

Risk-free interest rate term structures

Preliminary calculation of the UFR for 2019

1. Expected real rate

The UFR is the sum of an expected real rate and an expected inflation rate. The expected real rate is the same for all currencies. It is calculated as a simple average of the past real rates since 1961. For the calculation of the expected real rate for 2019, the observed real rate of 2017, which is - 1.73%, newly enters the calculation. The resulting expected real rate is 1.60%. Annex 1 sets out intermediate results of the calculation.

2. Expected inflation rate

The expected inflation rate is currency-specific. It is based on the inflation target of central banks and can take the values 1%, 2%, 3% or 4%.

The expected inflation rate is unchanged for most currencies. The expected inflation rates for the South Korean won changed because of changes to the inflation target. The following table sets out the expected inflation rate per currency. Annexes 2 and 3 set out the underlying inflation targets and the determination of the expected inflation rate for currencies without inflation target.

	Currency	Expected inflation rate
EUR	Euro	2%
CZK	Czech koruna	2%
GBP	Pound sterling	2%
HRK	Kuna	2%
HUF	Forint	3%
PLN	Zloty	2%
RON	Leu	2%
SEK	Krona	2%
CHF	Swiss franc	1%

ISK	Króna	2%
NOK	Norwegian krone	2%
AUD	Australian dollar	2%
BRL	Real	4%
CAD	Canadian dollar	2%
CLP	Chilean peso	3%
CNY	Renminbi-yuan	3%
COP	Colombian peso	3%
HKD	Hong Kong dollar	2%
INR	Indian rupee	4%
JPY	Yen	2%
KRW	South Korean won	2%
MYR	Ringgit	2%
MXN	Mexican peso	3%
NZD	New Zealand dollar	2%
RUB	Russian rouble	4%
SGD	Singapore dollar	2%
THB	Baht	2%
TRY	Turkish lira	4%
TWD	New Taiwan dollar	2%
USD	US dollar	2%
ZAR	Rand	4%

3. Ultimate forward rate

The following table sets out the calculated UFRs and the UFRs applicable in 2019.

	Currency	Calculated UFR	UFR applicable in 2019
EUR	Euro	3.60%	3.90%
CZK	Czech koruna	3.60%	3.90%
GBP	Pound sterling	3.60%	3.90%
HRK	Kuna	3.60%	3.90%
HUF	Forint	4.60%	4.50%
PLN	Zloty	3.60%	3.90%
RON	Leu	3.60%	3.90%
SEK	Krona	3.60%	3.90%
CHF	Swiss franc	2.60%	2.90%
ISK	Króna	3.60%	3.90%
NOK	Norwegian krone	3.60%	3.90%
AUD	Australian dollar	3.60%	3.90%
BRL	Real	5.60%	5.50%
CAD	Canadian dollar	3.60%	3.90%
CLP	Chilean peso	4.60%	4.50%
CNY	Renminbi-yuan	4.60%	4.50%
COP	Colombian peso	4.60%	4.50%
HKD	Hong Kong dollar	3.60%	3.90%
INR	Indian rupee	5.60%	5.50%
JPY	Yen	3.60%	3.50%
KRW	South Korean won	3.60%	3.90%
MYR	Ringgit	3.60%	3.90%
MXN	Mexican peso	4.60%	4.90%
NZD	New Zealand dollar	3.60%	3.90%
RUB	Russian rouble	5.60%	4.50%
SGD	Singapore dollar	3.60%	3.90%
THB	Baht	3.60%	3.90%
TRY	Turkish lira	5.60%	5.50%
TWD	New Taiwan dollar	3.60%	3.90%
USD	US dollar	3.60%	3.90%
ZAR	Rand	5.60%	5.50%

Annex 1 – Calculation of the expected real rate

The following table sets out the time series of real rates used for the calculation of the expected real rate. Real rates in the table are rounded to 3 digits for presentational reasons.

Year	Real rates
1961	1.57%
1962	0.11%
1963	0.02%
1964	0.46%
1965	1.08%
1966	1.65%
1967	1.89%
1968	1.81%
1969	2.08%
1970	2.49%
1971	-0.22%
1972	-0.91%
1973	0.80%
1974	-1.12%
1975	-4.82%
1976	-0.92%
1977	-1.65%
1978	0.77%
1979	1.45%
1980	1.06%
1981	3.72%
1982	3.35%
1983	3.48%
1984	4.35%
1985	4.48%
1986	5.83%
1987	5.02%
1988	4.76%
1989	5.73%
1990	5.75%
1991	4.88%
1992	5.56%
1993	3.90%
1994	3.12%
1995	3.58%
1996	2.33%
1997	2.80%
1998	3.15%

1999	2.28%
2000	2.81%
2001	1.82%
2002	1.24%
2003	0.48%
2004	0.50%
2005	0.57%
2006	1.62%
2007	2.59%
2008	1.18%
2009	0.56%
2010	-1.04%
2011	-1.70%
2012	-1.82%
2013	-1.32%
2014	-0.59%
2015	-0.09%
2016	-0.70%
2017 ¹	-1.73%

Expected real rate before rounding:

= Average of real rates from 1961 to 2017

= 1.57985%

Expected real rate after rounding:

= **1.60%**

¹ Please note that the short-term nominal interest rates used to derive the real rate component are not available yet from the AMECO website since the Commission changed the publication calendar. The same rates are however available on the Eurostat website (<http://ec.europa.eu/eurostat/web/interest-rates/data/database>, Short-term interest rates -> Money market interest rates annual -> 3-month rates).

Annex 2 – Inflation targets

The following table sets out the inflation targets. The information was derived from the specified sources on 22 and 23 February 2018.

	Currency	Inflation target	Source
EUR	Euro	Below, but close to 2%	https://www.ecb.europa.eu/mopo/html/index.en.html
CZK	Czech koruna	2% ± 100bps	https://www.cnb.cz/en/monetary_policy/inflation_targeting.html#c2 https://www.cnb.cz/miranda2/export/sites/www.cnb.cz/en/monetary_policy/strategic_documents/download/inflacni_cil_cnb_en_2010.pdf
GBP	Pound sterling	2%	https://www.bankofengland.co.uk/monetary-policy
HRK	Kuna	No IT	
HUF	Forint	3% ± 100bps	http://www.mnb.hu/en/monetary-policy/monetary-policy-framework/inflation-targeting
PLN	Zloty	2.5% ± 100bps	http://www.nbp.pl/homen.aspx?f=/en/onbp/informacje/polityka_pieniezna.html
RON	Leu	2.5% ± 100bps	http://bnr.ro/Inflation-Targets-3241.aspx
SEK	Krona	2%	https://www.riksbank.se/en-gb/monetary-policy/the-inflation-target/
CHF	Swiss franc	Less than 2 %	https://www.snb.ch/en/ifor/public/qas/id/qas_gp_strat#t6
ISK	Króna	2.50% ± 150bps	http://www.cb.is/monetary-policy/inflation-target/ , in addition also: http://www.cb.is/library/Skraarsafn---EN/Monetary-Policy-Committee/Declaration%20inflation.pdf
NOK	Norwegian krone	2.5%	http://www.norges-bank.no/en/Statistics/Inflation/
AUD	Australian dollar	2% - 3%	http://www.rba.gov.au/inflation/inflation-target.html

BRL	Real	4% ± 150bps	http://www.bcb.gov.br/pt-br/#!/n/inflation with further link to http://www.bcb.gov.br/pec/metas/InflationTargetingTable.pdf and to http://www.bcb.gov.br/ingles/copom/a-hist.asp
CAD	Canadian dollar	2% ± 100bps	http://www.bankofcanada.ca/rates/indicators/key-variables/inflation-control-target/
CLP	Chilean peso	3% ± 100bps	http://www.bcentral.cl/documents/145129/925400/mpr122017.pdf/732bded5-e890-d0c1-90eb-c9d0e2507b90 http://www.bcentral.cl/documents/145129/150750/bcch_archivo_102141_en.pdf/4296cb0e-e729-9bd9-0015-f1bd7a063f0a
CNY	Renminbi-yuan	3%	http://www.china.org.cn/china/2018-02/09/content_50466787.htm http://www.chinadaily.com.cn/a/201801/11/WS5a569f2ca3102e5b173740d3.html
COP	Colombian peso	3% ± 100bps	http://banrep.gov.co/en/monetary-policy/monetary-policy-inflation-targeting-strategy-colombia
HKD	Hong Kong dollar	No IT	
INR	Indian rupee	4% ± 200bps	https://rbi.org.in/Scripts/BS_PressReleaseDisplay.aspx?prid=43195
JPY	Yen	2%	https://www.boj.or.jp/en/mopo/outline/qqe.htm/#p01
KRW	South Korean won	2% ± 50bps	http://eng.bok.or.kr/broadcast.action?menuNaviId=1612
MYR	Ringgit	No IT	
MXN	Mexican peso	3%	http://www.banxico.org.mx/politica-monetaria-e-inflacion/material-de-referencia/basico/preguntas-frecuentes-de-politica-monetaria-e-infla/monetary-policy-and-inflation.html http://www.banxico.org.mx/publicaciones-y-discursos/publicaciones/informes-periodicos/trimestral-inflacion/%7B5645F1BC-7432-09B5-8689-0CEA6A10EF07%7D.pdf
NZD	New Zealand dollar	2% ± 100bps	https://www.rbnz.govt.nz/-/media/ReserveBank/Files/Publications/Monetary%20policy%20statements/2018/mpsfeb18.pdf https://www.rbnz.govt.nz/monetary-policy/policy-targets-agreements/pta-november-2017

RUB	Russian rouble	4%	http://www.cbr.ru/eng/
SGD	Singapore dollar	2%	http://www.mas.gov.sg/News-and-Publications/Speeches-and-Monetary-Policy-Statements/Monetary-Policy-Statements/2017/MAS-Monetary-Policy-Statement-13Oct17.aspx
THB	Baht	2.50% ± 150bps	https://www.bot.or.th/English/MonetaryPolicy/MonetPolicyKnowledge/Pages/Target.aspx
TRY	Turkish lira	5%	http://www.tcmb.gov.tr/wps/wcm/connect/EN/TCMB+EN/Main+Menu/Core+Functions/Monetary+Policy/PRICE+STABILITY+AND+INFLATION/Inflation+Targets
TWD	New Taiwan dollar	No IT	
USD	US dollar	2%	https://www.federalreserve.gov/monetarypolicy/files/FOMC_LongerRunGoals.pdf
ZAR	Rand	3%-6%	https://www.resbank.co.za/MonetaryPolicy/DecisionMaking/Pages/InflationMeasures.aspx

Annex 3 – Derivation of the expected real rate for currencies without inflation target

For currencies without inflation target the expected inflation rate is derived from the past inflation rates and their projection to the future. The following table sets out for the affected currencies the average inflation over the last 10 years and the projected inflation rate in 2052 (in 35 years) according to an ARMA model.

Currency	Average inflation rate over the last 10 years	Projection
Croatian kuna	1.4%	2.3%
Malaysian ringgit	2.6%	2.4%
Hong Kong dollar	3.0%	2.5%
New Taiwan dollar	1.0%	1.7%
Singapore dollar	2.1%	2.5%

According to the UFR methodology the expected inflation rate for currencies without inflation target is 2%, unless both the 10-year average and the projection clearly indicate that the inflation is expected to be at least one percentage point different from 2%. All currencies therefore fall in the 2% bucket. For the Hong Kong dollar the average is at 3%, but the trend is downwards.