Tactical Asset Allocation: Putting the Pieces Together

Dr. Bernhard Pfaff
bernhard_pfaff@fra.invesco.com

Invesco Asset Management Deutschland GmbH, Frankfurt am Main

The 2nd International R/Rmetrics User and Developer Workshop
29 June – 3 July 2007, Meielisalp, Lake Thune, Switzerland
Contents

Introduction

Data Analysis

Forecasting Model

Risk Model

Linear Program

Simulated Portfolio
Introduction
Overview

- Cash-portfolio with futures strategy.
- Long/short positions are allowed.
- Should cover the major bond and equity markets.
- Should include a protection mechanism.
- Fully-hedged against currency risk.
Introduction

The Pieces and Packages

- Forecasting model, e.g. `vars` and `urca`
- Risk model, e.g. `fExtremes` and `QRMLib`
- Linear integer program, e.g. `glpk`
Data Analysis

Continuous settlement (Wednesdays’ closing prices) of:

<table>
<thead>
<tr>
<th>Exchange : Instrument</th>
<th>DS-Mnemonic</th>
<th>Multiple</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CME: S&amp;P 500</td>
<td>ISPCS00</td>
<td>250 USD / IP</td>
</tr>
<tr>
<td>EUREX: DJ EURO STOXX 50</td>
<td>GEXCS00</td>
<td>10 EUR / IP</td>
</tr>
<tr>
<td>LIFFE: FTSE 250</td>
<td>LSYCS00</td>
<td>10 GBP / IP</td>
</tr>
<tr>
<td>OSX: NIKKEI 225</td>
<td>ONACS00</td>
<td>1000 JPY / IP</td>
</tr>
<tr>
<td>Bond</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBT: 10 YEAR US T-NOTE</td>
<td>CTYCS00</td>
<td>1000 USD / 100 BP</td>
</tr>
<tr>
<td>EUREX: EURO BUND</td>
<td>GGECS00</td>
<td>1000 EUR / 100 BP</td>
</tr>
<tr>
<td>LIFFE: LONG GILT</td>
<td>LIGCS00</td>
<td>1000 GBP / 100 BP</td>
</tr>
<tr>
<td>TSE: 10 YEAR T-BOND</td>
<td>JGBCS00</td>
<td>1000000 JPY / 100 BP</td>
</tr>
</tbody>
</table>
Data Analysis
U.S. Equity

Price of Future

Continuous Returns

Density Plot of Returns

QQ–Plot of Returns

N = 2334   Bandwidth = 0.1785
Data Analysis

Eurobloc Equity

Price of Future

Continuous Returns

Density Plot of Returns

QQ-Plot of Returns

N = 2356   Bandwidth = 0.2228
Data Analysis

U.K. Equity

Price of Future

Continuous Returns

Density Plot of Returns

QQ-Plot of Returns

N = 2341   Bandwidth = 0.1347
Data Analysis

Japan Equity

Price of Future

Continuous Returns

Density Plot of Returns

QQ-Plot of Returns

N = 2253   Bandwidth = 0.2463
Data Analysis

U.S. Bond

Price of Future

Continuous Returns

Density Plot of Returns

QQ-Plot of Returns

N = 2287   Bandwidth = 0.06802
Data Analysis

Eurobloc Bond

Price of Future

Continuous Returns

Density Plot of Returns

QQ–Plot of Returns

N = 2361   Bandwidth = 0.056
Data Analysis

U.K. Bond

Price of Future

Continuous Returns

Density Plot of Returns

QQ–Plot of Returns

N = 2338  Bandwidth = 0.05647
Data Analysis

Japan Bond

Price of Future

Continuous Returns

Density Plot of Returns

QQ-Plot of Returns

N = 2236  Bandwidth = 0.04195
Forecasting Model
Vector Error-correction Model (VECM)

- VECM specified in transitory form with one lagged difference.
- Logarithmic transformation applied.
- Full sample period from 1999-01-06 until 2008-04-30.
- Pseudo ex ante forecasts starting 2002-11-06.
- One-step ahead forecasts are obtained from implied level-VAR.
<table>
<thead>
<tr>
<th>variable</th>
<th>statistic</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
<th>lags</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. level</td>
<td>-1.39</td>
<td>-3.48</td>
<td>-2.89</td>
<td>-2.57</td>
<td>8</td>
</tr>
<tr>
<td>U.S. difference</td>
<td>-5.57</td>
<td>-2.57</td>
<td>-1.94</td>
<td>-1.62</td>
<td>8</td>
</tr>
<tr>
<td>Eurobloc level</td>
<td>-1.27</td>
<td>-3.48</td>
<td>-2.89</td>
<td>-2.57</td>
<td>8</td>
</tr>
<tr>
<td>Eurobloc difference</td>
<td>-5.45</td>
<td>-2.57</td>
<td>-1.94</td>
<td>-1.62</td>
<td>8</td>
</tr>
<tr>
<td>U.K. level</td>
<td>-1.29</td>
<td>-3.48</td>
<td>-2.89</td>
<td>-2.57</td>
<td>8</td>
</tr>
<tr>
<td>U.K. difference</td>
<td>-13.50</td>
<td>-2.57</td>
<td>-1.94</td>
<td>-1.62</td>
<td>8</td>
</tr>
<tr>
<td>Japan level</td>
<td>-1.37</td>
<td>-3.48</td>
<td>-2.89</td>
<td>-2.57</td>
<td>8</td>
</tr>
<tr>
<td>Japan difference</td>
<td>-4.81</td>
<td>-2.57</td>
<td>-1.94</td>
<td>-1.62</td>
<td>8</td>
</tr>
</tbody>
</table>
## Forecasting Model

### ERS Tests, Bonds

<table>
<thead>
<tr>
<th>variable</th>
<th>statistic</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
<th>lags</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. level</td>
<td>−1.98</td>
<td>−3.48</td>
<td>−2.89</td>
<td>−2.57</td>
<td>8</td>
</tr>
<tr>
<td>U.S. difference</td>
<td>−6.33</td>
<td>−2.57</td>
<td>−1.94</td>
<td>−1.62</td>
<td>8</td>
</tr>
<tr>
<td>Eurobloc level</td>
<td>−1.46</td>
<td>−3.48</td>
<td>−2.89</td>
<td>−2.57</td>
<td>8</td>
</tr>
<tr>
<td>Eurobloc difference</td>
<td>−15.57</td>
<td>−2.57</td>
<td>−1.94</td>
<td>−1.62</td>
<td>8</td>
</tr>
<tr>
<td>U.K. level</td>
<td>−2.25</td>
<td>−3.48</td>
<td>−2.89</td>
<td>−2.57</td>
<td>8</td>
</tr>
<tr>
<td>U.K. difference</td>
<td>−5.22</td>
<td>−2.57</td>
<td>−1.94</td>
<td>−1.62</td>
<td>8</td>
</tr>
<tr>
<td>Japan level</td>
<td>−1.54</td>
<td>−3.48</td>
<td>−2.89</td>
<td>−2.57</td>
<td>8</td>
</tr>
<tr>
<td>Japan difference</td>
<td>−3.35</td>
<td>−2.57</td>
<td>−1.94</td>
<td>−1.62</td>
<td>8</td>
</tr>
</tbody>
</table>
### Forecasting Model

#### KPSS Tests, Equities

<table>
<thead>
<tr>
<th>variable</th>
<th>statistic</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
<th>lags</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. level</td>
<td>5.49</td>
<td>0.216</td>
<td>0.146</td>
<td>0.119</td>
<td>8</td>
</tr>
<tr>
<td>U.S. difference</td>
<td>0.11</td>
<td>0.739</td>
<td>0.463</td>
<td>0.347</td>
<td>8</td>
</tr>
<tr>
<td>Eurobloc level</td>
<td>4.66</td>
<td>0.216</td>
<td>0.146</td>
<td>0.119</td>
<td>8</td>
</tr>
<tr>
<td>Eurobloc difference</td>
<td>0.14</td>
<td>0.739</td>
<td>0.463</td>
<td>0.347</td>
<td>8</td>
</tr>
<tr>
<td>U.K. level</td>
<td>5.51</td>
<td>0.216</td>
<td>0.146</td>
<td>0.119</td>
<td>8</td>
</tr>
<tr>
<td>U.K. difference</td>
<td>0.15</td>
<td>0.739</td>
<td>0.463</td>
<td>0.347</td>
<td>8</td>
</tr>
<tr>
<td>Japan level</td>
<td>5.40</td>
<td>0.216</td>
<td>0.146</td>
<td>0.119</td>
<td>8</td>
</tr>
<tr>
<td>Japan difference</td>
<td>0.13</td>
<td>0.739</td>
<td>0.463</td>
<td>0.347</td>
<td>8</td>
</tr>
</tbody>
</table>
## Forecasting Model

**KPSS Tests, Bonds**

<table>
<thead>
<tr>
<th>variable</th>
<th>statistic</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
<th>lags</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. level</td>
<td>3.73</td>
<td>0.216</td>
<td>0.146</td>
<td>0.119</td>
<td>8</td>
</tr>
<tr>
<td>U.S. difference</td>
<td>0.07</td>
<td>0.739</td>
<td>0.463</td>
<td>0.347</td>
<td>8</td>
</tr>
<tr>
<td>Eurobloc level</td>
<td>2.18</td>
<td>0.216</td>
<td>0.146</td>
<td>0.119</td>
<td>8</td>
</tr>
<tr>
<td>Eurobloc difference</td>
<td>0.13</td>
<td>0.739</td>
<td>0.463</td>
<td>0.347</td>
<td>8</td>
</tr>
<tr>
<td>U.K. level</td>
<td>1.45</td>
<td>0.216</td>
<td>0.146</td>
<td>0.119</td>
<td>8</td>
</tr>
<tr>
<td>U.K. difference</td>
<td>0.05</td>
<td>0.739</td>
<td>0.463</td>
<td>0.347</td>
<td>8</td>
</tr>
<tr>
<td>Japan level</td>
<td>4.21</td>
<td>0.216</td>
<td>0.146</td>
<td>0.119</td>
<td>8</td>
</tr>
<tr>
<td>Japan difference</td>
<td>0.12</td>
<td>0.739</td>
<td>0.463</td>
<td>0.347</td>
<td>8</td>
</tr>
</tbody>
</table>
## Forecasting Model

### Results of Trace Test

<table>
<thead>
<tr>
<th>rank</th>
<th>statistic</th>
<th>10%</th>
<th>5%</th>
<th>1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>r ≤ 7</td>
<td>0.39</td>
<td>6.50</td>
<td>8.18</td>
<td>11.65</td>
</tr>
<tr>
<td>r ≤ 6</td>
<td>6.82</td>
<td>15.66</td>
<td>17.95</td>
<td>23.52</td>
</tr>
<tr>
<td>r ≤ 5</td>
<td>17.95</td>
<td>28.71</td>
<td>31.52</td>
<td>37.22</td>
</tr>
<tr>
<td>r ≤ 4</td>
<td>32.91</td>
<td>45.23</td>
<td>48.28</td>
<td>55.43</td>
</tr>
<tr>
<td>r ≤ 3</td>
<td>54.48</td>
<td>66.49</td>
<td>70.60</td>
<td>78.87</td>
</tr>
<tr>
<td>r ≤ 2</td>
<td>83.30</td>
<td>85.18</td>
<td>90.39</td>
<td>104.20</td>
</tr>
<tr>
<td>r ≤ 1</td>
<td>123.52</td>
<td>118.99</td>
<td>124.25</td>
<td>136.06</td>
</tr>
<tr>
<td>r = 0</td>
<td>177.79</td>
<td>151.38</td>
<td>157.11</td>
<td>168.92</td>
</tr>
</tbody>
</table>

**Conclusion:** Cointegration rank of \( r = 2 \) cannot be rejected.
Risk Model
Settings and Quantitative Risk Measures

- Usage of expected shortfall (ES) numbers.
- Rolling window of 1000 observations per instrument.
- Estimates based on EVT (POT-method).
- KISS: No combined GARCH & ES forecast.
- Instead, ES of last trading day used as forecast for today’s ES.
## Risk Model

### Overview Long-Positions, 99%-Level

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Expected</th>
<th>VaR-GPD</th>
<th>ES-GPD</th>
<th>VaR-Norm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S.</td>
<td>14</td>
<td>20</td>
<td>6</td>
<td>23</td>
</tr>
<tr>
<td>Eurobloc</td>
<td>14</td>
<td>12</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>U.K.</td>
<td>14</td>
<td>21</td>
<td>9</td>
<td>36</td>
</tr>
<tr>
<td>Japan</td>
<td>14</td>
<td>18</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td><strong>Bonds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S.</td>
<td>14</td>
<td>17</td>
<td>6</td>
<td>28</td>
</tr>
<tr>
<td>Eurobloc</td>
<td>14</td>
<td>13</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>U.K.</td>
<td>14</td>
<td>13</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>Japan</td>
<td>14</td>
<td>12</td>
<td>3</td>
<td>25</td>
</tr>
</tbody>
</table>
Risk Model

U.S. Equity: VaR & ES (Long, 99%)

U.S. Equity

ES (GPD)

VaR (GPD)

VaR (Normal)
Risk Model

Eurobloc Equity: VaR & ES (Long, 99%)

Continuous return, percentages

2003 2005 2007

Eurobloc Equity

ES (GPD)

percentages

3.0 4.0 5.0 6.0

2003 2005 2007

4 shortfalls

VaR (GPD)

percentages

2.5 3.0 3.5 4.0 4.5

2003 2005 2007

12 shortfalls

VaR (Normal)

percentages

2.0 3.0 4.0

2003 2005 2007

18 shortfalls
Risk Model

U.K. Equity: VaR & ES (Long, 99%)
Risk Model

Japan Equity: VaR & ES (Long, 99%)

<table>
<thead>
<tr>
<th>Year</th>
<th>Continuous Return, Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>4.0</td>
</tr>
<tr>
<td>2005</td>
<td>4.4</td>
</tr>
<tr>
<td>2007</td>
<td>4.8</td>
</tr>
</tbody>
</table>

ES (GPD)

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>3.0</td>
</tr>
<tr>
<td>2005</td>
<td>3.4</td>
</tr>
<tr>
<td>2007</td>
<td>3.8</td>
</tr>
</tbody>
</table>

VaR (GPD)

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>2.6</td>
</tr>
<tr>
<td>2005</td>
<td>3.0</td>
</tr>
<tr>
<td>2007</td>
<td>3.4</td>
</tr>
</tbody>
</table>

VaR (Normal)

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>3.0</td>
</tr>
<tr>
<td>2005</td>
<td>3.4</td>
</tr>
<tr>
<td>2007</td>
<td>3.8</td>
</tr>
</tbody>
</table>
Risk Model

U.S. Bond: VaR & ES (Long, 99%)

- 6 shortfalls
- 17 shortfalls
- 28 shortfalls

Continuous return, percentages
2003 2005 2007
0 0.8 1.0 1.2 1.4

ES (GPD)
VaR (GPD)
VaR (Normal)
Risk Model

Eurobloc Bond: VaR & ES (Long, 99%)

- Eurobloc Bond
- ES (GPD) 6 shortfalls
- VaR (GPD) 13 shortfalls
- VaR (Normal) 25 shortfalls
Risk Model

U.K. Bond: VaR & ES (Long, 99%)

- **U.K. Bond**
  - Continuous return, percentages

- **ES (GPD)**
  - Percentages
  - 4 shortfalls

- **VaR (GPD)**
  - Percentages
  - 13 shortfalls

- **VaR (Normal)**
  - Percentages
  - 21 shortfalls
Risk Model

Japan Bond: VaR & ES (Long, 99%)

- **Japan Bond**
  - Continuous return, percentages

- **ES (GPD)**
  - Percentages
  - 3 shortfalls

- **VaR (GPD)**
  - Percentages
  - 12 shortfalls

- **VaR (Normal)**
  - Percentages
  - 25 shortfalls
### Risk Model

#### Overview Short-Positions, 99%-Level

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Expected</th>
<th>VaR-GPD</th>
<th>ES-GPD</th>
<th>VaR-Norm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S.</td>
<td>14</td>
<td>14</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Eurobloc</td>
<td>14</td>
<td>13</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>U.K.</td>
<td>14</td>
<td>24</td>
<td>6</td>
<td>30</td>
</tr>
<tr>
<td>Japan</td>
<td>14</td>
<td>14</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td><strong>Bonds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S.</td>
<td>14</td>
<td>21</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>Eurobloc</td>
<td>14</td>
<td>19</td>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td>U.K.</td>
<td>14</td>
<td>14</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>Japan</td>
<td>14</td>
<td>16</td>
<td>5</td>
<td>18</td>
</tr>
</tbody>
</table>
Risk Model

U.S. Equity: VaR & ES (Short, 99%)
Risk Model
Eurobloc Equity: VaR & ES (Short, 99%)

![Graphs of Eurobloc Equity, ES (GPD), VaR (GPD), and VaR (Normal)]
Risk Model

U.K. Equity: VaR & ES (Short, 99%)

Continuous return, percentages

2003 2005 2007

U.K. Equity

ES (GPD)

percentages

2003 2005 2007

6 exceedances

Percentages

2003 2005 2007

VaR (GPD)

24 exceedances

percentages

2003 2005 2007

VaR (Normal)

30 exceedances

percentages

2003 2005 2007
Risk Model

Japan Equity: VaR & ES (Short, 99%)

- Japan Equity
- ES (GPD) 5 exceedances
- VaR (GPD) 14 exceedances
- VaR (Normal) 14 exceedances

Continuous return, percentages

2003 2005 2007
Risk Model

U.S. Bond: VaR & ES (Short, 99%)

- U.S. Bond
- ES (GPD)
- VaR (GPD)
- VaR (Normal)

Continuous return, percentages

<table>
<thead>
<tr>
<th>Year</th>
<th>2003</th>
<th>2005</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Bond percentages</td>
<td>1.05</td>
<td>1.15</td>
<td>1.25</td>
</tr>
<tr>
<td>ES (GPD) exceedances</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VaR (GPD) exceedances</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VaR (Normal) exceedances</td>
<td>18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Risk Model

Eurobloc Bond: VaR & ES (Short, 99%)

- **Eurobloc Bond**
  - Continuous return, percentages

- **ES (GPD)**
  - 9 exceedances
  - Percentages

- **VaR (GPD)**
  - 19 exceedances
  - Percentages

- **VaR (Normal)**
  - 16 exceedances
  - Percentages
Risk Model

U.K. Bond: VaR & ES (Short, 99%)

Continuous return, percentages

2003 2005 2007

ES (GPD)

percentages

3 exceedances

U.K. Bond

VaR (GPD)

percentages

14 exceedances

VaR (Normal)

percentages

13 exceedances
Risk Model

Japan Bond: VaR & ES (Short, 99%)
Linear integer program

Target function

Maximize:

\[ z = \sum_{i=1}^{n} |\Delta p_i^f| m_i x_i , \quad (1) \]

- whereby \(|\Delta p_i^f|\) is the absolute expected price change of the \(i\)-th future contract, \(m_i\) is the corresponding multiple and \(x_i\) is the integer number of contracts to buy or sell.
- The expected price changes are denominated in Euro.
Linear integer program

Restrictions, I

- **Budget:**
  \[
  w \geq \sum_{i=1}^{n} p_i m_i x_i .
  \]  
  whereby \( w \) is the portfolio wealth.

- **Buffer:**
  \[
  p \geq \sum_{i=1}^{n} p_i m_i r_i x_i ,
  \]  
  whereby \( p \) assigns the risk buffer and \( r_i \) is the risk factor.

- **Equity share:**
  \[
  qa_1 \leq \frac{1}{w} \sum_{j=1}^{n_{equity}} p_j m_j x_j \leq qa_2 ,
  \]  
  whereby \( qa_1 \) and \( qa_2 \) are the equity bounds.
Linear integer program

Restrictions, II

- **Bond share:**

\[ qr_1 \leq \frac{1}{w} \sum_{j=1}^{n_{bonds}} p_j m_j x_j \leq qr_2 \quad (5) \]

whereby \( qr_1 \) and \( qr_2 \) are the fixed income bounds.

- **Shorts:**

\[ qs \geq \frac{1}{w} \sum_{j=1}^{n_{short}} p_j m_j x_j \quad (6) \]

whereby \( qs \) is the upper bound on short positions.
Simulated Portfolio
Assumptions and sample, I

- Risk-free rate: 1-week Euribor.
- Usage of 99% ES-rate derived from GPD-distribution (POT-method).
- Scaling of daily ES by \( \sqrt{7} \).
- No transaction costs and fully hedged.
Simulated Portfolio
Assumptions and sample, II

- Initial wealth, $w$, 1,000,000 Euro.
- Risk buffer: 90% of the highest wealth amount (high-watermark).
- Equity share between 10% and 90% of wealth.
- Bonds share between 10% and 90%.
- Maximal amount of short positions as high as 50% of wealth.
- Only trade if expected return is greater than 200 BP above 1 week risk-free rate.
Simulated Portfolio
Portfolio vs. Cash

![Graph showing simulated portfolio vs. cash from 2003 to 2008 in EUR]
Simulated Portfolio

Cash rate

![Graph of Simulated Portfolio Cash Rate from 2003 to 2008]
Simulated Portfolio

Equity Contribution

U.S. Equity

Eurobloc Equity

U.K. Equity

Japan Equity
Simulated Portfolio
Cumulated Contribution from Equity Futures

- U.S.
- Eurobloc
- U.K.
- Japan
Simulated Portfolio

Number of Traded Equity Futures
Simulated Portfolio

Average Return from Equity Futures

U.S. | Eurobloc | U.K. | Japan

0 | 200 | 400 | 600 | 800
Simulated Portfolio
Bond Contribution

U.S. Bond

Eurobloc Bond

U.K. Bond

Japan Bond
Simulated Portfolio

Cumulated Contribution from Bond Futures

U.S. Eurobloc U.K. Japan
0 5000 10000 15000 20000 25000 30000
Simulated Portfolio
Number of Traded Bond Futures
Simulated Portfolio
Average Return from Bond Futures

- U.S.
- Eurobloc
- U.K.
- Japan
Simulated Portfolio

Portfolio Characteristics

- Sharp ratio: 1.42
- Number of futures traded: 5348.
- Average return per single future: 155 EUR.
- Maximal draw down equities: -66310 EUR.
- Maximal draw down bonds: -8939 EUR.
- Contribution from tactical allocation: 831985 EUR.
- End value of portfolio: 2042979 EUR.