



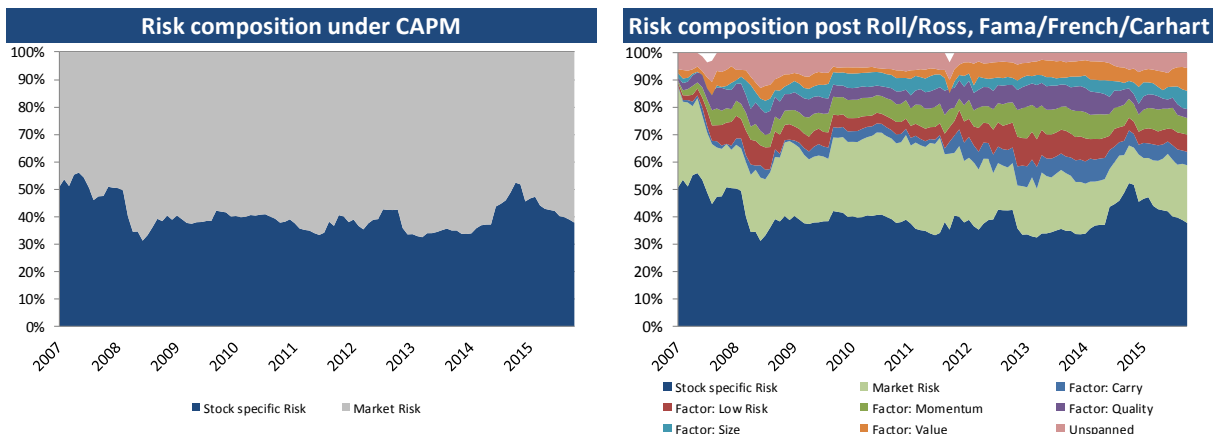
Factor investing – is there a rational explanation for Low Volatility?

In a recent article for the leading German speaking alternatives magazine ABSOLUT REPORT (AR) - thanks to Michael Busack, Ellen Hörth and their team once more for the opportunity, advice and helpful comments - we tried to shed more light on some of the **merits and challenges of factor investing** for institutional investors.

As the article is in German, we would like to provide a summary of our main thoughts to our English speaking audience and extend the ideas behind them. We decided to launch a new format for this type of publication and chose the GPS position of our office as a title, hoping to provide investors with more orientation and practical advice. We left out the typical cannon beats of math formulas and tried to find an economic rationale (instead of an "anomaly") in the sense of Kogan and Tianⁱ, who propose to find "**theoretical plausibility** and empirical evidence **in favour or against economic mechanism**". **Feedback and challenges are welcome.**

Polls conducted by RUSSELⁱⁱ and Edhecⁱⁱⁱ in 2015 provide some insights as to why European investors are reluctant to invest. **Information deficits** - with respect to theoretical, fundamental and economic rationale, sustainability of these premia, rebalancing frequency, turnover and associated implementation costs - came out as one of the main issues. The AR article dealt primarily with these and this summary covers the first part of the article.

We started with a brief introduction of the history of factor investing touching the work of Sharpe (CAPM), Banz (size premium), Fama/French (size and value premium), Carhart (momentum premium), Roll/Ross (arbitrage pricing theory). Given these foundations, every asset (like a stock shown in the graphics below) can be decomposed into several **systematic risk factors beyond market risk** and investors can draw first conclusions with respect to the **return sources of factor investing**. As they are a **compensation for systematic risk** (or beta beyond market risk) in the sense of portfolio theory, their **medium to long term expected return should be positive**. In contrast to "**alpha**", whose **expected return** for all investors in aggregate is "**zero**" before and **negative after transaction costs**. Sharpe brought this "fact of finance" up to the point in "The arithmetic of active management"^{iv}.



For Siemens; Source: FIS APT Risk Model

Then we highlighted that some of the so called "**paradigms**" of portfolio theory have been **called into question** over the past several years, for example that **volatility represents "the risk", investors are getting compensated for**. As a second - "**more return always requires more risk taking**" is a central tenet in finance - otherwise it is dubbed an "anomaly". Lemperiere et al^v among others (list available on request) **detected higher tail risk compensation but no higher volatility compensation**. A possible explanation may be delivered by the

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work of Black, Scholes^{vi} und Merton^{vii}, who in their ground-breaking work with respect to options and financing theory explained **all liabilities** (debt and equity) of a company as **options or a bundle of options**. Black and Scholes wrote: *"Since almost all corporate liabilities can be viewed as combinations of options, the formula and the analysis that led to it are also applicable to corporate liabilities such as common stock, corporate bonds, and warrants"*. Simply put with reference to payout profiles:

- debt (i.e. corporate bonds or credit) replicates a short put
- equity (stocks) replicates a long call

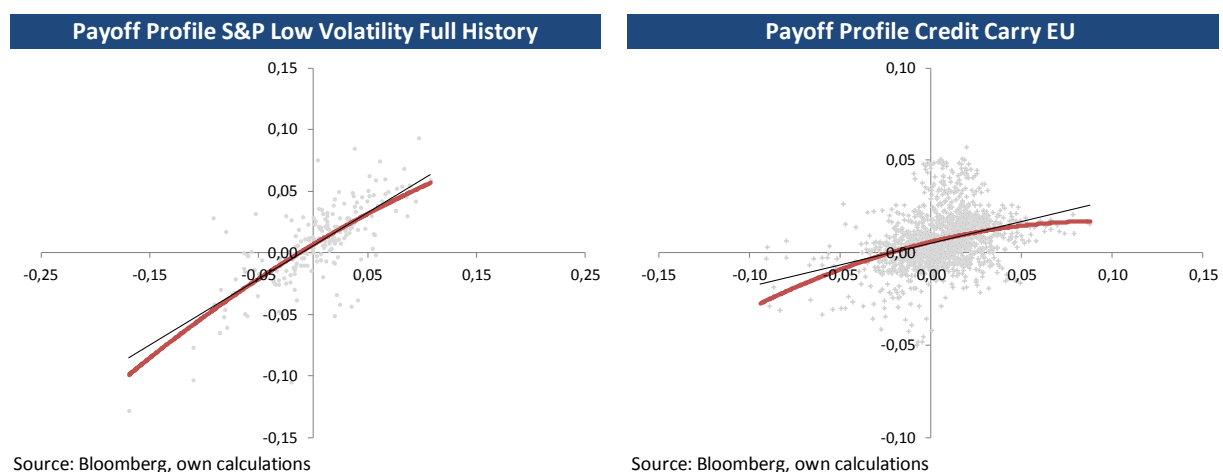
respectively with an exercise price on the book value of equity or market value of debt.

Optionality arises from "contingent claims" against cash flows and as a result against the assets of a company (see Merton). Richard Roll, one of the founders of Arbitrage Pricing Theory, described the position of an equity investor^{viii}: *"The equity claimant is long the firm's real assets, short its debt instruments, and **long an option to default and deliver the real assets to the bondholders**"*.

Debt and equity of one single company replicate a "beta 1" investment on the assets of this company, because a balance sheet always equals assets and liabilities. These liabilities are posted as assets on the investor's balance sheets, **where their risk - despite their asymmetries - is analysed under the assumption of normal distribution** (i.e. volatility) and linearity (i.e. correlation and beta).

In a next explanatory step, we first developed the view, that if a company's **debt replicates a short put** in general, all different forms of debt with respect to duration and seniority are like **puts with different theta and moneyness**. Short term debt with a low default probability is equivalent to short term (out of the money) puts under these assumptions and both (debt and put options) have to be rolled "up" along yield and volatility curves in short time frames, because both instruments lose duration or theta over time. For both investments, short term debt as well as out of the money puts, the risk adjusted return is higher than in longer dated instruments (long term bonds or longer dated short puts) – a typical "curve or carry effect".

From here, we jumped over to equity and highlighted the fact, that **factor exposures in any form exhibit asymmetric payoff profiles** (replicating options) as well. One of the most prominent is "**Low Volatility**", whose profile against benchmark **replicates a short put in the long run**, similar to carry strategies in corporates for example.

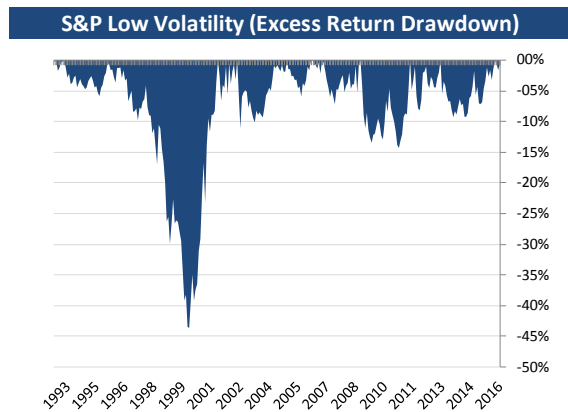


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This **profile is most profitable in phases of markets moving sideways** - a characteristic of most developed equity markets since 2001. That has been a timeframe in which most of the indices representative for European investors, achieved a performance below 2 % p.a. The put profile is a direct result of **low beta stocks lagging the market on the way up** and gradually **capturing more beta, when markets are falling**. The **low beta stocks**

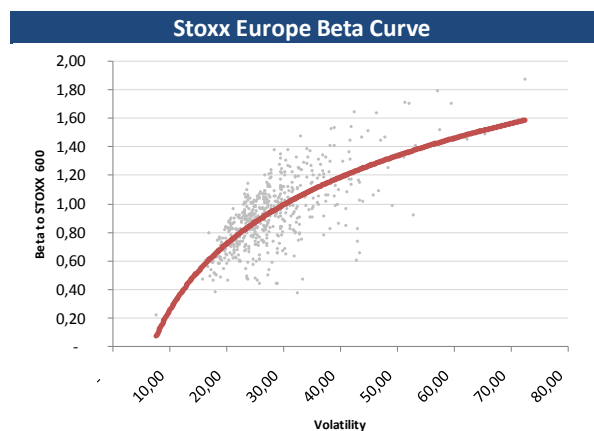
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are getting more risky and the put (profile) is moving "in the money", while former high beta stocks (long calls) are giving up on beta - they are becoming less riskier.

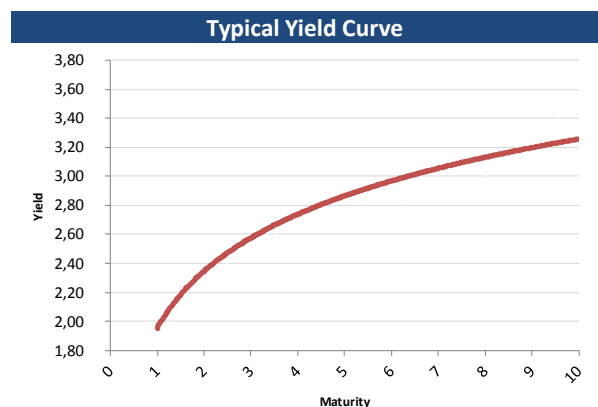


As investors more and more pile into Low Volatility strategies, they should be aware that Low Volatility is prone to **hefty phases of relative underperformance** vs. market performance as well. During the TMT bubble, Low Volatility underperformance vs. the market was more than 40% - the typical tail risk of a risk premia.

Low volatility and high beta stocks have to assemble the benchmark in aggregate - if a subset displays a short put profile, the remaining stocks have to replicate a "long call" to solve for a "beta of one" - equivalent to the balance sheet example mentioned above. So "Low Volatility" equities are "rolling up the volatility (or beta) curve" in opposition to the former examples of short term bond and options (volatility), which are "rolling down the curve". The result in general is the same - as bond and volatility investments have to be rolled over "up the curve", the same is true for "Low Volatility" stocks as they have to be "rolled down" their curve (in other words: rebalanced on a lower volatility level for the portfolio as a whole) again; **otherwise volatility and beta will change upwards**. The graph on the left shows beta (to benchmark) and volatility of all STOXX 600 components.



Source: FIS APT Risk Model



Source: Bloomberg, smoothed

Adjusting a "Low Volatility" investment across all other systematic betas - market beta of 1, minimum sector deviation and the likes - does not evaporate the effect (Asness et al ^{ix}) but changes the asymmetric profile considerably. The iStoxx Low Risk factor index (ISERRER Index) is a partial reflection of these research findings.

To sum up the main ideas:

- Low volatility equity factors seem to share common characteristics with well-known carry strategies in corporate credit and others
- it looks like an exploitation of roll yield (in reverse or "rolling up the beta curve")
- the payoff profile vs benchmark in all these strategies resemble a "Short Put" over time

Most of the existing literature classifies the "Low Volatility" effect as an anomaly, because a basic tenet of financial theory - more return always requires more risk taking - is not satisfied. During the implementation time of the iSTOXX indices, **Buchner und Wagner^x (2015)** analysed the "Low Volatility" effect through option

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theory as well and came to the notion that the **linear assumptions of the CAPM are inappropriate to describe the asymmetries** and the **high alphas seem to be a direct result of this** inability.

Our view seems to be **in line with this and the typical fundamental or “risk-based” view of factor premia**, which is explained by Ang, Chen and Xing^{xi}: *“If an asset tends to move downward in a declining market more than it moves upward in a rising market, it is an unattractive asset to hold because it tends to have very low payoffs precisely when the wealth of investors is low. Investors who are sensitive to downside losses, relative to upside gains, require a premium for holding assets that co-vary strongly with the market when the market declines. Hence, in an economy with agents placing greater emphasis on downside risk than upside gains, assets with high sensitivities to downside market movements have high average returns.”*

Using option theory, recognizing variation in betas over time and using the curve prospective, **a rational explanation** for one of the greatest "puzzles in finance" **seems possible**.

ⁱ Kogan,L; Tian, Mary; Firm Characteristics and Empirical Factor Models: A Model-Mining Experiment <http://ssrn.com/abstract=2182139>

ⁱⁱ FTSERussell; 2015; Smart beta: 2015 global survey findings from asset owners

ⁱⁱⁱ Edhec Risk Institute; 2015; Alternative Equity Beta Investing: A Survey

^{iv} Sharpe,W; The Arithmetic of Active Management; 1991; The Financial Analysts' Journal Vol. 47, No. 1, January/February. pp. 7-9

^v Lemperiere,Y; Deremble,C. et all; 2014;Risk Premia: Asymmetric Tail Risks and Excess Returns; available at <http://ssrn.com/abstract=2502743>

^{vi} Black,F; Scholes,M; 1973; The Pricing of Options and Corporate Liabilities, Journal of Political Economy; vol.81 637-659

^{vii} Merton,R; 1973; On the pricing of corporate debt: the risk structure of interest rates; journal of Finance, Vol.29; 449-470

^{viii} Pukthuanthong, Kuntara and Roll, Richard, A Protocol for Factor Identification (January 27, 2014). Available at SSRN: <http://ssrn.com/abstract=2342624>

^{ix} Asness,C; Frazzini,A; Pedersen,L.; 2013; Low Risk Investing without industry bets; AQR Research Paper

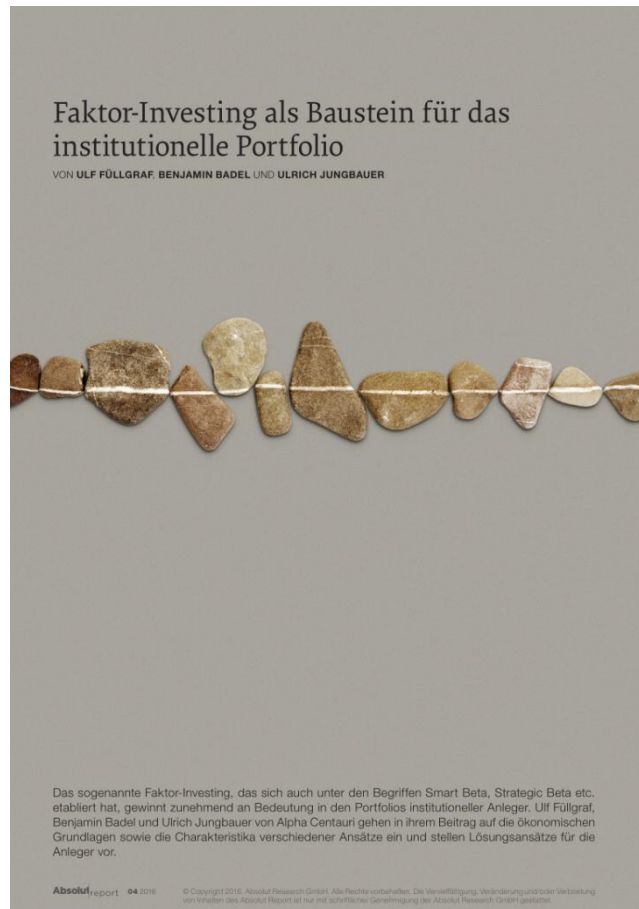
x Buchner,A; Wagner, N; 2015; The Betting against Beta Anomaly: Fact or Fiction:

<http://ssrn.com/abstract=2703752>

^{xi} Ang,A.; Chen,J.; Xing,Y.; 2005; Downside Risk; NBER Working Paper 11824

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You can request the full article (German) here <https://www.absolut-research.de/news/detail/n/faktor-investing-als-baustein-fuer-das-institutionelle-portfolio>



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