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# COVID-19: CONTAGION RISKS ALSO APPLY TO MARKETS

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**When Minsky strikes, Markovitz retreats.** The Covid-19 crisis caused one the most severe financial market turmoil of the last hundred years. A historic slump was followed by a historic rally. Volatility reached levels unseen since the Great Financial Crisis. In such market phases, asset returns shift to the tails of their distribution. Usually, such extreme values do not occur in isolation, but spread across asset classes. Correlations increase, the benefits of diversification decrease. The financial market as a whole becomes systemically more unstable.

**Increased tail co-movements between asset classes indicate the presence of a common risk factor.** In the Covid-19 crisis, this common factor might have been the rush for liquidity. By this we mean the investors' desire to build precautionary cash balances to hedge against the risk of income shortfall. In earlier crisis this common factor was for example a general shift in risk aversion, overvaluation, leverage, or market liquidity. The phenomenon of tail co-movement of asset prices is often referred to as spillover or contagion risk. Although most investors are aware of this risk, measuring it is a challenge. Correlation and Covariance are based on mean values. While the most common measure of tail risk – value-at-risk (VaR) – is not designed to provide explicit information about co-dependencies of risk. Value-at-risk is the expected loss over a given time horizon, at a pre-defined confidence level. For example, if the 95% weekly VAR of asset A is -8%, this means that the weekly return of asset A is expected to fall below that threshold approximatively two times in one year. VaR thus captures the tail risk of an asset from a partial equilibrium point of view.

**We therefor use "CoVaR" to extent the analysis of tail risk to a general equilibrium view** (with "Co" standing for contagion).[1] CoVaR can be defined as the VaR of an asset subject to other assets being in distress, i.e. being at their VaR level. In technical terms, CoVaR captures the cross-sectional dependence between a specific asset and a set of assets. The ratio of CoVaR to VaR reflects the extent to which an asset is exposed to contagion risk from another asset. Let us take our example from above. The VaR of asset A at 95% confidence is -8%. Its CoVaR, which is conditional on asset B being at its 95% VaR, turns out to be -10%. The contagion factor is thus -10% / -8% = 1.25. A factor above one indicates contagion risk. A factor around one shows immunity. A factor clearly below one indicates diversification. In our example, this means that the

[1] *For methodology see: "CoVaR", Tobias Adrian & Markus K. Brunnermeier, September 2008, Federal Reserve Bank of New York Staff Report*

95% VaR of asset A is 25% higher when asset B is in distress.

**A matrix of these contagion factors** across asset classes offers an easy way to map contagion risk. We apply this to a universe of 15 asset classes (equities, HY and IG bonds, government bonds and gold) using the 90% confidence interval for VaR and CoVaR based on rolling weekly returns. In a long-term view over the last 15 years, this matrix of clearly reveals contagion risks between asset classes with similar risk profiles (Table 1). Risky assets such as equities and HY bonds form one contagion cluster. Safe assets such as government bonds form another. To one another these clusters show immunity or even diversification. Two aspects are particularly interesting. First, unlike most euro government bonds the contagion structure of long-term Italian government bonds (BTP 7-10y) is more similar to a risky than to a safe asset. The euro crisis left its mark. Second, gold shows limited diversification properties when it comes to tail risk as one can observe slight contagion risks from most asset classes.

Table 1 – Long-term contagion matrix (last 15 years)

| | | | **Contagion factor** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | S&P 500 | MSCI EMU | MSCI EM | USD High Yield | EUR High Yield | USD Corp IG | EUR Corp IG | UST 1-3y | UST 7-10y | Bund 1-3y | Bund 7-10y | BTP 7-10y | OAT 7-10y | JP 7-10y | Gold |
| **asset class at VaR Level** | USD | S&P 500 | | 1.4 | 1.4 | 1.7 | 1.7 | 1.1 | 1.1 | 0.7 | 0.7 | 0.8 | 0.8 | 1.2 | 0.9 | 0.9 | 1.2 |
| | EUR | MSCI EMU | 1.5 | | 1.5 | 1.7 | 1.7 | 1.1 | 1.2 | 0.6 | 0.6 | 0.7 | 0.6 | 1.4 | 0.9 | 0.8 | 1.2 |
| | USD | MSCI EM | 1.5 | 1.4 | | 1.6 | 1.7 | 1.2 | 1.2 | 0.8 | 0.8 | 0.7 | 0.8 | 1.3 | 0.9 | 0.8 | 1.3 |
| | USD | USD High Yield | 1.3 | 1.3 | 1.3 | | 1.5 | 1.4 | 1.4 | 0.9 | 1.0 | 1.0 | 1.0 | 1.2 | 1.1 | 1.0 | 1.2 |
| | EUR | EUR High Yield | 1.3 | 1.2 | 1.3 | 1.5 | | 1.4 | 1.4 | 0.9 | 1.0 | 1.0 | 1.0 | 1.2 | 1.1 | 1.0 | 1.1 |
| | USD | USD Corp IG | 1.0 | 1.1 | 1.3 | 1.7 | 1.8 | | 1.5 | 1.4 | 1.3 | 1.2 | 1.3 | 1.2 | 1.3 | 1.3 | 1.2 |
| | EUR | EUR Corp IG | 1.1 | 1.2 | 1.3 | 1.6 | 1.7 | 1.6 | | 1.4 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.2 |
| | USD | UST 1-3y | 0.5 | 0.6 | 0.7 | 0.7 | 0.6 | 1.2 | 1.2 | | 1.2 | 1.3 | 1.3 | 1.1 | 1.3 | 1.2 | 1.1 |
| | USD | UST 7-10y | 0.4 | 0.4 | 0.7 | 0.7 | 0.6 | 1.3 | 1.3 | 1.4 | | 1.4 | 1.4 | 1.1 | 1.4 | 1.4 | 1.1 |
| | EUR | Bund 1-3y | 0.5 | 0.5 | 0.6 | 0.7 | 0.6 | 1.2 | 1.2 | 1.3 | 1.3 | | 1.3 | 1.0 | 1.2 | 1.2 | 1.0 |
| | EUR | Bund 7-10y | 0.5 | 0.4 | 0.7 | 0.9 | 0.8 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | | 1.1 | 1.3 | 1.5 | 1.1 |
| | EUR | BTP 7-10y | 1.1 | 1.2 | 1.1 | 1.1 | 1.2 | 1.2 | 1.3 | 1.2 | 1.2 | 1.1 | 1.2 | | 1.4 | 1.2 | 1.1 |
| | EUR | OAT 7-10y | 0.7 | 0.8 | 0.9 | 1.0 | 1.0 | 1.4 | 1.3 | 1.4 | 1.4 | 1.3 | 1.2 | 1.3 | | 1.4 | 1.1 |
| | JPY | JP 7-10y | 0.7 | 0.7 | 0.8 | 0.8 | 0.8 | 1.4 | 1.4 | 1.4 | 1.4 | 1.3 | 1.4 | 1.2 | 1.4 | | 1.1 |
| | USD | Gold | 1.1 | 1.0 | 1.3 | 1.1 | 1.0 | 1.2 | 1.2 | 1.2 | 1.2 | 1.0 | 1.2 | 1.1 | 1.2 | 1.1 | |

Contagion
Immunity
Diversification

*Source: Refinitiv, Allianz Research*

**During the Great Financial Crisis (GFC), the contagion clusters of risky and safe assets remained intact, but intensified** (Table 2). Government bonds, especially in the Eurozone, showed stronger diversification to distressed equity markets. For example, while the long-term contagion factor from MSCI EMU to German government bonds (7-10y) is 0.7, it reached 0.4 during the GFC. Within the risky asset cluster, the extent of contagion remained mostly unchanged. It only intensified for European IG bonds with a contagion factor of almost 2, especially from high yield bonds. This probably reflects the critical situation in the banking sector at this time, with risk premia of bank bonds rising massively and non-financial bonds suffering from the uncertain financing situation caused by the distressed banking sector.

Table 2 – Contagion matrix (Great Financial Crisis: Sept 2008 to Apr 2010)

| | | | Contagion factor | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | S&P 500 | MSCI EMU | MSCI EM | USD High Yield | EUR High Yield | USD Corp IG | EUR Corp IG | UST 1-3y | UST 7-10y | Bund 1-3y | Bund 7-10y | BTP 7-10y | OAT 7-10y | JP 7-10y | Gold |
| when at VaR Level | USD | S&P 500 | | 1.3 | 1.3 | 1.5 | 1.6 | 1.5 | 1.1 | 0.9 | 0.9 | 0.4 | 0.7 | 0.9 | 0.7 | 1.0 | 1.2 |
| | EUR | MSCI EMU | 1.5 | | 1.6 | 1.7 | 1.8 | 1.6 | 1.2 | 0.8 | 0.7 | 0.4 | 0.4 | 0.9 | 0.6 | 1.0 | 1.3 |
| | USD | MSCI EM | 1.4 | 1.3 | | 1.6 | 1.6 | 1.4 | 1.1 | 0.8 | 0.6 | 0.2 | 0.3 | 0.7 | 0.3 | 0.9 | 1.3 |
| | USD | USD High Yield | 1.5 | 1.4 | 1.5 | | 1.3 | 1.7 | 1.8 | 0.9 | 1.0 | 1.0 | 1.0 | 1.2 | 1.0 | 1.0 | 1.2 |
| | EUR | EUR High Yield | 1.5 | 1.3 | 1.5 | 1.4 | | 1.6 | 2.0 | 1.0 | 1.0 | 1.1 | 1.1 | 1.3 | 1.2 | 0.9 | 1.3 |
| | USD | USD Corp IG | 1.2 | 1.2 | 1.3 | 1.7 | 1.5 | | 1.7 | 1.3 | 1.4 | 1.5 | 1.4 | 1.6 | 1.4 | 1.3 | 1.2 |
| | EUR | EUR Corp IG | 1.1 | 1.1 | 1.1 | 1.6 | 1.4 | 1.5 | | 1.3 | 1.3 | 1.3 | 1.3 | 1.5 | 1.4 | 1.2 | 1.1 |
| | USD | UST 1-3y | 0.7 | 0.8 | 0.7 | 0.6 | 0.8 | 1.1 | 1.4 | | 1.1 | 1.4 | 1.2 | 1.2 | 1.2 | 1.2 | 0.9 |
| | USD | UST 7-10y | 0.5 | 0.7 | 0.5 | 0.8 | 0.8 | 1.4 | 1.9 | 1.4 | | 1.6 | 1.4 | 1.8 | 1.6 | 1.6 | 0.9 |
| | EUR | Bund 1-3y | 0.4 | 0.4 | 0.2 | 0.4 | 0.6 | 0.9 | 1.6 | 1.4 | 1.1 | | 1.3 | 1.3 | 1.4 | 1.2 | 0.8 |
| | EUR | Bund 7-10y | 0.4 | 0.3 | 0.3 | 0.6 | 0.7 | 1.4 | 1.8 | 1.4 | 1.4 | 1.6 | | 1.7 | 1.4 | 1.5 | 0.9 |
| | EUR | BTP 7-10y | 0.8 | 0.9 | 0.8 | 0.9 | 1.0 | 1.2 | 1.7 | 1.2 | 1.2 | 1.4 | 1.3 | | 1.4 | 1.1 | 1.0 |
| | EUR | OAT 7-10y | 0.6 | 0.6 | 0.4 | 0.8 | 0.9 | 1.2 | 1.7 | 1.4 | 1.3 | 1.7 | 1.2 | 1.6 | | 1.4 | 0.9 |
| | JPY | JP 7-10y | 0.8 | 0.9 | 0.6 | 0.8 | 0.8 | 1.4 | 1.7 | 1.3 | 1.3 | 1.5 | 1.4 | 1.5 | 1.4 | | 1.0 |
| | USD | Gold | 1.1 | 1.1 | 1.2 | 1.1 | 1.1 | 0.9 | 0.7 | 1.0 | 0.9 | 0.7 | 0.8 | 0.8 | 0.9 | 1.2 | |

Contagion
Immunity
Diversification

*Source: Refinitiv, Allianz Research*

**However, the Covid-19 showed a completely different contagion pattern.** Extreme price changes spread across almost all asset classes - equities and bonds – simultaneously (Table 3). From a contagion risk perspective, the Covid-19 crisis was a perfect storm. The interplay of economic crisis, increased default risks and a market liquidity crisis, which even made the market for long-term US Treasuries temporarily dysfunctional (contagion factors clearly above one,) resulted in high tail dependencies. Almost all contagion factors clearly went above one.

Table 3 – Contagion matrix (Covid-19 crisis: 01 Jan to 30 Jun 2020)

| | | | Contagion factor | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | S&P 500 | MSCI EMU | MSCI EM | USD High Yield | EUR High Yield | USD Corp IG | EUR Corp IG | UST 1-3y | UST 7-10y | Bund 1-3y | Bund 7-10y | BTP 7-10y | OAT 7-10y | JP 7-10y | Gold |
| when at VaR Level | USD | S&P 500 | | 1.5 | 1.4 | 2.0 | 1.7 | 4.9 | 3.5 | 0.8 | 1.2 | 1.5 | 1.8 | 2.0 | 3.0 | 2.5 | 2.3 |
| | EUR | MSCI EMU | 1.1 | | 1.3 | 1.4 | 1.3 | 3.5 | 2.3 | 0.9 | 1.7 | 1.4 | 2.0 | 1.8 | 2.5 | 2.0 | 1.9 |
| | USD | MSCI EM | 1.6 | 1.8 | | 1.7 | 1.9 | 4.7 | 3.6 | 0.9 | 1.9 | 1.7 | 2.5 | 2.2 | 3.3 | 2.3 | 1.8 |
| | USD | USD High Yield | 1.3 | 1.6 | 1.3 | | 1.3 | 3.6 | 2.4 | 1.1 | 1.8 | 1.7 | 2.2 | 2.1 | 2.6 | 2.0 | 1.6 |
| | EUR | EUR High Yield | 1.3 | 1.5 | 1.2 | 1.3 | | 3.4 | 2.4 | 0.9 | 1.7 | 1.8 | 2.4 | 2.0 | 3.0 | 2.0 | 1.7 |
| | USD | USD Corp IG | 1.1 | 1.4 | 1.0 | 1.3 | 1.2 | | 1.8 | 1.1 | 1.4 | 1.5 | 1.7 | 1.7 | 2.3 | 1.4 | 1.2 |
| | EUR | EUR Corp IG | 1.4 | 1.5 | 1.0 | 1.2 | 1.1 | 2.3 | | 1.1 | 1.3 | 1.5 | 1.7 | 1.6 | 2.2 | 1.5 | 1.4 |
| | USD | UST 1-3y | 0.4 | 0.6 | 0.4 | 0.7 | 0.2 | 0.6 | 0.6 | | 1.5 | 1.0 | 1.2 | 0.9 | 1.8 | 1.1 | 0.8 |
| | USD | UST 7-10y | 1.0 | 0.8 | 1.7 | 2.1 | 2.5 | 5.3 | 3.3 | 1.4 | | 1.3 | 1.5 | 1.1 | 2.4 | 1.8 | 1.8 |
| | EUR | Bund 1-3y | 1.0 | 0.8 | 1.2 | 1.8 | 1.9 | 3.8 | 3.4 | 1.7 | 1.8 | | 1.6 | 0.8 | 1.9 | 2.2 | 1.3 |
| | EUR | Bund 7-10y | 1.4 | 1.6 | 1.5 | 1.8 | 2.0 | 3.6 | 3.4 | 1.5 | 1.5 | 1.3 | | 2.0 | 2.3 | 1.9 | 1.5 |
| | EUR | BTP 7-10y | 1.3 | 1.6 | 1.3 | 1.5 | 1.6 | 2.9 | 2.1 | 1.1 | 1.8 | 1.2 | 1.8 | | 2.7 | 1.4 | 1.8 |
| | EUR | OAT 7-10y | 1.1 | 1.5 | 1.3 | 1.7 | 1.7 | 3.0 | 2.4 | 1.4 | 1.4 | 1.2 | 1.5 | 1.6 | | 1.4 | 1.5 |
| | JPY | JP 7-10y | 1.3 | 1.7 | 1.2 | 1.9 | 1.7 | 4.0 | 3.2 | 1.4 | 1.5 | 1.6 | 1.6 | 2.0 | 2.4 | | 1.6 |
| | USD | Gold | 1.5 | 1.7 | 1.6 | 1.9 | 2.2 | 4.0 | 2.9 | 1.3 | 1.8 | 1.3 | 2.2 | 1.9 | 2.9 | 1.0 | |

Contagion
Immunity
Diversification

*Source: Refinitiv, Allianz Researc*

The usual diversification properties between risky and safe assets were wiped out. Corporate bonds found themselves in the eye of this storm with unseen high contagion factors between 3 and 5 (Figure 2). They shared at the same time the extreme movements of risky assets and the liquidity related distortions on bond markets. Only short-term U.S. Treasuries (1-3y) were able to somehow maintain their status as immune safe assets. In our view, this is related to their function as the ultimate store of liquidity.

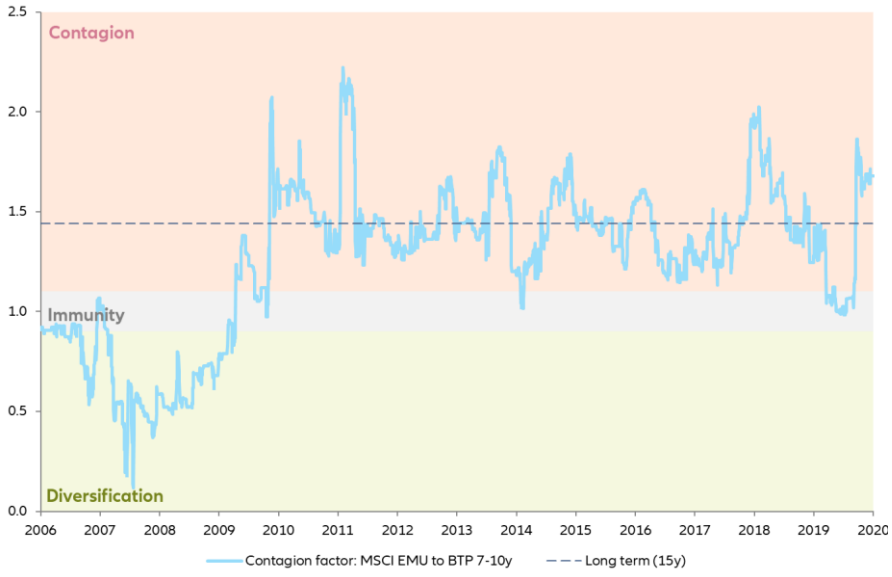
### What conclusions can we draw from the CoVaR analysis?

1) Short-term U.S. Treasuries (1-3y) are the only asset class that shows little contagion risk even in most extreme market phases. They are the ultimate means of managing portfolio tail risk. In a sense, this is the tail risk expression of the fact that this asset class represents the ultimate store of liquidity. Especially in a market phase that is characterized by "dash for cash", like the covid-19 crisis, this gives an unique diversification properties.

2) Gold might have a favorable correlation structure to other asset classes in normal market phases. But its diversification property decreases significantly at the tails of the distribution. This was particularly evident in the Covid-19 crisis when gold changed from a diversifier to a liquidity provider when USD funding was drying up.

3) Italian government bonds have left the pool of safe assets in a contagion risk perspective. In extreme market phases, they tend to show tail risk dependency to risky assets. This contagion risk varies over time, but during the Covid-19 crisis it has again reached the levels of the euro crisis or the government crisis of 2018 (Figure 1).

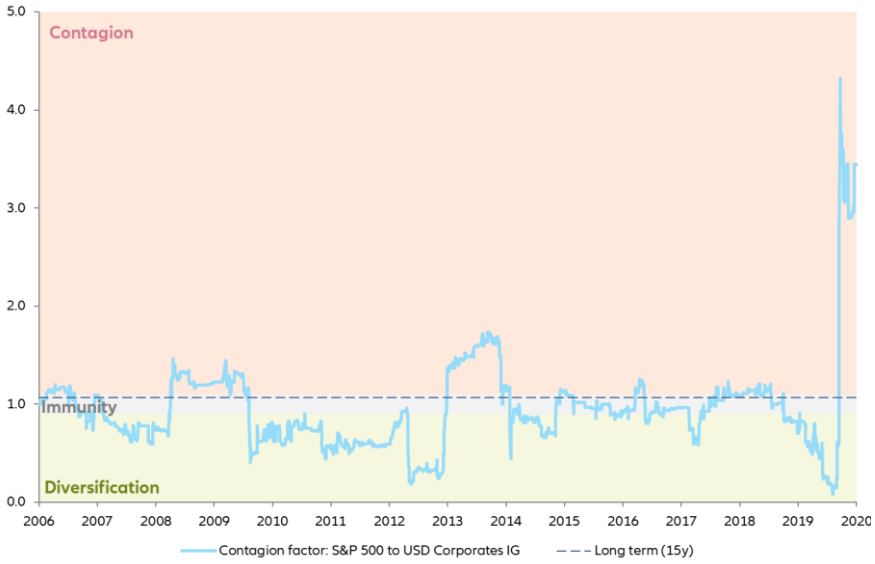
Figure 1 – Contagion factor from MSCI EMU to BTP 7-10y*




**1y rolling window*

*Sources: Refinitiv, Allianz Research*

Figure 2 – Contagion factor from S&P 500 to USD Corporates IG*




*1y rolling window*

*Sources: Refinitiv, Allianz Research*

## What contagion risk to expect from the next financial market turmoil?

We currently see the most likely trigger for renewed market turmoil in overvalued US equities and US high yield bonds. However, if a shock occurs in these asset classes, the contagion is unlikely to again spread equally across all asset classes. Thanks to the massive easing measures by central banks and the reactivation of the international liquidity framework (swap lines), it is unlikely that the rush for liquidity will reappear in a similar way. In addition, the asset purchases by major central banks should have increased the robustness of the market for IG and government bonds. In the event of renewed market turmoil, a classic contagion pattern within the risky assets cluster can therefore rather be expected. For the management of tail risk this means the preferred strategy is to build up positions in US Treasuries or other safe government bonds, especially at the short end of the curve.

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