



**AR
KUS**

RISK BASED
GOVERNANCE

MARKET VOLATILITY RISK NEWSLETTER – October 2021

Crossroads

Member of the Profidata Group

Executive Summary

- **Region's volatility results were mixed.** Region volatility spanned a range that goes from 12.1% (Asia ex-Japan) to 18.3% (Japan (Nikkei)), with Japan changing from low to high volatility regime, while North America and Europe changed from low up to medium, and Asia ex-Japan from high down to low.
- **Realized volatility** (of the Euro Stoxx 50 index over 30 days) increased from 8% (Low) to 16.6% (Medium).
- **Equity price sector results were mixed**, with Energy increasing the most (+9.1%) and IT losing the most (-5.8%). Sector **volatilities** spanned a range that goes from 8.3% (Consumer Staples) to 25.2% (Energy), with all sectors changing from low up to medium.
- **Sovereign bond price movements were all downwards**, with Germany losing the most(-3.2%). **Volatility** moves were all upwards and spanned a range that goes from 1% (Japan) to 5.4% (Italy).
- **€ price results were mixed**, with the EUR losing the most against US Dollar(-2%) and only gaining against the GBP(+0.1%). **FX volatility results were mixed**; ended ranging between 3.6%(€/€) and 5.9%(€/£).
- **Options' implied volatility increased in both observed markets**, with the VIX going up from 16.48 to 23.1, while the VSTOXX from 18.8 to 23.2, with both markets changing from low up to high.
- **Commodities price changes were mixed**; with Iron Ore losing the most (-21.4%) and only Oil (Brent) closing on the positive side (+7.6%). **Volatility changes were mixed** and spanned a ranged between 15.5% (Gold) to 64.2% (Iron Ore).
- **Real Estate (equity) prices movements were all downwards**, with Europe decreasing the most (-8.6%). **Volatility moves were mixed**, ranging between 12.7% (Japan) to 18.3% (Europe).
- **The average PE Funds** gained +2.5%, while the **average Hedge Fund** lost -0.4%. **Volatility** for the average hedge fund increased from 1.9% to 2.8%, while for the average PE fund it went also up from 10.6% to 12.9%, with the average hedge fund changing from low up to medium.

The Arkus Risk Team



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Summary volatility matrix and outlook

Equity markets remain unimpressed by persistent global supply chain issues, rising energy prices and the FED signaling a potential end to tapering. Looking at the still unresolved tension between the US, China, and Russia, further distress might be on the way. Some equity volatility is starting to creep up, while index levels remain close to ATHS.

Looking at Europe provides mixed signals on the political side. Shelves in British shops are staying partially empty due to Brexit complications in supply chains. At the same time, Mario Draghi seems to be making progress with his huge reform agenda in Italy, and Germany is preparing for the post-Merkel era with lengthy discussions to form a tripartite coalition. The ECB still considers rising inflation a temporary phenomenon, but some analysis also see signs of a potential slow down of the endless money supply.

ASSET CLASS	AREA	LATEST VOLATILITY	LATEST Z-SCORE	REGIME
EQUITIES	North America	12.5%	-0.2	medium
	Asia ex-Japan	12.1%	-0.6	low
	Europe	12.8%	0.1	medium
	Japan (Nikkei)	18.3%	0.5	high
	Energy	25.2%	-0.3	medium
	Consumer Staples	8.3%	-0.4	medium
	Financials	15.4%	-0.2	medium
	IT	15.8%	-0.4	medium
VOLATILITY OF VOLATILITY	Volatility of VIX	154%	0.6	high
	Volatility of VSTOXX	123%	0.0	medium
GOVERNMENT BONDS	Germany	3.7%	0.6	high
	US	3.8%	0.5	high
	Japan	1.0%	-0.0	medium
	Italy	5.4%	0.8	high
FX VS \$	€/\$	3.6%	-1.6	low
	€/Yen	5.0%	-0.2	medium
	€/CHF	4.1%	0.7	high
	€/£	5.9%	0.1	medium
COMMODITIES	Oil (Brent)	21.9%	-1.0	low
	Gold	15.5%	-0.0	medium
	Copper	28.9%	1.1	high
	Iron Ore	64.2%	2.4	high
PROPERTY	US	15.3%	-0.5	low
	Europe	18.3%	0.9	high
	Japan	12.7%	-0.4	low
ALTERNATIVES	HFRX Global HF	2.8%	0.1	medium
	Avg PE Fund	12.9%	-0.6	low
KURTOSIS	ZCF 1% left (vs -2.33 for normal curve)	-3.03	-0.7	high
CORRELATION	Average market correlation with euro equities	15%	-1.7	low

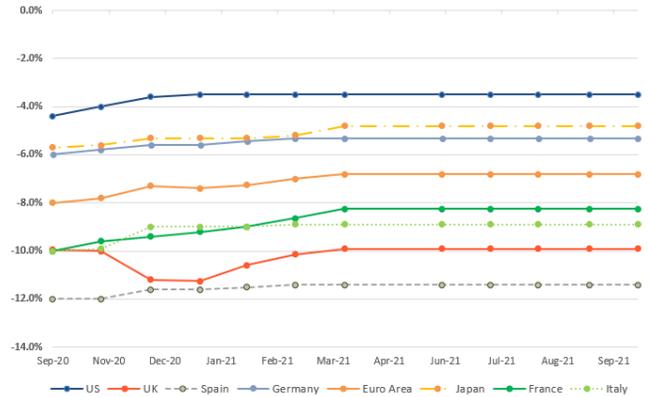
Note: Throughout the text we refer to volatilities as being "low", "medium" or "High". We define this by defining three equal "sized" regimes over the last 12 months. i.e. "High" volatility implies that volatility is in the upper third of its statistical range over the last 12 months. The table shows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

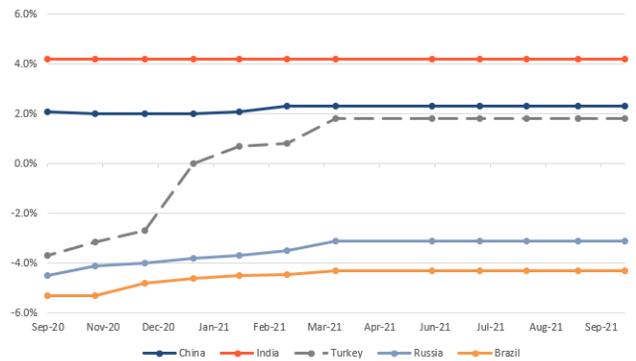
Major Volatility-Driving Events

- Elections in Germany reveal voters' appetite for change without one candidate clearly emerging. Socialist Olaf Scholz is most likely to succeed Angela Merkel as chancellor in a tripartite coalition with The Green party and the Liberals.
- President of the Bundesbank Jens Weidmann announced his departure from the institution at year-end. He is one of the biggest critics of the impact of loose monetary policy.
- British supply chains are being strained by Brexit effects as shops are starting to run out of stock. UK government seeks to re-negotiate border checks and tries to attract people working in supply chains.
- German carmaker Volkswagen is said to cut 30,000 jobs due to cost pressure and in the wake of a reorganisation to focus on alternative engines.
- Facebook intends to create 10,000 jobs in Europe to work on metaverse, a technology for a virtual environment for work and or socialise. This comes in the middle of a wave of critique kicked off by whistleblower Frances Haugen, who casts severe doubts over the integrity of Facebook's values and business approach.
- Energy prices, particularly oil and gas, shooting through the roof after global demand rises and Russia cuts its gas supply while Australia is in the clinch with China over coal supply.

GDP ESTIMATES FOR 2021, DEVELOPED COUNTRIES



GDP ESTIMATES FOR 2021, DEVELOPING COUNTRIES



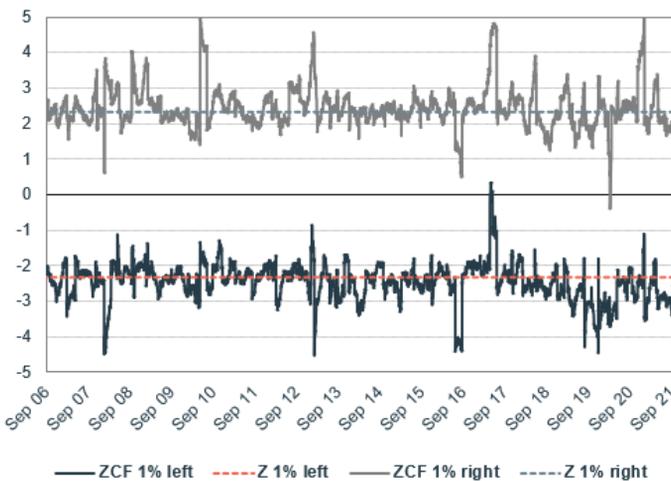
Kurtosis

Correlation in the equity markets

Kurtosis (against normal +/- 2.33)

The distribution of risks in European equity market displays denormalization on the left side with the ZCF 1% left at -3.03 and the right ZCF 1% at +1.48 (both as of 30th of September).

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.

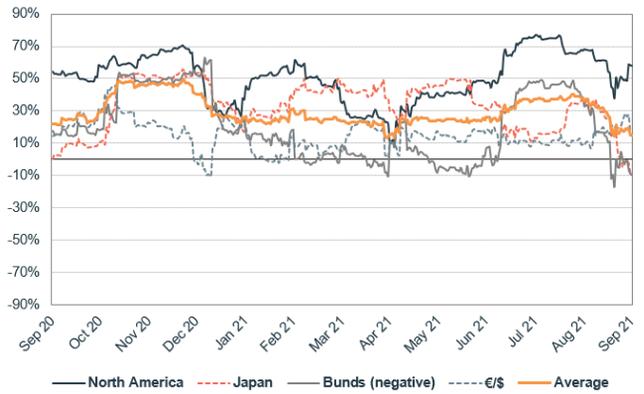
Inter-market correlations with EU equities



14.9%

AVERAGE
CORRELATION

Inter-market correlations (with EU equities)



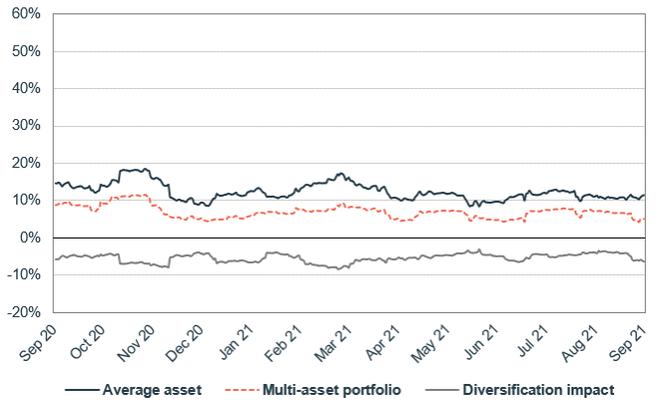
Correlation with euro equities decreased during last month, leading our average correlation indicator to down from 36% to 14.9% (high down to low).



11.41%

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 increased, moving from 11.08% to 11.41%, while the benefit of multi-asset diversification increased, moving from 3.9% to 6.3%.

In combination, multi-asset portfolio volatility decreased from 7.2% to 5.1%.



5.1%

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

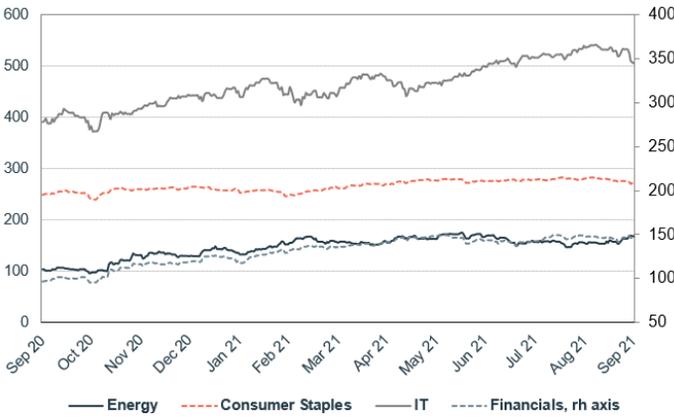
STOCK PRICE PERFORMANCE: REGIONS (LOG SCALES)



-3.1%
Europe

Equity region price movements were mixed. North America lost -4.7%, Asia ex-Japan lost -3.6%, Europe lost -3.1%, and Japan (Nikkei) gained +4.9%.

STOCK PRICE PERFORMANCE: SECTORS (LOG SCALES)



-1.5%
FINANCIALS

-5.8%
IT

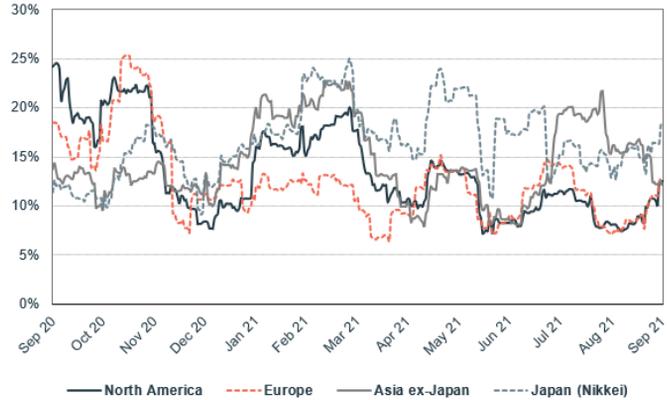
+9.1%
ENERGY

-4.1%
CONSUMER STAPLES

Equity price sector results were mixed. Energy gained +9.1%, Consumer Staples lost -4.1%, Financials lost -1.5%, IT lost -5.8%.

Equities Volatility

EQUITY VOLATILITY: REGIONS



12.8% EUROPE

Region's volatility results were also mixed. North America rose from 8.1% to 12.5% (low up to medium), Asia ex-Japan fell from 16.2% to 12.1% (high down to low), Europe rose from 7.2% to 12.8% (low up to medium), Japan (Nikkei) rose from 13.4% to 18.3% (low up to high).

EQUITY VOLATILITY: SECTORS



Volatility results were all upward. Energy rose from 23.6% to 25.2% (low up to medium), Consumer Staples rose from 6.8% to 8.3% (low up to medium), Financials rose from 11.7% to 15.4% (low up to medium), IT rose from 10.9% to 15.8% (low up to medium).

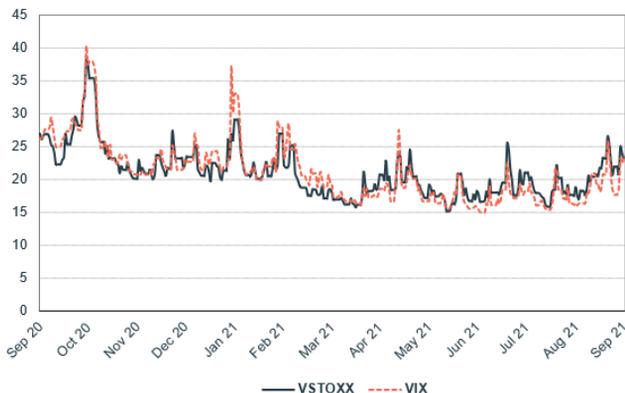
Equity Implied Volatility

Market-Implied Near Term Outlook

Implied Volatility

Implied volatility increased during September in both observed markets. VIX rose from 16.5 to 23.1 (low up to high), and the VSTOXX rose from 18.8 to 23.2 (low up to high).

IMPLIED VOLATILITY



23.1% VIX

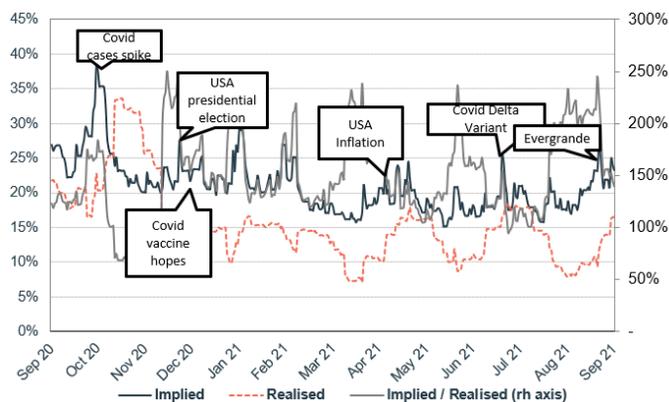
23.2% VSTOXX

Implied vs Realised Volatility

The realised volatility (of the Euro Stoxx 50 index over 30 days) increased also from 8% to 16.6% bringing the ratio of implied/realised volatility to move down from 234% to 140%.

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

IMPLIED VS. REALISED VOLATILITY



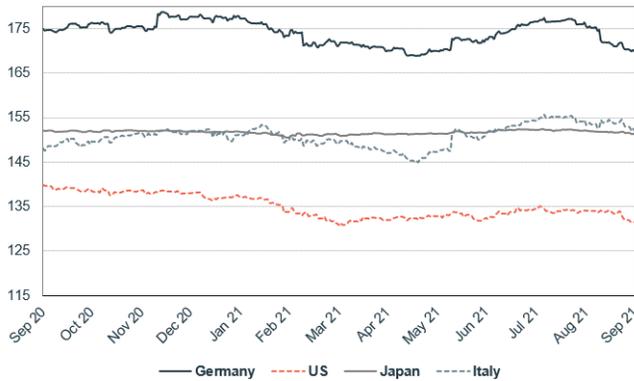
140% IMPLIED/REALISED VOLATILITY

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

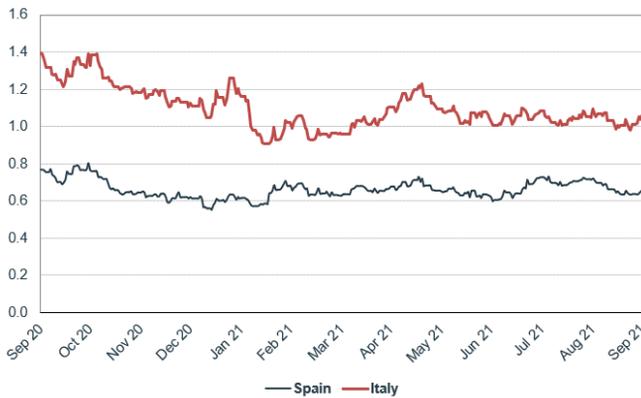
PRICES OF 10Y BOND FUTURES



Prices

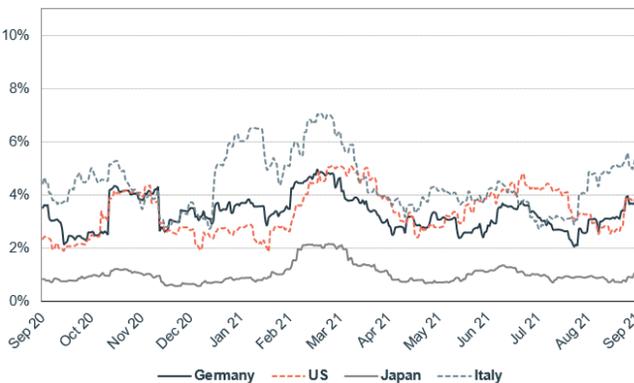
Government bond prices movements were all downwards. Germany lost -3.2%, US lost -1.8%, Japan lost -0.5%, Italy lost -0.9%.

10 YEAR BOND SPREADS OVER GERMANY, %



Italian spreads over Germany decreased slightly from 1.09% to 1.06%, while the Spanish spreads against Germany decreased from 0.72% to 0.66%.

VOLATILITY OF 10Y BOND FUTURES

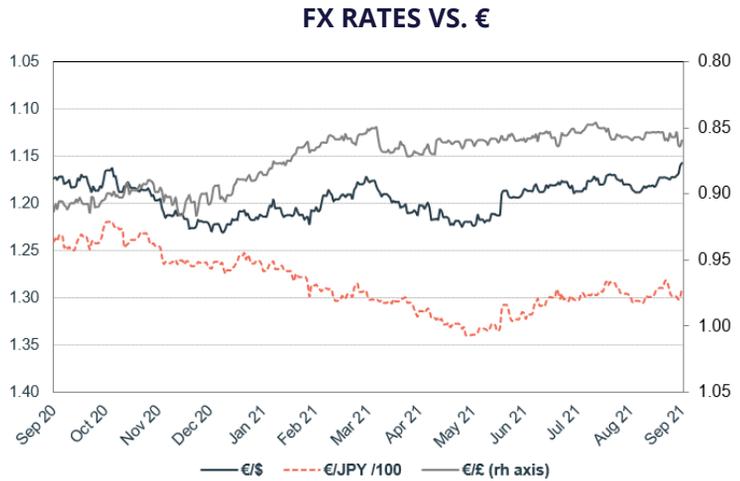


Volatility results were all upwards. Germany rose from 3.0% to 3.7% (low up to high), US rose from 3.3% to 3.8% (medium up to high), Japan rose from 0.9% to 1.0% (medium), Italy rose from 4.9% to 5.4% (medium up to high).

Foreign Exchange

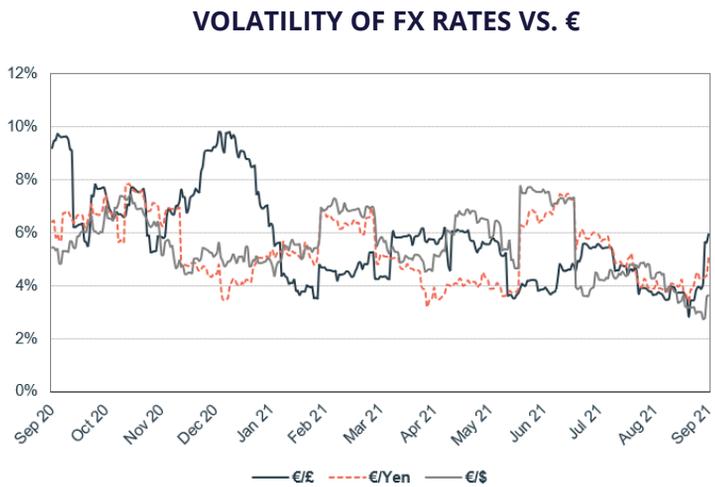
Prices

Euro results were mixed. Euro lost 2.0% against the US Dollar, Euro lost 0.7% against the Japanese Yen, Euro lost 0.1% against the Swiss Franc, Euro gained 0.1% against the British Pound.



Volatility

FX volatility moves were also mixed. €//\$ fell from 4.3% to 3.6% (low), €/Yen rose from 3.9% to 5.0% (low up to medium), €/CHF fell from 4.6% to 4.1% (high), €/£ rose from 3.7% to 5.9% (low up to medium).



3.6% € vs. \$

5.9% € vs. £

5.0% € 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.

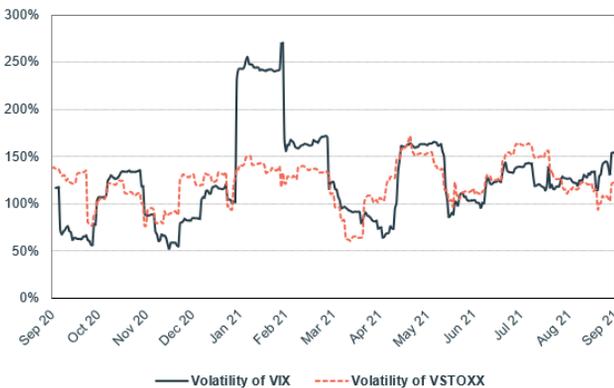
(Equity) Options

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 113.9% to 123.1% (medium), and the Volatility of VIX rose from 126.7% to 154.0% (medium up to high).

VOLATILITY OF VOLATILITY



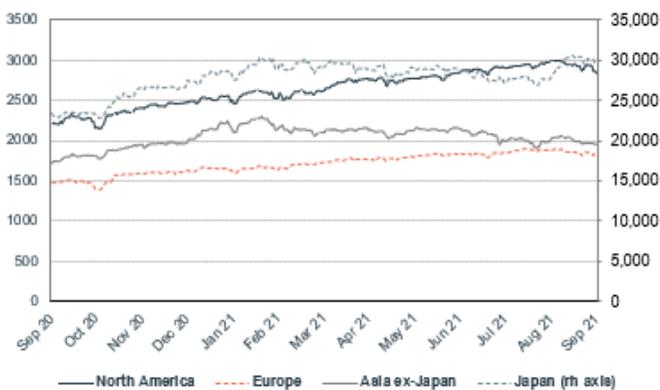
154.0% US

123.1% EUROPE

Major (Regional Equity) price moves

Regions price movements were mixed. North America lost -4.7%, Asia ex-Japan lost -3.6%, Europe lost -3.1%, Japan (Nikkei) gained +4.9%.

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

Prices

Commodities price movements were mixed during September. Oil (Brent) gained +7.6%, Gold lost -3.3%, Copper lost -6.2%, Iron Ore lost -21.4%.

+ 7.6% OIL

- 3.3% GOLD

- 6.2% COPPER

COMMODITIES PRICES, \$



Volatility

Volatility movements for Commodities were also mixed. On this regard we have that Oil (Brent) fell from 36.4% to 21.9% (high down to low), Gold rose from 15.4% to 15.5% (medium), Copper rose from 22.4% to 28.9% (medium up to high), Iron Ore rose from 32.1% to 64.2% (medium up to high).

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 prices movements were all downwards. US lost -6.1%, Europe lost -8.6%, Japan lost -0.2%.

- 8.6% EUROPE

- 6.1% US

- 0.2% JAPAN

REAL ESTATE (REIT) VOLATILITY



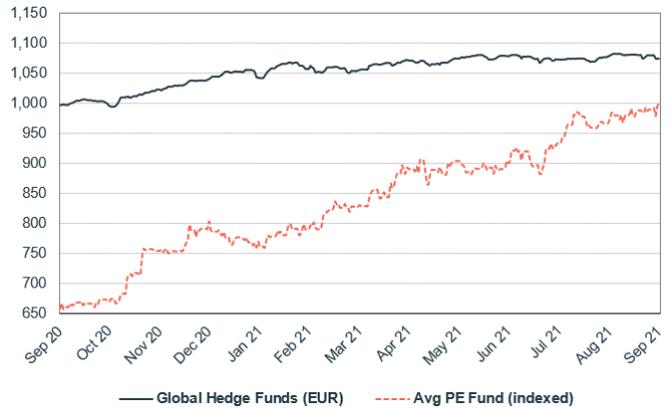
Volatility moves were mixed. US rose from 10.0% to 15.3% (low), Europe rose from 12.3% to 18.3% (low up to high), Japan fell from 13.0% to 12.7% (medium down to low).

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.

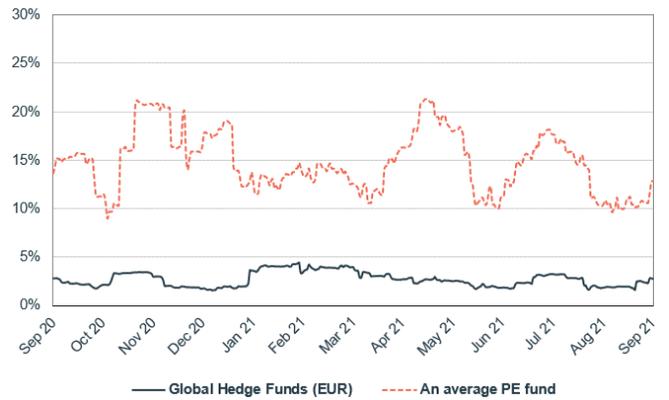
Alternatives

ALTERNATIVES PRICES



The average hedge fund lost -0.4%, and the average PE fund gained +2.5%.

AI VOLATILITY



Volatility results for Alternative Investments were all up. We have that the average hedge fund rose from 1.9% to 2.8% (low up to medium), and the average PE fund rose from 10.6% to 12.9% (low).



2.8%

HFRX
Volatility



12.9%

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 September 2021, and news and events are included up to that date. The commentary was written on or before October 11th, 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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