

Datos y Metodología Paper

Septiembre 2023

1 Data

Since the purpose of this paper is to study the effects of natural disasters on the mean and variance of financial series in emerging economies, we retrieved data from several sources. Firstly, we downloaded the 5-year sovereign Credit Default Swap (*CDS*) daily series for all the countries of interest: Brazil, Chile, China, Colombia, Indonesia, South Korea, Malaysia, Mexico, Peru, South Africa, and Turkey. The sample we were able to obtain starts on October 10, 2004, and it ends on August 10, 2022. In Table 1 we present the descriptive statistics of the first difference of all the CDS series.

Country	Minimum	Maximum	Mean	Std. Dev.	Skewness	Kurtosis
Brazil	-124.91	186.53	-0.03	8.45	2.01	81.53
Chile	-64.27	63.11	0.02	3.71	0.66	67.48
China	-58.91	67.47	0.01	3.52	0.63	73.61
Colombia	-126.52	180.59	-0.02	8.20	1.38	83.91
Indonesia	-223.81	324.52	-0.06	13.30	3.12	170.85
South Korea	-168.55	133.28	0.00	5.72	-2.92	266.79
Malaysia	-101.34	119.40	0.01	5.22	1.71	128.90
Mexico	-132.96	197.20	0.01	7.31	3.82	168.49
Peru	-126.10	161.39	-0.04	6.72	1.82	120.92
South Africa	-82.36	146.45	0.03	7.99	2.25	58.39
Turkey	-131.91	166.47	0.08	10.72	1.57	48.01
Moving Average	-11.46	20.19	0.01	1.33	3.17	50.01

Table 1: Descriptive Statistics CDS spreads

We also aimed to assess the impact of natural disasters on the major stock indices of various countries. We utilized the following indices: Bovespa for Brazil, S&P CLXIPSA for Chile, ChinaA50 for China, COLCAP for Colombia, JSX for Indonesia, KOSPI for South Korea, KLCI for Malaysia, S&P BMVIPC for Mexico, IGBVL for Peru, South Africa Top 40 for South Africa, and BIST100

for Turkey. Table 2 presents the descriptive statistics of the returns for all these stock index series, covering the same sample period as the CDS data, from October 10, 2004, to August 10, 2022.

Stock Index	Min.	Max.	Mean	Std. Dev.	Skewness	Kurtosis
BIST100	-11.06	12.13	0.06	1.59	-0.53	7.53
Bovespa	-15.99	13.68	0.03	1.68	-0.43	12.70
ChinaA50	-9.86	9.20	0.02	1.61	-0.24	7.57
JSX	-10.95	7.62	0.05	1.22	-0.62	10.39
KOSPI	-11.17	11.28	0.02	1.20	-0.47	12.30
S&P BMVIPC	-7.27	10.44	0.03	1.17	-0.01	9.66
S&P CLXIPSA	-15.22	11.80	0.02	1.12	-0.80	23.81
SouthAfricaTop40	-10.45	9.11	0.04	1.29	-0.20	8.76
IGBVL	-117.48	230.26	0.04	4.40	23.49	1842.97
KLCI	-9.98	6.63	0.01	0.72	-0.88	17.32
COLCAP	-16.29	14.69	0.03	1.25	-0.80	26.72
Moving Average	-1.81	0.86	0.03	0.22	-1.59	12.39

Table 2: Descriptive Statistics Stock Indexes Returns

In light of the diverse range of countries represented in our sample, we have opted to employ the internationally recognized Emergency Events Database (EM-DAT) published by the Centre for Research on the Epidemiology of Disasters (CRED)¹. Our data collection focused on cataloging natural disasters occurring within the time frame spanning from October 10, 2004, to August 10, 2022, within our selected countries of interest. While the EM-DAT initially comprised 1400 natural disasters, we excluded three cases due to a lack of information regarding their respective start months. Consequently, we obtained a dataset encompassing 1397 disasters, classified into five distinct and mutually exclusive categories: Biological, Climatological, Geophysical, Hydrological, and Meteorological.

According to the Peril Classification and Hazard Glossary, as defined by the Integrated Research on Disaster Risk (IDRD), geophysical disasters originate from solid earth processes, hydrological disasters stem from occurrences, movements, and distributions of surface and subsurface freshwater and saltwater, meteorological disasters result from **short-lived** extreme weather conditions, climatological disasters arise from **long-lived** atmospheric processes, and biological disasters are triggered by exposure to living organisms or their toxic substances, as well as diseases they may carry. In Table 3 we provide a breakdown of the disasters corresponding to each disaster type.

Meanwhile, Table 4 presents the count and the proportion of each type and subtype of disaster within our sample. Notably, our analysis reveals that the most prevalent types of disasters in our sample are hydrological, meteorological, and geophysical. Conversely, the most frequent subtypes of disasters are

¹This database can be accessed in the next link <https://www.emdat.be/>

floods, accounting for 46.81% of the sample, storms at 20.26%, and earthquakes at 13.96% of the total sample.

Disaster Group	Sub-	Disaster Type	Disaster Sub-Type	Disaster Type	Sub-sub
Geophysical		Earthquake	Ground Movement Tsunami		
		Volcanic Activity	Ash fall Lahar Pyroclastic Flow Lava Flow		
		Mass movement			
Meteorological	Storm		Tropical Storm Extra-tropical Storm Convective Storm	Derecho Hail Lightning/Thunderstorm Rain Tornado Sand-dust Storm Winter Storm/Blizzard Storm/Surge Wind Severe storm	
		Extreme temperature	Cold wave Heat wave Severe wind conditions	Snow-ice Frost/Freeze	
		Fog			
Hydrological	Flood		Coastal flood Riverine flood Flash flood Ice jam flood		
		Landslide	Avalanche (snow, debris, mudflow, rock fall)		
	Wave action		Rogue wave Seiche		
Climatological	Drought		Drought		
	Glacial Lake Outburst				
	Wildfire		Forest fires Land fire: brush, bush, pasture		
Biological	Epidemic		Viral diseases Bacterial diseases Parasitic diseases Fungal diseases Prion diseases		
		Insect infestation	Locust Grasshopper		
	Animal accident				

Table 3: List of disasters for each type of disaster

Disaster Type	Disaster Subtype	Count	Proportion
Biological	Epidemic	20	1.43%
	Subtotal	20	1.43%
Climatological	Drought	33	2.36%
	Wildfire	28	2.00%
	Subtotal	61	4.36%
Geophysical	Earthquake	195	13.96%
	Volcanic Activity	35	2.51%
	Mass Movement	4	0.29%
	Subtotal	234	16.76%
Hydrological	Flood	654	46.81%
	Landslide	115	8.23%
	Subtotal	769	55.04%
Meteorological	Storm	283	20.26%
	Extreme temperature	30	2.15%
	Subtotal	313	22.41%
Total		1397	100%

Table 4: Count and proportion of each disaster type

Another method of representing the natural disasters in our dataset is through the use of maps. Figure 1 illustrates the number of climatological disasters by country, Figure 2 presents the count of geophysical disasters, Figure 3 provides data on hydrological disasters, Figure 4 showcases meteorological disasters, and Figure 5 offers a comprehensive overview of all disasters in the sample.

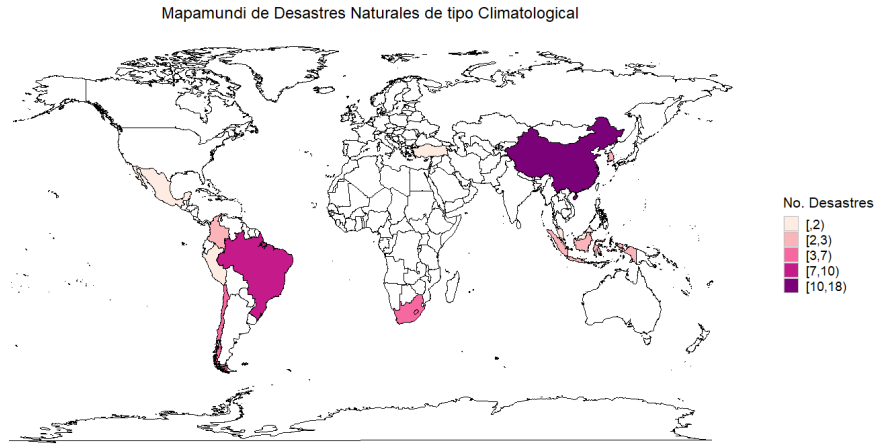


Figure 1: Frequency of climatological disasters.

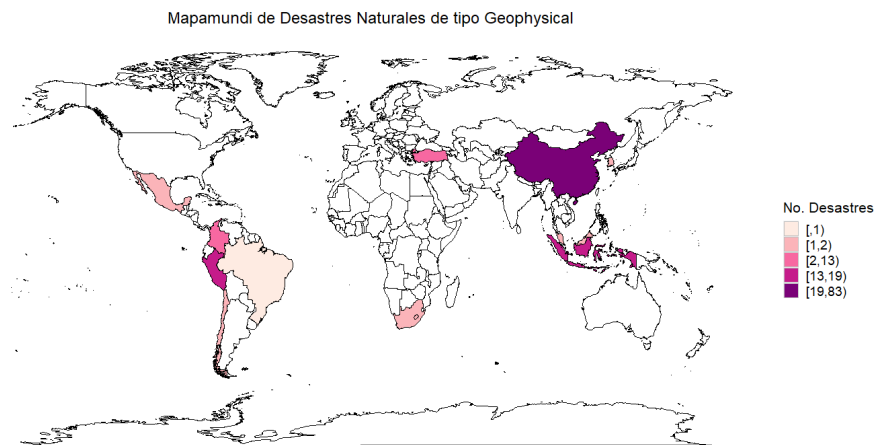


Figure 2: Frequency of geophysical disasters.

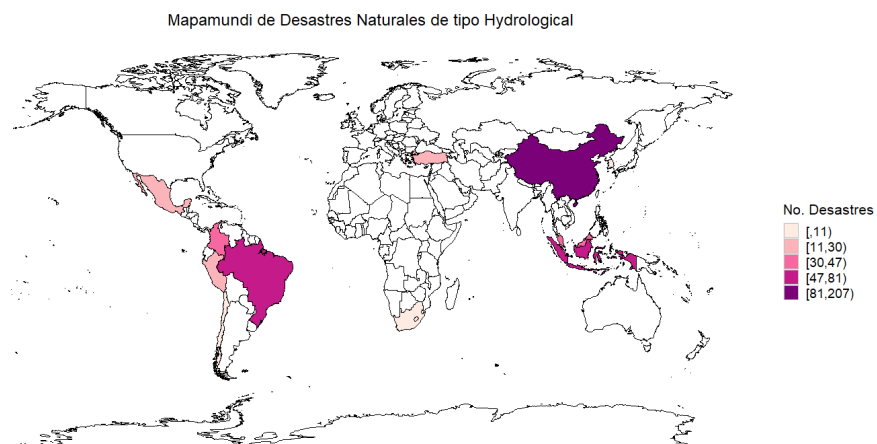


Figure 3: Frequency of hydrological disasters.

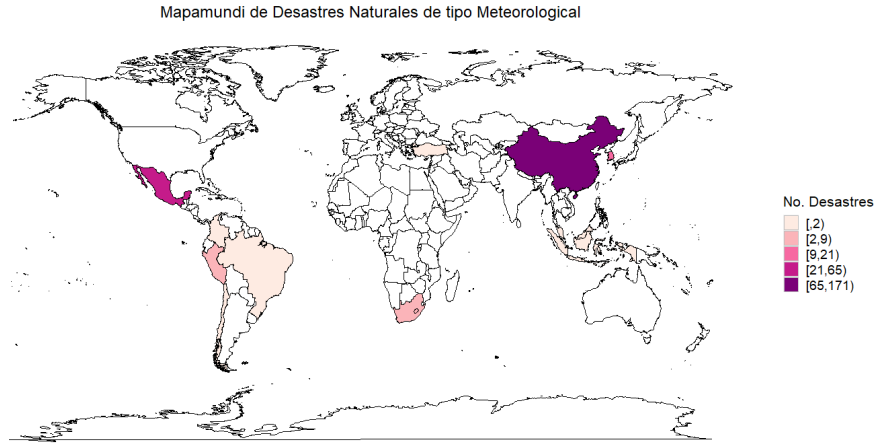


Figure 4: Frequency of meteorological disasters.

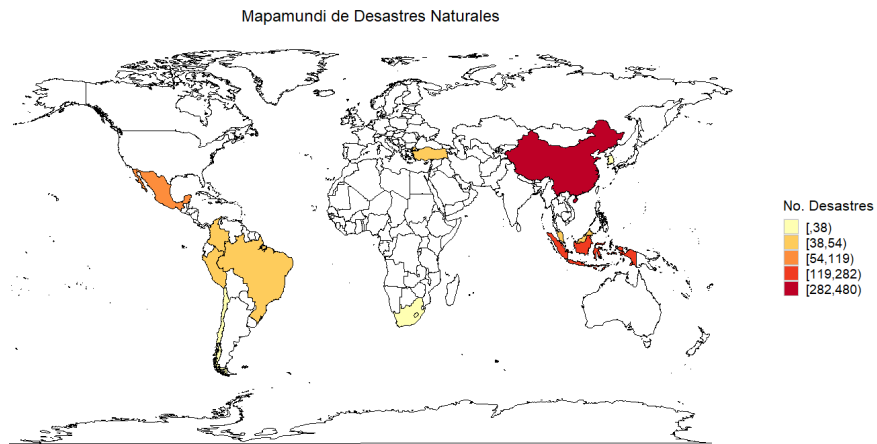


Figure 5: Frequency of natural disasters.

As the event study method's effectiveness hinges on the precise identification of the event's commencement date, we opted to exclude the outcomes pertaining to disasters lacking information about their initiation date, accounting for 6.37% of the data set. By doing this, the number of biological disasters is reduced from 20 to 5, so we decided to drop this category from our analysis. Conversely, in line with Cavallo, Becerra, and Acevedo², we chose to eliminate the climatological category from our analysis. This decision was driven by the

²The Impact of Natural Disasters on Economic Growth

fact that these disasters tend to be less fatal and have considerably longer durations compared to other types of events.

According to the event study methodology, there is an estimation window, where we estimated the market model to calculate the expected returns after the disaster, and the event window, where we will test the abnormal returns due to the disaster. Subsequently, any disasters failing to meet the criteria of either window are excluded from the analysis.

Lastly, we applied a window to reduce the overlap of the estimation windows, since there were events that started roughly on the same date. This entailed selecting a defined window, such as 50 days, to ensure that within each 50-day period and for each country, only a single event was considered. The selection criteria for this event was based on the one with the highest number of people affected by the disaster.