Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Benjamin Keddad[a], Takashi Matsuki[b] and Kimiko Sugimoto[c]
(alphabetic order)

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French/Japanese Webinar in Economics (FJWE)

Introduction
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Methodology
○○○

Empirical results
○○○○○○○○○

Conclusion
○○

Motivation

Goal of the paper:

$\rightarrow$ Quantifying the investors' reaction to the pandemic in Asia

$\rightarrow$ Stock markets spillovers and COVID variables

Effect of the COVID-19:

$\rightarrow$ Restrictive and isolation policies

$\rightarrow$ Concerns about the economic outlook

$\rightarrow$ Freezing of most economic activities

$\rightarrow$ Investor panic and increase of volatility across all financial markets

Benjamin Keddad[a], Takashi Matsuki[b] and Kimiko Sugimoto[c] (alphabetic order)
Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Introduction
○●○○○○○

Methodology
○○○

Empirical results
○○○○○○○○○

Conclusion
○○

Motivation

The COVID-19 pandemic has wreaked havoc on the global equities, commodities, and cryptocurrency markets.

Some examples:

→ March 9, 2020, the S&P dropped by 7% in just four minutes.
→ March 12, European stock markets fell 11%, the worst decline observed during a single day in history
→ The yield on 10 and 30-year US Treasury Securities experienced record falls, with the 30-year options settling below 1% for the first time in their history

Significant increase in cross-markets co-movements is expected due to greater cross-regional financial connections between countries or regions.

Benjamin Keddad[a], Takashi Matsuki[b] and Kimiko Sugimoto[c] (alphabetic order)
Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Introduction
ooo●ooo

Methodology
ooo

Empirical results
ooooooooo

Conclusion
oo

Literature Review

Empirical and theoretical literature on international transmission of financial shocks is important:

$\rightarrow$ Common economic factors (Giglio et al., 2016)

$\rightarrow$ Overlapping claims between financial institutions of different countries/regions (Allen and Gale, 2000)

$\rightarrow$ Flight to quality (Pericolli and Sbracia, 2003)

$\rightarrow$ Self-fulfilling expectations and incomplete information (Keister, 2009)

$\rightarrow$ Irrational or herd behavior (Cipriani and Guarino, 2008)

Contagion versus Interdependence.

$\rightarrow$ shock in one country typically has international repercussions, as a result of market integration and because of fundamental real and financial cross-country links

$\rightarrow$ Important issue of the increase in asset price comovements across markets and across borders that occurs during financial crises (contagion)

Benjamin Keddad^{a}, Takashi Matsuki^{b} and Kimiko Sugimoto^{c} (alphabetic order)
Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Introduction
○○○●○○

Methodology
○○○

Empirical results
○○○○○○○○○

Conclusion
○○

Literature Review

Different measures or definitions of contagion, but...

→ Discontinuities in the international transmission mechanism

→ Channels of international transmission only active during crises

→ See Pericoli and Sbracia (2003) or Forbes and Rigobon (2002)

To summarize

→ Interdependence is defined as the relationship that exists between asset classes, while Contagion is defined as a change in the transmission mechanism between asset classes in crisis times (Beirne and Gieck, 2002).

Implications:

→ Relevant problem in the design of policies to contain spillovers

→ Reduced benefits of portfolio diversification during episodes of financial stress

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Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Literature Review on COVID-19

Studies examining the impact of COVID-19 on stock markets:

→ Harioto et al. (2021) compare developed and emerging countries' equity markets

→ Li et al. (2021) examine the impact on G20 stock markets and volatility connectedness

→ Chopra and Metha (2022) compare the contagion effect during different crisis

Almost all studies focus on

→ Unilateral country setting and the role of COVID 19 measured by new cases, new deaths...

→ Or change between cross-market linkages during the COVID-19

They do not address whether the specific informational flows contained in pandemic proxies play a significant role in the dynamic of spillovers. We also distinguish between global and regional spillovers.

Benjamin Keddad[a], Takashi Matsuki[b] and Kimiko Sugimoto[c]   (alphabetic order)
Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Introduction
○○○○○●

Methodology
○○○

Empirical results
○○○○○○○○○

Conclusion
○○

Contribution

In this paper, we quantify return/volatility spillovers (global and regional) and investigate its determinants with a specific focus on Asian stock markets

$\rightarrow$ We do not focus on whether the increase of stock markets co-movements is due to real or financial interdependence between Asian countries.

$\rightarrow$ We aim at detecting the occurrence of contagion defined as a change affecting linkages between financial markets

$\rightarrow$ Then we investigate whether COVID-19 related variables can explain the observed returns spillovers within the Asian region

We assume the notion of contagion as a discontinuous transmission mechanism across stock markets during the COVID-19 (Pericolli and Sbracia, 2003)

Benjamin Keddad[a], Takashi Matsuki[b] and Kimiko Sugimoto[c]   (alphabetic order)
Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Introduction
oooooo

Methodology
●oo

Empirical results
ooooooooo

Conclusion
oo

Spillover analysis

Step 1: Spillover Index from Diebold and Yilmaz's (2012, 2014)

→ Data set: United States, China, Hong Kong, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, Taiwan, and Thailand

→ Daily average stock prices of the main domestic indices, from January 5, 2016, to February 22, 2022

→ We mainly focus on the spillovers from US, China (plus HK), and Taiwan, Singapore and South Korea (regional markets)

VAR model with generalized impulse response approach:

→ Each element of the forecast error variance decomposition matrix is normalized to compute cross-variance share for all or specific set of pairs.

Benjamin Keddad[a], Takashi Matsuki[b] and Kimiko Sugimoto[c] (alphabetic order)
Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Introduction
000000

Methodology
0●0

Empirical results
000000000

Conclusion
00

Panel estimation

Step 2: Panel estimation

$$spillover_{i,j,t} = \alpha_i + \beta\ CASE_{i,t} + \gamma\ DEATH_{i,t} + \delta\ STRG_{i,t} + \zeta\ GOV_{i,t}$$
$$+ \eta\ FX_{i,t} + \theta\ VIX_t + \rho\ OIL_t + \kappa\ USEPU_t + \lambda\ CNEPU_t + \varepsilon_{i,t} \tag{1}$$

$\rightarrow$ We focus on the numbers of new cases and new deaths, government policy measures against the COVID-19 in Asian countries (degree of restriction and economic support)

$\rightarrow$ We control for nominal exchange rates, VIX, oil price returns and economic policy uncertainty (in US an China)

$\rightarrow$ Sample period: January 9, 2017, to February 18, 2022

COVID-19 variables:

$\rightarrow$ Oxford Covid-19 Government Response Tracker (OxCGRT)

$\rightarrow$ https://github.com/OxCGRT/covid-policy-tracker

$\rightarrow$ STRG: composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest)

$\rightarrow$ GOV: Domestic government support index records measures such as income support and debt relief.

9/ 21

Benjamin Keddad[a], Takashi Matsuki[b] and Kimiko Sugimoto[c]   (alphabetic order)

Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Introduction
oooooo

Methodology
ooo●

Empirical results
ooooooooo

Conclusion
oo

Sub-sample analysis

Step 3: We repeat the same exercise on three different subsamples

→ Period 1 (lockdown): January 6, 2020-July 18, 2021

→ Period 2 (relaxing): July 19, 2021-October 31, 2021

→ Period 3 (Omicron - WHO): November 1, 2021-February 18, 2022

Benjamin Keddad[a], Takashi Matsuki[b] and Kimiko Sugimoto[c] (alphabetic order)
Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Introduction
○○○○○○

Methodology
○○○

Empirical results
●○○○○○○○○

Conclusion
○○

Gross-sum spillover

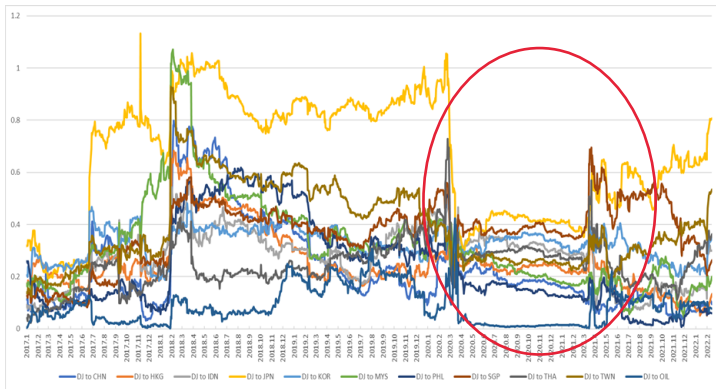$$S^{sum}(H) = \frac{\sum_{i \in G} \sum_{j \in G, i \neq j} \tilde{\theta}_{ij}^{g}(H)}{N} \times 100.$$

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Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Spillovers (Sample period: 2016.01.05-2022.02.22) (Full sample)

	DJ	CHN	HKG	IDN	JPN	KOR	MYS	PHL	SGP	THA	TWN	OIL	From Others
DJ	36.6	0.1	5.9	5.4	8.9	8	4.2	3.7	9.9	7.7	7.2	2.4	63
CHN	1.9	38.8	16.6	3	5.7	7.7	3.6	1.8	7.9	3.9	8.2	0.8	61
HKG	2.4	0.2	31.2	4.4	8	12.6	6.3	3.4	12.5	6.7	11.2	1.1	69
IDN	2.9	0.1	6.2	43.6	2.4	7.5	6.4	9.4	7.7	5.9	7	1	56
JPN	6.1	0.2	9.6	2.2	37.5	12.8	4.4	2.4	9.9	3.7	10	1.1	63
KOR	3.4	0.1	11.7	5	10	29.1	6.2	4.2	10.9	5.8	12.5	1	71
MYS	3	0	7.7	5.7	4.9	8.1	38	6.8	9.8	6.7	7.9	1.4	62
PHL	2.1	0	5.5	9.5	3.6	7.5	7.8	42.4	7.6	6.3	6.3	1.3	58
SGP	4	0.1	11.7	5.2	7.8	11	7.5	4.6	29.4	8.2	9.1	1.5	71
THA	2.9	0.1	8.4	5.2	4	8	6.9	5.7	11.1	40.3	6.5	0.9	60
TWN	3.8	0.1	11.3	5.1	8.5	13.3	6.5	4.2	9.8	5.1	31.1	1.2	69
OIL	0.1	0.1	1.9	1.5	2	0.9	1.1	0.6	2.1	1.1	1	87.6	12
Contribution to others	33	1	97	52	66	97	61	47	99	61	87	14	714
Contribution including own	69	40	128	96	103	127	99	89	128	101	118	101	59.50%

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Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Introduction
oooooo

Methodology
ooo

Empirical results
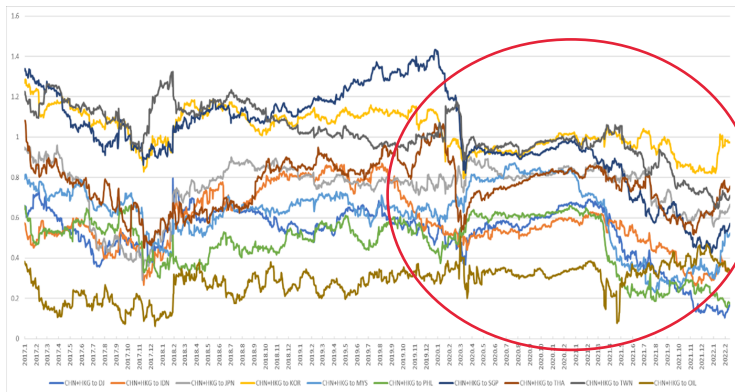ooo●oooooo

Conclusion
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One-way spillover from Dow Jones return to each stock/oil price return

$$S_{USA\cdot i}^{give}(H) = \frac{\sum_{j \in USA} \tilde{\theta}_{ij}^g(H)}{12} \times 100, \ i \in Asia \ and \ Regional$$

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Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Introduction
oooooo
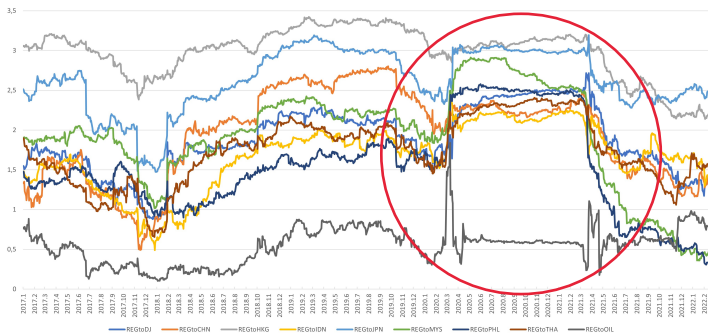
Methodology
ooo

Empirical results
ooooo●oooo

Conclusion
oo

One-way spillover from CHN+HKG stock return to each stock/oil price return

$$S_{CHN+HKG \cdot i}^{give}(H) = \frac{\sum_{j \in \{CHN, HKG\}} \tilde{\theta}_{ij}^{g}(H)}{12} \times 100, \quad i \in \{IDN, JPN, KOR, MYS, PHL, SGP, THA, TWN\}$$

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Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Introduction
oooooo

Methodology
ooo

Empirical results
ooooo●ooooo

Conclusion
oo

One-way spillover from Regional stock return to each stock/oil price return

$$S^{give}_{Regional \cdot i}(H) = \frac{\sum_{j \in Regional} \tilde{\theta}^g_{ij}(H)}{12} \times 100, i \in Asia$$

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Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Introduction
oooooo

Methodology
ooo

Empirical results
oooooo●ooo

Conclusion
oo

Spillovers (Sample period: 2016.01.05-2019.12.31) (Before COVID-19)

	DJ	CHN	HKG	IDN	JPN	KOR	MYS	PHL	SGP	THA	TWN	OIL	From Others
DJ	43	0.2	6.8	2.8	9.8	7.2	5.2	3.4	6.8	3.2	8	3.5	57
CHN	2.6	39	17.7	2.4	5.2	7.4	2.8	2	8.5	3	8.5	1	61
HKG	3.1	0.5	29.5	4.6	7.5	12.4	6.1	3.6	13.4	5.6	12.2	1.4	71
IDN	2.8	0.5	7.5	48.4	1.9	6.2	8.4	7.5	6.2	3.2	7.1	0.4	52
JPN	7.3	0.4	9.6	1.4	37.4	11.7	4.6	2.8	9.5	3.2	9.7	2.4	63
KOR	3.6	0.2	13.6	4.1	10	31.9	5.8	3.6	9.7	4.4	11.8	1.2	68
MYS	4	0.1	8.3	6.8	4.8	7	39.3	6.8	8.5	3.1	9.7	1.4	61
PHL	3.9	0.1	6.4	7.5	3.5	5.6	8.4	47.5	5.5	3.6	7.1	0.9	53
SGP	3.7	0.2	14.8	4.1	8	9.7	7	3.6	32.4	5.1	9.5	1.8	68
THA	1.9	0.3	9.7	3.4	4.1	7	4	3.1	8	50.9	6.3	1.4	49
TWN	4.9	0.2	13	4.6	8.1	11.6	7.8	4.6	9.2	3.9	31.2	0.9	69
OIL	0.3	0.4	1.9	0.4	1.7	2.2	0.6	0.8	2.4	2.5	1.2	85.6	14
Contribution to others	38	3	109	42	64	88	61	42	88	41	91	17	684
Contribution including own	81	42	139	91	102	120	100	89	120	92	122	102	57.00%

Benjamin Keddad[a], Takashi Matsuki[b] and Kimiko Sugimoto[c]   (alphabetic order)
Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Introduction
oooooo
Methodology
ooo
Empirical results
ooooooo●oo
Conclusion
oo

Spillovers (Sample period: 2020.01.02-2022.02.22) (During COVID-19)

	DJ	CHN	HKG	IDN	JPN	KOR	MYS	PHL	SGP	THA	TWN	OIL	From Others
DJ	27.9	0.1	5.5	8.4	9	7.9	3.5	6.2	12	10.5	7.2	1.9	72
CHN	1.7	35	14.9	4.2	6.1	9.1	4.9	1.7	7.4	5.8	8.2	1.1	65
HKG	2.1	0	31.9	4.3	8.1	13.3	6.6	3.2	11	7.9	10.3	1.2	68
IDN	3.4	0.1	5.4	38.3	3.2	8.3	5.2	10.7	9.1	7.9	6.9	1.5	62
JPN	5.4	0.1	9	3.3	36	14	4.2	2.3	10	4.5	10.2	0.9	64
KOR	3.4	0.1	11.1	5.7	10.9	26.8	6	4.5	11.6	6.3	12.6	1	73
MYS	2.3	0	7.5	5.2	5.8	8.3	37.1	6.6	10.5	8.6	6.3	1.7	63
PHL	1.4	0.1	4.9	11	5.3	8.7	7.1	37.5	9.2	7.4	5.8	1.6	62
SGP	4.4	0	9.2	6.3	8	11.7	7.6	5.2	27.1	10	8.7	1.7	73
THA	3.5	0.2	8	6.7	5.3	7.9	7.9	6.5	12.4	34.3	6.4	0.9	66
TWN	3.1	0.1	10.1	5.5	9.5	14.3	5.3	3.9	10.1	5.9	30.7	1.5	69
OIL	0.2	0.1	2.7	2.4	2.1	0.8	1.8	0.8	2.8	1.3	1.3	82.2	18
Contribution to others	31	1	88	63	75	104	60	52	106	76	84	15	755
Contribution including own	59	36	120	101	111	131	97	89	133	110	115	97	62.90%

Panel data estimation results

	Dependent variable: one way spillover					
	from DJ to each		from China&HK to each		from Regional to each	
New cases	0.003		0.010 *		0.030	
	0.003		0.005		0.019	
New deaths	-0.022 ***	-0.020 ***	-0.033 ***	-0.027 ***	-0.159 ***	-0.139 ***
	0.003	0.002	0.003	0.003	0.022	0.023
Stringency index	0.035 ***	0.035 ***	0.029 ***	0.030 ***	-0.039 *	-0.065 ***
	0.003	0.003	0.005	0.005	0.022	0.022
Government support	-0.062 ***	-0.061 ***	-0.041 ***	-0.042 ***	0.121 ***	0.146 ***
	0.005	0.005	0.006	0.006	0.023	0.024
FX	0.001		-0.015 ***	-0.015 ***	-0.014	
	0.001		0.004	0.004	0.009	
VIX	-0.006 **		-0.032 ***	-0.032 ***	-0.083 ***	
	0.003		0.003	0.003	0.014	
Oil price	-0.009 ***	-0.006 ***	-0.102 ***	-0.098 ***	-0.464 ***	-0.427 ***
	0.002	0.002	0.004	0.004	0.015	0.013
US EPU	-0.010 ***	-0.011 ***	-0.020 ***	-0.019 ***	-0.054 ***	-0.086 ***
	0.002	0.002	0.004	0.004	0.016	0.015
China EPU	-0.001		-0.001		0.003	
	0.001		0.003		0.013	
New deaths in US	-0.003 **	-0.003 **				
	0.001	0.001				
New cases in China			-0.004 **	-0.004 **		
			0.002	0.002		
R-squared	0.71	0.70	0.78	0.78	0.74	0.73
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Model	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
Observations	4590	4590	3672	3672	3213	3213
Countries	10	10	8	8	7	7

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Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Panel data estimation results in three subsamples

	from DJ to each			from China&HK to each			from Rregional to each		
	1st period	2nd period	3rd period	1st period	2nd period	3rd period	1st period	2nd period	3rd period
	1/06/2020~	7/19/2021~	11/01/2021~	1/06/2020~	7/19/2021~	11/01/2021~	1/06/2020~	7/19/2021~	11/01/2021~
	7/18/2021	10/31/2021	2/18/2022	7/18/2021	10/31/2021	2/18/2022	7/18/2021	10/31/2021	2/18/2022
New deaths	-0.026 ***	-0.006 ***	0.010 ***	-0.020 ***	-0.002	-0.002	-0.139 ***	-0.032 ***	-0.001
	0.005	0.001	0.002	0.004	0.001	0.002	0.023	0.006	0.003
Stringency index	0.046 ***	-0.017 **	-0.026 ***	0.0005	0.007	-0.020 ***	-0.065 ***	0.182 ***	-0.068 *
	0.005	0.008	0.005	0.004	0.009	0.005	0.022	0.030	0.035
Government support	-0.076 ***	-0.038 ***	0.015 ***	-0.009 *	0.018	0.022 ***	0.146 ***	-0.293 ***	0.087 **
	0.006	0.010	0.004	0.005	0.017	0.007	0.024	0.035	0.037
Oil price	-0.008 **	-0.003	0.034 ***	-0.040 ***	-0.072 ***	0.053 ***	-0.427 ***	-0.153 ***	0.028 **
	0.004	0.004	0.005	0.007	0.007	0.007	0.013	0.016	0.012
US EPU	-0.018 ***	0.004 **	0.003	-0.021 ***	-0.002	0.008 ***	-0.086 ***	-0.016	0.002
	0.004	0.002	0.002	0.005	0.006	0.002	0.015	0.016	0.003
R-squared	0.69	0.97	0.95	0.76	0.97	0.96	0.73	0.99	0.98
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Model	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
Observations	3350	630	610	2680	504	488	3213	441	427
Countries	10	10	10	8	8	8	7	7	7

Dependent variable: one way spillover

Introduction
000000

Methodology
000

Empirical results
000000000

Conclusion
●○

Conclusion

Main results:

- Increase in new deaths in each Asian country decreases the global and regional spillovers in the COVID-19 period
- Global investors may worry more about the accumulating debts from government supports
- Global investors predict that more stringent policies will bring the early end of the pandemic and economic recovery
- In the Omicron predominant period, they change their mind and regard the stringent measure as impediments to economic recovery

Future extension:

- Google research trend
- Liquidity and volume measures
- Compute volatility spillovers

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Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective

Introduction
oooooo

Methodology
ooo

Empirical results
ooooooooo

Conclusion
o●

Thanks for your attention

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Global and regional stock market spillovers during the COVID-19 pandemic context: an Asian perspective