

Market Price Monitor

Local Equity Markets

- European equity markets continued their positive performance in December, as a “phase one” trade deal agreement was reached between the US and China.
- The FTSE 100 ended the month up 2.8%, as the conservative party managed to secure a large majority in the UK elections. The index ended the year up 17.3%.
- The Euro Stoxx 50 index gained 1.2% in December, up by 28.2% for the year.

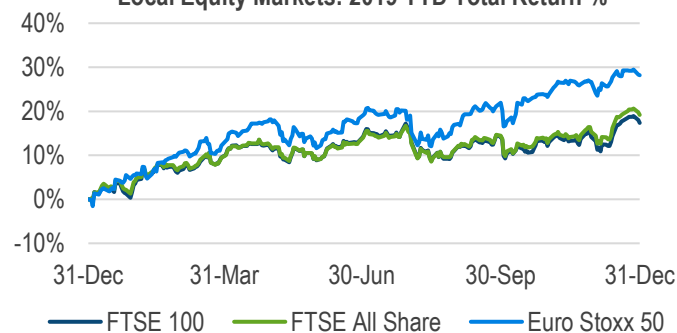
Global Equity Markets

- Emerging markets outperformed their developed economies counterparts in December, with the MSCI index yielding an impressive 7.5% for the month.
- The S&P 500 gained 3% during the month, with the index ending the year up by 31.5%.
- Japanese equities ended the month up 1.4%.

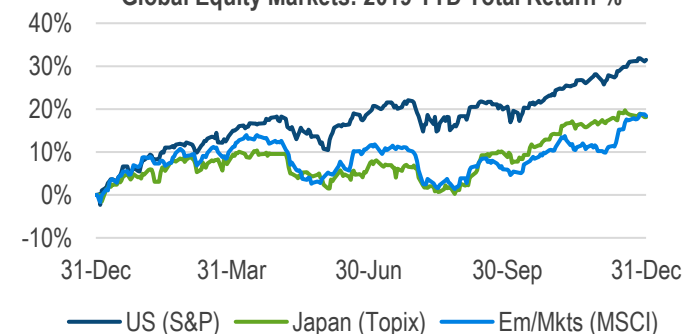
Bond/FX Markets

- The British government bond index was down for the third consecutive month, losing 1.5%.
- The British corporate bond index ended the month flat while its global counterpart gained 0.9%.
- The Pound had a strong performance, as it returned 2.5% against the US Dollar, 1.7% against the Japanese Yen and 0.6% against the Euro.

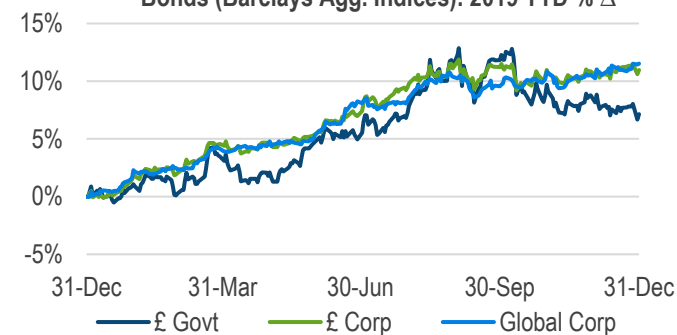
Local Equity Markets: 2019 YTD Total Return %



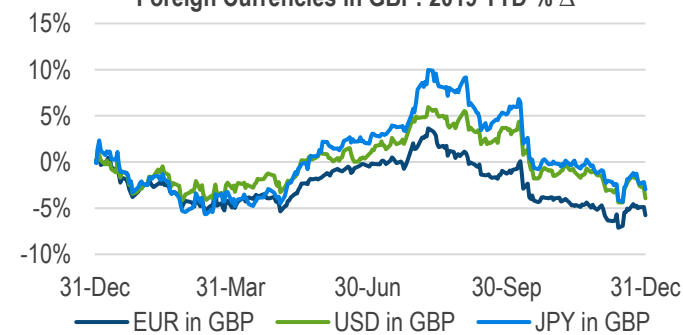
Global Equity Markets: 2019 YTD Total Return %



Bonds (Barclays Agg. Indices): 2019 YTD % Δ



Foreign Currencies in GBP: 2019 YTD % Δ



Total Returns as of December 31, 2019

	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	2.8%	3.3%	1.2%	3.0%	1.4%	7.5%	-1.5%	0.1%	0.9%	-0.6%	-2.5%	-1.7%
3 Month	2.7%	4.2%	5.2%	9.1%	8.6%	11.8%	-4.2%	-0.2%	1.8%	-4.6%	-7.3%	-7.7%
1 Year	17.3%	19.2%	28.2%	31.5%	18.1%	18.4%	7.1%	11.0%	11.5%	-5.8%	-3.9%	-3.0%
YTD	17.3%	19.2%	28.2%	31.5%	18.1%	18.4%	7.1%	11.0%	11.5%	-5.8%	-3.9%	-3.0%

Solvency II Monitor - Rates

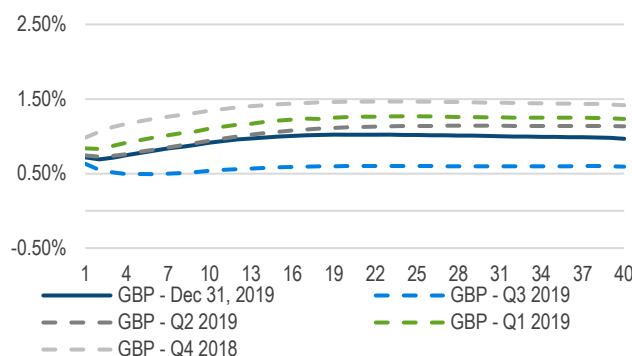
Risk Free Rates

- GBP Solvency II risk-free rates increased at all terms in December.
- The 10 and 20-year GBP risk-free rates increased by 11 basis points, while the 30-year rate increased by 10 basis points.
- European risk-free rates continued to increase at all terms for the fourth consecutive month.
- The medium and longer-term EUR risk-free rates saw the biggest increase as the 10 and 20-year rates increased by 16 basis points, while the 30-year risk-free rates increased by 13 basis points.
- Rate levels at year-end remained materially lower than those at the start of 2019, however the recent increase has seen them reach levels last observed in Q2 2019.

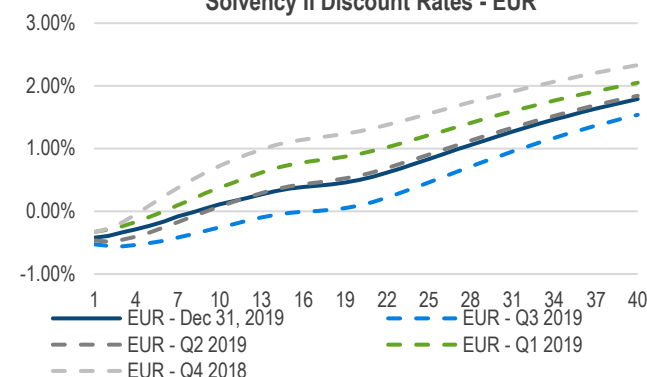
Credit Risk Adjustment

- GBP and EUR CRAs remained unchanged at 11 and 10 basis points, respectively.

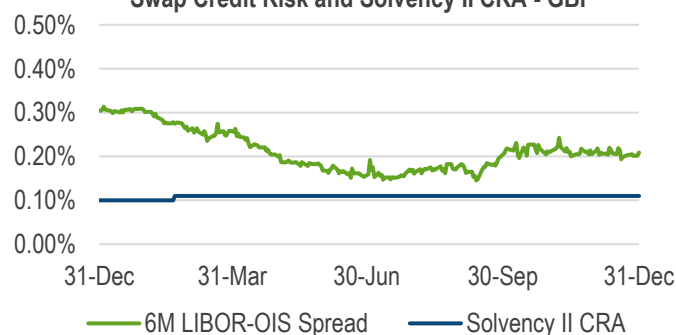
Solvency II Discount Rates - GBP



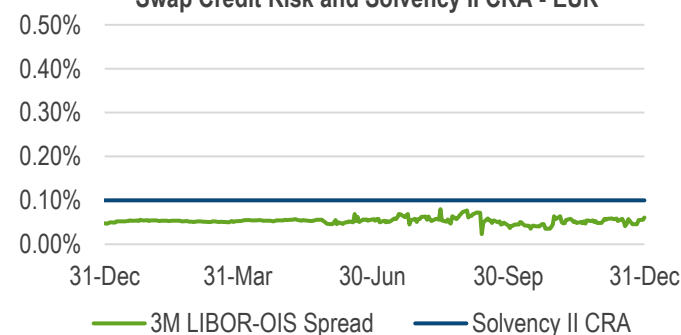
Solvency II Discount Rates - EUR



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 Q3 2019	9	29	38	42	41	0
Since Q2 2019	-3	-2	-3	-10	-14	0
Since Q1 2019	-12	-17	-19	-24	-25	0
Since Q4 2018	-27	-43	-43	-44	-45	1

Change in EUR Discount and CRA (bps)

	1Y	Y5	Y10	Y20	Y30	CRA
Since Q3 2019	10	28	37	41	33	0
Since Q2 2019	4	11	4	-7	-7	0
Since Q1 2019	-9	-14	-27	-41	-33	0
Since Q4 2018	-9	-33	-61	-78	-65	0

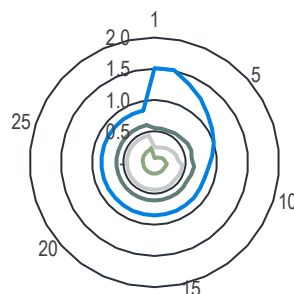
Solvency II Monitor - Spreads

Fundamental Spreads

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

Fundamental Spreads %

GBP - Financial



— AAA — AA — A — BBB

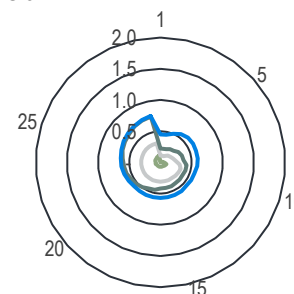
GBP Financial Fundamental Spread %

	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	0.75
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	0.75
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 31/12/19) 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 30/11/19. **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.

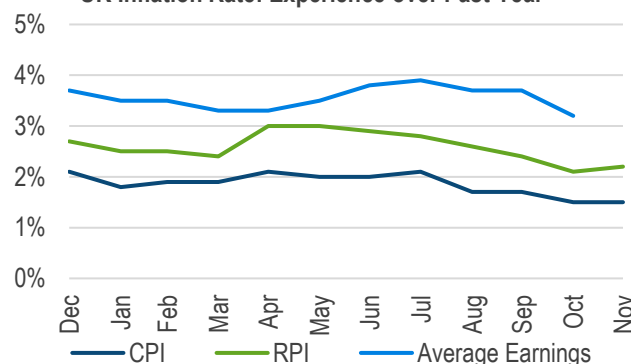
UK Inflation Monitor

- CPI inflation remained unchanged in November.
- RPI inflation measure increased by 10 basis to 2.2% in November.
- 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 tobacco. The largest offsetting upward contributions came from food, and recreation and culture”*
- UK average earnings for September were revised up by 10 basis points to 3.7%. The October reading was lower by 50 basis points at 3.2%.
- UK's third quarter GDP was revised higher by 10 basis points to 1.1%.

House of Lords' Report

- Concluded for now – awaiting debate.

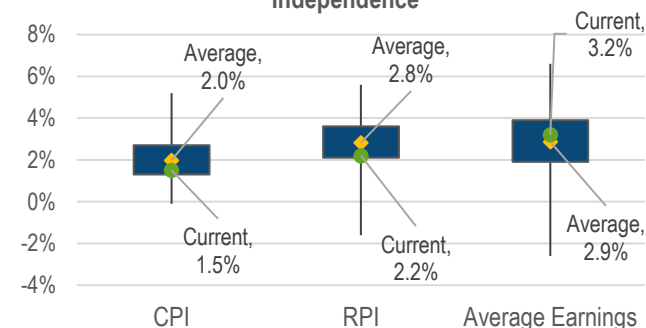
UK Inflation Rate: Experience over Past Year



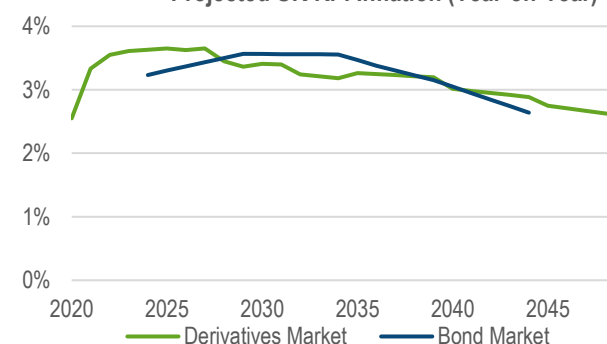
Historical UK GDP Growth (Year-on-Year)



Max, Min and 50% Range: Since BoE Independence



Projected UK RPI Inflation (Year-on-Year)



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

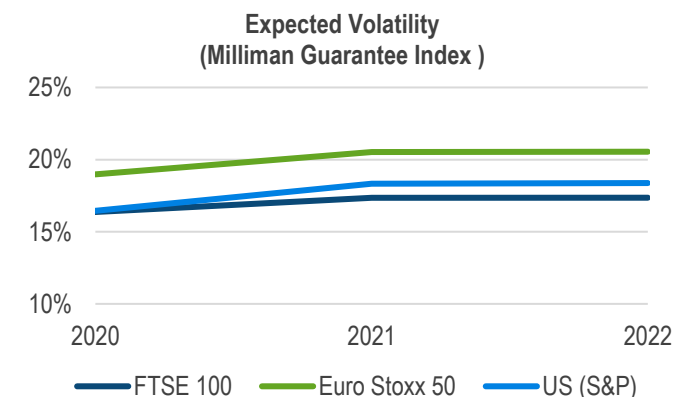
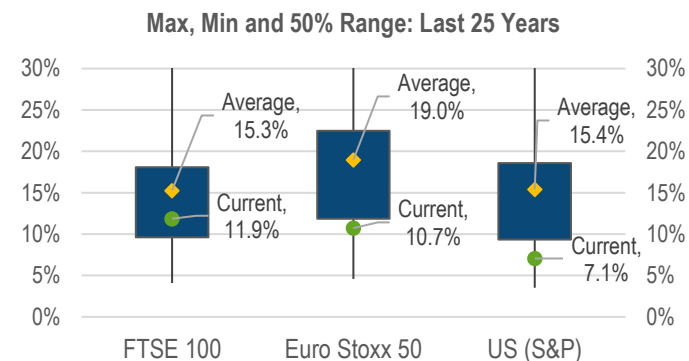
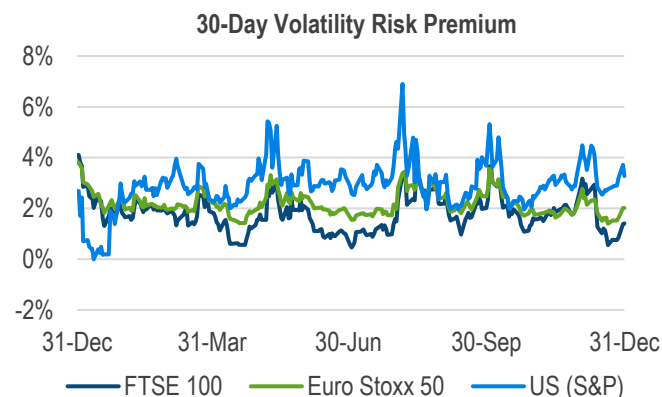
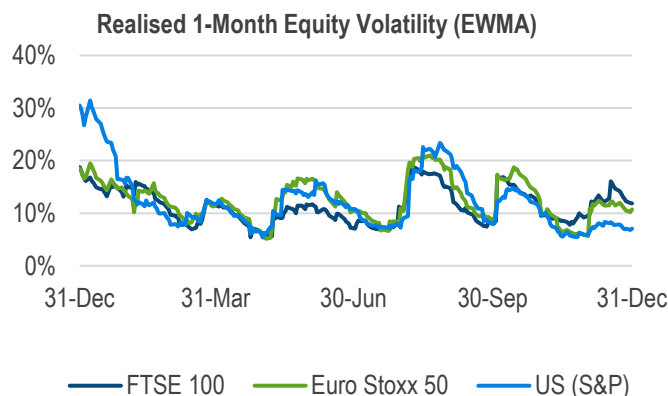
- **Consumer Price Index (CPI)** – measuring the monthly price of a basket of consumer goods and services
- **Retail Price Index (RPI)** – similar to CPI, but the main difference due the addition of mortgage payments, council tax and other housing costs
- **Average Earnings** – measuring the average 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 volatility in December was higher than the previous month, but still remains materially lower than historical averages.
- The FTSE 100 and the Euro Stoxx 50 indices had realised volatilities of 11.9% and 10.7% at month-end. While the S&P 500 realised volatility stood at 7.1% by the end of the month.
- The volatility risk premium for the FTSE 100 decreased in December, ending the month at 1.4%.
- Volatility risk premiums for EuroStoxx 50 and the S&P 500 indices were unchanged at month-end, with their volatility risk premiums standing at 2% and 3.3%, respectively.



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.



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

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 \$151.2 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.COM/FRM

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.

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