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RISK BASED
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MARKET VOLATILITY RISK NEWSLETTER – February 2021

Predatory Trading

Member of the Profidata Group

Executive Summary

- **Volatility increased in all observed market.** Region volatility spanned a range that goes from 11.8% (Europe) to 19.1% (Asia Ex-Japan), with Asia ex-Japan changing from low up to medium volatility regime, and all other observed markets settling in the low regime.
- **Realized volatility** (of the Euro Stoxx 50 index over 30 days) Increased from **13.7% to 14.4%**.
- **Equity price sector results were mixed, with Consumer Staples losing the most (-4.3%) and Energy appreciating the most (+2.7%).** Sectors **volatility** spanned a range that goes from 9.6% (Consumer Staples) to 29.8% (Energy), with all observed markets settling in the low regime
- **Sovereign bond price movements were all downward. Volatility** moves were all upward and spanned a range that goes from 0.9% (Japan) and 6% for Italy, with Italy changing from low up to high.
- **The EUR closed the month depreciating against all other major currencies, except for the pair €/JPY in which case it appreciated by +0.7%. FX volatility results were mixed;** ended ranging between 2.7% (€/CHF) and 5.5%% (€/£), with €/\$, €/CHF and €/£ changing from medium to low regime and the pair €/Yen settling in the low regime.
- **Options' implied volatility increased in both observed markets,** with the VIX changing from 22.8 to 33.1 and the VSTOXX increasing from 23.4 to 29, with both observed markets changing from low to medium regime.
- **Commodities price changes were mixed,** with the Oil (Brent) gaining +7.9%, Gold -2.5%, Copper increasing +1.1%, and Iron Ore +2%. **Volatility changes were mixed.** It spanned and ranged between 15.1% (Iron Ore) to 24.9% (Oil Brent).
- **Real Estate** (equity) prices results were mixed, with US -0.4%, Europe -2.8%, and finally Japan +2.2%. **Volatility moves were also mixed,** ranging from 12.5% (Japan) to 19.9% (US).
- **The average PE Funds** lost -3.3%, while the **average Hedge Fund** decreased -0.2%. **Volatility** for the average hedge fund increased from 1.7% to 3.5%, while the average PE fund decreased from 16.9% to 12.1%.

The Arkus Risk Team



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Summary volatility matrix and outlook

Better be the hunter than the prey - Retail online investors collude to form a swarm that successfully squeezed out some of the big shorts in the industry. The rebellion was shut down as neobrokers (Reddit, Robin Hood etc.) restricted trading due to systemic concerns. After some cash outs were made by a few members of the swarm the assets concerned reverted to usual levels. If we are on the verge of a new era of swarm activism on capital markets this episode will enter as a textbook example of a further systemic driver of volatility. The VIX peaked to similar levels as at the beginning of the second COVID-19 wave.

While vaccine suppliers struggle to reach their delivery targets European countries are still mostly in lockdown with the UK leading the vaccination race. New US president Joe Biden trying to re-establish relationships with international partners but also among US-Americans.

Realized equity volatilities remained calm for the start of the year, whereas there was a little bit of upside movement on bond volatility (notably for Italy), EURGBP reverted back to ATs after the (political) finalization of Brexit.

| ASSET CLASS | AREA | LATEST VOLATILITY | LATEST Z-SCORE | REGIME |
|--------------------------|---|-------------------|----------------|--------|
| EQUITIES | North America | 15.9% | -0.5 | low |
| | Asia ex-Japan | 19.1% | 0.0 | medium |
| | Europe | 11.8% | -0.8 | low |
| | Japan (Nikkei) | 16.3% | -0.5 | low |
| | Energy | 29.8% | -0.5 | low |
| | Consumer Staples | 9.6% | -0.5 | low |
| | Financials | 18.5% | -0.5 | low |
| | IT | 19.3% | -0.6 | low |
| VOLATILITY OF VOLATILITY | Volatility of VIX | 243% | 1.6 | high |
| | Volatility of VSTOXX | 141% | 0.1 | medium |
| GOVERNMENT BONDS | Germany | 3.7% | -0.5 | low |
| | US | 2.8% | -0.6 | low |
| | Japan | 0.9% | -0.8 | low |
| | Italy | 6.0% | 0.6 | high |
| FX VS \$ | €/\$ | 4.4% | -0.9 | low |
| | €/Yen | 5.1% | -1.0 | low |
| | €/CHF | 2.7% | -0.9 | low |
| | €/£ | 5.5% | -1.1 | low |
| COMMODITIES | Oil (Brent) | 24.9% | -0.8 | low |
| | Gold | 20.5% | 0.0 | medium |
| | Copper | 18.4% | -0.5 | low |
| | Iron Ore | 15.1% | -0.8 | low |
| PROPERTY | US | 19.9% | -0.6 | low |
| | Europe | 12.7% | -0.8 | low |
| | Japan | 12.5% | -0.6 | low |
| ALTERNATIVES | HFRX Global HF | 3.5% | -0.1 | medium |
| | Avg PE Fund | 12.1% | -0.9 | low |
| KURTOSIS | ZCF 1% left (vs -2.33 for normal curve) | -3.03 | -0.6 | high |
| CORRELATION | Average market correlation with euro equities | 23% | -1.2 | low |

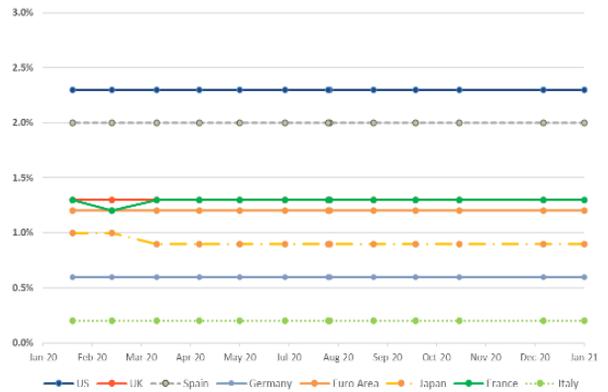
Note: Throughout the text we refer to volatilities as being "low", "medium" or "High". We define this by defining three equal "sized" regimes over the last 12 months. i.e. "High" volatility implies that volatility is in the upper third of its statistical range over the last 12 months. The table shows 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

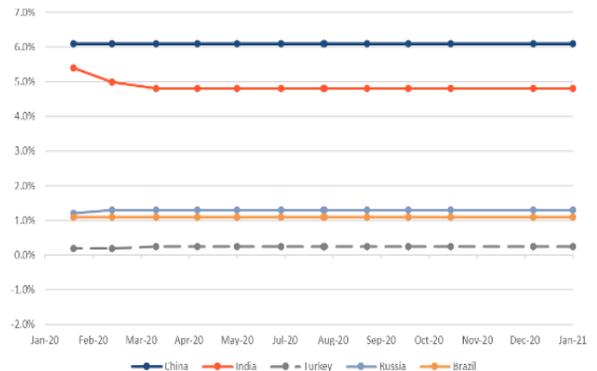
Major Volatility-Driving Events

- ▶ Intelligent Swarm? Retail investors colluded successfully via online trading platforms Reddit on Robin Hood to arrange an attack on short selling Hedge Funds on the stock of game retailing chain Gamestop. The stock won more than 400% in a week causing massive losses for the short sellers. Same trading patterns for occurred for other stocks such as Blackberry, AMC or Nokia, before trading got restricted in the wake of systemic concerns. Stocks concerned plunged afterwards.
- ▶ EU in clinch with AstraZeneca over missed targets in vaccine deliveries. Biontech to enhance production capacities with the help of French Sanofi SA. Also, Germans Bayer AG plans to build up vaccine production capacities.
- ▶ EU plans stimulus programme of EUR 12bn for investments in battery technologies to close the gap to Asia this sector and re-patriate battery production in Europe.
- ▶ Whatever it takes: former ECB president Mario Draghi asked by Italian president Sergio Mattarella to form a new government after the coalition of current prime minister Guiseppe Conte failed. Italian 10y yields dropped as a consequence.
- ▶ Against analyst's expectations German car makers BMW, Mercedes and Volkswagen beat forecast results for 2020, mostly due to overseas sales.
- ▶ Alphabet Inc. posts record sales of \$57bn generating a profit of \$15.2bn (both Q4 2020), mostly due to advertising on search engine Google and Youtube, both profiting from the lockdown restrictions around the world.
- ▶ After announcing record numbers (Q4 2020 revenues: \$125.6 bn) founder Jeff Bezos intends to step down as CEO from Amazon.com and hand the post over to Andy Jassy.
- ▶ German online car trading platform Auto1 set to be valued at EUR 7.6bn in highly sought-after IPO.

GDP ESTIMATES FOR 2021, DEVELOPED COUNTRIES



GDP ESTIMATES FOR 2021, DEVELOPING COUNTRIES



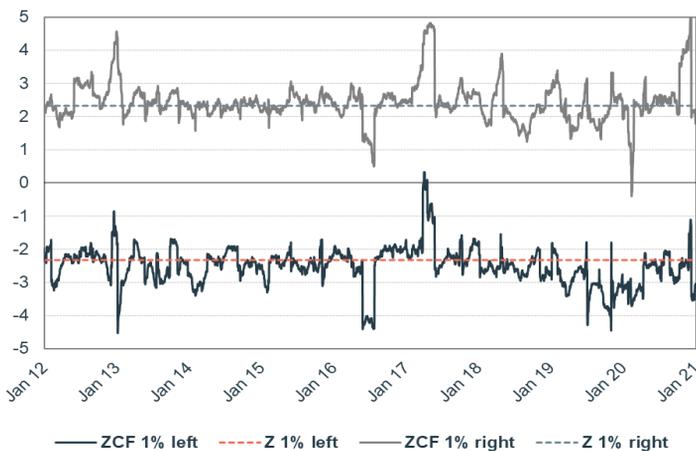
Kurtosis

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 -3.03 and the right ZCF 1% at +1.81 (both as of 31st of January).

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



23.5% AVERAGE CORRELATION

Inter-market correlations (with EU equities)



Correlation decreased during last month, leading our average correlation indicator to change from 40% to 23.5% (high down to low).

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 increased, moving from 9.2% to 12.4%, while the benefit of multi-asset diversification increased, moving from 4.4% to 6.4%.

In combination, multi-asset portfolio volatility increased from 4.8% to 6%.

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.



12.4% AVERAGE VOLATILITIES

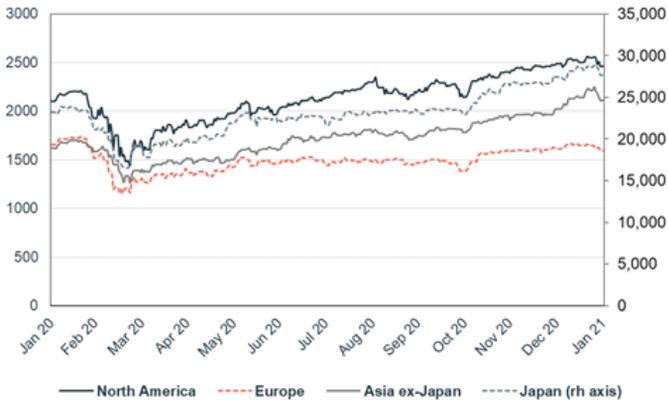


6% PORTFOLIO VOLATILITY

Equities

Stock price

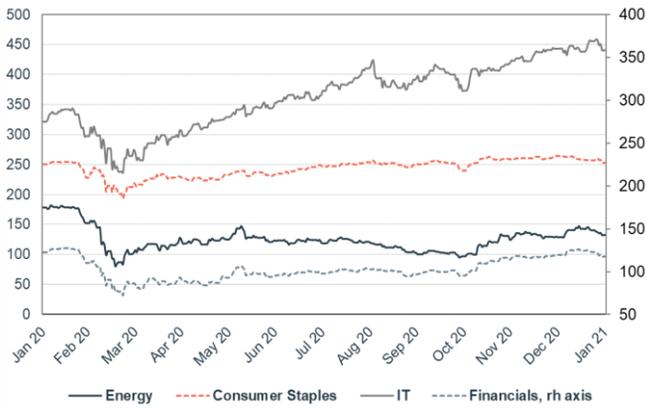
STOCK PRICE PERFORMANCE: REGIONS (LOG SCALES)



Equity region results were mixed. North America lost -1.0%, Asia ex-Japan gained +4.4%, Europe lost -1.0%, Japan (Nikkei) gained +0.8%.

-1.0%
Europe

STOCK PRICE PERFORMANCE: SECTORS (LOG SCALES)



Equity sector results were mixed. Energy gained +2.7%, Consumer Staples lost -4.3%, Financials lost -1.7%, IT lost -0.6%.

-1.7%
FINANCIALS

-0.6%
IT

+2.7%
ENERGY

-4.3%
CONSUMER
STAPLES

Equities Volatility

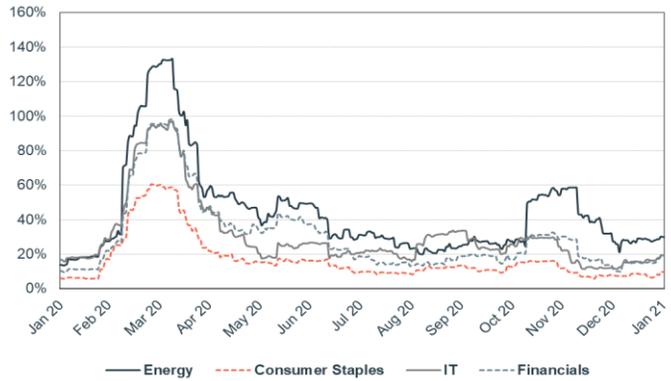
EQUITY VOLATILITY: REGIONS



11.8% EUROPE

Volatility increased in all observed markets. North America rose from 8.3% to 15.9% (low), Asia ex-Japan rose from 10.8% to 19.1% (low up to medium), Europe rose from 10.9% to 11.8% (low), Japan (Nikkei) rose from 12.7% to 16.3% (low).

EQUITY VOLATILITY: SECTORS



Volatility increased in all observed sectors. Energy rose from 27.3% to 29.8% (low), Consumer Staples rose from 7.6% to 9.6% (low), Financials rose from 12.0% to 18.5% (low), IT rose from 11.9% to 19.3% (low).

Equity Implied Volatility

Market-Implied Near Term Outlook

Implied Volatility

Implied volatility in both, US and Europe, increased. VIX rose from 22.8 to 33.1 (low up to medium), VSTOXX rose from 23.4 to 29.0 (low up to medium).

IMPLIED VOLATILITY



33.1% VIX

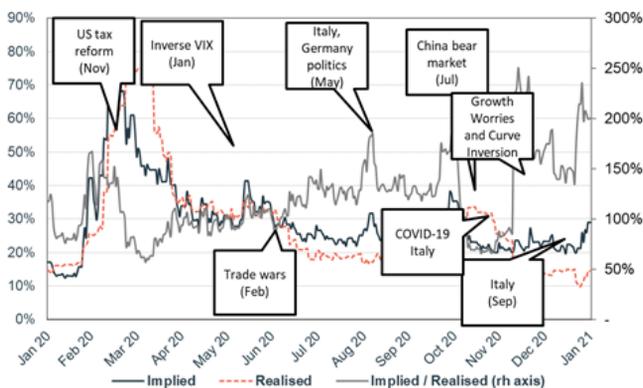
29.0% VSTOXX

Implied vs Realised Volatility

(European equity) implied volatility increased to 29%. The realised volatility (of the Euro Stoxx 50 index over 30 days) also increased to 14.4% bringing the ratio of implied/realised volatility to move up from 170% to 201%.

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

IMPLIED VS. REALISED VOLATILITY



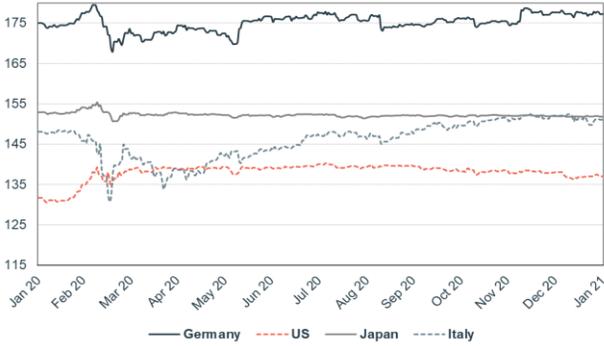
201% IMPLIED/REALISED VOLATILITY

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

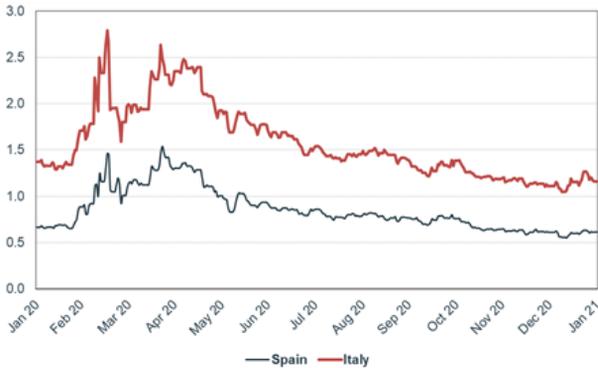
PRICES OF 10Y BOND FUTURES



Prices

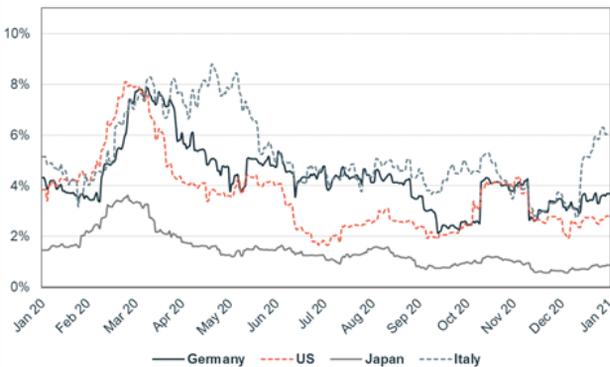
Government bond prices movements were all downward. Germany lost -0.2%, US lost -0.8%, Japan lost -0.1%, Italy lost -0.7%.

10 YEAR BOND SPREADS OVER GERMANY, %



Italian spreads over Germany increased from 1.11% to 1.16%, while the Spanish spreads against Germany also increased from 0.61% to 0.62%.

VOLATILITY OF 10Y BOND FUTURES

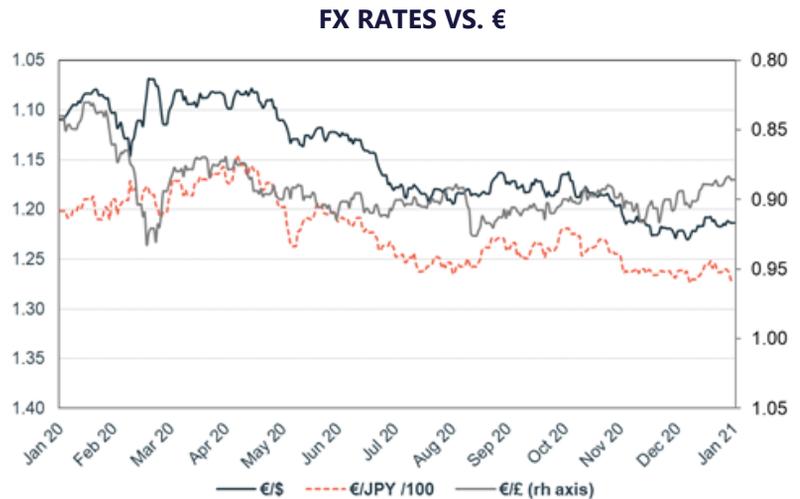


Volatility moves were all upward. Germany rose from 3.5% to 3.7% (low), US rose from 2.7% to 2.8% (low), Japan rose from 0.6% to 0.9% (low), Italy rose from 3.6% to 6.0% (low up to high).

Foreign Exchange

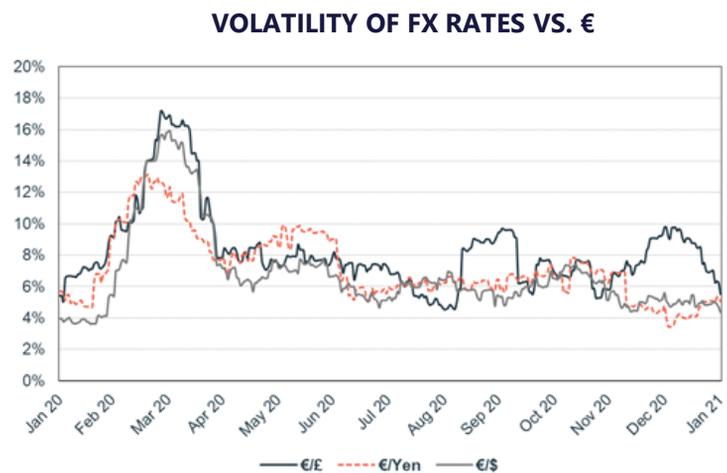
Prices

Euro results were mixed. We have that Euro lost 0.7% against the US Dollar, Euro gained 0.7% against the Japanese Yen, Euro lost 0.1% against the Swiss Franc, Euro lost 1.1% against the British Pound.



Volatility

FX volatility moves were also mixed. €/USD fell from 5.6% to 4.4% (medium down to low), €/Yen rose from 4.8% to 5.1% (low), €/CHF fell from 3.2% to 2.7% (medium down to low), €/£ fell from 9.8% to 5.5% (high down to low).



4.4% € vs. \$

5.5% € vs. £

5.1% € 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 increased in both US and Europe. Volatility of VSTOXX rose from 122.3% to 140.6% (medium), and Volatility of VIX rose from 84.6% to 243.4% (low up to high),.

VOLATILITY OF VOLATILITY



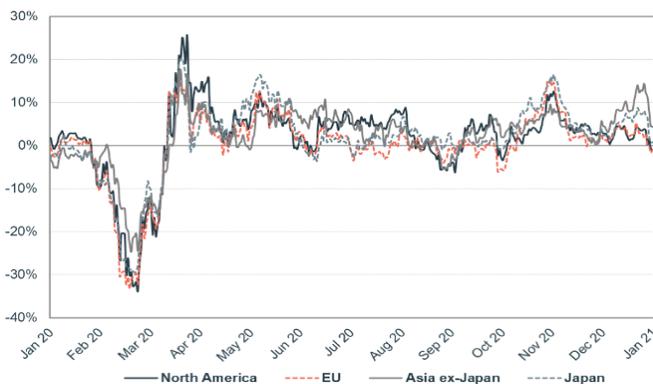
243.4% US

140.6% EUROPE

Major (Regional Equity) price moves

Price movements mixed. We have that North America lost -1.0%, Asia ex-Japan gained +4.4%, Europe lost -1.0%, Japan (Nikkei) gained +0.8%.

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

+7.9% OIL

-2.5% GOLD

+1.1% COPPER

Prices

Commodities price changes were mixed; we have that Oil (Brent) gained +7.9%, Gold lost -2.5%, Copper gained +1.1%, Iron Ore gained +2.0%.

COMMODITIES PRICES, \$



Volatility

Volatility movements of Commodities were mixed during January. On this regard, we have that Oil (Brent) rose from 19.8% to 24.9% (low), Gold rose from 14.0% to 20.5% (low up to medium), Copper rose from 14.4% to 18.4% (low), Iron Ore fell from 46.1% to 15.1% (high down to low).

COMMODITIES VOLATILITY

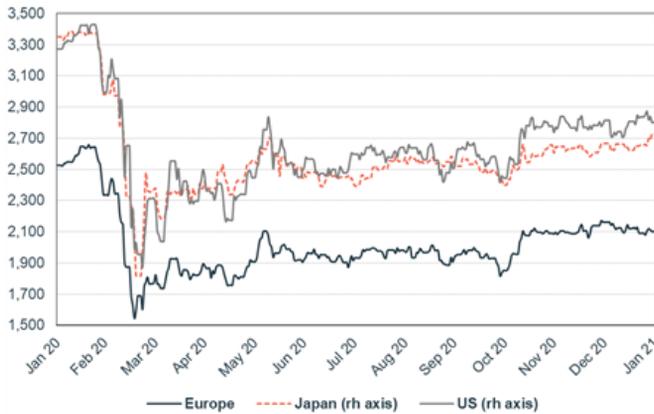


Note: all prices refer to near futures rather than spot with the exception of iron ore which is a spot price.

Real Estate and Alternatives

(Real Estate Share Prices)

REAL ESTATE (REIT) PRICES



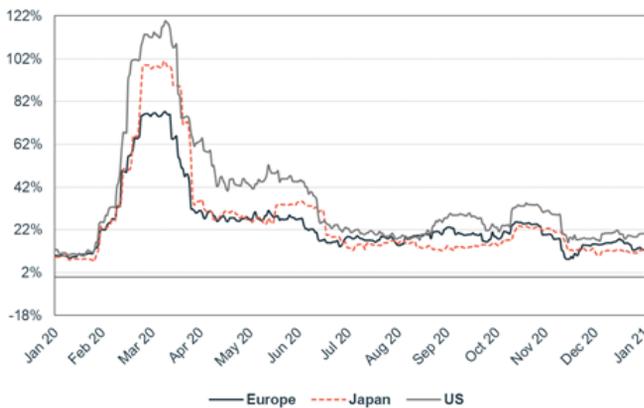
Real estate regional prices movements were mixed. We have that US lost -0.4%, Europe lost -2.8%, Japan gained +2.2%.

- 2.8% EUROPE

- 0.4% US

+ 2.2% JAPAN

REAL ESTATE (REIT) VOLATILITY



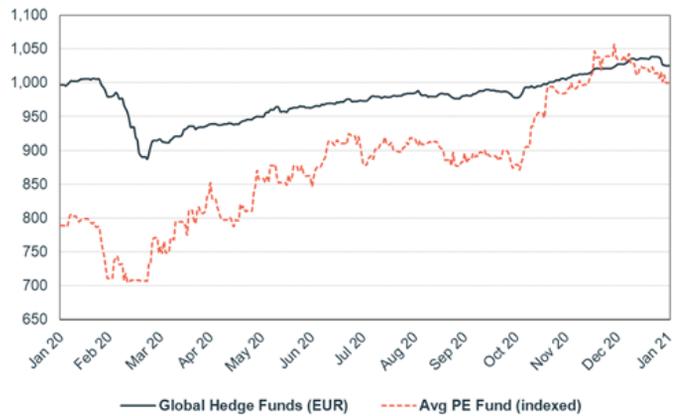
Volatility moves were mixed, and all observed markets settled in the low regime. We have that US rose from 17.6% to 19.9% (low), Europe fell from 15.4% to 12.7% (low), Japan rose from 11.3% to 12.5% (low).

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.

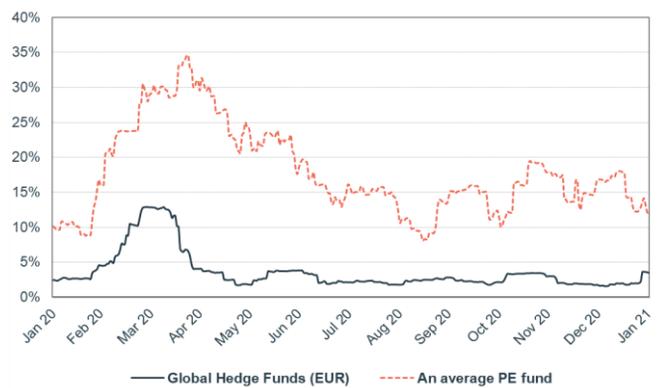
Alternatives

ALTERNATIVES PRICES



the average hedge fund lost -0.2%, an average PE fund lost -3.3%.

AI VOLATILITY



Volatility results for Alternative Investments were mixed. We have that the average hedge fund rose from 1.7% to 3.5% (low up to medium), and the average PE fund fell from 16.9% to 12.1% (medium down to low).



3.5% HFRX
Volatility



12.1% 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 31st January 2021, and news and events are included up to that date. The commentary was written on or before February 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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