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RISK BASED
GOVERNANCE

MARKET VOLATILITY RISK NEWSLETTER – March 2021

Inflationary Bugbears

Member of the Profidata Group

Executive Summary

- **Region volatility movements were mixed.** Region volatility spanned a range that goes from 12.6%(Europe) to 22.7% (Japan Nikkei), with Japan changing from a low up to medium volatility regime.
- **Realized volatility** (of the Euro Stoxx 50 index over 30 days) decreased slightly from **14.4% to 14.1%**.
- **Equity price sector results were mixed, with Consumer Staples losing the most (-2.7%) and Energy appreciating the most (+15%).** Sector's **volatility** spanned a range that goes from 11.1% (Consumer Staples) to 27.1% (Energy), with all observed markets settling in the low regime.
- **Sovereign bond price movements were all downward. Volatility** moves were mixed and spanned a range that goes from 1.2% (Japan) and 5.1% for Italy, with Italy changing from high down to medium, and Japan from low to medium.
- **The EUR closed the month appreciating against Japanese Yen against Swiss Franc, while depreciating against US Dollar and British Pound. FX volatility results were mixed;** ended ranging between 4.5% (€/CHF) and 6.83% (€/£), with €/£ and €/Yen changing from low regime to medium, while the pair €/CHF changed from low up to high, and the pair €/£ settling in the low regime.
- **Options' implied volatility decreased in both observed markets,** with the VIX changing from 33.1 to 28 and the VSTOXX decreasing from 29 to 27, with both observed markets settling in the medium regime.
- **Commodities price changes were mixed;** with the Oil (Brent) gaining +18.3%, Gold -6.4%, Copper +15.1%, and Iron Ore +6%. **Volatility changes were mixed** and spanned a range between 17.9% (Gold) to 26.6% (Copper).
- **Real Estate (equity) prices results were mixed,** with US +5.1%, Europe -1.2%, and Japan +6.5%. **Volatility moves were also mixed,** ranging from 10% (Europe) to 22.5% (Japan).
- **The average PE Funds** gained +2.8%, while the **average Hedge Fund** gained +1.8%. **Volatility** for the average hedge fund decreased from 3.5% to 3.1%, while the average PE fund increased from 12.1% to 14.1%.

The Arkus Risk Team



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Summary volatility matrix and outlook

Equity markets took a breather as bond yields started to crawl upwards across the board. Raw materials (particularly Brent) climbed on hopes for a sustainable recovery and the distant possibility of returning to full economic activity.

However, vaccination rates differ across countries with the UK still on top of the list while current vaccines are being challenged by the ever-growing variety of mutants of the virus. The lockdown back and forth continues, for now.

On top of this, the old bugbear of inflation has re-appeared here and there sparking fears that the chicken central banks have released might be coming home to roost. The volatilities of both the VIX and the VSTOXX have surged.

ASSET CLASS	AREA	LATEST VOLATILITY	LATEST Z-SCORE	REGIME
EQUITIES	North America	15.1%	-0.5	low
	Asia ex-Japan	20.2%	0.1	medium
	Europe	12.6%	-0.8	low
	Japan (Nikkei)	22.7%	0.1	medium
	Energy	27.1%	-0.7	low
	Consumer Staples	11.1%	-0.4	low
	Financials	16.5%	-0.7	low
	IT	20.4%	-0.5	low
VOLATILITY OF VOLATILITY	Volatility of VIX	156%	0.2	medium
	Volatility of VSTOXX	122%	-0.2	medium
GOVERNMENT BONDS	Germany	3.5%	-0.6	low
	US	2.6%	-0.6	low
	Japan	1.2%	-0.3	medium
	Italy	5.1%	-0.1	medium
FX VS \$	€/\$	6.8%	-0.0	medium
	€/Yen	6.8%	-0.2	medium
	€/CHF	4.5%	0.8	high
	€/£	4.7%	-1.2	low
COMMODITIES	Oil (Brent)	21.3%	-0.8	low
	Gold	17.9%	-0.3	medium
	Copper	26.6%	0.7	high
	Iron Ore	19.6%	-0.2	medium
PROPERTY	US	15.4%	-0.8	low
	Europe	10.0%	-1.0	low
	Japan	22.5%	-0.2	medium
ALTERNATIVES	HFRX Global HF	3.1%	-0.2	medium
	Avg PE Fund	14.1%	-0.7	low
KURTOSIS	ZCF 1% left (vs -2.33 for normal curve)	-2.51	0.4	medium
CORRELATION	Average market correlation with euro equities	31%	-0.4	medium

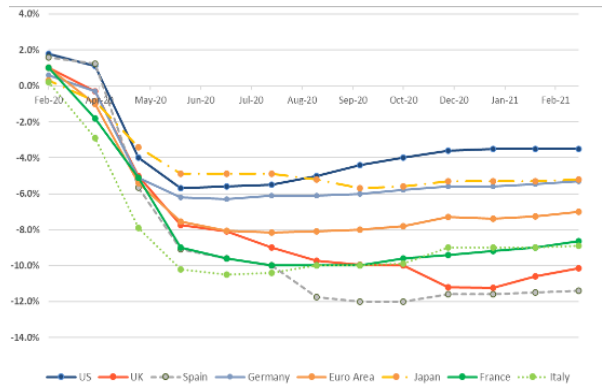
Note: Throughout the text we refer to volatilities as being "low", "medium" or "High". We define this by defining three equal "sized" regimes over the last 12 months. i.e. "High" volatility implies that volatility is in the upper third of its statistical range over the last 12 months. The table shows the "z-score" of the volatility of each market, i.e. how many standard deviations above (or below) the mean over the last 12 months each market's volatility is.

Key News

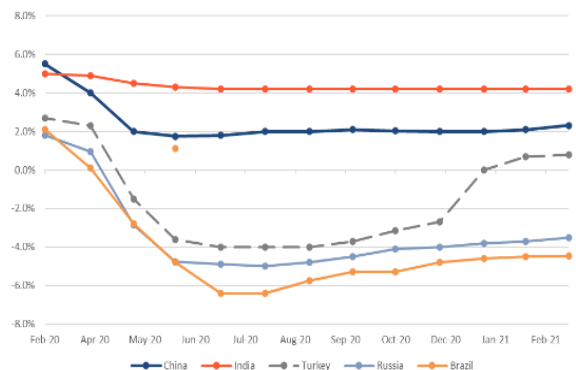
Major Volatility-Driving Events

- Inflation is back! In the Eurozone up to 0.9% (coming from -0.3%), core inflation rose to 1.2%, based on a flash estimate from Eurostat. No consensus for now among economists if this is only temporary for now or the beginning of a new inflationary phase. Also, US inflation expectations for 5y horizon up at highest levels in a decade.
- Super Mario - Italian spreads fall by 10 basis points in the wake of the appointment of Mario Draghi as new Italian prime minister. Now back at similar levels as before in the wake of a general rise in yields as inflation concerns rise. ECB balance sheet hitting yet another ATH.
- Raw materials were rising with Brent (+7.9 %) leading the pack as hopes for economic recovery rose, Gold fared 2.5% lower while its invading antagonist Bitcoin reached new ATH receiving further backing from institutional investors.
- Democratization of investments – After the Gamestop hysteria the responsible individuals involved, like Vlad Tenev from RobinHood, were scrutinized in Congress hearings. So far, no conclusive findings. The Gamestop stocks are rising again.
- Creation of Special Purpose Acquisition Companies (SPACS) booming with 200 deals worth of \$64 bn in 2020. These structures aim to facilitate financing for companies as an alternative to IPOs in uncertain market times collecting money from investors through an IPO (of the SPAC) without having any concrete deals at hand. Sectors or themes are outlined before and the deal is information provided for the respective target companies when they are identified.
- The Communist Party of China is holding its biggest political meeting and announced that it will renew the political system in Hong Kong in a clear sign of no tolerance for dissidents. Also targeted economic growth is set to 6% for the country.

GDP ESTIMATES FOR 2021, DEVELOPED COUNTRIES



GDP ESTIMATES FOR 2021, DEVELOPING COUNTRIES



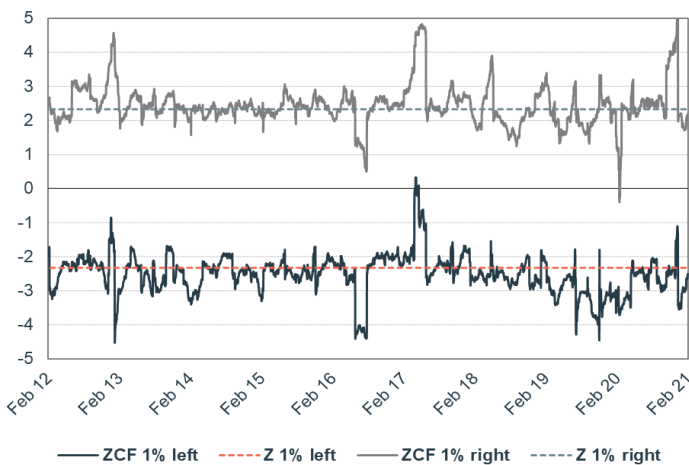
Kurtosis

Correlation in the equity markets

Kurtosis (against normal +/- 2.33)

The distribution of risks in European equity market displays denormalization with the ZCF 1% left at -2.51 and the right ZCF 1% at +2.15 (both as of 28th of February).

Cornish-Fischer expansion of Eurostoxx50 (60 days)



Methodology

To capture a measure of both Skewness and Kurtosis we look at the Cornish-Fischer expansion, which gives a good measure of the tails of the equity market. (We use a 60-calendar day rolling basis). The underlying market we plot is the Euro Stoxx 50, but other equity markets normally show very similar results.

We plot on the chart the expected Z-scores for 1% left tail (i.e. a 99% VaR) and a 1% right tail assuming a normal distribution: +/-2.33.

We also show the Cornish-Fischer expansion result for the same market. This indicates how far from a normal distribution each tail was.

On a long-term basis, on average, the tails are slightly fatter than the normal distribution would suggest, which should not come as a surprise. What is perhaps more surprising is how much variation in fat-tailedness there has been: a daily 99% VaR has varied between -1 and -4.5 standard deviations over time.

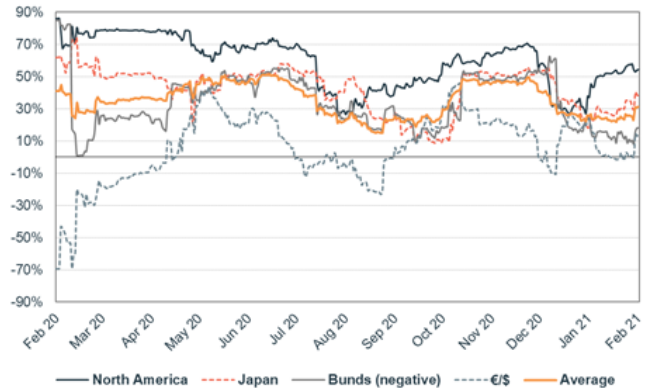
Inter-market correlations with EU equities



31.0%

AVERAGE
CORRELATION

Inter-market correlations (with EU equities)



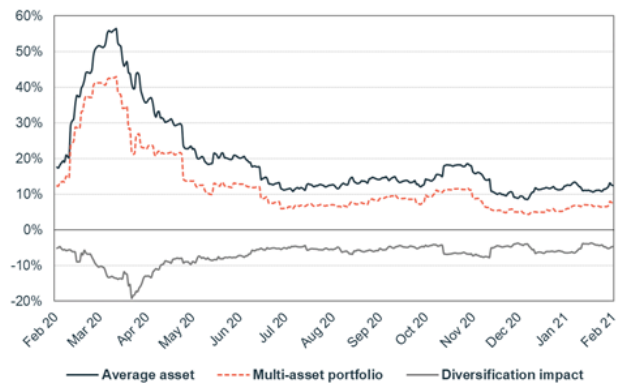
Correlation increased during last month, leading our average correlation indicator to change from 23.5% to 31% (low up to medium).



12.39%

AVERAGE
VOLATILITIES

Multi-asset portfolio volatility



We also look at a hypothetical multi-asset portfolio consisting of equities, bonds, gold, oil, and hedge funds.

The average asset volatility decreased slightly, moving from 12.43% to 12.39%, while the benefit of multi-asset diversification decreased, moving from 6.4% to 4.8%.

In combination, multi-asset portfolio volatility increased from 5.9% to 7.6%.



7.60%

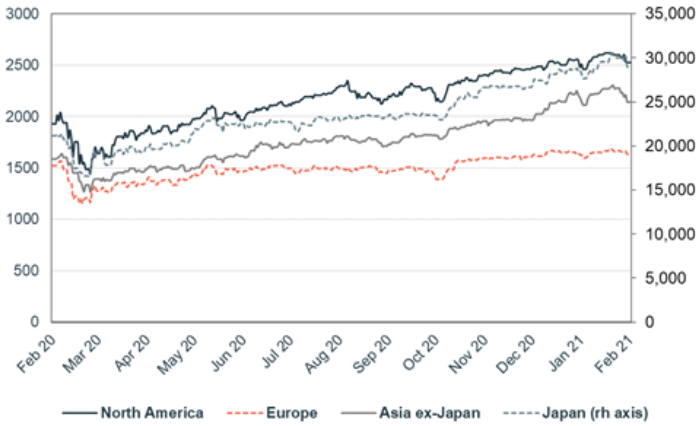
PORTFOLIO
VOLATILITY

Note: The chart shows 30-day correlation over time between different markets and the pan-Euro equity market. Higher levels of correlation will in general lead to less ability to diversify risks, and higher portfolio volatility for given position holding volatility.

Equities

Stock price

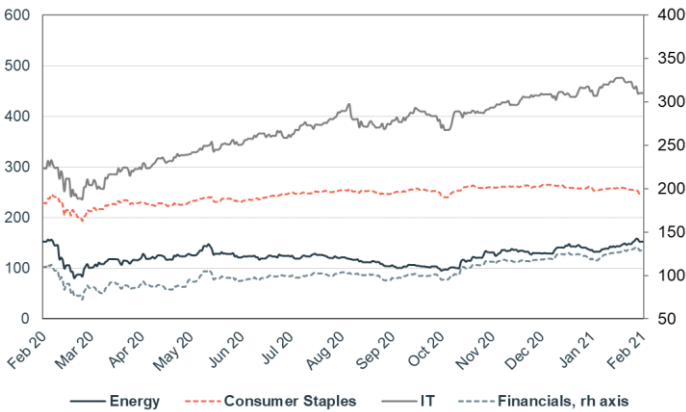
STOCK PRICE PERFORMANCE: REGIONS (LOG SCALES)



Equity region results were all upward trending. North America gained +2.6%, Asia ex-Japan gained +1.4%, Europe gained +2.3%, Japan (Nikkei) gained +4.7%.

+2.3%
Europe

STOCK PRICE PERFORMANCE: SECTORS (LOG SCALES)



Equity sector results were mixed. Energy gained +15.0%, Consumer Staples lost -2.7%, Financials gained +9.9%, IT gained +1.1%.

+9.9%
FINANCIALS

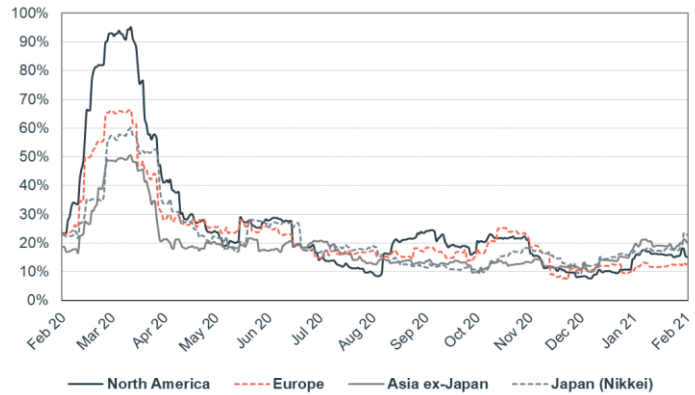
+1.1%
IT

+15.0%
ENERGY

-2.7%
CONSUMER STAPLES

Equities Volatility

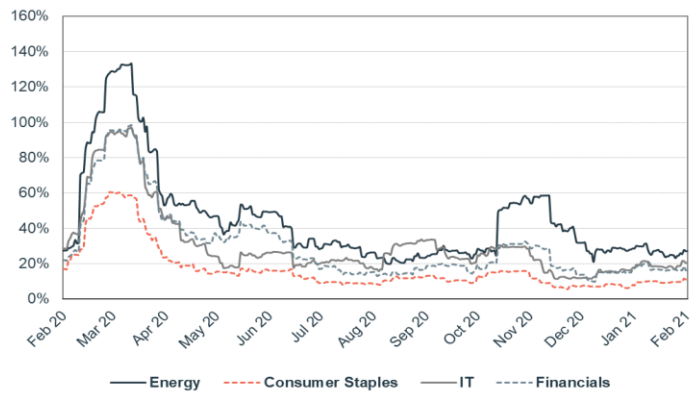
EQUITY VOLATILITY: REGIONS



12.6% EUROPE

Volatility results were mixed. North America fell from 15.9% to 15.1% (low), Asia ex-Japan rose from 19.1% to 20.2% (medium), Europe rose from 11.8% to 12.6% (low), Japan (Nikkei) rose from 16.3% to 22.7% (low up to medium).

EQUITY VOLATILITY: SECTORS



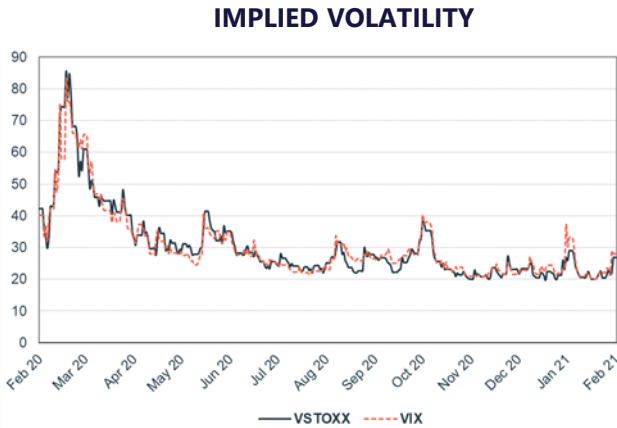
Volatility results were mixed. Energy fell from 29.8% to 27.1% (low), Consumer Staples rose from 9.6% to 11.1% (low), Financials fell from 18.5% to 16.5% (low), IT rose from 19.3% to 20.4% (low).

Equity Implied Volatility

Market-Implied Near Term Outlook

Implied Volatility

Implied volatility in both, US and Europe, decreased. VIX fell from 33.1 to 28.0 (medium), VSTOXX fell from 29.0 to 26.9 (medium).



28.0% VIX

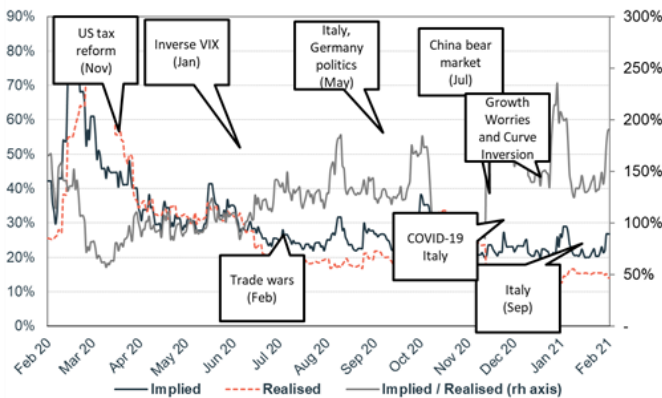
26.9% VSTOXX

Implied vs Realised Volatility

(European equity) implied volatility decreased from 29 to 26.9%. The realised volatility (of the Euro Stoxx 50 index over 30 days) also decreased from 14.4% to 14.1% bringing the ratio of implied/realised volatility to move up from 201% to 191%.

This ratio is suggesting that the market is currently still anticipating future volatility to be higher than current.

IMPLIED VS. REALISED VOLATILITY



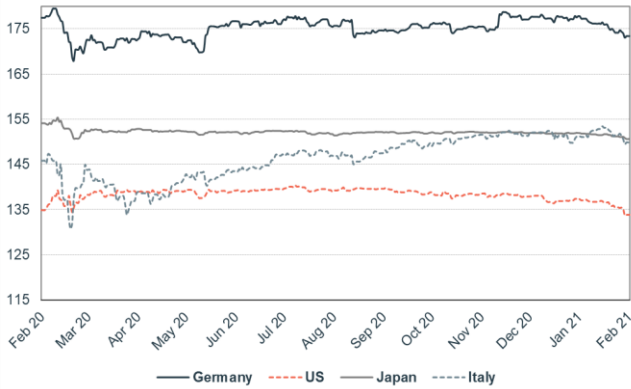
191% IMPLIED/REALISED VOLATILITY

Note: Note: the implied/realised volatility ratio gives an indication as to whether the market sees an event in the next 30 days (the implied volatility period) which will increase realised volatility (implied/realised >100%, e.g. within 30 days prior to the Greek elections during the Greek crisis) or a period of relative calm after high realised volatility (implied/realised <100%, e.g. immediately after Draghi's calming "whatever it takes" comments).

Fixed Income

10-Year Government Bond Futures

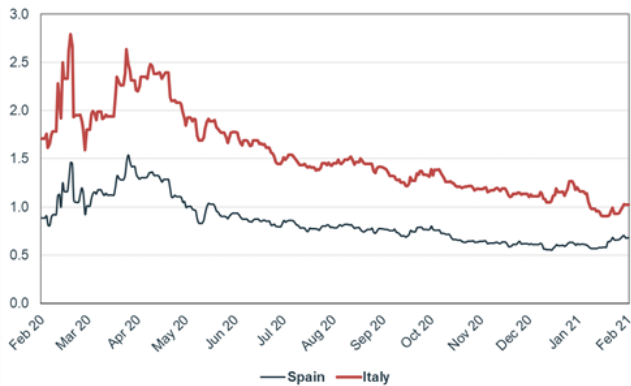
PRICES OF 10Y BOND FUTURES



Prices

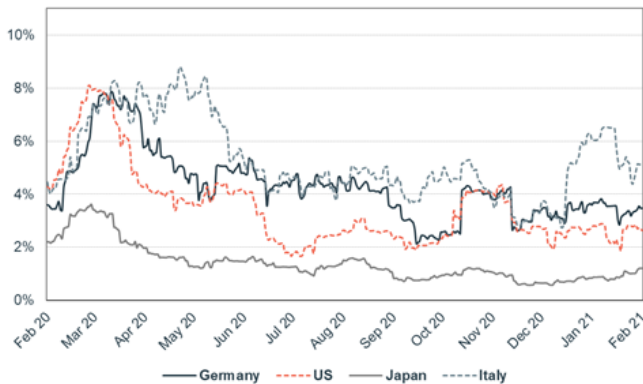
Government bond prices movements were all downward. Germany lost -2.2%, US lost -2.4%, Japan lost -0.8%, Italy lost -0.8%.

10 YEAR BOND SPREADS OVER GERMANY, %



Italian spreads over Germany decreased from 1.16% to 1.02%, while the Spanish spreads against Germany increased from 0.62% to 0.68%.

VOLATILITY OF 10Y BOND FUTURES



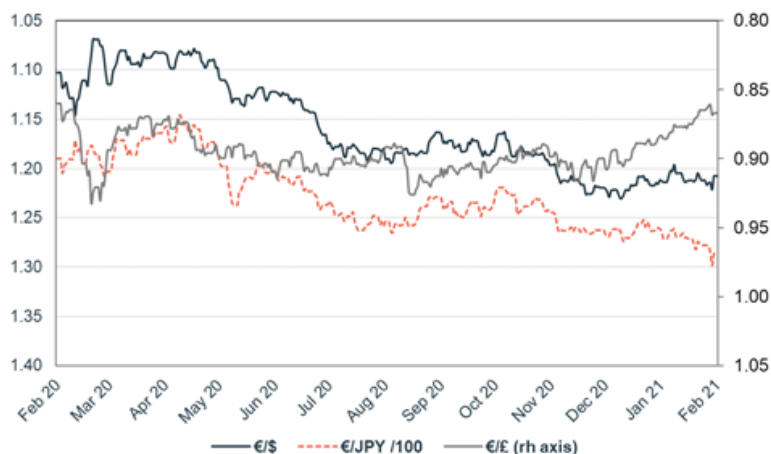
Volatility moves were mixed. Germany fell from 3.7% to 3.5% (low), US fell from 2.8% to 2.6% (low), Japan rose from 0.9% to 1.2% (low up to medium), Italy fell from 6.0% to 5.1% (high down to medium).

Foreign Exchange

Prices

Euro results were mixed. We have that Euro lost 0.5% against the US Dollar, Euro gained 1.2% against the Japanese Yen, Euro gained 1.5% against the Swiss Franc, Euro lost 2.1% against the British Pound.

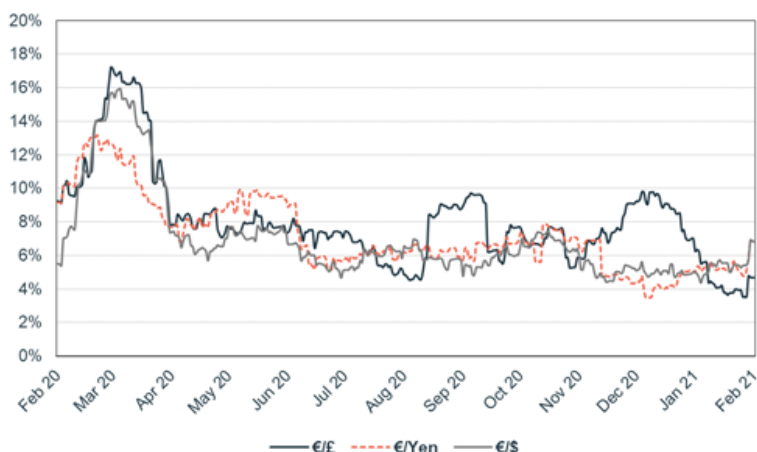
FX RATES VS. €



Volatility

FX volatility moves were also mixed. €/€ rose from 4.4% to 6.8% (low up to medium), €/Yen rose from 5.1% to 6.8% (low up to medium), €/CHF rose from 2.7% to 4.5% (low up to high), €/£ fell from 5.5% to 4.7% (low).

VOLATILITY OF FX RATES VS. €



↗ 6.8% € vs. \$

↘ 4.7% € vs. £

↗ 6.8% € vs. ¥

Note: The charts show currencies vs. the €. Axes on the first chart are inverted to show conventional currency quotations, but with higher on the chart representing a stronger currency vs. the euro.

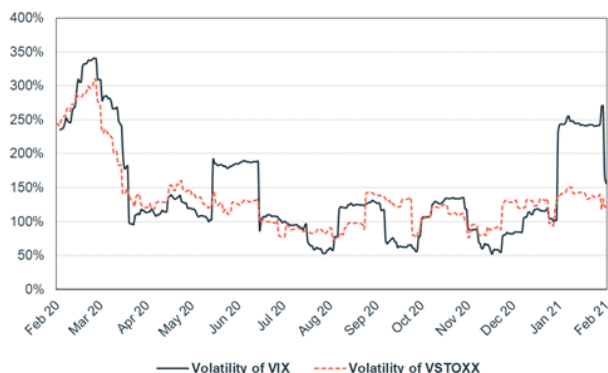
(Equity) Options

Option volatility is mainly driven by the volatility of volatility and moves in prices of the underlying instruments affecting options' deltas.

Implied volatility

Volatility of implied volatility decreased in both US and Europe. Volatility of VSTOXX fell from 140.6% to 121.6% (medium) Volatility of VIX fell from 243.4% to 156.4% (high down to medium).

VOLATILITY OF VOLATILITY



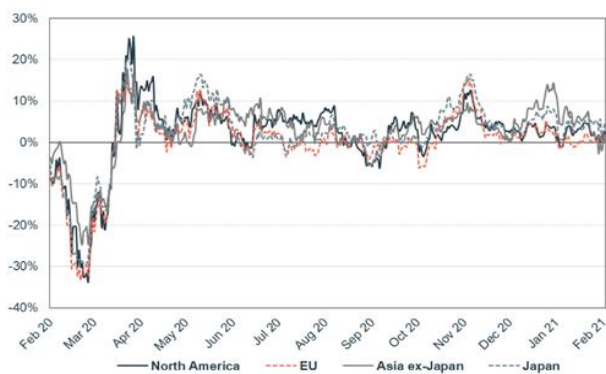
156.4% US

121.6% EUROPE

Major (Regional Equity) price moves

All regions price movements were upward. We have that North America gained +2.6%, Asia ex-Japan gained +1.4%, Europe gained +2.3%, Japan (Nikkei) gained +4.7%.

CHANGE IN PRICES OF EQUITY INDICES, 30 DAYS



Note on Treatment: Options show more complex behaviour than the other instruments we look at in this report, so we make some simplifying assumptions. As Calls and Puts are in effect polar opposites and in and out of the money options behave very differently, it is hard to generalise all options' behaviour. However, we look at the two key drivers: volatility of implied volatility and major price movements of the underlying security.

Implied volatility (via an option's Vega) drives option prices, so a big indicator of option price volatility is the "volatility of implied volatility".

But usually the biggest driver of individual option prices is the movement of the underlying (via the option Delta): a move in either direction will cause the option to go more in or out of the money (and a corresponding change in the option's Delta and price volatility). As a proxy for this, we look at the 30-day price swing of equity market indices; options on bonds or FX could of course behave differently. The 30-day period is relatively close to the time to maturity of many options. Calls and Puts will respond in opposite fashions: calls becoming more volatile (relative to the size of the underlying notional) as prices rise.

Note on Convertibles: Convertibles are in effect a combination of a bond and a call option, with the bond portion usually making little contribution to the instrument volatility unless the option is significantly out of the money. As such, convertible portfolios' volatilities will tend to behave similarly to call option portfolios, and this commentary can be applied to convertibles as well as options.

Commodities

+18.3% OIL

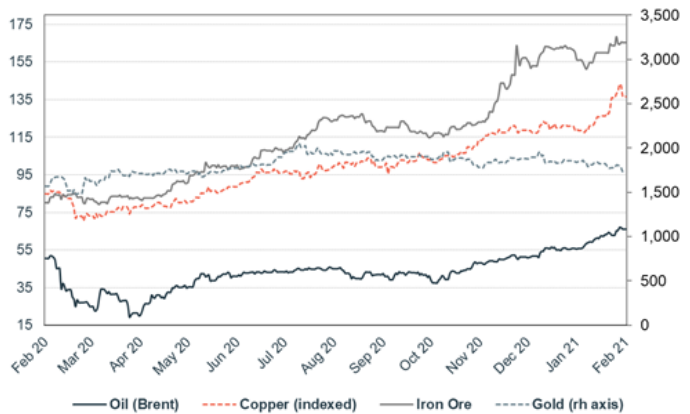
-6.4% GOLD

+15.1% COPPER

Prices

Commodities price changes were mixed; we have that Oil (Brent) gained +18.3%, Gold lost -6.4%, Copper gained +15.1%, Iron Ore gained +6.0%.

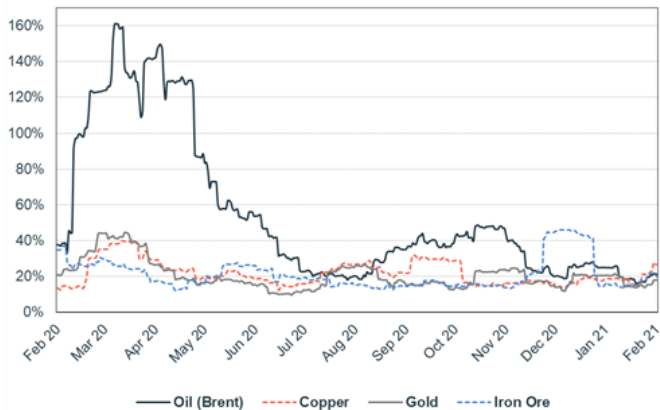
COMMODITIES PRICES, \$



Volatility

Volatility movements of Commodities were mixed during February. On this regard, we have that Oil (Brent) fell from 24.9% to 21.3% (low), Gold fell from 20.5% to 17.9% (medium), Copper rose from 18.4% to 26.6% (low up to high), Iron Ore rose from 15.1% to 19.6% (low up to medium).

COMMODITIES VOLATILITY

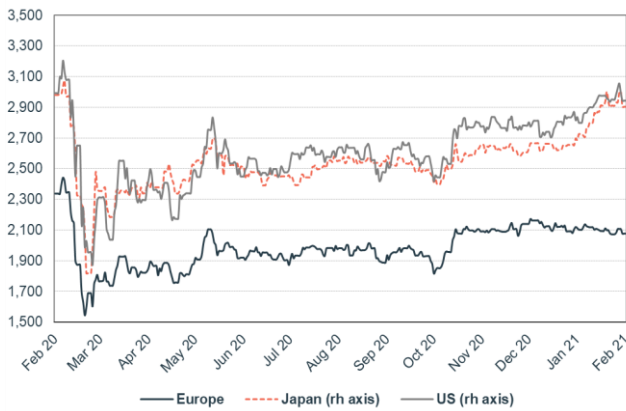


Note: all prices refer to near futures rather than spot with the exception of iron ore which is a spot price.

Real Estate and Alternatives

(Real Estate Share Prices)

REAL ESTATE (REIT) PRICES



-1.2% EUROPE

+5.1% US

+6.5% JAPAN

Real estate regional prices results were mixed. We have that US gained +5.1%, Europe lost -1.2%, Japan gained +6.5%.

REAL ESTATE (REIT) VOLATILITY



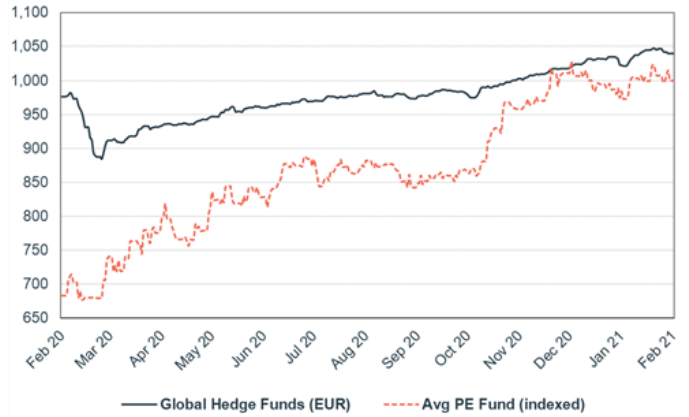
Volatility moves were also mixed. We have that US fell from 19.9% to 15.4% (low), Europe fell from 12.7% to 10.0% (low), Japan rose from 12.5% to 22.5% (low up to medium).

Note: Note that for property we look at indices of the share prices of REITs, and not the underlying property directly, for which little real-time data is available. This is usually consistent with funds which tend to invest in property indirectly, e.g. via REITs or property companies.

As REITs are usually focused on commercial property, residential property may also follow a slightly different pattern to that discussed in this article.

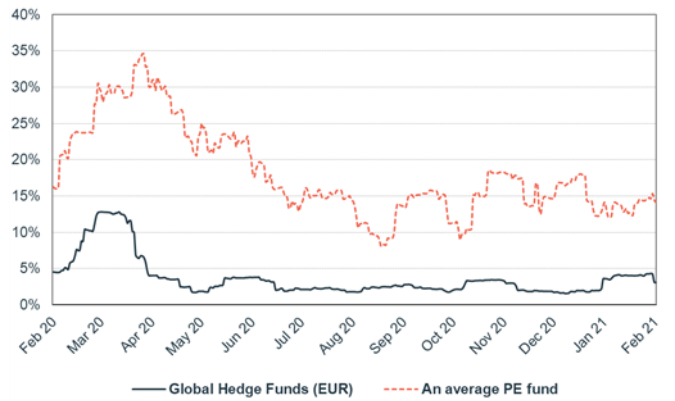
Alternatives

ALTERNATIVES PRICES



the average hedge fund gained +1.8%, an average PE fund +2.8%.

AI VOLATILITY



Volatility results for Alternative Investments were mixed. We have that the average hedge fund fell from 3.5% to 3.1% (medium), and the average PE fund rose from 12.1% to 14.1% (low).



3.1% HFRX
Volatility



14.1% AVERAGE
PE FUND

Definitions

To avoid repetitions, the term volatility refers to annualised, 30-day average realised volatility in local currency unless otherwise specified. As such, it may be lower than, and lag, shorter-term market volatility in times of high market volatility.

Charts show data up to 28th February 2021, and news and events are included up to that date. The commentary was written on or before March 5th, 2021.

Disclaimer

The commentary does not constitute, and is not intended to constitute, investment advice.

Any views expressed in this report are based on historical market data and as such cannot be interpreted as being forward-looking, or to constitute forecasts. Past movements are not necessarily indicative of future movements.

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