S&P PRISM Index

Methodology

March 2019
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Introduction

Index Objective and Highlights

The S&P PRISM Index is an index of indices designed to measure the performance of an inverse risk weighted basket of three component indices after accounting for technical and fundamental indicators. The three underlying component indices each represent a different asset class, as defined below:

<table>
<thead>
<tr>
<th>Underlying Component Index</th>
<th>Asset Class Represented</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P 500 ER (3M Libor) Index</td>
<td>Equities</td>
</tr>
<tr>
<td>S&amp;P GSCI Excess Return Index</td>
<td>Commodities</td>
</tr>
<tr>
<td>S&amp;P 10-Year U.S. Treasury Note Futures Excess Return Index</td>
<td>Fixed Income</td>
</tr>
</tbody>
</table>

Please refer to Index Construction for details on each index’s allocation to equities, commodities, and fixed income.

Supporting Documents

This methodology is meant to be read in conjunction with supporting documents providing greater detail with respect to the policies, procedures and calculations described herein. References throughout the methodology direct the reader to the relevant supporting document for further information on a specific topic. The list of the main supplemental documents for this methodology, and the hyperlinks to those documents, is as follows:

<table>
<thead>
<tr>
<th>Supporting Document</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P Dow Jones Indices' Index Mathematics Methodology</td>
<td>Index Mathematics Methodology</td>
</tr>
<tr>
<td>S&amp;P Dow Jones Indices’ Float Adjustment Methodology</td>
<td>Float Adjustment Methodology</td>
</tr>
<tr>
<td>S&amp;P Dow Jones Indices’ Fixed Income Index Mathematics Methodology</td>
<td>Index Mathematics Methodology</td>
</tr>
</tbody>
</table>

This methodology was created by S&P Dow Jones Indices to achieve the aforementioned objective of measuring the underlying interest of each index governed by this methodology document. Any changes to or deviations from this methodology are made in the sole judgment and discretion of S&P Dow Jones Indices so that the index continues to achieve its objective.
Index Construction

**Approach**

The index allocates among three sub-indices based on their respective realized volatilities and a multiplier that is applied to its volatility. The resulting index of indices forms the underlying non-risk controlled index.

The underlying Commodity and Treasury futures sub-indices are calculated and published by S&P DJI on a daily basis as excess return indices.

The third underlying sub-index, the S&P 500 ER (3M Libor) Index, is calculated as follows and is based on the S&P 500 TR Index using the 3-month LIBOR for the interest rate:

**S&P 500 ER (3M Libor) Index (SP500 ER3ML)**

\[
SP500\ ER3ML_t = SP500\ ER3ML_{t-1} \times (1 + SP500\ 3ML_t\ Excess\ Return)
\]

\[
SP500\ 3ML_t\ Excess\ Return = \left( \frac{SP500\ TR\ Index_t}{SP500\ TR\ Index_{t-1}} \right) - \left( InterestRate_{t-1} \times \frac{NumDays_t}{360} \right) - 1
\]

**Step 1: Trend Signals and Volatilities**

Before calculating the weights in the non-risk controlled index, three trend signals are calculated. For each sub-index, the following process is used to calculate a binary “position indicator” series of 1 or 0:

A. Calculate the 200 day simple moving average of the underlying sub-indices.
Calculate a trend signal based on the following rule:

\[
\text{Trend Signal}_{\text{asset}, t} = \begin{cases} 
1, & \text{if } \text{Index}_{\text{asset}, t} > 200 \text{DMA}_{\text{asset}, t} \\
0, & \text{otherwise} 
\end{cases}
\]

Create two series, \(\text{UpCount}_{t}\) and \(\text{DownCount}_{t}\), that serve as counting indices. These indices will start at 0 on the 200th day, and increment each day thereafter.

\[
\text{UpCount}_{\text{asset}, 200} = \text{DownCount}_{\text{asset}, 200} = 0 \\
\text{UpCount}_{\text{asset}, t} = \begin{cases} 
\text{UpCount}_{\text{asset}, t-1} + 1, & \text{if Trend Signal}_{\text{asset}, t} = 1 \\
0, & \text{otherwise} 
\end{cases} \\
\text{DownCount}_{\text{asset}, t} = \begin{cases} 
\text{DownCount}_{\text{asset}, t-1} + 1, & \text{if Trend Signal}_{\text{asset}, t} = 0 \\
0, & \text{otherwise} 
\end{cases}
\]

Finally, calculate the binary “position indicator” as follows:

\[
\text{Position Indicator}_{\text{asset}, t} = \begin{cases} 
1, & \text{if UpCount}_{\text{asset}, t} > 4 \\
0, & \text{if UpCount}_{\text{asset}, t} \leq 4 \text{ AND DownCount}_{\text{asset}, t} > 4 \\
\text{Position Indicator}_{\text{asset}, t-1}, & \text{otherwise} 
\end{cases}
\]

For each sub-index, compute the 90 day volatility of excess returns

\[
\text{Volatility}_{\text{asset}, t} = \sqrt{\frac{\sum_{i=1}^{90} (\text{DailyReturn}_{\text{asset}, t} - \text{AvgDailyReturn}_{\text{asset}, t})^2}{89}} \times \sqrt{252}
\]

Where,

\[
\text{DailyReturn}_{\text{asset}, t} = \frac{\text{Index}_{\text{asset}, t}}{\text{Index}_{\text{asset}, t-1}} - 1 \\
\text{AvgDailyReturn}_{\text{asset}, t} = \frac{\sum_{i=0}^{90} \frac{\text{Index}_{\text{asset}, t-i-1}}{\text{Index}_{\text{asset}, t-i}} - 1}{90}
\]

**Step 2: Rank Long Sub-Index Returns**

A. For each sub-index, compute the 200 day excess return

\[
\text{200 Day Return}_{\text{asset}, t} = \frac{\text{Index}_{\text{asset}, t}}{\text{Index}_{\text{asset}, t-200}} - 1
\]

B. For each sub-index on an excess return basis, plus cash (which has a daily excess return of 0), rank the 200 day excess returns on day \(t\) across sub-index, with 1 being the highest return, and 4 being the lowest return.

C. Compute the trailing 5 day average rank for equities and fixed income.
Step 3: Volatility Scalars

A. Calculate a yield curve multiplier that is based on a lagged 120 day 60 day average of the spread between the 10-year U.S. Treasury rate and the 3-month U.S. Treasury rate as follows:

\[
Yield\ Curve\ Multiplier_t = \begin{cases} 
1, & \text{if } \frac{\sum_{i=1}^{60} 10\ Year\ Rate_{t-19-i} - 3\ Month\ Tbill\ Rate_{t-19-i}}{60} > 0 \\
5, & \text{Otherwise}
\end{cases}
\]

B. Calculate a bond trend indicator:

\[
Bond\ Trend\ Position_t = \begin{cases} 
1, & \text{if } Position\ Indicator_{Bond,t} = 1 \\
10, & \text{if } Position\ Indicator_{Bond,t} = 0 \text{ AND } (10\ Year\ Rate_t - 3\ Month\ Tbill\ Rate_t) < 0 \\
1, & \text{Otherwise}
\end{cases}
\]

C. Calculate the earnings yield and reference 10-year yield as:

\[
EY_t = \frac{1}{1\ yr\ forward\ PE_{t,s&p500}} \\
10Y_t = 10 - Year\ Yield\ at\ time\ t
\]

D. Calculate equity and bond volatility multipliers.

<table>
<thead>
<tr>
<th>Yield Curve Multiplier (5A)</th>
<th>Average Equity Rank (2B)</th>
<th>10Y vs EY (3C)</th>
<th>Position Indicator_t (1D)</th>
<th>Equity Mult_t (Result)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1</td>
<td>1</td>
<td>4</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>1</td>
<td>&lt;&gt; 4</td>
<td>10Y &gt; EY</td>
<td>5</td>
</tr>
<tr>
<td>Scenario 3</td>
<td>1</td>
<td>&lt;&gt; 4</td>
<td>10Y &lt;= EY</td>
<td>1</td>
</tr>
<tr>
<td>Scenario 4</td>
<td>1</td>
<td>&lt;&gt; 4</td>
<td>10Y &lt;= EY</td>
<td>&lt;&gt; 1</td>
</tr>
<tr>
<td>Scenario 5</td>
<td>&lt;&gt; 1</td>
<td></td>
<td></td>
<td>Yield Curve Multiplier_t</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Avg Fixed Income Rank (2B)</th>
<th>20 Day 10Y MA (1A)</th>
<th>Bond Trend Position_t (3B)</th>
<th>Fixed Income Mult_t (Result)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1</td>
<td>4</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>&lt;&gt; 4</td>
<td>&lt; 2%</td>
<td>10</td>
</tr>
<tr>
<td>Scenario 3</td>
<td>&lt;&gt; 4</td>
<td>&gt;= 2%</td>
<td>1</td>
</tr>
<tr>
<td>Scenario 4</td>
<td>&lt;&gt; 4</td>
<td>&gt;= 2%</td>
<td>&lt;&gt; 1</td>
</tr>
</tbody>
</table>

Step 4: Inverse Volatility Weighting

A. Calculate the scaled volatilities for both equities and fixed income as:

\[
Equity\ Vol_t = Volatility_{Equity,t} \ast Equity\ Mult_t \\
Fixed\ Income\ Vol_t = Volatility_{Fixed\ Income,t} \ast Fixed\ Income\ Mult_t
\]

B. Determine the inverse weights with regard to the target volatility

\[
Inverse_{Equity,t} = \frac{5.5\%}{Equity\ Vol_t} \\
Inverse_{Fixed,t} = \frac{5.5\%}{Fixed\ Income\ Vol_t}
\]
\[ \text{Inverse}_{\text{Comm},t} = \begin{cases} \frac{5.5\%}{\text{Volatility}_{\text{Comm},t}}, & \text{if } \text{Rank}_{\text{Comm},t} = 1 \text{ AND } \text{Position Indicator}_{\text{Comm},t} = 1 \\ 0\%, & \text{Otherwise} \end{cases} \]

C. Calculate the final weights for each sub-index:

\[ \text{Final Weight}_{\text{asset},t} = \frac{\text{Inverse}_{\text{asset},t}}{\sum_{\text{asset}} \text{Inverse}_{\text{asset},t}} \]

**Step 5: Reference Index Calculation**

A. Calculate the index return:

\[ \text{Weighted Avg Return}_t = \sum \text{Final Weight}_{\text{asset},t-2} \times \text{Excess Daily Return}_{\text{asset},t} \]

\[ \text{Ref Index Return}_t = \begin{cases} 0.75 \times \text{Weighted Avg Return}_t, & \text{if } \text{Equity Mult}_{t-2} + \text{Fixed Income Mult}_{t-2} = 15 \\ \text{Weighted Avg Return}_t, & \text{Otherwise} \end{cases} \]

B. Final step is to calculate the reference index level

\[ \text{Ref Index Level}_t = \text{Ref Index Level}_{t-1} \times (1 + \text{Ref Index Return}_t) \]

**Step 6: Final Index Level**

In order to calculate the final index levels, a risk control methodology is applied. Please refer to the Risk Control Indices section of the index mathematics document for equations 55, 56, 59 and 60, where the underlying index is the reference index calculated above and:

\[ K_{rb} = \min(100\%, \frac{5.5\%}{\text{Realized Volatility}_{t-2}}) \]
Index Maintenance

Rebalancing

The index is rebalanced on US business days after the market close. If a component of the index is not published on the rebalancing date, the prior value of that component is used. As part of the rebalancing process, the weights of the various asset class components are determined based on the sub-indices weights in the benchmarks as described in Index Construction.

Corporate Actions

For information on Corporate actions, please refer to S&P Dow Jones Indices’ Equity Indices Policies & Practices.

Currency of Calculation and Additional Index Return Series

In addition to the indices detailed in this methodology, additional return series versions of the indices may be available, including, but not limited to: currency, currency hedged, decrement, fair value, inverse, leveraged, and risk control versions. For a list of available indices, please refer to S&P DJI's All Indices by Methodology Report.

For information on the calculation of different types of indices, please refer to S&P Dow Jones Indices’ Index Mathematics Methodology.

Base Date and History Availability

Index history availability, base date and base value are shown in the table below.

<table>
<thead>
<tr>
<th>Index</th>
<th>Launch Date</th>
<th>First Value Date</th>
<th>Base Date</th>
<th>Base Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P PRISM Index (USD)</td>
<td>02/12/2018</td>
<td>08/16/1990</td>
<td>08/16/1990</td>
<td>1000</td>
</tr>
</tbody>
</table>
Index Governance

Index Committee

S&P Dow Jones Indices’ Factor Indices Index Committee maintains the index. The Committee meets regularly. At each meeting, the Committee reviews matters that may affect index constituents, statistics comparing the composition of the index to the market, and any significant market events. In addition, the Index Committee may revise index policy covering rules for selecting constituents, treatment of dividends, share counts or other matters.

S&P Dow Jones Indices’ considers information about changes to its indices and related matters to be potentially market moving and material. Therefore, all Index Committee discussions are confidential.

S&P Dow Jones Indices’ Index Committees reserve the right to make exceptions when applying the methodology if the need arises. In any scenario where the treatment differs from the general rules stated in this document or supplemental documents, clients will receive sufficient notice, whenever possible.

In addition to the daily governance of indices and maintenance of index methodologies, at least once within any 12-month period, the Index Committee reviews the methodology to ensure the indices continue to achieve the stated objectives, and that the data and methodology remain effective. In certain instances, S&P Dow Jones Indices may publish a consultation inviting comments from external parties.

For information on Quality Assurance and Internal Reviews of Methodology, please refer to S&P Dow Jones Indices’ Equity Indices Policies & Practices Methodology.
Index Policy

Holiday Schedule

The index is calculated on all U.S. equity market business days.

A complete holiday schedule for the year is available at www.spdji.com.

Rebalancing

The index committee may change the date of a given rebalancing for reasons including market holidays occurring on or around the scheduled rebalancing date. Any such change will be announced with proper advance notice where possible.

Unexpected Exchange Closures

For information on Unexpected Exchange Closures, please refer to S&P Dow Jones Indices’ Equity Indices Policies & Practices Methodology.

Recalculation Policy

For information on the recalculation policy, please refer to S&P Dow Jones Indices’ Equity Indices Policies & Practices Methodology.

For information on Calculations and Pricing Disruptions, Expert Judgment and Data Hierarchy, please refer to S&P Dow Jones Indices’ Equity Indices Policies & Practices Methodology.

Contact Information

For questions regarding an index, please contact: index_services@spglobal.com.
Index Dissemination

Index levels are available through S&P Dow Jones Indices’ Web site at www.spdji.com, major quote vendors (see codes below), numerous investment-oriented Web sites, and various print and electronic media.

Tickers

The table below lists headline indices covered by this document. All versions of the below indices that may exist are also covered by this document. Please refer to S&P DJI's All Indices by Methodology Report for a complete list of indices covered by this document.

<table>
<thead>
<tr>
<th>Index</th>
<th>Return Type</th>
<th>Bloomberg</th>
<th>Reuters</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P PRISM Index (USD)</td>
<td>Excess Return</td>
<td>SPPRISME</td>
<td>.SPPRISME</td>
</tr>
</tbody>
</table>

Index Data

Daily constituent and index level data are available via subscription.

For product information, please contact S&P Dow Jones Indices, www.spdji.com/contact-us.

Web site

For further information, please refer to S&P Dow Jones Indices’ Web site at www.spdji.com.
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