



# Yield Floors and Asset Allocation: When Is the Role of Bonds Impaired?

## Executive Summary

Over the past few years, many investors have questioned the role of bonds in a portfolio based on the belief that yields had limited room for further declines. *If* a so-called “floor” existed for bond yields, the return generation and diversification properties of bonds could be impaired. However, the existence of a floor doesn’t necessarily doom bonds. Only very restrictive yield floor assumptions matter. We estimate that a floor of

50 basis points below prevailing yield levels would have the potential to materially impact the role of bonds in a portfolio over the next year. At a floor of 100 basis points below prevailing yield levels, the bond portfolio may no longer be impaired; traditional and risk-balanced asset allocations behave almost *as if* no yield floor existed. After the recent yield increases in early 2021, a 100 basis point decline is likely possible today.

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The Portfolio Solutions Group (PSG) provides thought leadership to the broader investment community and custom analyses to help AQR clients achieve better portfolio outcomes.

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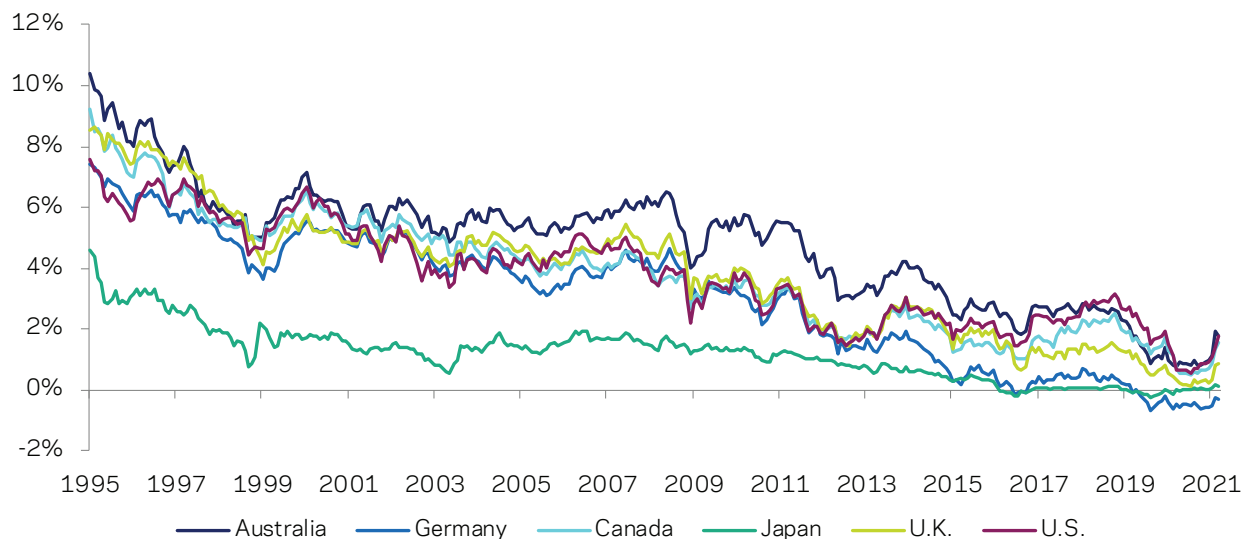
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# Introduction

While government bond yields have risen recently, developed market yields are still extremely low by historical standards (see **Figure 1**). The low yield environment has put a bull’s eye on the back of bonds. For the past few years, investors have questioned

whether bonds can still generate an attractive return and provide diversification in the future, possibly jeopardizing the role of bonds in a traditional or risk-balanced asset allocation. So-called “bond substitutes” have emerged to soothe this bond anxiety.<sup>1</sup>

**Figure 1: 10-Year Government Bond Yields, January 31, 1995 - March 31, 2021**



Source: Bloomberg, Reuters, AQR. Bonds are selected to represent the respective current or on-the-run 10-Year bond per country. Yields are gross of fees and t-costs.

The goal of this paper is to map views on future bond yields into practical, actionable guidance regarding asset allocation. We try to constructively address one key source of debate: the implications of a yield floor. While some investors believe that yields have limited room for further drops, i.e. current levels are approaching a so-called “yield floor,” many struggle with identifying the point where their yield floor view materially impacts asset allocation in practice—the point where a bond’s return generation and diversification

properties are impaired. This paper sheds light on this critical issue.

It is important to remember that the extremely low yields observed during the 2020 pandemic exacerbated, but did not start, concerns over the possible impact of bond yield floors. Investors had similar concerns prior to 2020. Yields are higher today, but they are still low and similar in magnitude to the levels observed pre-pandemic. Furthermore, a negative economic shock could easily bring

<sup>1</sup> We think this bond anxiety is overblown, and we have written extensively about it. A summary of our views is listed in the Appendix.

yields back into 2020 territory, and investors need to be prepared.

Only very restrictive views impair the role of bonds in a traditional or risk-balanced asset allocation. We estimate that a floor of 50 basis points below prevailing yield levels materially impacts the role of bonds in a portfolio over the next year. Under this restrictive view, the global bond portfolio's<sup>2</sup> return-generating

capabilities are approximately cut in half, both in normal times and equity stress environments. At a floor of 100 basis points below prevailing yield levels, the global bond portfolio is no longer impaired; traditional and risk-balanced asset allocations behave almost *as if* no yield floor existed. The yield increases in early 2021 make a 100 basis point decline likely possible today.

## Model Description and Capital Market Assumptions

To assess the impact of various yield floor views, we simulate monthly returns over a one-year investment horizon for three hypothetical portfolios: global bonds, traditional 60/40 global stock/bond<sup>3</sup> and a levered, risk-balanced global stock/bond portfolio.<sup>4</sup> In each portfolio, the bond allocation includes 10-year bonds in the following six countries in equal notional proportions: US, UK, Germany, Japan, Canada, and Australia. Yield floors are defined relative to each country's starting yield ("SY")

in increments of 50 basis points ("distance from the starting yield"): SY-50 bps, SY-100 bps, SY-150 bps, SY-200 bps, and "No Floor." Unlike *absolute* yield floors, measuring yield floors *relative* to the starting yield helps to ensure the results from the analysis will be relevant through time irrespective of future bond yield movements. The process for calculating the "yield-floor-adjusted" bond return is described in **Table 1**.<sup>5</sup>

2 Throughout this paper, all references to a "Global Bond Portfolio" refer to an equal-notional-weight portfolio that is invested in US, German, Japanese, Australian, Canadian and UK 10-year bonds. The "Global Bond Portfolio" is rebalanced monthly to equal-notional-weight.

3 The 60/40 portfolio is a synthetic, constant-notional-weight portfolio. The portfolio directly applies a weighting of 60% to the equity investment and 40% to the bond investment. The equity investment is represented by a random return series that is meant to emulate the return characteristics of the MSCI World Hedged Net Index (WHANWIHD Index on Bloomberg). The global bonds are similarly represented by the equal-notional-weight investment in a randomly generated return series which are meant to represent each of the six country-bonds.

4 The static weights of the risk-balanced portfolio are 178% and 43% in bonds and equities, respectively. The risk-balanced portfolio has the same volatility as 60/40 stock/bond. All asset returns are USD hedged. USD hedged bond returns are achieved by subtracting the beginning of month local one-month LIBOR and adding back US LIBOR. Monthly returns are assumed to be multivariate normal, an easy-to-understand and popular choice amongst investment practitioners. All yield curve moves are assumed to be parallel. The financing rate for leverage is assumed to be equal to one-month T-Bills. This two-asset-class portfolio differs from typical risk parity portfolios in not including an inflation protection bucket.

5 For each scenario (Eg: A scenario being "SY-0.5%"), we simulate 100,000 paths of 12 monthly returns per asset and execute the transformation documented in Table 1. A "path" is a simulated matrix of data where each column represents an asset and each row represents that asset-month's simulated return. For example, for the US bond, we have 1 column and 12 rows for one year of monthly returns.

**Table 1: Yield Floor Adjustment Process**

The Capital Market Assumptions used in the simulations are provided in **Table 2**. Global equities are assumed to have a 0.3 Sharpe ratio. Bond expected returns are calculated assuming the current yield curve is the best forecast of the year-ahead yield curve.<sup>6</sup> The key input to the yield floor analysis is bond return volatility. Volatile bonds are more likely to experience large positive returns,

pushing yields lower and possibly reaching the yield floor. We estimate forward-looking stock and bond volatility using the last-three-year realized volatility.<sup>7</sup> Correlations are estimated using a similar approach with one exception: while the recent realized stock-bond correlation has been slightly negative, we impose a more neutral assumption of zero.<sup>8</sup>

6 The main analysis was completed in Q1 2021 and used the yield curve as of January 29, 2021. The country starting 10-year yields are the following: Germany -0.52%, Canada 0.87%, Japan 0.05%, United States 1.09%, Australia 1.17% and United Kingdom 0.32%. The country 1-month starting T-Bills are the following: Germany -0.63%, Canada 0.07%, Japan -0.09%, United States 0.05%, Australia 0.02% and United Kingdom -0.05%. Given that the yield floors are defined *relative* to the starting yield, the specific yield curve date is less important. Also, the starting yield impacts the expected bond return assumption, and the expected return isn't an important driver of the results. Bond volatility is the most important Capital Market Assumption for the yield floor analysis.

7 We also calculate "stress" results using CMAs motivated by the volatile European debt crisis timeframe, October 2011. In this environment, the global bond portfolio has a 6.6% volatility, which is approximately 60% higher than the current CMA. Details are available upon request.

8 The stock-bond correlation isn't an important driver of the results. The forward-looking correlation is a function of the relative amounts of economic growth and inflation uncertainty. Periods of high economic growth uncertainty, such as the last decade, tend to lead to negative correlations while periods of high inflation uncertainty tend to lead to positive correlations. When economic growth and inflation uncertainty are similar in magnitude, the correlation is close to zero, which is consistent with the long-run evidence. While beyond the scope of the analysis here, if the stock-bond correlation became meaningfully positive, this would lessen the diversification benefit of a fixed-income allocation but not negate it completely.

**Table 2: USD Hedged Capital Market Assumptions<sup>9</sup>**

Asset	Expected Total Return	Volatility	Sharpe
German 10-Year Bond	0.9%	4.7%	0.19
Canadian 10-Year Bond	1.2%	5.7%	0.20
Japan 10-Year Bond	0.8%	1.8%	0.39
United States 10-Year Bond	2.1%	6.9%	0.30
Australian 10-Year Bond	2.5%	5.2%	0.47
United Kingdom 10-Year Bond	1.1%	4.5%	0.24
Developed Equities	5.2%	17.3%	0.30
Global Bonds	1.4%	4.2%	0.33
60/40 Portfolio	3.7%	10.5%	0.35
Risk-Balanced Scaled to 60/40 Vol	4.7%	10.5%	0.45

Source: Reuters, Bloomberg, AQR. All numbers are USD hedged. The volatility for all single asset series is the realized 3-year volatility of the representative asset series. For the Sharpe ratio, we use the US T-Bill. For developed equities, the expected excess return is arrived at by taking the realized volatility of the representative series over the prior 3-years multiplied by the Sharpe ratio of 0.3 (a static assumption regarding the expected risk-adjusted return of equities). To calculate the total return, we add the 3-month T-Bill. For the portfolios (Global Bonds through Risk-Balanced) we calculate the expected total return and volatility using a covariance matrix which reflects the market-realized trailing 3-year return but overrides the cross terms of developed equities and bonds to be zero.

At the portfolio level, our “No Floor” Capital Market Assumptions imply a Sharpe ratio of 0.33, 0.35, and 0.45 for the global bond portfolio, traditional 60/40 stock/bond, and the risk-balanced stock/bond portfolio, respectively. It is important to point out that the global bond portfolio offers a competitive risk-adjusted return even with current low

yields. Despite low yields, the slope of the yield curve plus rolldown, i.e. carry, is still within historical norms. The risk-balanced portfolio has the highest risk-adjusted return because it fully takes advantage of diversification.<sup>10</sup> The diversification advantage is monetized using prudent leverage, leading to the highest expected total return.

9 Fixed Income capital market assumptions are calculated by first taking the yield of the respective country's 10-year bond. We next add the roll-down return which is the difference between the 10-year and 9-year yield, multiplied by the bond duration. Duration is calculated using the 10-year yield and pricing the bond accordingly. Next, we add ½ times the product of the bond convexity and the trailing 3-year annualized variance of yield changes of the 10-year bond. From this value we subtract the current 3-month U.S. T-Bill yield to create the “excess return.” For more details on par bonds, duration, convexity and bond math generally, we recommend the reader pursue introductory texts which cover “fixed income securities.”

For developed equities, we assume the Sharpe ratio is 0.3. We then multiply the assumed Sharpe ratio by the standard deviation of past 3-year monthly returns of MSCI World Index Hedged (WHANWIHD Index) to find the expected excess return. From this value we subtract the current 3-month U.S. T-Bill yield to create the “excess return.”

The “Global Bonds” portfolio is an equal-notional-weight portfolio which has a position in all 6 bonds. The return covariance is calculated using the past 3-year monthly returns of each respective 10-year on-the-run bond series. The 10-year on-the-run bond series is sourced from Datastream, Reuters, Bloomberg (Eg: US 10-year is BMUS10Y field RI).

The “60/40” portfolio is formed by investing 40% of notional weight in the “Global Bonds” portfolio and 60% in the “Developed Equities” portfolio. We assume the stock-bond correlation over the last 3-years to be zero.

The “Risk-Balanced Scaled to 60/40 Vol” portfolio is formed via a 3-step process. Step 1 of the process is to numerically find the portfolio which has equal contribution to variance of stocks and bonds; we assume zero correlation between the two assets. Once we have solved for the portfolio weights that have equal contribution to variance, we calculate the volatility of that portfolio. Next, we scale the weights from step 1 such that the volatility of that portfolio is equal to the volatility of the 60/40 portfolio. “Expected” or “Target” returns or characteristics refer to expectations based on the application of mathematical principles to portfolio attributes and/or historical data, and do not represent a guarantee. These statements are based on certain assumptions and analyses made by AQR in light of its experience and perception of historical trends, current conditions, expected future developments and other factors it believes are appropriate in the circumstances, many of which are detailed herein. Changes in the assumptions may have a material impact on the information presented. Hypothetical data has inherent limitations, some of which are disclosed in the Appendix.

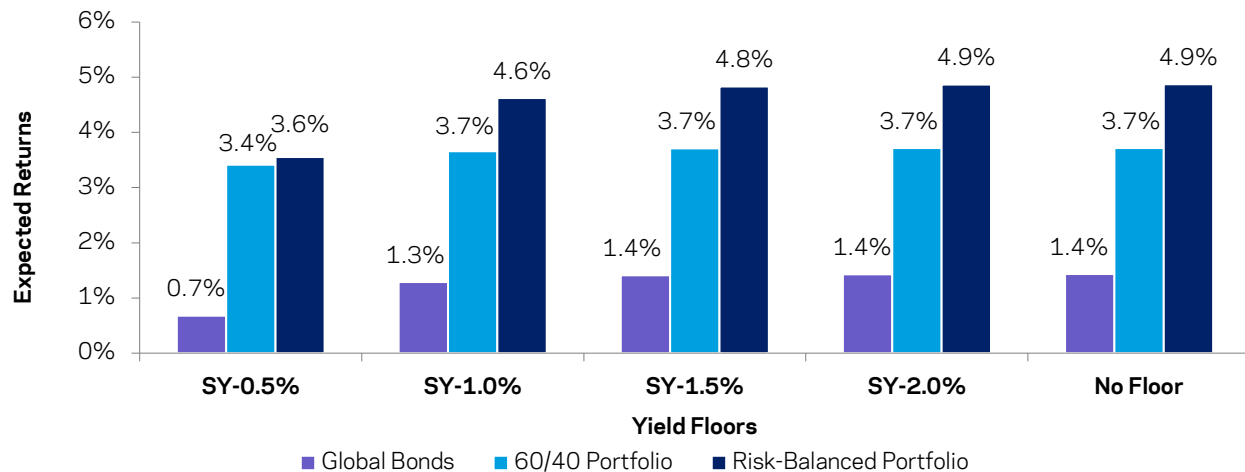
10 In the risk-balanced portfolio, stocks and bonds contribute equally to total portfolio risk. In contrast, 60/40 stock/bond total portfolio risk is dominated by stocks.

# How Do Yield Floors Impact Expected Returns?

**Figure 2** presents the one-year portfolio expected total returns as a function of the assumed yield floor. The most-restrictive yield floor, “Starting Yield–50 bps,” is on the left while the least-restrictive yield floor, “No Floor,” is on the right. As a reminder, “Starting Yield–50 bps” means the investor believes it is *impossible* for yields to drop more than 50 basis points over the next year. In other words, there is a yield floor 50 basis points below the current starting yield.<sup>11</sup> For

the “No Floor” scenario, we should recover results consistent with our assumed Capital Market Assumptions.<sup>12</sup> When interpreting Figure 2, focus on the *relative* results, i.e. compare the yield floor results to the “No Floor” results. This answers important questions, such as “How does the assumed yield floor impact the expected return when compared to the ‘No Floor’ results?” and “Is the degradation in expected return material?”.

**Figure 2: Portfolio Expected Return by Yield Floor<sup>13</sup>**



Source: AQR. 60/40 is a 60% weight to hypothetical simulated stock portfolio 40% weight to hypothetical simulated global bond portfolio.

If the investor believes that yields cannot drop more than 50 basis points, the bond portfolio’s

expected return is impaired, halving from the “No Floor” expected return of 1.4% to

11 Since each country bond has a different starting yield, “Starting Yield–50 basis points” delivers a different *absolute* yield floor level for each country.

12 There could be small differences due to simulation error and horizon effects, i.e. our Capital Market Assumptions are annual values, but we simulate monthly data.

13 For each scenario (Eg: A scenario being “SY-0.5%”), we simulate 100,000 paths of 12 monthly returns per asset and execute the transformation documented in Table 1. For each of these paths, we calculate the total return of the portfolio over 12 months and average those 100,000 values. “Expected” or “Target” returns or characteristics refer to expectations based on the application of mathematical principles to portfolio attributes and/or historical data, and do not represent a guarantee. These statements are based on certain assumptions and analyses made by AQR in light of its experience and perception of historical trends, current conditions, expected future developments and other factors it believes are appropriate in the circumstances, many of which are detailed herein. Changes in the assumptions may have a material impact on the information presented. Hypothetical data has inherent limitations, some of which are disclosed in the Appendix.

0.7%. Intuitively, the bond portfolio's upside is truncated by the yield floor. At the total portfolio level, the traditional 60/40 stock/bond portfolio loses 30 basis points while the risk-balanced portfolio loses more, at 1.3%. Under this restrictive scenario, the traditional and risk-balanced portfolios have similar expected returns; the risk-balanced portfolio loses most of its edge over the equity-concentrated, traditional portfolio.

The expected return results materially change at the "Starting Yield-100 bps" yield floor.<sup>14</sup> With a slightly less restrictive view on future yield movements, the bond portfolio delivers almost 100% of the "No Floor" expected returns (1.3% versus 1.4%). The

bond portfolio's upside is rarely truncated by the more relaxed yield floor over a one-year horizon. Consistent with these results, the traditional portfolio recovers its full "No Floor" expected return of 3.7%, and the risk-balanced portfolio regains its edge over the traditional portfolio (4.6% versus 3.7%).

What's the bottom line? Until one believes that it's impossible for bond yields to drop more than 50 basis points over the next year, the return generating properties of bonds are not impaired by yield floors. Additionally, risk-balanced portfolios deliver higher *expected* returns than equity-concentrated, traditional portfolios.

## How Do Yield Floors Impact Diversification?

The diversification-related results in this section follow the same layout as the expected return results presented previously: the most restrictive yield floor, "Starting Yield-50 bps," is on the left while the least restrictive yield floor, "No Floor," is on the right. We tackle the diversification issue using three different, but related, metrics: the stock-bond correlation, total portfolio risk, and bond expected returns during equity stress scenarios.

Correlation is a widely used measure of diversification. If a yield floor distorts diversification, it may increase the stock-bond correlation. The simulation results do not support this hypothesis. Irrespective

of the yield floor, all of the correlations are consistent with the "No Floor" Capital Market Assumption of zero to two decimal places.<sup>15</sup> We obtain a similar result when assuming a "No Floor" stock-bond correlation of -0.2 or +0.2.

Given that yield floors potentially truncate return distributions, perhaps "linear" measures of dependence, such as correlation, might not be appropriate for measuring the diversification impact. For this reason, we next turn to the 95% annual VaR (Value-at-Risk), a simple nonparametric measure of total portfolio risk.<sup>16</sup> In **Figure 3**, similar in spirit to the correlation results, we see no yield floor impact on total portfolio risk. Downside

<sup>14</sup> We also calculate "stress" results using CMAs motivated by the European debt crisis timeframe, October 2011. In this more volatile environment, the bond portfolio delivers most of the "No Floor" expected return at the "Starting Yield-150 bps" yield floor. Details are available upon request.

<sup>15</sup> As discussed earlier, if the stock-bond correlation became meaningfully positive, this would lessen, but not eliminate, the diversification benefit of a fixed-income allocation.

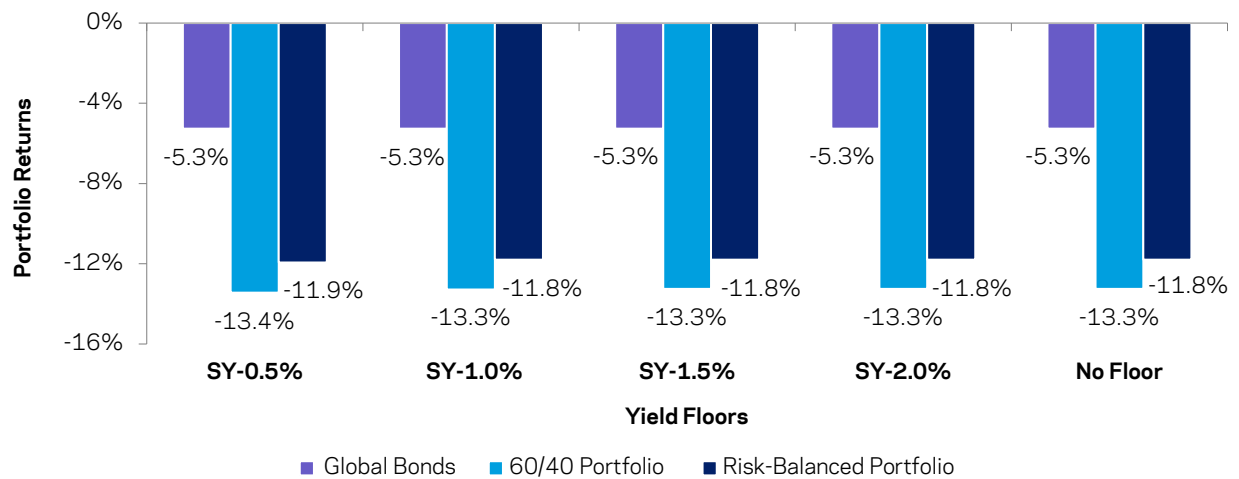
<sup>16</sup> The 95% annual VaR is equivalent to the 5th percentile of the annual return distribution.



portfolio risk at the most restrictive yield floor, “Starting Yield-50 bps,” is similar in magnitude to the “No Floor” result. Assuming

a “No Floor” stock-bond correlation of -0.2 or +0.2 does not change this result.

**Figure 3: Portfolio 95% VaR<sup>17</sup>**



Source: AQR. 60/40 is a 60% weight to hypothetical simulated stock portfolio 40% weight to hypothetical simulated global bond portfolio.

Bond diversification properties seem to be fairly resilient to yield floors. However, investors don’t just hold bonds to manage overall portfolio risk across all environments. They also hold bonds to protect the portfolio during large equity drawdowns. We address this next by measuring expected returns as a function of the yield floor during equity stress environments, defined as the bottom 20<sup>th</sup> percentile of annual equity return outcomes.<sup>18</sup>

The equity stress scenario results in **Figure 4** are consistent with our earlier *unconditional* bond expected return and stock-bond correlation results.<sup>19</sup> If the zero correlation isn’t impacted by yield floors, then bond expected returns during equity stress

scenarios should mirror the unconditional expected return results (Figure 2). This is confirmed in the bar chart. If the investor believes yields cannot drop more than 50 basis points, the bond’s “equity stress scenario” expected return is impaired, dropping in half from the “No Floor” expected return of 1.5% to 0.7%. At the portfolio level, the risk-balanced allocation is impacted more by the restrictive yield floor, going from a “No Floor” return of -0.5% to -1.7%.<sup>20</sup> The traditional, equity-concentrated portfolio’s expected return loses 30 basis points due to the yield floor (-4.0% versus -3.7%). Given the nature of an equity stress scenario, the risk-balanced portfolio performs the best in absolute terms. Clearly, if an investor is concerned about an equity

17 For each scenario (Eg: A scenario being “SY-0.5%”), we simulate 100,000 paths of 12 monthly returns per asset and execute the transformation documented in Table 1. For each of these paths, we calculate the total return of the portfolio over 12 months and calculate the 5th percentile return for those 100,000 values per portfolio.

18 The 20th percentile of annual equity return outcomes is -7.4%.

19 The equity stress scenario results leverage the same stock-bond model from the previous results.

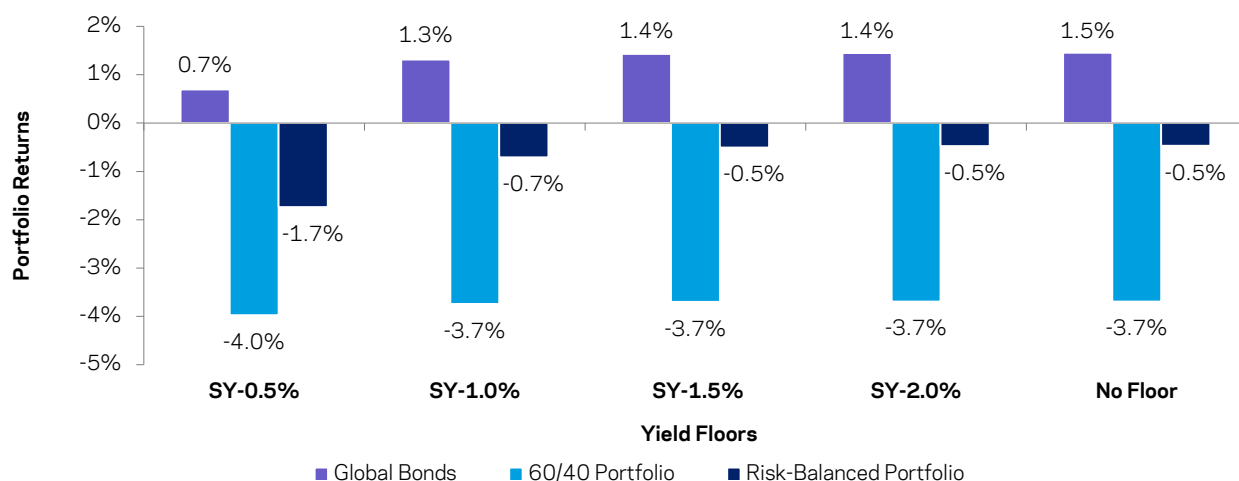
20 While the expected return absolute levels vary as a function of the assumed stock-bond correlation, the spirit of the results do not change for different correlation assumptions. Almost 100% of the “No Floor” expected return is obtained at the “Starting Yield - 100 bps” yield floor.

drawdown, the risk-balanced portfolio is superior *even if the bond return is impaired*.

Like the earlier unconditional expected return results, an inflection point occurs at the “Starting Yield-100 bps” yield floor.

With a slightly less restrictive view on future yield moves down, all three portfolios deliver almost 100% of the “No Floor” expected returns during equity stress scenarios.<sup>21</sup> This result holds even if the “No Floor” stock-bond correlation is -0.2 or +0.2.

**Figure 4: Portfolio Return Given a 20<sup>th</sup> Percentile Bad Equity Return<sup>22</sup>**



Source: AQR. 60/40 is a 60% weight to hypothetical simulated stock portfolio 40% weight to hypothetical simulated bond portfolio.

What’s the bottom line? Until one believes that it’s impossible for bond yields to drop more than 50 basis points over the next year, the

broadly defined diversification properties of bonds are not impaired by yield floors.

## Conclusion

While we believe yields can meaningfully decline both now and during the lows of 2020, some investors disagree. A “restrictive enough” view on future yield declines could impair the return generating and diversification properties of bonds, questioning their role within a traditional or risk-balanced asset allocation. Many investors

struggle with mapping yield floor views into portfolio outcomes and identifying the “inflection point” where their view no longer matters in practice.

In this paper, we find that only very restrictive views impair the role of bonds in a portfolio. We estimate that a floor of 50 basis points

21 We also calculate “stress” results using CMAs motivated by the European debt crisis timeframe, October 2011. In this more volatile environment, the broadly defined diversification properties of bonds are not materially impaired at the “Starting Yield-150 bps” yield floor. Details are available upon request. Hypothetical data has inherent limitations, some of which are disclosed in the Appendix.

22 For each scenario (Eg: A scenario being “SY-0.5%”), we simulate 100,000 paths of 12 monthly returns per asset and execute the transformation documented in Table 1. For each of these paths, we identify those paths which experience a less than 20<sup>th</sup> percentile bad outcome for equities. For that subset of paths, we average the cumulative return for each portfolio. Hypothetical data has inherent limitations, some of which are disclosed in the Appendix.

below prevailing yield levels materially impacts the role of a global bond allocation over the next year. At a slightly less restrictive floor of 100 basis points below prevailing yield levels, the bond portfolio is no longer impaired; traditional and risk-balanced asset allocations behave almost *as if* no yield floor existed. The more diversified, risk-balanced portfolio regains its total return and risk-adjusted return edge over a traditional 60/40 stock/bond portfolio.

Before we end, it is important to put the 100 basis point inflection point in context. As of the writing of this paper, the average developed market 10-year yield is 85 basis points.<sup>23</sup> The average yield reached an all-time low of 14 basis points during the coronavirus pandemic.<sup>24</sup> Whatever yield floor views investors have, the recent yield increases provide a greater cushion above the floor, and thus less chance for bond return or diversification impairment.

23 As of March 11, 2021.

24 As of March 9, 2020.

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# Appendix

Continuous 10-year government bonds are created by sourcing the on-the-run yield curve for each sovereign from Bloomberg. From this yield curve, we take the yield of the 10-year, on-the-run government bond. The series representing bond yields is the 10-year bond at each point in time following this methodology.

The MSCI World Index Hedged Net TR USD is an index which is meant to represent a return resulting from hedging the MSCI equity index exposure in the forward currency markets and contains both an equity and a currency component.

For additional familiarity regarding on-the-run government bonds, we encourage the reader to explore common tooling such as: the Bloomberg terminal screen “WB” for world bonds, and the St. Louis Federal Reserve website <https://fred.stlouisfed.org/>.

## Table A1: Bond Views Summary

### Bond Yield Determinants

Long maturity bond yields move one-for-one with long-term inflation and real growth expectations. These fundamental macroeconomic variables provide the backdrop for low yields today.

Monetary policy is still viable even if short-term interest rates are close to zero, through forward guidance and targeted asset purchases (aka quantitative easing).

Despite yield levels being low, they continue to react to news about economic activity and inflation.

Jointly these considerations should alleviate concerns that central banks are fostering a bond bubble, that monetary policy is impotent, or that the relationship between yields and fundamentals has been materially impaired.

### Investment-Related Implications

Short-term interest rates and long-term bond yields can both move into negative territory. Bond yields can move up or down even if short-term interest rates are at their lower bound.

Bond risk has always been, and continues to be, two-sided. It is extremely difficult to time the bond market.

Bonds still offer a competitive risk-adjusted return, allowing them to materially contribute to portfolio total returns when used with proper risk management and prudent leverage.<sup>25</sup>

Actively managed, thoughtfully implemented, unlevered bond strategies can still provide attractive total returns within a traditional asset allocation.

True “bond substitutes” do not exist. None can simultaneously provide equity diversification, recession protection, and deflation protection. Bonds still offer these attractive properties.

<sup>25</sup> Assuming the current yield curve is the best forecast of the year-ahead yield curve, we estimate an attractive 0.33 Sharpe ratio for global bonds as of January 29, 2021.

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