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RISK CONTROLLED INVESTMENT STRATEGIES

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INTRODUCTION

The recent financial crisis was the worst of its kind since the great depression of the nineteen thirties and has lead to a fundamental change in our understanding of financial markets and investment strategies. In particular, we observe two trends in the aftermath of the financial crisis:

1. The investment community has learned the lesson that markets are not always fully efficient and not fully rational as finance theory taught us the years before the crisis. In particular, systematically ill-posed incentive schemes within the financial industry and risk supervision models and procedures that were heavily based on optimistic assumptions and input parameters lead to an irrational level of risk taking across the investment community and to the development of asset bubbles. The recent two years were therefore dominated by a de-leveraging of the financial world and the definition of improved and more efficient risk supervision rules across the globe.

2. At the same time, the investment community has shifted from a mere return based thinking to a risk-return based assessment of investment opportunities. For instance, before the financial crisis the investment community was focused on choosing between different investment styles such as relative value, growth, momentum or deep value and investment research was heavily focused on determining which investment style outperform in certain market areas or points of time within the business cycle. However, after the financial crisis investment research has been extended or even focused on assessing the risks involved in different investment styles to derive investment strategies that use risk indicators as input variables in the asset allocation process.

In the following we will present rules-based investment strategies that use risk indicators in the asset allocation process which fulfil two objectives:

1. In "normal" markets the investment strategy ensures a 1:1 participation in the upside potential of financial markets, i.e. investors do not forego potential profits due to the protection procedures built into the investment strategy.
2. In turbulent markets the investment strategy shifts assets away from risky assets into save havens to protect the investors from significant losses.

In the following, we will describe a detailed rules-based investment process to achieve these two objectives.

MARKET RISK CONTROLLED INVESTMENT

The basic idea of controlling market risk is to follow a multi-asset strategy with (at least) two components: A risky equity-based asset that offers attractive returns in the long run but bears a significant amount of market risk measured as the price volatility of the corresponding equity basket. A "safe haven" asset where the investment amount can be shifted to whenever the equity markets are in unfavourable conditions.

The key to create a successful investment schemes that shifts the investment portfolio between the risky asset and the haven asset is to identify an appropriate indicator that can be used to trigger a re-balancing between these asset classes.
For equity markets a valid risk indicator is the market volatility as measured by standard volatility indices such as the VDAX or the VSTOXX, since these indices show a significant negative correlation to the related equity markets. In other words, high levels of volatility tend to coincide with adverse returns in the equity markets and vice versa, as can be seen from the following chart comparing the VSTOXX (measuring implied volatilities for the European equity markets) to the performance of the EURO STOXX 50 Index:

![Chart comparing EURO STOXX 50 Index versus the VSTOXX volatility index measuring the implied volatility of options on the former. The key observation is the negative correlation between equity markets and volatility is apparent.](chart.png)

Figure 1: EURO STOXX 50 Index versus the VSTOXX volatility index measuring the implied volatility of options on the former. The key observation is the negative correlation between equity markets and volatility is apparent.

One of the most popular risk control investment scheme that has evolved after the financial crisis is a strategy that defines a clear target volatility level for the investment portfolio and then re-balances the portfolio between the equity market and the safe asset to keep the overall portfolio volatility at the desired volatility level. The advantage of these volatility based strategies are as follows:

- Investors can define their risk appetite by setting the target volatility level of the desired portfolio. Consequently, at any given point in time they know the riskiness of their investment in terms of the volatility of the portfolio.
- Investors are protected from serious losses in times when market are crashing due to a shift into a safe asset.
- Target volatility based equity indices are suitable as underlying for option-based derivative products since the issuing financial institutions faces nearly no vega risk due to the fixed volatility level of the underlying. In particular, these indices are suited as underlying of capital protected notes as additional risk-protection overlay, which typically embody a protecting put option written by the issuing bank in favour of the investor.
As an example, we consider the STOXX Risk Control 20% Index that invests in the EURO STOXX 50 as risky asset and EONIA overnight as safe asset. The target volatility level of the index is $T=20\%$ and hence the corresponding target portfolio weight $W$ for the EURO STOXX 50 investment is

$$W = \frac{T}{V_{STOXX}} \quad (1)$$

Whereas the portfolio weight of the EONIA investment is $1-W$. The $V_{STOXX}$ measures the implied volatility of the EURO STOXX 50 Index at a 1 month horizon and is an ideal risk indicator due to its forward-looking character. To avoid excessive trading costs, the STOXX Risk Control 20% Index is not re-balanced every day. Instead, a re-balancing is triggered on those days where the portfolio volatility deviates by more than 1% from the target volatility level in absolute terms.

Further, in markets with very low levels of volatility the equity weight (1) can be greater than 100%, i.e. the strategy allows for leverage in very favourable markets. However, to prevent excessive risk taking the leverage is limited to a maximum of 150%.

The corresponding performance of the investable index is shown in Figure 2 below:

![Figure 2: Performance of the EURO STOXX 50 Index versus the EURO STOXX 50 Risk Control 20% Index.](image)

The key observation is that the STOXX Risk Control Index outperforms the underlying EURO STOXX 50 Index, which is due to the following reasons: In favourable markets such as the bull run from 2003 to 2007 the strategy invests more than 100% in the equity markets and therefore outperforms the blue-chip index by a leveraged exposure.
On the other hand, in the bear market of 2000 to 2003 and 2007 to 2008 the investor was protected by an equity investment that was clearly below 100% of the portfolio weight. The development of the portfolio composition is summarised in Figure 3.

It is also interesting to analyse the behaviour of a risk control strategy across the business cycle. Figure 4 compares the yearly returns of the STOXX Risk Control 20% Index versus the corresponding returns on the EURO STOXX 50 Index. The analysis shows the effectiveness of the risk control algorithm: In bullish markets its yearly returns are higher than the returns on the blue-chip index due to leverage, whereas in unfavourable markets the investor suffers significantly lower losses than the blue-chip index by shifting part of the portfolio into the money market.
To offer a suitable investment strategy for investors with a variety of different levels of risk-appetite, the ideal risk control product strategy is to offer a set of portfolios strategies with pre-defined target-volatility levels, ranging from relatively low volatility levels for risk averse investors to volatility levels that allow for leveraged positions in bull-markets for risk-loving investors. An example of a risk control index family is shown in Figure 5 below.
Figure 5: Risk-return comparison of various risk-control strategies based on different target volatility levels (5%, 10%, 12%, 15% and 20%) versus the EURO STOXX 50 Net Return Index.

Figure 5 shows clearly that the risk control strategy improves the long-term risk-return profile in comparison to an equity-only investment portfolio across the risk control index family. In particular, the risk control 15% and risk control 20% indices show an outperformance compared to the underlying EURO STOXX 50 Index at a much lower level of volatility.

Further, it is interesting to note that the realised long-term volatility of each index is below its target level due to the fact that implied volatilities are used to forecast future volatility, which are (on average) higher than realised volatilities. Thus, using implied volatilities in a risk control environment results in two advantages:

1. Implied volatilities are forward looking and therefore react faster to market movements than backwards looking historical volatilities.
2. Using implied volatilities results in a conservative investment strategy in the long-run since on average implied volatilities are higher than realised volatilities.
CONCLUSION

We have shown that simple rules-based investment strategies using implied volatility as risk indicator can improve significantly the long-run risk-return profile of multi-asset portfolios. In particular, when markets are very volatile, the equity exposure is reduced in favour of an increase in money market investments to protect the investor. On the other hand, in markets with low levels of volatility the strategy follows a leveraged equity strategy to fully exploit the bull market. Our analysis showed that this simple rules-based strategy is very transparent and outperforms a standard blue-chip index across the business cycle.

To conclude, risk control investment schemes offer a broad variety of possible use cases: For issuers of financial products such as ETFs or structured products risk control indices are a highly transparent underlying for investors with a clearly defined risk appetite. Moreover, for active asset managers they offer a guideline for how to allocate their asset portfolios between the risk equity markets and the safer money markets. In particular, the risk control strategies provide a clear investment framework for asset managers who manage portfolio mandates within clearly defined risk budgets.

LITERATURE


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is Director of Research & Development at STOXX Ltd. in Zurich where he is responsible for applied research in the area of asset management and financial products and for the development of new asset management strategies. Before joining STOXX in 2008, he held managerial positions in various Swiss asset managers and international investment banks in the area of trading and financial products. Guido holds a PhD in applied mathematics from ETH Zurich, an MSc in physics from the University of Heidelberg and an MSc in economics from the University of Hagen.

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