S&P U.S. Mortgage-Backed Securities Index
Methodology

September 2019
# Table of Contents

Introduction

- Index Objective 2
- Supporting Documents 2

Eligibility Criteria

- Eligibility Factors 3

Index Construction

- Index Calculations 4

Index Maintenance

- Rebalancing 5
- Currency of Calculation and Additional Index Return Series 5
- Base Dates and History Availability 6

Index Governance

- Index Committee 7

Index Policy

- Announcements 8
- Holiday Schedule 8
- Rebalancing 8
- End of Day Calculation 8
- Recalculation Policy 8
- Contact Information 8

Index Dissemination

- Tickers 9
- Index Data 9
- Web site 9

Appendix – Index Calculations

- Calculating Total Return 10
- Constituent Level Daily Mortgage Return 12
- Index Level Daily Mortgage Return 12

Disclaimer 13
Introduction

Index Objective

The S&P U.S. Mortgage-Backed Securities Index measures the performance of residential mortgage pass-through securities publicly issued by U.S. agencies in the U.S. domestic market.

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’ Fixed Income Index Mathematics Methodology</td>
<td><a href="#">Index Mathematics Methodology</a></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.
Eligibility Criteria

Eligibility Factors

Eligible Issuers. U.S. agencies.

Currency. Bonds must be issued in U.S. dollars.

Country. The country of incorporation of the issuer must be the U.S.

Maturity. Each bond must have a maturity greater than one month from the rebalancing date. No bonds mature in the index.

Pricing. Daily pricing is provided by ICE Data Services.

Bond Type. Residential mortgage pass-through securities publicly issued by U.S. agencies are eligible.

Market of Issue. Bonds must be publicly issued in the U.S. market.

Size. A minimum par amount of US$ 250 million at each rebalancing is required.
Index Construction

Index Calculations

The index is market value weighted.

The total return is calculated by aggregating the interest return, reflecting the return due to paid and accrued interest, and price return, reflecting the gains or losses due to changes in the end-of-day price and principal repayments.

For further details regarding Index Calculations, please refer to the Appendix.
Index Maintenance

Rebalancing

The index is reviewed and rebalanced in accordance with their stated schedule. The Index Committee, nevertheless, reserves the right to make adjustments to an index at any time that it believes appropriate.

Additions, deletions and other changes to the index arising from the rebalancing are made provided the security's reference information and pricing are available by designated pricing and data providers on the rebalancing reference date. Changes to the index are published on the announcement date and become effective on the rebalancing date. Information related to the rebalancing is obtained and disseminated after the close of business.

<table>
<thead>
<tr>
<th>Rebalancing Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rebalancing Frequency</td>
</tr>
<tr>
<td>Rebalancing Date</td>
</tr>
<tr>
<td>Announcement Date</td>
</tr>
<tr>
<td>Reference Date</td>
</tr>
</tbody>
</table>

All days reflect after the close and count business days

Ongoing Maintenance

The index is also reviewed on an ongoing basis to account for the following:

- When an index bond is in default or misses an interest payment, the price reported by the pricing source is used. However, the Index Committee may determine that the bond be removed from the index at a different price and may specify a price of 0.00. The decision of the Index Committee is final.
- If an index bond is no longer priced by the pricing source, the last available price is used.

However, the Index Committee may determine that a different price be used. The decision of the Index Committee is final. For clarity, index bonds that are no longer priced by the pricing source fail to meet the pricing eligibility factors and are removed at the next rebalancing date. If the bond is priced for at least one of the five business days prior to the rebalancing announcement date, the bond remains in the index. Otherwise, it is removed from the index at the subsequent rebalancing date.

Currency of Calculation and Additional Index Return Series

Additional currency and currency hedged versions of the index, as well as maturity, sector, and rating-based sub-indices, may be available. For a list of available sub-indices and tickers, please refer to S&P Dow Jones Indices’ Fixed Income Index Directory available at www.spdji.com.

For more information on currency and currency hedged indices, please refer to S&P Dow Jones Indices’ Fixed Income Index Mathematics Methodology.
### Base Dates 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 U.S. Mortgage-Backed Securities Index</td>
<td>07/15/2014</td>
<td>12/31/2008</td>
<td>12/31/2008</td>
<td>100</td>
</tr>
</tbody>
</table>
Index Governance

Index Committee

S&P Dow Jones Indices’ Fixed Income Index Committee maintains the index. All committee members are full-time professionals at S&P Dow Jones Indices. Meetings are held regularly.

The Index Committee oversees the day-to-day management of the index, including the monthly rebalancing, determinations of intra-rebalancing changes to the indices, and maintenance and inclusion policies, including additions or deletions of bonds and other matters affecting the maintenance and calculation of the index.

In fulfilling its responsibilities, the Index Committee has full and complete discretion to (i) amend, apply, or exempt the application of index rules and policies as circumstances may require and (ii) add, remove, or by-pass any bond in determining the composition of an index.

The Index Committee may rely on any information or documentation submitted to it or gathered by it that the Index Committee believes to be accurate. The Index Committee reserves the right to reinterpret publicly available information and to make changes to the indices based on a new interpretation of that information at its sole discretion. All Index Committee discussions are confidential.

The Index Committee is separate from and independent of other analytical groups at S&P Global. In particular, the Index Committee has no access to or influence on decisions by S&P Global Ratings analysts.

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’ Fixed Income Policies & Practices Methodology.
Index Policy

Announcements

Announcements of any relevant information pertaining to the index are made after market close. Press releases are posted on the S&P Dow Jones Indices Web site at www.spdji.com.

Holiday Schedule

The index is calculated when the Securities Industry and Financial Markets Association (SIFMA®) declares the U.S. fixed income markets to be open.

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.

End of Day Calculation

Index levels are calculated at the end of each business day, via S&P Dow Jones Indices' Web site. This may be subject to change.

Recalculation Policy

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

For information on Calculations and Pricing Disruptions, Expert Judgment and Data Hierarchy, please refer to S&P Dow Jones Indices’ Fixed Income 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 (Total Return)</th>
<th>Ticker</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P U.S. Mortgage-Backed Securities Index</td>
<td>SPMBST</td>
</tr>
</tbody>
</table>

Index Data

Daily index level data is available via subscription.

*For product information, please contact S&P Dow Jones Indices, [www.spdji.com/contact-us](http://www.spdji.com/contact-us).*

Web site

*For further information, please refer to S&P Dow Jones Indices’ Web site at [www.spdji.com](http://www.spdji.com).*
Appendix – Index Calculations

The percentage change in market value (i.e. total return) for a bond can be broken out into price, income and paydown components.

Calculating Total Return

Total return (assuming no reinvestment of cash flows) for a bond in a given timeframe is defined to be the change in its market value divided by its beginning market value, as shown below.

\[
\text{Total Return} = \frac{\text{Change in Market Value}}{\text{Beginning Market Value}} = \frac{MV_1 - MV_0}{MV_0}
\]

where:

- \(MV_0\) Beginning market value from a single bond.
- \(MV_1\) Ending market value from a single bond, including any cash flows during that time frame.

The beginning market value of the bond is the product of its beginning price (including accrued interest) and its par balance (i.e. number of units owned). Mathematically, the beginning market value is represented by:

\[
MV_0 = \left( P_0 + A_0 \right) * B_0
\]

where:

- \(P_0\) = Beginning flat price (as a percent of par) of the bond.
- \(A_0\) = Beginning accrued interest (as a percent of par).
- \(B_0\) = Beginning par amount of the bond.

Similarly, to define the ending market value, we first determine the market value of the remaining principal (i.e. the ending principal amount or \(B_i\)).

\[
\text{Market Value of Remaining Principal} = \left( P_i + A_i \right) * B_i
\]

where:

- \(P_i\) = Ending flat price (as a percent of par) of the bond.
- \(A_i\) = Ending accrued interest (as a percent of par).
- \(B_i\) = Ending par amount of the bond.

Next, add any paid cash flows (either interest or principal) during the timeframe. If the bond paid an interest cash flow during the given timeframe (so that \(\Phi = 1\), the payment is the product of \(\Phi\), the beginning par balance of the bond, and the coupon rate (in decimal form) divided by the payment frequency as shown below:

\[
\text{Interest Cash Flow} = \Phi \left( \frac{C}{F} \right) * B_0
\]
where:

\[ \Phi = \text{Number of coupon payments made by the bond in the given timeframe.} \]

\[ C = \text{Coupon rate of the bond.} \]

\[ F = \text{Payment frequency of the bond.} \]

\[ B_0 = \text{Beginning par amount of the bond.} \]

If the bond also pays principal during the timeframe (either scheduled or due to prepayment), it is assumed that the payment will be made at face value (i.e. at par). This means that the principal paydown, \( D_1 \), is simply the difference between the beginning par balance and the par balance as observed from actual payments made by the bond.

Principal Paydown = \( D_1 = B_0 - B_1 \)

where:

\[ B_0 = \text{Beginning par amount of the bond.} \]

\[ B_1 = \text{Ending par amount of the bond.} \]

Combining these components, the ending market value of the bond is given by:

\[
\text{Ending Market Value} = \text{Market Value of Remaining Principal} + \text{Interest Cash Flow} + \text{Principal Paydown}
\]

Using the beginning and ending market values, total return is given by:

\[
\frac{MV_f - MV_0}{MV_0} = \frac{(P_1 + A_1)B_1 + \Phi \frac{C}{F} B_0 + (B_0 - B_1)(P_0 + A_0)B_0}{(P_0 + A_0)B_0}
\]

\[
= \frac{(P_1 - P_0)}{P_0 + A_0} \frac{(A_1 - A_0) + \Phi \frac{C}{F} B_0 + (B_0 - B_1)(P_0 + A_0)B_0}{(P_0 + A_0)B_0}
\]

\[
= \frac{(P_1 - P_0)}{P_0 + A_0} \frac{(A_1 - A_0)}{P_0 + A_0} \text{ Price} + \frac{\Phi \frac{C}{F}}{P_0 + A_0} \text{ Coupon Income} + \frac{(B_0 - B_1)(P_0 + A_0)B_0}{(P_0 + A_0)B_0} \text{ No Loss Paydown}
\]

To summarize, the sources of return (excluding currency) are as follows.

\[
\text{Price} = \frac{(P_1 - P_0)}{P_0 + A_0}
\]

\[
\text{Income} = \frac{(A_1 - A_0) + \Phi \frac{C}{F}}{P_0 + A_0}
\]
Paydown = \frac{(100-(P_i + A_i))(B_0-B)}{(P_0 + A_0)} 

Constituent Level Daily Mortgage Return

Daily Income Return

\[ IR_t = \frac{Accrued \ Interest_t - Accrued \ Interest_{t-1} + Interest_{t-1,t}}{Dirty \ Price_{t-1}} \]

Daily Price Return

\[ PR_t = \frac{Clean \ Price_t - Clean \ Price_{t-1}}{Dirty \ Price_{t-1}} \]

Daily Paydown Return

\[ PD_t = \frac{(Redemption \ Price - Dirty \ Price_t) \times (1 - \frac{mortgage \ factor_t}{mortgage \ factor_{t-1}})}{Dirty \ Price_{t-1}} \]

Daily Return

Total Return (TR_t) = IR_t + PR_t + PD_t

where:

- \( t \) = Current time.
- \( t-1 \) = Previous time.

Note: accrued interest and interest are in percent of par price.

Cash

Cash is in percent units and includes any interest paid and any principle reductions (uses change in mortgage factor) occurring within the month.

\[ Cash = Interest_{RB,t} \% + \left(1 - \frac{mortgage \ factor_t}{mortgage \ factor_{RB,t}}\right) \% \]

where:

- \( RB \) = Time at rebalance.

Note: interest is usually paid on the first of the month while mortgage factor updates/changes occur at the end of the month.

Index Level Daily Mortgage Return

\[ Index \ Total \ Return = \sum w_i \times TR_i \]

where:

- \( w_i \) = Market value weight of security \( i \) at \( t-1 \) (\( MV_i / MV_{total} \)).
- \( TR_i \) = Total return of security \( i \) at \( t \).
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