Tracking Exchange Rate Determinants amid the Pandemic

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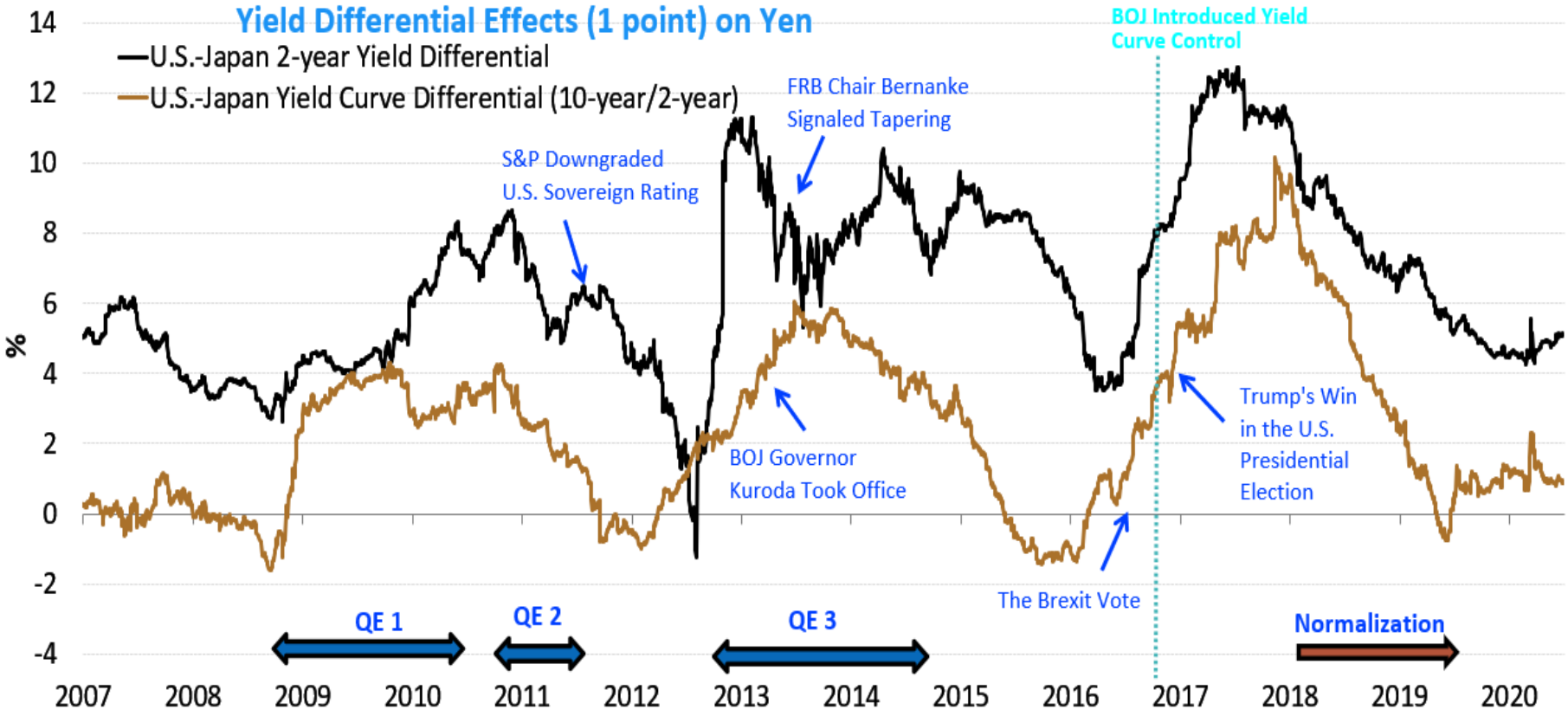
MOTIVATION AND QUESTIONS

- Risk-off episodes usually drive the FX move – interest rate differentials and risk factors safe haven currencies as well as fragile currencies
  - a safe-haven currency, which appreciates when global investors' behavior tends to be risk-averse
  - Masujima(2017) finds the safe-haven/vulnerable status is changing overtime
- Masujima(2019) shows importance of market-based determinants increased during and after the Global Financial Crisis
- Why were the yen's move relatively stable during the Covid -19 Crisis?
- The pandemic more severely hit the demand and supply side of the real economy, different from financial crisis. So the activity in the real economy may have bigger impacts on the FX moves than during the normal time

QUESTIONS

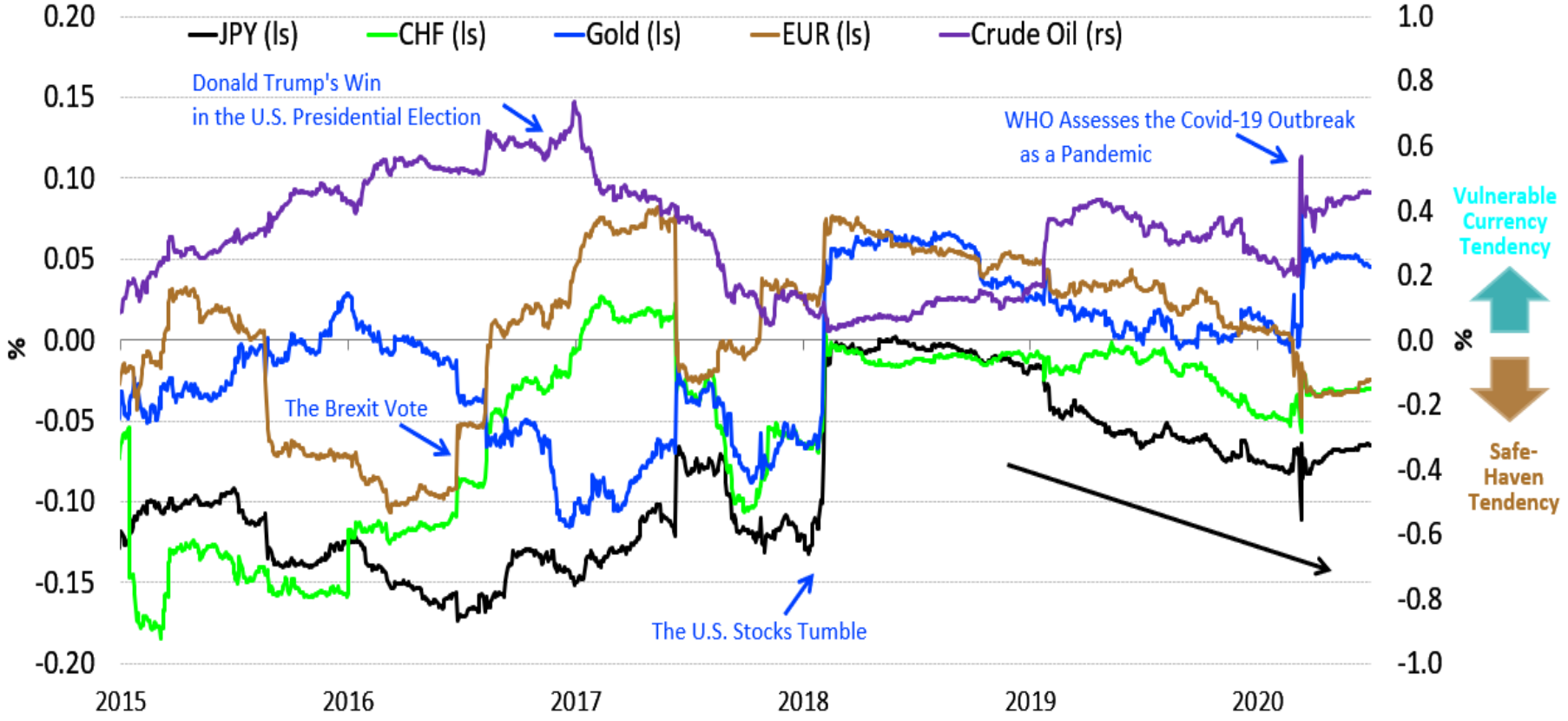
1. What are determinants of the FX movement?
2. How did the drivers of exchange rate and its impacts change during the Covid-19 pandemic, compared to the Global Financial Crisis of 2008-09 and normal times?

IMPACTS OF YIELD DIFFERENTIALS ON FX MOVES FELL BEFORE THE PANDEMIC



YEN'S SAFE CURRENCY STATUS RELATIVELY STABLE AMID THE PANDEMIC

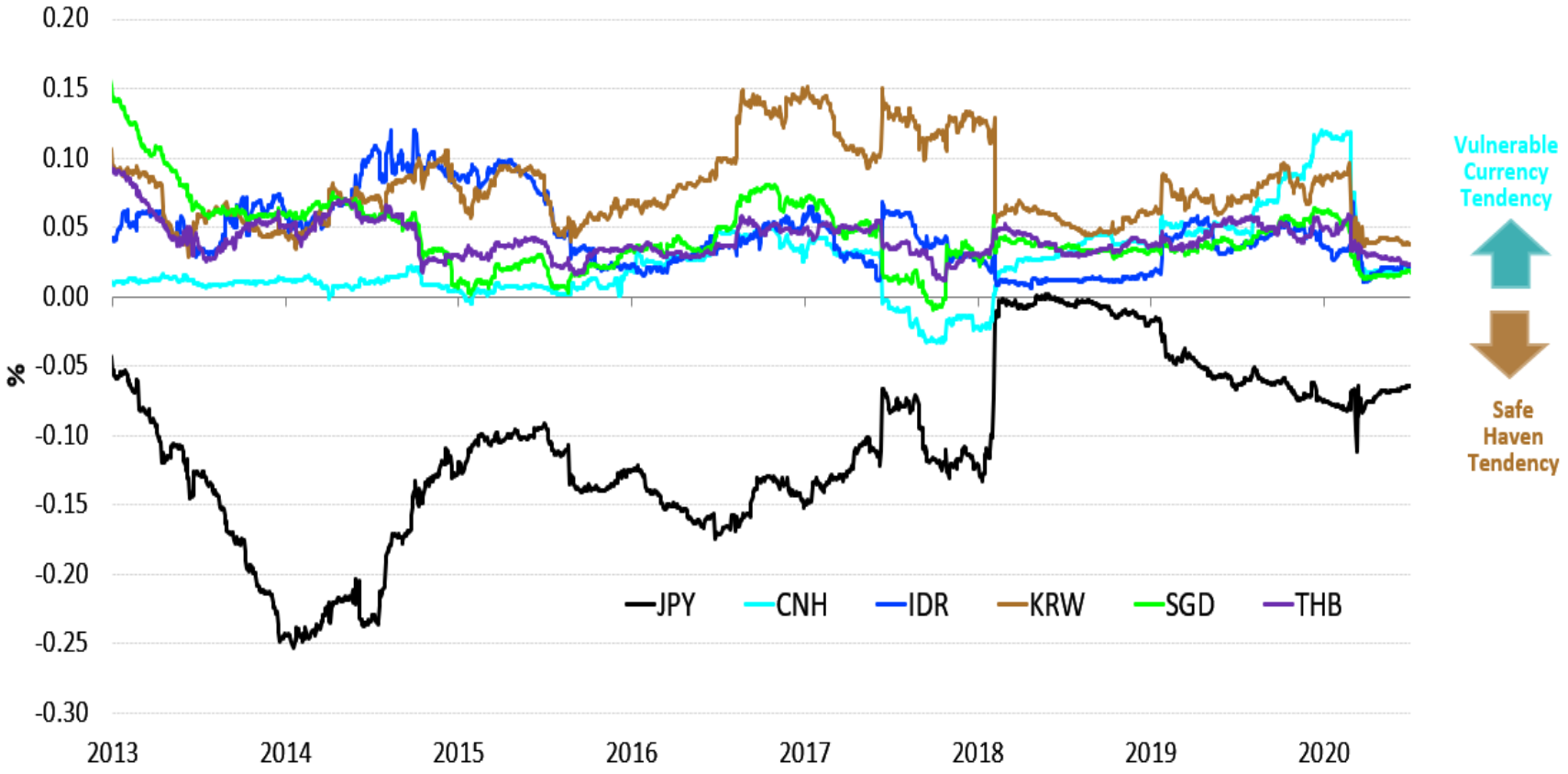
Exchange rates and asset returns per dollar associated with a 1-ppt rise in VIX (250 business day)



Note: Indexes show exchange rate and asset returns per dollar associated with a 1-ppt rise in VIX

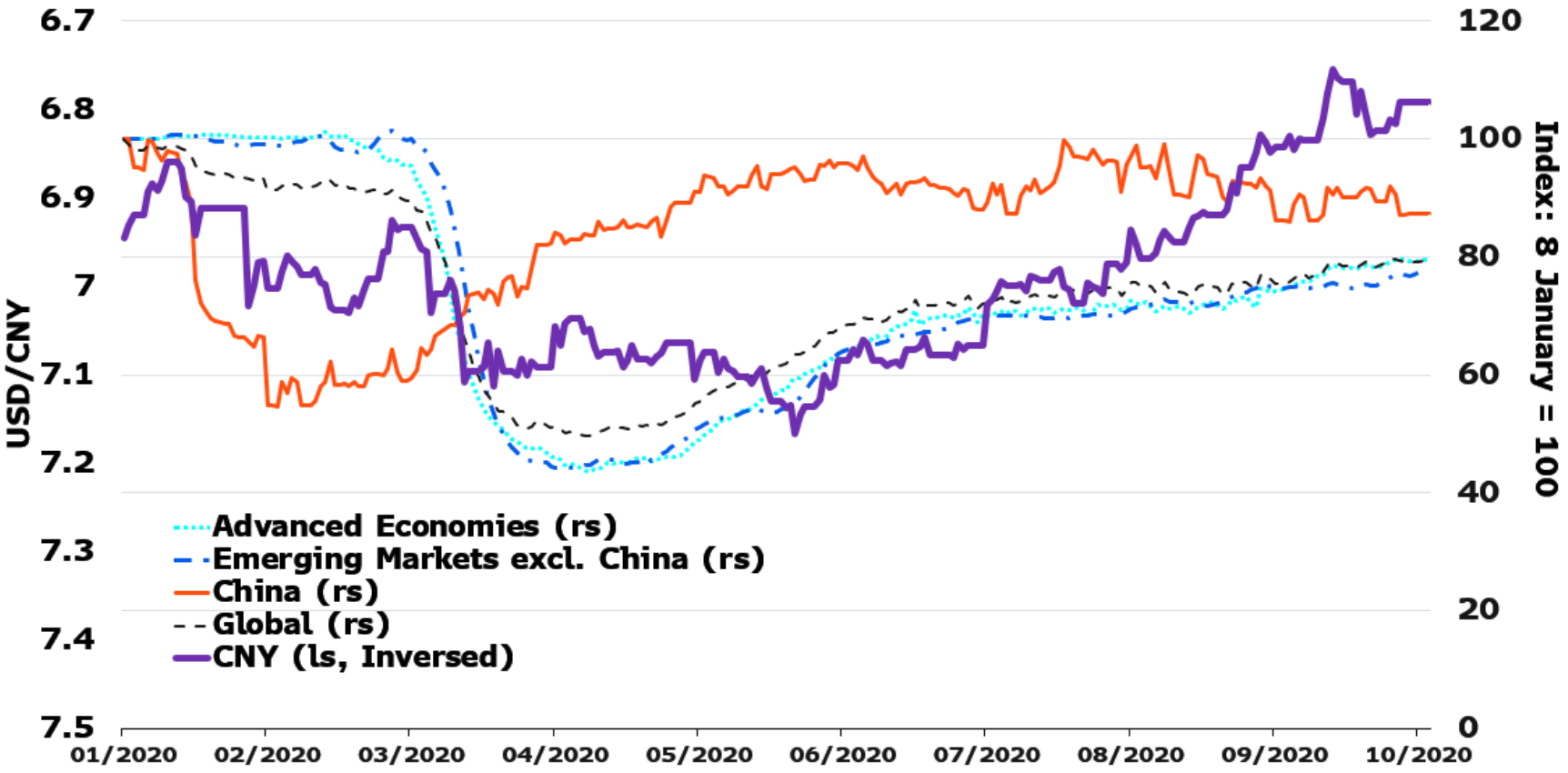
VIX SENSITIVITY OF EMERGING CURRENCIES WEAKENS AMID THE PANDEMIC

Exchange rates per dollar associated with a 1-ppt rise in VIX (250 business day)



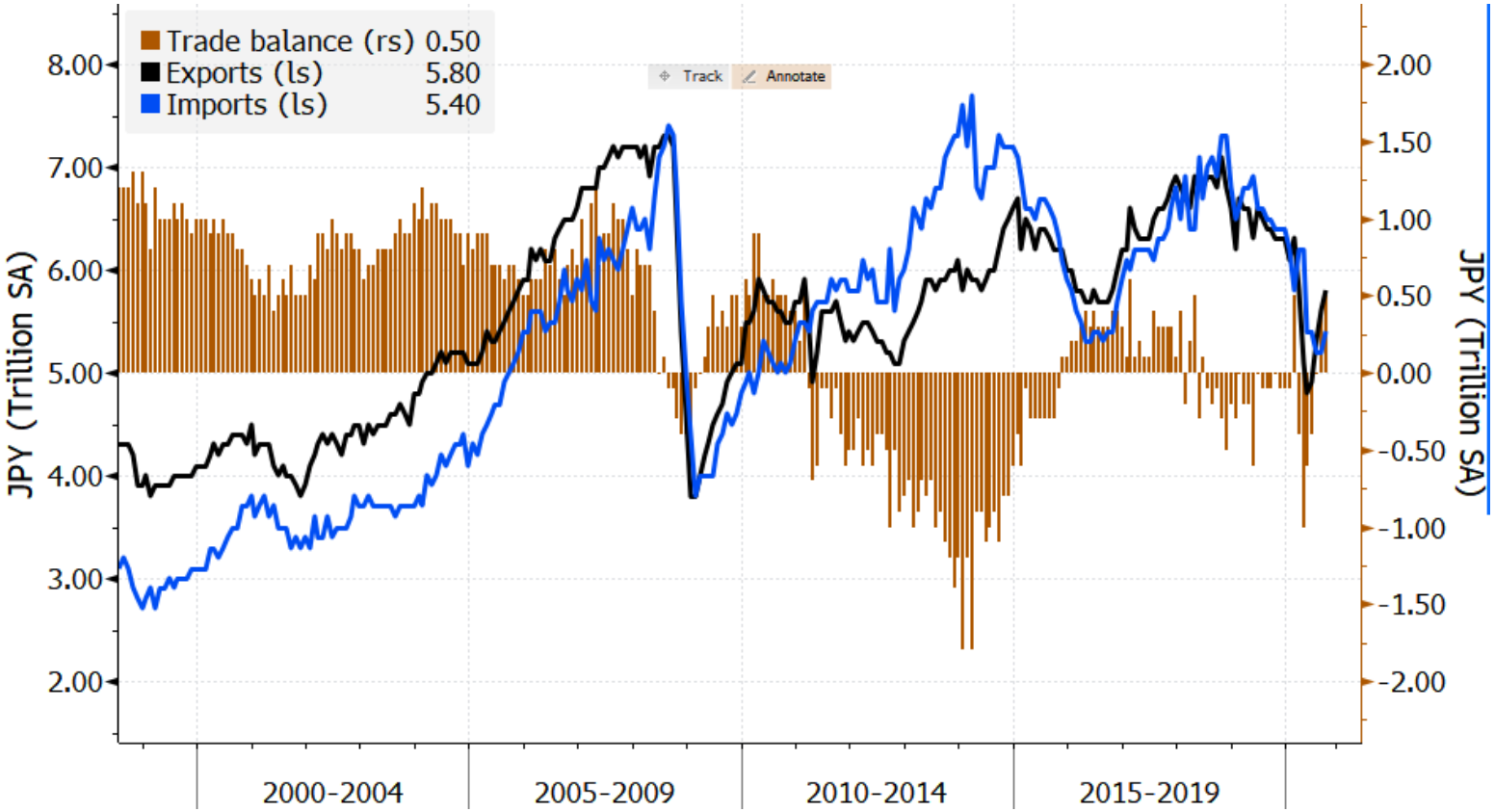
ECONOMIC ACTIVITY GAPS WIDENED DURING THE PANDEMIC

On-Shore Renminbi, Economic Activity amid the Pandemic



ACTIVITY GAPS COULD DRIVE FX MOVES

Economic activity differentials between home and overseas have been associated with fluctuation of trade balance during the pandemic



ECONOMIC ACTIVITY GAPS WIDENED DURING THE PANDEMIC

Trade channel could play a greater role in the FX moves during the pandemic. That may have offset impacts from portfolio investment channel

	Trade Channel	Portfolio Investment Channel
Economic Activity (Home) ↑	Domestic Consumption ↑ Imports ↑ Trade Deficit ↑ Currency Depreciation	Domestic Demand ↑ Domestic Price, Interest Rate ↑ Capital Inflows ↑ Currency Appreciation
Economic Activity (Overseas) ↑	External Demand↑ Exports ↑ Trade Surplus ↑ Currency Appreciation	External Demand ↑ Foreign Price, Interest Rate ↑ Capital Outflows ↑ Currency Depreciation

LITERATURE REVIEW

Literature for the link between the pandemic and the FX moves are extremely limited, particularly its link to the real economy

Liao and Zhang (2020) -- the hedging channel of portfolio investments during the pandemic

Daehler, Aizenman, and Jinjarak (2020) -- relationship between the Covid-19 cases, policy response and Credit Default Swap (CDS)

Verdelhan (2018) – dollar and carry trade risks factors and FX Movements

Masujima (2019) – Safe-haven determinants shifted from external sustainability factors (current account surplus) to market driven factors (carry trade opportunity and high liquidity) during and after the Global Financial Crisis.

Ozturk and Sheng (2017), Baker, Bloom, and Davis (2016) – Uncertainty measurement
OS show persistent effects on economic activity from common uncertainty and short-lived effects from idiosyncratic uncertainty. BBD develop text-based uncertainty measurements.

CONTRIBUTION OF THIS PAPER

1. Tracking a shift of the FX determinants during the Covid-19 pandemic via portfolio investment channel, compared to the Global Financial Crisis
2. Showing the significance of trade channel for the exchange rate movements, using daily business activities in home and overseas
3. Proving safe haven effects of the yen remained significant even during the pandemic, while its relevance to the emerging markets became much weaker.

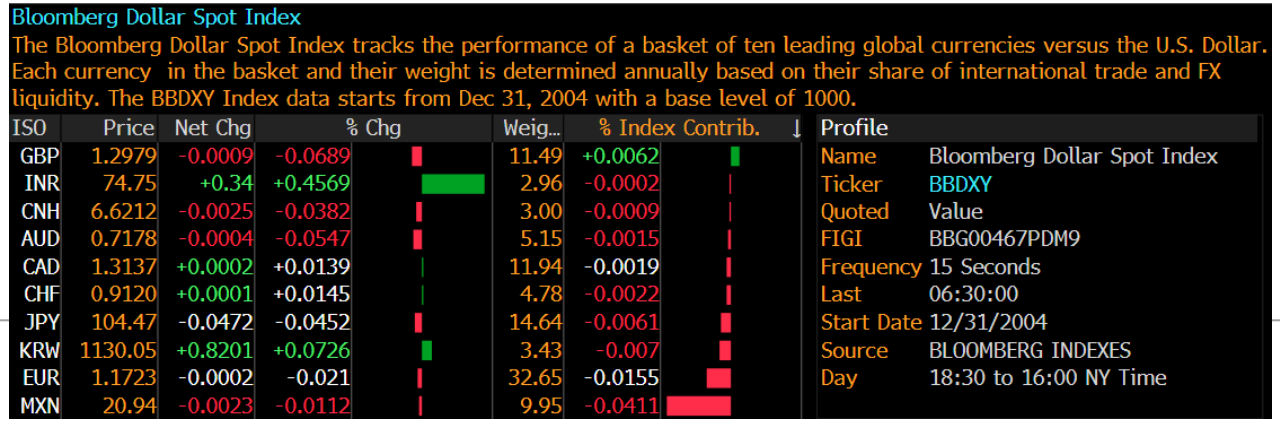
DATA

DATA

- Bilateral foreign exchange rates of 16 currencies (7 advanced, 9 emerging economies) against the dollar (plus CNH)
- Bloomberg dollar index (effective exchange rate)
- Two-year government bond yields of 16 economies
- VIX - 30-day expected volatility of the U.S. S&P 500 volatility index
- Daily Economic Activity Indexes
- Covid-19 new confirmed cases and other alternative measures

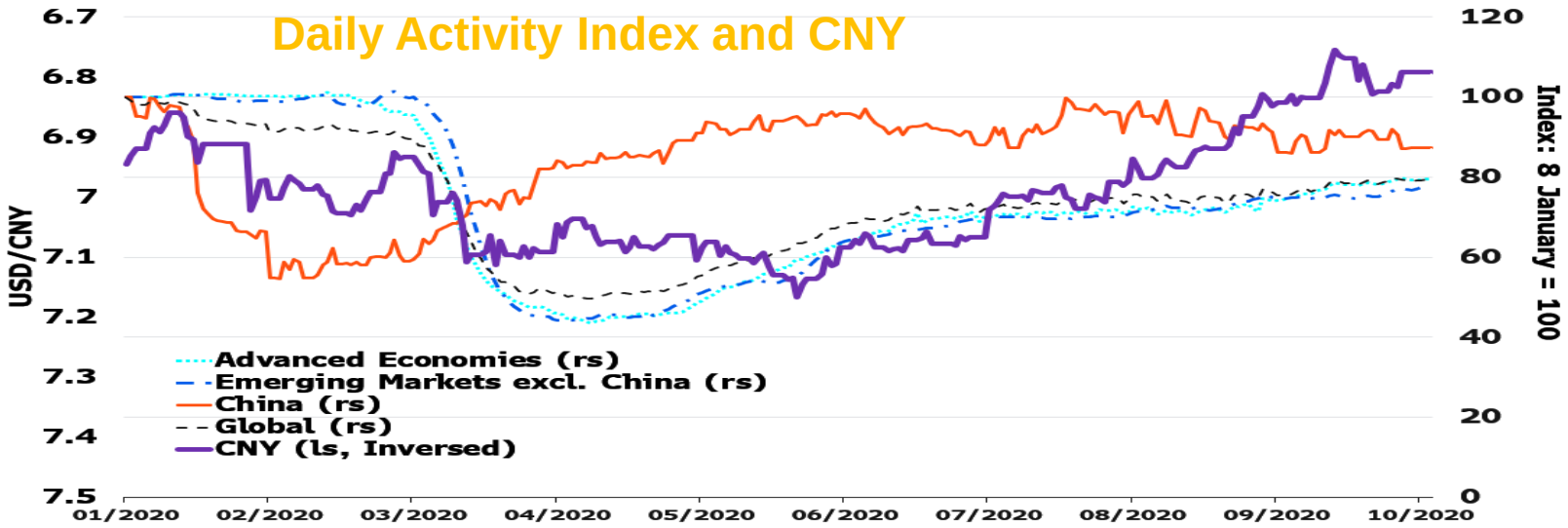
Sample period: daily data from the beginning of 2005 through Sept. 30, 2020

Sources: Bloomberg, Bloomberg Economics, Johns Hopkins University



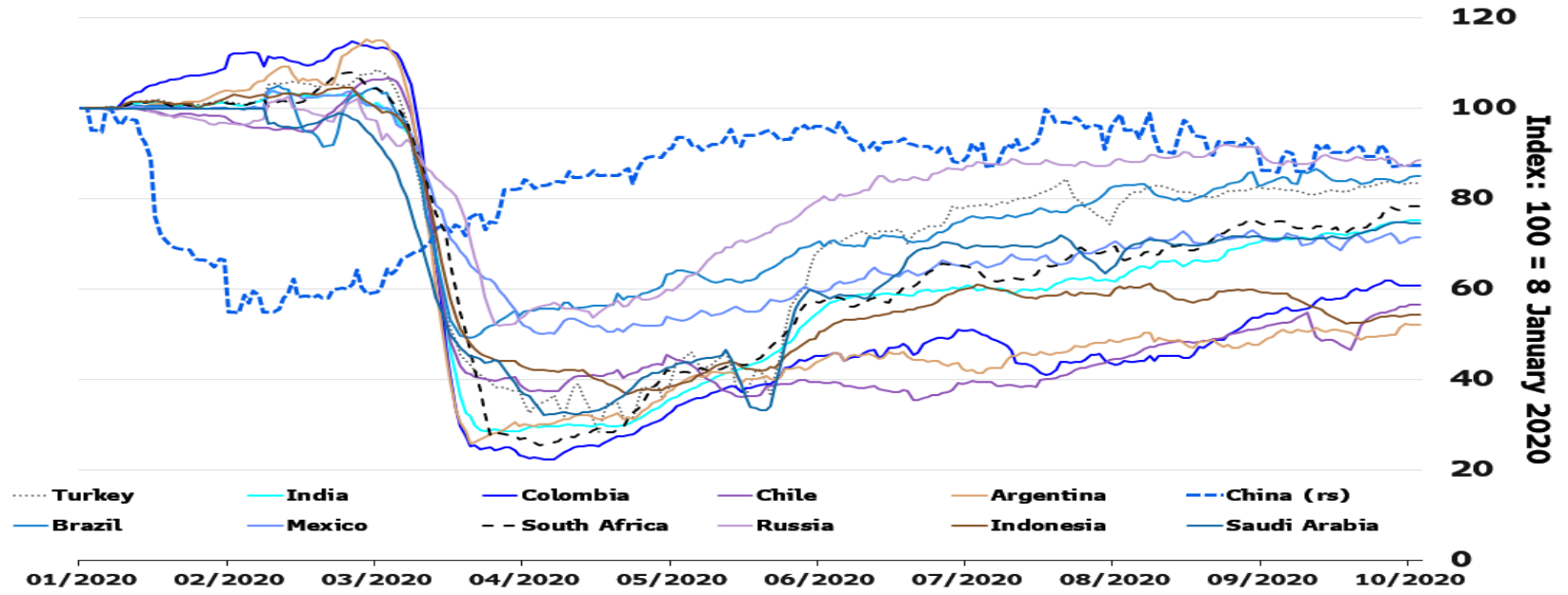
DAILY ACTIVITY INDEX

DATA METHODOLOGY



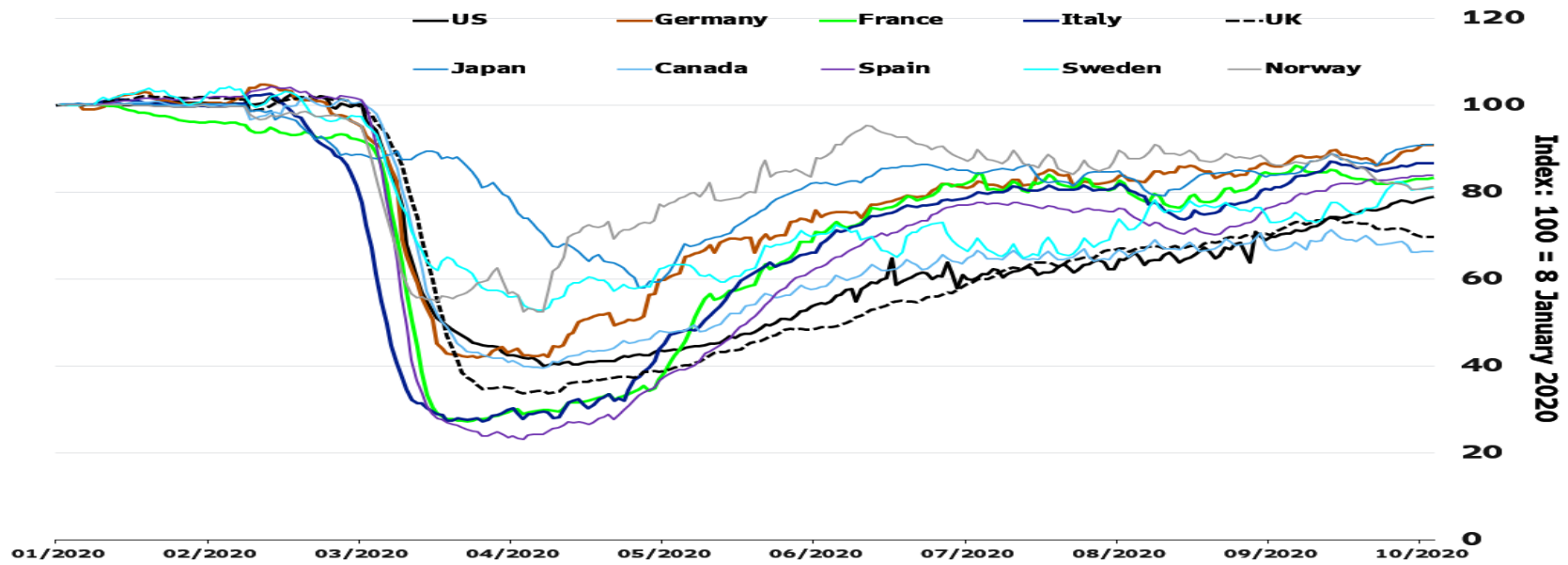
- The activity indexes are estimated using a dynamic factor model by Roye and Orlik (2020).
- This methodology extracts an unobservable latent common factor of the underlying high-frequency data in the spirit of Stock and Watson (2010).
- Sample period: daily data from Jan. 1, 2020 to September 30, 2020
- Country/area coverage: 23 economies (11 advanced, 12 emerging economies) – 17 economies used for this paper
- The high weight of travel and mobility indicators may lead to overweighting this type of activity in the index.
- The index is not fully comparable across countries as we partly use different indicators for different countries. A complete set of sources is shown in the table below.
- In a dynamic factor model, component weights adjust as new data becomes available. Future updates of the index will likely result in small backward revisions to historical readings.

DAILY ACTIVITY INDEX: EMERGING ECONOMIES



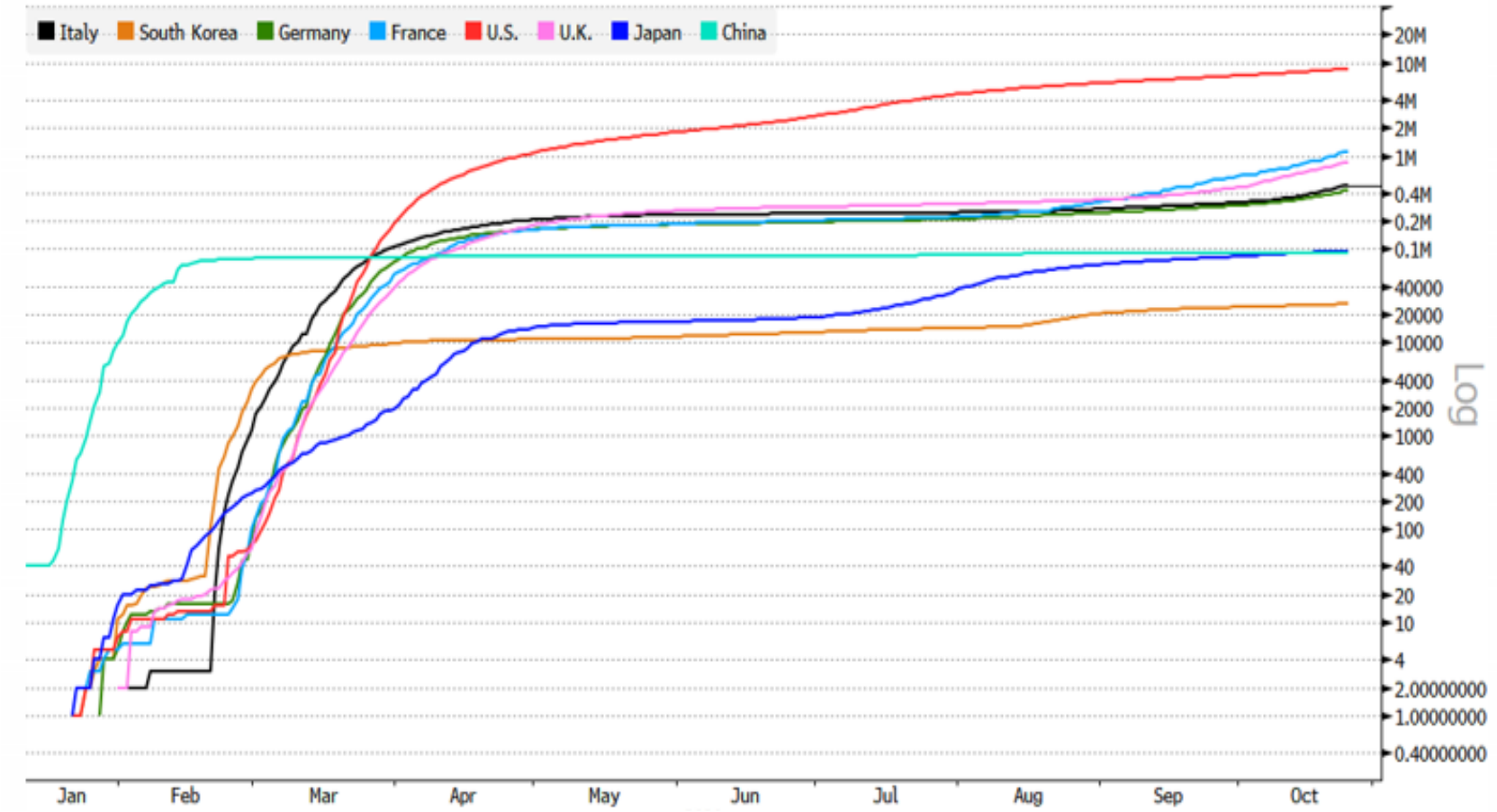
	Mobility data					Electricity	Financial market	
Source	Google.com				Moovitapp.com	BNEF.com	Bloomberg	https://evds2.tcmb.gov.t
Description	Grocery and pharmacy	Transit stations	Retail and recreation	Work places	Public transit demand	Electricity demand	Stock market index	Credit card payments
Brazil	x	x	x	x	x		x	
Russia	x	x	x	x			x	
India	x	x	x	x	x		x	
Indonesia	x	x	x	x	x		x	
South Africa	x	x	x	x	x		x	
Turkey	x	x	x	x	x		x	x
Saudi Arabia	x	x	x	x			x	
Mexico	x	x	x	x	x		x	
Argentina	x	x	x	x	x		x	
Chile	x	x	x	x	x		x	
Colombia	x	x	x	x	x		x	
	FX turnover	Steel bar inventories	Refinary run rate					
China	x	x	x			x	x	

DAILY ACTIVITY INDEX: ADVANCED ECONOMIES



Source	Mobility data Google.com				Moovitapp.com	Statistical Office	Electricity BNEF.com	Financial market Bloomberg	Retail ShopperTrak
Description	Grocery and pharmacy	Transit stations	Retail and recreation	Work places	Public transit demand	Toll Mileage	Electricity demand	Stock market index	Retail footfall
United States	x	x	x	x	x		x	x	
Germany	x	x	x	x	x	x	x	x	x
France	x	x	x	x	x		x	x	x
Italy	x	x	x	x	x		x	x	x
Spain	x	x	x	x	x		x	x	x
Japan	x	x	x	x			x	x	
United Kingdom	x	x	x	x	x		x	x	x
Canada	x	x	x	x	x		x	x	
Sweden	x	x	x	x	x		x	x	
Norway	x	x	x	x	x		x	x	
South Korea	x	x	x	x	x			x	

COVID-19 CONFIRMED CASES (LOG SCALE)



MODEL

THE MODEL

Baseline Model

$$\Delta s_t = \alpha + \beta_1 \Delta(r_t - r_t^*) + \beta_2 \Delta(r_t - r_t^*) \cdot \textbf{Covid-19 Dummy} + \beta_3 \Delta(r_t - r_t^*) \cdot \textbf{GFC Dummy}$$
$$+ \gamma_1 \Delta(VIX_t) + \gamma_2 \Delta(VIX_t) \cdot \textbf{Covid-19 Dummy} + \gamma_3 \Delta(VIX_t) \cdot \textbf{GFC Dummy}$$
$$+ \delta \Delta(\textbf{Business Activity}(\textbf{Home})_t)$$
$$+ \tau \Delta(\textbf{Business Activity}(\textbf{Overseas})_t)$$
$$+ v \Delta ln(\textbf{Covid} - 19\ \textbf{Cases}(\textbf{Home})_{t-1}) + \varepsilon$$

Carry Trade Risk Factor

Pull Factor

Push Factor

Covid-19 factors

- s_t denotes the bilateral exchange rate in foreign currency per U.S. dollar
- $r_t - r^*_t$ is the two-year interest rate differential between the foreign country and the U.S. [β>0]
- VIX_t reflects Chicago Board Options Exchange (CBOE) volatility index of S&P 500 index

  [γ >0, safe haven currency; γ <0, vulnerable currency]
- *Crisis dummies* are interaction term with yield differentials and VIX
  - Global financial crisis dummy (= 1 during Sept 2010 – June 2009)
  - Covid-19 crisis dummy (= 1 during Jan 2020 – Sept 2020)
- Business activity indexes – the pre-covid activity level = 100 (Max 100, Min 0)

  [δ>0, portfolio cannel dominates trade channel for home; δ <0, trade channel dominates portfolio investment cannel]
- New Covid-19 confirmed cases [opposite to business activity index]

EMPIRICAL RESULTS

COUNTRY COMPARISON — ADVANCED ECONOMIES

- Wider interest rate differentials have positive impacts on a home currency, following the expectation for all the advanced economies
- Higher market uncertainty (VIX) has the positive impacts on JPY and USD and its magnitude shrank for all the currencies but JPY
- Business activities, compared to the pre-virus crisis level appears to work for some currencies via trade channel during the pandemic.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependant Variable		*dln(bilateral exchange rate against the U.S. dollar) [t]*							*dln(Bloomberg Dollar Index)*
Currency		**AUD**	**CAD**	**EUR**	**GBP**	**JPY**	**NOK**	**SEK**	**USD**
Starting Date		Jan. 2005	Jan. 2005	Jan. 2005	Jan. 2005	Jan. 2005	Jan. 2005	Jan. 2005	Jan. 2005
End Date		Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020
Constant [t]	α	-0.003	-0.001	-0.001	-0.005	0.001	-0.008	-0.005	0.001
d(Two-year government bond yield differential[t])	β1	2.675***	4.582***	4.166***	3.562***	5.463***	1.207***	2.910***	2.865***
- Covid-19 Dummy	β2	1.039	-1.170	-2.705**	1.462	0.535	-3.017**	0.478	-1.597*
- Global Financial Crisis Dummy	β3	-0.908**	-2.412***	-2.204***	-1.270***	-1.790***	-1.616***	-1.673***	-1.043***
d(VIX[t])	γ1	-0.200***	-0.144***	-0.063***	-0.081***	0.072***	-0.129***	-0.119***	0.056***
- Covid-19 Dummy	γ2	0.125***	0.091***	0.085***	0.071***	-0.016	0.032*	0.080***	-0.054***
- Global Financial Crisis Dummy	γ3	-0.123***	-0.036***	-0.030***	-0.012	0.048***	-0.032**	-0.050***	0.029***
d(Business Activity -Home[t])	δ	-0.099*	0.033	-0.062*	-0.055	-0.064	-0.018	0.060	-0.093***
d(Business Activity -World[t])	τ	0.229***	0.094	0.139**	0.197***	0.071*	0.192***	0.075	0.010
dln(Covid-19 confirmed cases - Home[t-1])	υ	0.462*	0.118	-0.015	-0.089	0.616*	0.976***	0.289	-0.165
R-squared		0.287	0.273	0.120	0.119	0.272	0.116	0.123	0.145
Durbin-Watson		2.145	2.077	2.008	1.949	2.065	2.006	2.075	1.997
Observations		4025	4024	3987	4026	4027	4025	4023	1669

Note: *, **, *** indicate the 10%, 5%, 1% significant level.

COUNTRY COMPARISON — ADVANCED ECONOMIES

Re-Grouping Overseas Economic Activities

- The FX moves of advanced economies has a stronger link to advanced economies business activities
- Japan's home business activity at home turns significant

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependant Variable		*dln(bilateral exchange rate per U.S. dollar) [t]*							*dln(Bloomberg Dollar Index)*
Currency		**AUD**	**CAD**	**EUR**	**GBP**	**JPY**	**NOK**	**SEK**	**USD**
Starting Date		Jan. 2005	Jan. 2005	Jan. 2005	Jan. 2005	Jan. 2005	Jan. 2005	Jan. 2005	Jan. 2005
End Date		Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020
Constant [t]	α	-0.004	-0.001	-0.001	-0.006	0.000	-0.008	-0.005	0.001
d(Two-year government bond yield differential[t])	β1	2.675***	4.582***	4.166***	3.562***	5.463***	1.207***	2.910***	2.865***
- Covid-19 Dummy	β2	0.801	-1.266	-2.613**	1.378	0.740	-3.336***	0.528	-1.523*
- Global Financial Crisis Dummy	β3	-0.908**	-2.412***	-2.204***	-1.270***	-1.790***	-1.617***	-1.673***	-1.043***
d(VIX[t])	γ1	-0.200***	-0.144***	-0.063***	-0.081***	0.072***	-0.129***	-0.119***	0.056***
- Covid-19 Dummy	γ2	0.128***	0.089***	0.086***	0.077***	-0.011	0.035**	0.077***	-0.052***
- Global Financial Crisis Dummy	γ3	-0.123***	-0.036***	-0.030***	-0.012	0.048***	-0.032**	-0.050***	0.029***
d(Business Activity - Home[t])	δ	-0.160**	0.008	-0.094**	-0.183**	-0.098**	-0.060	0.069	-0.103**
d(Business Activity - China[t])	τ1	-0.065	-0.037	-0.024	-0.111*	0.004	0.015	-0.041	0.031
d(Business Activity - Emerging Markets ex China[t])	τ2	0.155	0.089	0.043	0.222*	-0.093	-0.072	0.102	-0.043
d(Business Activity - Advanced Economies[t])	τ3	0.177***	0.061	0.152**	0.198***	0.163***	0.272***	-0.007	0.042
dln(Covid-19 confirmed cases - Home[t-1])	υ	0.472**	0.155	-0.041	-0.090	0.708**	1.072***	0.260	-0.170
R-squared		0.287	0.272	0.120	0.121	0.274	0.118	0.123	0.145
Durbin-Watson		2.145	2.075	2.008	1.958	2.066	2.009	2.073	1.995
Observations		4025	4024	3987	4026	4027	4025	4023	1669

Note: *, **, *** indicate the 10%, 5%, 1% significant level.

COUNTRY COMPARISON — EMERGING ECONOMIES

- Wider interest rate differentials have positive impacts on only CNY
- Higher market uncertainty (VIX) has the negative impacts on for all the emerging currencies but smaller impacts during the pandemic
- Business activities at home, compared to the pre-virus crisis level appears to work for some currencies via portfolio channel during the pandemic. The trade channel works for business activities in the world

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependant Variable		*dlog(bilateral exchange rate per U.S. dollar) [t]*								
Currency		**BRL**	**CNY**	**IDR**	**INR**	**KRW**	**MXN**	**TRY**	**ZAR**	**CNH**
Starting Date		Mar. 2007	June 2005	Jan. 2005	Jan. 2005	Jan. 2005	Jan. 2005	Apr. 2005	Jan. 2005	Aug. 2010
End Date		Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020
Constant [t]	α	-0.029*	0.009***	-0.014	-0.015*	0.006	-0.018	-0.045***	-0.022	0.001
d(Two-year government bond yield differential[t])	β1	-2.858***	0.219***	-0.475***	-0.415***	-0.539**	-1.295***	-1.275***	-2.939***	0.208*
- Covid-19 Dummy	β2	1.332***	0.287	-2.627***	-0.523	-2.240*	0.808	0.640***	-2.075**	0.672*
- Global Financial Crisis Dummy	β3	0.148	-0.091	0.211*	0.297	-1.921***	0.725	-0.405*	-0.113	
d(VIX[t])	γ1	-0.181***	-0.004*	-0.048***	-0.041***	-0.088***	-0.208***	-0.134***	-0.216***	-0.026***
- Covid-19 Dummy	γ2	0.143***	0.000	-0.003	0.040***	0.047***	0.082***	0.097***	0.121***	0.013**
- Global Financial Crisis Dummy	γ3	-0.032	0.004	-0.007	-0.003	-0.059***	-0.026	-0.061***	-0.059***	
d(Business Activity - Home[t])	δ	-0.027	0.007	0.146***	0.049**	-0.040	0.021	0.025	0.114**	0.001
d(Business Activity - World[t])	τ	0.276***	0.057***	0.061	0.022	0.164***	0.269***	0.021	0.017	0.053***
dln(Covid-19 confirmed cases - Home[t-1])	υ	-0.314	0.862***	-0.048	0.211	0.093	-1.763***	0.494	0.002	0.479***
R-squared		0.276	0.021	0.087	0.033	0.081	0.276	0.216	0.267	0.039
Durbin-Watson		2.127	2.054	2.270	1.983	2.098	2.004	1.971	2.061	2.121
Observations		4025	4024	3987	4026	4027	4025	4023	1669	2740

Note: *, **, *** indicate the 10%, 5%, 1% significant level.

COUNTRY COMPARISON — EMERGING ECONOMIES

Re-Grouping Overseas Economic Activities

- The FX moves of emerging economies has a stronger link to emerging economies business activities
- China's home business activity at home turns significant

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependant Variable		*dlog(bilateral exchange rate per U.S. dollar) [t]*								
Currency		**BRL**	**CNY**	**IDR**	**INR**	**KRW**	**MXN**	**TRY**	**ZAR**	**CNH**
Starting Date		Mar. 2007	June 2005	Jan. 2005	Jan. 2005	Jan. 2005	Jan. 2005	Apr. 2005	Jan. 2005	Aug. 2010
End Date		Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020
Constant [t]	α	-0.029*	0.009***	-0.015	-0.015*	0.005	-0.018	-0.045***	-0.022	0.000
d(Two-year government bond yield differential[t])	$\beta 1$	-2.858***	0.219***	-0.310***	-0.415***	0.353	-1.295***	-1.275***	-2.939***	0.217*
- Covid-19 Dummy	$\beta 2$	1.306***	0.197	-2.244***	-0.445	0.305	0.684	0.643***	-1.985**	0.680*
- Global Financial Crisis Dummy	$\beta 3$	0.148	-0.091	0.055	0.297	-2.879***	0.725	-0.405*	-0.113	
d(VIX[t])	$\gamma 1$	-0.181***	-0.004*	-0.045***	-0.041***	-0.089***	-0.208***	-0.134***	-0.216***	-0.027***
- Covid-19 Dummy	$\gamma 2$	0.140***	-0.001	0.012	0.040***	0.049***	0.079***	0.097***	0.119***	0.009
- Global Financial Crisis Dummy	$\gamma 3$	-0.032	0.004	-0.008	-0.003	-0.031**	-0.026	-0.061***	-0.059***	
d(Business Activity - Home[t])	δ	-0.062	-0.042**	-0.054	0.073	-0.019	-0.109	0.018	0.089	-0.067***
d(Business Activity - China[t])	$\tau 1$	-0.055		-0.174**	0.036	0.006	-0.126**	-0.012	-0.061	
d(Business Activity - Emerging Markets ex China[t])	$\tau 2$	0.153	0.131***	0.423***	-0.078	0.099	0.193*	-0.001	0.116	0.174***
d(Business Activity - Advanced Economies[t])	$\tau 3$	0.196**	-0.011	0.017	0.042	0.083	0.342***	0.042	-0.028	-0.036
dln(Covid-19 confirmed cases - Home[t-1])	υ	-0.272	0.821***	-0.168	0.198	0.046	-1.481***	0.539	-0.010	0.357
R-squared		0.276	0.024	0.077	0.033	0.077	0.281	0.216	0.267	0.042
Durbin-Watson		2.745	2.062	2.267	1.983	2.099	2.008	1.971	2.061	2.122
Observations		4025	4024	3987	4026	4027	4025	4023	1669	2740

Note: *, **, *** indicate the 10%, 5%, 1% significant level.

EXTENDED MODEL -- JAPAN

Adding long-term yield differentials as the proxy of unconventional monetary policies and risk premium didn't change main results

	(1)	(2)	(3)	(4)
Dependant Variable	***dln(bilateral exchange rate per U.S. dollar) [t]***			
Country	Japan			
Starting Date	Jan. 2005	Jan. 2005	Jan. 2005	Jan. 2005
End Date	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020
Constant[t]	0.001	0.001	0.001	0.001
d(Two-year government bond yield differential[t])	5.462***	5.716***	5.716***	5.716***
- Covid-19 Dummy		0.141	-0.032	-0.056
- Global Financial Crisis Dummy		-1.266***	-1.267***	-1.267***
d(Long-term yield curve spread differential[t])	2.126***	1.815***	1.815***	1.815***
- Covid-19 Dummy		-1.130	-1.054	-1.373
- Global Financial Crisis Dummy		2.021***	2.022***	2.022***
d(VIX[t])	0.071***	0.063***	0.063***	0.063***
- Covid-19 Dummy		-0.008	-0.008	-0.005
- Global Financial Crisis Dummy		0.052***	0.052***	0.052***
d(Business Activity -Home[t])	-0.075*	-0.072*	-0.078*	
d(Business Activity -World[t])	0.083**	0.074**	0.077**	
d(Business Activity Gap: Japan - USA[t])				-0.089***
d(Lockdown Index[t])			-0.018	-0.018
dln(Covid-19 confirmed cases - Home[t-1])		0.640*	1.047***	1.063***
dln(Covid-19 confirmed cases - World[t-1])			-0.176*	-0.167*
	OLS	OLS	OLS	OLS
Adj. R-squared	0.285	0.292	0.293	0.295
Durbin-Watson	2.083	2.081	2.083	2.084
Observations	3808	3808	3808	3808

Note: *, **, *** indicate the 10%, 5%, 1% significant level.

EXTENDED MODEL – UNITED STATES

	(1)	(2)	(3)	(4)
Dependant Variable	***dln(Bloomberg Dollar Index) [t]***			
Country	United States			
Starting Date	Jan. 2005	Jan. 2005	Jan. 2005	Jan. 2005
End Date	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020
Constant[t]	0.001	0.001	0.001	0.001
d(Two-year government bond yield differential[t])	2.796***	3.088***	3.089***	3.090***
- Covid-19 Dummy		-1.700**	-0.581	-1.750**
- Global Financial Crisis Dummy		-1.023***	-1.023***	-1.024***
d(Long-term yield curve spread differential[t])	0.619***	0.602***	0.604***	0.608***
- Covid-19 Dummy		-0.322	-0.328	-0.186
- Global Financial Crisis Dummy		0.029	0.028	0.026
d(VIX[t])	0.055***	0.058***	0.058***	0.058***
- Covid-19 Dummy		-0.057***	-0.087***	-0.059***
- Global Financial Crisis Dummy		0.029***	0.029***	0.029***
d(Business Activity -Home[t])	-0.086***	-0.098***	-0.091***	
d(Business Activity -World[t])	0.026	0.012	0.018	
d(Business Activity Gap: USA - World[t])				-0.096***
d(Lockdown Index[t])			0.014	0.035**
dln(Covid-19 confirmed cases - Home[t-1])	-0.173	-0.378	-0.320	-0.348
dln(Covid-19 confirmed cases - World[t-1])			-1.933	-1.849
	OLS	OLS	OLS	OLS
Adj. R-squared	0.129	0.148	0.150	0.146
Durbin-Watson	2.015	2.008	2.010	2.008
Observations	3806	3806	3806	3806

Note: *, **, *** indicate the 10%, 5%, 1% significant level.

EXTENDED MODEL – EURO AREA

	(1)	(2)	(3)	(4)
Dependant Variable	***dln(bilateral exchange rate per U.S. dollar) [t]***			
Country/Area	**Euro Area**			
Starting Date	Jan. 2005	Jan. 2005	Jan. 2005	Jan. 2005
End Date	Sept. 2020	Sept. 2020	Sept. 2020	Sept. 2020
Constant[t]	0.000	-0.001	0.000	-0.001
d(Two-year government bond yield differential[t])	3.833***	4.297***	4.297***	4.297***
- Covid-19 Dummy		-2.778**	-2.824**	-3.027***
- Global Financial Crisis Dummy		-1.845***	-1.845***	-1.845***
d(Long-term yield curve spread differential[t])	0.652***	0.361	0.361	0.361
- Covid-19 Dummy		0.761	0.608	0.615
- Global Financial Crisis Dummy		0.999*	0.998*	0.999*
d(VIX[t])	-0.057***	-0.064***	-0.064***	-0.064***
- Covid-19 Dummy		0.082***	0.084***	0.085***
- Global Financial Crisis Dummy		-0.032***	-0.032***	-0.032***
d(Business Activity - Euro Area [t])	-0.084***	-0.054	-0.069*	
d(Business Activity -World[t])	0.132**	0.125**	0.118*	
d(Business Activity Gap: Euro Area - USA[t])				-0.063**
d(Lockdown Index[t])			-0.027	-0.035*
dln(Covid-19 confirmed cases - Home[t-1])		-0.004	-0.093	-0.160
dln(Covid-19 confirmed cases - World[t-1])			0.136	0.232
	OLS	OLS	OLS	OLS
Adj. R-squared	0.101	0.121	0.121	0.122
Durbin-Watson	0.000	2.011	2.010	2.010
Observations	3820	3820	3820	3820

Note: *, **, *** indicate the 10%, 5%, 1% significant level.

SUMMARY OF RESULTS

- Impacts of a VIX change on FX moves intensified during the Global Financial Crisis, but its impacts could be weaker, or more or less same during the Covid-19 crisis, particularly for emerging economies
- Renminbi response is more closer to advanced economies
- During the Covid-19, a rapid changes in trade balance could be a key determinants of FX moves due to the fluctuation of gaps of activity between home and overseas

Future Improvement

- Adding more explanatory variables (CDS) or split activity indexes.
- Panel regressions

POLICY IMPLICATIONS

- The financial authorities needs to change policies, based on the stages of the virus-infections and its recovery as the impacts of economic recovery on the FX moves may could shift in transition to post-lockdown period.
  - At the stage of lockdown and early post-lockdown period, the economic recovery is associated with the currency depreciation due to trade channel.
  - As the virus-containment measures are softening and the business activities are approaching the pre-virus crisis level, effects via the trade channel diminishes.
  - At the same time impacts via the portfolio channel increases and the economic recovery is also associated with the currency appreciation with higher interest rates and inward foreign investment. The exchange rate moves are determined by the balance of effects between the trade channel and portfolio investment channel.
- After the Covid-19 vaccines are distributed, exchange rate determinants are dominated by the portfolio investment channel. Therefore, the government and central banks need to make careful adjustments of fiscal policy and monetary policy to stabilize exchange rates as well as the real economy.

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