Deutsche Bank
Research

Global

Economics
Foreign Exchange
FX Spot

Date
5 April 2016

Gautam Kalani
Strategist
(+44) 20 754-57066
gautam.kalani@db.com

Daniel Brehon
Strategist
(+44) 20 754-50946
daniel.brehon@db.com

FX Valuation Snapshot
(March 2016)

This report brings together our estimates of longer-term fair value for major EM and G10 exchange rates based on three alternative models summarized in the appendix.

Where do we find agreement on all three valuation metrics (BEER, FEER, PPP)?

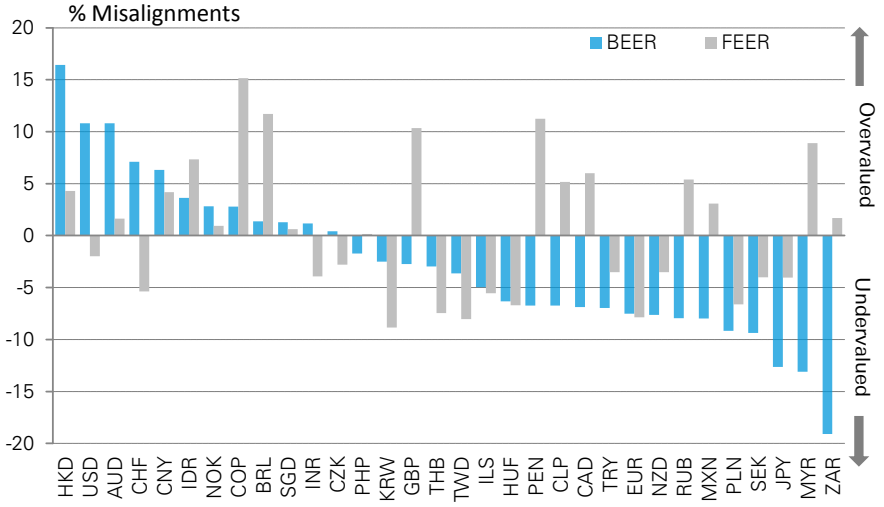
The latest results for EM exchange rates for March point to overvaluation (in REER terms) across all three approaches in China, Hong Kong and Indonesia and undervaluation in Hungary, Poland and Turkey. On the other hand, in G10, the March results point to undervaluation in Japan and Sweden and overvaluation in Australia.

What are the latest results according to our preferred BEER model?

Our preferred Behavioral Equilibrium Exchange Rate model suggests that exchange rates in March were significantly overvalued (in REER terms) in China and Hong Kong in EM, and in the US, Australia and Switzerland in the developed world. Unsurprisingly, most of EM FX is undervalued on BEER, with Malaysia, Poland, Russia, Turkey, South Africa, and Mexico being significantly undervalued. In G10, Japan, Euro area, Canada, New Zealand and Sweden are substantially undervalued. The results elsewhere are more mixed or show little evidence of significant misalignment.

In this update, we have included the USD-cross fair values implied by the REER misalignments, for all three valuation models. These are calculated using the matrix inversion technique suggested by Cline (2008) – results are provided on page 3 and more details on the methodology are provided in the appendix. We have also made some amendments to our FEER and PPP models, which are highlighted in the appendix.

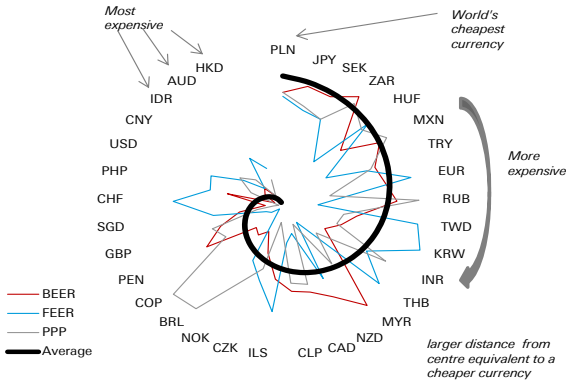
FX Valuation Snapshot (March 2016): REER misalignments



Source: Haver Analytics, Deutsche Bank

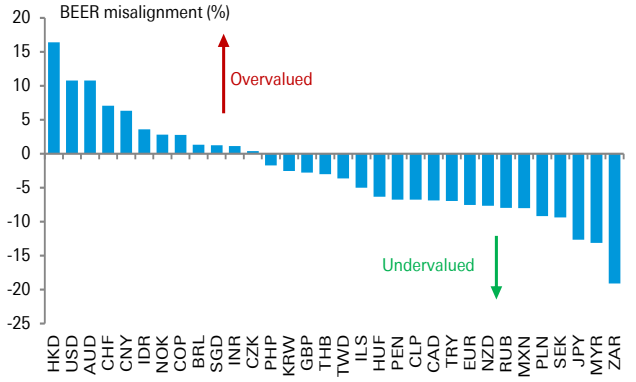
REER misalignments (March 2016)

Valuations ranked



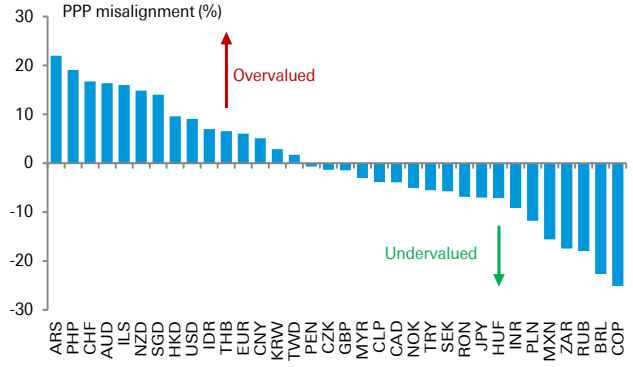
Source: Haver Analytics, Deutsche Bank

BEER misalignment



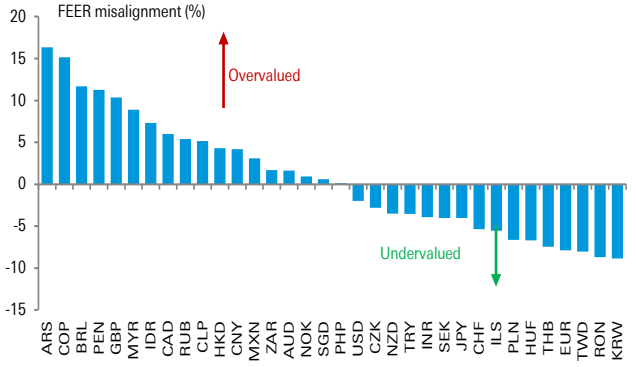
Source: Haver Analytics, Deutsche Bank

PPP misalignment



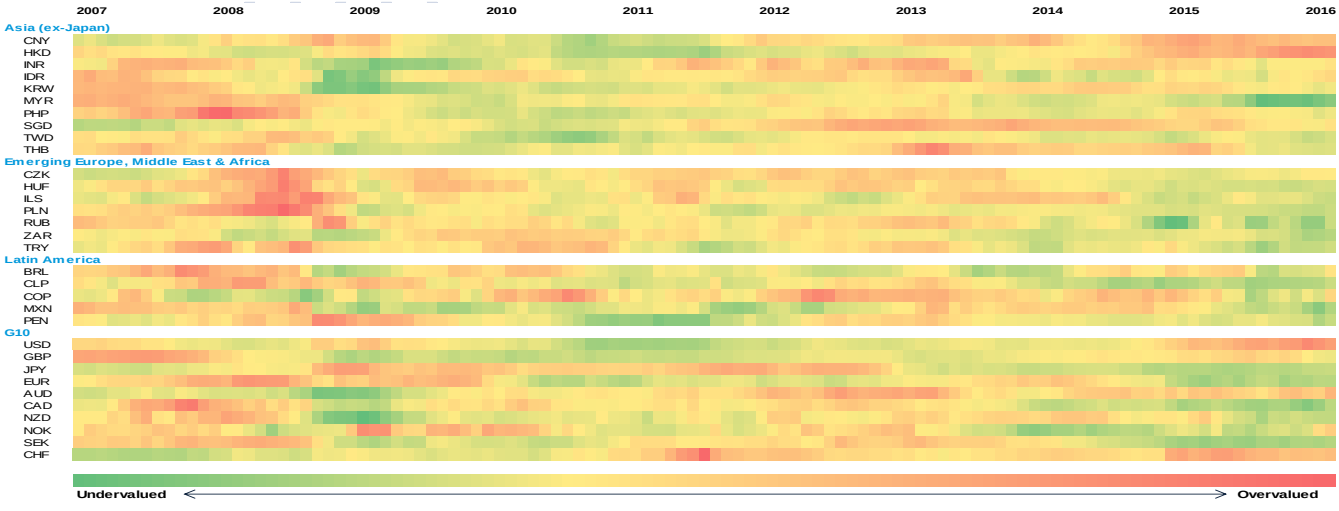
Source: Haver Analytics, Deutsche Bank

FEER misalignment



Source: Haver Analytics, Deutsche Bank

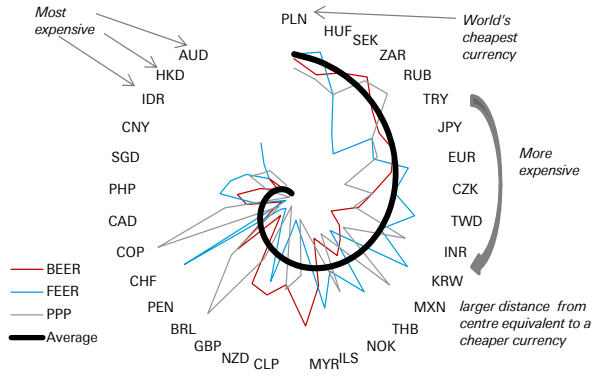
Evolution of REER valuations (BEER, z-scores)



Source: Haver Analytics, Deutsche Bank

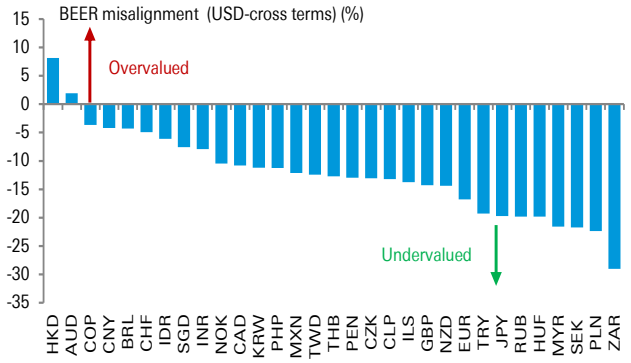
USD cross misalignments (March 2016)

Valuations ranked



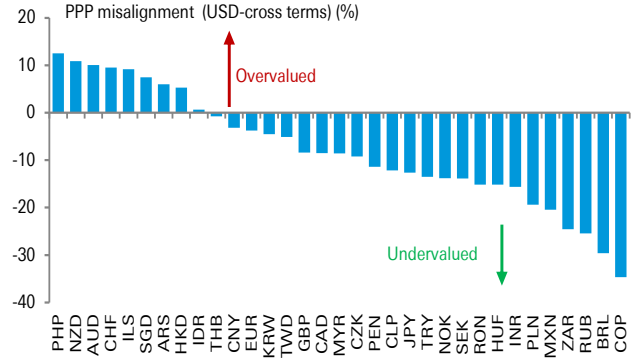
Source: Haver Analytics, Deutsche Bank

BEER misalignment



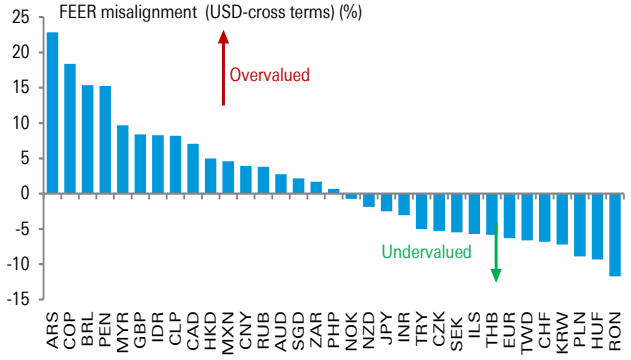
Source: Haver Analytics, Deutsche Bank

PPP misalignment



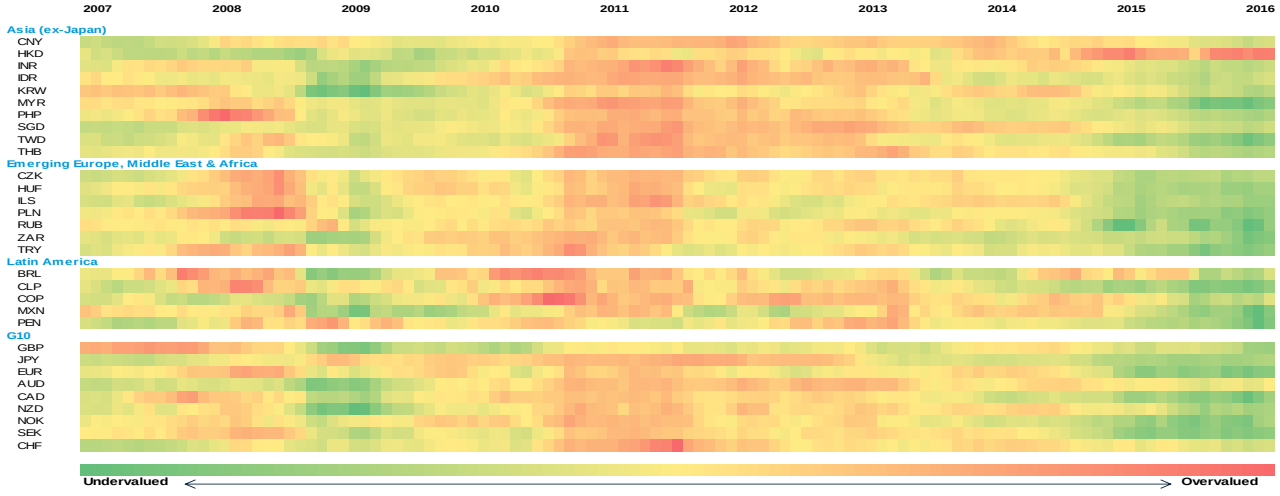
Source: Haver Analytics, Deutsche Bank

FEER misalignment



Source: Haver Analytics, Deutsche Bank

Evolution of USD cross valuations (BEER, z-scores)



Source: Haver Analytics, Deutsche Bank

Valuations summary (March 2016)

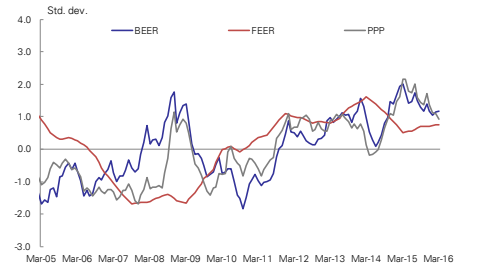
	Current REER Misalignment				Actual USD cross	PPP		BEER		FEER		Average USD cross misalignment (%)	Implied average USD cross fair value
	PPP	BEER	FEER	Average		USD cross misalignment (%)	USD cross fair value	USD cross misalignment (%)	USD cross fair value	USD cross misalignment (%)	USD cross fair value		
Asia (ex-Japan)													
China	5.1 ↓	6.3 ↑	4.2 ↑	**5.2 ↓**	6.51	-3.2	6.30	-4.2	6.23	3.9	6.76	**-1.1**	**6.43**
Hong Kong	9.6 ↓	16.4 ↓	4.3 ↑	**10.1 ↓**	7.76	5.3	8.17	8.2	8.39	5.0	8.15	**6.2**	**8.24**
India	-9.1 ↑	1.2 ↑	-3.9 ↓	**-4.0 ↑**	67.0	-15.6	56.5	-7.9	61.7	-3.1	65.0	**-8.9**	**61.1**
Indonesia	7.0 ↑	3.6 ↑	7.3 ↑	**6.0 ↑**	13193	0.7	13283	-6.1	12391	8.3	14283	**1.0**	**13319**
Korea	2.9 ↑	-2.5 ↑	-8.8 ↓	**-2.8 ↑**	1188	-4.5	1135	-11.2	1055	-7.2	1103	**-7.6**	**1097**
Malaysia	-3.0 ↑	-13.1 ↑	8.9 ↑	**-2.4 ↑**	4.08	-8.6	3.73	-21.6	3.20	9.7	4.47	**-6.8**	**3.80**
Philippines	19.1 ↑	-1.7 ↑	0.1 ↓	**5.8 ↑**	46.7	12.5	52.6	-11.2	41.5	0.7	47.0	**0.6**	**47.0**
Singapore	14.1 ↑	1.3 ↑	0.6 ↑	**5.3 ↑**	1.37	7.5	1.48	-7.6	1.27	2.2	1.40	**0.7**	**1.38**
Taiwan	1.7 ↑	-3.6 ↑	-8.0 ↑	**-3.3 ↑**	32.9	-5.1	31.2	-12.4	28.8	-6.6	30.7	**-8.1**	**30.2**
Thailand	6.6 ↓	-3.0 ↑	-7.5 ↓	**-1.3 ↓**	35.2	-0.7	35.0	-12.7	30.8	-5.8	33.2	**-6.4**	**33.0**
Emerging Europe, Middle East & Africa													
Czech	-1.3 ↓	0.4 ↓	-2.8 ↓	**-1.2 ↓**	24.4	-9.2	22.1	-13.1	21.2	-5.3	23.1	**-9.2**	**22.1**
Hungary	-7.1 ↓	-6.3 ↓	-6.7 ↓	**-6.7 ↓**	280	-15.2	238	-19.8	225	-9.3	254	**-14.8**	**239**
Israel	16.0 ↓	-5.0 ↓	-5.5 ↑	**1.8 ↓**	3.87	9.2	4.22	-13.7	3.34	-5.7	3.65	**-3.4**	**3.74**
Poland	-11.8 ↑	-9.2 ↑	-6.6 ↑	**-9.2 ↑**	3.87	-19.4	3.12	-22.3	3.00	-8.9	3.52	**-16.9**	**3.21**
Romania	-6.8 ↑	-	-8.7 ↓	**-7.8 ↑**	4.02	-15.2	3.41	-	-	-11.7	3.55	**-13.4**	**3.48**
Russia	-17.9 ↑	-7.9 ↑	5.4 ↑	**-6.8 ↑**	70.4	-25.4	52.5	-19.8	56.5	3.8	73.1	**-13.8**	**60.7**
South Africa	-17.4 ↑	-19.1 ↑	1.7 ↑	**-11.6 ↑**	15.4	-24.5	11.6	-29.0	11.0	1.7	15.7	**-17.3**	**12.8**
Turkey	-5.5 ↑	-7.0 ↑	-3.5 ↑	**-5.3 ↑**	2.90	-13.5	2.51	-19.3	2.34	-5.0	2.75	**-12.6**	**2.53**
Latin America													
Argentina	22.0 ↓	-	16.3 ↑	**19.2 ↑**	14.9	6.0	15.8	-	-	22.8	18.3	**14.4**	**17.0**
Brazil	-22.6 ↑	1.4 ↑	11.7 ↑	**-3.2 ↑**	3.70	-29.6	2.61	-4.3	3.55	15.4	4.27	**-6.2**	**3.48**
Chile	-3.9 ↑	-6.7 ↑	5.2 ↑	**-1.8 ↑**	682	-12.2	599	-13.2	592	8.2	738	**-5.7**	**643**
Colombia	-25.1 ↑	2.8 ↑	15.1 ↑	**-2.4 ↑**	3145	-34.6	2056	-3.7	3030	18.4	3724	**-6.6**	**2936**
Mexico	-15.6 ↑	-8.0 ↑	3.1 ↑	**-6.8 ↑**	17.7	-20.4	14.1	-12.1	15.6	4.6	18.6	**-9.3**	**16.1**
Peru	-0.7 ↑	-6.7 ↑	11.3 ↑	**1.3 ↑**	3.41	-11.4	3.02	-13.0	2.97	15.3	3.93	**-3.0**	**3.30**
G10													
United States	9.1 ↓	10.8 ↓	-2.0 ↓	**6.0 ↓**									
United Kingdom	-1.4 ↓	-2.7 ↓	10.3 ↓	**2.0 ↓**	1.43	-8.4	1.56	-14.3	1.66	8.4	1.31	**-4.8**	**1.49**
Japan	-7.0 ↑	-12.6 ↑	-4.0 ↓	**-7.9 ↑**	112.9	-12.6	98.7	-19.7	90.6	-2.5	110.1	**-11.6**	**99.8**
Euro area	6.0 ↑	-7.5 ↓	-7.9 ↓	**-3.1 ↑**	1.11	-3.8	1.16	-16.8	1.34	-6.3	1.19	**-9.0**	**1.21**
Australia	16.4 ↑	10.8 ↑	1.6 ↓	**9.6 ↑**	0.75	10.1	0.68	1.9	0.74	2.7	0.73	**4.9**	**0.71**
Canada	-3.9 ↑	-6.9 ↑	6.0 ↑	**-1.6 ↑**	1.32	-8.5	1.21	-10.8	1.18	7.0	1.41	**-4.1**	**1.27**
New Zealand	14.9 ↓	-7.6 ↓	-3.5 ↑	**1.2 ↓**	0.67	10.9	0.61	-14.4	0.79	-1.9	0.69	**-1.8**	**0.69**
Norway	-5.0 ↑	2.8 ↑	0.9 ↑	**-0.4 ↑**	8.47	-13.8	7.30	-10.5	7.58	-0.7	8.41	**-8.3**	**7.76**
Sweden	-5.7 ↓	-9.4 ↑	-4.0 ↓	**-6.4 ↑**	8.33	-13.8	7.18	-21.7	6.52	-5.5	7.88	**-13.7**	**7.19**
Switzerland	16.7 ↓	7.1 ↑	-5.4 ↑	**6.2 ↓**	0.98	9.5	1.07	-4.9	0.93	-6.8	0.91	**-0.7**	**0.97**

↑/↓ indicates change in valuation over the last month; upward arrow indicates currency has become more overvalued or less undervalued relative to our model-implied fair values

For USD cross rates - EUR/USD, GBP/USD, AUD/USD and NZD/USD values reported. For all other currencies USD/FX values reported.
Source: Haver Analytics, Deutsche Bank

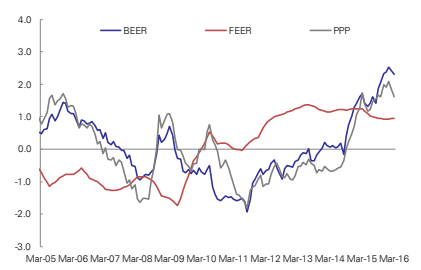
REER misalignments by country: EM Asia

China



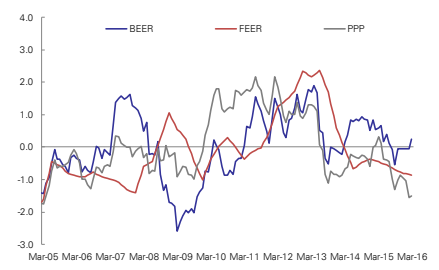
	2015												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	10.8	9.5	7.6	7.9	9.3	8.0	7.0	6.3	7.5	6.3	5.7	6.2	6.3
FEER	2.8	2.9	3.0	3.1	3.3	3.6	3.8	3.9	3.9	3.9	4.0	4.1	4.2
PPP	11.9	11.9	9.8	9.6	11.0	8.8	7.9	7.6	9.4	7.6	6.2	6.0	5.1

Hong Kong



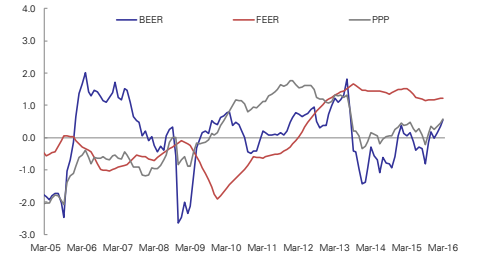
	###												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	2.8	2.9	3.0	3.1	3.3	3.6	3.8	3.9	3.9	3.9	4.0	4.1	4.2
FEER	11.9	11.9	9.8	9.6	11.0	8.8	7.9	7.6	9.4	7.6	6.2	6.0	5.1
PPP	12.2	10.1	9.3	10.1	11.4	10.0	13.2	14.6	16.6	17.0	17.9	17.1	16.4

India



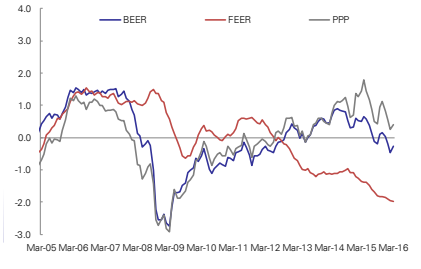
	###												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	2.8	3.1	0.8	1.8	0.6	-0.3	-2.6	-0.3	-0.3	-0.3	-0.3	-0.3	1.2
FEER	-2.1	-2.2	-2.4	-2.6	-2.7	-3.0	-3.2	-3.4	-3.6	-3.7	-3.8	-3.9	-3.9
PPP	1.9	0.7	-2.2	-2.4	-2.8	-6.1	-8.0	-6.2	-5.3	-5.8	-6.3	-9.4	-9.1

Indonesia



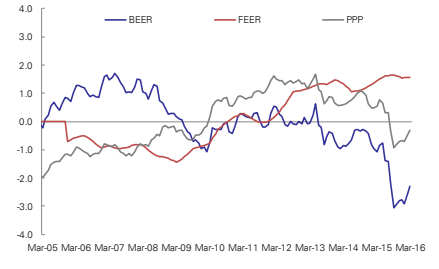
	2015												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	0.4	1.1	-0.7	-2.5	-1.8	-2.2	-5.4	-0.9	1.2	-0.1	1.0	2.3	3.6
FEER	9.1	8.6	8.0	7.5	7.3	7.1	6.9	7.0	7.0	7.1	7.2	7.3	7.3
PPP	4.8	5.8	3.4	2.3	3.2	0.8	-2.6	1.5	4.2	3.0	4.3	5.5	7.0

Korea



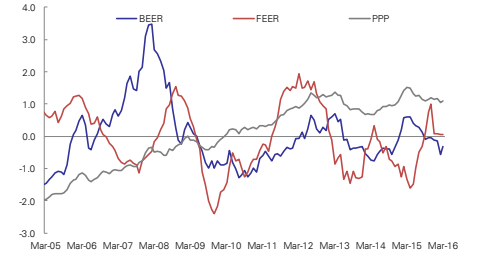
	###												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	4.9	6.3	5.5	3.7	1.2	-1.1	-1.8	0.9	1.5	0.4	-1.9	-4.5	-2.5
FEER	-6.1	-6.2	-6.2	-6.7	-7.2	-7.6	-8.1	-8.2	-8.2	-8.3	-8.5	-8.8	-8.8
PPP	10.2	12.7	10.2	8.2	6.2	3.5	3.0	6.8	7.9	5.9	3.9	1.7	2.9

Malaysia



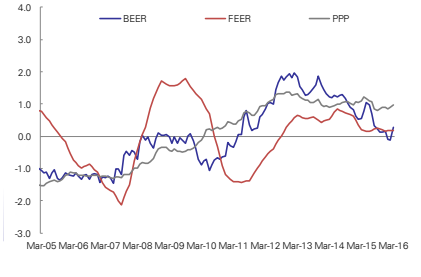
	###												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	-6.1	-4.9	-4.4	-7.8	-8.0	-12.5	-17.5	-16.7	-16.0	-15.8	-16.6	-14.7	-13.1
FEER	8.1	8.5	8.8	9.1	9.2	9.3	9.3	9.2	9.0	8.8	8.9	8.9	8.9
PPP	5.2	7.2	6.3	2.9	3.0	-3.3	-8.8	-7.8	-6.9	-6.5	-6.8	-4.6	-3.0

Philippines



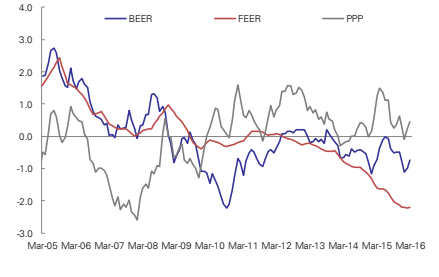
	2015												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	3.2	3.3	2.2	1.8	1.5	0.7	-0.5	-0.3	-0.2	-0.6	-0.8	-3.1	-1.7
FEER	-3.6	-4.3	-4.0	-2.7	-1.3	-0.8	0.3	2.0	2.7	0.2	0.2	0.2	0.1
PPP	26.4	25.9	23.2	21.9	22.3	20.1	19.2	20.0	20.7	20.1	20.3	18.2	19.1

Singapore



	###												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	2.6	3.7	5.0	4.6	3.3	1.6	1.1	0.6	0.6	0.8	-0.4	-0.6	1.3
FEER	0.7	0.6	0.5	0.5	0.6	0.7	0.8	0.7	0.6	0.5	0.6	0.6	0.6
PPP	15.9	17.7	17.1	16.2	15.7	12.5	11.7	12.3	13.2	13.3	12.4	13.0	14.1

Taiwan



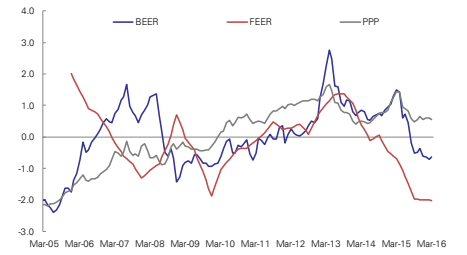
	###												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	-3.4	-1.8	-0.6	0.0	-0.3	-1.9	-2.5	-2.4	-2.4	-3.8	-5.3	-4.8	-3.6
FEER	-5.9	-5.9	-5.9	-6.0	-6.4	-6.8	-7.3	-7.5	-7.7	-7.9	-8.0	-8.0	-8.0
PPP	4.8	5.7	5.3	4.3	4.3	1.6	1.0	1.3	2.4	1.0	-0.4	0.9	1.7

Source: Deutsche Bank

The misalignment estimates in the charts above are presented in terms of standard deviations. The misalignment estimates are shown in the equivalent percentage terms in the tables. The color shading in the tables is based on the standard deviations: no shading indicates that the misalignment estimate is within plus or minus one standard deviation.

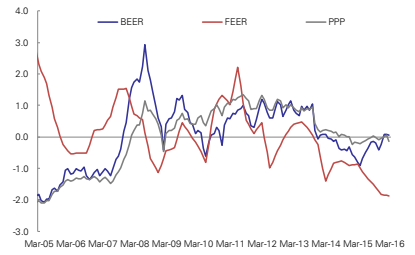
REER misalignments by country: EM Asia (continued) and EMEA

Thailand



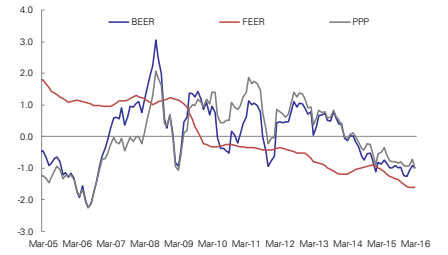
%	2015 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	6.7	6.4	2.7	3.2	2.0	-0.9	-2.4	-2.2	-1.6	-2.7	-2.9	-3.2	-3.0
FEER	-2.5	-3.2	-3.9	-4.7	-5.5	-6.4	-7.3	-7.3	-7.4	-7.4	-7.5	-7.5	-7.5
PPP	17.0	16.6	11.1	10.6	9.8	6.8	5.6	6.4	7.8	6.4	7.2	7.1	6.6

Czech Republic



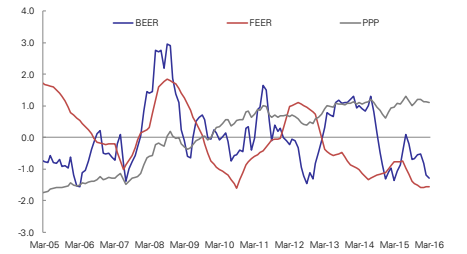
%	### Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	-5.1	-5.7	-4.3	-3.0	-2.3	-1.1	-0.8	-1.2	-2.5	-1.4	0.6	0.5	0.4
FEER	-1.3	-1.5	-1.7	-1.9	-2.0	-2.1	-2.3	-2.4	-2.6	-2.7	-2.8	-2.8	-2.8
PPP	-1.8	-2.0	-1.6	-1.0	-0.7	-0.1	0.4	-0.1	-0.9	-0.4	0.0	0.5	-1.3

Hungary



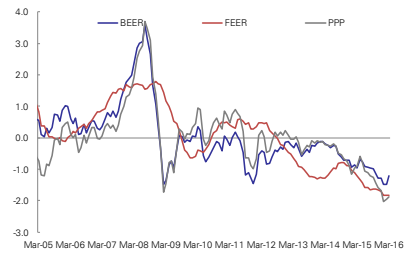
%	2015 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	-5.5	-4.8	-5.5	-6.4	-6.3	-5.9	-6.4	-6.3	-7.9	-8.1	-7.1	-5.9	-6.3
FEER	-4.3	-4.6	-5.0	-5.3	-5.4	-5.5	-5.7	-6.0	-6.3	-6.6	-6.7	-6.7	-6.7
PPP	-3.6	-2.6	-4.1	-5.5	-5.8	-5.7	-6.1	-5.6	-6.6	-6.8	-6.5	-5.2	-7.1

Israel



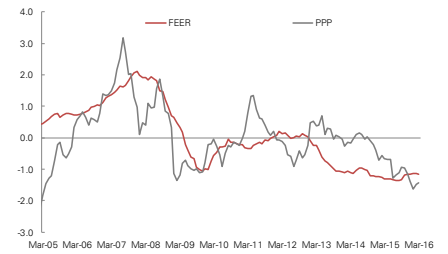
%	2015 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	-5.2	-4.1	-3.3	-1.7	0.3	-0.8	-2.6	-2.6	-2.1	-2.0	-3.2	-4.5	-5.0
FEER	-2.8	-2.7	-2.7	-2.7	-3.4	-4.1	-4.9	-5.1	-5.4	-5.6	-5.6	-5.6	-5.5
PPP	13.7	15.6	15.3	16.5	18.7	16.6	14.5	15.6	17.4	17.2	16.2	16.2	16.0

Poland



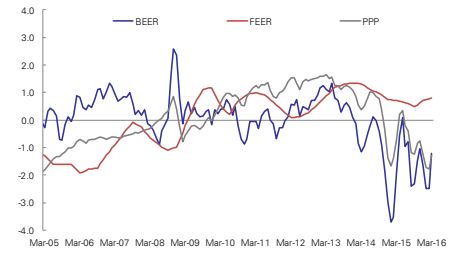
%	### Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	-7.4	-5.3	-5.9	-7.1	-7.2	-7.3	-7.6	-8.6	-9.9	-9.9	-11.3	-11.4	-9.2
FEER	-4.4	-4.9	-5.2	-5.8	-5.8	-6.0	-5.9	-6.0	-6.0	-6.2	-6.6	-6.6	-6.6
PPP	-5.7	-3.6	-4.9	-6.7	-7.0	-7.6	-7.9	-9.0	-9.9	-10.5	-12.7	-12.3	-11.8

Romania



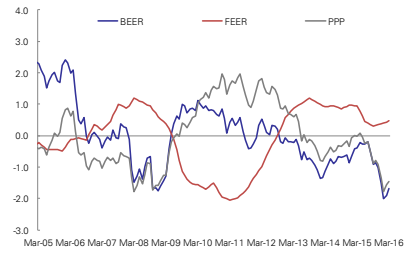
%	2015 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	...	...	...	...	...	...	...	...	...	...	...	...	...
FEER	-10.0	-10.0	-10.0	-10.1	-10.2	-10.2	-10.0	-8.9	-8.8	-8.7	-8.6	-8.7	-8.7
PPP	-3.1	-3.3	-3.2	-6.1	-5.6	-5.3	-4.4	-4.6	-5.6	-6.6	-7.8	-7.0	-6.8

Russia



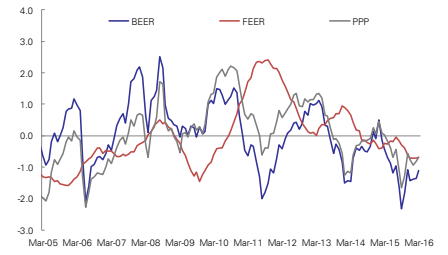
%	2015 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	-12.8	-3.6	0.5	-6.2	-5.1	-15.6	-15.2	-9.6	-6.8	-10.6	-16.2	-16.3	-7.9
FEER	4.8	4.7	4.5	4.2	4.0	3.6	3.2	3.7	4.3	4.8	5.1	5.2	5.4
PPP	-10.1	2.9	4.9	-2.6	-5.3	-16.6	-17.3	-11.7	-10.6	-17.3	-23.8	-24.7	-17.9

South Africa



%	### Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	-4.4	-2.4	-2.8	-3.0	-2.2	-5.3	-10.1	-9.6	-11.1	-16.6	-22.0	-20.9	-19.1
FEER	3.4	2.8	2.2	1.7	1.5	1.3	1.1	1.2	1.3	1.4	1.5	1.6	1.7
PPP	-0.3	1.1	-0.5	-2.9	-2.3	-5.9	-10.7	-9.4	-10.9	-16.1	-21.3	-18.8	-17.4

Turkey



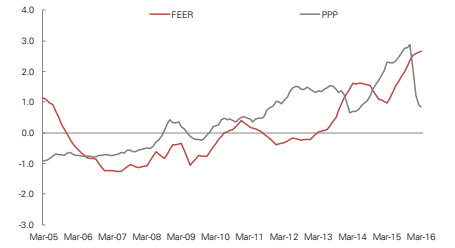
%	2015 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	-2.6	-4.4	-5.6	-7.5	-6.0	-10.4	-14.8	-11.5	-6.9	-9.1	-8.8	-8.7	-7.0
FEER	-1.2	-1.3	-0.8	-0.9	-0.3	-0.9	-1.5	-2.0	-3.1	-3.6	-3.7	-3.6	-3.5
PPP	0.2	-1.4	-3.0	-5.4	-3.5	-8.7	-13.1	-10.1	-4.5	-6.1	-7.4	-6.4	-5.5

Source: Deutsche Bank

The misalignment estimates in the charts above are presented in terms of standard deviations. The misalignment estimates are shown in the equivalent percentage terms in the tables. The color shading in the tables is based on the standard deviations: no shading indicates that the misalignment estimate is within plus or minus one standard deviation

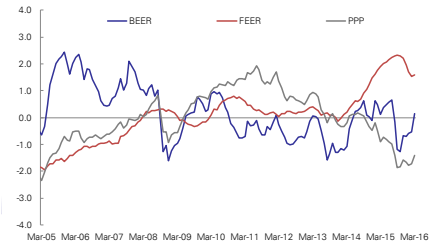
REER misalignments by country: Latin America and G10

Argentina



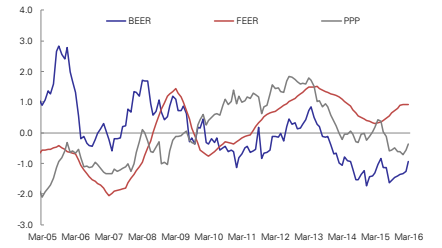
%	2015 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	...	...	...	...	...	...	...	...	...	...	...	...	...
FEER	6.0	7.1	8.2	9.3	10.3	11.3	12.3	13.3	14.4	15.5	15.8	16.1	16.3
PPP	60.4	59.9	59.9	61.4	64.7	68.0	72.2	72.7	75.3	54.7	31.8	23.8	22.0

Brazil



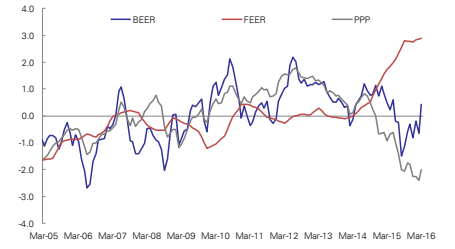
%	2015 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	1.1	3.6	4.7	5.6	6.5	-1.6	-11.7	-12.6	-6.6	-7.0	-5.9	-5.4	1.4
FEER	14.0	14.9	15.2	15.9	16.6	17.0	17.1	17.0	16.3	14.5	12.6	11.2	11.7
PPP	-14.5	-11.5	-13.0	-14.2	-15.6	-22.4	-29.8	-29.0	-24.9	-26.6	-28.5	-27.4	-22.6

Chile



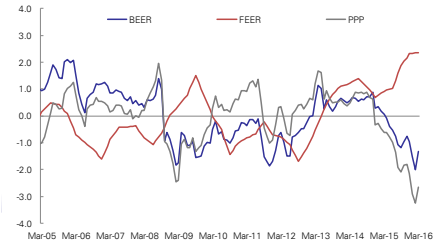
%	2015 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	-9.5	-7.5	-6.1	-8.2	-8.3	-11.7	-11.3	-10.5	-10.3	-9.9	-9.6	-9.2	-6.7
FEER	1.7	1.8	2.0	2.2	2.6	3.1	3.6	4.0	4.4	4.9	5.0	5.1	5.2
PPP	1.8	4.4	3.9	0.3	-1.3	-6.0	-5.9	-5.1	-6.3	-6.2	-7.2	-5.8	-3.9

Colombia



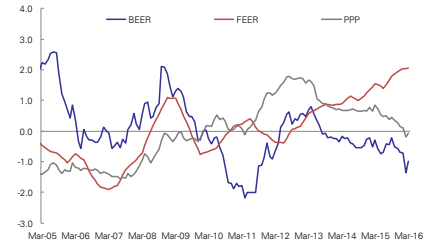
%	2015 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	3.3	1.6	4.0	-1.3	-1.6	-10.0	-7.5	-3.8	-2.0	-5.5	-1.4	-4.2	2.8
FEER	9.1	9.6	10.4	11.0	12.1	13.3	14.7	14.6	14.5	14.4	14.9	15.0	15.1
PPP	-11.7	-8.3	-7.8	-12.4	-17.6	-25.0	-25.6	-21.6	-22.4	-28.1	-28.0	-29.8	-25.1

Mexico



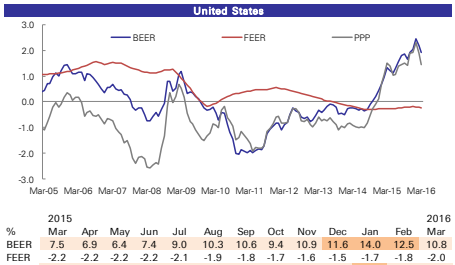
%	2015 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	0.3	-0.4	-2.4	-3.3	-4.5	-6.4	-7.1	-5.7	-4.6	-5.7	-9.1	-11.9	-8.0
FEER	1.2	1.3	1.3	1.3	1.7	2.1	2.5	2.7	2.8	3.0	3.1	3.1	3.1
PPP	-3.7	-3.7	-4.7	-5.9	-8.0	-11.2	-12.3	-10.9	-10.6	-12.7	-17.1	-19.0	-15.6

Peru



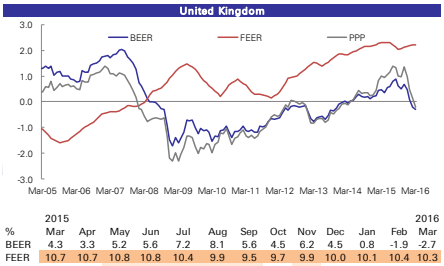
%	2015 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	-1.8	-3.9	-5.0	-4.6	-2.8	-2.9	-1.5	-3.3	-3.7	-4.6	-4.7	-9.0	-6.7
FEER	8.5	8.2	8.0	7.6	8.3	9.1	9.8	10.2	10.5	10.8	11.1	11.2	11.3
PPP	9.2	7.9	5.8	5.3	5.6	4.1	5.1	4.0	3.0	1.8	1.1	-2.2	-0.7

United States



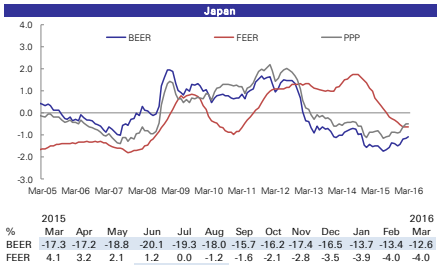
%	2015 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	7.5	6.9	6.4	7.4	9.0	10.3	10.6	9.4	10.9	11.6	14.0	12.5	10.8
FEER	-2.2	-2.2	-2.2	-2.2	-2.1	-1.9	-1.8	-1.7	-1.6	-1.5	-1.7	-1.8	-2.0
PPP	9.5	8.7	6.4	6.6	8.8	9.1	9.4	8.9	11.9	12.1	14.4	11.9	9.1

United Kingdom



%	2015 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	4.3	3.3	5.2	5.6	7.2	8.1	5.6	4.5	6.2	4.5	0.8	-1.9	-2.7
FEER	10.7	10.7	10.8	10.8	10.4	9.9	9.5	9.7	9.9	10.0	10.1	10.4	10.3
PPP	7.3	6.9	7.7	8.5	10.2	9.7	7.4	7.2	10.0	7.2	3.5	1.0	-1.4

Japan



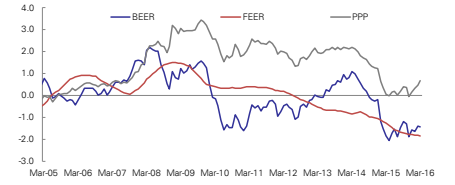
%	2015 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	2016 Mar
BEER	-17.3	-17.2	-18.8	-20.1	-19.3	-18.0	-15.7	-16.2	-17.4	-16.5	-13.7	-13.4	-12.6
FEER	4.1	3.2	2.1	1.2	0.0	-1.2	-1.6	-2.1	-2.8	-3.5	-3.9	-4.0	-4.0
PPP	-11.4	-11.2	-13.5	-15.7	-14.7	-14.4	-12.1	-12.3	-12.7	-12.2	-9.0	-7.1	-7.0

Source: Deutsche Bank

The misalignment estimates in the charts above are presented in terms of standard deviations. The misalignment estimates are shown in the equivalent percentage terms in the tables. The color shading in the tables is based on the standard deviations: no shading indicates that the misalignment estimate is within plus or minus one standard deviation.

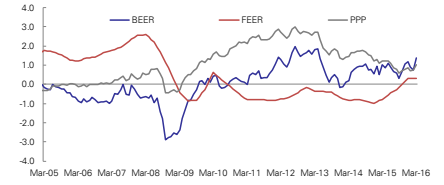
REER misalignments by country: G10 (continued)

Euro area



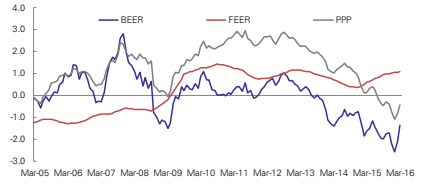
	2015												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	-9.8	-10.8	-8.9	-8.0	-9.8	-7.7	-6.3	-6.8	-9.8	-8.2	-8.5	-7.3	-7.5
FEER	-5.5	-5.9	-6.3	-6.8	-6.9	-7.1	-7.3	-7.4	-7.6	-7.7	-7.8	-7.8	-7.9
PPP	0.3	-0.1	1.3	1.5	0.0	1.8	3.5	3.2	-0.4	1.2	2.8	4.2	6.0

Australia



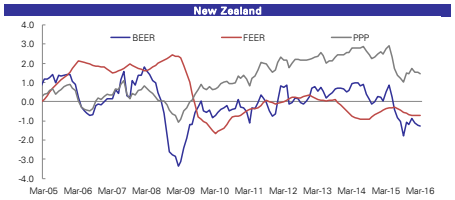
	2015												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	7.9	7.0	8.7	7.1	5.4	4.5	2.4	5.2	8.4	9.3	7.0	5.9	10.8
FEER	-4.0	-3.4	-2.9	-2.3	-1.8	-1.3	-0.8	0.0	0.8	1.6	1.6	1.6	1.6
PPP	19.9	19.7	20.2	17.8	14.3	12.7	9.5	11.5	13.0	14.2	11.5	12.2	16.4

Canada



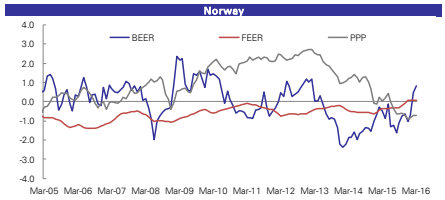
	2015												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	-8.3	-7.7	-6.0	-7.3	-8.6	-9.9	-10.1	-8.8	-8.7	-11.1	-13.1	-10.7	-6.9
FEER	3.3	3.6	3.9	4.2	4.6	4.9	5.3	5.4	5.6	5.7	5.8	6.0	6.0
PPP	1.0	3.0	3.7	2.3	-1.3	-3.4	-4.3	-2.8	-3.7	-6.8	-9.8	-7.6	-3.9

New Zealand



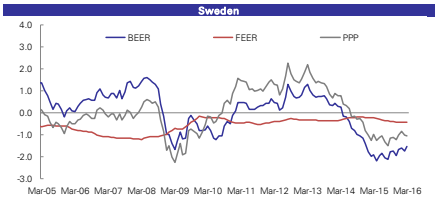
	2015												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	3.2	5.3	1.3	-2.5	-5.2	-6.3	-10.7	-6.5	-7.2	-5.2	-6.7	-7.5	-7.6
FEER	-1.7	-1.6	-1.5	-1.4	-1.8	-2.2	-2.7	-2.9	-3.2	-3.5	-3.5	-3.5	-3.5
PPP	28.0	29.9	23.8	17.8	13.9	12.6	10.3	15.4	15.0	17.5	15.5	15.8	14.9

Norway



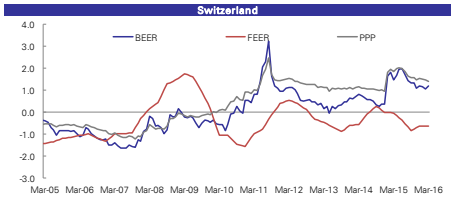
	2015												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	-1.6	-3.0	-0.4	-4.5	-4.2	-5.5	-3.8	-2.6	-2.2	-3.5	-2.4	1.6	2.8
FEER	-4.1	-4.1	-4.2	-4.1	-4.1	-4.0	-3.9	-2.4	-0.9	0.8	0.8	0.9	0.9
PPP	0.2	1.4	3.1	0.0	-2.6	-4.5	-4.7	-4.4	-5.2	-6.7	-6.1	-5.1	-5.0

Sweden



	2015												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	-11.5	-13.1	-11.7	-11.1	-12.3	-12.8	-10.7	-10.5	-11.8	-10.1	-9.7	-10.5	-9.4
FEER	-2.1	-2.5	-2.8	-3.1	-3.3	-3.4	-3.6	-3.7	-3.8	-3.9	-3.9	-4.0	-4.0
PPP	-5.4	-6.8	-6.1	-5.7	-7.1	-8.1	-6.2	-6.0	-6.7	-5.5	-4.5	-5.4	-5.7

Switzerland



	2015												2016
%	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BEER	8.8	10.0	11.5	11.7	10.2	8.6	7.9	7.9	6.4	7.0	6.8	6.3	7.1
FEER	-0.4	-1.2	-2.1	-3.0	-4.4	-5.7	-7.1	-6.6	-6.0	-5.5	-5.4	-5.4	-5.4
PPP	22.2	23.9	24.2	23.9	22.4	19.6	18.7	18.8	17.8	18.5	17.9	17.8	16.7

Source: Deutsche Bank

The misalignment estimates in the charts above are presented in terms of standard deviations. The misalignment estimates are shown in the equivalent percentage terms in the tables. The color shading in the tables is based on the standard deviations: no shading indicates that the misalignment estimate is within plus or minus one standard deviation.

The authors of this report wish to acknowledge the contribution made by Twisha Roy and Antara Banerjee in preparation of this report.

Appendix: Methodological Summary

Behavioral Equilibrium Exchange Rates (BEERs)

We have made a number of technical changes to our preferred long-term valuation model, starting with the October 2015 results. It has evolved into a regional panels estimation with country fixed effects supplemented by individual country estimates for Brazil and Colombia. Panel regressions of the BIS real broad trade weighted exchange rate (REER) are estimated from 2005 onwards for country i, region r (G10, Asia, EMEA, LatAm) and time t, taking the form:

$$REER_{it} = \alpha_i + \beta_r * TOT_{it} + \delta_r * TFP_{it} + \phi_r * OPEN_{it} + \varepsilon_{it}$$

TOT is the ratio of export prices to imports prices and captures the income, wealth and substitution effects from terms of trade shocks. We use Citibank commodity terms of trade indices for commodity exporters (Australia, Canada, New Zealand, Norway, Indonesia, Malaysia, Russia, South Africa, Argentina, Brazil, Chile, Colombia and Peru) and national source TOT indices for all other countries except the Philippines (due to data availability issues).

Although commodity TOT indices miss important non-commodity TOT shifts we use them for commodity producers because they update in a timely fashion with daily commodity prices whereas national source TOT indices are often computed on a 1-2 month lag.

TFP is the ratio of domestic total factor productivity to foreign (trade-weighted) total factor productivity and captures so-called "Balassa-Samuelson" effects through which fast growing countries experience real appreciation via non-tradables inflation. We have changed the way we measure TFP in several key ways. As before we assume a standard Cobb-Douglas production function such that TFP equals the ratio of real GDP per capita over capital stock per capita raised to a constant alpha. Our estimate of alpha has changed from two-fifths to one-third. Additionally, we employ capital stock data from the Penn World Tables v8.1 through 2011 while post-2011 data is extrapolated using the old method of summing gross fixed capital formation. UN working age population estimates replace total population data.

OPEN is a proxy of economic openness measured by the ratio of total trade (exports + imports) to GDP, measured in USD and lagged twelve months to prevent endogeneity. More open regions are typically associated with lower tradables prices and thus lower real exchange rates. We discontinued net foreign assets as an explanatory variable on data availability and endogeneity concerns.

Brazil and Colombia individual regressions are estimated from 1996 and panel regressions are robust back to this time. For more details please see: Finding your equilibrium with BEER, in the November 2015 Emerging Markets Monthly.

Fundamental Equilibrium Exchange Rates (FEERs)

Following Williamson (1983) and others, we define a country's fundamental equilibrium exchange rate (FEER) as the exchange rate needed to ensure that the current account balance converges to a sustainable level over the medium term. There is no strong consensus on what precisely constitutes a sustainable current account balance. The European Commission, for example, has set thresholds of +6% of GDP and -4% of GDP in its mechanism for identifying macroeconomic imbalances. The IMF estimates current account balances that would be consistent with a country's fundamentals and desirable policies. It also calculates the current account balance that would be needed to stabilize a country's net foreign asset position at a benchmark level. We adopt a simpler approach, defining a country's sustainable current account balance as its post-2005 average for EM and post-1991 average for G10. We also adjust for the impact of the business cycle, measured by a country's output gap relative to the output gap of its trading partners. The exchange rate adjustment needed to eliminate the difference between the latest cyclically-adjusted current account balance and its long-term average level is then calculated using an impact parameter.

We use two methodologies to calculate this impact parameter:

(1) Cline's (2008) high elasticity impact parameter, which is equal to price elasticity of exports*(exports/GDP), where price elasticity of exports = -1.583 + 0.83*(exports/GDP). The elasticity of exports is calibrated to vary between -1.5 for highly closed economies (exports<10% of GDP) and -0.75 for highly open economies (exports>100% of GDP).[1]

(2) IMF's External Balance Assessment methodology: the impact parameter is dependent on both export and import openness and elasticities. In particular, impact parameter = -0.71*(exports/GDP) - 0.92*(imports/GDP). The advantage of this methodology is that it explicitly captures how much current account adjustment comes from the import side, whereas Cline's methodology implicitly assumes that all the adjustment takes place on the export side. However, the disadvantage with the IMF methodology is that the elasticity of exports (-0.71) and imports (-0.92) is the same for every country.[2]

[1] See: http://www.iie.com/publications/wp/wp08-6.pdf

[2] See: https://www.imf.org/external/np/res/eba/pdf/2014estimates.pdf

There is no consensus on which of these methods is the single 'correct' one, and there is an inherent arbitrariness in any impact parameter calculation. Therefore, to compute the final FX misalignments in our FEER model, we use the average of the misalignments obtained using the two impact parameters described above.

Note that both methods imply that more open (closed) economies need a smaller (larger) exchange rate adjustment to bring about a given change in the external balance. The two impact parameters we describe above are higher in absolute value than the impact parameter used in our earlier FEER model (which was based on Cline's low elasticity case). Thus, the FEER FX misalignments are smaller in absolute terms in our new model than in the old model, though the ordering of currencies is largely similar.

Purchasing Power Parities (PPPs)

Our third approach to assessing the longer-term fair value of G10 and EM exchange rates is based on the notion that nominal exchange rates should move in line with the ratios of national price levels to ensure purchasing power parity (PPP). As is well known, market exchange rates tend to be substantially more depreciated than PPP rates at lower levels of economic development, i.e. things tend to be cheaper in poorer countries than in richer countries. This gap typically closes as income and productivity levels in a country rise. Our PPP estimates for EM are adjusted to account for this relationship. Our productivity-adjusted PPPs for EM are measured in relative rather than absolute terms, and are calibrated to ensure that they are on average equal to the corresponding market exchange rate from 2005 onwards such that the average misalignment over this period is zero. For G10, we do not employ a productivity adjustment and use a longer calibration period (1996 onwards); this is a departure from our earlier PPP model for G10 which used a productivity adjustment and a post-2005 calibration period.

Many factors move currencies in the short run. Politics, risk appetite, monetary policy, flows and positioning all play their part. Our results are meant to provide a benchmark for long-term "fair value" and deviations from these model values, typically with half-lives of 0.9-1.5 years, are driven by considerations such as the ones above. Indeed, these short-term factors consistently produce opportunities for patient long term investors to profit from fair value misalignments.

Conversion of REER misalignments to USD-cross misalignments

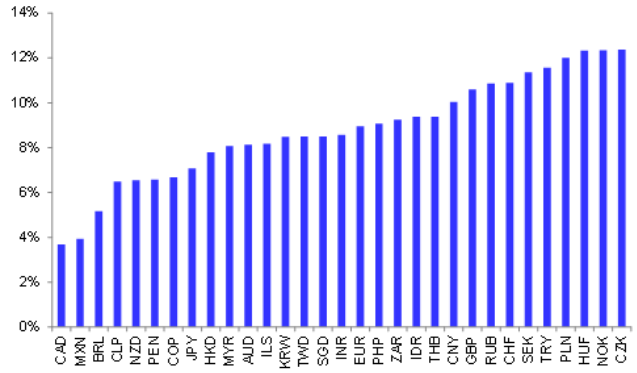
Pages 5-7 of Cline 2008 (http://www.iie.com/publications/wp/wp08-6.pdf) provide a detailed description of the matrix inversion method we use to convert REER misalignments to USD-cross misalignments. For robustness, the USD-cross misalignments reported are an average of those obtained using the matrix inversion method and least squares method, two commonly used methods for this conversion.

Some results may seem surprising. Take the example of the PPP and BEER models. Essentially, because we use USD as the base currency in these conversions, and USD REER is overvalued on these models, the USD-cross misalignment is lesser than the REER misalignment; in other words, the currencies generally look more undervalued on the USD-cross as compared to the REER, because the USD is broadly overvalued. This implies that in some cases a REER overvaluation can flip into a USD-cross undervaluation –for example, CNY REER is 5% overvalued on BEER, but CNY is 5% undervalued vs. USD, meaning USDCNY "fair value" is 6.19.

Below are the differences (REER minus USD cross misalignment) for the BEER model. Bear in mind that USD REER is roughly 12% overvalued. Clearly, this means that USD-crosses are more undervalued than the REERs for all currencies, hence all the differences are positive in the chart below. However, how large the difference is depends on the country's trade share with the US. For countries with large direct trade links with the US (CAD, MXN) the difference between REER and USD cross misalignment is the smallest. For example, if we assume the extreme case where a country only trades with the US, the REER misalignment = USD cross misalignment.

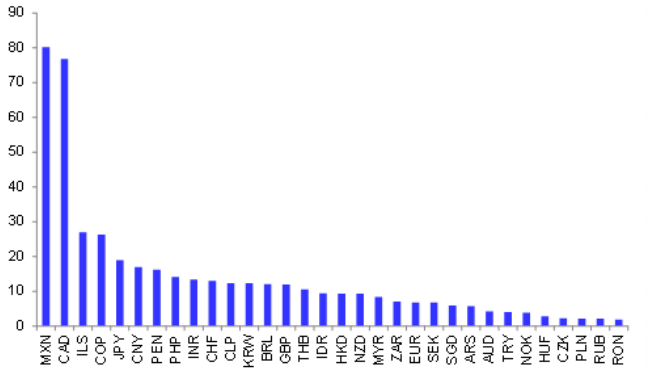
On the other hand there are countries with limited direct trade links with the US, e.g. the euro-linked CEE economies. For these countries, the conversion process essentially adds on the USD REER misalignment (12%) to the HUF REER misalignment to get the USDHUF misalignment. Take the extreme case where a country has zero trade share with the US and only trades with the euro area. As such, the country's REER misalignment would = EUR cross misalignment; therefore to get the USD cross misalignment from the REER misalignment we would need to add on the USD/EUR misalignment, which is close to the USD REER misalignment. Therefore for these countries the differences in the chart below are close to 12%, the USD REER misalignment itself. A similar pattern of differences between REER and USD cross misalignments is reported by Cline (2008).

REER minus USD cross misalignment (%) – BEER model



Source: Deutsche Bank

Export shares to the US (% of total country exports)



Source: Deutsche Bank

Appendix 1

Important Disclosures

Additional information available upon request

*Prices are current as of the end of the previous trading session unless otherwise indicated and are sourced from local exchanges via Reuters, Bloomberg and other vendors . Other information is sourced from Deutsche Bank, subject companies, and other sources. For disclosures pertaining to recommendations or estimates made on securities other than the primary subject of this research, please see the most recently published company report or visit our global disclosure look-up page on our website at http://gm.db.com/ger/disclosure/DisclosureDirectory.eqsr

Analyst Certification

The views expressed in this report accurately reflect the personal views of the undersigned lead analyst(s). In addition, the undersigned lead analyst(s) has not and will not receive any compensation for providing a specific recommendation or view in this report. Gautam Kalani/Daniel Brehon

Regulatory Disclosures

1.Important Additional Conflict Disclosures

Aside from within this report, important conflict disclosures can also be found at https://gm.db.com/equities under the "Disclosures Lookup" and "Legal" tabs. Investors are strongly encouraged to review this information before investing.

2.Short-Term Trade Ideas

Deutsche Bank equity research analysts sometimes have shorter-term trade ideas (known as SOLAR ideas) that are consistent or inconsistent with Deutsche Bank's existing longer term ratings. These trade ideas can be found at the SOLAR link at http://gm.db.com.

Additional Information

The information and opinions in this report were prepared by Deutsche Bank AG or one of its affiliates (collectively "Deutsche Bank"). Though the information herein is believed to be reliable and has been obtained from public sources believed to be reliable, Deutsche Bank makes no representation as to its accuracy or completeness.

If you use the services of Deutsche Bank in connection with a purchase or sale of a security that is discussed in this report, or is included or discussed in another communication (oral or written) from a Deutsche Bank analyst, Deutsche Bank may act as principal for its own account or as agent for another person.

Deutsche Bank may consider this report in deciding to trade as principal. It may also engage in transactions, for its own account or with customers, in a manner inconsistent with the views taken in this research report. Others within Deutsche Bank, including strategists, sales staff and other analysts, may take views that are inconsistent with those taken in this research report. Deutsche Bank issues a variety of research products, including fundamental analysis, equity-linked analysis, quantitative analysis and trade ideas. Recommendations contained in one type of communication may differ from recommendations contained in others, whether as a result of differing time horizons, methodologies or otherwise. Deutsche Bank and/or its affiliates may also be holding debt securities of the issuers it writes on.

Analysts are paid in part based on the profitability of Deutsche Bank AG and its affiliates, which includes investment banking revenues.

Opinions, estimates and projections constitute the current judgment of the author as of the date of this report. They do not necessarily reflect the opinions of Deutsche Bank and are subject to change without notice. Deutsche Bank has no obligation to update, modify or amend this report or to otherwise notify a recipient thereof if any opinion, forecast or estimate contained herein changes or subsequently becomes inaccurate. This report is provided for informational purposes only. It is not an offer or a solicitation of an offer to buy or sell any financial instruments or to participate in any particular trading strategy. Target prices are inherently imprecise and a product of the analyst's judgment. The financial instruments discussed in this report may not be suitable for all investors and investors must make their own informed investment decisions. Prices and availability of financial instruments are subject to change without notice and investment transactions can lead to losses as a result of price fluctuations and other factors. If a financial instrument is denominated in a currency other than an investor's currency, a change in exchange rates may adversely affect the investment. Past performance is not necessarily indicative of future results. Unless otherwise indicated, prices are current as of the end of the previous trading session, and are sourced from local exchanges via Reuters, Bloomberg and other vendors. Data is sourced from Deutsche Bank, subject companies, and in some cases, other parties.

Macroeconomic fluctuations often account for most of the risks associated with exposures to instruments that promise to pay fixed or variable interest rates. For an investor who is long fixed rate instruments (thus receiving these cash flows), increases in interest rates naturally lift the discount factors applied to the expected cash flows and thus cause a loss. The longer the maturity of a certain cash flow and the higher the move in the discount factor, the higher will be the loss. Upside surprises in inflation, fiscal funding needs, and FX depreciation rates are among the most common adverse macroeconomic shocks to receivers. But counterparty exposure, issuer creditworthiness, client segmentation, regulation (including changes in assets holding limits for different types of investors), changes in tax policies, currency convertibility (which may constrain currency conversion, repatriation of profits and/or the liquidation of positions), and settlement issues related to local clearing houses are also important risk factors to be considered. The sensitivity of fixed income instruments to macroeconomic shocks may be mitigated by indexing the contracted cash flows to inflation, to FX depreciation, or to specified interest rates – these are common in emerging markets. It is important to note that the index fixings may -- by construction -- lag or mis-measure the actual move in the underlying variables they are intended to track. The choice of the proper fixing (or metric) is particularly important in swaps markets, where floating coupon rates (i.e., coupons indexed to a typically short-dated interest rate reference index) are exchanged for fixed coupons. It is also important to acknowledge that funding in a currency that differs from the currency in which coupons are denominated carries FX risk. Naturally, options on swaps (swaptions) also bear the risks typical to options in addition to the risks related to rates movements.

Derivative transactions involve numerous risks including, among others, market, counterparty default and illiquidity risk. The appropriateness or otherwise of these products for use by investors is dependent on the investors' own circumstances including their tax position, their regulatory environment and the nature of their other assets and liabilities, and as such, investors should take expert legal and financial advice before entering into any transaction similar to or inspired by the contents of this publication. The risk of loss in futures trading and options, foreign or domestic, can be substantial. As a result of the high degree of leverage obtainable in futures and options trading, losses may be incurred that are greater than the amount of funds initially deposited. Trading in options involves risk and is not suitable for all investors. Prior to buying or selling an option investors must review the "Characteristics and Risks of Standardized Options", at http://www.optionsclearing.com/about/publications/character-risks.jsp. If you are unable to access the website please contact your Deutsche Bank representative for a copy of this important document.

Participants in foreign exchange transactions may incur risks arising from several factors, including the following: (i) exchange rates can be volatile and are subject to large fluctuations; (ii) the value of currencies may be affected by numerous market factors, including world and national economic, political and regulatory events, events in equity and debt markets and changes in interest rates; and (iii) currencies may be subject to devaluation or government imposed exchange controls which could affect the value of the currency. Investors in securities such as ADRs, whose values are affected by the currency of an underlying security, effectively assume currency risk.

Unless governing law provides otherwise, all transactions should be executed through the Deutsche Bank entity in the investor's home jurisdiction.

United States: Approved and/or distributed by Deutsche Bank Securities Incorporated, a member of FINRA, NFA and SIPC. Analysts employed by non-US affiliates may not be associated persons of Deutsche Bank Securities Incorporated and therefore not subject to FINRA regulations concerning communications with subject companies, public appearances and securities held by analysts.

Germany: Approved and/or distributed by Deutsche Bank AG, a joint stock corporation with limited liability incorporated in the Federal Republic of Germany with its principal office in Frankfurt am Main. Deutsche Bank AG is authorized under German Banking Law and is subject to supervision by the European Central Bank and by BaFin, Germany's Federal Financial Supervisory Authority.

United Kingdom: Approved and/or distributed by Deutsche Bank AG acting through its London Branch at Winchester House, 1 Great Winchester Street, London EC2N 2DB. Deutsche Bank AG in the United Kingdom is authorised by the Prudential Regulation Authority and is subject to limited regulation by the Prudential Regulation Authority and Financial Conduct Authority. Details about the extent of our authorisation and regulation are available on request.

Hong Kong: Distributed by Deutsche Bank AG, Hong Kong Branch.

India: Prepared by Deutsche Equities India Pvt Ltd, which is registered by the Securities and Exchange Board of India (SEBI) as a stock broker. Research Analyst SEBI Registration Number is INH000001741. DEIPL may have received administrative warnings from the SEBI for breaches of Indian regulations.

Japan: Approved and/or distributed by Deutsche Securities Inc.(DSI). Registration number - Registered as a financial instruments dealer by the Head of the Kanto Local Finance Bureau (Kinsho) No. 117. Member of associations: JSDA, Type II Financial Instruments Firms Association and The Financial Futures Association of Japan. Commissions and risks involved in stock transactions - for stock transactions, we charge stock commissions and consumption tax by multiplying the transaction amount by the commission rate agreed with each customer. Stock transactions can lead to losses as a result of share price fluctuations and other factors. Transactions in foreign stocks can lead to additional losses stemming from foreign exchange fluctuations. We may also charge commissions and fees for certain categories of investment advice, products and services. Recommended investment strategies, products and services carry the risk of losses to principal and other losses as a result of changes in market and/or economic trends, and/or fluctuations in market value. Before deciding on the purchase of financial products and/or services, customers should carefully read the relevant disclosures, prospectuses and other documentation. "Moody's", "Standard & Poor's", and "Fitch" mentioned in this report are not registered credit rating agencies in Japan unless Japan or "Nippon" is specifically designated in the name of the entity. Reports on Japanese listed companies not written by analysts of DSI are written by Deutsche Bank

Group's analysts with the coverage companies specified by DSI. Some of the foreign securities stated on this report are not disclosed according to the Financial Instruments and Exchange Law of Japan.

Korea: Distributed by Deutsche Securities Korea Co.

South Africa: Deutsche Bank AG Johannesburg is incorporated in the Federal Republic of Germany (Branch Register Number in South Africa: 1998/003298/10).

Singapore: by Deutsche Bank AG, Singapore Branch or Deutsche Securities Asia Limited, Singapore Branch (One Raffles Quay #18-00 South Tower Singapore 048583, +65 6423 8001), which may be contacted in respect of any matters arising from, or in connection with, this report. Where this report is issued or promulgated in Singapore to a person who is not an accredited investor, expert investor or institutional investor (as defined in the applicable Singapore laws and regulations), they accept legal responsibility to such person for its contents.

Taiwan: Information on securities/investments that trade in Taiwan is for your reference only. Readers should independently evaluate investment risks and are solely responsible for their investment decisions. Deutsche Bank research may not be distributed to the Taiwan public media or quoted or used by the Taiwan public media without written consent. Information on securities/instruments that do not trade in Taiwan is for informational purposes only and is not to be construed as a recommendation to trade in such securities/instruments. Deutsche Securities Asia Limited, Taipei Branch may not execute transactions for clients in these securities/instruments.

Qatar: Deutsche Bank AG in the Qatar Financial Centre (registered no. 00032) is regulated by the Qatar Financial Centre Regulatory Authority. Deutsche Bank AG - QFC Branch may only undertake the financial services activities that fall within the scope of its existing QFCRA license. Principal place of business in the QFC: Qatar Financial Centre, Tower, West Bay, Level 5, PO Box 14928, Doha, Qatar. This information has been distributed by Deutsche Bank AG. Related financial products or services are only available to Business Customers, as defined by the Qatar Financial Centre Regulatory Authority.

Russia: This information, interpretation and opinions submitted herein are not in the context of, and do not constitute, any appraisal or evaluation activity requiring a license in the Russian Federation.

Kingdom of Saudi Arabia: Deutsche Securities Saudi Arabia LLC Company, (registered no. 07073-37) is regulated by the Capital Market Authority. Deutsche Securities Saudi Arabia may only undertake the financial services activities that fall within the scope of its existing CMA license. Principal place of business in Saudi Arabia: King Fahad Road, Al Olaya District, P.O. Box 301809, Faisaliah Tower - 17th Floor, 11372 Riyadh, Saudi Arabia.

United Arab Emirates: Deutsche Bank AG in the Dubai International Financial Centre (registered no. 00045) is regulated by the Dubai Financial Services Authority. Deutsche Bank AG - DIFC Branch may only undertake the financial services activities that fall within the scope of its existing DFSA license. Principal place of business in the DIFC: Dubai International Financial Centre, The Gate Village, Building 5, PO Box 504902, Dubai, U.A.E. This information has been distributed by Deutsche Bank AG. Related financial products or services are only available to Professional Clients, as defined by the Dubai Financial Services Authority.

Australia: Retail clients should obtain a copy of a Product Disclosure Statement (PDS) relating to any financial product referred to in this report and consider the PDS before making any decision about whether to acquire the product. Please refer to Australian specific research disclosures and related information at https://australia.db.com/australia/content/research-information.html

Australia and New Zealand: This research, and any access to it, is intended only for "wholesale clients" within the meaning of the Australian Corporations Act and New Zealand Financial Advisors Act respectively.
Additional information relative to securities, other financial products or issuers discussed in this report is available upon request. This report may not be reproduced, distributed or published without Deutsche Bank's prior written consent.

David Folkerts-Landau
Chief Economist and Global Head of Research

Raj Hindocha
Global Chief Operating Officer
Research

Marcel Cassard
Global Head
FICC Research & Global Macro Economics

Steve Pollard
Global Head
Equity Research

Michael Spencer
Regional Head
Asia Pacific Research

Ralf Hoffmann
Regional Head
Deutsche Bank Research, Germany

Andreas Neubauer
Regional Head
Equity Research, Germany

International Locations

Deutsche Bank AG
Deutsche Bank Place
Level 16
Corner of Hunter & Phillip Streets
Sydney, NSW 2000
Australia
Tel: (61) 2 8258 1234

Deutsche Bank AG
Große Gallusstraße 10-14
60272 Frankfurt am Main
Germany
Tel: (49) 69 910 00

Deutsche Bank AG
Filiale Hongkong
International Commerce Centre,
1 Austin Road West,Kowloon,
Hong Kong
Tel: (852) 2203 8888

Deutsche Securities Inc.
2-11-1 Nagatacho
Sanno Park Tower
Chiyoda-ku, Tokyo 100-6171
Japan
Tel: (81) 3 5156 6770

Deutsche Bank AG London
1 Great Winchester Street
London EC2N 2EQ
United Kingdom
Tel: (44) 20 7545 8000

Deutsche Bank Securities Inc.
60 Wall Street
New York, NY 10005
United States of America
Tel: (1) 212 250 2500