Interest Rate Sensitive Asset Class Implementation Plan
FY 2021

Investment Committee Meeting
December 21, 2020
Summary

• We recommend a dynamic underweight to the Interest Rate Sensitive asset class as we believe it should significantly underperform the total fund’s 7.5% return target over a multi-year time frame.

• The low return expectation is underpinned by a yield of only 1.2% for the Bloomberg Barclays U.S. Aggregate Bond Index (the “Aggregate Index”), the benchmark for the asset class.

• While annual returns will vary depending on the direction of interest rates, over a multi-year time frame, our expected return for the asset class is 1.0-1.5%.

• Despite the low expected return, our investment strategy is to remain invested in the Interest Rate Sensitive asset class as a potential funding source to:
  – rebalance the overall portfolio when equities and other risky assets materially sell-off
  – fund obligations of the total fund such as benefit payments and capital calls from private market managers.
Interest Rate Sensitive

• Interest Rate Sensitive is a fixed income asset class comprised of the U.S. investment-grade bond market which includes:
  – U.S. Treasuries and Agencies
  – Agency Mortgage-Backed Securities
  – Corporate Bonds
  – Commercial Mortgage-Backed Securities (CMBS)
  – Asset-Backed Securities (ABS).

• Fixed income strategies that invest exclusively in this market are typically referred to as “Core”, “Core Fixed income” or “Core Bonds.”

• The performance of Interest Rate Sensitive Fixed Income is heavily tied to the direction of US Treasury rates.

• In addition, Interest Rate Sensitive Fixed Income tends to perform well when equity markets decline (ex. 2008, 2020) or when inflation expectations materially decline.

• As a result, it is an important part of the overall ASRS portfolio because it provides a source of balance and diversification from riskier assets such as equities.
Interest Rate Sensitive

- The benchmark for Interest Rate Sensitive is the Bloomberg Barclays U.S. Aggregate Bond Index (the “Aggregate Index”), which encompasses the market for U.S. dollar denominated, fixed-rate, taxable, investment-grade bonds that are SEC-registered.

- The SAA target for the Interest Rate Sensitive asset class is 10% with a range of 0-20%.

- As of late October, Interest Rate Sensitive represented 8.9% of the total fund vs. an SAA interim target of 10.4%.

- ASRS’s Interest Rate Sensitive investments do not have any liquidity constraints; it is a very liquid asset class.

- Per the SAA, Interest Rate Sensitive bonds will not be levered.
Investment Strategy

• Due to the low level of interest rates, we do not expect the Interest Rate Sensitive asset class to meet the targeted return of the total fund over an extended period of time. Nonetheless, it is an important part of the overall ASRS portfolio.

• The primary reason we invest in the asset class is because it provides a source of balance and diversification away from riskier assets in the total fund such as equities.

• Due to the large percentage of U.S. Treasury bonds, and to a lesser extent, agency mortgage-backed securities in the asset class, the Interest Rate Sensitive Asset Class remains a safe haven in times of market turbulence or uncertainty and tends to perform well when risky assets such as equities sell off (ex. 2008, 2020). Historically, Interest Rate Sensitive assets will tend to hold their value or even appreciate in these situations.

• Our investment strategy is to hold investments in Interest Rate Sensitive as a potential funding source to:
  – rebalance the overall portfolio when equities and other risky assets materially sell-off
  – fund obligations of the total fund such as benefit payments and capital calls from private market managers
Implementation Approach

• Focus on investing in Core Fixed Income which offers a higher yield than U.S. Treasuries of comparable duration with better diversification and less volatility over time. Core Fixed Income encompasses the assets in the Bloomberg Barclays U.S. Aggregate Bond Index, the benchmark of the Interest Rate Sensitive Asset Class.

• Invest in low-cost, passive and enhanced passive index strategies which are well diversified. The internal management of the F2, a very low-cost, enhanced passive strategy, provides valuable market insights.

• When appropriate, invest in Blackrock funds which target specific sub-sectors of the Bloomberg Barclays U.S. Aggregate Bond Index. These targeted investments provide the capability to adjust our Interest Rates Sensitive allocation to take advantage of compelling market opportunities or to express an investment view.
  – In the past, we invested in diversified Blackrock funds targeting Corporate Bonds and CMBS when credit spreads were unusually attractive following the 2008-2009 financial crisis.
  – In 2015-2016, we invested in a Blackrock long-duration U.S. Treasury Bond fund based on an investment view that interest rates would fall significantly; this targeted investment contributed to excess performance of Core Fixed Income during this time period.
# Interest Rate Sensitive Core Fixed Income Managers

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Market Value ($MM) 10/26/2020</th>
<th>%</th>
<th>IMD Commentary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackrock US Debt Index Fund</td>
<td>$1,704</td>
<td>45</td>
<td>Passive strategy with history of modest outperformance.</td>
</tr>
<tr>
<td>F2 Internally Managed Account</td>
<td>$2,086</td>
<td>55</td>
<td>Enhanced passive strategy with an objective to slightly outperform the Barclays U.S. Aggregate Bond Index (the “Index”) through a stratified sampling strategy.</td>
</tr>
<tr>
<td>Total</td>
<td>$3,790</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
House Views

• The Bloomberg Barclays U.S. Aggregate Bond Index, the benchmark for Interest Rate Sensitive Fixed Income, is now yielding only 1.2% vs. 2.3% at the beginning of 2020. The yield of the index has historically been a good indicator of long-term expected returns of the asset class.

• With this low yield, we do not expect attractive returns in the asset class going forward relative to the total fund’s target return.

• However, we expect to maintain a meaningful investment in the asset class to use as a source of liquidity to meet the total fund’s needs and to serve as a counter-balance to potential sell-offs in risky assets such as equities.

• That being said, the efficacy of the asset class as a counter-balance to potential sell-offs in risky assets has likely diminished. The asset class has less room to appreciate in value as it has during past sell-offs as rates have little capacity to fall further unless negative rates are adopted in the U.S. Based on comments from the Fed, we do not believe negative rates will be implemented.
Yield of Bloomberg Barclays U.S. Aggregate Bond Index
Average Corporate Option Adjusted Spread of Bloomberg Barclays U.S. Aggregate Bond Index
Average MBS Option Adjusted Spread of Bloomberg Barclays U.S. Aggregate Bond Index
## Interest Rate Sensitive
### Historical Performance Through 9/30/2020

<table>
<thead>
<tr>
<th>Fund/Composite</th>
<th>1-Year</th>
<th>3-Year</th>
<th>5-Year</th>
<th>10-Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Composite</td>
<td>7.25</td>
<td>5.36</td>
<td>4.46</td>
<td>3.83</td>
</tr>
<tr>
<td>Bloomberg Barclays Aggregate</td>
<td>6.99</td>
<td>5.24</td>
<td>4.18</td>
<td>3.64</td>
</tr>
<tr>
<td><strong>Core Composite Excess</strong></td>
<td><strong>0.26</strong></td>
<td><strong>0.12</strong></td>
<td><strong>0.28</strong></td>
<td><strong>0.19</strong></td>
</tr>
<tr>
<td>Blackrock US Debt Index Fund</td>
<td>7.11</td>
<td>5.33</td>
<td>4.27</td>
<td></td>
</tr>
<tr>
<td>Bloomberg Barclays Aggregate</td>
<td>6.99</td>
<td>5.24</td>
<td>4.18</td>
<td></td>
</tr>
<tr>
<td><strong>Blackrock Excess</strong></td>
<td><strong>0.12</strong></td>
<td><strong>0.09</strong></td>
<td><strong>0.09</strong></td>
<td></td>
</tr>
<tr>
<td>F2 Internally Managed Account</td>
<td>7.66</td>
<td>5.47</td>
<td>4.34</td>
<td>3.85</td>
</tr>
<tr>
<td>Bloomberg Barclays Aggregate</td>
<td>6.99</td>
<td>5.24</td>
<td>4.18</td>
<td>3.64</td>
</tr>
<tr>
<td><strong>F2 Excess</strong></td>
<td><strong>0.67</strong></td>
<td><strong>0.23</strong></td>
<td><strong>0.16</strong></td>
<td><strong>0.21</strong></td>
</tr>
</tbody>
</table>
Interest Rate Sensitive
Comments on Historical Performance

• The Blackrock US Debt Index Fund and F2 comprise our expected investment allocation for the Interest Rate Sensitive Asset Class going forward.

• The Blackrock US Debt Index Fund has historically outperformed the Interest Rate Sensitive benchmark by a modest amount over the 1, 3 and 5-year periods as it closely adheres to the characteristics of the Aggregate Index benchmark while generating incremental return vs. the benchmark from securities lending activities.

• The F2 Internally Managed Account outperformed the Aggregate Index benchmark over all periods driven by relatively consistent long term outperformance and a significant boost during the height of the COVID-19 dislocation in March 2020.
  – In early 2020, the F2 portfolio was positioned conservatively in the corporate sector given how tight spreads had become with underweights along the curve and particularly toward the long end.
  – During the first week of the March dislocation, we tepidly purchased some new issue corporates but remained defensive while trying to assess the scope of the pandemic’s impact on corporate profitability.
  – Once the Federal Reserve announced liquidity provisions that included purchasing shorter term investment grade corporate debt, we became positive on the outlook for credit spreads due to the reduced risk of defaults. We quickly established an overweight position in corporate bonds particularly in long duration, 30-year corporates through a robust new issue market and secondary trading.
  – The combination of being conservatively positioned prior to the onset of the COVID-19 dislocation and quickly establishing an overweight in corporate bonds – particularly long-duration corporates -- following a sharp widening in corporate spreads led to substantial outperformance for the F2 portfolio during the first half of 2020 as spreads rapidly recovered and tightened.
Expected Performance

• The yield-to-worst of the Bloomberg Barclays U.S. Aggregate Bond Index was only 1.2% in late October 2020.

• While annual returns will vary depending on the direction of interest rates, over a multi-year time frame, we believe the Aggregate Index’s yield is a reasonable proxy for the long-term expected return\(^1\) of the Interest Rate Sensitive asset class assuming that interest rates do not materially change.

• **With this view, we believe that a 1.0 - 1.5% expected return over the intermediate term for the Interest Rate Sensitive Asset Class is reasonable.**

• Based on the low expected return versus the total fund’s 7.5% return target, **we recommend a dynamic\(^2\) underweight to the Interest Rate Sensitive asset class.**

• In the fiscal 2020 implementation plan, we established 10 bps as the expected outperformance for the asset class based on the historical performance of the two funds comprising our investments. While ASRS’s performance over the past twelve months suggests a higher outperformance expectation can be justified, **we continue to recommend 10 bps as the expected outperformance** as we believe the exceptional outperformance of F2 over the past 12 months is highly unusual and not likely to be repeated.

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\(^1\) A study by T. Rowe Price (“What’s the Simplest Way to Forecast Bond Returns”, June 2018) found that the yield-to-worst of the Bloomberg Barclays U.S. Aggregate Bond Index had a correlation of 0.96 with future returns over the time period of the original index duration.

\(^2\) Dynamic is a mid-range view taking into account the current economic environment and market dynamics.
Historical And Expected Tracking Error

<table>
<thead>
<tr>
<th>Tracking Error</th>
<th>1-Year</th>
<th>3-Year</th>
<th>5-Year</th>
<th>10-Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Composite</td>
<td>0.19%</td>
<td>0.14%</td>
<td>0.30%</td>
<td>0.27%</td>
</tr>
<tr>
<td>Blackrock US Debt Index Fund</td>
<td>0.06%</td>
<td>0.04%</td>
<td>0.05%</td>
<td></td>
</tr>
<tr>
<td>F2 Internally Managed Account</td>
<td>0.59%</td>
<td>0.38%</td>
<td>0.31%</td>
<td>0.29%</td>
</tr>
</tbody>
</table>

- Tracking error for the Core Composite for the 1 and 3-year periods of 19 and 14 bps, respectively, reflects the current composition of the Interest Rate Sensitive asset class with investments solely in the Blackrock US Debt Index Fund and F2.

- The higher tracking error for the Core Composite in the 5 and 10-year periods reflects: 1) unusually high returns of investments in targeted Blackrock funds in 2015-2016 (which took advantage of falling long-term Treasury rates) and following the 2008-2009 credit crisis (when corporate and CMBS credit spreads were unusually high); and 2) the unusually strong outperformance of F2 during the COVID-19 dislocation in the first half of 2020.

- Under its strategy paper, F2 is allowed up to 40 bps of predicted tracking error as estimated by PORT, an analytical system provided by Bloomberg. For the one year period, actual tracking error exceeded this level due to the unusual outperformance of F2 during the market volatility associated with the COVID-19 crisis in the first half of 2020. Note that predicted tracking error per PORT did not exceed 40 bps during this time period. It rose from 16 bps in January 2020 to a peak at 26 bps on April 14th. It was 21 bps as of October 30th.

- In the FY 2020 implementation plan, we adopted an expected tracking error of 12.5 bps or 0.125% based on the historical 1-year and 3-year performance. We recommend maintaining this level of expected tracking error. The recent uptick in tracking error is due to the unusual level of outperformance of F2, which is unlikely to be repeated.
Core Bonds Dollar Value Add

Dollar Value Add

in Millions

$77

Internal Fixed Income  BlackRock US Debt  BlackRock Long Govt

One Year  Three Year  Five Year

17  20
F2 Portfolio Performance
Blackrock US Debt Performance