50 shades of Smart Beta
How to make a smart choice among multifactorial approaches?

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Speakers

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  - DEFI (Diversified Equity Factor Investing) solutions: 4-factor strategy with a precise management of relative risk

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INTRODUCTION
What is Smart Beta, and why use it?

Smart beta (or factor investing) “attempts to deliver better risk and return trade-offs than conventional market cap weighted indices by using alternative weightings in factors such as volatility or dividends”

- **Fully systematic**, with the aim to:
  - Take advantage of behavioural biases, which are the main cause of most anomalies
  - Allow for large and diverse universe, maximizing the opportunity set
  - Be fully transparent through the process
  - Be cost efficient, relative to traditional active or passive investment

- **Research-based**, in order to:
  - Understand the actual sources of persistent alpha
  - Avoid the focus on short-termism or exuberant markets

- **Risk-oriented**, to:
  - Maximise robustness and stability

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Smart Beta and the major traditional management styles

- **At the crossroads between the main investment approaches**
  - High degree of transparency
  - A focus on the long-term drivers of performance
  - A systematic investment process

Source: BNP Paribas Investment Partners, for illustrative purpose only
Academic research at the origin of Smart Beta

Academic research points to persistent CAPM anomalies (or premia)

- According to the CAPM\(^1\) theory, the excess return of a security should be proportional to its beta
- That implies that any portfolio that differs from the market portfolio should have a sub-optimal return-to-risk ratio
- But abundant academic research points to the contrary

Empirical evidence of persistent anomalies

- 1972: Risk anomaly = Low Volatility anomaly (Haugen & Heins)
- 1977: Value anomaly (Basu)
- 1979: Earnings Revisions anomaly (Lakonishok and Givoly)
- 1981: Small Cap stocks anomaly (Banz)
- 1990: Short-term reversal anomaly (Jagadeesh)
- 1993: Momentum anomaly (Jagadeesh and Titman)
- 1996: Accruals anomaly (Sloan)

\(^1\) CAPM: Capital Asset Pricing Model
BNP Paribas’ thought leadership research papers

Source: BNP Paribas Investment Partners, December 2015
From Smart Beta to Factor Investing

Regression shows Smart beta is essentially factor-based

- Performance of risk-based strategies can be explained by factor exposure (large R² and near-zero alphas)
- EW exposed to small cap stocks. ERB and ERC less exposed to small-cap and more to low beta stocks
- MV and MD exposed to low beta stocks and are the most defensive

Regression of strategy excess returns over the market against:

<table>
<thead>
<tr>
<th>3 Fama-French factors</th>
<th>Mkt: Market cap index excess returns over cash rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMB: Small cap relative to large cap stocks orthogonal to HML</td>
<td></td>
</tr>
<tr>
<td>HML: Value relative to growth stocks orthogonal to SMB</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2 beta neutral risk-based factors:</th>
<th>LBMHB: Low beta relative to high beta stock orthogonal to LVMHV</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVMHV: Low residual volatility relative to high residual volatility stocks orthogonal to LBMHB</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>EW</th>
<th>ERB</th>
<th>ERC</th>
<th>MD</th>
<th>MV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Mkt</td>
<td>-0.01</td>
<td>-0.12</td>
<td>-0.20</td>
<td>-0.63</td>
<td>-0.71</td>
</tr>
<tr>
<td>SMB</td>
<td>0.37</td>
<td>0.32</td>
<td>0.26</td>
<td>0.06</td>
<td>0.03</td>
</tr>
<tr>
<td>HML</td>
<td>0.14</td>
<td>0.16</td>
<td>0.15</td>
<td>-0.04</td>
<td>-0.02</td>
</tr>
<tr>
<td>LBMHB</td>
<td>0.06</td>
<td>0.16</td>
<td>0.24</td>
<td>0.57</td>
<td>0.54</td>
</tr>
<tr>
<td>LVMHV</td>
<td>-0.02</td>
<td>0.09</td>
<td>0.05</td>
<td>0.04</td>
<td>0.12</td>
</tr>
<tr>
<td>R square</td>
<td>75%</td>
<td>79%</td>
<td>84%</td>
<td>78%</td>
<td>84%</td>
</tr>
</tbody>
</table>

Factor Investing & Behavioral biases

The systematic approach helps:
- Remove any subjectivity from investment decisions
- Protect against home bias, or other reductions of diversification (style balancing)
- Reduce the “benchmark-dependency”
- Analyze long term behaviors, avoiding the focus on short term past performance
- Operate efficiently on large universes
- Develop “timing-free” investment processes

Smart beta factors use the biases of other investors to generate alpha:
- Low Vol uses overconfidence (popular stocks), estimation (attraction for low probabilities of gain) & representativeness (memory) biases
- Momentum uses the group-think effect: better wrong together than right alone
- Fundamental factors (Value, Quality) use the tendency to underrate data vs stories

Examples of biases:
- Estimation bias (lottery effect)
- Anchoring bias (underrating the importance of data)
- Familiarity bias (lottery effect)
- Conservatism bias (reluctance to change one’s mind)
## Strengths and weaknesses of Factor Investing

### Strengths
- **Scalability**: can be adapted to most investment universes
- **Customability (in risk and pay-off)**: can copy styles
- **Stability of style / Capacity to backtest**
- **Cost efficiency / Absence of key man risk**

### Weaknesses
- **Quant Crisis of 2008**: Opacity of hedge funds in 2008 has hurt confidence
- **“Plane without pilot”**: reluctance to pure systematic processes

### Opportunities
- **Growing acceptance of Academic research**: Nobel prizes, behavioural speeches,…
- **Increased need for risk control**: (regulation,…)
- **Fashion for global & flexible styles**

### Threats
- Competition of **smart beta public indices**
- Competition of **traditional managers** (using quant techniques among others)

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A disruptive innovation in Asset Management
SMART BETA STRATEGIES
What type of factor investing strategy fits your needs?
The three questions to answer before choosing the right strategy

- **What investment universe and what tolerance to regional and/or sector biases?**
  - Larger investment universe usually associated with higher performance potential
  - Control of region/sector biases may reduce the performance potential but will help constrain relative risk

- **Single factor or multi-factor?**
  - Single factor produces a transparent stock selection while multi-factor usually improves robustness
  - Combining several single-factor strategies is different from a multi-factor strategy with the same factors

- **How will the strategy’s behaviour be assessed: Excess return, Information ratio, Sharpe ratio?**
  - Excess return (i.e. main focus on performance): favour unconstrained strategies (high conviction)
  - Information ratio (focus on performance and risk relative to the benchmark): favour risk budgeting strategies
  - Sharpe ratio (optimizing the overall risk-return profile): favour low-volatility or long/short strategies
How can BNP Paribas Investment Partners help you?

Early-mover advantage in factor Investing

- **Significant expertise and strong quantitative culture:**
  - Production of ground-breaking research on the best factors to use and the best way to combine them - from low volatility to multi-factor

- **Extensive experience in transforming research into actual added value:**
  - Spearheaded the developments in Smart Beta in multiple regions and segments
  - Offer a broad range of strategies

- **Flexibility and research capabilities to provide tailored solutions:**
  - Ability to tailor our strategies to fit client’s investment needs
An extensive range of Smart Beta strategies

Risk budgeting approach (precise control of TE and/or beta)

Low Volatility Strategy

DEFI Strategy

GURU™ Strategy

CUSTOM SOLUTIONS

Unconstrained strategies (best in class/high conviction approach)

Single Factor
- Value: Using valuation indicators as investment criteria in order to buy at the right price
- Profitability: Favouring the securities of companies with a profitable business model
- Momentum: Selecting winners over losers to avoid missing the big market trends
- Low Volatility: Capturing the premium of low volatility assets

Multi-Factor
2. GURU™ SOLUTIONS
The GURU™ investment methodology

A systematic and transparent approach for equity stock-picking

- The GURU™ investment methodology was inspired by the techniques used by famous asset managers for nearly a century (e.g. Benjamin Graham, Warren Buffet), hence the name GURU

> "I believe in the discipline of mastering the best that other people have ever figured out. I don't believe in just sitting down and trying to dream it all up yourself. Nobody's that smart."

(C. Munger)

- The investment method “goes back to basics”: stock selection is based on company fundamentals regardless of their market capitalization, according to three criteria:
  - Profitability: selecting companies generating more cash than they consume
  - Prospects: selecting companies anticipated to realise the strongest potential growth
  - Valuation: selecting companies with a low relative valuation

- A fully systematic market screening and rebalancing process with rigorous risk management and volatility control

- The strategy offers a well-diversified exposure to large and liquid stocks
GURU™ investment process

A systematic investment method aiming to combine the respective strengths of active and passive asset management

1. **Universe Selection**
   - **Liquidity**: Selection of the most liquid securities in every region
     - Europe
     - US
     - Asia (ex Japan)
     - Global Emerging
     - Global Developed
     - All Countries

2. **Company Selection**
   - **Profitability**: Is the company profitable?
   - **Prospects**: Is the company going the right way?
   - **Valuation**: Is the company a good bargain?

3. **Portfolio Construction**
   - **Simplicity**: Profitability, perspectives and valuation are of equal importance in the company selection process
   - **Liquidity**: Monthly rebalancing of a fraction of the portfolio
   - **Risk Control**: Volatility control mechanism

**The GURU™ Strategy**

- ‘Long Only’ GURU™ indices
  - US
  - Europe
  - Asia ex Japan
  - Global Emerging
  - World Developed
  - All Country

- ‘Long/Short’ GURU™ indices
  - US
  - Europe
  - Europe + US

*For illustrative purpose only. Source: BNP Paribas*
GURU™ investment process

GURU approach: Examples of company scores

"To me, it's obvious that the winner has to bet very selectively. It's been obvious to me since very early in life. I don't know why it's not obvious to very many other people."

(Charlie Munger)

Analyzing companies’ fundamentals according to three groups of criteria:

- RoEA: Return on Equity, Return on Assets
- Profitability
- EPS mom.: Momentum
- Price mom.: Momentum
- Info ratio
- Prospects
- PEG
- EV/EBIT to Gth
- P/FCF
- Valuation

<table>
<thead>
<tr>
<th>RoEA</th>
<th>Profitability</th>
<th>EPS mom.</th>
<th>Price mom.</th>
<th>Info ratio</th>
<th>Prospects</th>
<th>PEG</th>
<th>EV/EBIT to Gth</th>
<th>P/FCF</th>
<th>Valuation</th>
<th>GURU Score</th>
<th>6-month Volatility</th>
<th>GURU Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresenius</td>
<td>10</td>
<td>10.0</td>
<td>9</td>
<td>10</td>
<td>9</td>
<td>9.3</td>
<td>6</td>
<td>5</td>
<td>9</td>
<td>8.67</td>
<td>21.0%</td>
<td>1</td>
</tr>
<tr>
<td>Roche Holding</td>
<td>10</td>
<td>10.0</td>
<td>8</td>
<td>10</td>
<td>9</td>
<td>9.0</td>
<td>8</td>
<td>5</td>
<td>7</td>
<td>8.56</td>
<td>15.3%</td>
<td>1</td>
</tr>
<tr>
<td>Reed Elsevier</td>
<td>10</td>
<td>10.0</td>
<td>10</td>
<td>9</td>
<td>9</td>
<td>9.3</td>
<td>6</td>
<td>3</td>
<td>10</td>
<td>6.3</td>
<td>8.56</td>
<td>19.7%</td>
</tr>
<tr>
<td>Next</td>
<td>10</td>
<td>10.0</td>
<td>10</td>
<td>9</td>
<td>10</td>
<td>9.7</td>
<td>7</td>
<td>2</td>
<td>8</td>
<td>5.7</td>
<td>8.44</td>
<td>20.0%</td>
</tr>
<tr>
<td>Anheuser-Busch Inbev</td>
<td>10</td>
<td>10.0</td>
<td>8</td>
<td>10</td>
<td>10</td>
<td>9.3</td>
<td>6</td>
<td>3</td>
<td>9</td>
<td>6.0</td>
<td>8.44</td>
<td>21.8%</td>
</tr>
</tbody>
</table>

Indices GURU US, GURU Europe, GURU Asia ex Japan, GURU Emerging, GURU Developed, GURU All Country

Number of securities in the final selection 40 30 30 30 30 50

Source: BNP Paribas, September 2012. For illustrative purposes only. The above mentioned securities are for illustrative purpose only and do not constitute any investment recommendation.

Portfolio rebalancing mechanism

Instead of revisiting the composition of the whole portfolio every 12 months, we chose to reshuffle it fractionally
What sets us apart?

- A simple and stable investment process avoiding behavioral and structural biases
- A highly selective methodology and well-diversified strategy
  - The 30 best ranked stocks selected each month for 120 holdings on average in the European strategy
- A monthly partial rebalancing (by 1/12th) which minimizes liquidity and market timing risks
- An excellent track record
  - A EUR 3.7 billion strategy* that has proven its efficiency by generating robust returns in a variety of market environments
  - Implemented on different geographical universes and showing superior competitive positioning with 5 Morningstar stars for World, Europe and US strategies**

* Source BNP Paribas IP, as of 20/11/2015

Past performance is not a reliable indicator of future returns. Four funds based on the GURU™ strategies have been awarded 5 stars by Morningstar as of 30 October 2015. Data Source - © 2015 Morningstar, Inc. All Rights Reserved. The information contained herein: (1) is proprietary to Morningstar and/or its content providers; (2) may not be copied or distributed; and (3) is not warranted to be accurate, complete or timely. Neither Morningstar nor its content providers are responsible for any damages or losses arising from any use of this information. Past performance is no guarantee of future results. Morningstar stars rank from 1 to 5, with the top ranking being 5 stars. All Morningstar ratings shown in this document are for Classic capitalising shares, as of 30 October 2015.
## Our GURU™ solutions

### Portfolio characteristics

<table>
<thead>
<tr>
<th>Equity Strategy</th>
<th>Date of inception</th>
<th>Benchmark</th>
<th>Volatility Cap</th>
<th>Number of holdings</th>
<th>Strategy assets (M EUR)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>GURU™ World</td>
<td>18 July 2012</td>
<td>MSCI All Country World</td>
<td>32%</td>
<td>250</td>
<td>407</td>
</tr>
<tr>
<td>GURU™ Europe</td>
<td>7 May 2009</td>
<td>Stoxx Europe 600</td>
<td>32%</td>
<td>120</td>
<td>2 050</td>
</tr>
<tr>
<td>GURU™ US</td>
<td>29 December 2010</td>
<td>S&amp;P 500</td>
<td>32%</td>
<td>160</td>
<td>1 000</td>
</tr>
<tr>
<td>GURU™ Asia</td>
<td>22 July 2011</td>
<td>MSCI Asia ex Japan</td>
<td>32%</td>
<td>120</td>
<td>4</td>
</tr>
<tr>
<td>GURU™ Emerging Markets</td>
<td>23 February 2012</td>
<td>MSCI Emerging Markets</td>
<td>32%</td>
<td>120</td>
<td>99</td>
</tr>
<tr>
<td>GURU™ Long-Short</td>
<td>10 June 2010</td>
<td>HFRX Equity Hedged</td>
<td>7%</td>
<td>300 long / 200 short</td>
<td>90</td>
</tr>
</tbody>
</table>

*Source: BNP Paribas IP, as of 20/11/2015.

Past performance is not a guide to future performance. The value of investments and the income derived from those investments may fluctuate over time and investors may not get back the original amount invested.
3. DEFI SOLUTIONS
Our philosophy on DEFI (Diversified Equity Factor Investing) solutions

- Capture premiums from factors:
  - Which exhibit strong complementarity,
  - That can be explained by behavioural finance,
  - With the fewest capacity constraints:
    - Value, Profitability, Momentum and Low Volatility

- Purifying factor premiums by removing unwanted exposures:
  - Such as market beta and size effect

- Simplify whenever possible:
  - Keep only the smallest number of indicators required
  - Avoid data mining and over-optimisation

- Combine factor premiums efficiently:
  - Minimising the impact of portfolio constraints
  - Keeping implementation costs as low as possible
Combining four complementary factors

- With strong backing from academic research
- Based on intuitively complementary concepts

**Value**
Using valuation as an investment rule in order to buy at the right price

**Profitability**
Favouring the stocks of companies with a profitable business model

**Low Volatility**
Capturing the premium of low volatility assets ("Low Volatility anomaly")

**Momentum**
Selecting winners over losers, to avoid missing the big market trends

Source: BNP Paribas Investment Partners, December 2015. For illustrative purposes only.
From factors to the final portfolio
A risk-budget approach for a balanced factor contribution

1. Calculation of the factors
   - Low vol
     - Lowest volatility
   - momentum
     - Winners
   - value
     - Cheap
   - quality
     - Highly profitable
   - Highest Volatility
     - Losers
     - Expensive
     - un-profitable

2. Equal-risk combination of the factors
   - Risk budgeting
     - Factor scores (or alpha) are combined to create a global score
     - Risk budgets are allocated to each factor (25% each).
     - Highest score
     - Lowest score

3. Portfolio construction
   - Implementation of portfolio constraints*
     - Long-only
     - Beta: 1 (use of futures)
     - weights ranging from 0.2% to 2%
     - Ex-ante tracking error: 5%
     - Turnover control
     - Between 150 and 200 stocks

   *On the example of DEFI World

Source: BNPP IP. For illustration purpose only
*These internal guidelines are mentioned for your information only and are subject to change.
DEFI World: Pro-forma results split on factors & constraints

Cumulated pro forma performance attribution from Jan. 2002 to July 2014 (%)

Excess returns versus benchmark attribution of projected factors' exposure

Returns in excess of MSCI World index

« Constraints » refers to the costs of implementing constraints (ex-ante TE of 5%, beta 1, long-only equity portfolio, number of stocks, etc.)

Source THEAM Quant Equity Management, October 2015.
These figures refer to a simulation of past performance, past performance or achievement is not indicative of current or future performance.
What sets us apart?

- A robust and efficient framework of portfolio construction
  - Published in a peer reviewed publication

- Clear choices in the factor exposures:
  - We do not view Small Caps as a factor but as a liquidity premium
  - Use of Quality, still often overlooked

- Full control over the risk exposures and sources of excess returns in the portfolio
  - Purify alpha by neutralising the sector, region and size exposures
  - Risk budget allocated to each factor (as % of ex ante Tracking Error)
  - Beta hedged via futures to allow for low-volatility exposure without beta bias

- A process allowing full customization
  - Alpha sources: Factors, Universes, use of futures can be expanded or restricted
  - Constraints: exclusion lists, filters (SRI*, Div Yield,...) can be added
  - Risk calibration: risk parameters (Tracking Error, beta) are managed separately from alpha generation and can be adapted

* SRI: Sustainable and Responsible Investment
## Our DEFI solutions

### Main portfolio characteristics

<table>
<thead>
<tr>
<th>Equity Strategy</th>
<th>Date of inception</th>
<th>Benchmark</th>
<th>Investment Universe</th>
<th>Factor combination (risk contribution)</th>
<th>Ex-ante Beta</th>
<th>Ex-ante tracking error</th>
<th>Number of holdings</th>
<th>2-way turnover (equity portfolio)</th>
<th>Strategy assets (M EUR)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFI World</td>
<td>29 July 2014</td>
<td>MSCI World</td>
<td>1600 stocks + 3 futures</td>
<td>Equal weighted</td>
<td>1</td>
<td>5%</td>
<td>150 to 200</td>
<td>~150%</td>
<td>85</td>
</tr>
<tr>
<td>DEFI US</td>
<td>25 June 2015</td>
<td>S&amp;P 500</td>
<td>900 stocks + S&amp;P futures</td>
<td>Equal weighted</td>
<td>1</td>
<td>3.5%</td>
<td>60 to 120</td>
<td>~70%</td>
<td>294</td>
</tr>
<tr>
<td>DEFI Japan</td>
<td>25 June 2015</td>
<td>Topix</td>
<td>400 stocks + Topix futures</td>
<td>Value oriented</td>
<td>1</td>
<td>4.5%</td>
<td>60 to 120</td>
<td>~120%</td>
<td>166</td>
</tr>
<tr>
<td>DEFI Long-Short</td>
<td>17 Sept. 2015</td>
<td>Eonia</td>
<td>1600 stocks + 3 futures</td>
<td>Equal weighted</td>
<td>0 in EUR</td>
<td>5.5%</td>
<td>150</td>
<td>~170%</td>
<td>14</td>
</tr>
</tbody>
</table>

*Source THEAM, data as of 20 November 2015.

The value of investments and the income derived from those investments may fluctuate over time and investors may not get back the original amount invested. Past performance or achievement is not indicative of current or future performance.
CONCLUSION
Comparing multi-factor approaches: GURU™ vs DEFI
Security picking or pure factor investing

<table>
<thead>
<tr>
<th>Security picking = GURU™</th>
<th>Factor allocation = DEFI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What it consists in:</strong></td>
<td><strong>What it consists in:</strong></td>
</tr>
<tr>
<td>Filtering the investment universe, in</td>
<td>Building and combining factor portfolios, i.e. portfolios</td>
</tr>
<tr>
<td>order to keep the securities with the</td>
<td>where all the securities are weighted according to their</td>
</tr>
<tr>
<td>top factor scoring – the top quantile –</td>
<td>factor value.</td>
</tr>
<tr>
<td>and/or exclude those with the worst.</td>
<td></td>
</tr>
<tr>
<td>It is similar to a best-in-class approach.</td>
<td></td>
</tr>
<tr>
<td><strong>Key strengths:</strong></td>
<td><strong>Key strengths:</strong></td>
</tr>
<tr>
<td>❖ Good “explainability” of the security</td>
<td>❖ Enables to allocate specific risk budgets to each factor.</td>
</tr>
<tr>
<td>selection</td>
<td>Good “explainability” of the factor exposure.</td>
</tr>
<tr>
<td>❖ Allows for more “story telling” about</td>
<td>❖ Precise control of risk parameters (tracking error, beta)</td>
</tr>
<tr>
<td>the portfolio</td>
<td></td>
</tr>
<tr>
<td><strong>Potential drawbacks:</strong></td>
<td><strong>Potential drawbacks:</strong></td>
</tr>
<tr>
<td>❖ Sub-optimal control of the tracking error</td>
<td>❖ Partial loss of transparency: weights cannot be explicitly</td>
</tr>
<tr>
<td>❖ Imprecise control of the risk budget</td>
<td>linked to the factor signals</td>
</tr>
<tr>
<td>spent on a specific factor</td>
<td></td>
</tr>
</tbody>
</table>

Depending on the objective and investment universe, either can make sense.
Conclusion on the universe of global developed equities

Absolute & Relative LT performances of Low Volatility, GURU™ and DEFI strategies

Different Smart Beta strategies are efficient for different objectives and in different contexts

These figures refer to a simulation of past performance, past performance or achievement is not indicative of current or future performance. Gross of fees annualised returns in USD, monthly data, from December 2005 to December 2014. For illustrative purpose only

Source: THEAM, as of end of November 2015
Focus on Long / Short Multi-factorial equity

In a context of low rates, equity neutral strategies are a rare source of liquid alphas.

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For illustrative purpose only

Source: THEAM, as of end of November 2015
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