# EUROPEAN STOCKS WİTH THE SAFE-HAVEN ATRİBUTES. DRAWDOWN BETA VS TRADİTİONAL BETA FOR THE STOXX EUROPE 600 COMPANİES

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***Abstract:*** The objective of the article is to calculate Conditional Drawdown-at-Risk Beta and Expected Regret of Drawdown Beta, accounting for the drawdowns of the STOXX Europe 600 index in the period 2014-2023. These drawdown betas show the impact of unprecedented events of the COVID-19 crisis, the Russian invasion of Ukraine, and the Israeli-Palestinian conflict. Similar to the standard beta, the drawdown betas relate the expected return of an asset to the expected return of the market, but are based on the concept of drawdown (decline in the value from a peak to a subsequent low). The numerical results show that drawdown betas are sensitive to market distress during unexpected events. The drawdown betas may have negative values and work as safe-haven assets for investors during financial crises, while the standard beta is positive. We provide a case study demonstrating the approach for European markets.

*Keywords*: CAPM, drawdown beta, STOXX Europe 600, safe-haven stocks

## INTRODUCTION

The relationship between risk and expected return is a significant challenge in financial theory. Traditional Capital Asset Pricing Model (CAPM) explaines how to measure risk and the relation between expected return and risk (Sharpe, 1964, Lintner, 1965, Mossin, 1966). CAPM proves that investors are rewarded for risk which is not diversifiable (systematic risk) and it is measured by beta. Beta is the tendency of the stock's return to respond to changes in the market represented by the stock market index.

However, in the single period CAPM, stocks' beta explains returns on the risky assets, it does not mean that the beta can capture all variation in expected returns. The beta parameter might be unstable for many reasons and international empirical studies have proved that e.g., the American market (Fabozzi and Francis, 1978), (Feder-Sempach et al, 2023), or the European market (Wells, 1994; Chaveau and Maillet 1998). The standard CAPM variance risk measure has a conceptual drawback because it does not differenciate between losses and gains of the portfolio. Various risk measures have been proposed as an alternative to variance with the latest drawdown based risk measures called Conditional Drawdown-at-Risk Beta (CdaR Beta) introduced by Zabarankin *et al.* (2014) and Expected Regret of Drawdown Beta (EroD Beta) proposed by Ding and Uryasev (2022). These two measures, like the standard or traditional beta, relate the returns of an asset to the returns of the market, but are based on the concept of drawdons: the decline in the value of an asset from a peak to a subsequent low. CdaR Beta and EroD Beta differ in their approach to determining which drawdowns to include. The former is based on a percentage of worst case market drawdowns, while the latter is based on drawdowns with a known threshold.

The research sample consist of STOXX Europe 600 companies listed in euro and in domestic curriences. It is a stock market index of European stocks with a fixed number of 600 components representing large, mid, and small capitalisation companies among 17 European countries. The proposed index provides coverage for country and industry allocation offering portfolio of developed European economies, replicating almost 90% of the underlying investable market.

The main objective of the papaer is to calculate the drawdown betas accounting for the drawdowns of the STOXX Europe 600 index according to the methodology proposed by Zabarankin *et al.* (2014) and Ding and Uryasev (2022) in the period 2014-2023 to show the impact of unprecedented events of the COVID-19 crisis, the Russian invasion of Ukraine, and the Israeli-Palestinian conflict. The drawdown beta evaluates portfolio performance during market drawdowns in Europe.

## METHODOLOGY

In this paper, two drawdown betas are used: CdaR Beta and ERoD Beta, and compared with standard Beta. CdaR Beta is equal to average instrument losses *over a percentage of the largest* market drawdown periods, divided by the average losses of the market during those same drawdown periods, while ERoD Beta is calculated as the average losses of a security *during periods when the market experiences a drawdown exceeding a specified threshold* $\epsilon$, divided by the average losses of the market during those same drawdown periods, Ding and Uryasev (2022). The formula for calculating ERoD Beta and CdaR Beta for security $i$ are as follows:

$$\hat{\beta}^{i}_{CDaR,\alpha} = \frac{\sum_{t=1}^{T} q_t\left(w^{i}_{\tau(t)} - w^{i}_{t}\right)}{\sum_{t=1}^{T} q_t\left(w^{M}_{\tau(t)} - w^{M}_{t}\right)},$$

$$\hat{\beta}^{i}_{ERoD,\epsilon} = \frac{\frac{1}{T}\sum_{t=1}^{T} q^{*}_t\left(w^{i}_{\tau(t)} - w^{i}_{t}\right)}{\frac{1}{T}\sum_{t=1}^{T} q^{*}_t\left(w^{M}_{\tau(t)} - w^{M}_{t}\right)},$$

where:
$i$ – index of security $i = 1, \ldots \mathrm{I}$,
$t$ – time, $t = 1, \ldots, T$,
$w^{i}_{t}$ - uncompounded cumulative return of asset i at time moment t,
$w^{M}_{t}$- uncompounded cumulative returns of the market portfolio at time moment t,
$d^{M}_{t} = w^{M}_{\tau(t)} - w^{M}_{t}$drawdowns of the market portfolio,
$q_t$ –indicator function which is equal to $1/\left((1-\alpha)T\right)$ if $d^{M}_{t}$ is one of the $(1-\alpha)T$ largest drawdowns $d^{M}_{1}, d^{M}_{2}, \ldots, d^{M}_{T}$ of the matrket portfolio, and equal to zero otherwise,
$q^{*}_{t} = 1(d^{M}_{t} \geq \epsilon)$ – indicator function which is equal to 1 for $d^{M}_{t} \geq \epsilon$, and 0 otherwise.
$\tau(t) = \max\{k \mid 1 \leq k \leq t, w^{M}_{k} = \max_{1 \leq l \leq t} w^{M}_{l}\}$.

In the case of CdaR Beta, $\alpha \in [0,1]$ control the percentage of the largest drawdowns to include, with $\alpha = 0$ representing all market drawdowns and $\alpha = 1$ representing the maximum (the largest) market drawdown. For example, $\mathrm{CdaR}_{0.9}$ Beta is accounting for the largest 10% of drawdowns of the market portfolio. In the case of ERoD Beta, $\epsilon \in (0, +\infty)$ determines the magnitude of evaluated drawdowns. Ding and Uryasev (2022) propesed the trhshold $0+$ with $\epsilon = 10^{-6}$ to account for all non-zero drawdowns.

## FINDINGS

The main idea is to evaluate the impact of unprecedented events like the COVID-19 crisis, the Russian invasion of Ukraine, and the Israeli-Palestinian conflict and compere ERoD, CDaR, and standard betas for European companies and find the safe-haven attributes of European stocks.
The discussion of the drawdown betas vs. traditional beta can potentially prove that traditional beta is more stable, but it cannot provide significant information during the market distress. Drawdown betas are more sensitive to market distress during unecpeted events while having negative values could work as safe haven assets for European oriented investors by having greater informative power.

## CONCLUSIONS

The drawdown beta goes beyond the traditional beta, which measures volatility relative to the market and specifically focusses on an asset's performance during market downturns. The drawdown beta evaluates portfolio performance during market drawdowns. The study revealed that drawdown betas are more sensitive to market drawdowns than traditional ones. For some European stocks, drawdown betas are negative, while traditional beta is always positive, thus these stocks generate positive returns when the market was in drawdown and work as safe-haven assets. At the same time, the traditional beta is positive and the safe- haven effect might be missing. Drawdown betas have quite different characteristics compared to traditional betas.

It seems apparent that the research sample is relatively small and should be extended to larger numbers of European listed companies. The drawdown beta offers valuable insights to construct more resilient portfolios, effectively manage risk, and evaluating performance amidst market volatility. This gives rise to a legitimate hope of using the drwdown beta in other highly developed markets in European countries or perhaps emerging economies.

In turn, more effective beta parameter estimates, as well as their greater informative power, can be used to more accurately estimate investment risk, which will certainly interest all investors who build and manage investment portfolios, especially during the market distress. It is recommended to use drawdown betas for constructing portfolios with controlled drawdown. A more precisely estimated investment risk is highly desirable and effective in financial market analysis and it allows one to achieve better returns on investments.

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