

Market Price Monitor

Local Equity Markets

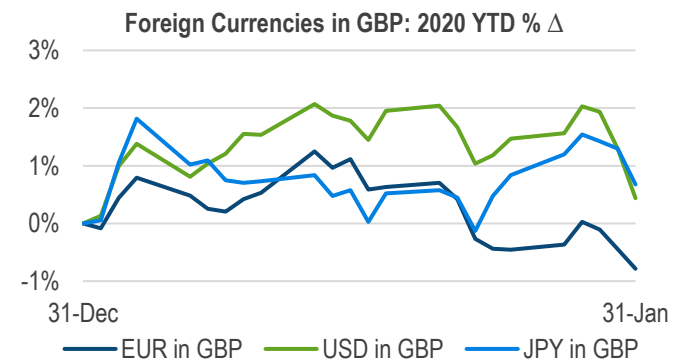
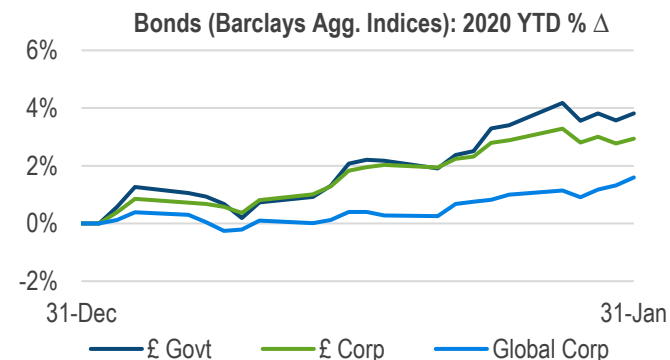
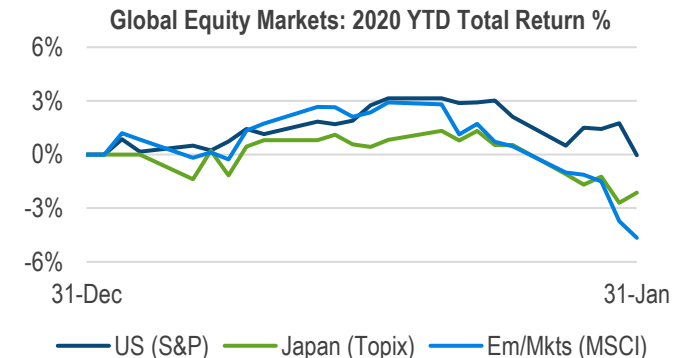
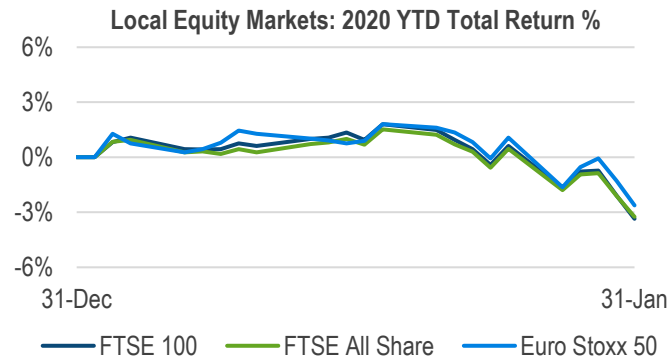
- After a very strong performance in 2019, equity markets started 2020 on the back foot due to fears of a coronavirus outbreak and rising tensions between the US and Iran.
- The FTSE 100 ended the month down by 3.4%, with the UK officially leaving the EU on the last day of the month.
- The Euro Stoxx 50 index was down 2.6% at month-end.

Global Equity Markets

- The MSCI emerging markets index suffered a loss of 4.7% during the month, while Japanese equity markets lost 2.1% in that period.
- The S&P 500 was unchanged at month-end.

Bond/FX Markets

- Bond markets had a strong performance during the month, as investors poured into less risky assets.
- The British government bond index was up 3.8% at month-end, while its corporate counterpart ended the month 2.9% up.
- The British Pound had a mixed performance in January, ending the month down against the Japanese Yen, and the US dollar losing 0.7% and 0.4% against them, respectively.
- In contrast, the Pound gained 0.8% against the Euro.



	Total Returns as of January 31, 2020											
	FTSE 100	FTSE All Share	Euro Stoxx 50	US (S&P)	Japan (Topix)	Em/Mkts (MSCI)	£ Govt	£ Corp	Global Corp	EUR in GBP	USD in GBP	JPY in GBP
1 Month	-3.4%	-3.2%	-2.6%	0.0%	-2.1%	-4.7%	3.8%	2.9%	1.6%	-0.8%	0.4%	0.7%
3 Month	1.1%	2.2%	1.3%	6.7%	1.2%	2.4%	1.4%	2.9%	2.2%	-2.5%	-2.0%	-2.4%
1 Year	9.4%	10.7%	19.3%	21.7%	10.2%	4.2%	10.1%	12.1%	10.8%	-3.7%	-0.6%	-0.2%
YTD	-3.4%	-3.2%	-2.6%	0.0%	-2.1%	-4.7%	3.8%	2.9%	1.6%	-0.8%	0.4%	0.7%

Milliman Financial Risk Management

London Market Monitor – 31 January 2020

Data sources: Bloomberg; Barclays; EIOPA; Oxford-Man Institute; ONS; Milliman FRM

Solvency II Monitor - Rates

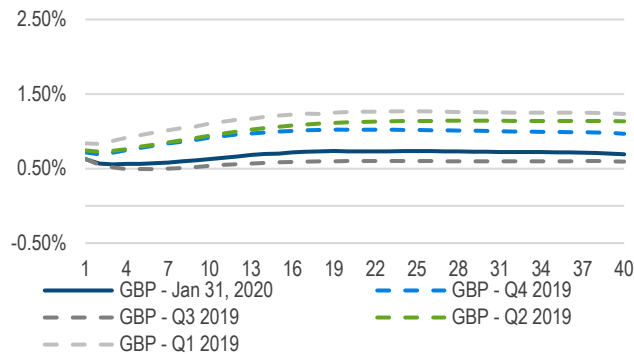
Risk Free Rates

- GBP Solvency II risk-free rates decreased at all terms in January, with medium to longer-term rates seeing the largest declines.
- The 10 and 20-year GBP risk-free rates decreased by 29 basis, while the 30-year rate decreased by 28 basis points.
- European risk-free rates decreased at all terms in January, reversing the trend from the previous four months.
- The 10 and the 20-year EUR risk-free rates saw the biggest decline, decreasing by 27 and 29 basis points, respectively.
- The UFR for the GBP and EUR were reduced by 15 basis points in January to 3.75%.

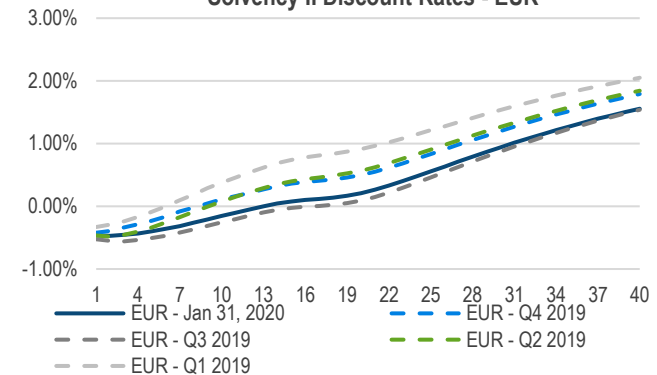
Credit Risk Adjustment

- GBP CRA decreased by 1 basis point in January to 10 basis points. While the EUR CRA remained unchanged at 10 basis points.

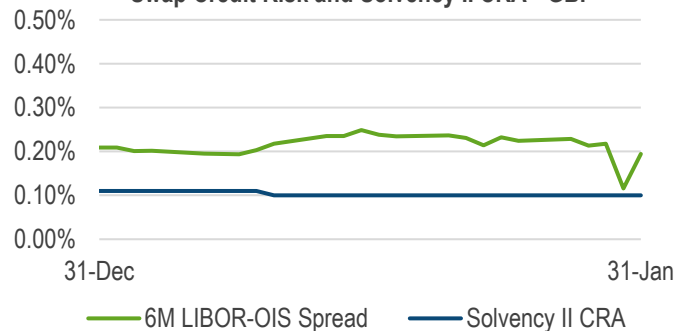
Solvency II Discount Rates - GBP



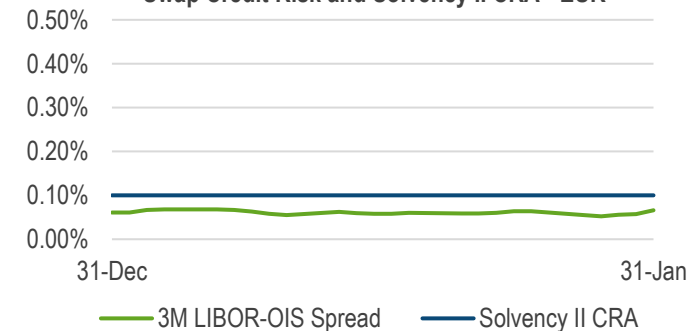
Solvency II Discount Rates - EUR



Swap Credit Risk and Solvency II CRA - GBP



Swap Credit Risk and Solvency II CRA - EUR



Change in GBP Discount and CRA (bps)

	1Y	Y5	Y10	Y20	Y30	CRA
Since Q4 2019	-9	-22	-29	-29	-28	-1
Since Q3 2019	0	7	9	13	13	-1
Since Q2 2019	-12	-23	-32	-39	-42	-1
Since Q1 2019	-21	-39	-48	-53	-53	-1

Change in EUR Discount and CRA (bps)

	1Y	Y5	Y10	Y20	Y30	CRA
Since Q4 2019	-5	-17	-27	-29	-26	0
Since Q3 2019	6	11	10	12	7	0
Since Q2 2019	0	-6	-23	-36	-33	0
Since Q1 2019	-14	-31	-53	-70	-59	0

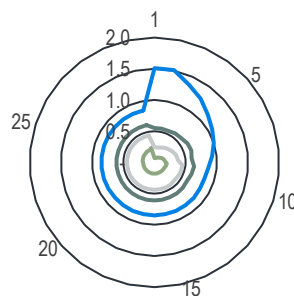
Solvency II Monitor - Spreads

Fundamental Spreads

- The fundamental spread data shown is for the end of December.
- There were no material changes since the last report.

Fundamental Spreads %

GBP - Financial

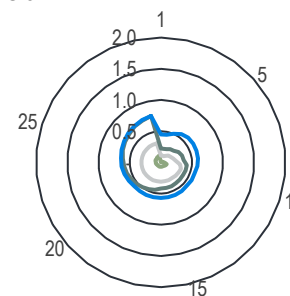


— AAA — AA — A — BBB

GBP Financial Fundamental Spread %					
	1Y	Y5	Y10	Y20	Y30
AAA	0.07	0.11	0.19	0.18	0.23
AA	0.24	0.31	0.45	0.44	0.44
A	0.55	0.58	0.62	0.61	0.61
BBB	1.51	1.15	0.84	0.85	0.85

GBP Financial 'Before Floor' %					
	1Y	Y5	Y10	Y20	Y30
AAA	0.00	0.04	0.08	0.16	0.23
AA	0.04	0.06	0.11	0.19	0.27
A	0.06	0.13	0.21	0.34	0.47
BBB	0.16	0.27	0.37	0.53	0.65

GBP - Non-Financial



— AAA — AA — A — BBB

GBP Non-Financial Fundamental Spread %					
	1Y	Y5	Y10	Y20	Y30
AAA	0.00	0.01	0.10	0.07	0.11
AA	0.11	0.16	0.34	0.31	0.31
A	0.22	0.28	0.42	0.52	0.76
BBB	0.45	0.59	0.57	0.57	0.76

GBP Non-Financial 'Before Floor' %					
	1Y	Y5	Y10	Y20	Y30
AAA	0.00	0.01	0.04	0.07	0.11
AA	0.00	0.04	0.08	0.17	0.25
A	0.04	0.15	0.27	0.52	0.76
BBB	0.11	0.22	0.35	0.56	0.76

The **Solvency II risk-free discount rates** are based on applying the Smith-Wilson Extrapolation to LIBOR swap rates sourced from Bloomberg (current curve is for 31/01/20) and applying the Credit Risk Adjustment as defined in the Technical Specs.

The **Credit Risk Adjustment** is a component of the risk-free discount curve defined by EIOPA. It is calculated from actual experience in the 'LIBOR-OIS' spread (3 months for EUR, 6 months for GBP), and is bounded between 0.10 and 0.35. We show actual LIBOR-OIS spread levels and the defined CRA, for both GBP and EUR.

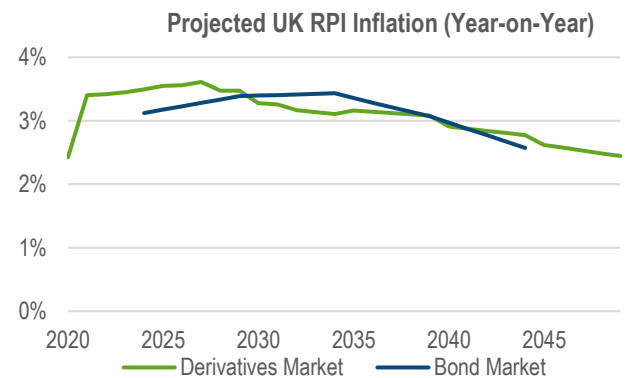
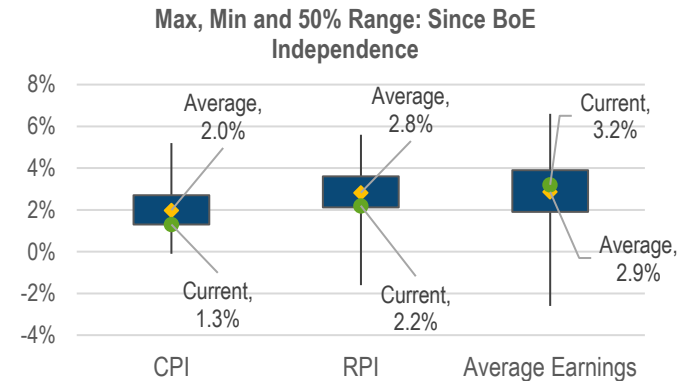
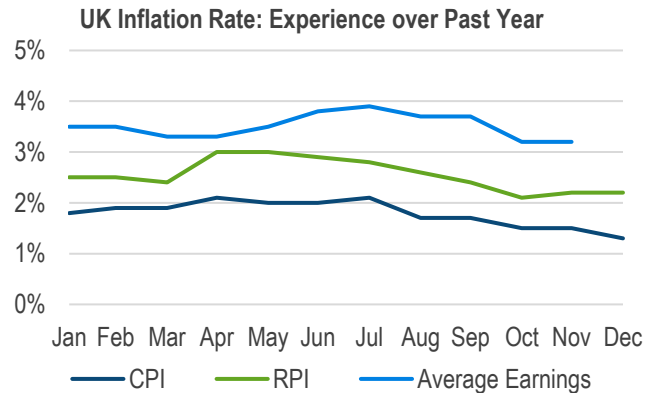
EIOPA fundamental spreads show the credit spread corresponding to the risk of default or downgrading of an asset. This is shown here across financial and non-financial assets, credit quality steps 0-3 and durations of 1-30 years. The data is provided by EIOPA and as of 31/12/19. **Fundamental spread** = maximum (probability of default + cost of downgrade; 35% of long-term average spread). In the tables we show the 'before floor' measure = probability of default + cost of downgrade.

UK Inflation Monitor

- UK's CPI inflation decreased by 20 basis points to 1.3% in December, while the RPI measure remained unchanged at 2.2%.
- According to the ONS: "The largest contribution came from housing, water, electricity, gas and other fuels. The largest downward contribution came from accommodation services and clothing."
- UK average earnings were unchanged in November, with the headline reading at 3.2%.
- There were no updates to the GDP figure this month.

House of Lords' Report

- On 13 January 2020, the chancellor of exchequer [wrote](#) to Lord Forsyth - the Chairman of the Economic Affairs Committee, in regards to the planned consultation, on whether the proposed correction to the RPI measure should be made at a date other than 2030.
- The consultation was originally planned to launch in January, however, the chancellor in his letter announced that this has been delayed to 11 March 2020, where it will be open for responses until 22 April 2020.
- In his letter, the chancellor indicates that the government and the UK Statistics Authority (UKSA), will respond to the consultation before the parliamentary summer recess.



Historical year-on-year inflation rate is assessed by the % change on:

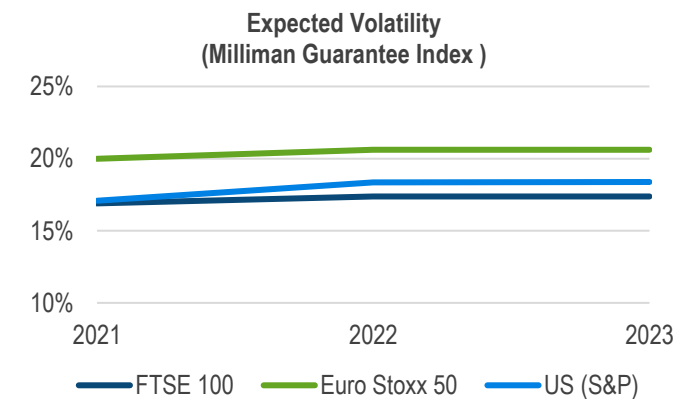
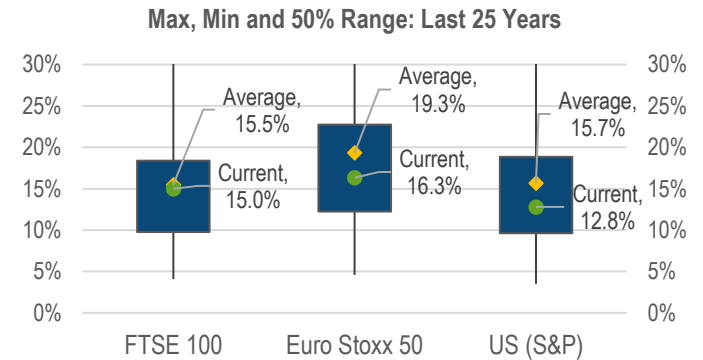
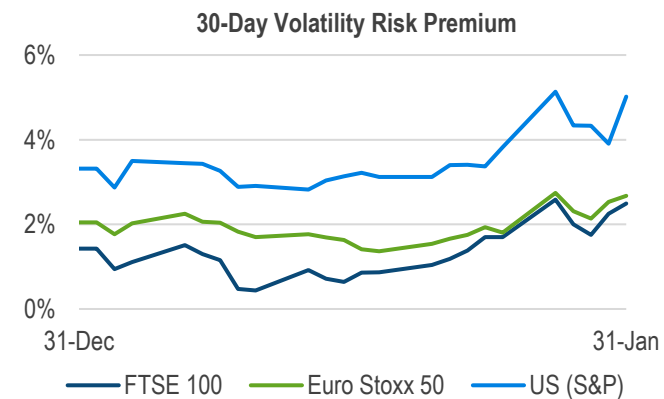
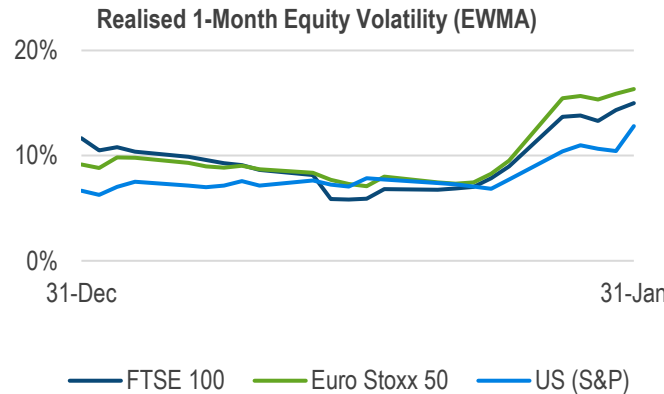
- **Consumer Price Index (CPI)** – measuring the monthly price of a basket of consumer goods and services
- **Retail Price Index (RPI)** – similar to CPI, but the main difference due the addition of mortgage payments, council tax and other housing costs
- **Average Earnings** – measuring the average total weekly employee remuneration over the previous 3 months.

Projection year-on-year inflation rate is the forward rate calculated from market data:

- **Derivatives Market View** – constructed from zero coupon inflation par swap rates against the RPI index at various tenors
- **Bond Market View** – constructed from the difference between the nominal rates implied by the conventional gilts and the real rates implied by the index-linked (RPI) gilts.

Volatility and Hedging Cost Monitor

- Realised volatilities increased in January, surging above 10% by month-end on the back of coronavirus fears, but remain below historical averages.
- The FTSE 100 ended the month with a realised volatility of 15%, while the S&P 500 had a lower realised volatility of 13% at month-end.
- The Euro Stoxx 50 index ended the month with realised volatility of 16%.
- The S&P 500 had a high risk premium of 5.0% at month-end due to the surge in its implied volatility.
- The FTSE 100 had a volatility risk premium of 2.5% at month-end, while the Euro Stoxx 50 had volatility risk premium of 2.7%.



Actual realised equity volatility is measured by the weighted standard deviation of 1 month daily index change. The Exponentially Weighted Moving Average (EWMA) methodology places more importance to the recent returns in the calculation of the volatility.

Volatility Risk Premium is estimated as the difference between 30-day implied volatility and projected realised volatility (on data from the Oxford-Man Institute). This reflects the additional cost of hedging from purchasing a basket of options, in comparison to managing a dynamic delta hedge with futures (ignoring rolling transaction costs).

Expected realised volatility is an intermediate result from the [Milliman Guarantee Index™ \(MGI\)](#), which provides volatility parameters for variable annuity guarantee (VA) valuation and risk management. The levels shown are on an expected basis, and do not reflect any risk adjustment.



Creating transformational improvement in the retirement savings industry.

Milliman Financial Risk Management LLC / Milliman Financial Strategies Ltd. is a global leader in financial risk management to the retirement savings industry. Milliman FRM provides investment advisory, hedging, and consulting services on over \$155.5 billion in global assets (as of December 31, 2019).

Established in 1998, the practice includes professionals operating from three trading platforms around the world (Chicago, London, and Sydney).

Milliman is among the world's largest providers of actuarial and related products and services. The firm has consulting practices in healthcare, property & casualty insurance, life insurance and financial services, and employee benefits. Founded in 1947, Milliman is an independent firm with offices in major cities around the globe.

MILLIMAN.COM/FRM

Chicago

71 South Wacker Drive
Chicago, IL 60606
+1 855 645 5462

London

11 Old Jewry
London
EC2R 8DU
UK
+44 0 20 7847 1557

Sydney

32 Walker Street
North Sydney, NSW 2060
Australia
+610 2 8090 9100

Recipients must make their own independent decisions regarding any strategies or securities or financial instruments mentioned herein.

The products or services described or referenced herein may not be suitable or appropriate for the recipient. Many of the products and services described or referenced herein involve significant risks, and the recipient should not make any decision or enter into any transaction unless the recipient has fully understood all such risks and has independently determined that such decisions or transactions are appropriate for the recipient.

Past performance is not indicative of future results. Index performance information is for illustrative purpose only, does not represent the performance of any actual investment or portfolio, and should not be viewed as a recommendation to buy/sell. It is not possible to invest directly in an index. Any hypothetical, backtested data illustrated herein is for illustrative purposes only, and is not representative of any investment or product.

Any discussion of risks contained herein with respect to any product or service should not be considered to be a disclosure of all risks or a complete discussion of the risks involved.

The recipient should not construe any of the material contained herein as investment, hedging, trading, legal, regulatory, tax, accounting or other advice. The recipient should not act on any information in this document without consulting its investment, hedging, trading, legal, regulatory, tax, accounting and other advisors.

The materials in this document represent the opinion of the authors and are not representative of the views of Milliman, Inc. Milliman does not certify the information, nor does it guarantee the accuracy and completeness of such information. Use of such information is voluntary and should not be relied upon unless an independent review of its accuracy and completeness has been performed. Materials may not be reproduced without the express consent of Milliman.

Milliman Financial Strategies Ltd. is authorised and regulated by the Financial Conduct Authority. Firm Registration Number 539399