

THE IMPACT OF NEGATIVE CONVEXITY
WHEN RATES CHANGE: HOW CORPORATE
BONDS CAN DIVERSIFY AN MBS PORTFOLIO



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Introduction

In an environment where many investors are searching for yield, one sector of the fixed income market that has drawn a lot of interest is mortgage-backed securities (“MBS”). As of the end of June, the Barclays MBS Index carried a yield of 2.76% and an option adjusted duration of 4.54 years, compared to a yield of 2.24% and a duration of 5.16 years for the Barclays Aggregate Index.¹ Coupled with the implicit (in the case of Fannie Mae and Freddie Mac) and explicit (in the case of Ginnie Mae) guarantees from the US Government against loss of principal and interest, MBS appear to be an attractive option relative to the broader Aggregate index: higher yield, lower duration, and credit risk similar to Treasuries.

Of course, MBS carry the additional risk of negative convexity, which can drive duration higher as interest rates rise (i.e., “extension risk”) and lower as interest rates fall (i.e., “prepayment risk”). While investors are compensated for this risk in the form of a higher yield, the risk of duration extension in a rising rate environment should not be underestimated. This risk can, however, be mitigated through diversification into non-negatively convex bonds such as non-callable (i.e., “bullet” maturity) corporate securities.

¹ Unless otherwise noted, all data is as of June 30, 2013; source: BlackRock

A WORD ON NEGATIVE CONVEXITY

The negative convexity in MBS is driven by the option that borrowers hold to repay their loan at any time. While similar to the call option embedded in many corporate bonds, the negative convexity associated with the homeowner prepayment option is a more prevalent feature of the MBS universe than the corporate universe. As of 6/30/13, the Barclays US Corporate Index included less than 2% weight in “true” callable bonds (non-make whole callable bonds that are callable more than 1 year before stated maturity). As a result, the weighted average convexity of the corporate index was +0.82 vs. -0.89 for the MBS index.

It is important to note that while the risk associated with negative convexity is significant in mortgage-backed securities, investors are being compensated for this in the form of a higher yield. As noted earlier, the yield on the Barclays MBS Index is 2.76% vs. a duration of 4.54 years and credit risk of the US Government. Compare this with the yield on a similar duration US Treasury index, the Barclays 3-7 Year UST Index, which carries a duration of 4.46 years and similar credit risk, but only yields 1.27%, or about half as much as MBS. The difference in yield is largely attributable to the compensation MBS investors are paid for negative convexity risk. Interestingly, this compensation for convexity risk is similar to the compensation investors receive for investment grade credit risk. As an example, the Barclays Intermediate Corporate Index has a duration of 4.45 years and a yield of 2.69%.

MODELING THE IMPACT OF EXTENSION RISK²

To quantify the impact of extension risk for an MBS investor, we can model theoretical changes in the duration and total return for the Barclays MBS Index in a number of different interest rate scenarios using a prepayment model. For this analysis we shocked the level of US Treasury rates up and down in 50 basis point increments from down 100 bps to up 300 bps. We can observe the changes in effective duration and profit or loss in each environment as shown in the table below. For comparison, the same analysis is performed on similar duration Treasury (Barclays 3-7 Year UST Index) and corporate (Barclays Intermediate Corporate Index) indices.

² The illustrative total return analysis shown is generated using a BlackRock Solutions rate shock model designed to isolate the impact to securities of changing interest rates. The model uses economic conditions as of a given date, then shifts US Treasury rates higher in parallel, linearly over the course of one year while holding the option-adjusted spread for each security constant. Cash flows for callable securities are adjusted based on assumed changes in rates and are designed to reflect the issuer’s incentive and ability to prepay. The duration values assume an instantaneous shift in US Treasury rates rather than a linear change over one year. It’s important to note that this analysis is based on “all-else-equal” assumptions and does not attempt to take into account a number of factors that can impact securities.

FIGURE 1: ILLUSTRATIVE MODELED OPTION-ADJUSTED DURATION FOR A GIVEN CHANGE IN INTEREST RATES

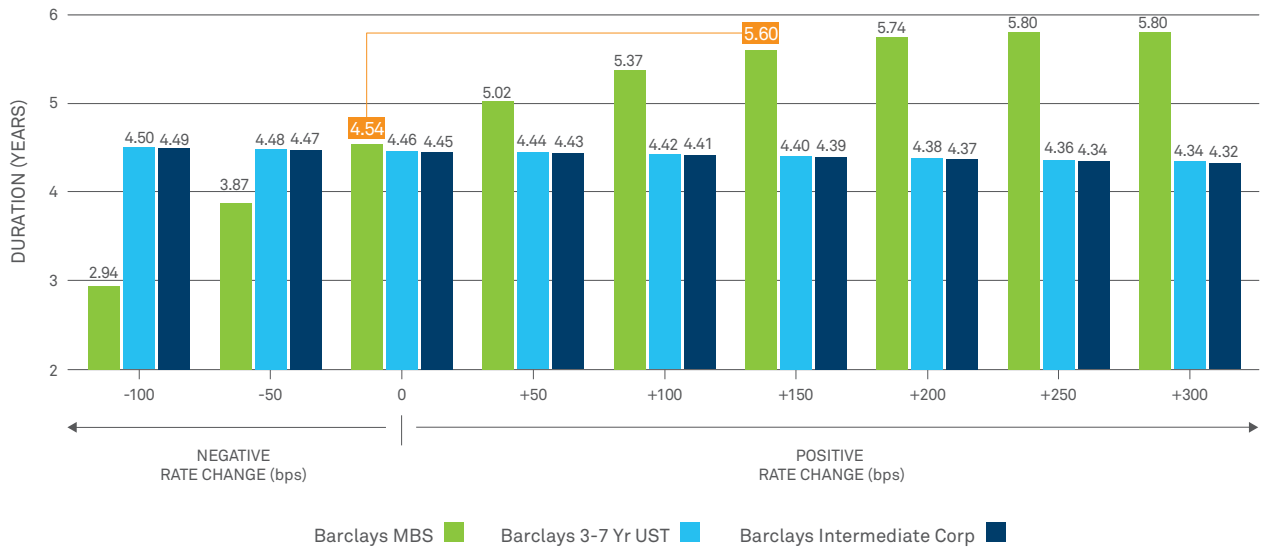
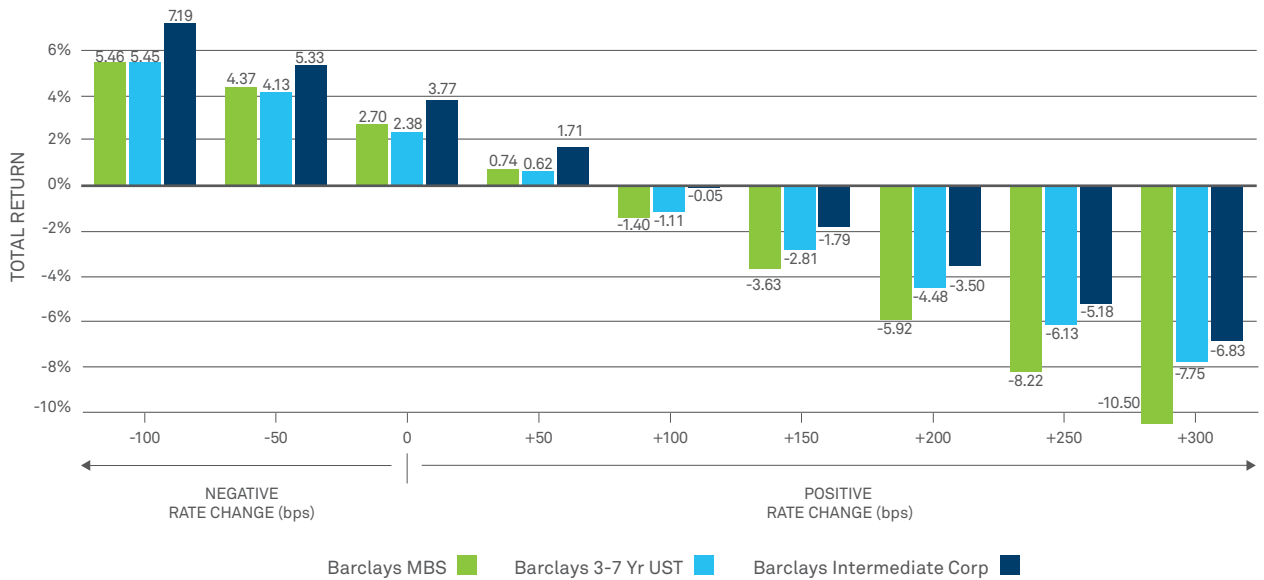


FIGURE 2: ILLUSTRATIVE MODELED TOTAL RETURN FOR A GIVEN CHANGE IN INTEREST RATES



Data shown is hypothetical and for illustrative and educational purposes only, and does not represent the performance of any index or security.

This simple scenario analysis confirms that as rates rise from current levels, the duration of even a diversified set of mortgage pools (as represented by the index) can be expected to extend significantly, resulting in higher interest rate sensitivity. As an example, for a 150 basis point rise in interest rates, the duration of the Barclays MBS Index is modeled to move from 4.54 years to 5.60 years. On a total return basis, the MBS index is modeled to lose over 360 bps in this scenario—as the price decline eclipses coupon and reinvestment income.

Looking at the results for the Treasury and corporate indexes, we can make three observations. First, the durations of these indexes do not materially change as a result of the rate moves. Second, the direction of any duration changes is inverse to rate moves (the indices are positively convex). Third, the modeled losses for the UST and corporate indices are much lower relative to the MBS index even though their yields are lower and their (initial) durations are approximately equal.

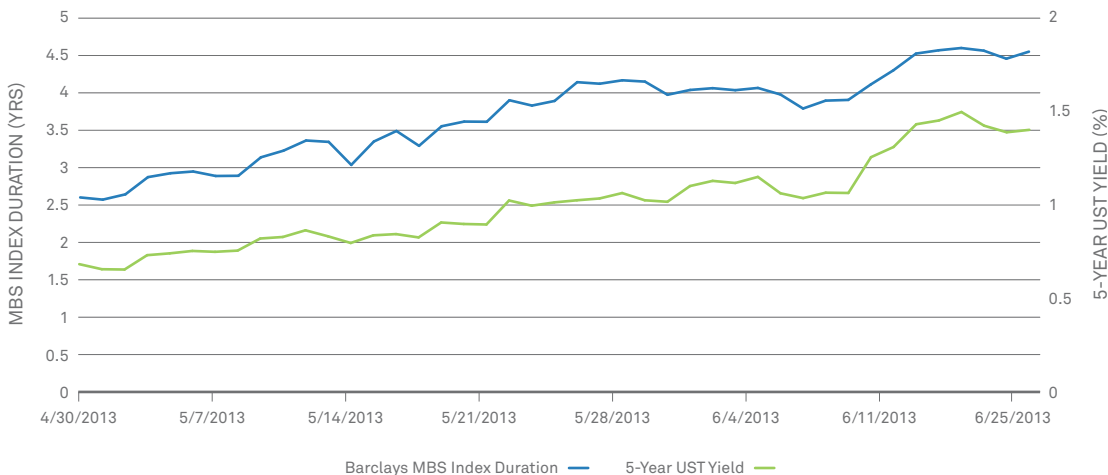
EXAMPLE OF OBSERVED MBS EXTENSION

While a scenario analysis like the one above is helpful for understanding how securities may react for a given change in rates, it relies on assumptions that may or may not be observed in practice. However, empirical data illustrating the impact of MBS duration extension can be observed in the recent sharp rise in interest rates during May and June of 2013.

Over the course of this 2 month period, the 5-year US Treasury yield rose from 68 bps³ to 139 bps³. Beginning the month of May with a duration of approximately 2.6 years, the Barclays MBS Index declined by 2.48% on a total return basis. Compare this with the return of the Barclays 1-5 Year UST Index, which had a similar duration at the beginning of May but only declined by 0.87% during the period. Further, the Barclays 1-5 Year Corporate Index, with a duration at the beginning of May of 2.9 years, declined by 1.54%⁴

The most striking result of the surge in rates was the extension of duration in the MBS index by nearly 2 years from 2.61 to 4.54 years. An investor holding the index at the beginning of the period may have been comfortable with a duration of 2.6 years, but may find that having the investment extend to a duration in excess of 4.5 years in only two months may no longer be an acceptable level of risk.

FIGURE 3: CHANGE IN MBS DURATION VS. CHANGES IN 5-YEAR UST RATES⁵



3 Source: BlackRock, Bloomberg as of June 30, 2013.

4 Source: BlackRock, Barclays as of June 30, 2013.

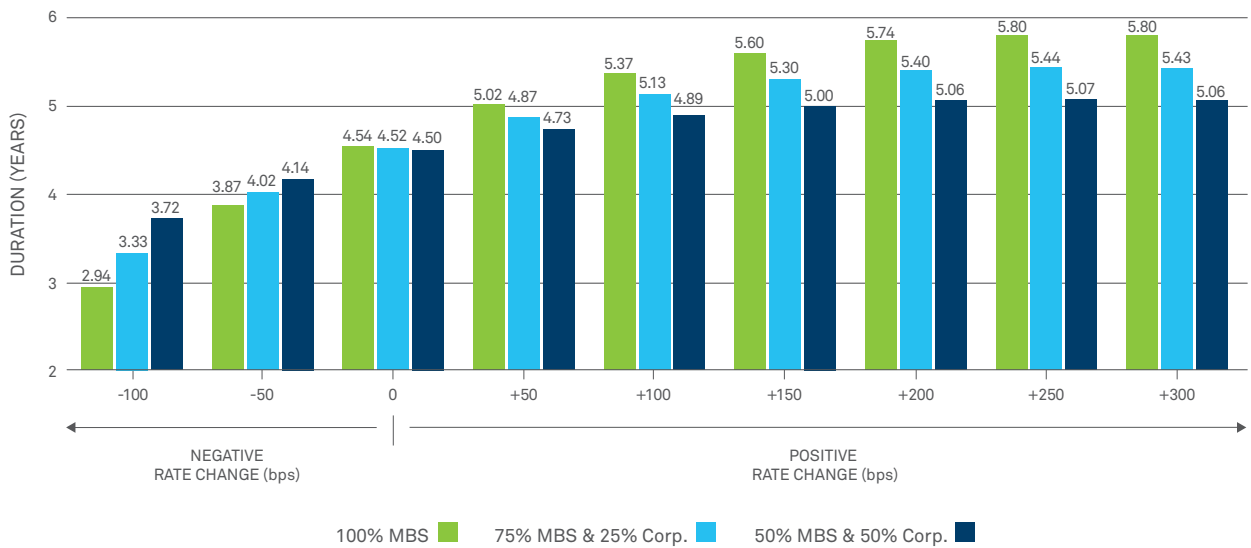
5 Source: BlackRock, Bloomberg as of June 30, 2013.

MANAGING NEGATIVE CONVEXITY THROUGH DIVERSIFICATION

In an environment of rate stability, MBS should provide an attractive return relative to comparable bullet bonds through higher yields as investors are able to simply collect the risk premium without recognizing the consequences of negative convexity. In more volatile rate environments, however, bullet bonds would be expected to outperform; exhibiting higher duration in a falling rate environment and lower duration in a rising rate environment. Combining the two types of securities into a portfolio helps to diversify interest rate exposure through varying rate environments, lowering the overall risk of the portfolio.

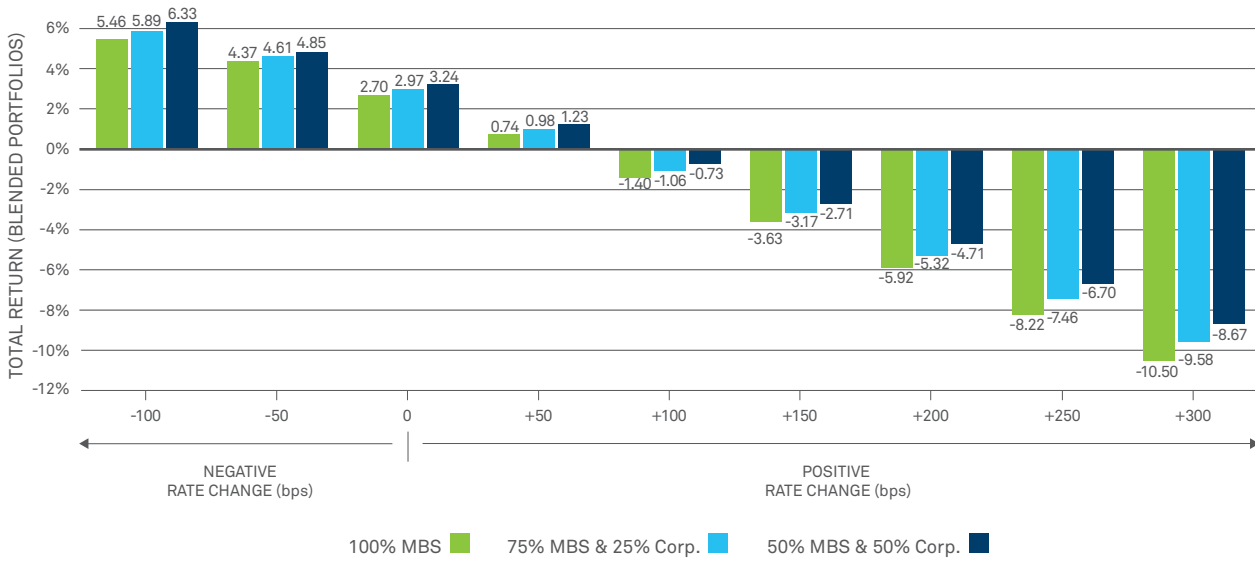
Using the results of the modeled scenarios shown previously, we can build a set of portfolios consisting of different mixes of MBS and non-negatively convex corporate bonds to see the net result across different interest rate scenarios. For example, mixing a relatively small 25% allocation of corporate bonds with an MBS portfolio showed improved returns in both rising and falling rate scenarios. Additionally, the duration of the overall portfolio remains more stable versus a 100% MBS portfolio.

FIGURE 4: ILLUSTRATIVE MODELED OPTION-ADJUSTED DURATION FOR A GIVEN CHANGE IN INTEREST RATES (BLENDED PORTFOLIOS)



Data shown is hypothetical and for illustrative and educational purposes only, and does not represent the performance of any index or security.

FIGURE 5: ILLUSTRATIVE MODELED TOTAL RETURN FOR A GIVEN CHANGE IN INTEREST RATES (BLENDED PORTFOLIOS)



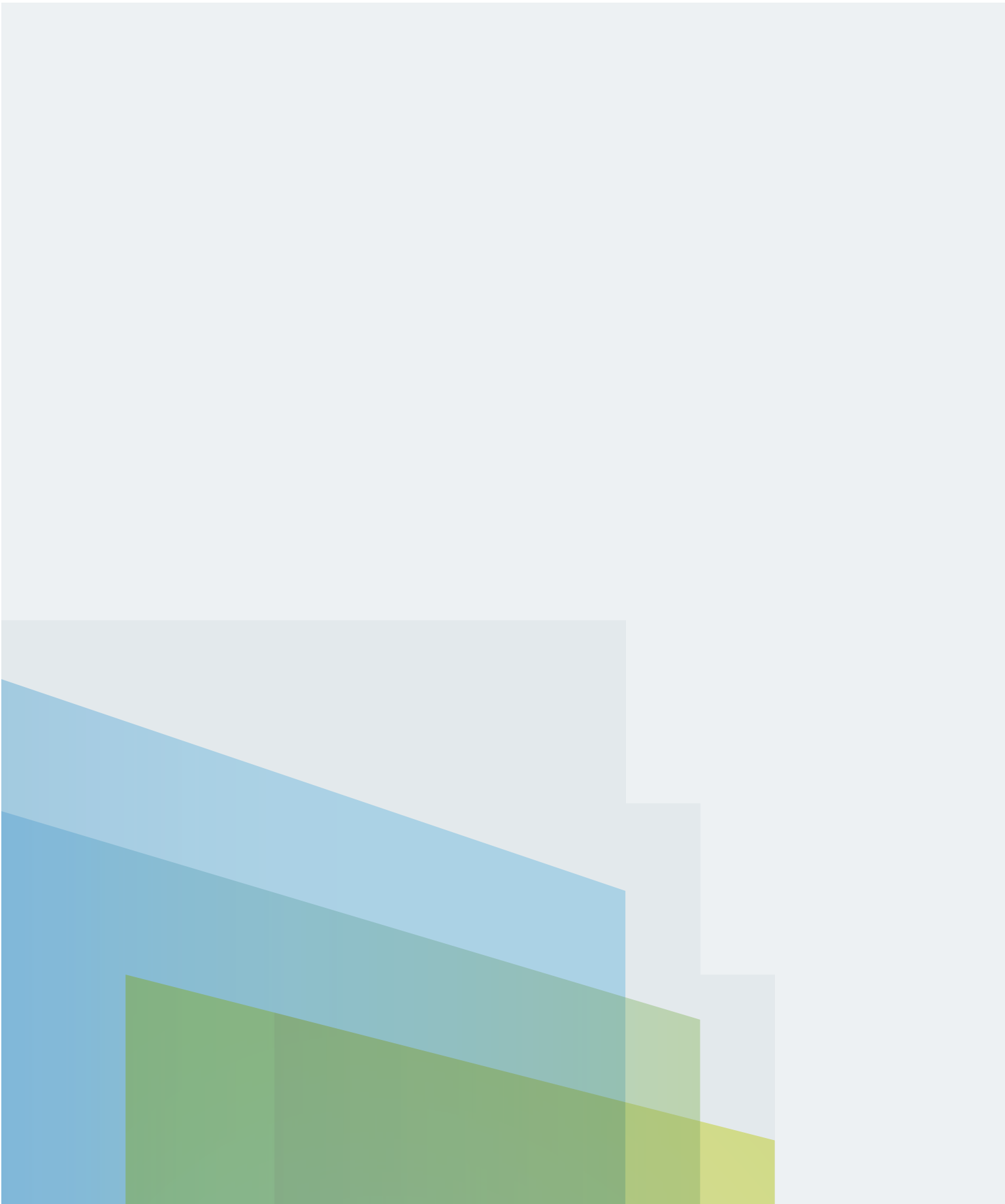
Using corporate bonds to diversify a negatively convex MBS portfolio not only reduces the extension risk and attendant price volatility, but can also provide further diversification of the sources of yield (convexity risk vs. credit risk). Historically, credit risk tends to be diversifying relative to interest rate moves, assuming that increases in interest rates occur because economic conditions are improving, lowering credit risk, and tightening spreads⁶ Investors are exposed to the idiosyncratic risk of the issuers within a credit portfolio, but this can easily be mitigated through the use of a broadly diversified vehicle such as an exchange traded fund (ETF).

⁶ In the total return scenarios modeled here, the credit spread to Treasuries in corporate bonds is assumed to remain constant.

CONCLUSION

Mortgage-backed securities are a major component of many investors' portfolios, and at a relatively high yield given their duration and level of default risk, they appear to be quite attractive on the surface. Importantly, this higher yield comes at the cost of taking on negative convexity, which can increase the securities' duration as interest rates rise, leading to larger than expected price declines. This risk can be diversified by holding bonds that do not exhibit negative convexity and that will generally be expected to have stable durations over different rate environments. Both US Treasuries and corporate bonds can fulfill this diversification role, but Treasuries have lower yields due to the lack of credit risk. Investors willing to add some investment grade credit risk can mitigate their MBS portfolio extension risk without materially reducing yield.





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