# Risk-free interest rate term structures

# Report on the

# Calculation of the UFR for 2020

## Executive summary

EIOPA has calculated ultimate forward rate (UFR) for 2020 in accordance with the methodology to derive the UFR. For the euro the calculated UFR for 2020 is 3.55%. As the current UFR for the euro is 3.90% and the annual change of the UFR is according to the methodology limited to 15 basis points, the applicable UFR in 2020 is 3.75%. That UFR is for the first time applicable for the calculation of the risk-free interest rates of 1 January 2020[1].

## 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 2020, the observed real rate of 2018, which is - 1.68%, newly enters the calculation. The resulting expected real rate is 1.55%. 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%.

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[1] Please note that the EC Delegated act published by the Commission on the 8th of March 2019 will introduce some new provisions concerning EIOPA's work on the risk-free technical information, including that the technical information shall be modified by EIOPA at the request of the European Commission. http://ec.europa.eu/finance/docs/level-2-measures/solvency2-delegated-regulation-2019-1900_en.pdf

The expected inflation rate remains unchanged for all currencies. 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 2020.

| Currency Code | Currency | Calculated UFR | UFR applicable in 2020 |
|---|---|---|---|
| EUR | Euro | 3.55% | 3.75% |
| CZK | Czech koruna | 3.55% | 3.75% |
| GBP | Pound Sterling | 3.55% | 3.75% |
| HRK | Kuna | 3.55% | 3.75% |
| HUF | Forint | 4.55% | 4.50% |
| PLN | Zloty | 3.55% | 3.75% |
| RON | Leu | 3.55% | 3.75% |
| SEK | Krona | 3.55% | 3.75% |
| CHF | Swiss franc | 2.55% | 2.75% |
| ISK | Króna | 3.55% | 3.75% |
| NOK | Norwegian krone | 3.55% | 3.75% |
| AUD | Australian dollar | 3.55% | 3.75% |
| BRL | Real | 5.55% | 5.50% |
| CAD | Canadian dollar | 3.55% | 3.75% |
| CLP | Chilean peso | 4.55% | 4.50% |
| CNY | Renminbi-yuan | 4.55% | 4.50% |
| COP | Colombian peso | 4.55% | 4.50% |
| HKD | Hong Kong dollar | 3.55% | 3.75% |
| INR | Indian rupee | 5.55% | 5.50% |
| JPY | Yen | 3.55% | 3.50% |
| KRW | South Korean won | 3.55% | 3.75% |
| MYR | Ringgit | 3.55% | 3.75% |
| MXN | Mexican peso | 4.55% | 4.75% |
| NZD | New Zealand dollar | 3.55% | 3.75% |
| RUB | Russian rouble | 5.55% | 4.65% |
| SGD | Singapore dollar | 3.55% | 3.75% |
| THB | Baht | 3.55% | 3.75% |
| TRY | Turkish lira | 5.55% | 5.50% |
| TWD | New Taiwan dollar | 3.55% | 3.75% |
| USD | US dollar | 3.55% | 3.75% |
| ZAR | Rand | 5.55% | 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 2 decimal digits for presentational reasons.

| Year | Real rates[2] |
|------|-----------|
| 1961 | 1.58% |
| 1962 | 0.09% |
| 1963 | 0.01% |
| 1964 | 0.46% |
| 1965 | 1.09% |
| 1966 | 1.64% |
| 1967 | 1.89% |
| 1968 | 1.82% |
| 1969 | 2.08% |
| 1970 | 2.50% |
| 1971 | -0.23% |
| 1972 | -0.91% |
| 1973 | 0.81% |
| 1974 | -1.11% |
| 1975 | -4.82% |
| 1976 | -0.94% |
| 1977 | -1.66% |
| 1978 | 0.78% |
| 1979 | 1.45% |
| 1980 | 1.05% |
| 1981 | 3.71% |
| 1982 | 3.34% |
| 1983 | 3.48% |
| 1984 | 4.35% |
| 1985 | 4.48% |
| 1986 | 5.83% |
| 1987 | 5.01% |
| 1988 | 4.74% |
| 1989 | 5.66% |
| 1990 | 5.61% |
| 1991 | 4.87% |
| 1992 | 5.53% |
| 1993 | 3.90% |
| 1994 | 3.11% |
| 1995 | 3.56% |

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[2] For the CPI in the UK the ONS changed the main national statistic from the CPI to the CPIH (CPI including owner-occupiers' housing costs). Therefore, minor changes can be observed in the history of the real rate compared to last year.

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|------|--------|
| 1996 | 2.25% |
| 1997 | 2.73% |
| 1998 | 3.12% |
| 1999 | 2.23% |
| 2000 | 2.74% |
| 2001 | 1.77% |
| 2002 | 1.21% |
| 2003 | 0.49% |
| 2004 | 0.47% |
| 2005 | 0.57% |
| 2006 | 1.61% |
| 2007 | 2.58% |
| 2008 | 1.18% |
| 2009 | 0.58% |
| 2010 | -0.94% |
| 2011 | -1.61% |
| 2012 | -1.79% |
| 2013 | -1.28% |
| 2014 | -0.60% |
| 2015 | -0.17% |
| 2016 | -0.73% |
| 2017 | -1.72% |
| 2018 | -1.68%[3] |

Expected real rate before rounding:

    = Average of real rates from 1961 to 2018

    = 1.51312%

Expected real rate after rounding:

    = **1.55%**

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[3] Due to a change in the publication calendar the nominal rates for 2018 were not yet available from the regular data provider AMECO. The same data were already available from EUROSTAT and were used for the calculaton (http://ec.europa.eu/eurostat/web/interest-rates/data/database -> "Short term interest rates (irt_st)" -> "Money market interest rates - annual data (irt_st_a)" -> 3-month Money Market interest 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** | https://www.hnb.hr/en/core-functions/monetary-policy/monetary-policy-framework |
| **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 | around 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% | http://www.norges-bank.no/en/Statistics/Inflation/ |
| **AUD** | Australian dollar | 2% - 3% | http://www.rba.gov.au/inflation/inflation-target.html |

| | | | |
|---|---|---|---|
| **BRL** | Real | 4.5% ± 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** | https://www.hkma.gov.hk/eng/key-functions/monetary-stability.shtml |
| **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% | http://eng.bok.or.kr/broadcast.action?menuNaviId=1612 https://www.bok.or.kr/eng/main/contents.do?menuNo=400015 |
| **MYR** | Ringgit | **No IT** | |
| **MXN** | Mexican peso | 3% ± 100bps | 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 in addition also: http://www.banxico.org.mx/publicaciones-y-discursos/publicaciones/informes-periodicos/trimestral-inflacion/%7B5645F1BC-7432-09B5-8689-0CEA6A10EF07%7D.pdf and http://www.centralbanknews.info/p/inflation-targets.html |
| **NZD** | New Zealand | 2% ± 100bps | https://www.rbnz.govt.nz/-/media/ReserveBank/Files/Publications/Monetary%20policy%20statements/2018/mpsfeb18.pdf |

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|---|---|---|---|
| | dollar | | 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 | **No IT** | http://www.mas.gov.sg/News-and-Publications/Speeches-and-Monetary-Policy-Statements/Monetary-Policy-Statements/2017/MAS-Monetary-Policy-Statement-13Oct17.aspx<br>http://www.mas.gov.sg/Monetary-Policy-and-Economics/Monetary-Policy.aspx |
| **THB** | Baht | 2.50% ± 150bps | https://www.bot.or.th/English/MonetaryPolicy/MonetPolicyKnowledge/Pages/Target.aspx |
| **TRY** | Turkish lira | 5% ± 200bps | 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 2053 (in 35 years) according to an ARMA model.

| Currency | Average inflation rate over the last 10 years | Projection |
|---|---|---|
| Croatian kuna | 1.2% | 2.3% |
| Malaysian ringgit | 2.1% | 2.3% |
| Hong Kong dollar | 3.0% | 2.6% |
| New Taiwan dollar | 0.9% | 1.6% |
| Singapore dollar | 1.6% | 2.4% |

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.