



The Bomb Shelter Portfolio: Maximum Income with the Least Risk

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Conservative investors are faced with unappealing choices. They can reduce risk and accept low yields and high exposure to rising rates, or they can push the bounds of their risk tolerance to increase yield. My analysis shows a way out of this predicament: a “bomb shelter” portfolio of exchange-traded funds (ETFs), which offers attractive yield with minimal volatility and exposure to rising rates.

Equities are not cheap after a 25% gain in the last 12 months. A viable alternative for conservative, yield-seeking investors lies in asset allocations that are outside of the norm.

Conservative investors have three critical requirements. Total portfolio risk must be low. The portfolio should generate a reasonable level of income so that investors are not forced to sell a disproportionate fraction of their assets into a declining market to maintain necessary cash flow. And the portfolio needs to minimize exposure to rising interest rates.

These three objectives compete with one another. To increase bond yield, one must accept either higher interest rate risk or default risk. To increase dividend yield, one must accept higher market risk (beta). To increase correlation between return and rising interest rates, market risk will be greater.

The solution that I outline here is a low-risk all-ETF implementation of the methodology that I used to develop my ultimate income portfolio. The motivation for this article came from an advisor who read my previous article and asked whether the approach could be used to develop portfolios that could achieve the three objectives mentioned above.

In this article, I determine the maximum available yields and expected total returns for portfolios with risk levels (volatilities, as measured by standard deviation) between 33% and 45% of the S&P 500, which equates to between 64% and 89% of the risk level of an investment-grade corporate bond index (LQD). At these low-risk thresholds, the balance among income, interest-rate exposure and total risk is even more challenging.

Asset classes

I started by examining the range of yields and risk levels available from individual asset classes, along with their sensitivities to 10-year Treasury bond yields. The asset classes I considered are in the table

below.

Most bonds have relatively low volatility, and their returns have strongly negative correlations to changes in Treasury bond yields. The exceptions are high-yield corporate bonds (HYG), which fall into the middle range of risk levels and have a modest positive correlation to Treasury bond yield. For my target risk range — between 33% and 45% of the risk of the S&P 500 — investment-grade corporate bonds (LQD) are the optimal asset class. Their yield is 3.9%, but they have a substantially negative correlation to Treasury bond yields (-52%).

Table 1: Asset class characteristics

Asset Class	Ticker	Trailing 3-Year Volatility	Risk As Fraction of S&P500 Risk	Correlation to 10-Year Treasury Bond Yield	Yield
Short-Term Treasury Bonds	SHY	0.6%	5%	-57%	0.3%
Aggregate Bond Index	AGG	3.0%	24%	-86%	2.4%
Intermediate Credit Bonds	CIU	3.2%	26%	-42%	2.9%
Corporate Bonds	LQD	5.9%	48%	-52%	3.9%
Preferred Shares	PSK	6.1%	49%	2%	6.6%
Preferred Shares	PFF	7.5%	60%	21%	5.6%
Build America Bonds	BAB	7.8%	63%	-78%	5.1%
High-Yield Muni Bonds	HYD	7.9%	64%	-49%	5.8%
High Yield Corporate Bonds	HYG	8.5%	69%	20%	6.4%
S&P500 Buy-Write Index	PBP	9.0%	72%	42%	5.4%
MLPs	AMPLP	9.4%	76%	31%	5.9%
S&P500	SPY	12.4%	100%	56%	1.9%
Mortgage REITs	REM	15.0%	120%	-2%	18.3%
Global Real Estate	DRW	19.6%	158%	18%	10.0%
Global Dividend Index	DWX	20.0%	161%	39%	6.7%

I included two preferred share ETFs because they exhibit different correlations to Treasury bond yields from one another, as well as different risk levels and yields.

Higher yield is obtained by assuming higher risk, and asset classes with moderate risk and meaningful yield provide poor returns in a rising-rate environment (evidenced by a negative correlation to 10-year Treasury bond yield). This is the core of our challenge in designing a portfolio that meets the stated criteria. I have calculated the correlations between these key variables across all of the asset classes above.

Table 2: Correlations between yield, volatility, and correlation to 10-Year Treasury bond yield

	Trailing 3-Year Volatility	Correlation to 10-Year Treasury Bond Yield	Yield
Trailing 3-Year Volatility	100%		
Correlation to 10-Year Treasury Bond Yield	62%	100%	
Yield	62%	27%	100%

Equities have the highest positive response to rising bond yields because corporations can boost earnings by raising prices in higher-rate environments, which tend also to be those periods with rising inflation. Across all of these asset classes, there is a 62% correlation between yield and correlation to 10-year Treasury bond yield. Higher-yield assets in this group tend to respond more positively to a rise in interest rates than lower-yield assets do.

Model portfolios

Let's now see how much yield we can obtain from portfolios with positive correlation to Treasury yield and total risk in the range of 33%-45% of the S&P 500. I have used a Monte Carlo simulator (Quantext Portfolio Planner, QPP) as well as historical data with an optimizer to identify portfolios with the maximum yield that satisfy the design goals. The portfolios are designed to have projected annualized volatility (standard deviation of return) equal to 5%, 6% and 7%. The default expected volatility for the S&P 500 in QPP is 15.1%, so these risk levels correspond to 33%, 39% and 46% of the S&P 500's risk. Perhaps coincidentally, the implied volatility of at-the-money put options on the S&P 500 expiring at the end of September 2014 is almost identical to QPP's baseline value, so no calibration of QPP's input risk level is required.

I designed portfolios to maximize yield at three levels of correlation between portfolio return and 10-year Treasury bond yield: 10%, 20% and 30%. This results in nine optimized portfolios, corresponding to the three risk levels and the three correlation thresholds to Treasury bond yield. The allocations to each individual fund in each portfolio are provided in Appendix A.

Along with the thresholds on risk and correlation to bond yield, I also limited the allocation to any individual fund to 15% of the portfolio. Since each fund represents a single asset class or asset subclass, the portfolio optimizer is required to diversify across asset classes. I modified three constraints in the optimization. There is no maximum allocation to short-term Treasury bonds (SHY), and because there are two preferred share funds (PFF and PSK), I limited to the sum of the allocations to these two funds to 15% of the total portfolio. Finally, I have limited the allocation to mortgage real-estate investment trusts (REM) to a maximum of 8%. The optimizer tended to select higher allocations to REM, but I judged that conservative investors might be uncomfortable with such allocations.

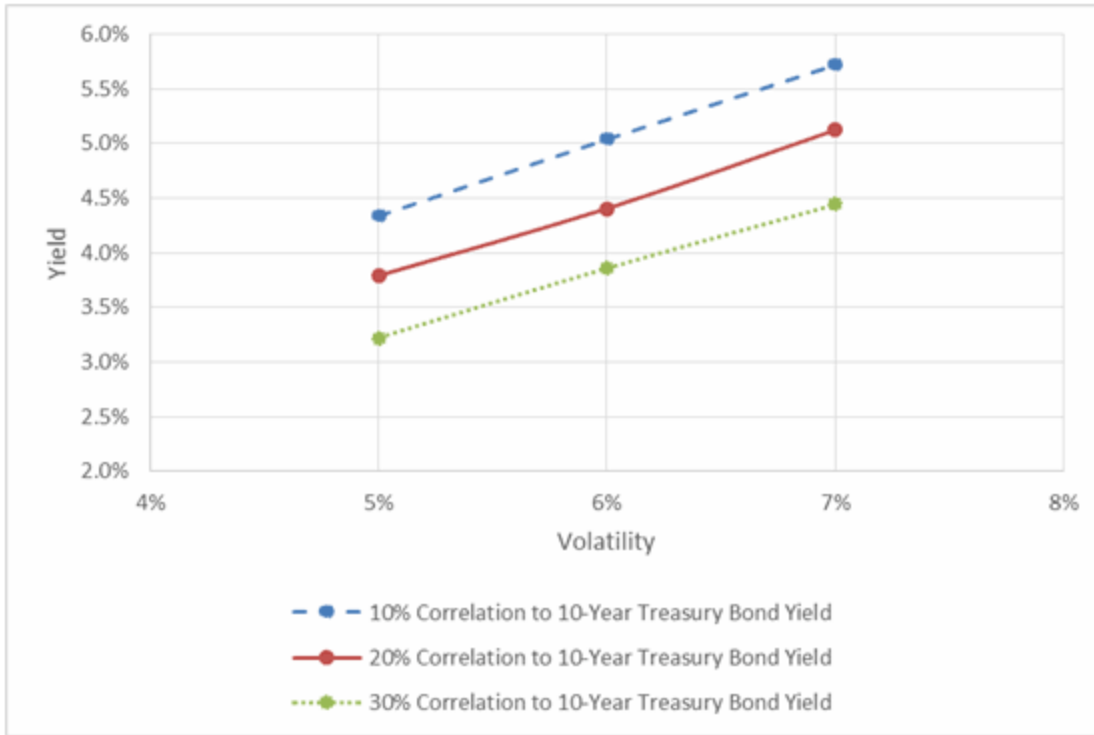
The maximum yields for the portfolios that meet these criteria were generally between 4% and 6%. These yields present a compelling opportunity for conservative investors.

Table 3: Yields for optimal portfolios at three risk levels and three minimum correlations to 10-year Treasury bond yield

Projected Volatility	Correlation to 10-Year Treasury Bond Yield		
	10%	20%	30%
5%	4.3%	3.8%	3.2%
6%	5.0%	4.4%	3.9%
7%	5.7%	5.1%	4.4%

We can also display the yield and risk levels for these nine portfolios in the form of an "efficient

frontier” of yield vs. risk.



Higher risk levels (volatilities) and lower correlations to bond yields increase total portfolio yield. Generating yield is more difficult if investors require a more positive response to rising rates.

While income is our primary objective, estimated total return is also very important. The difference between yield and expected return is the contribution from expected price appreciation. Estimates of expected price appreciation are more uncertain than for income. The table below shows the expected total return for each of the nine optimal portfolios.

Table 4: Expected total return for optimal portfolios

Projected Volatility	Correlation to 10-Year Treasury Bond Yield		
	10%	20%	30%
5%	3.9%	3.7%	3.9%
6%	4.6%	4.4%	4.3%
7%	5.4%	5.1%	4.8%

The expected returns are generated by the Monte Carlo simulations on the basis of trailing return and correlations between asset classes, along with the expected return and risk of the S&P 500 (from which the assumed equity risk premium is determined). These returns are very close to the yields for these nine portfolios, which indicates that most of the return will come from income. For a more detailed discussion of the Monte Carlo simulations of expected total return and the relationships between yield and total return, please see this [article](#).

To put these portfolios into context, I calculated the same metrics for three two-asset portfolios that have allocations to an S&P 500 ETF (SPY) and an aggregate bond ETF (AGG).

Table 5; Characteristics of two-asset stock/bond portfolios

S&P500 (SPY)	Aggregate Bond Index (AGG)	Projected Volatility	Correlation to 10-Year Treasury Bond Yield	Yield	Expected Total Return
33%	67%	5.0%	13.1%	2.2%	4.5%
40%	60%	6.0%	24.7%	2.2%	4.9%
47%	53%	6.9%	32.9%	2.2%	5.3%

The two-asset portfolios have total volatility levels and exposure to bond yields that are similar to the model portfolios, although the yields are dramatically lower. A 33%/67% SPY/AGG portfolio has projected volatility of 5% and a correlation to the 10-year Treasury bond yield of 13.1%. The model portfolio with a 5% projected volatility and 10% correlation to 10-year Treasury bond yield has a 4.4% yield, twice that of the two-asset portfolio. The historical volatilities of these two portfolios confirm that they have behaved in a similar fashion. The two-asset portfolio has a trailing three-year volatility of 4.2% as compared to 3.8% for the model portfolio.

There are similar relationships between the other two-asset portfolios and the model portfolios. The model portfolios can replicate the risk and interest-rate exposure of the two-asset-class portfolios, but it does so with twice or more yield.

I also included the expected total return from these two-asset portfolios, which are based on an expected long-term return for the S&P 500 of 8.3% with annualized volatility of 15.1%. For AGG, the expected return is 2.64%; the yield is 2.4%. The return for the S&P 500 is far more difficult to predict.

Despite the very different makeup of the model portfolios as compared to the traditional two-asset portfolios, the total expected returns at each risk level are similar. At the most similar risk and correlations to 10-year Treasury yield, the model portfolios have about 0.5% per year less in expected return than the two-asset portfolios. We may think of this as the cost associated with a more accurate estimate of expected return, because the income-oriented model portfolios do not rely as heavily on the accuracy of the equity-risk premium estimate.

A notable characteristic of the model portfolios is that they have not participated in the huge run-up in equities in recent years. The S&P 500 has a trailing 3-year average annual return of 15.8% through September of 2013. The nine model portfolios, by contrast, have provided returns comparable to or below their yields.

Table 6: Trailing 3-Year average annual return (through September 2013)

Projected Volatility	Correlation to 10-Year Treasury Bond Yield		
	10%	20%	30%
5%	3.7%	3.7%	4.4%
6%	3.9%	5.1%	5.1%
7%	4.5%	4.1%	5.6%

The model portfolios have substantial allocations to short-term Treasury bonds (SHY). Those allocations to an asset class that is not much different from cash provide comfort to conservative investors. In a generally over-valued market for income asset classes, this provides the "dry powder" to purchase higher-yielding assets if their prices fall.

Aside from short-term bonds, the highest allocations are to preferred shares, high-yield bonds and master-limited partnerships (MLPs). MLPs are represented by the Alerian MLP ETF (AMLPE), which does not require filing of K-1 tax forms, as is usually the case with individual MLPs. Instead, it requires a 1099 form like traditional funds do.

Conclusions

Investors with low risk tolerance face unique challenges in the current environment. Bond yields are low and equities are hitting new record highs. Even inflation is below the Fed's target for sustainable economic growth. No single asset class provides returns much above inflation without requiring investors to bear substantial exposure to interest-rate or market risk. At the same time, annuities are paying out less than they did in the past.

My analysis shows that investors can build a portfolio with 4% in yield, market risk of one-third of the S&P 500 (and two-thirds of the risk of investment-grade corporate bonds) and a modest positive correlation to 10-year Treasury bond yields. This portfolio has 44% of its assets in short-term Treasury bonds.

These portfolios, while very different from the traditional stock-bond mix, show what is possible in terms of income at low risk levels. The high allocations to short-term bonds address the crucial goal of flexibility in the event of rising rates. At the same time, these portfolios are likely to weather a bear market in equities or a stagnant economy, thanks to their substantial income streams.

This is the best "bomb-shelter" solution in the current environment for investors with low risk tolerance.

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Appendix A: Portfolio Allocations

10% Correlation to 10-Year Treasury Bond Yield

Asset Class	Ticker	5% Volatility	6% Volatility	7% Volatility
Short-Term Treasury Bonds	SHY	44.0%	34.0%	25.0%
Preferred Shares	PSK	13.5%	15.0%	15.0%
High Yield Corporate Bonds	HYG	10.5%	11.5%	15.0%
MLPs	AMLP	14.5%	15.0%	15.0%
Preferred Shares	PFF	1.0%	0.0%	0.0%
Build America Bonds	BAB	0.0%	0.0%	4.0%
Intermediate Credit Bonds	CIU	3.0%	2.0%	0.0%
High-Yield Muni Bonds	HYD	2.0%	8.0%	10.0%
S&P500 Buy-Write Index	PBP	0.0%	0.0%	0.0%
Global Dividend Index	DWX	0.0%	4.5%	7.0%
Mortgage REITs	REM	8.0%	8.0%	8.0%
Corporate Bonds	LQD	0.0%	0.0%	0.0%
Global Real Estate	DRW	0.0%	0.0%	1.0%
S&P500	SPY	1.5%	0.0%	0.0%
Aggregate Bond Index	AGG	2.0%	2.0%	0.0%

20% Correlation to 10-Year Treasury Bond Yield

Asset Class	Ticker	5% Volatility	6% Volatility	7% Volatility
Short-Term Treasury Bonds	SHY	52.0%	44.0%	33.5%
Preferred Shares	PSK	15.0%	15.0%	15.0%
High Yield Corporate Bonds	HYG	4.5%	6.5%	15.0%
MLPs	AMLP	15.0%	15.0%	15.0%
Preferred Shares	PFF	0.0%	0.0%	0.0%
Build America Bonds	BAB	0.0%	0.0%	2.0%
Intermediate Credit Bonds	CIU	0.0%	0.0%	0.0%
High-Yield Muni Bonds	HYD	0.0%	3.0%	3.0%
S&P500 Buy-Write Index	PBP	0.0%	0.0%	0.0%
Global Dividend Index	DWX	0.0%	4.0%	9.5%
Mortgage REITs	REM	7.5%	8.0%	7.0%
Corporate Bonds	LQD	0.0%	0.0%	0.0%
Global Real Estate	DRW	0.0%	0.0%	0.0%
S&P500	SPY	6.0%	4.5%	0.0%
Aggregate Bond Index	AGG	0.0%	0.0%	0.0%

30% Correlation to 10-Year Treasury Bond Yield

Asset Class	Ticker	5% Volatility	6% Volatility	7% Volatility
Short-Term Treasury Bonds	SHY	53.0%	43.5%	35.0%
Preferred Shares	PSK	15.0%	14.0%	13.5%
High Yield Corporate Bonds	HYG	0.0%	7.5%	10.0%
MLPs	AMLP	12.0%	13.0%	15.0%
Preferred Shares	PFF	0.0%	0.0%	1.5%
Build America Bonds	BAB	0.0%	0.0%	0.0%
Intermediate Credit Bonds	CIU	0.0%	0.0%	1.0%
High-Yield Muni Bonds	HYD	0.0%	0.0%	0.0%
S&P500 Buy-Write Index	PBP	0.0%	0.0%	0.0%
Global Dividend Index	DWX	0.0%	0.0%	1.0%
Mortgage REITs	REM	6.0%	7.0%	8.0%
Corporate Bonds	LQD	0.0%	0.0%	0.0%
Global Real Estate	DRW	0.0%	0.0%	0.0%
S&P500	SPY	14.5%	15.0%	15.0%
Aggregate Bond Index	AGG	0.0%	0.0%	0.0%