S&P GSCI Inverse Industrial Metals 1-Month Forward Capped Commodity Index

Methodology Supplement

February 2017
S&P GSCI Inverse Industrial Metals 1-Month Forward Capped Commodity Index

The S&P GSCI Inverse Industrial Metals 1-Month Forward Capped Commodity Index (the Index) is an inverse version of the S&P GSCI Industrial Metals 1-Month Forward Capped Commodity Index. The Index seeks to provide the inverse return of the S&P GSCI Industrial Metals 1-Month Forward Capped Commodity Index, measured on a daily basis. The Index contains the specific commodities of the S&P GSCI Industrial Metals Index and is calculated on a basis similar to the S&P GSCI Industrial Metals 1-Month Forward Index. It is, then, modified to apply the S&P GSCI Capped Commodity 35/20 capping rules and the S&P Dow Jones Indices’ Futures-based Leveraged Indices Methodology.

The S&P GSCI Industrial Metals 1-Month Forward Capped Commodity version of the S&P GSCI Industrial Metals 1-Month Forward Index maintains continuity and commodity weight proportion to the S&P GSCI Industrial Metals 1-Month Forward Index. The capping procedure follows two rules, in succession:

The S&P GSCI Inverse Industrial Metals 1-Month Forward Capped Commodity Index Methodology Supplement

This methodology supplement is divided into three sections: 1) the details of the S&P GSCI Industrial Metals 1-Month Forward Index, 2) the S&P Capped Commodity 35/20 methodology and 3) the S&P futures based leveraged and inverse methodology. This methodology supplement uses various terms from the S&P GSCI Index Methodology. Where not specifically noted otherwise in this document, the rules of the S&P GSCI Methodology will prevail. Where the terms in this document are also defined in the S&P GSCI Methodology, the definitions in this document prevail.

This methodology supplement 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 supplement. Any changes to or deviations from this methodology supplement are made in the sole judgment and discretion of S&P Dow Jones Indices so that the index continues to achieve its objective.

For information on:
- Quality Assurance
- Internal Reviews of Methodology
- Calculations and Pricing Disruptions
- Expert Judgment
- Data Hierarchy
- Unexpected Exchange Closures


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1 35/20 is a means of identifying a two tiered capping model. It does not connote compliance with any regulatory regime or guideline.
Section I – The S&P GSCI Industrial Metals 1-Month Forward Index Methodology

Value of the Index

On any given day, the value of the index is equal to the total dollar weight of the index divided by a normalizing constant, which assures the continuity of the index over time. The total dollar weight of the index is the total dollar weight of the underlying commodities. The dollar weight of the underlying commodities on any given day is equal to the product of:

- the daily contract reference price,
- the appropriate contract production weight (CPW) and,
- the appropriate “roll weights” needed during a roll period (discussed below).

On any given day, the daily contract reference price used in calculating the dollar weight of the commodity futures contract is the most recent daily contract reference price made available by the relevant trading facility. The daily contract reference price for the most recent prior day will be used if the trading facility is closed or otherwise fails to publish a daily contract reference price on that day. In addition, if the trading facility fails to make a daily contract reference price available or publishes a daily contract reference price that, in the reasonable judgment of S&P Dow Jones Indices reflects manifest error, the relevant calculation will be delayed until the price is made available or corrected. However, if the price is not made available or corrected by 4:00 PM ET, S&P Dow Jones Indices may determine the appropriate daily contract reference price for the applicable futures contract for purposes of the relevant calculation of the value of the index, if it deems such action to be appropriate under the circumstances.

Calculation of the Index

The value of the index on any S&P GSCI business day is equal to the product of (i) the value of the index on the immediately preceding S&P GSCI business day, (ii) one plus the sum of the contract daily return and the Treasury bill return on the hypothetical investment in the index on the S&P GSCI business day on which the calculation is made, and (iii) one plus the Treasury bill return on the hypothetical investment in the index for each non-S&P GSCI business day since the immediately preceding S&P GSCI business day. We use the term S&P GSCI business day to mean each day on which S&P Dow Jones Indices’ offices in New York City are open for business. The value of the index has been normalized such that its hypothetical level on January 16, 1995 was 100.

In formulaic terms:

$$\text{Index TR}_d = \text{Index TR}_{d-1} \times (1 + \text{CDR}_d + \text{TBR}_d) \times (1 + \text{TBR}_d)^{\text{days}}$$

where \(\text{days}\) is the number of non-S&P GSCI Business Days since the immediately preceding S&P GSCI Business Day.

Contract Daily Return

On any given day, the contract daily return is equal to the applicable daily contract reference price on the specific commodity contract multiplied by the CPW and the appropriate “roll weight,” (Total Dollar Weight Obtained) divided by the total dollar weight of the contract on the preceding day (Total Dollar Weight Invested), minus one.

In formulaic terms, the Contract Daily Return is calculated as follows:

$$\text{CDR}_d = \frac{\text{TDWO}_d}{\text{TDWI}_{d-1}} - 1$$
$$TDW_d = \sum_c CPW^c \ast (CRW^1_d \ast DCRP^1_d + CRW^2_d \ast DCRP^2_d)$$

where:

- $c$ = each Designated Contract
- $d$ = the S&P GSCI Business Day on which the calculation is made
- $CRW^1$ = the Contract Roll Weight of the First Nearby Contract Expiration
- $CRW^2$ = the Contract Roll Weight of the Roll Contract Expiration
- $DCRP$ = the Daily Contract Reference Price of each respective Contract Expiration

The S&P GSCI Industrial Metals 1-Month Forward Total Return Index is calculated based on the Contract Expiration that would be in the regular index one month from the current date. Although the S&P GSCI Industrial Metals 1-Month Forward Total Return Index uses the same CPWs and includes the same commodities as the S&P GSCI Industrial Metals Index, the contract months will vary and the returns and values will differ from the S&P GSCI Industrial Metals Index.

The table below identifies the Contracts included in the S&P GSCI Industrial Metals 1-Month Forward Total Return Index and their respective designated contract roll schedules.

<table>
<thead>
<tr>
<th>Trading Facility</th>
<th>Commodity (Contract)</th>
<th>Ticker(1)</th>
<th>Expired at Month Begin(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LME</td>
<td>Aluminum (High Gd. Prim.)</td>
<td>MAL</td>
<td>H J K M N Q U V X Z F G</td>
</tr>
<tr>
<td>LME</td>
<td>Copper – Grade A</td>
<td>MCU</td>
<td>H J K M N Q U V X Z F G</td>
</tr>
<tr>
<td>LME</td>
<td>Standard Lead</td>
<td>MPB</td>
<td>H J K M N Q U V X Z F G</td>
</tr>
<tr>
<td>LME</td>
<td>Primary Nickel</td>
<td>MNI</td>
<td>H J K M N Q U V X Z F G</td>
</tr>
<tr>
<td>LME</td>
<td>Zinc (Special High Grade)</td>
<td>MZN</td>
<td>H J K M N Q U V X Z F G</td>
</tr>
</tbody>
</table>

(1) Tickers are Reuters RIC Codes.
(2) Future months included in the index at the beginning of each calendar month, starting with January.

<table>
<thead>
<tr>
<th>Month</th>
<th>Letter Code</th>
<th>Month</th>
<th>Letter Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>F</td>
<td>July</td>
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<tr>
<td>June</td>
<td>M</td>
<td>December</td>
<td>Z</td>
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</table>
Section II - S&P GSCI Capped Commodity 35/20 Methodology

Due to the limited number of index constituents, this version of the Capped Commodity Methodology utilizes buffers.

Rule 1: Only one commodity can reach a maximum weight of 35%. If there is any commodity above 35%, it is capped at 32%, and any excess weight is distributed proportionately among the remaining commodities. The cap of 32% is used as a buffer.

Once Rule 1 is implemented,

Rule 2: No remaining commodity weight can exceed 20%. If any remaining commodity is above 20% it is capped at 17%, and any excess weight is distributed proportionately among the remaining commodities. The cap of 17% is used as a buffer.

Capping Frequency: Quarterly. Determination date: The S&P GSCI Business Day before the first quarterly roll date (January, April, July and October).

Capping excess distribution: Distributed proportionately among the remaining commodities.

Commodities: Aluminum, copper, lead, nickel and zinc.

Implementation

Any excess weight from a rule #1 violation is distributed proportionally among the remaining index commodities.

After rule #1 is implemented, if there are rule #2 violations, then any commodity that violates the 20% rule is capped at 17% and the balance is distributed proportionately among the remaining uncapped index commodities.

In order to properly implement, Contract Production Weights (CPWs) are adjusted to arrive at the assigned weights for each commodity. This adjustment process takes place at the beginning of each quarter and every time the S&P GSCI Industrial Metals Index is rebalanced, adjusted, and/or new commodities are added to or deleted from the index, in order to remain proportional with the S&P GSCI Industrial Metals Index commodities.

The adjustment process takes place as follows.

1. On the S&P GSCI Business Day before each quarterly first roll date, the latest S&P GSCI Industrial Metals Index commodity CPWs are multiplied by their respective 1-month forward commodity prices to determine the commodity weights. For January, the CPWs will be the new ones that were determined with that year's annual rebalancing.

2. The commodities are sorted in descending order by their respective index weights.

3. If there is any commodity above 35% it is capped at 32%, and the excess weight is distributed proportionately among the remaining commodities.

4. If any additional commodity is above 20% it is capped at 17%, and the excess weight is distributed among the remaining uncapped index commodities. This process is repeated iteratively until all the capping rules are met.

5. The percentage weights of all commodities are converted to CPW-equivalents, based on the prices from the S&P GSCI Business Day, one day prior to the first roll date, and with the initial S&P GSCI Industrial Metals 1-Month Forward Index weights implied by those last business day prices and the latest S&P GSCI Industrial Metals Index CPWs. For January, the CPWs are the new ones that were determined with that year's annual rebalancing. For example, the S&P GSCI Industrial Metals Index CPWs were multiplied by the 1-month forward commodity prices from the last business day before the roll.
6. This capping adjustment process takes place every quarter and utilizes any CPW commodity changes to the base index, additions to, subtractions from, commodity substitutions, etc. in order to maintain continuity and proportion with the base S&P GSCI Industrial Metals Index.

**Capping formulas**

At each rebalancing, CPWs are calculated as follows:

\[ CPW_{capped,i} = CPW_{GSCI,i} \times \frac{TargetWeight_i}{GSCIWeight_i} \]

where:

- \( CPW_{capped,i} \) = CPW for commodity \( i \) in the S&P GSCI Industrial Metals 1-Month Forward Capped Commodity Index as of the rebalancing reference date
- \( CPW_{GSCI,i} \) = CPW for commodity \( i \) in the S&P GSCI Industrial Metals 1-Month Forward Index as of the rebalancing reference date
- \( GSCIWeight_j \) = Weight of Commodity \( j \), of which commodity \( i \) is a part, in the S&P GSCI Industrial Metals 1-Month Index as of the rebalancing reference date.
- \( TargetWeight_j \) = Weight of Commodity \( j \), of which commodity \( i \) is a part, in the S&P GSCI Industrial Metals 1-Month Forward Capped Commodity Index as of the rebalancing reference date.

Target weights are calculated at each rebalancing as follows:

If \( GSCIWeight_i > 35\% \), then \( TargetWeight_i = 32\% \)

For all remaining Commodities:

\[ TargetWeight_j = \frac{68\% \times GSCIWeight_i}{100\% - GSCIWeight_c} \]

where:

- \( GSCIWeight_c \) = Total S&P GSCI Industrial Metals 1-Month Forward Commodity weight of all the capped Commodities as of the rebalancing reference date.

For any subsequent commodities:

If \( GSCIWeight_i > 20\% \), then \( TargetWeight_i = 17\% \)

For all remaining uncapped Commodities:

\[ TargetWeight_j = \frac{(100\% - Total Capped Weights) \times GSCIWeight_i}{100\% - GSCIWeight_c} \]

\( Total Capped Weights \) = Total weight of the capped Commodities in the S&P GSCI Industrial Metals 1-Month Forward Capped Commodity Index as of the rebalancing reference date.

This process is repeated iteratively until no more than one commodity has a weight of greater than 20% in the index with a maximum weight of 35% for that commodity.
Section III - S&P Dow Jones Indices' Futures-based Leveraged and Inverse Indices Methodology

S&P Dow Jones Indices’ Futures-based Leveraged Indices are designed to generate a multiple of the return of the underlying futures index in situations where the investor borrows funds to generate index exposure greater than the cash position provides alone.

S&P Dow Jones Indices’ Futures-based Inverse indices are designed to provide the inverse performance of the underlying futures index; this represents a short position in the underlying index.

The approach is to first calculate the underlying index, and then calculate the daily returns for the leveraged or inverse index. There is no change to the calculation of the underlying futures index.

The leveraged or inverse index may be rebalanced daily or periodically.

Daily Rebalanced Leverage or Inverse Indices

If the S&P Dow Jones Indices’ Futures-Based Leveraged or Inverse Index is rebalanced daily, the index excess return is the multiple of the underlying index excess return since the previous rebalancing business day and is calculated as follows:

\[
IndexER_t = IndexER_{t - LR} \times \left( 1 + K \left( \frac{UnderlyingIndexER_t}{UnderlyingIndexER_{t - LR}} - 1 \right) \right)
\]

where:

- \( IndexER_{t - LR} \) = The Index Excess Return on the last rebalancing business day \( t_{LR} \).
- \( UnderlyingIndexER_{t - LR} \) = The Underlying Index Excess Return value on the last rebalancing business day \( t_{LR} \).
- \( t_{LR} \) = the last rebalancing business day.
- \( K \) (\( K \neq 0 \)) = Leverage / Inverse Ratio

For example, where:

- \( K = 1 \), no leverage or net exposure = 100%
- \( K = 2 \), leverage is 2x or net exposure = 200%
- \( K = 3 \), leverage is 3x or net exposure = 300%
- \( K = -1 \), no leverage inverse or net exposure = -100%

A total return version of each of the Indices is calculated, which includes interest accrual on the notional value of the index based on the 91-day US Treasury rate, as follows:

\[
IndexTR_t = IndexTR_{t-1} \times \left( \frac{IndexER_t}{IndexER_{t-1}} + TBR_t \right)
\]

where:

- \( IndexTR_{t-1} \) = The Index Total Return on the preceding business day.
- \( TBR_t \) = Treasury Bill Return, as determined by the following formula:
\[
TBR_t = \left[ \frac{1}{1 - \frac{91}{360} \cdot TBAR_{t-1}} \right]^{-1} - 1
\]

\(Delta_t\) = The number of calendar days between the current and previous business days.

\(TBAR_{t-1}\) = The most recent weekly high discount rate for 91-day US Treasury bills effective on the preceding business day. Generally the rates are announced by the US Treasury on each Monday. On Mondays that are bank holidays, Friday's rates will apply.

### Tickers

<table>
<thead>
<tr>
<th>Index</th>
<th>Bloomberg</th>
<th>Reuters</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P GSCI Inverse Industrial Metals 1-Month Forward Capped Commodity ER</td>
<td>.SG1MINIP</td>
<td>.SG1MINIP</td>
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<tr>
<td>S&amp;P GSCI Inverse Industrial Metals 1-Month Forward Capped Commodity TR</td>
<td>.SG1MINIT</td>
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</table>
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