negative impact on the capability of a country to raise resources to fight COVID-19. For instance, Moody's recently downgraded the sovereign credit rating of South Africa on March 27, 2020.[5] It was then followed by a similar downgrade for four of its banks four days later. In its analysis, Moody's cited high fiscal deficit in

[1] Health crises of the scale of epidemics and pandemics can have substantial costs. Noy et al. [2019] study a pre-COVID-19 period and establish that the economic costs are particularly high in most of Africa, the Indian Subcontinent, China, and Southeast Asia.

[2] Fornaro and Wolf [2020] evaluates the optimal fiscal policy response for the US to fight COVID-19.

[3] According to IMF, investors have already pulled out USD 83 billion from emerging markets since the start of the crisis. The problem can be further exacerbated by rating downgrades or countries not spending enough to protect their ratings. Nearly 80 countries have already requested help from the IMF.

[4] Elgin et al. [2020] construct a COVID-19 Economic Stimulus Index (CESI) index to summarize the overall economic responses by governments around the world.

[5] Moody's downgrade South Africa.

the current financial year, possibly reaching 8.5 percent of GDP, as well as debt overhang problems as a reason behind the downgrade. Such events of rating downgrade are associated not only with an increase in credit spread (Cantor and Packer [1996]), but also a flight of capital as many institutional investors are not allowed to invest in non-investment grade securities (Becker and Milbourn [2011]). We explore if downgrade concerns are, therefore, affecting countries' responses to the current pandemic.[6]

To undertake this exercise, we prepare cross-sectional country-level data on credit ratings and other COVID-19 related variables from OxCGRT (Oxford COVID-19 Government Response Tracker). In our sample of 116 countries, only 67 have declared a stimulus till April 9, 2020. Even out of these 67, many countries have pledged minimal amounts. The average stimulus stands at 2.9 percent of GDP, with a standard deviation of 4.2 percent.

So what determines the level of fiscal stimulus? To evaluate these factors, we regress total fiscal stimulus against country-level exogenous variables, including a measure of economic stringency[7] during the pandemic, the sovereign bond rating, confirmed cases count, and country-level controls. We find that both economic stringency and rating determine fiscal spending, but not the number of confirmed COVID-19 cases. More stringent measures constrain economic activity and cause severe disruptions. We find that one percent higher stringency results in 0.11 percentage points higher fiscal spending. On the rating side, our estimates suggest that a one-level upgrade in credit rating increases fiscal stimulus by 0.3 percentage points of GDP. This suggests that countries around the world are concerned about the effect of fiscal stimulus on their credit ratings, which inhibits them from reacting to the stringent measures they have imposed on the economy. Since the pandemic is an exogenous event and countries have to allocate unanticipated funds to fight the economic stringency, our results capture the risk associated with rating downgrade.

We also find that countries with credit-rating risk imposed harsher lockdowns much

[6]Economic stimulus required to fight COVID-19 can lead to a large fiscal deficit in the current year. Balajee et al. [2020] estimate that it can go up to 8.8 percent of GDP for India.

[7]We compute the average level of stringency index from the index defined in OxCGRT.

earlier and provided fiscal stimulus only much later. In other words, they delayed fiscal stimulus in an environment where strict lockdown measures had made such stimulus all the more necessary. Figure 4 shows these patterns graphically. Each sub-figure plots economic stringency (blue) and fiscal stimulus (red) over time for a given country. Starting from January 1, 2020, we see that the blue lines rise much earlier than the red ones. The gap between the two is our measure of the delay in fiscal stimulus. An overview of the figures shows that there is substantial heterogeneity in stimulus delay. This is confirmed by Figure 5, which plots the density of our primary delay variable. Most countries announced fiscal stimulus only a few days after imposing a 50% level of stringency. Some countries at the extreme waited more than 25 days after imposing a 50% stringency (like the Philippines), while some announced fiscal stimulus even before imposing harsh containment (like the United Kingdom). We formally test this proposition in a regression framework and find that countries with a low credit-rating waited longer to announce their fiscal stimulus package.

Our results thus suggest that the vulnerable population in countries with low credit ratings may face considerable economic hardship due to a lack of support from their government. The fiscal response of governments in such countries is both small as well as delayed. Based on our indicators (mean credit rating and mean stringency), we identify twenty-two countries that are extremely vulnerable and might need external support to fight the crisis. In terms of the policy, long-term loans from multilateral institutions such as the World Bank and the International Monetary Fund (IMF) at low-interest rates will ensure that fiscal stimulus will have minimum impact on government budget in the current fiscal year. If each of these countries receives 1 percent of their GDP as loans, it will amount to a total of 87 billion USD. Thus, an international emergency finance package can help bridge the funding gap for these countries.

Our paper contributes to the broad literature on the importance of credit ratings. Sovereign credit ratings contain information beyond observable macroeconomic indicators (Dell'Ariccia et al. [2006] and Eichengreen and Mody [1998]). Sovereign credit rating downgrades result

in a rise in sovereign risk premium, which spills over to private sector credit markets (Uribe and Yue [2006], Almeida et al. [2017]). Credit rating downgrades thus have real economic implications. In contrast, our study documents reduced spending by governments *to prevent potential* rating downgrades. It has important policy implications as countries need large funds to support the economy during COVID-19, but they are probably unable to do so for fear of inviting a rating downgrade. More generally, our work also highlights the role of global economic cooperation perspective during the pandemic. For instance, Bahaj and Reis [2020] study the role of swap lines extended by the US Fed to other central banks.

In the next section, we describe our data. In section 3, we provide the impact of credit ratings on fiscal stimulus and delay in stimulus announcement. In section 4, we provide the list of most vulnerable countries and the quantum of support required to fight COVID-19. Finally, section 5 concludes.

2 Data

We have used three primary sources of data for our analysis. First, we use crisis-related data from the Oxford COVID-19 Government Response Tracker(OxCGRT) as of April 9, 2020 (Hale and Webster [2020]). It gives us country-wise statistics on COVID-19 related variables, both health and economy. We use the information on the stringency index (normalized between 0-100), which captures the level of containment of economic activities by a country. An index of 0 corresponds to a business-as-usual scenario, while 100 corresponds to maximum disruption. For instance, the United States has an index of 66 on April 9, 2020, while Italy has 95, pointing to a higher disruption in Italy. We also use the information on fiscal stimulus collected by OxCGRT, both on the level and timing of stimulus (as on April 9, 2020). Second, we hand collect fiscal stimulus numbers from the IMF policy response tracker (as on April 16, 2020).[8] To calculate the fiscal stimulus, we aggregate all the payments which increase government expenditures in the current financial year. We exclude loan guarantees and tax

[8] IMF policy response tracker

deferrals. Our methodology is similar to the one used by OECD Country Policy Tracker.[9] The fiscal stimulus numbers in the IMF and OxCGRT datasets broadly match each other (Figure 7).

The third set of data consists of most recent economic variables, like GDP and GDP per capita, from the IMF. Most importantly, we collect data on the most recent sovereign bond ratings from S&P, Moody's, and Fitch rating agencies as on April 9, 2020. The sovereign ratings capture the general macroeconomic health of a country.

3 Rating affects the fiscal response of countries

In this section, we study how credit ratings influence the level and timing of fiscal stimulus announced by countries. We first describe our methodology and then present the results.

3.1 Size of a fiscal stimulus depends on credit ratings

To test whether the level of a fiscal stimulus depends on sovereign ratings, we regress the government response - measured as government spending as a share of GDP - against a slew of measures on a cross-section of countries. First is the severity of the crisis. We average daily stringency index for each country between January 1 - April 9, 2020. The average measure, therefore, takes into account the loss in economic output since January 1. It is a better measure than using the daily index measure because it takes into account the aggregate economic loss since the beginning of the year. We substitute for fiscal health by the distance of sovereign bond ratings from the junk category. For instance, India has a Baa2 rating from Fitch, which is two categories above junk (non-investment grade), so India receives a distance score of two. The minimum distance from the junk rating is 0, and the maximum is 10. We use the average distance from non-investment grade for the three rating agencies

[9] OECD Country Policy Tracker. OECD also uses the data from IMF Policy Response Tracker for fiscal stimulus calculation.

in our primary analysis.[10] We finally estimate the following equation:

$$\text{Stimulus}_i = \beta_0 + \beta_1 * \overline{\text{Stringency}}_i + \beta_2 * \log(\text{COVID cases})_i + \beta_3 * \overline{\text{Rating}}_i + \text{Controls}_i + \epsilon_i \quad (1)$$

where Stimulus_i is the ratio of fiscal spending to GDP ratio for country i. The variable Stimulus_i is the sum of all stimulus packages announced by the country i till April 9, 2020. The independent variables include $\overline{\text{Stringency}}_i$, the mean stringency, and $\log(\text{COVID cases})_i$, the log of the number of confirmed cases in country i till April 9, 2020. The variables, $\log(\text{COVID cases})_i$ and $\overline{\text{Stringency}}_i$, can be correlated because the severity of COVID-19 spread influenced the level of economic shutdown measures announced by the government. A country more impact by COVID-19 should spend more, and thus the expected sign on the two coefficients, β_1 and β_2, should be positive. Finally, our primary variable of interest, $\overline{\text{Rating}}_i$, should have a positive coefficient. A country with a better credit rating is better placed to undertake high government spending, as it can issue higher debt with less risk.

Before we discuss the results, it is essential to mention that the variable $\overline{\text{Stringency}}_i$ is better defined compared to the total number of confirmed COVID cases. The total number of COVID cases has been influenced by country-specific health policies and the availability of testing kits. Hence, it is not uniformly measured across countries and suffers from measurement error issues. In comparison, once announced, the economic stringency index is more uniformly measured across countries.

Results: We present the raw correlation between $\overline{\text{Stringency}}_i$ and Stimulus_i in Figure 1 through a binscatter. It shows that for every 10 percent increase in stringency, the stimulus goes up by 2 percent of GDP. Similarly, we find that stimulus has a positive correlation with mean ratings and log(COVID-19 cases), as shown in Figure 2 and 3 respectively.

We report the results from estimating the equation 3 in Table 2. In column (1), when we

[10] For some countries, rating information is only available from one or two agencies, in which case we take the average over the available ratings.

regress stimulus only on mean stringency, we find that the coefficient $\beta_1 = 0.19$. It shows that the correlation between stimulus and repression is positive and significant. A 10 percent increase in mean stringency (roughly equal to one standard deviation) increases the fiscal stimulus by 1.9 percent of GDP. Our results differ from Elgin et al. [2020] in that they do not find stringency to be a statistically significant factor driving overall economic response by a country. This is because they consider the correlation of stringency with an index constructed from an array of economic measures and not just fiscal stimulus. Also, they use the recently reported stringency index instead of a mean stringency index like us. In column (2), we report the results when the stimulus is regressed only on $\overline{\text{Rating}}_i$. Here again, we find that countries with higher rating have a higher stimulus. We find that a one-level decrease in a credit rating is also associated with a 0.47 percentage point decrease in the stimulus. Similarly, in column (3), we find that stimulus is also higher in countries with a high number of COVID-19 cases.

In columns (4), (5), and (6), we report results based on using two of the independent variables together. When we include mean stringency and mean ratings as in column (4), we find both have a positive and significant correlation with stimulus. Similarly, both mean stringency and log of COVID-19 cases are positive and significant in column (5). In column (7), when we include all three of these variables, only the coefficients on mean stringency and mean ratings stay positive and significant. Finally, in column (8), we also include other country-specific controls like GDP in our regression. Even in this case, we find that the coefficient on mean stringency and mean credit rating stays positive and significant. In this case, a one-level fall in mean ratings decreases the fiscal stimulus by 0.32 percentage points of GDP. In column (9) we also include log(GDP per capita) in the regression. In this case the coefficient on the mean ratings variable through positive is not significant. This could be because log(GDP per capita) and mean ratings are highly correlated (correlation coefficient = 0.8), which makes collinearity a possible concern.[11] However, the two variables are jointly

[11] GDP per capita is an important fundamental variable determining sovereign credit rating. Hence, it is not surprising that the two are highly correlated.

significant. The hypothesis that both log(GDP per capita) and mean ratings are zero is rejected with an F-statistic of 4.21 and has an associated p-value of 0.018. In general, our results show that the mean ratings is one of the most significant factors that determine the fiscal stimulus of a country. The stimulus also seems to be correlated with the mean stringency of the country in most cases.

Robustness: We also test the robustness of the above results based on fiscal stimulus data from the IMF. These results are reported in Table 3. The results on mean ratings are robust to using alternate fiscal stimulus measures. We find sovereign credit rating is the most important determinant of stimulus package (column (9)), even after the inclusion of log(GDP per capita). In this case, the results are different from column (9) in Table 2 because the IMF numbers are less dispersed for countries with low credit ratings. This change can be noticed by comparing the binscatter in Figure 9 with Figure 2. The binscatter in Figure 9 has a better fit for the mean ratings closer to zero. Overall, the coefficient on $\overline{\text{Rating}}$ is positive and significant in all the specifications in Table 3.

3.2 Credit ratings correlated with the delay between containment and stimulus announcement

The fight against COVID-19 has involved both health and economic response at the same time. However, countries have differed in their reaction horizon when it comes to these two responses. As mentioned in the introduction, we plot the time series of raw daily stringency measures and normalized fiscal stimulus package announced until given date t in Figure 4. For most of the countries, the health response becomes more stringent before the stimulus package is declared. For instance, India declared a 100 percent lockdown on March 24, 2020, but the main stimulus package was announced on March 26, 2020. On the other hand, there are some outlier countries like the UK whose economic response preceded the containment announcement by 12 days.

Another way to look at it is to compute the difference in the number of days between

the first day of threshold stringency and stimulus package. We compute this difference for threshold stringency of 50, 60, and 70 percent and the day of the first stimulus package. The density function for stimulus delay is shown in Figure 5. We find that the three distributions overlap with each other as countries quickly increased the intensity of stringency measures once the number of cases started rising quickly. The median delay between the date of 50 percent stringency and the date of the fiscal announcement is three days. However, there is a large heterogeneity in the response of countries. It is also important to highlight that many countries did not announce any fiscal measures and are thus not captured in this figure. Out of 95 countries in our final sample, 29 did not declare any stimulus package. We report the average rating and whether a country declared stimulus in Table 1. We find that out of 29 countries that did not declare any fiscal stimulus, 22 have a non-investment grade or junk rating.

We now formally test whether the time gap between imposing containment measures and the stimulus package is correlated with any country-specific parameters. We use the following estimation equation based on the cross-section of countries that have announced a non-zero stimulus:

$$\text{Stimulus Delay}_i = \beta_0 + \beta_1 * \overline{\text{Stringency}}_i^{T_i} + \beta_2 * \log(\text{COVID cases})_i^{T_i} + \beta_3 * \overline{\text{Rating}}_i + \text{Controls}_i + \epsilon_i \tag{2}$$

where, Stimulus Delay_i is the number of days between the two announcements, threshold containment, and first fiscal package by country i. The variable $\overline{\text{Stringency}}_i^{T_S}$ corresponds to the mean stringency level in country i on the day, T_i, first stimulus package was announced. Each country has a different date T_i corresponding to the day of the first stimulus for country i. We also control for the log number of cases on date T_i. Once again, our main variable of interest is $\overline{\text{Rating}}_i$, which captures whether countries with lower ratings delay their fiscal response.

A priory, we expect that countries should have a reason to delay their economic response to the crisis. An early fiscal stimulus, relative to stringency, is a measure of an economy with strong fundamentals that can support fiscal expenditure and vice-versa for a country with weak fundamentals. It should be reflected through a negative coefficient on the mean credit ratings in equation 3, i.e., β_3 should be negative. We present the binscatter for these two variables in Figure 6 and find a negative correlation. The coefficient on mean stringency, $\overline{\text{Stringency}}_i^{T_i}$, is more difficult to predict. The countries can announce mild stringency measures very early to contain the spread of the virus. This can reduce the expected number of days of total containment and, thus, total economic cost. In this case, the mean stringency on T_i can allow for a delay in the fiscal stimulus. Conversely, a high level of $\overline{\text{Stringency}}_i^{T_i}$ can also push governments to announce fiscal stimulus sooner rather than later. Finally, we also include the log(COVID Cases) on the day of the stimulus announcement. If more days have passed between the threshold stringency and fiscal stimulus, it means more days for the COVID-19 to spread. So, these two can be positively correlated, without signifying any direction of causation.

We present the OLS estimates for this regression in Table 4. In column (1), we report the results by regressing the delay in stimulus on mean stringency on the day of the fiscal announcement. We find that there is a positive correlation between the two. A 10 percent higher mean stringency leads to a delay of 7.9 days in the stimulus. We also find that a higher sovereign rating reduces the delay in the fiscal stimulus (column (2)). A country with five steps away from junk bond status announces stimulus 6.5 days in advance, relative to a country with a rating of 0. We also find that coefficient on $\log(\text{COVID cases})_i^{T_i}$ is also positive and significant in column (3). In the rest of the columns (4)-(7), we use different combinations of these variables, and we find that the coefficient on the mean rating is always negative and significant. In column (7), which includes all the independent variables, we find every single step of rating is associated with 1.7 days of delay. The coefficient on the mean rating in column (7) is also more negative than the one reported in column (1). The

results are similar when we include log(GDP) in the regression, as reported in column (8).[12]

We also find that these results are robust for other threshold levels of stringency, 60 or 70 percent. It is not surprising since the densities in Figure 5 overlap with each other as most countries went from an almost negligible level to a very high level of stringency in one step. The results for mean rating hold for a battery of other definitions for mean stringency and number of COVID-19 cases. Overall, these results suggest that sovereign ratings are an important ingredient in determining the timing of fiscal stimulus. Furthermore, these results do not even account for countries, which did not declare any stimulus until now despite imposing strong stringency measures. The results will look starker once these countries announce some level of stimulus in the future. In the next section, we discuss the countries that are most vulnerable to COVID-19 due to their inability to respond to the crisis using fiscal measures.

4 Vulnerable countries

Our arguments have shown so far that countries with low credit ratings are stuck in a ratings-COVID-19 crisis trap. Based on the results from the previous section, we now identify countries that are vulnerable based on two characteristics - mean stringency and mean credit rating. The countries with above-median stringency and below-median credit rating are those that need immediate assistance. There are twenty-two such countries, ranging from South Africa with a mean stringency of 20 to Burkina Faso, which has a mean stringency of 49 as of April 9, 2020. The fiscal stimulus in these countries has been low, ranging from zero (Burkina Faso, Russia, Costa Rica, Iraq, Lebanon, Venezuela, Vietnam, and Ecuador) to the highest among these countries at 4.7 percent of GDP (Peru). Portugal is also included in the list, although its ability to access Euro bonds makes it less susceptible. Indeed, Portugal has spent 4.4 percent of GDP by the end of our sample period and does not need immediate

[12]We cannot use the IMF policy response tracker to construct a measure of stimulus delay because the IMF does not report fiscal stimulus announcement dates for all countries.

assistance.

The full list of countries and their characteristics is provided in Table 5. We calculate the financial support needed by these countries under three different scenarios. The columns (9), (10) and (11) give the difference (USD billion) between threshold stimulus package (1, 2, and 5 percent of GDP) and the announced fiscal stimulus (percent of GDP) by a country until April 9, 2020. The numbers are zero if a country has already announced its stimulus above the threshold level. Based on our calculations, these countries need USD 36 billion support in the 1 percent stimulus scenario, while the number jumps to USD 98 and 342 billion for 2 and 5 percent stimulus scenario. If one excludes India and Russia, the loans needed for a 5 percent stimulus support drop from USD 342 billion to 138 billion. These numbers are well below the USD 1 trillion lending capacity that the IMF is willing to deploy if needed (IMF [2020]).

As a note of caution, our sample only includes those countries that have imposed higher stringency and provided low fiscal stimulus. So it excludes those vulnerable countries that might not have imposed any stringency measures fearing economic slowdown. Thus, a broader international support policy will also need to cover the countries that are not present in Table 5.

5 Conclusions

The COVID-19 pandemic continues to impact the global economy. In this backdrop, fiscal stimulus is seen as one of the few ways to support the economies during a period of forced containment. Fiscal spending at this juncture can support households that have lost their jobs and firms that are in dire need of liquidity. However, as documented above, not all countries have been able to raise the necessary funding required for support. Using a cross-section of countries, we find that fear of rating downgrades is an important driver that is preventing countries from providing stimulus. Furthermore, countries that face tighter

funding conditions due to fear of credit downgrades also delay the fiscal stimulus. This delay can happen despite the stringent containment measures imposed by them to contain the virus, thereby exposing their most vulnerable population to economic hardships in addition to the health risks. Finally, we provide the list of most vulnerable countries based on our measures and the funding support needed to help them provide a threshold level stimulus.

References

Heitor Almeida, Igor Cunha, Miguel A. Ferreira, and Felipe Restrepo. The real effects of credit ratings: The sovereign ceiling channel. *The Journal of Finance*, 72(1):249–290, 2017. doi: 10.1111/jofi.12434.

Saleem Bahaj and Ricardo Reis. Central bank swap lines during the covid-19 pandemic. *https://www.cepr.org*, Mar 2020.

Anuragh Balajee, Shekhar Tomar, and Gautham Udupa. Fiscal situation of india in the time of covid-19. *Available at SSRN 3571103*, 2020.

Bo Becker and Todd Milbourn. How did increased competition affect credit ratings? *Journal of Financial Economics*, 101(3):493–514, 2011.

Richard Cantor and Frank Packer. Determinants and impact of sovereign credit ratings. *Economic policy review*, 2(2), 1996.

Giovanni Dell'Ariccia, Isabel Schnabel, and Jeromin Zettelmeyer. How do official bailouts affect the risk of investing in emerging markets? *Journal of Money, credit and Banking*, pages 1689–1714, 2006.

Barry Eichengreen and Ashoka Mody. What explains changing spreads on emerging-market debt: fundamentals or market sentiment? Technical report, National Bureau of Economic Research, 1998.

Ceyhun Elgin, Gokce Basbug, and Abdullah Yalaman. Economic policy responses to a pandemic: Developing the covid-19 economic stimulus index. *Covid Economics: Vetted and Real-Time Papers*, 2020.

Luca Fornaro and Martin Wolf. Covid-19 coronavirus and macroeconomic policy. *Covid Economics: Vetted and Real-Time Papers*, 2020.

Thomas Hale and Samuel Webster. Oxford covid-19 government response tracker. *URL https://www. bsg. ox. ac. uk/research/research-projects/oxford-covid-19-government-response-tracke r [accessed 26 March 2020]*, 2020.

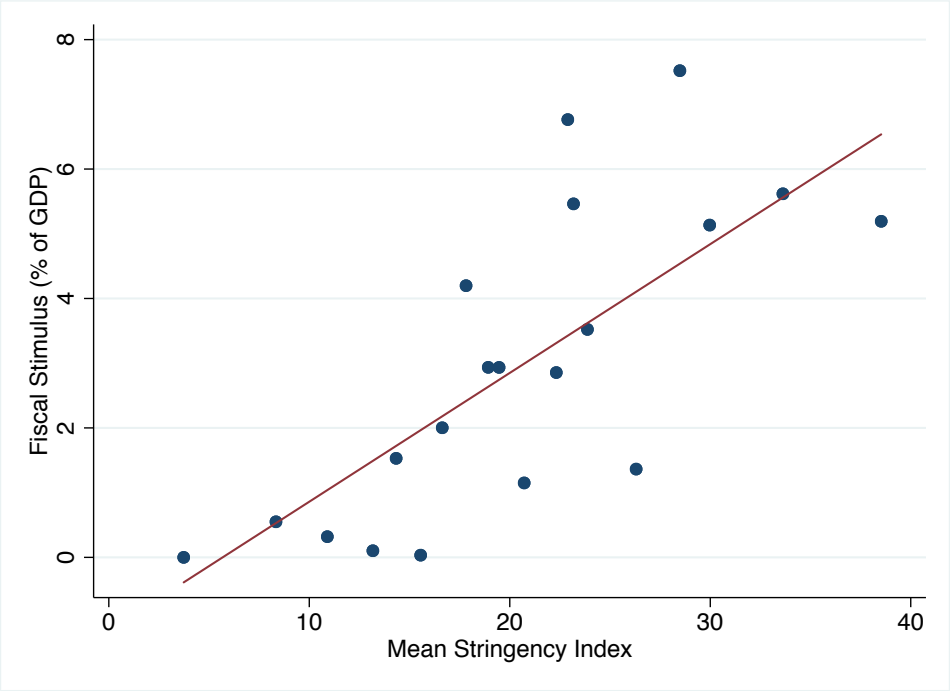
IMF. Imf executive board approves immediate debt relief for 25 countries. *IMF*, 2020.

Ilan Noy, Nguyen Doan, Benno Ferrarini, and Donghyun Park. Measuring the economic risk of epidemics. 2019.

Martin Uribe and Vivian Z. Yue. Country spreads and emerging countries: Who drives whom? *Journal of International Economics*, 69(1):6–36, June 2006.

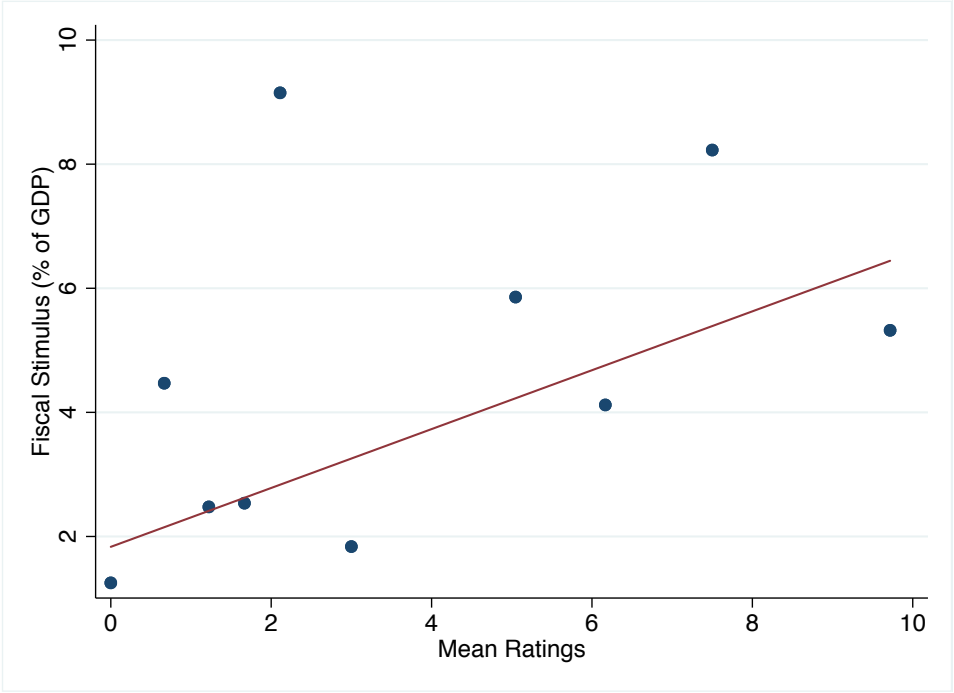
Figures

Figure 1: Fiscal Stimulus vs. Mean Stringency Index



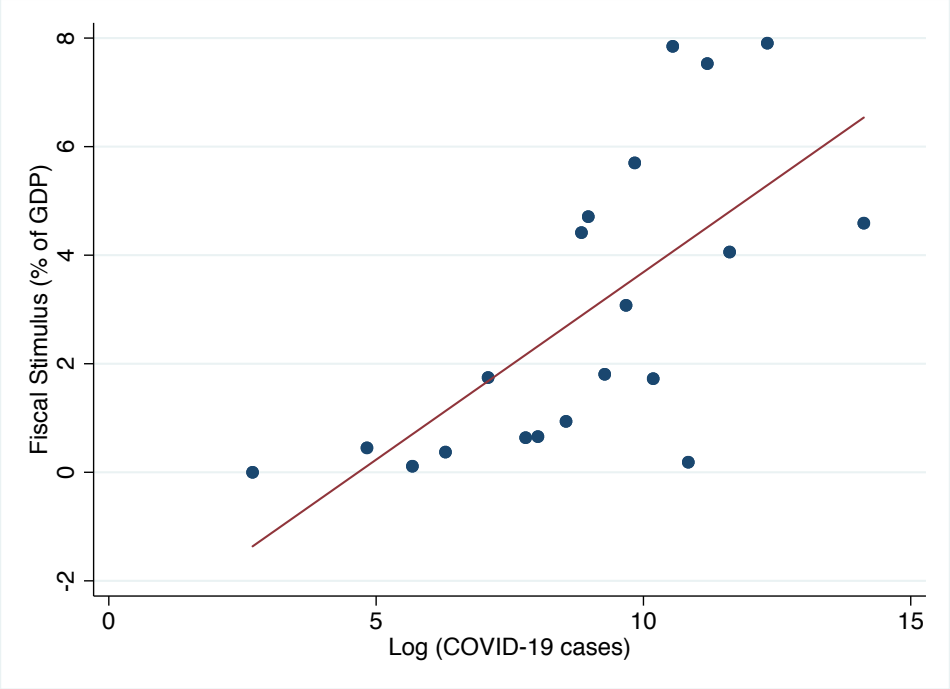
Notes: The figure shows the cross-country binscatter between fiscal stimulus and mean stringency index. It corresponds to the regression specification (1) in Table 2. Fiscal stimulus is the sum of stimulus announced (as a percentage of 2019 GDP), while mean stringency index is the simple average of the daily stringency index until April 9, 2020. (Data Source: OxCGRT)

Figure 2: Fiscal Stimulus (OxCGRT) vs. Mean Rating



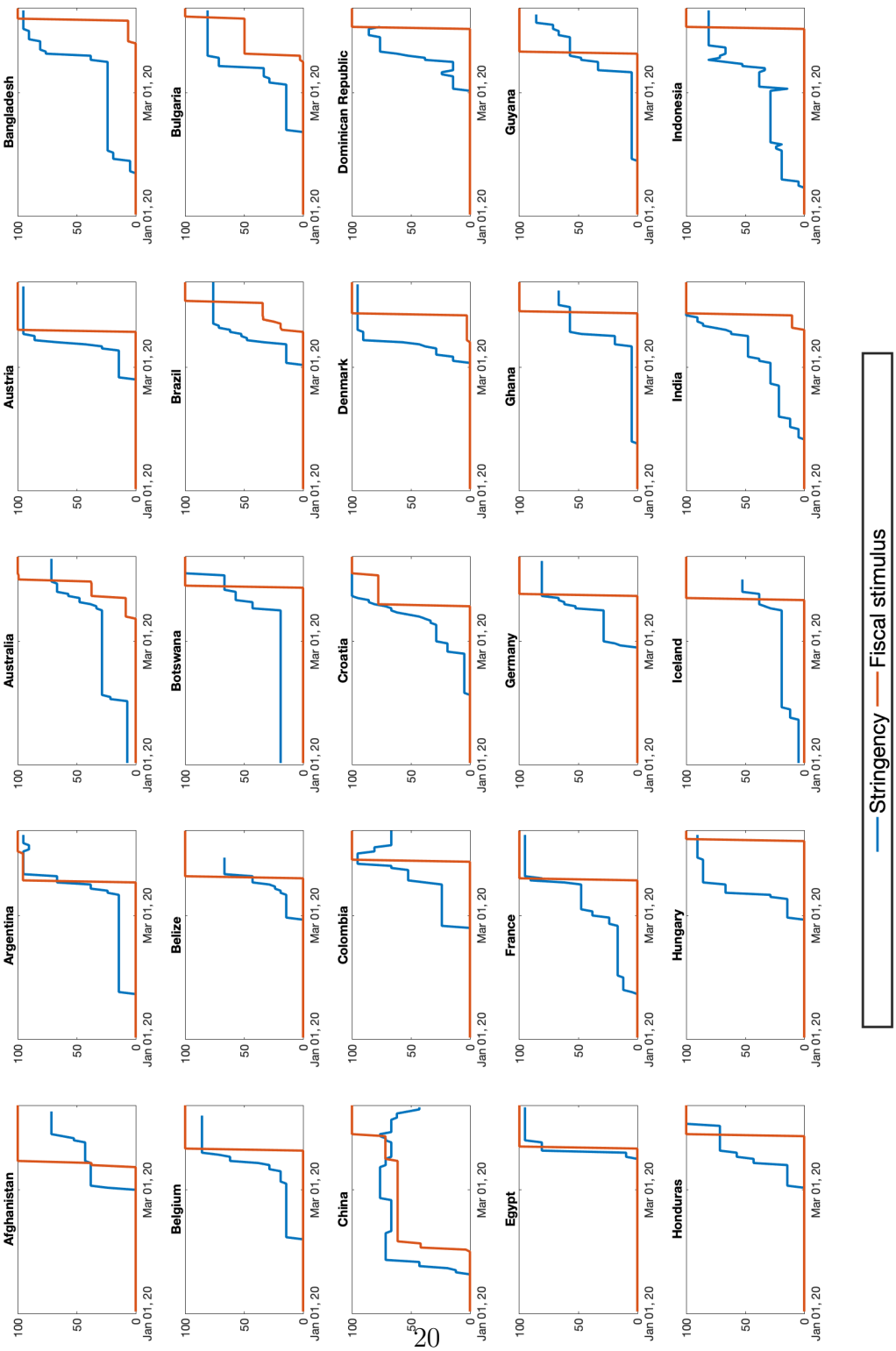
Notes: The figure shows the cross-country binscatter between fiscal stimulus and mean rating. It corresponds to the regression specification (2) in Table 2. Fiscal stimulus is the sum of stimulus announced (as a percentage of 2019 GDP) until April 9, 2020. The mean rating is the simple average of the sovereign credit ratings from Moody's, Fitch and S&P as on April 9, 2020. (Data Source: OxCGRT and countryeconomy.com)

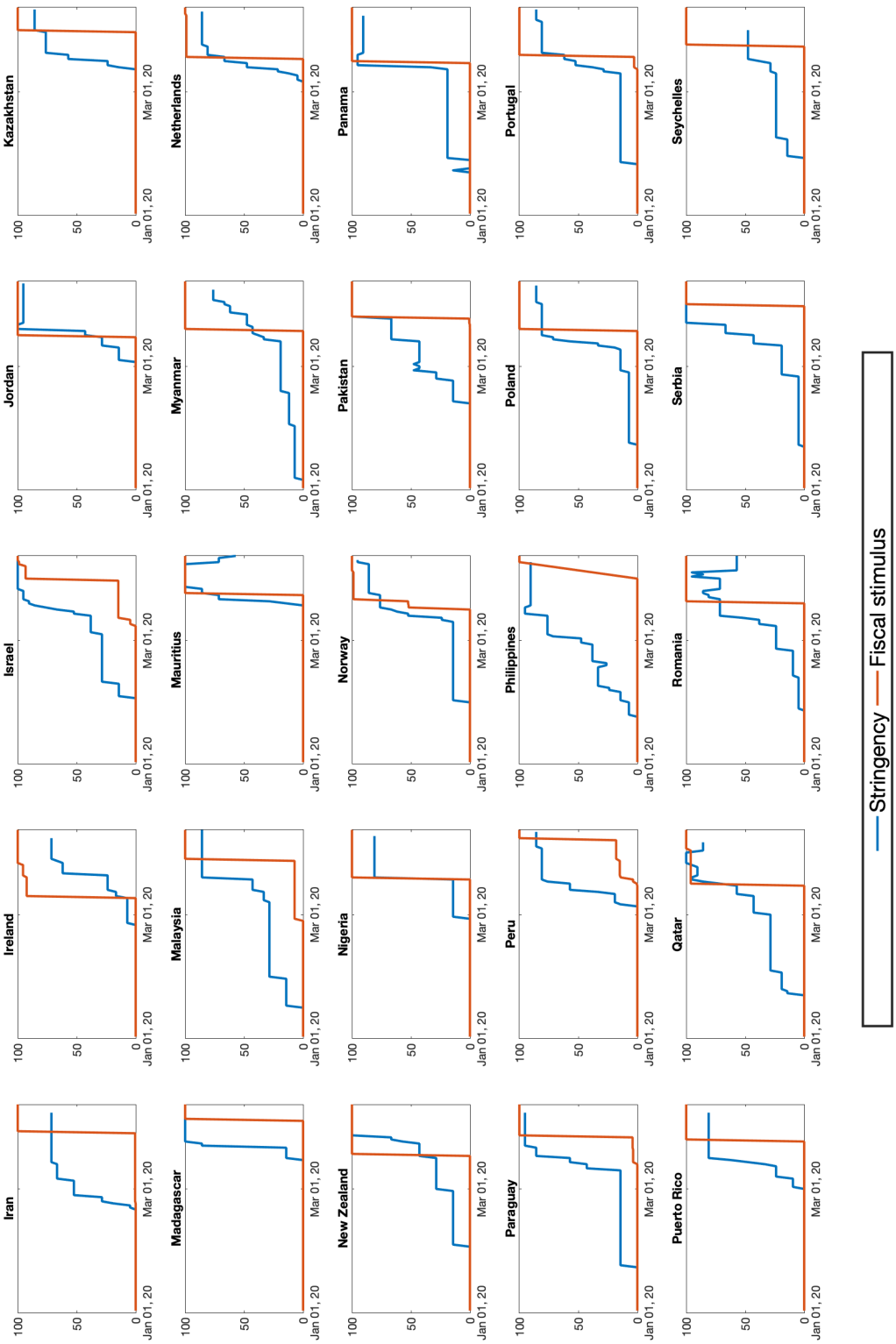
Figure 3: Fiscal Stimulus vs. Log(COVID-19 cases)

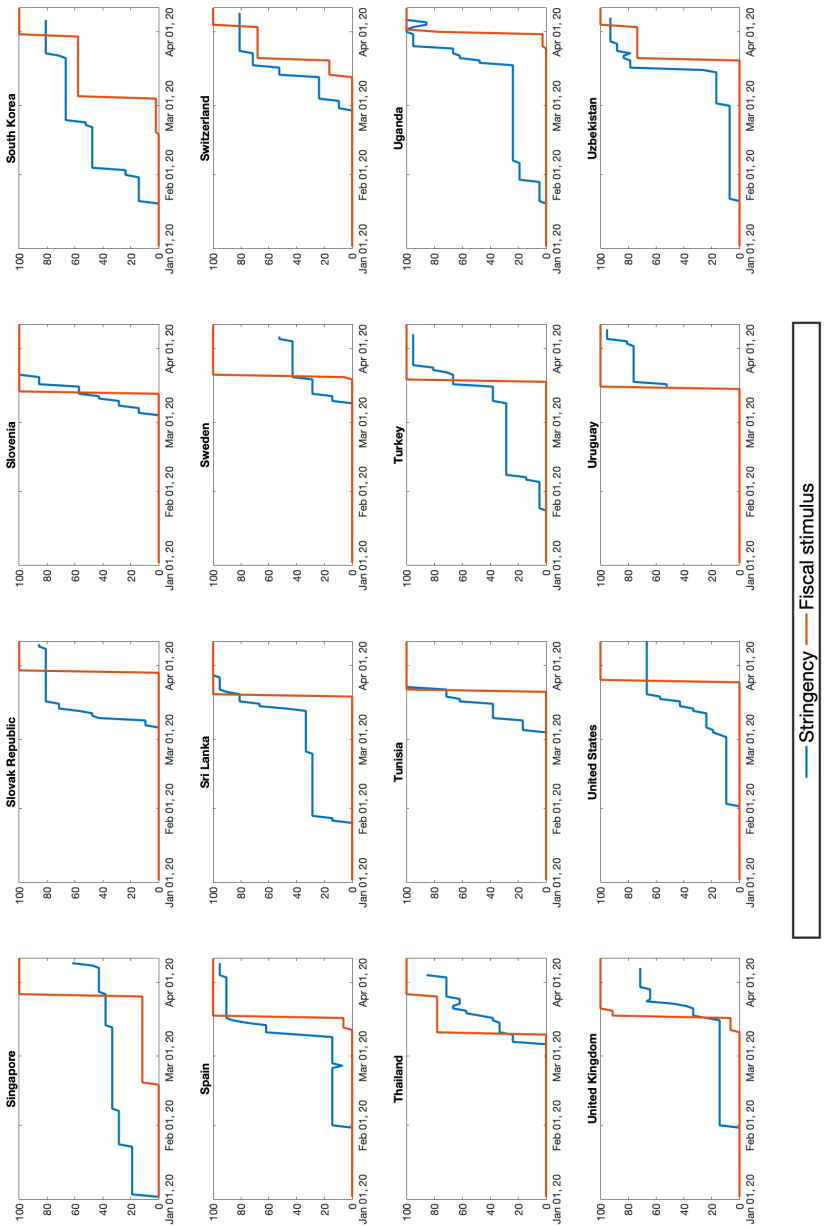


Notes: The figure shows the cross-country binscatter between fiscal stimulus and Log(COVID-19 cases). It corresponds to the regression specification (3) in Table 2. Fiscal stimulus is the sum of stimulus announced (as a percentage of 2019 GDP) until April 9, 2020. The Log(COVID-19 cases) is based on the reported COVID-19 cases as on April 9, 2020. (Data Source: OxCGRT)

Figure 4: Time Series of Fiscal Stimulus vs. Stringency Measures

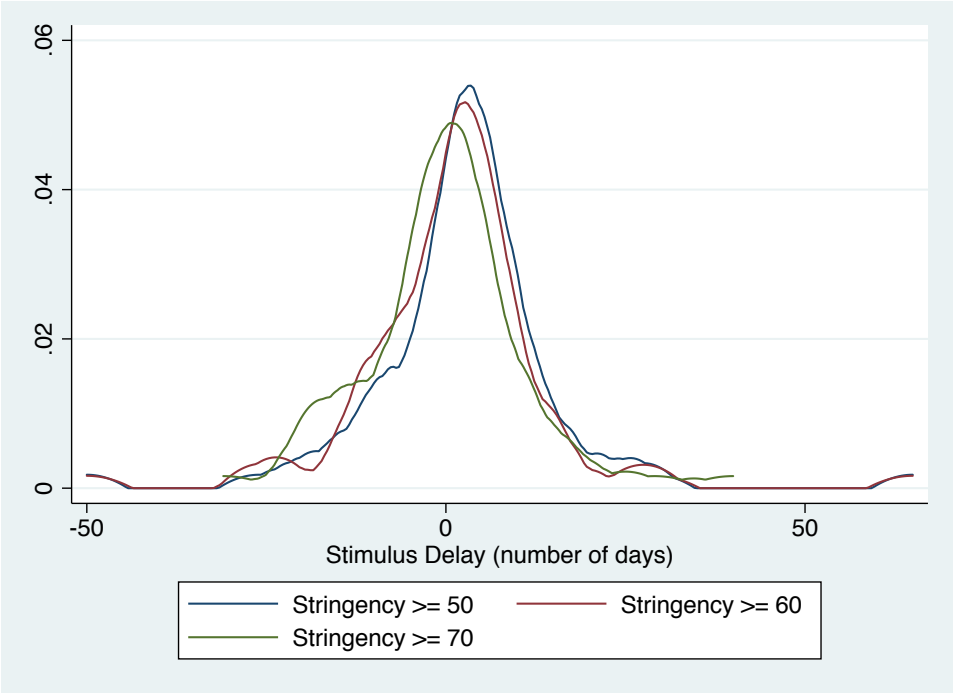



Kazakhstan
Netherlands
Panama
Portugal
Seychelles
Jordan
Myanmar
Pakistan
Poland
Serbia
Israel
Mauritius
Norway
Philippines
Romania
Ireland
Malaysia
Nigeria
Peru
Qatar
Iran
Madagascar
New Zealand
Paraguay
Puerto Rico
100
50
0
Jan 01, 20
Mar 01, 20
Stringency
Fiscal stimulus



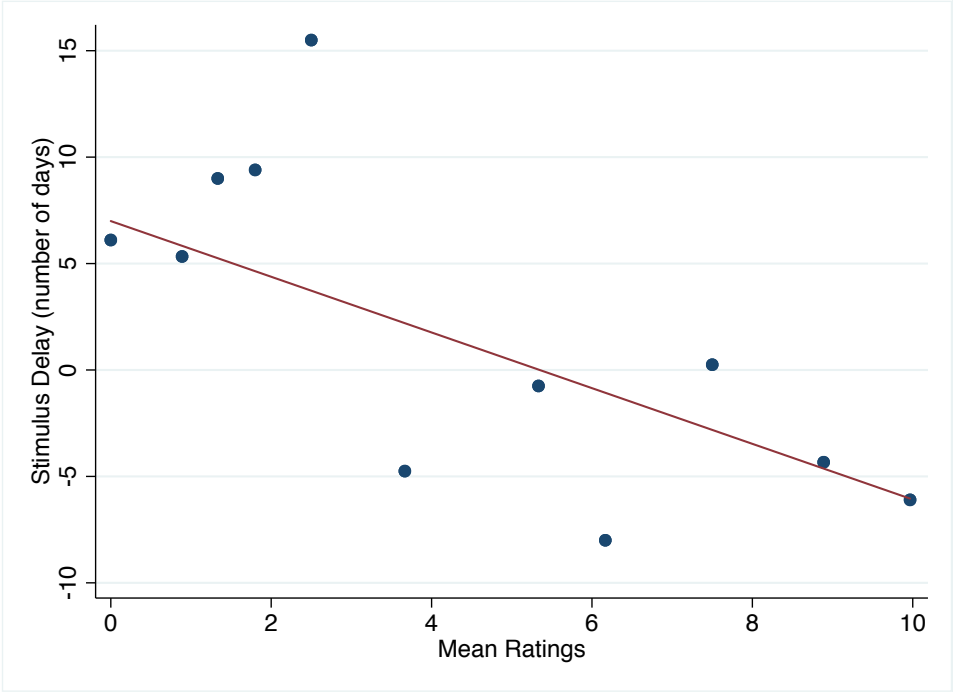
Notes: Each panel in the figure shows the time series evolution of stringency (blue) and fiscal stimulus (red) for countries that have declared fiscal stimulus between January 1-April 9, 2020. The stringency measure is the raw index, while the fiscal stimulus is the percentage of stimulus declared by the country until date t. For most countries, fiscal measures only follow after the announcement of strong stringency measures. (Data Source: OxCGRT)

Figure 5: Number of Days Between Stimulus Declaration and Threshold Stringency Level



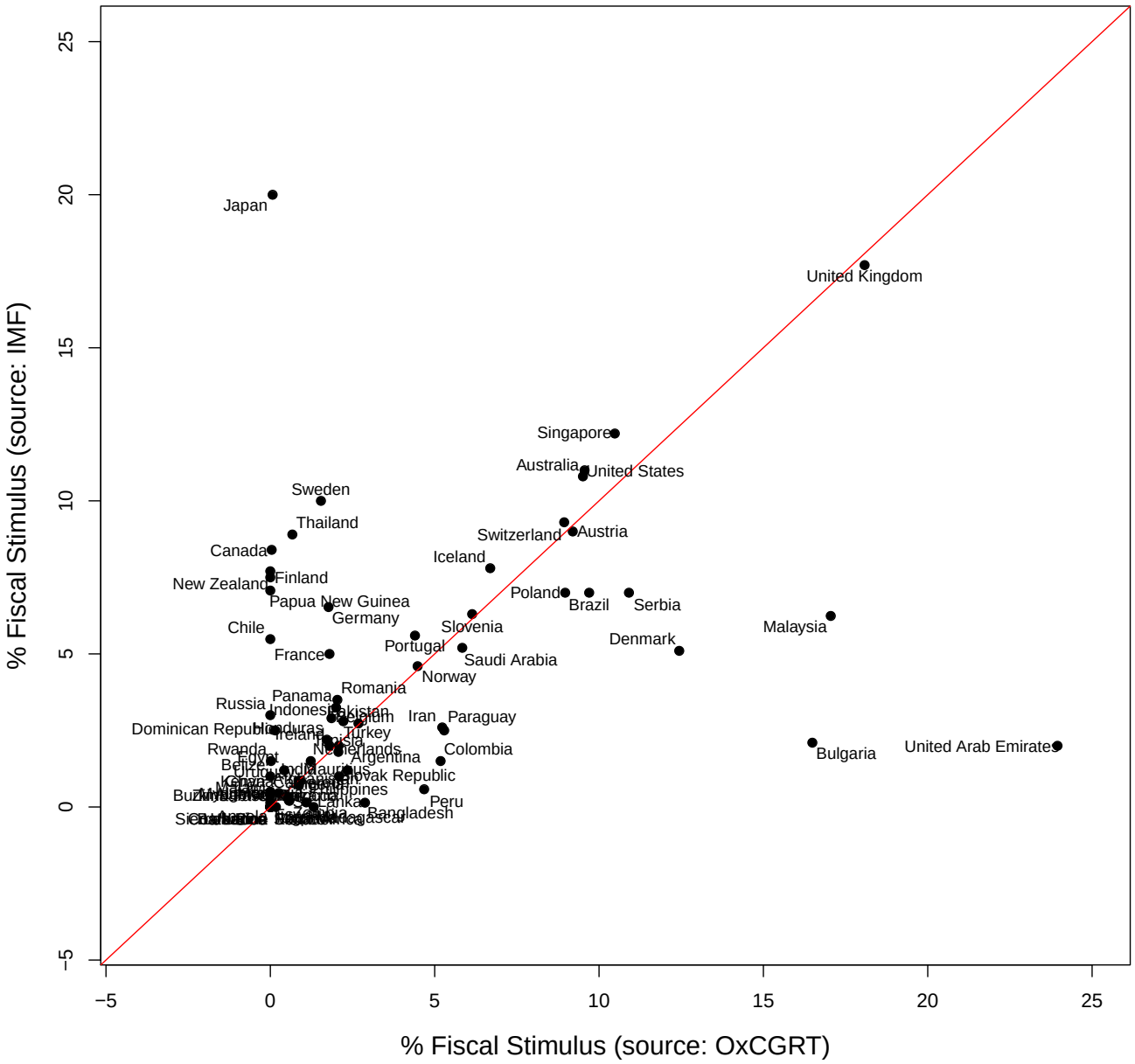
Notes: The figure shows the kernel density plot of delay (number of days) in the announcement of the first fiscal stimulus after the imposition of a threshold stringency level. Each line corresponds to a different threshold stringency level, 50, 60, and 70 percent. (Data Source: OxCGRT)

Figure 6: Delay in Stimulus Declaration vs. Mean Ratings



Notes: The figure shows the cross-country binscatter between stimulus delay (number of days) and mean ratings. It corresponds to the regression specification (2) in Table 4. Stimulus delay is calculated w.r.t. to a threshold stringency level of 50. The mean ratings is the simple average of the sovereign credit ratings from Moody's, Fitch and S&P as on April 9, 2020. (Data Source: OxCGRT and countryeconomy.com)

Figure 7: Comparison of OxCGRT and IMF Stimulus Data - Full Sample



Notes: This figure compares the fiscal stimulus (%) from the IMF and OxCGRT for all countries in our sample. We could not calculate the fiscal stimulus for some countries using the IMF policy response tracker data. There was no data available for Venezuela. The information was unclear to calculate a precise number for fiscal stimulus in the case of the following countries: Guatemala, Croatia, Uzbekistan, El Salvador, Qatar, Kazakhstan, Spain, Hungary, Jordan, Greece, and Seychelles. (Source: IMF policy response tracker as on April 16, 2020 and OxCGRT as on April 9, 2020)

Tables

Table 1: Average Rating and Fiscal Stimulus Status (By country)

Mean	Fiscal Stimulus		
Rating	Yes	No	NA
< 1	26	22	3
1-2	9	2	0
2-3	4	1	0
3-4	2	1	1
4-5	3	0	0
5-6	5	1	1
6-7	3	0	0
7-8	4	0	0
8-9	2	1	1
9-10	11	1	0
Total	69	29	6

Notes: The mean rating is the simple average of the sovereign credit ratings from Moody's, Fitch and S&P as on April 9, 2020. The mean rating is the distance from non-investment grade rating and varies from 0-10, where 0 is equal to junk and 10 is equal to prime status. (Data Source: OxCGRT and countryeconomy.com)

Table 2: Fiscal Stimulus (OxCGRT) vs. Mean Ratings

	Stimulus (percent of GDP)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\overline{\text{Stringency}}$	0.199***			0.138**	0.099		0.109	0.110	0.116
	(0.050)			(0.054)	(0.074)		(0.074)	(0.074)	(0.074)
$\overline{\text{Rating}}$		0.474***		0.379***		0.286*	0.307**	0.326**	0.213
		(0.132)		(0.139)		(0.153)	(0.147)	(0.148)	(0.188)
log(COVID-19 Cases)			0.691***		0.494**	0.436***	0.214	0.451*	0.343
			(0.129)		(0.215)	(0.149)	(0.235)	(0.247)	(0.262)
log(GDP)								-0.463	-0.374
								(0.369)	(0.378)
log(GDP per capita)									0.456
									(0.351)
Constant	-1.130	1.833***	-3.223***	-0.825	-3.476***	-1.641	-1.963*	1.366	-2.702
	(0.847)	(0.416)	(0.924)	(0.916)	(0.948)	(1.040)	(1.077)	(3.199)	(4.516)
Observations	94	87	94	87	94	87	87	87	87
R-squared	0.153	0.159	0.187	0.218	0.210	0.198	0.225	0.236	0.242

Notes: The table is based on regression equation 2. All variables are based on the information released until April 9, 2020. The stimulus (percent of GDP) is the percentage of aggregate fiscal stimulus to GDP declared by country i to fight COVID-19. The $\overline{\text{Stringency}}$ is the cumulative level of economic repression in country i as measured until April 9, while log(COVID-19 Cases) is based on the number of reported cases until April 9. The $\overline{\text{Rating}}$ is the average distance from junk rating. We report robust standard errors. ***- $p < 0.01$, **- $p < 0.05$ and * - $p < 0.1$

Estimation equation:

$$\text{Stimulus}_i = \beta_0 + \beta_1 * \overline{\text{Stringency}}_i + \beta_2 * \log(\text{COVID cases})_i + \beta_3 * \overline{\text{Rating}}_i + \text{Controls}_i + \epsilon_i$$

Table 3: Fiscal Stimulus (IMF) vs. Mean Ratings

	Stimulus (percent of GDP)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\overline{\text{Stringency}}$	0.156**			0.034	-0.052		-0.012	-0.015	-0.015
	(0.062)			(0.053)	(0.078)		(0.071)	(0.070)	(0.069)
$\overline{\text{Rating}}$		0.726***		0.710***		0.621***	0.618***	0.588***	0.375**
		(0.104)		(0.105)		(0.117)	(0.122)	(0.114)	(0.163)
log(COVID-19 Cases)			0.842***		0.932***	0.273	0.296	-0.006	-0.177
			(0.184)		(0.240)	(0.211)	(0.270)	(0.427)	(0.462)
log(GDP)								0.564	0.675
								(0.534)	(0.547)
log(GDP per capita)									0.826*
									(0.489)
Constant	-0.477	1.348***	-4.934***	0.567	-4.554***	-1.067	-0.986	-4.655	-11.171*
	(1.391)	(0.317)	(1.712)	(1.206)	(1.713)	(1.922)	(1.890)	(3.840)	(6.469)
Observations	83	76	83	76	83	76	76	76	76
R-squared	0.071	0.426	0.270	0.429	0.274	0.442	0.442	0.460	0.479

Notes: The table is based on regression equation below. All variables are based on the information released until April 19, 2020. The stimulus (percent of GDP) is the percentage of aggregate fiscal stimulus to GDP declared by country i to fight COVID-19. The $\overline{\text{Stringency}}$ is the cumulative level of economic repression in country i as measured until April 19, while log(COVID-19 Cases) is based on the number of reported cases until April 19. The $\overline{\text{Rating}}$ is the average distance from junk rating. We report robust standard errors. ***- $p < 0.01$, **- $p < 0.05$ and * - $p < 0.1$

Estimation equation:

$$\text{Stimulus}_i = \beta_0 + \beta_1 * \overline{\text{Stringency}}_i + \beta_2 * \log(\text{COVID cases})_i + \beta_3 * \overline{\text{Rating}}_i + \text{Controls}_i + \epsilon_i$$

Table 4: Delay in Stimulus vs. Mean Rating

	Stimulus delay (number of days)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\overline{\text{Stringency}}^T$	0.79***			0.74***		0.76***	0.62**	0.57*
	(0.25)			(0.25)		(0.28)	(0.31)	(0.29)
$\overline{\text{Rating}}$		-1.30***		-1.09**	-2.07***		-1.68***	-1.32**
		(0.44)		(0.47)	(0.45)		(0.56)	(0.60)
log(COVID-19 Cases)^T			1.10**		2.49***	0.55	1.79**	2.45***
			(0.44)		(0.55)	(0.43)	(0.70)	(0.72)
log(GDP)								-2.34***
								(0.76)
Observations	78	72	78	72	72	78	72	72
R-squared	0.282	0.132	0.046	0.382	0.304	0.293	0.465	0.516

Notes: The table is based on regression equation 3. All variables are based on the information released until April 9, 2020 by OxCGRT. Stimulus delay (number of days) is calculated w.r.t. to a threshold stringency level of 50 and first announcement of fiscal stimulus on date T. The $\overline{\text{Stringency}}^T$ is the average of economic stringency and Log(COVID-19 Cases)^T are the number of reported cases in country i on date T. The $\overline{\text{Rating}}$ is the average distance from junk rating. We report robust standard errors. ***- $p < 0.01$, **- $p < 0.05$ and * - $p < 0.1$

Estimation Equation:

$$\text{Stimulus Delay}_i = \beta_0 + \beta_1 * \overline{\text{Stringency}}_i^{T_i} + \beta_2 * \log(\text{COVID cases})_i^{T_i} + \beta_3 * \overline{\text{Rating}}_i + \text{Controls}_i + \epsilon_i \quad (3)$$

Table 5: List of Vulnerable Countries

Country	Confirmed Cases (1)	Stringency (2)	Nominal GDP (USD bn) (2019) (3)	GDP per Capita (USD) (2019) (4)	Fiscal Stimulus (% of GDP) (5)	Moody's Ratings (6)	S&P Ratings (7)	Fitch Ratings (8)	Stimulus (USD bn) (1%) (9)	(2%) (10)	(5%) (11)
BURKINA FASO	2824	49	15	718	0.0	NA	B	NA	0	0	1
COSTA RICA	6114	23	61	12015	0.0	B2	B+	B+	1	1	3
ECUADOR	45054	23	108	6249	0.0	Caa3	CCC-	CC	1	2	5
EGYPT	14909	20	302	3047	0.4	B2	B	B+	2	5	14
HUNGARY	9089	25	170	17463	2.3	Baa3	BBB	BBB	0	0	5
INDIA	54155	37	2936	2172	0.9	Baa2	BBB-	BBB-	4	33	122
INDONESIA	29704	33	1112	4164	2.2	Baa2	BBB	BBB	0	0	31
IRAQ	10267	31	224	5738	0.0	NA	NA	B-	2	4	11
JORDAN	4841	23	44	4387	1.6	B1	B+	BB-	0	0	2
LEBANON	7610	28	59	9655	0.0	Ca	SD	RD	1	1	3
PAKISTAN	31650	29	284	1388	2.7	B3	B-	B-	0	0	7
PANAMA	16566	23	69	16245	2.0	Baa1	BBB+	BBB	0	0	2
PERU	26083	23	229	7047	4.7	A3	BBB+	BBB+	0	0	1
PORTUGAL	133431	23	236	23031	4.4	Baa3	BBB	BBB	0	0	1
ROMANIA	17028	22	244	12483	2.0	Baa3	BBB-	BBB-	0	0	7
RUSSIA	55405	25	1638	11163	0.0	Baa3	BBB-	BBB	16	33	82
SOUTH AFRICA	17772	20	359	6100	0.0	Ba1	BB	BB	3	7	18
SRI LANKA	2593	35	87	3947	0.6	B2	B	B	0	1	4
TUNISIA	4686	22	39	3287	2.1	B2	NR	B+	0	0	1
UKRAINE	16063	24	150	3592	0.0	Caa1	B	B	1	3	8
VENEZUELA	2495	21	70	2548	0.0	C	B-	WD	1	1	4
VIETNAM	4739	42	262	2740	0.0	NA	NA	BB	3	5	13
Total									36	98	342

Notes: The vulnerable country list is based on mean stringency index ≥ 20.1 (cross-country median), and mean credit rating ≤ 5. We drop all countries whose stimulus already exceed 5 percent of GDP as on April 9, 2020. The columns (9), (10) and (11) give the difference (USD bn value) between threshold stimulus package (1, 2, and 5 percent of GDP) and the announced fiscal stimulus (percent of GDP) by a country until April 9, 2020 according to OxCGRT. If this difference is negative, we report it as zero.

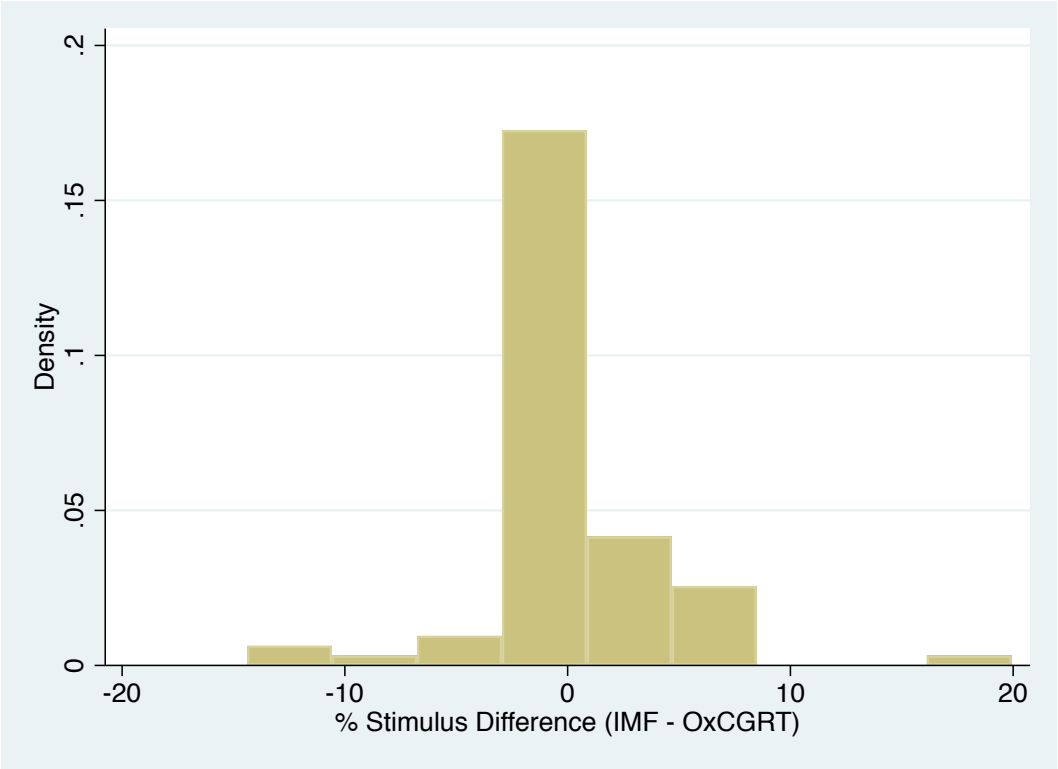
Table 6: Data Sources

Variable	Source
Daily Stringency Index	Oxford COVID-19 Government Response Tracker (OxCGRT)
Daily confirmed cases	Oxford COVID-19 Government Response Tracker (OxCGRT)
Daily fiscal measures	Oxford COVID-19 Government Response Tracker (OxCGRT)
Fiscal Measures	IMF Policy Response Tracker
Sovereign credit rating	countryeconomy.com & tradingeconomics.com
Nominal GDP (2019)	IMF
GDP per capita (2019)	IMF

Notes: This table lists the sources of data used in this paper.

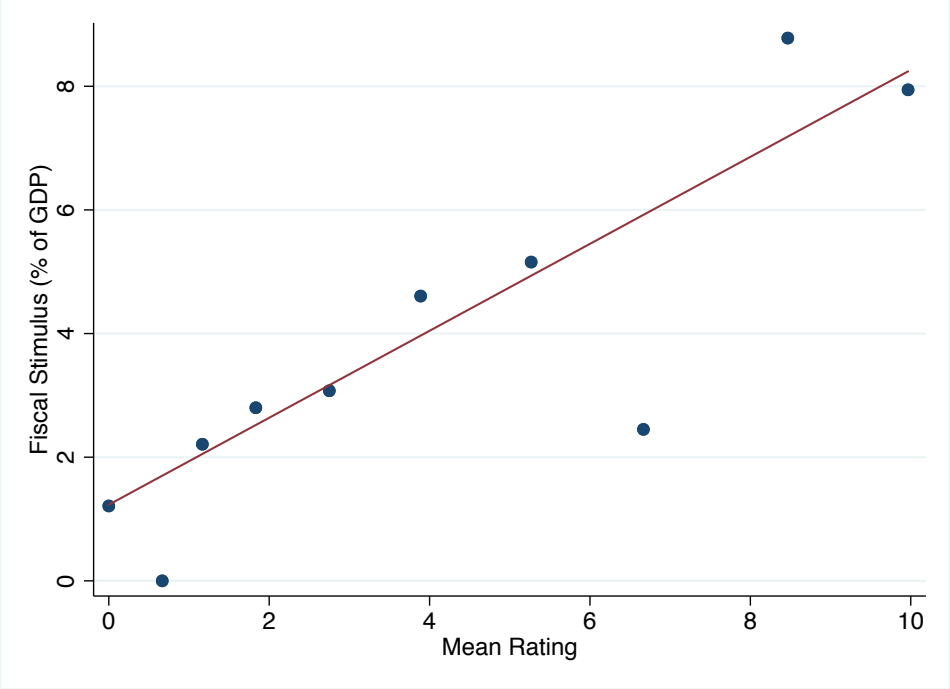
Appendix

Figure 8: Difference between IMF and OxCGRT Fiscal Stimulus - Full Sample



Notes: This figure reports the histogram of the difference between % Fiscal stimulus (IMF) and % Fiscal Stimulus (OxCGRT). Many of the countries with positive value of the difference corresponds to those which have declared additional stimulus after April 9, 2020 (our original sample end period). There are a few countries with significant discrepancies, which arises for two reasons. First, in OxCGRT, some of the loan guarantees were counted as stimulus (for instance, Bulgaria and China), which we exclude while aggregating the numbers from the IMF. Second, some countries have announced additional fiscal stimulus since our calculations based on OxCGRT data on April 9, 2020. (Source: IMF policy response tracker as on April 16, 2020 and OxCGRT as on April 9, 2020)

Figure 9: Fiscal Stimulus (IMF) vs. Mean Rating



Notes: The figure shows the cross-country binscatter between fiscal stimulus and mean rating. It corresponds to the regression specification (2) in Table 3. Fiscal stimulus is the sum of stimulus announced (as a percentage of 2019 GDP) until April 16, 2020 (IMF data). The mean rating is the simple average of the sovereign credit ratings from Moody's, Fitch and S&P as on April 16, 2020. (Data Source: IMF and countryeconomy.com)