COVID-19 market volatility and social media forecasting

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Outline

- COVID-19 causes endogenous market volatility spikes in the region
  - Brief summary of results
- COVID-19 spreading severity can be forecasting through crowd wisdom and social media analysis
  - Twitter and COVID time series
  - Most affected regions
  - Forecasting relation
  - Statistical tests
- Conclusion

Locality of COVID-19 market volatility

Continent/Country	COVID Infection Surge	Market Stress Surge	Nature (Commodity)
China	20/01/2020	20/01/2020	Endogenous
China	-	01/03/2020	Exogenous - Global Demand
Italy	20/02/2020	20/02/2020	Endogenous
Europe (excl. Italy)	24/01/2020	26/01/2020	Endogenous
Europe (excl. Italy)	23/02/2020	24/02/2020	Endogenous
North America	24/01/2020	26/01/2020	Endogenous
North America	24/02/2020	25/02/2020	Endogenous
South America	26-28/02/2020	26/02/2020-07/03/2020	Endogenous
Asia (excl. China)	23/01/2020	26/01/2020	Endogenous
Asia (excl. China)	20/02/2020	23/02/2020	Endogenous
Middle East	-	09/01/2020 - 05/02/2020	Exogenous - Oil
Middle East	20/02/2020	23/02/2020	Endogenous
Australia	-	20/02/2020	Exogenous - Mining
Australia	6/02/2020	8/02/2020	Endogenous
Africa	25/02/2020	28/02/2020	Endogenous

Table 1: Comparison between the surge in COVID-19 cumulative recorded cases and the surge in average intraday return volatility throughout corresponding financial indices.

Twitter activity and COVID

Main affected regions

a.

b.

Spain
cumulative number of deaths
3.0×10^4
2.5×10^4
2.0×10^4
1.5×10^4
1.0×10^4
5.0×10^3
0.0
Madrid
Cataluña
Castilla y Leon
20/2/20
27/2/20
5/3/20
12/3/20
19/3/20
26/3/20
2/4/20
9/4/20
16/4/20
23/4/20
30/4/20
7/5/20
13/5/20

c.

United States
cumulative number of deaths
3.0×10^4
2.5×10^4
2.0×10^4
1.5×10^4
1.0×10^4
5.0×10^3
0.0
New York
New Jersey
Michigan
20/2/20
27/2/20
5/3/20
12/3/20
19/3/20
26/3/20
2/4/20
9/4/20
16/4/20
23/4/20
30/4/20
7/5/20
13/5/20

COVID-19 social media reaction and forecasted impact

COVID-19 social media reaction and forecasted impact

Statistical testing

Regression Model	Country	Weighted			Non-Weighted		
		p Adjusted Tweets	*p* log (Population)	R^2	*p* Adjusted Tweets	*p* log (Population)	R^2
Model-1 Adjusted Tweets vs. log (Death Cases)	Italy	$2x10^{-7}$	-	0.798	$5x10^{-4}$	-	0.489
	Spain	$1x10^{-5}$	-	0.684	$4x10^{-2}$	-	0.402
	US	$5x10^{-6}$	-	0.340	$3x10^{-2}$	-	0.073
Model-2 log (Population) vs. log (Death Cases)	Italy	-	$9x10^{-4}$	0.456	-	$9x10^{-3}$	0.431
	Spain	-	$8x10^{-4}$	0.482	-	$2x10^{-3}$	0.475
	US	-	$9x10^{-4}$	0.189	-	$1x10^{-13}$	0.680
Model-3 Adjusted Tweets and log (Population) vs. log (Death Cases)	Italy	$3x10^{-6}$	$1x10^{-2}$	0.857	$3x10^{-4}$	$8x10^{-4}$	0.737
	Spain	$7x10^{-4}$	$4x10^{-2}$	0.748	$3x10^{-1}$	$1x10^{-1}$	0.477
	US	$1x10^{-3}$	$3x10^{-1}$	0.343	$3x10^{-1}$	$1x10^{-12}$	0.681

	Country	*Empirical correlation value*	*Null hypothesis correlation quantiles*		
			90%	*95%*	*99%*
Adjusted Tweets vs. log (Death Cases)	Italy	0.66	0.31	0.39	0.53
	Spain	0.51	0.34	0.42	0.58
	US	0.31	0.18	0.24	0.33

Conclusions

- Local geographic expansion of the pandemic leads to harsh volatility climbs
- Local pandemic expansion can be detected by peaks in social media activity
- Social media attention forecasts the severity of regional spreadings

Thank you for your attention!

- Joint works with Tomaso Aste and Delmiro Fernandez-Reyes
- Works available and always updated at: https://financial-computing.com/blog-2/
- Market Volatility note at the above link
- COVID-19 Twitter paper draft on Arxiv and submitted to Lancet Infectuous Diseases (https://arxiv.org/abs/2004.04125)