

# Dynamic hedging of equity price risk with an equity protect overlay: reduce losses and exploit opportunities

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AS PART OF THE DISTORTIONS ON THE INTERNATIONAL STOCK MARKETS IN THE CONTEXT OF THE FINANCIAL CRISIS AFTER 2008 AND THE ONGOING EURO CRISIS SINCE 2010, MAJOR PARADIGMS OF CLASSIC INVESTMENT THEORY HAVE BEEN PERMANENTLY CHALLENGED. THE FACT THAT, IN THE LONG-TERM, INVESTORS HAVE LOST MONEY THROUGH OWNERSHIP OF EQUITIES EXPLAINS THEIR CURRENT RESERVATION.

However, current index levels, which remain low by historic standards, represent an attractive opportunity for entry. Particularly with the ongoing low interest rate levels, long-term investors are attracted by high dividend payments. Within a risk-adjusted portfolio allocation the limited risk budget substantially curtails the equity allocation. One option to reduce the risk of a stock investment and thus increase the overall equity allocation is to combine a stock portfolio with a protect overlay for price risk management (see Exhibit 1).

Comparison of the performance curves between a 'long-only' Euro Stoxx 50 investment, e.g. by means of ETF and a Euro Stoxx 50 investment secured with a protect overlay in order to protect against falling market prices shows that substantial value added could be generated through the systematic risk management in the protect overlay. The efficiency of the protect overlay can be measured in two respects here: in positive stock market years (2003 – 2007, 2009, 2012), the hedging strategy in the protect overlay should cost as little as possible from the positive performance of the stock markets, i.e. the overall yield from the protect overlay and the Euro Stoxx 50 investment should be equally as high as a long-only Euro Stoxx 50

investment as far as possible. On the other hand, in poor market phases (2002, 2008, 2010, 2011), the loss incurred on the Euro Stoxx 50 investment secured with a protect overlay should be as low as possible. Exhibit 1 demonstrates that in absolute and in risk-adjusted terms, the performance of a Euro Stoxx 50 investment secured with a protect overlay is respectively better and positive compared with the long-only Euro Stoxx 50 investment.



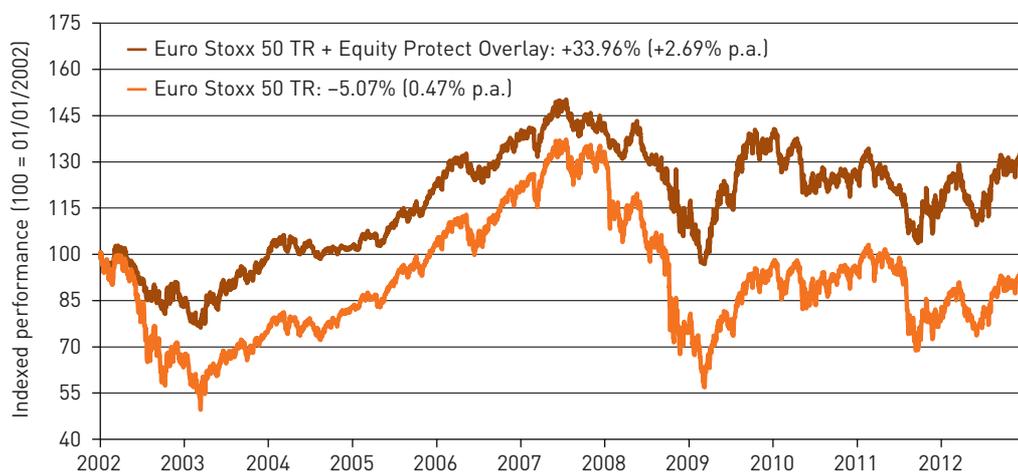
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Note: Past performance is no guarantee for futures performance, real-money track record of Berenberg's equity protect overlay, GIPS compliant and SAS70 certified.

Source: Berenberg Bank

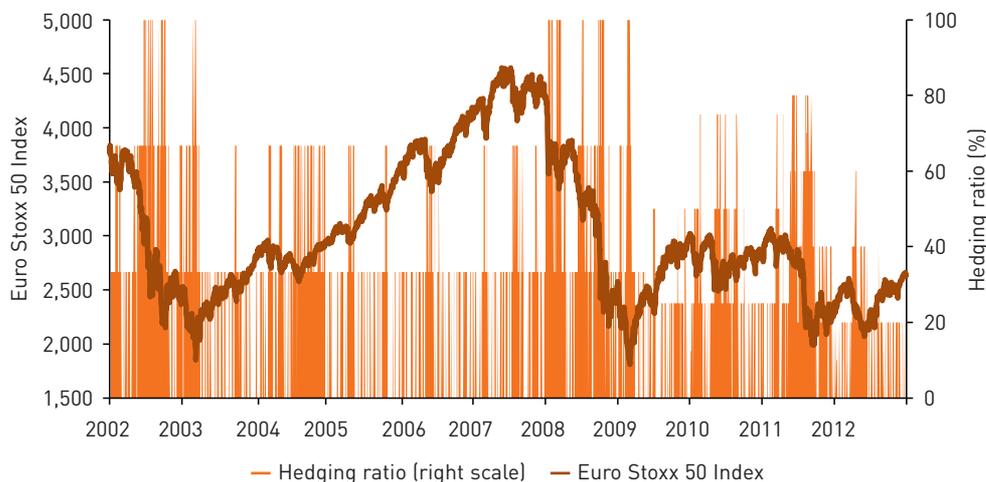
The risk parameters of maximum drawdown and volatility in particular were permanently reduced.

### The equity protect overlay: a separate portfolio

Protect overlay management is generally understood to be the targeted management of specific price risks of an underlying portfolio by means of derivatives, e.g. such as futures, forwards, options and swaps. It is implemented in isolation from the underlying portfolio, in a separated overlay portfolio. A protect overlay is generally of interest and feasible for all asset classes for which a liquid hedging instrument is available. For stock portfolios, the protect overlay can be applied both to a base portfolio of ETFs and to a base portfolio of individual stocks selected by an active manager. By clear separation of the alpha and beta management, systematic protect overlay management reflects the on-going progress in the splitting of the value chain in asset management.

Protect overlay management can generally be referred to as risk management. For a stock portfolio, its simplest form is ongoing hedging with put options. Trend-following futures strategies offer a dynamic alternative. The aim is to achieve an improved risk/return ratio with the use of equity futures (here Euro Stoxx 50 futures). At times of rising stock markets, as far as possible, no futures positions should be built up in the protect overlay, so the investor obtains the greatest possible participation in the positive performance of the underlying stock portfolio. By contrast, in the case of falling stock prices, a futures position is gradually built up in order to protect the investor from losses in his underlying stock portfolio. An asymmetric pay-out profile corresponding to the characteristic of a plain vanilla put option is therefore created in the protect overlay using a trend-following futures strategy.

In Exhibit 2, the progression of the Euro Stoxx 50 TR is shown over time on the left scale and contrasted with the



Note: Past performance is no guarantee for futures performance, real-money track record of Berenberg's equity protect overlay, GIPS compliant and SAS70 certified.

Source: Berenberg Bank

hedging ratios in the form of the blue area in the futures-based protect overlay with a trend-following characteristic, as used at Berenberg Bank. It is made very clear here how the hedging ratio rises particularly in falling market phases and how a stock portfolio was 100% secured in for example October 2008 at the height of the financial crisis.

As the stock markets recover, the hedging ratio is then cut back significantly from the middle of March 2009, so participation in the share recovery can be achieved.

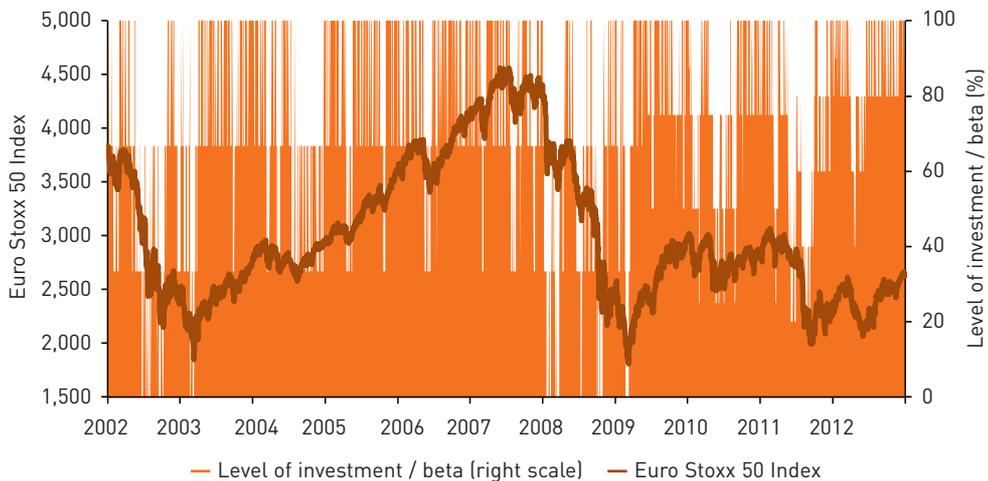
The level of investment, i.e. the beta can therefore be managed dynamically: the investor holds 100% stocks in the underlying portfolio in all market phases and thereby gains attractive dividend payments. In the protect overlay, equity futures are sold, i.e. traded short. The level of hedging in Exhibit 2 can therefore be considered as negative equity exposure. Overall, the result of 100% stocks plus equity futures short is a systematically managed equity investment that is as close as possible to

100% when the markets are rising and as close as possible to 0% when the markets are falling. Exhibit 3 shows the level of equity investment, i.e. the managed beta.

### Behavioural finance as a scientific explanation for systematic trend-following

In the protect overlay of Berenberg Bank, the hedging decisions are based exclusively on systematic trend-following. The theoretical explanatory framework is provided by behavioural finance. This is based specifically on the description of various anomalies in the behaviour of financial market participants. The qualitative findings were translated into quantitative algorithms and thus into a systematic risk management.

Behavioural finance translates behavioural science into modern financial market theory. It breaks with the assumption that underlies virtually all capital market



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theories: the rational market participant. The lack of their empirical validity is seen in the disregard for human behaviour. Behavioural finance explores the irrational behaviour of investors and attempts to systematise it.

Anomalies in the information perception and information processing give rise to irregularities in the decision-making of the financial market participant, resulting in effects such as the herd instinct and self-fulfilling prophecies. The use of trading models with a trend-following characteristic therefore seems to be an effective method to identify resulting price trends. Unlike econometric-economic explanatory approaches, systematic trend following is a non-predictive and market-technical approach. Risk management aims to provide security in extreme situations. Econometric-economic explanatory approaches frequently fail to forecast the exact moment of occurrence and magnitude of a market shock. By contrast, systematic trend-following reacts only to price movements and continues to follow a trend until a trend reversal appears.

Only the market price itself is quantitatively analysed by various algorithms. If the validity of behavioural finance theory is assumed then the market price is sufficient as the sole input factor. In its movement, it describes the action of market participants and is therewith the highest measure of information aggregation. Appropriate risk management therefore ensures the increase of hedging positions only at the time of occurrence of a negative price trend and it conversely ensures the decrease of hedging positions only when a new, positive price trend emerges.

### Quantitative trend following for future repeatability of results

Unlike discretionary risk management, a purely quantitative strategy offers the highest level of repeatable results: if stock markets fall the investor expects protection. Mathematical analysis fundamentally provides a guarantee here: if the algorithm analyses similar time series, it will produce similar results. Strong risk markets have one thing

in common: they stand out for having a fast, strong trend. Therefore, if a mathematical model has demonstrated the property of identifying fast, strong trends in the past then it gives the investor a high level of confidence that it can also identify fast, strong trends in the future. It therefore lends itself to systematic risk management.

Moreover, by using quantitative models in conjunction with a team approach, key man risk can be reduced. This fact has resulted in increasing mandating of quantitative managers, particularly among board-based, institutional investors.

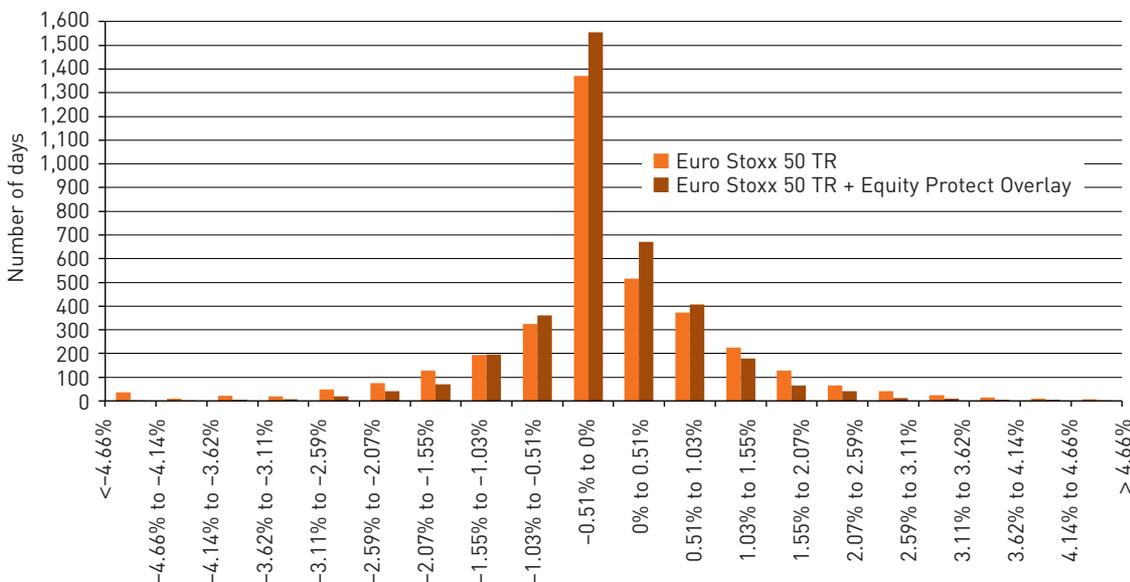
By using a variety of models for different time horizons, various market anomalies can be identified and systematised. In the process of the Berenberg protect overlay management, the behaviour of short, medium and

long-term market participants is analysed and occurring market trends are tracked with short-, mid- and long-term models. The applied multi-model approach increases the asymmetry between high hedging efficiency on falling and low hedging costs on rising stock markets. The resulting performance can be described as positively skewed and leptokurtic. The daily returns realised by the protected stock investment are shifted into the positive area. At the same time, it is possible to avoid particularly the problematic, negative 'fat tails' of the return distribution, as illustrated in Exhibit 4.

With respect to their structure and performance characteristic, the models used are technical trading models with a trend-following characteristic. In principle, they can be distinguished in terms of trading frequency, trading sensitivity and mathematical analysis technique.

## Distribution of daily returns

Exhibit 4



Note: Past performance is no guarantee for futures performance, real-money track record of Berenberg's equity protect overlay, GIPS compliant and SAS70 certified

Source: Berenberg Bank

Within the Berenberg protect overlay, the models are always weighted equally (naive distribution). There are currently five models traded in the Euro Stoxx 50. One model therefore governs the price risk of 20% of the stock portfolio. Because of the equal weighting of the models, optimisation of the past is avoided.

## Comparison of a futures-based protect overlay with alternative hedging by means of put options

To evaluate the quality of a trend-following futures overlay, we can compare its asymmetric performance characteristic with the alternative of a rolling strategy with put options.

The option premium to be paid on acquisition of a put option is similar to the hedging costs of the futures overlay incurred in sideways and rising markets, which both have the effect of reducing the return for the investor. These opportunity costs of the futures overlay arise as a result of an unclear directional price progression of the underlying. In such a market environment, no sustained trends emerge, so hedging positions are dissolved again and produce 'hedging costs'.

In addition to the asymmetric pay-out profile, there is a further similarity between the put option and the trend-following futures overlay in the form of a 'volatility long' characteristic. With both strategies, rising volatility consequently promises the investor the prospect of high returns from the derivatives in markets with a falling trend. The loss potential for the entire portfolio of physical share investment and hedging strategy is limited.

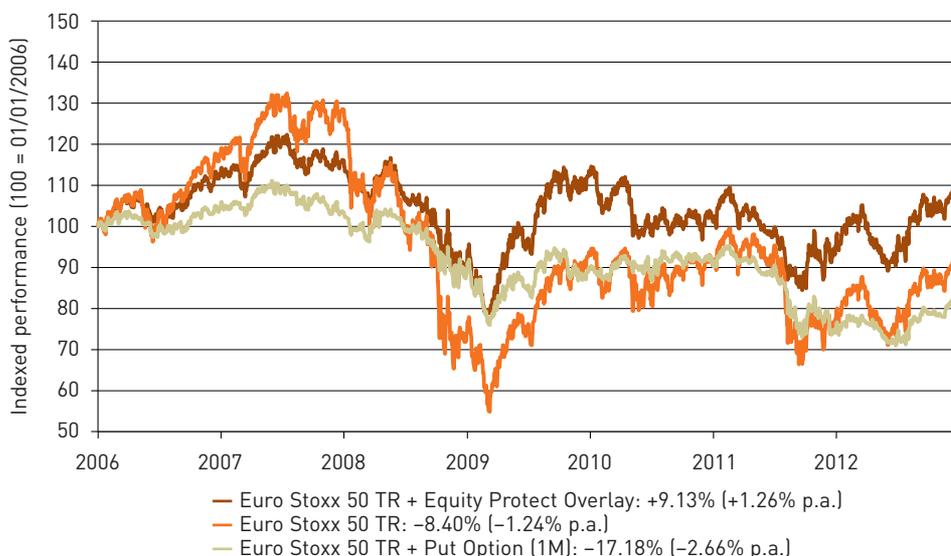
Another analogy between the two hedging strategies can be identified with the 'delta short' and 'gamma long' characteristic. Here, the delta denotes the participation rate in the case of a change of the underlying and the gamma denotes the change in the delta. Just as the delta of the put option, the hedging ratio of the trend-following futures overlay also ranges between 0 (no hedging) and -1 (complete hedging). However, the movement of the delta

between 0 and -1 is not linear and it is therefore described by the gamma.

Despite the similarities between the two strategies, there are crucial differences: the delta of the trend-following futures overlay also ranges between 0 and -1 and its gamma is likewise positive but the trend of the gamma and consequently of the delta does not correspond to that of the put option; by using a multi-model architecture in which the managed volume per model is weighted equally, the rate of change of the delta remains constant over time. At Berenberg, each of the five trading models used to hedge the Euro Stoxx 50 has a weighting of 20%, so the participation rate and therefore the gamma for a managed bandwidth moves from 0 to -1 in increments of -0.2 and therefore smoothly. The delta of the trend-following futures overlay therefore changes only directionally as a function of the increase or decrease of hedging positions. By contrast, the delta and gamma changes of a put option are functions of the remaining term, interest, basic price, implied volatility and price of the underlying. The advantage of the trend-following futures overlay therefore lies in its directionality with the increase or decrease of hedging positions, such that – unlike a put option – it reacts more flexibly and quickly in the case of incipient trends.

In the direct comparison between trend-following futures overlay and put option, the different cost factors stand out. Whereas the implied volatility claimed by the seller is paid for a put option, the realised volatility is paid for the trend-following futures overlay. An explicit insurance premium as in the case of the option is not charged in the case of the trend-tracking futures overlay but rather emerges from the hedging costs in the rising market environment. In tabular form, Exhibit 5 shows the results of the Berenberg equity protect overlay compared with a rolling strategy using 30-day 'at the money' put options.

Hedging costs in rising markets are entirely characteristic of a protect overlay. A moderated risk/return ratio can be achieved by diversifying the temporal orientation of the multi-model approach or the put options used.



Note: Past performance is no guarantee for futures performance, real-money track record of Berenberg's equity protect overlay, GIPS compliant and SAS70 certified, implied volatility data to calculate put options strategy are publically available since 2006, only.

Source: Berenberg Bank

## Conclusion

In summary, it can be stated that, compared with the 'long-only' investment, a targeted improvement in the risk/return characteristic of a stock portfolio can be achieved through the use of systematic protect overlay management and lasting investment success can thus be ensured in the long term. Particularly in the low interest rate environment, the attractive dividend yield to be expected on an equity investment is attractive to long-term investors. However, a risk-adjusted investment strategy with a limited risk budget allows only investment of small volumes on the volatile stock market. The risk parameters such as volatility and maximum drawdown, which are significantly improved with an equity protect overlay, allow a higher allocation of equities and therefore compensation for the lack of income from interest in the low interest rate environment.

Systematic trend-following in the context of protect overlay management has been presented and shown to be an effective risk management, with scientific proof from behavioural finance. Little valid forecasting, particularly of the moment of occurrence and magnitude of a market shock, is possible using econometric-economic models.

The temporal clustering of trends was also presented. A daily movement is significantly smaller than a weekly movement, which in turn is significantly smaller than a monthly movement or vice versa. Whereas a strong positive trend prevails on the stock market for several consecutive days and the correction movement appears on subsequent days, the weekly trend may be neutral despite great turbulence during the week. A multi-model architecture therefore lends itself here, which is scaled into and back out of the market by means of short, medium and long-term signals.

A futures-based trend-following protect overlay aims for the performance characteristic of a put option. A corresponding comparison has demonstrated the similarities and differences. The decisive advantage is the directionality of the delta and thus the hedging efficiency in market shock phases and therefore precisely when risk management is required, as well as in phases of a strong positive market with respect to low hedging costs and therefore precisely when participation is desired.

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