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MARKET VOLATILITY RISK NEWSLETTER – December 2020

# *Tumbling Colossus*

Member of the Profidata Group

# Executive Summary

- **Volatility results for the observed markets were mixed.** Region volatility spanned a range that goes from 14.2% (Asia -Ex. Japan-) to 19.2% (Europe), with North America and Japan changing from medium to low 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 **20.4% to 26.1%**.
- **All observed equity sector markets increased in price during the last month.** Sectors **volatility** spanned a range that goes from 11.7% (Consumer Staples) to 57.9% (Energy), with Energy changing from medium to high and Financials from low to medium regime.
- **Sovereign bond price movements were mixed. Volatility** moves were also mixed and spanned a range that goes from 1% for Japan and 3.9% for US, which changed from low to medium regime. All other markets closed on low volatility.
- **The EUR closed the month appreciating against all other major currencies, with the exception of the pair EUR/GBP, in which case it depreciated by 0.5%. FX volatility results were mixed and** ended ranging between 3.4% (€/CHF) and 6.3% (€/Yen), with €/¥ and €/CHF changing from low to medium regime, and all other pairs settling in the low and medium regime.
- **Options' implied volatility decreased in both observed markets**, with the VIX changing from 38.02 to 20.54 and the VSTOXX decreasing from 35.3 to 22.9, and both observed markets settled on low volatility.
- **With the exception of Gold, all commodities' prices were upwards trending**, with the Oil (Brent) gaining +27.0%, Gold losing -5.5%, Copper increasing +12.2%, and Iron Ore +5.5%. **Volatility changes were mixed.** It spanned and ranged between 13.4% (Iron Ore) to 40.2% (Oil Brent).
- **Real Estate** (equity) prices increased in all observed markets, with US +12.0%, Europe +12.7%, and finally Japan +8.5%. **Volatility moves were all upward**, ranging from 19.8% (Europe) to 30.7% (US).
- **The average PE Funds** gained +11.6%, while the **average Hedge Fund** increased +2.7%. **Volatility** for the average hedge fund increased from 2.1% to 3%, while the average PE fund increased from 10.5% to 17.9%, with both changing to medium volatility regime.

The Arkus Risk Team



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# Summary volatility matrix and outlook

Grouchy Donald Trump reluctantly cedes the Oval office to president-elect Joe Biden who prepares to take over a country more divided than ever. Meanwhile, the EU is still squabbling with the UK on the conditions of their separation. On the other side of the world, Asian Pacific countries, including China and Japan, form the largest trade union in the world.

Markets rallied strongly in the wake of vaccine hopes. Most European countries still have re-instated lockdown measures before the Christmas break to dampen the second wave of the pandemic. Once again this is accompanied by huge fiscal support and dovish central banks.

As the pandemic year of 2020 comes to an end, we at Arkus hope that you are healthy and safe and wish you and your families a happy festive season and all the best for the (hopefully less restricted) year 2021!

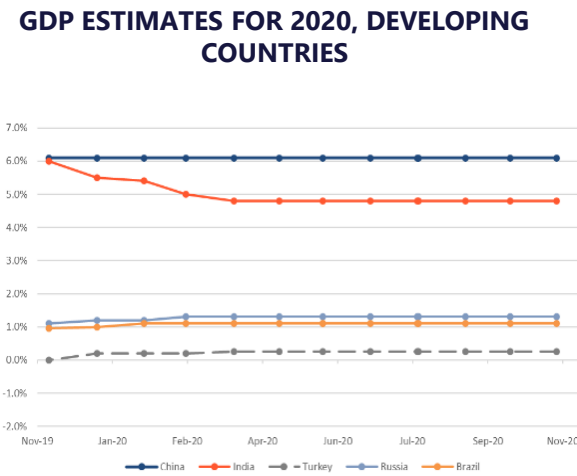
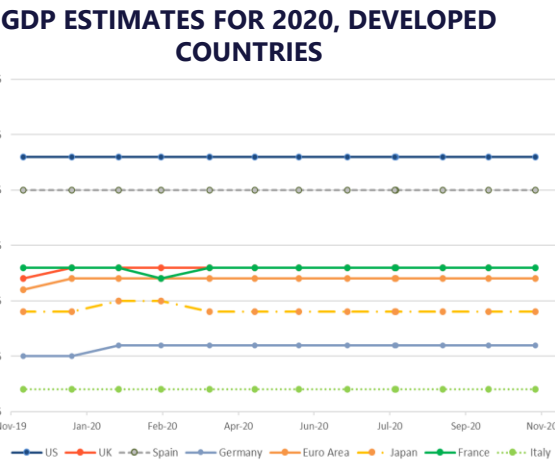
ASSET CLASS	AREA	LATEST VOLATILITY	LATEST Z-SCORE	REGIME
EQUITIES	North America	15.5%	-0.5	low
	Asia ex-Japan	14.2%	-0.5	low
	Europe	19.2%	-0.2	medium
	Japan (Nikkei)	17.1%	-0.4	medium
	Energy	57.9%	0.6	high
	Consumer Staples	11.7%	-0.3	medium
	Financials	30.2%	0.1	medium
	IT	22.1%	-0.4	medium
VOLATILITY OF VOLATILITY	Volatility of VIX	87%	-0.8	low
	Volatility of VSTOXX	93%	-0.8	low
GOVERNMENT BONDS	Germany	3.8%	-0.6	low
	US	3.9%	0.0	medium
	Japan	1.0%	-1.0	low
	Italy	3.6%	-1.4	low
FX VS \$	€/\$	5.2%	-0.5	low
	€/Yen	6.3%	-0.4	medium
	€/CHF	3.4%	-0.2	medium
	€/£	5.8%	-0.9	low
COMMODITIES	Oil (Brent)	40.2%	-0.4	medium
	Gold	23.3%	0.5	high
	Copper	16.0%	-0.7	low
	Iron Ore	13.4%	-0.8	low
PROPERTY	US	30.7%	-0.2	medium
	Europe	19.8%	-0.3	medium
	Japan	22.3%	-0.1	medium
ALTERNATIVES	HFRX Global HF	3.0%	-0.2	medium
	Avg PE Fund	17.9%	0.1	medium
KURTOSIS	ZCF 1% left (vs -2.33 for normal curve)	-2.47	0.8	low
CORRELATION	Average market correlation with euro equities	46%	1.2	high

**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

- ▶ US pharma company Pfizer and its German partner Biontec reported promising test results from vaccination trials with protection rates >90%. Similar results were reported by US based biotech company Moderna. Both products preliminarily approved by admission agencies. First vaccinations happening in the UK.
- ▶ 15 nations in the Asia-Pacific region, among them China, Japan and South Korea, have signed a free trade deal that constitutes the biggest trade union in the world. The agreement labelled Regional Comprehensive Economic Partnership (RCEP) includes 2.2 bn people and 29% of global GDP.
- ▶ Spanish bank BBVA (Banco Bilbao Vizcaya Argentaria) sells its US business unit to PNC Financial Services Group for \$ 11.6 bn in the biggest second largest banking deal in the US after the financial crisis.
- ▶ Subject to shareholder approval, S&P Global acquires IHS Markit for \$44 bn in the continued wave of consolidation in the data market. The deal would be the biggest in 2020.
- ▶ Brexiting UK are still in intense discussions with the European Union on the exit conditions. As time runs thin, the UK Government are still confident to find a solution.
- ▶ Deutsche Bank finalizes a cooperation agreement with Google for an initial intended period of 10 years in a move to modernize its IT infrastructure. It is also planned to join forces for the development AI based financial software applications.



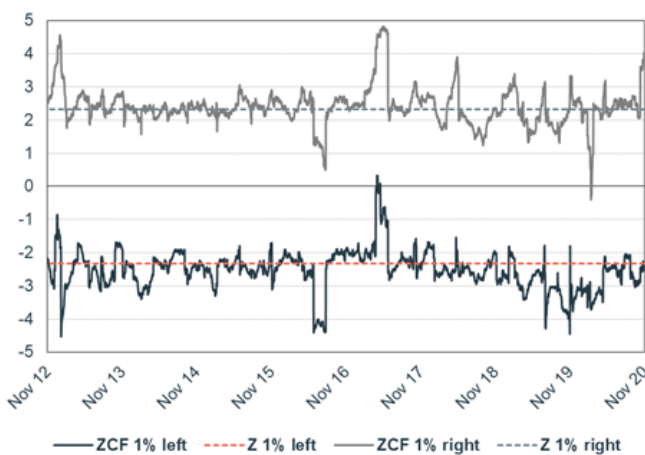
# Kurtosis

## 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 -2.47 and the right ZCF 1% at +3.93 (both as of 30th of November).

### *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.

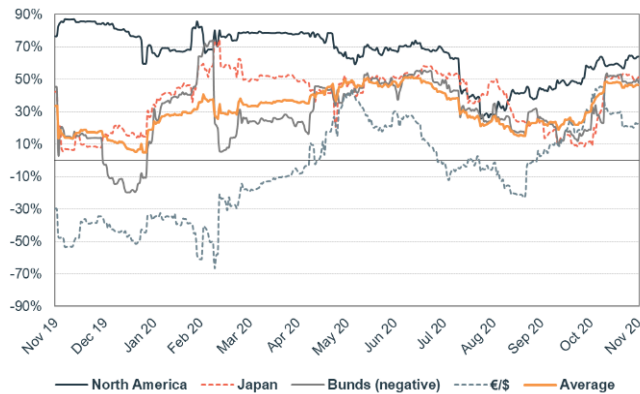


# Inter-market correlations with EU equities



46.4% AVERAGE  
CORRELATION

Inter-market correlations (with EU equities)

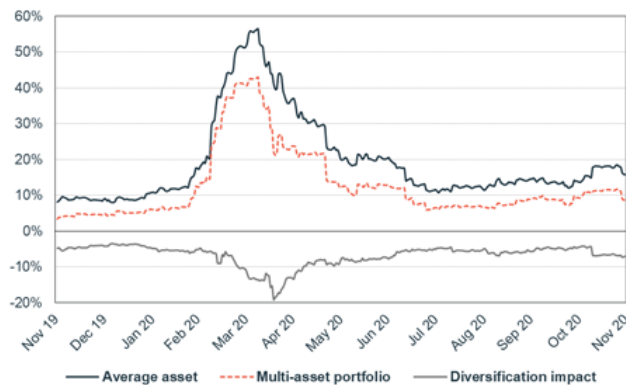


Correlation increased during last month, leading our average correlation indicator to change from 29.9% to 46.4% (medium up to high).

## Multi-asset portfolio volatility



15.8% AVERAGE  
VOLATILITIES



8.8% 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 13.7% to 15.8%, while the benefit of multi-asset diversification improved, moving from 4.5% to 7.1%.

In combination, multi-asset portfolio volatility decreased from 9.3% to 8.8%.

**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

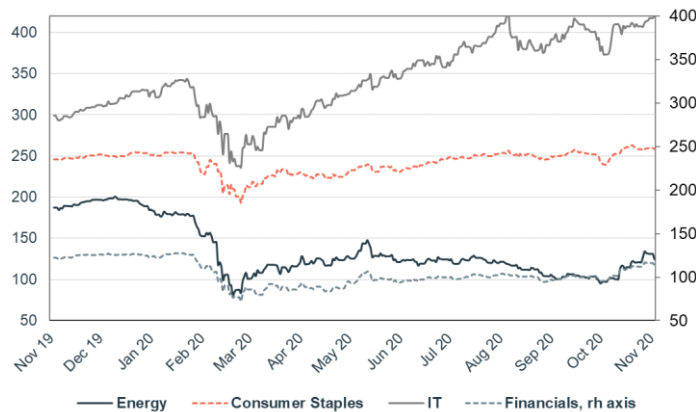
### STOCK PRICE PERFORMANCE: REGIONS (LOG SCALES)



All equity regions closed the month increasing in price. North America gained +11.5%, Asia ex-Japan gained +7.2%, Europe gained +13.8%, Japan (Nikkei) gained +15.0%

+13.8%  
Europe

### STOCK PRICE PERFORMANCE: SECTORS (LOG SCALES)



All equity sectors increased in price during the last month. Energy gained +28.2%, Consumer Staples gained +7.8%, Financials gained +19.2%, IT gained +12.5%

+19.2%  
FINANCIALS

+12.5%  
IT

+28.2%  
ENERGY

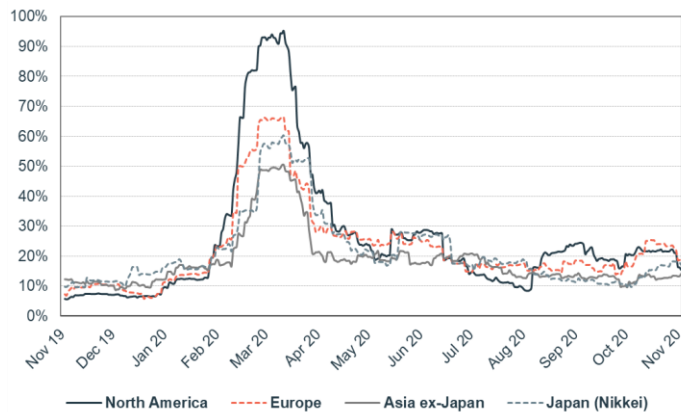
+7.8%  
CONSUMER  
STAPLES



# Equities

## Volatility

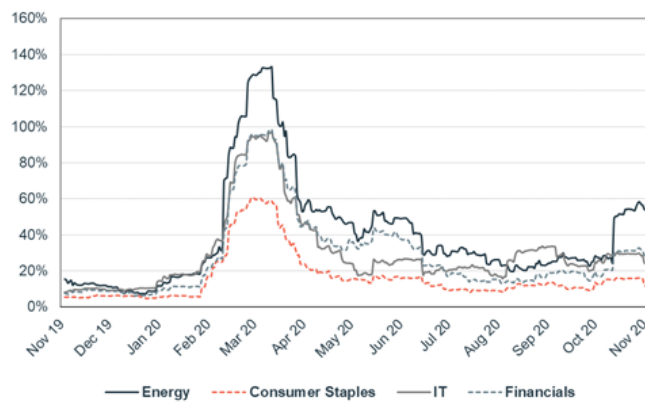
EQUITY VOLATILITY: REGIONS



19.2% EUROPE

Volatility results were mixed. North America fell from 20.5% to 15.5% (medium down to low), Asia ex-Japan rose from 11.0% to 14.2% (low), Europe rose from 16.6% to 19.2% (medium), Japan (Nikkei) rose from 9.9% to 17.1% (low up to medium)

EQUITY VOLATILITY: SECTORS



Sectors volatility results were mixed. Energy rose from 27.4% to 57.9% (medium up to high), Consumer Staples fell from 12.5% to 11.7% (medium), Financials rose from 17.1% to 30.2% (low up to medium), IT fell from 25.7% to 22.1% (medium).

**Equity volatility: sectors**

# Equity Implied Volatility

## Market-Implied Near Term Outlook

### Implied Volatility

Implied volatility in both, US and Europe, decreased.  
VIX fell from 38.0 to 20.6 (high down to low), VSTOXX  
fell from 35.3 to 22.9 (high down to medium).



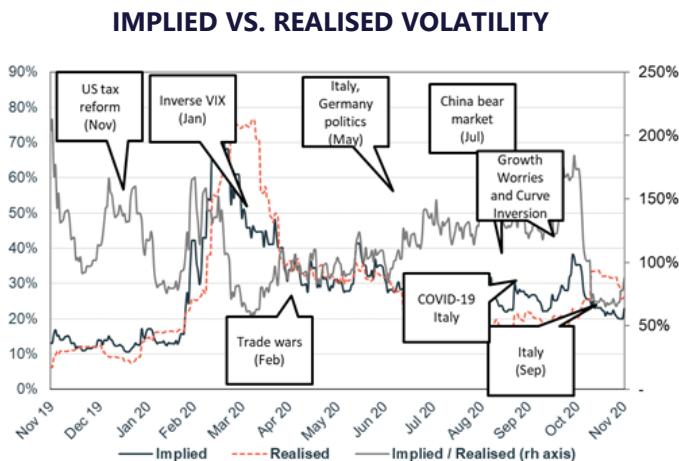
20.6% VIX

22.9% VSTOXX

### Implied vs Realised Volatility

(European equity) implied volatility decreased. The realised volatility increased also (of the Euro Stoxx 50 index over 30 days) to 26.1% (medium) bringing the ratio of implied/realised volatility to move down from 173% to 88%.

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



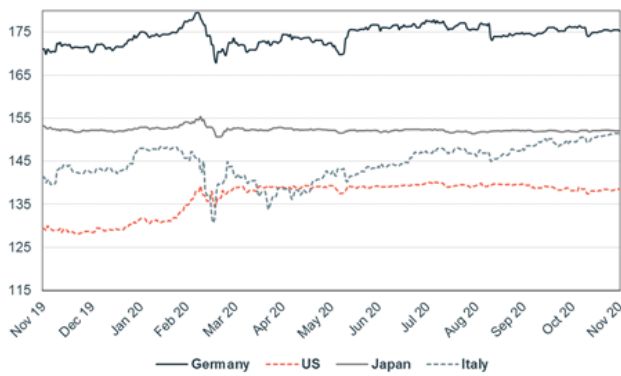
88% IMPLIED/REALISED VOLATILITY

**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

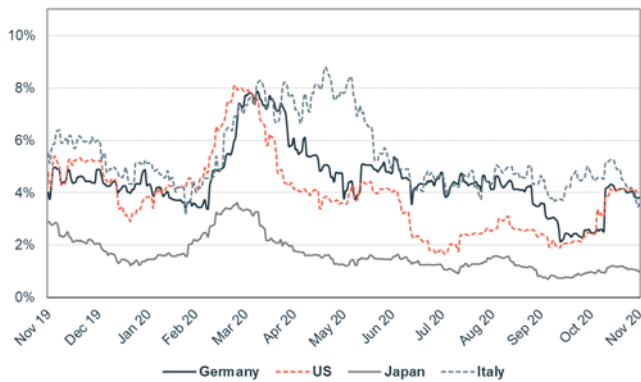
Government bond prices movements were mixed. Germany lost -0.5%, US gained +0.2%, Japan gained +0.1%, Italy gained +1.0%.

10 YEAR BOND SPREADS OVER GERMANY, %



Italian spreads over Germany decreased from 1.39% to 1.2%, while the Spanish spreads against Germany decreased from 0.76% to 0.65%.

VOLATILITY OF 10Y BOND FUTURES

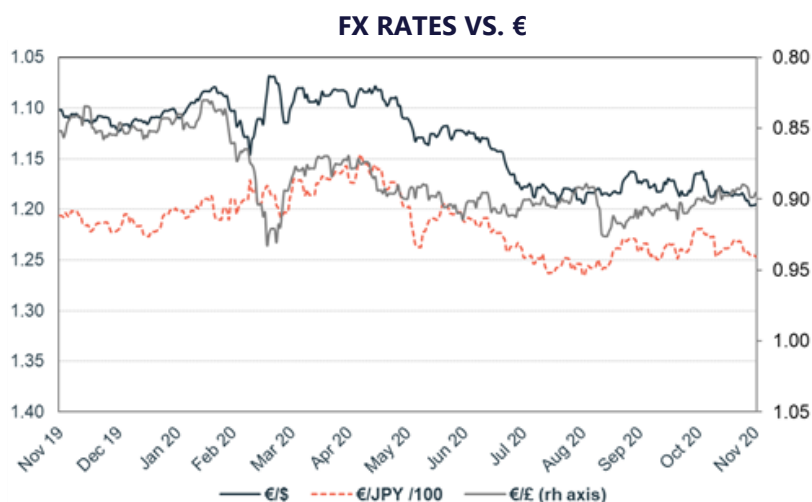


Volatility moves were mixed. Germany rose from 2.5% to 3.8% (low), US rose from 2.4% to 3.9% (low up to medium), Japan rose from 1.0% to 1.0% (low), Italy fell from 4.7% to 3.6% (low).

# Foreign Exchange

## Prices

Euro results were mixed. We have that Euro gained 2.6% against the US Dollar, Euro gained 2.2% against the Japanese Yen, Euro gained 1.4% against the Swiss Franc, Euro lost 0.5% against the British Pound.



## Volatility

FX volatility moves were also mixed. €/£ fell from 6.5% to 5.2% (medium down to low), €/Yen fell from 6.8% to 6.3% (medium), €/CHF rose from 2.1% to 3.4% (low up to medium), €/£ fell from 6.9% to 5.8% (low).

## VOLATILITY OF FX RATES VS. €



5.2% € vs. \$



5.8% € vs. £



6.3% € 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.

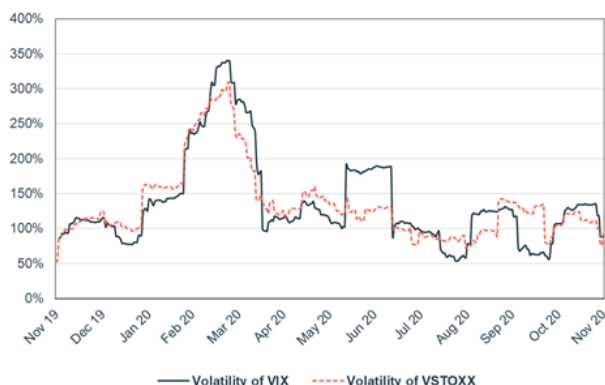
# (Equity) Options

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 105.1% to 93.2% (low) and the Volatility of VIX fell from 106.8% to 87.4% (medium down to low).

### VOLATILITY OF VOLATILITY



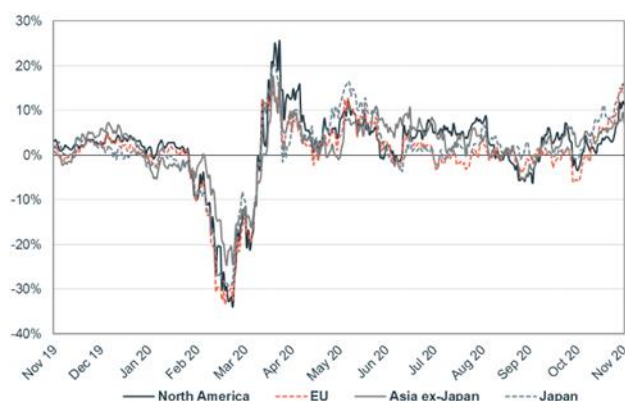
87.4% US

93.2% EUROPE

## Major (Regional Equity) price moves

Price movements were all upward, with Japan (Nikkei) increasing the most. North America gained +11.5%, Asia ex-Japan gained +7.2%, Europe gained +13.8%, Japan (Nikkei) gained +15.0%.

### 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

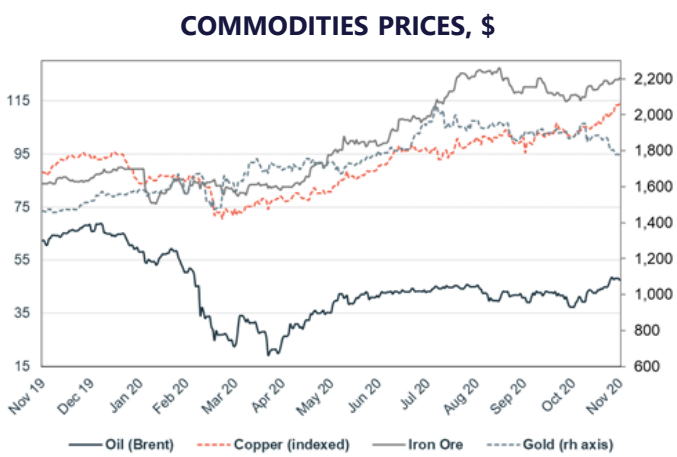
## Prices

With the exception of Gold, commodity prices increased during the last month; we have that Oil (Brent) gained +27.0%, Gold lost -5.5%, Copper gained +12.2%, and Iron Ore gained +5.5%

+27% OIL

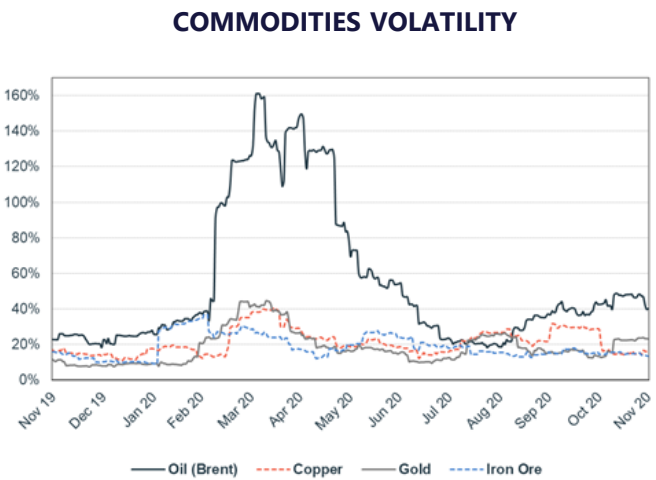
-5.5% GOLD

+12.2% COPPER



## Volatility

Volatility movements of Commodities were mixed during November. On this regard, we have that Oil (Brent) fell from 42.5% to 40.2% (medium), Gold rose from 13.5% to 23.3% (low up to high), Copper fell from 28.4% to 16.0% (high down to low), Iron Ore fell from 14.4% to 13.4% (low).

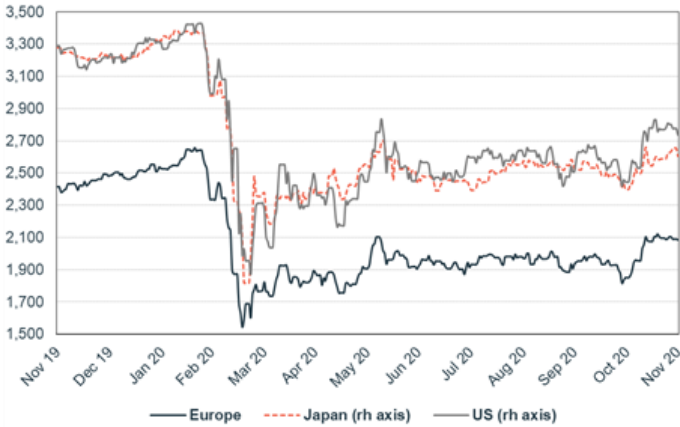


*Note: all prices refer to near futures rather than spot with the exception of iron ore which is a spot price.*

# Real Estate and Alternatives

## (Real Estate Share Prices)

REAL ESTATE (REIT) PRICES



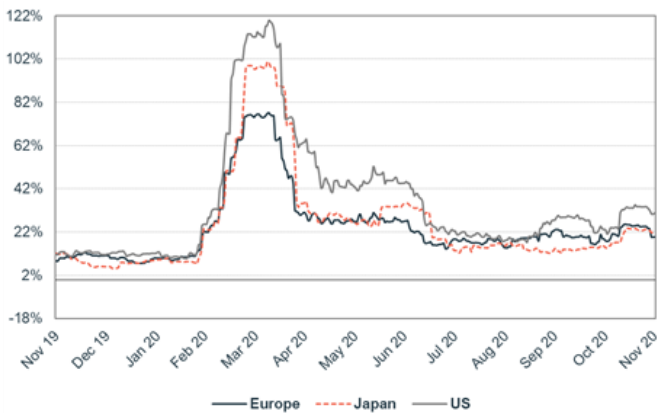
Real estate regional prices movements were all upward. We have that US gained +12.0%, Europe gained +12.7%, Japan gained +8.5%.

+12.7% EUROPE

+12.0% US

+8.5% JAPAN

REAL ESTATE (REIT) VOLATILITY



Volatility moves were all upward. We have that US rose from 23.1% to 30.7% (medium), Europe rose from 18.1% to 19.8% (medium), Japan rose from 14.7% to 22.3% (low up to medium).

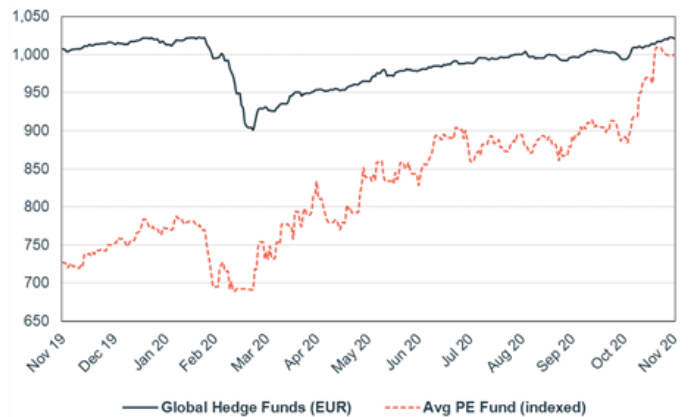
*Note: Note that for property we look at indices of the share prices of REITs, and not the underlying property directly, for which little real-time data is available. This is usually consistent with funds which tend to invest in property indirectly, e.g. via REITs or property companies.*

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



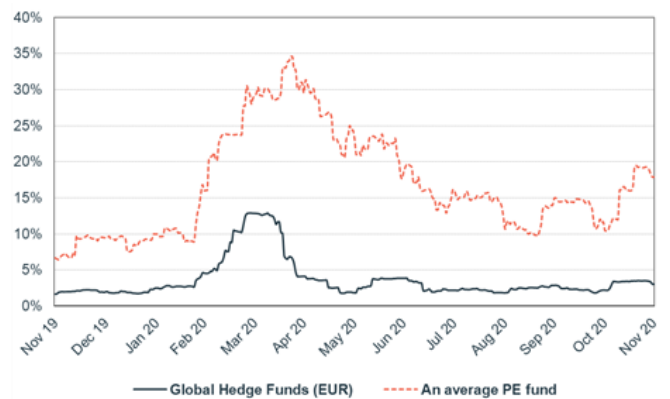
# Alternatives

## ALTERNATIVES PRICES



The average hedge fund gained +2.7%, an average PE fund gained +11.6%.

## AI VOLATILITY



Volatility movements for Alternative Investments were upward. The results show that the average hedge fund rose from 2.1% to 3.0% (low up to medium), and the average PE fund rose from 10.5% to 17.9% (low up to medium).



3.0% HFRX  
Volatility



17.9% 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 30th November 2020, and news and events are included up to that date. The commentary was written on or before November 7th, 2020.

## Disclaimer

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

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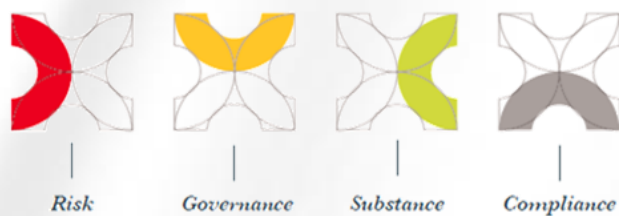
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Societe Anonyme  
6B Route de Treves L-2633  
Senningerberg  
Luxembourg  
T +352 42 26 11 111 F +352 42 26 399  
[info@arkus-fs.com](mailto:info@arkus-fs.com)

150 Minories  
London  
EC3N 1LS  
T +44 (0) 207 264 2027  
[www.arkus-fs.com](http://www.arkus-fs.com)

