MARKET TRACKER NOVEMBER 2016

Analysing risks for investments in European commercial real estate up to 2020 – what about extremely unlikely events?

When dealing with the real estate sector, it can be worth pausing to think about the impact of a "black swan" event, i.e. an occurrence that is extremely unlikely from a purely mathematical point of view. The Catella market tracker investigates the application of normal distribution models when calculating risks – asking if these models reflect the empirical reality, or if the sector's professionals should look for new ways to assess risks within the property business – and provides a forecast for up to 2020.

Normal distribution illustrates normal situations, but the reality is often very different

Probability theory has a term for the outliers of a statistical distribution function: fat tails. These reveal the likelihood of occurrences which are extremely improbable and have, today, become commonly known as "black swan events".

When the market experiences a major upset, institutional investors often subsequently state that they "obviously miscalculated" the frequency and severity of an extreme risk event when performing their asset allocation activities. There is a reason for this: when looking at a Gaussian bell curve model, the person tasked with making a decision assumes that an extremely unlikely event is indeed not likely to happen. In other words, something that seems unimaginable is simply not considered, and the risk of it taking place gets relegated to the fat tails of such events' statistical distribution. Despite this old tool's shortcomings, a large percentage of users stick with it, partly because a lack of sufficient data represents a problem for more accurate risk models or KPIs.

A broader-based investigation

In the search for a more effective alternative, Catella Research embarked on an analysis of the various models. We looked at a real estate portfolio comprising 28 major European cities including office and retail properties.

Our study focused on four central moments in statistical distribution: **expected value for total return, volatility, skewness and kurtosis.** Using these, we generated random variables and a VaR (value at risk) based on the time series of random variables. The weighting in the multi-asset portfolio by country was based on a 50 % weighting for retail and office properties. Finding no. 1: The European commercial real estate market offers a solid basis for the long-term generation of yields.

FIG. 1: TOTAL RETURN FOR COMMERCIAL REAL ESTATE INVESTMENT IN EUROPE

Source: Catella Research 2016
based on data from Property Market Analysis (PMA)

Such a standard European property portfolio delivers an average **total return** – the first central moment in the return distribution – of 7.9 % in the assessment period (1994–2015 and forecast for 2016–2020). The following cities display an above-average performance: Dublin (12.7 %), Lyon (10.6 %), Marseilles (10.2 %), Paris (9.8 %) and Barcelona (9.8 %). Five German cities occupy the six lowest positions: Munich (6.3 %), Cologne (5.6 %), Hamburg (5.4 %), Frankfurt (5.4 %) and Berlin (5.2 %). Finland's capital Helsinki (5.9 %) completes this sextet.

When analysing average **volatility** (second central moment), it becomes clear that yield and risk are two sides of the same coin and that they mirror each other. In this way, the "underperformers" named above display the lowest risks, while three of the top-performing cities are among the five riskiest. Here, it becomes evident that the top and bottom performers can only be described as such within the context of a particular risk assessment.

Catella is a leading financial advisor across Europe and asset manager for the areas of property, fixed-income and equity. We occupy a leading position in the real estate sector, with a strong local presence in Europe with around 500 employees across 12 countries.

Your contacts:

Dr. Thomas Beyerle
thomas.beyerle@catella.de
+49 (0)69 31 01 930-220

Maximilian Radert
maximilian.radert@catella.de
+49 (0)89 189 1665 80

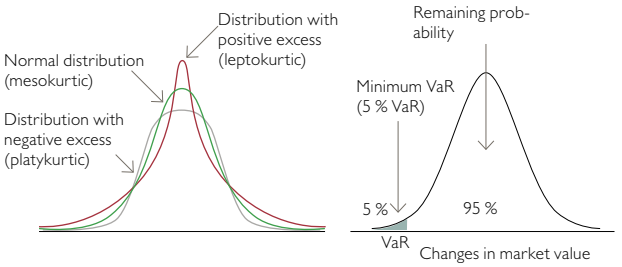
As a result, it comes as little surprise to see that the **Sharpe ratio** analysis (a figure that comprises value development along with the severity of fluctuations) generates a different attractiveness ranking for cities. The supposed strong performer Dublin (0.54) joins Berlin (0.62) and Lisbon (0.66) in the lowest three positions, while the strongest figures are generated by Brussels (1.19), Lille (1.11) and Amsterdam (1.09).

As a general rule, this volatility rating is a good indication of the possibility of an undesirable occurrence, such as damage or loss, taking place. Risks can be ascertained using empirical methods that focus on the probability distribution for the occurrence of a specific phenomenon. As a result, however, using volatility as a means of describing a risk is no longer adequate, so we must resort to the third and fourth moments plus risk-related data such as **VaR (value at risk)**, which utilise explicit distribution assumptions.

For most risk models, constructing the VaR (value at risk) is based on the normal distribution, which in turn is shaped by values for **skewness** (third central moment) and **excess & kurtosis** (fourth central moment) being at zero. Our investigation reveals that excess is subject to considerable variation and that this component quantifies the extent of the fat tails. Out of the 28 cities analysed, 24 display a negative excess.

The empirical distribution of yields from stocks and shares reproduces the normal distribution almost perfectly. However, the average excess for the 28 property markets is negative and comes to -1.6. This negative excess is a sign that the normal distribution assumption for real estate investments is out of kilter. In the event of a platykurtic distribution like this, using the normal distribution to assess VaR (value at risk) generates VaR figures that are systematically skewed upward.

FIG. 3: THEORETICAL CONCEPT OF EXCESS AND VaR (VALUE AT RISK)



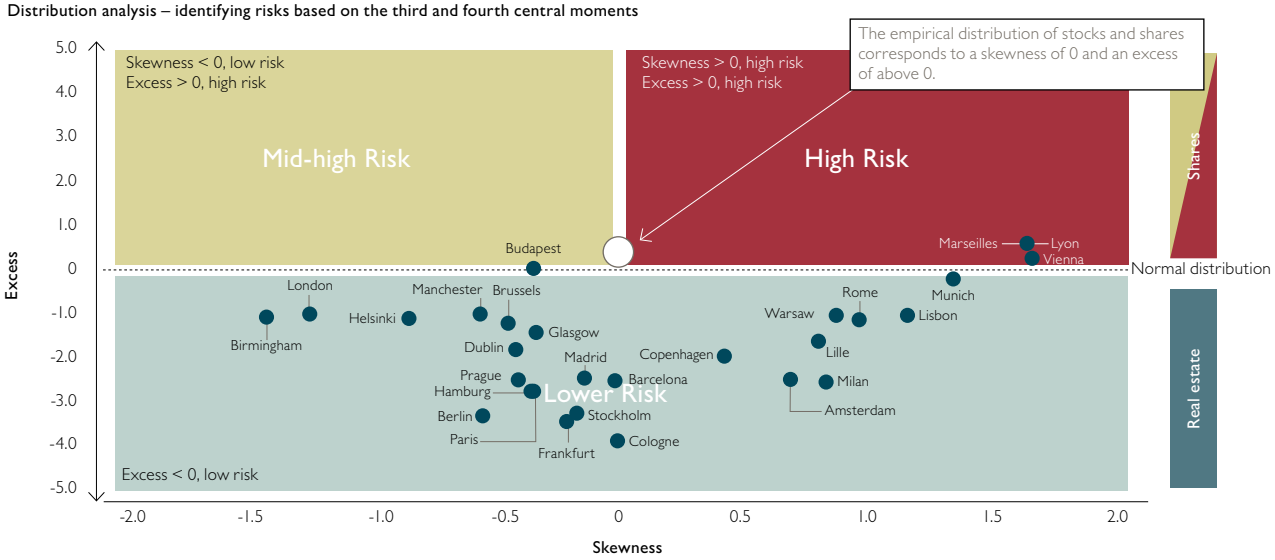
Source: Catella Research 2016

"Black swans" are a comparatively rare phenomenon in the real estate sector

For these 28 locations, Catella Research carried out assessments for the VaR based on the normal distribution in addition to the "best fitted estimation". The results show that in 65 % of cases, the estimates using the normal distribution exaggerated the real VaR by an average of 390 basis points. These "real estate tails" are evidently a good deal more slender than the "corporate equity tails". Extrapolating, we can say that, "black swan events" are less frequent in the real estate sector than they are on stock markets, and this fact means that investing in property is a substantially more stable option.

The deviation of the overall commercial portfolio in Europe is a mere 21 percentage points. The "best fitted estimation" VaR for this portfolio is -4 % (see Fig. 4). Dublin returns the worst VaR: -31 %. This is due to the 2008 financial crisis, which saw the Irish market generating figures reaching -47 %. The Irish capital is followed by Budapest (-13 %) and Manchester (-12 %).

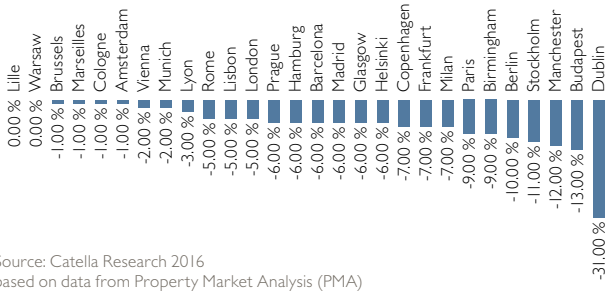
FIG. 2: SKEWNESS AND EXCESS IN EMPIRICAL DISTRIBUTIONS FOR EUROPEAN REAL ESTATE INVESTMENT



Source: Catella Research 2016
based on data from Property Market Analysis (PMA)

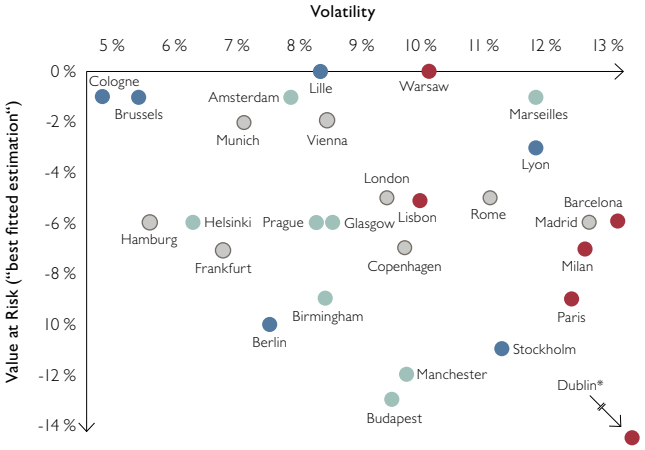
Warsaw and Lille are the best in terms of performance with 0 %. Amsterdam, Cologne, Marseilles and Brussels come in joint second at -1 % each. The median value for the VaR distribution is -6.0 %, with German cities averaging -5.2 %.

FIG. 4: EX ANTE VaR (UP TO 2020) BASED ON MULTIVARIATE DISTRIBUTIONS FOR 28 PROPERTY MARKETS



Source: Catella Research 2016
based on data from Property Market Analysis (PMA)

FIG. 5: YIELD ANALYSIS (2016–2020) CONSIDERING MULTI-DIMENSIONAL RISKS (1994–2020)



Total return p.a.: 1.0 % to 2.5 % >2.5 % to 3.0 % >3.0 % to 4.5 % >4.5 % to 5.5 %
* VaR -31 %, volatility 22.46 %, total return p.a. 1.0 % to 2.5 %

Source: Catella Research 2016
based on data from Property Market Analysis (PMA)

Outlook

Looking at the 2016–2020 period, Catella Research believes that the following cities have the greatest potential in terms of average overall yields: Marseilles (5.3 %), Birmingham (5.2 %), Helsinki (5.2 %), Prague (5.1 %) and Glasgow (4.9 %). Within this group of exceptional performers, Helsinki stands out even more as it displays the best yield-risk profile. Among German cities, Cologne, Munich and Hamburg will generate yields of 3.2 % on average in the coming years. Berlin is subject to substantially greater risks, so the anticipated yield for the German capital is 4.1 %. The following cities are expected to generate particularly low total returns from commercial property: Paris (1.1 %), Warsaw (1.3 %), Dublin (2.0 %), Lisbon (2.3 %), Milan (2.4 %) and Barcelona (2.4 %). Such figures cannot be justified by a low risk profile.

While the ranking results for the risk activities of volatility and VaR are similar, they are not necessarily linked. Dublin performs worst in terms of volatility and VaR. Warsaw on the other hand has the best VaR figures, but only ranks 20th out of 28 regarding volatility.

Summary

The details supplied here make it evident that a holistic risk analysis requires the third and fourth central moments of the return distribution and VaR (value at risk) to be taken into account. A distribution assumption beyond the Gaussian bell curve makes it possible to generate a more realistic risk assessment and minimise yield losses, thereby ultimately saving money. This applies especially to banks, major insurance companies or pension funds that calculate the risks of their investments and must back these with equity in line with Basel III and Solvency II. As a result, mixed-risk real estate funds can deliver an added bonus in terms of risk reduction.

Total return
The overall yield generated by an investment. The total return includes increases in value and revenue from leases or payouts over a specific period of time. The total return as an expected value is the first central moment in a distribution.

Volatility
Here, volatility is defined as the standard deviation of the changes (including yields, returns) of the parameter being studied, and it frequently serves as a yardstick for measuring risks.

Sharpe ratio
The Sharpe ratio is a yield-risk KPI that reflects the excess yield, i.e. the yield from an investment (provided it exceeds the risk-free interest rate) depending on the risk.

Skewness
Also known as skew, this factor pertains to the symmetry of a distribution. As the normal distribution is symmetrical, the Gaussian bell curve has a skewness value of 0.

Kurtosis & excess
Kurtosis is how much a distribution deviates from the shape of a normal deviation. It shows how pointed a curve is. Excess is one of the central moments of a distribution used to define the shape of the curve. An excess of 0 results in a curve with a normal peak (mesokurtic).

Value at risk (VaR)
The value at risk is defined as the absolute loss in value of a risk item defined by a company that is not exceeded by a previously defined probability (confidence level). The loss can be represented as an absolute figure in a specific currency or as a yield.

Catella Research's methodology for estimating VaR
Catella Research uses two different models for estimating the VaR, both based on a 95 % confidence interval. The first approach models the yields of a VaR estimation sample based exclusively on the normal distribution. The second approach ("best fitted estimation") uses the normal distribution as well as five other distributions (Laplace, log-normal, exponential, inverse Gaussian and Weibull) for modelling yields.