



# COVID-19

## Response and Recovery

### Mobilizing financial resources for development

DA-COVID-19 project led by Debt and Development Finance Branch, Division on Globalization and Development Strategies (DDFB/DGDS)



## Workstream 1.3

# Helping LICs and MICs understanding financial conditions - Financial Conditions Indicator

**Guillaume Blanc**

**Julien Bodelet**

Consultants, GDS/UNCTAD

**Rachid Bouhia**

Economic Affairs Officer, GDS/UNCTAD

*This document has not been formally  
edited and does not necessarily represent  
the views of the UN, UNCTAD, ECA,  
ESCAP or ECLAC*



## About the COVID-19 Response and Recovery project

This paper is an output from the project “Response and Recovery: Mobilising financial resources for development in the time of COVID-19”, which is co-ordinated by the Debt and Development Finance Branch of UNCTAD and jointly implemented with ECA, ECLAC and ESCAP. This project is one of the five UN Development Account short-term projects launched in May 2020 in response to the COVID-19 crisis.

The project aims to enable low-income and middle-income developing countries (LICs and MICs) from Africa, Asia-Pacific, and Latin America and the Caribbean to diagnose their macro-financial, fiscal, external financial and debt fragilities in the global context, and design appropriate and innovative policy responses to the COVID-19 pandemic leading toward recoveries aligned with the achievement of the Sustainable Development Goals (SDGs).

### Abstract

This paper aims at taking stock of the progress achieved, as of April 2021, in creating synthetic indicators to measure financial conditions in developing countries, in accordance with the specifications of the project “Response and Recovery: Mobilising financial resources for development in the time of Covid-19”. The work presented herein draws on the conceptual framework defined in the literature on “financial stress”, which has mostly focused on advanced economies to date. In line with this literature, our indicators broadly result from a factor analysis on a large series of country-level financial variables. However, we implement numerous methodological innovations in order to better accommodate the specificities of low or middle-income developing countries, such as the “clustering” — or regrouping — of countries with similar financial conditions with a view to undermining the constraints relating to the scarcity or poor quality of financial data. The paper presents some preliminary and provisional results based on a dataset with 843 monthly or quarterly financial variables for 53 developing countries in total, including a world map highlighting five different clusters and the financial conditions indicators per se, for the two largest groups between January 2005 and July 2020, hinting, among other things, the respective magnitudes of the pandemic.

## Contents

Monitoring financial conditions to preempt financial crises in developing countries.....	6
The new generation of UNCTAD FCIs.....	7
Group-level Financial condition indicators .....	7
Preliminary and provisional results.....	8
Bibliography.....	10

**This workstream aims at providing an assessment of the financial conditions in developing countries, with emphasis on MICs and LICs, through a new generation of UNCTAD financial conditions indicators (UNCTAD FCIs), in accordance with the specifications of the project “Response and Recovery: Mobilising financial resources for development in the time of Covid-19”.**

## Monitoring financial conditions to preempt financial crises in developing countries

The main purpose of monitoring financial conditions in developing countries is to provide early warning of “financial stress” before it has adverse effects on the real economy. Although financial stress is often associated with economic downturns and public debt crises, there is no precise definition. Financial stress is indeed a complex and abstract concept, and various definitions are provided in the literature. According to Hakkio and Keeton (2009) financial stress is defined as “the interruption to the normal functioning of the financial markets”. Illing and Liu (2006) defined it as the “force exerted on economic agents by uncertainty and changing expectations of losses in financial markets and institutions”. According to Balakrishnan et al. (2011) “financial stress tends to be associated with droughts, and concerns about the health of the banking system”. Also, following Illing and Liu (2006), it is important to emphasize that financial stress is not a binary state characterized by financial crises. It is more a continuous phenomenon whose extreme values are characterized by financial crises. To sum up, financial stress can be thought as a continuous and abstract variable which reflects the pathological functioning of the financial markets. Although, being an abstract concept, financial stress cannot be directly observed, it may exhibit multiple concrete consequences which in turn can be measured. According to Hakkio and Keeton (2009) any financial crisis relates to one or more of five key phenomena: i) Increased uncertainty about fundamental value of assets, ii) Increased uncertainty about behaviour of other investors, iii) Increased asymmetry of information, iv) Decreased willingness to hold risky assets, v) Decreased willingness to hold illiquid assets.

The first step in measuring financial stress is to carefully select variables which fall under these five key phenomena. The financial stress indicator is, in a second step, captured as the main driver of how these variables fluctuate together. This is typically done through *factor analysis* (see Bartholomew, Knott, and Moustaki, 2011) which is commonly used to produce modern financial stress indicators in the economic literature. Illing and Liu (2006) used it to measure financial stress in Canada, Cevik, Dibooglu, and Kutan (2013) studied transition economies, and Cevik, Dibooglu, and Kenc (2012) studied the case of Turkey. This is also the technique employed by many institutions such as the Reserve Bank of Kansas City, the Federal Reserve Bank of St. Louis and the IMF, among others. Whereas most of these initiatives relate to advanced economies, UNCTAD is among the first institutions to design and produce such indicators specifically for developing countries.

Factor analysis is a way to efficiently summarise the information provided by the observed financial variables that fluctuate over time, allowing to separate these fluctuations into two components: a common component, which in our case is the (unobserved) level of financial stress, and an idiosyncratic component, which is a residual information specific to each variable. With only one observed variable, it would be hopeless to separate these two components. The idea of factor analysis is to filter out the noise by combining the information from many different variables, and thereby to estimate the unobserved factor - or in other words the financial conditions or the level of financial stress - that drives all these variables. The quality of this estimation depends on both the relevance of the chosen variables and the quality of the data itself.

## The new generation of UNCTAD FCIs

The first UNCTAD FCIs essentially applied factor analysis to each country individually, resulting in country-level financial stress indicators. These indicators seemed to perform well in signalling and capturing major shocks, such as for instance the financial crisis of 2007-2008, but they were highly volatile and suffered from scant and poor-quality data. Upon closer inspection, it became clear that for many developing countries, mostly LICs and MICs, the data were of insufficient quality for reliable estimation: too few variables were available, the data contained too many missing variables, and/or they were not reported in a regular fashion, resulting in extreme volatility of the estimated financial stress indicators. This all brought into question the reliability of the country-level FCIs and ultimately reduced their relevance for policy making.

A solution to this problem, as implemented in the new generation of FCIs, is to regroup – or “cluster” - countries together, and to compute the financial stress indicator for each group. Although each situation is unique, developing countries share a large variety of similar patterns, in particular as to their exposure to external shocks and the vagaries of international financial markets. The new generation of FCIs does not intend to mirror detailed country idiosyncrasies but rather combine them into key archetypes to which any developing country could relate regardless of the availability and the quality of its data. This new approach should not only better capture global drivers of financial stress in developing countries but also facilitate direct comparisons across countries, as similar countries would automatically fall into the same clusters. Also, from a technical point of view, this should result in more stable, timely, and reliable indicators while overcoming the problem of scarcity of data. We expect to be able to provide reliable indicators even though we do not have enough observations for some countries, as long as the “clustering” is relevant, and data is available for other members of the group. In other words, countries with scarce, delayed, or poor-quality data are expected to benefit from the statistical strength of other countries in their groups.

## Group-level Financial condition indicators

The question of group formation, or *clustering*, is essential to the new methodology. A first idea would be to cluster the countries according to their geographical proximity. However, when it comes to financial profile, this approach is inadequate: for instance, the financial situation of Argentina is relatively closer to that of Turkey than that of Brazil, despite being geographically closer to the latter. Another option would be to cluster the countries based on qualitative and/or subjective assessments of the countries’ economic situation, but this approach may be biased and therefore criticized.

Instead, we propose to let the data “speak for itself” and automatically cluster the countries based on a measure of similarity between their respective financial conditions. This approach is not only more objective but also perfectly aligned with respect to the goal of having group-level FCIs which are the most representative of the financial condition of its members. It is important to note that the clusters will not necessarily match geographical regions, but may bring out new network patterns, which will

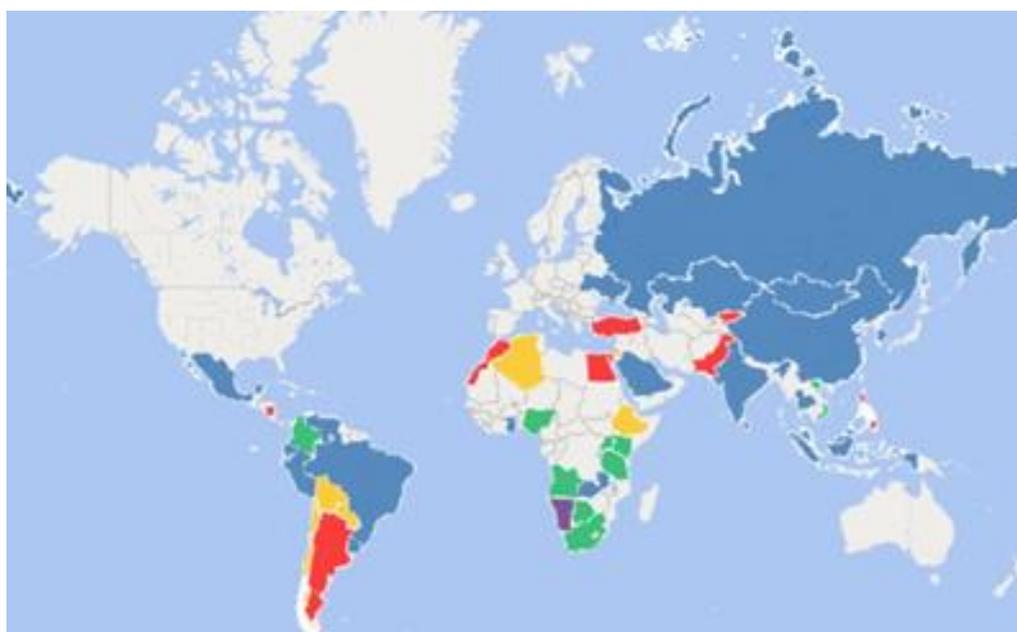
as such enhance the economic analysis stemming from the FCIs. This, however, poses a great methodological challenge: each estimated FCI at a group level depends on the country members of the group, and, conversely, the membership of each country to a particular group depends on the estimated group-level FCIs. To our knowledge, solving this conundrum has never been attempted in the literature: finding the best group memberships would obviously require testing every single potential group combination, which is computationally infeasible. However, we were able to overcome this challenge with a brand-new methodology, tailored-made for the project, which we have extensively tested by computer simulations to guarantee a proper grouping of the countries *and* estimation of the factors.

## Preliminary and provisional results

We applied this innovative methodology to our in-house datasets of financial variables for 53 developing countries and selected 5 clusters. The data consist of monthly and quarterly observations which span from January 2005 to July 2020 (T=187). The dataset is chiefly obtained from Thomson Reuters Datastream. For each country the number of financial variables differ and ranges from 7 to 24 with 843 variables in total. The data include financial and macroeconomic variables (interest rates, exchange rates, GDP, capital flows, ...). Seasonality and trend are estimated and subtracted in order to obtain stationary indicators. It is worth noting that all the variables are selected to be specific to the country in order to avert artificial grouping effects.

Figure 1 (below) shows a world map with the distribution of the country groups. The algorithm comes up with 5 groups and each group is identified in the map with a distinct colour.

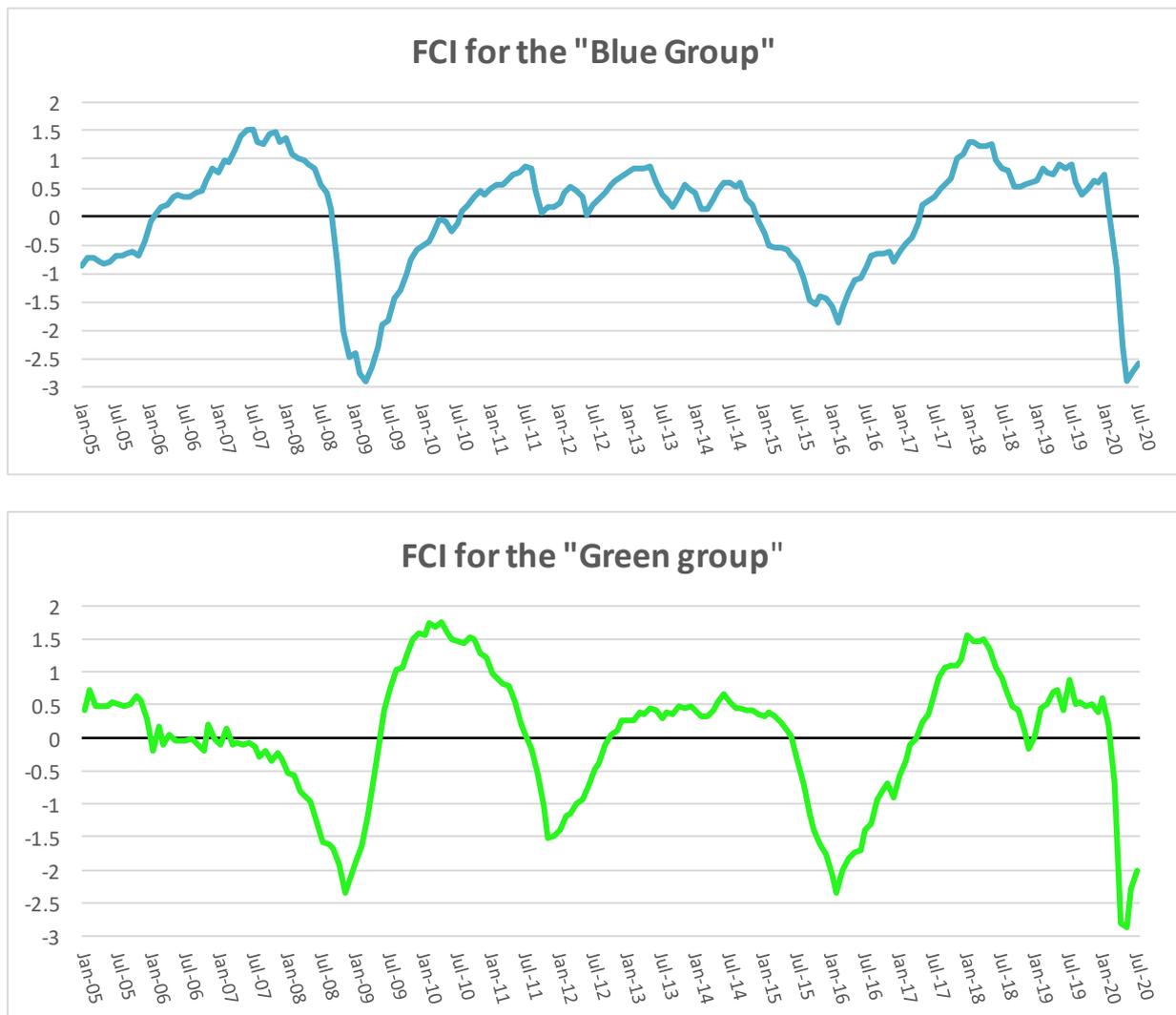
**Figure 1: Composition of the country groups for the FCIs**



Figures 2 (below) presents the FCIs for the groups in blue and green. The financial conditions in the group are improving when the FCI increases and vice-versa. One of the most blatant finding (but which needs to be confirmed) is that in most of the 5 groups the Covid-19 pandemic seems to have had a larger impact than the 2008 financial crisis.

**Please note that these are preliminary and provisional results only and subject to change as the work progresses.** Further work will include the careful selection of the optimal number of clusters, a detailed scrutiny of each of the variables in the model, the inclusion of more variables, when applicable and, last but not least, a preliminary economic characterization of the clusters to have a better understanding of what factors and drivers tie the countries together.

**Figure 2: FCIs for the blue and green groups**



## Bibliography

Balakrishnan, Ravi, Stephan Danninger, Selim Elekdag, and Irina Tytell, 2011, The transmission of financial stress from advanced to emerging economies, *Emerging Markets Finance and Trade* 47, 40–68.

Bartholomew, David J., Martin Knott, and Irini Moustaki, 2011, *Latent Variable Models and Factor Analysis: A Unified Approach*. Vol. 904 (John Wiley & Sons).

Cevik, Emrah Ismail, Sel Dibooglu, and Turalay Kenc, 2012, Measuring financial stress in Turkey, *Journal of Policy Modeling* 35, 370–383.

Cevik, Emrah Ismail, Sel Dibooglu, and Ali M. Kutan, 2013, Measuring financial stress in transition economies, *Journal of financial stability* 9, 597–611.

Hakkio, Craig S., and William R. Keeton, 2009, Financial stress: what is it, how can it be measured, and why does it matter?, *Economic Review* 94, 5–50.

Illing, Mark, and Ying Liu, 2006, Measuring financial stress in a developed country: An application to Canada, *Journal of Financial Stability* 2, 243–265.