Examination of Fixed Income Securities Pooled with the S&P Index for Retirement Diversification: From Convertibles to Treasuries to Cash Alternatives

Armand Picou
Texas A&M University – Corpus Christi

We examine the returns of retirement portfolios containing a diversified stock selection and various fixed income combinations to determine the best risk return tradeoffs for the 10 years 2010 -2019. The classic 60/40 Equity/Debt holds the track record for delivering returns while reducing risk. For comparison, we test for the optimal mix and 70/30, 80/20 among others; for the 10 years in the study. The lowest risk return combinations for a 60/40 mix were found; with Municipal Securities dominating followed by Preferred Stocks, US High Yield, and Convertibles. The worst performing 60/40 combinations were made with International Bonds, Treasury Bills, and Government Bonds excluding U.S.

Keywords: bonds, fixed income, retirement diversification, portfolio performance

INTRODUCTION

We examine the returns of selected proportional portfolios of stocks and bond/ fixed income securities to determine the best risk return tradeoffs for the 10 years 2010 -2019. Advisory services routinely tout the benefits of fixed income securities in stabilizing portfolio values, especially the 60 /40 Equity to Debt mix. The classic 60/40 rule has a good historical record of delivering returns while reducing the risk of serious annual portfolio drawdowns. For comparison, we test for the S&P 500 in various proportions: 60/40, 70/30, 80/20 among others; for the 10 years in the study.

Retirement portfolios are usually allocated across a broad asset mix to maximize stability of earnings. Recently some financial advisors have advocated for inclusion of convertible bonds as part of this strategy. Along with preferred stock, convertible bonds have an element of stock market volatility inherent in the overall return that differs from all the purely fixed income bonds classes studied.

We question; considering today's current low inflation rates and consequently low bond rates, whether the 60/40 mix may be too heavily weighted in bonds, especially if inflation accelerates. Historically speaking, equity returns do not rise as quickly as inflation, but they have always reacted better than bonds. Stock valuations at historical highs with bond yields near all-time lows also do not bode well for high future returns.

For the 10 years of the study inflation averaged 1.76 %. Because of recent market volatility, any blend of stocks and bonds will have lower returns going forward. However it is worth examining the most recent period of low inflation since the 2008 market drop. Would a standard 60/40 stock/bond portfolio have compare favorably from a risk return perspective?

To insure a thorough examination, we include aggregates of several fixed income securities: Convertible Bonds, U.S. High Yield, Preferred Stock, Investment Grade Corporate Bonds, U.S. Securitized Bonds, Government excluding U.S., U.S. Government Bonds, T-Bills, Global Aggregate Bonds, Leveraged Loans, Treasuries, Mortgage Backed Securities, International Bonds, Short-term Government Credit, and Municipal Bonds.

DATA

To represent the US stock market, the S&P500 is used. While several stock indexes were examined, the S&P 500 Index was deemed most appropriately diversified for the final analysis. Also examined were International Small Caps, Emerging Markets, World Stocks excluding U.S. among others. As the volatility of those stock Indexes proved higher than the S&P 500, they were ultimately rejected.

The S&P500 represents a stable portion of the most successful US Companies and is defined as follows: The S&P 500 is a market-cap weighted index that represents the average performance of the 500 largest capitalization stocks. It contains 11 sectors and is thought of as a well-diversified portfolio suitable for the average investor. Investing in the S&P 500 is also a passive strategy increasingly favored in moderately conservative low cost retirement plans. As stated previously, other stock indexes were rejected due to higher volatility. Below are the source and definitions of the various fixed income securities used in the study.

1) **Convertible Securities**: From the ICE Bank of America All U.S. Convertible Index.
2) **Government Ex-US**: From the ICE Bank of America Global Government Bond index Excluding U.S, measuring investment grade sovereign debt publically issued in foreign markets and denominated in foreign currency.
3) **International Bonds**: From the Bloomberg Barclays Global Aggregate Index ex USA, measuring the performance of global investment grade fixed-rate debt excluding dollar denominated securities.
4) **Leveraged Loans**: From the S&P/ Loan Syndications and Trading Association Leveraged Loan Index, measured across the largest 100 leveraged loan facilities.
5) **Mortgage Backed Securities**: From the Bloomberg Barclays U.S. Mortgage-Backed Securities Index, resulting from the fixed and adjustable rate agency mortgage-backed pass-through securities issued by Ginnie Mae, Fannie Mae and Freddie Mac.
6) **Municipal Bonds**: From the Bloomberg Barclays Municipal Bond Index including the long-term tax exempt bond sectors of state and local obligations, revenue bonds, insured bonds and prerefunded bonds.
7) **Preferred Stock**: From the ICE Bank of America Fixed Rate Preferred Securities Index including investment grade fixed rate US dollar denominated preferred stock issued in the US domestic market.
8) **Short-Term Government/Credit**: From the Bloomberg Barclays US Government/Credit 1-3 Year Index which measures the non-securitized component of the US Aggregate Index with maturities of 1-3 years to include Treasuries, Government Agency Securities and Corporate Bonds.
9) **Treasuries**; From the Bloomberg Barclays US Treasuries Index, an aggregate of the public obligations of the US Treasury. Includes all Treasuries with 12 or fewer months to maturity.
10) **Treasury Bills:** From the Bloomberg Barclays U.S Treasury 1-3 Month Index; Includes all Treasuries with 12 or fewer months to maturity.
11) **U.S. Aggregate Bonds**: From the Bloomberg Barclays US aggregate Bond Index composed of dollar denominated investment-grade fixed-rate taxable SEC-registered bonds; includes Treasuries, Government Agency and Corporate Securities, Mortgage-Backed Bonds (both fixed and adjustable Agency mortgages), Asset-Backed Securities, and commercial mortgage-backed securities.
12) **U.S. Government Bonds**: From the Bloomberg Barclays US Government Index, an index representing bonds issued by the Treasury, U. S. Agencies, and Quasi-Federal Corporations.

13) **US High Yield Bonds #1:** From the Bloomberg Barclays US Corporate High Yield Bond Index measuring performance of fixed-rate non-investment grade bonds.
14) **US High Yield Bonds #2**: From the Credit Suisse U.S. High Yield Index which includes only fixed-rate non-investment-grade bonds.
15) **US Investment Grade Corporate Bonds**: From the Bloomberg Barclays U.S. Corporate Bond Index which includes investment grade, dollar denominated, fixed-rate taxable publicly issued Industrial, Utility and Financial Corporate Bonds.
16) **U.S. Securitized Bonds**: From the Bloomberg Barclays US Securitized MBS/ABS/CMBS index**.**

METHODOLOGY

The formula for Sample Standard Deviation where

x_i (1)

is the return for the ith year, and

$\bar{x}$ (2)

is the simple average and N = 10 to adjust for the degrees of freedom is as follows:

$$s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2} \quad (3)$$

The formula for Coefficient of Variation or risk per unit of geometric mean return is as follows:

C.V. = S / (G.M.R.) (4)

Returns are calculated as follows. First the investment of $1000 is assumed on January 1, of 2010. Supposing no transaction fees or loads, the funds are held in each asset class for the entire 10 years. No additional funds are added to the accounts. The annual return in dollars is then computed and the ending amount for each year becomes the starting amount for the following year. This procedure creates hypothetical future values referred to as dollar returns, allowing for direct visual comparison between asset classes.

The same data is used to calculate geometric mean return. The present value is the original $1000; the future value is the ending value or dollar return after 10 years; no deposits or withdrawals and time is 10 years. The geometric mean return is computed to determine the average rate per period on investments compounded over multiple periods.

Once the yearly returns are known, the sample standard deviation of returns is determined for each of the asset classes over the 10-year period. Standard deviation divided by the geometric mean return produces a coefficient of variation (C.V.). The geometric mean return is preferred over the arithmetic mean as a more accurate representation of the compound returns.

Following evaluation of the individual asset classes, combinations of asset classes are examined for comparison. We test the standard recommendations of leading financial advisors, namely 60/40 stock/bond portfolios as well as others. Table 1 contains the combinations studied.

LITERATURE REVIEW

The inclusion of fixed income securities in portfolios is not new. It is generally recognized that retirement portfolios focused on stability and capital preservation are generally comprised of the classic 60/40 stock to debt mix. We begin our literature review with coverage of the need for a diversified stock portfolio; lending credence to using the S&P500 as our base portfolio. We conclude our review by covering research related to both bond portfolio performance and stock-bond portfolios.

In the influential paper by Bruno Solnik (1974) international diversification is intensely supported. The benefits of an international portfolio are demonstrated relative to domestic only diversified portfolios. The author concludes the likely result is a "large" reduction of risk over a purely domestic portfolio. Solnik's research started a important change in financial advice.

Global equity market mixing has become a prominent research area particularly since the October 1987 stock market crash. (See Srivastava 2007 for a summary). Emerging market research increasingly grew with the multiple concerns of both variations in market integration over time and the reduced potential for diversification: See Chariou, Malris, & Nishiotis (2006) Bekaert & Urias (1996) or French & Poterba (1991).

Obviously, research is trying to measure changes in the risk reduction of global diversification over time. In Ratner & Leal (2005) the authors are study the increasingly interconnected world economies and whether this reduces diversification. As world economies become progressively more connected, will the price of diversification outweigh the benefits? Ratner and Leal concluded in 2005 there are substantial advantages worth the cost. To limit the complexity, our research uses a domestic only diversified portfolio in combination with a wide range of domestic fixed income securities and two non-US bond indexes.

Considerable data exists today that U.S. investor's favor domestic investments (see Bergin & Pyun 2016, O'Hagan-Luff & Berrill 2015 and Gorman & Jorgensen 2002). Investor portfolios are dominated by domestic stocks throughout the accumulation stages of a person's life. But upon attainment of retirement and seeing the need for savings to last the projected remainder of investor's life span, many advisors back more globally diversified portfolios that contain significant investment in fixed income as well as international, emerging markets and the riskier small caps. But to study the interaction of fixed income on stocks, we limit the choice of stocks to a purely domestic portfolio.

Investors favor the highly integrated domestic markets rather than international markets. Thus, we examine various combinations of prominent domestic fixed income securities with leading domestic stocks.

Reaching a portfolio target value takes a variety of skills: dedication, persistence, and good luck. Once the target is in sight with retirement goals likely to be achieved, preservation becomes the new goal. The advent of the 60/40 stock to debt mix is now standard industry guidance for preservation of capital in the latter part of one's life. But the advent of lower fixed rates of return in today's world were not envisioned when in the past, the 60/40 recommendation gained prominence.

As recently as 2007, a paper by Schleef & Eisingler found that target values were more likely to be achieved when investors used 80/20 instead of 60/40. With Qualified retirement plans limiting retirement contributions, and yearly returns varying greatly, to assume a constant return when calculating end results beforehand increases the probability of failure.

In research by Barberis (2000), he found the time horizon to achieve a set goal influences the allocation to stocks. The shorter the horizon, the greater the need to allocate more into stocks. However, the paper suggests if the investors fail to realize returns are somewhat predictable over long time periods, they may over-allocate to stocks. Those truly risk averse would do the opposite. However, the period studied was from 1955 to 1995, a period of much higher returns with fixed income securities.

In O'Brien (2020) the author argues that interest rate uncertainty may reduce the need for optimal reallocation to maintain a constant mix. In our study, we assume that rates may remain low for some time, which lends support to our results favoring more stocks in an allocation to insure reaching the retirement goal.

In Elton & Gruber (2000) the authors examine asset allocation advice provided by financial advisors. Most advisors had client allocations roughly equal to the advisors' personal allocation. Clients tended to

gravitate to advisors who shared their allocation beliefs. Riskier allocations were generally advised by more aggressive managers who themselves had similar allocations.

Finally, we recognize a key limitation of this paper: time varying integration. The data assumes no changes in correlation in fixed income securities between international and the U.S. during the time period covered (2010-2019). Multiple authors have stated concerns for the variations in country integration (see Chollete, Pena & Lu 2012 or Bai and Green 2010).

RESULTS

The initial results of the various proportional combinations are found in Table 1 below. The table is arranged with the most attractive fixed income security listed first in terms of Coefficient of variation or the lowest risk per unit of return. While Municipal bonds are highly favored, with second and third place Treasuries and US Government Bonds closely trailing, to focus purely on the numerical results can be misleading.

First, at higher percentage combinations than the normally recommended 60/40, i.e., 70/30 and 80/20 we found some advantages for preferred stock. At lower fixed income levels, preferred stock did significantly better than the US Bond Aggregate. Similarly at much high fixed proportions (50/50 and 40/60) we found that short term government credit did significantly better than High Yield.

Figures 1 through 5 below provides a different interpretation similar to a feasible investment set with efficient frontier addressing unique investor indifference curves. Figure 1 is a scatter plot of the risk return coordinates of the 60/40 portfolio. The visual interpretation lends much to the discussion. Items found on this 60/40 efficient frontier are Municipal Bonds, Preferred Stock, High Yield Bonds and Convertible bonds. All other combinations are inferior to the combinations found on the leading edge of the 60/40 Feasible set. However, it is necessary for investors to have very high risk tolerance in order to have indifference curves that would make them prefer Convertible Bonds, High Yield Bonds and Preferred Stocks over Municipal Bond combinations.

CONCLUSIONS

The results we found are for static portfolios for the 10 years studied. Keep in mind that the mix of investments will likely be adjusted over time with a rebalancing strategy. We recognize but exclude instances where changes in life circumstances as well as changes in withdrawal rates will impact decisions to change the allocation mix. Furthermore, the time horizon of 10 years we used may be inadequate when considering the longevity of many retirees today. However, the likelihood of success is a hypothetical analysis based on statistical modeling of historical data. As all models use historical data in predicting future outcomes and there are no guarantees of success, a static model has as reasonable a chance of success as does a more actively managed mix.

For the conservative investor, the best risk return tradeoff is any mix of the S&P and Municipal Bond Funds. For the more tolerant risk adverse investor, the S&P combined with Preferred Stock, High Yield Debt, or Convertible Debt remain attractive. All of the Government based products are inferior to Municipal securities at the low risk levels, earning more than 50 basis point lower returns on an annual basis with similar risk levels. For example, Investment Grade Bonds are inferior to Preferred Stock by approximately 70 basis points but have a relatively equivalent risk level.

The future of annual rebalancing appears likely to change. If stocks continue to perform well compared to fixed income, the rebalancing advice of the past will result in sales of stocks with ever increasing investment in currently low fixed returns. With todays low interest rate environment, if a strategy of investing in Treasuries and Investment Grade Corporate securities continues, returns will remain bleak for retirement portfolios. Specifically, having significant investments (at least 40 %) in fixed income will add large swings in valuation as interest rates rise in the future given that higher rates of future inflation seem likely.

The 60/40 mix may have seen better days. It works well in a high interest rate environment and as rates fall, results in significant contributions to overall portfolio return. However, in a low rate environment when rates won't or cannot fall further, an eventual rise in interest rates means existing portfolio values will drop. This begs the question, would a portfolio 70/30 or 80/20 or even 100/0 be advisable for the future?

If the investment horizon is a long one and one has other sources for expenses, this may allow an investor the luxury of accepting reduced returns in a low interest rate environment. As rate rise, the attractiveness of rebalancing into a rising interest rate market may well be rewarding to the heirs of your portfolio. But it may be prudent to consider skewing portfolios more towards 70/30 or 80/20 as potentially better to weather a rising interest rate market. Once interest rates return to some semblance of historical norms, increasing the asset mix back toward 60/40 may once again achieve the risk return tradeoff so many have profited from.

While municipals remain attractive presently, there is no guarantee that the future will be one without problems. For the risk averse investor willing to accept higher risk levels, it seems the appropriate mix should consider preferred stock, convertibles and even High Yield debt. Such a future may be one that few find attractive as the risks associated with those securities require long periods of investing and withstanding of volatility in the face of wide swings in portfolio wealth.

It seems obvious as well as likely that conservative investors seeking security of return will stay with a safer mix of US and International Government and Investment Grade Corporates. The conclusion is with US and International Government bonds they must be willing to accept returns that are 200 basis points lower than currently achievable. Otherwise, leaving the fixed portion entirely to Investment Grade US Bonds while offering the potential for higher returns, comes at the price of increased risk: approximately 16 % more risk for 0.5 % more return.

REFERENCES

Bai, Y., & Green, C. (2010). International diversification strategies: Revisited from the risk perspective. *Journal of Banking & Finance*, *34*, 236–245.

Bekaert, G., & Urias, M.S. (1996). Diversification, integration and emerging market closed-end funds. *Journal of Finance*, *51*, 835–869.

Barberis, Ni. (2000). Investing for the Long Run when Returns are Predictable. *The Journal of Finance*, *55*(1), 225-265.

Bergin, P., & Pyun, J., (2016). International portfolio diversification and multilateral effects of correlations. *Journal of International Money and Finance*, *62*, 52-71.

Charitou, A., Makris, A., & Nishiotis, G. (2006). Closed-End Country Funds and International Diversification. *Multinational Finance Journal*, *10*(3/4), 251–276.

Chollete, L., Pena, V., & Lu, C. (2012). International diversification: An extreme value approach. *Journal of Banking & Finance*, *36*, 871–885.

Elton, E., & Gruber, M. (2000). The Rationality of Asset Allocation Recommendations. *Journal of Financial and Quantitative Analysis*, *35*(1), 27-41.

French, K.R., & Poterba, J.M. (1991). Investor diversification and international equity markets. *American Economic Review*, *81*, 222–226.

Gorman, L.R., & Jorgensen, B.N. (2002). Domestic versus international portfolio selection: A statistical examination of the home bias. *Multinational Finance Journal*, *6*, 131–166.

O'Brien, T.J. (2020). Buy-and-Hold and Constant-Mix May be better Allocation Strategies than you Think. *The Journal of Portfolio Management*, *46*(6), 159-171.

O"Hagan-Luff, M., & Berrill, J. (2015). Why stay-at-home investing makes sense. *International Review of Financial Analysis*, *38*, 1-14.

Ratner, M., & Leal, R. (2005). Sector Integration and the Benefits of Global Diversification. M*ultinational Finance Journal*, *9*(3/4), 235-267.

Schleef, H.J., & Eisinger, R.M. (2007). Hitting or Missing the Retirement Target: Comparing Contribution and Asset Allocation Schemes of Simulated Portfolios. *Financial Services Review*, *16*(3), 229-243.

Solnik, B. (1974, July/August). Why Not Diversify Internationally Rather Than Domestically? *Financial Analysts Journal*, *30*(4), 48-96.

APPENDIX

FIGURE 1
SCATTER PLOT OF THE RISK/ RETURN COORDINATES OF THE 80/20 PORTFOLIO

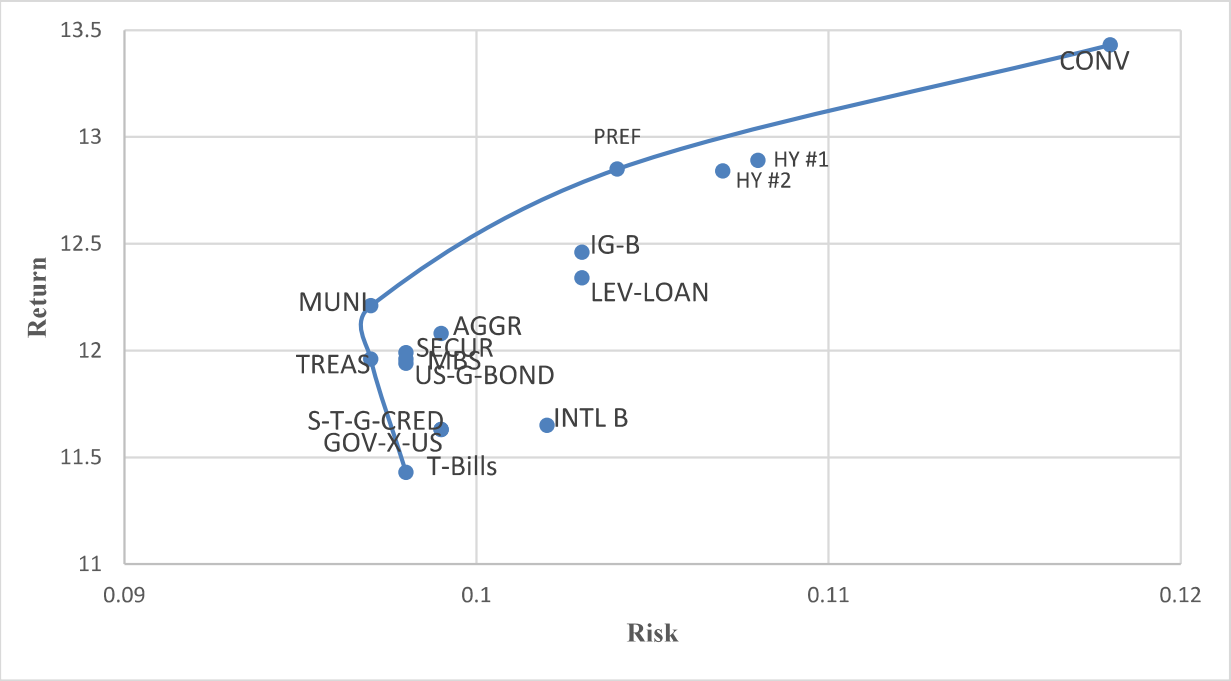

FIGURE 2
SCATTER PLOT OF THE RISK/ RETURN COORDINATES OF THE 70/30 PORTFOLIO

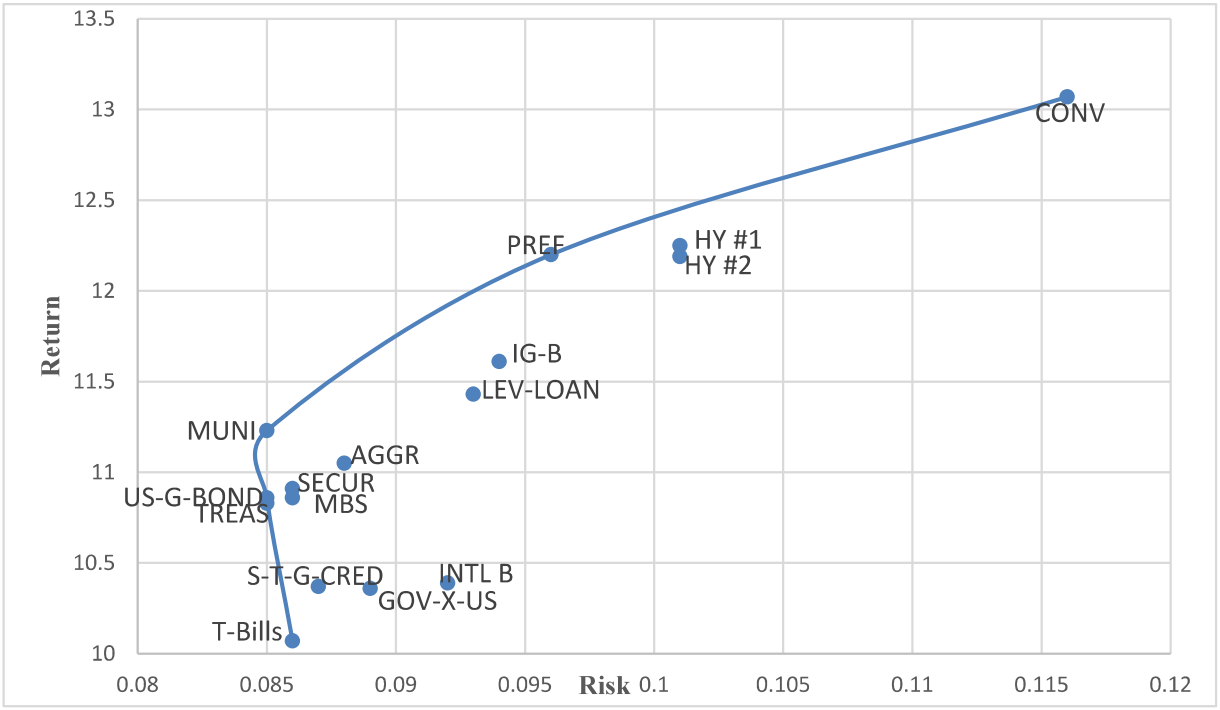

FIGURE 3
SCATTER PLOT OF THE RISK/ RETURN COORDINATES OF THE 60/40 PORTFOLIO

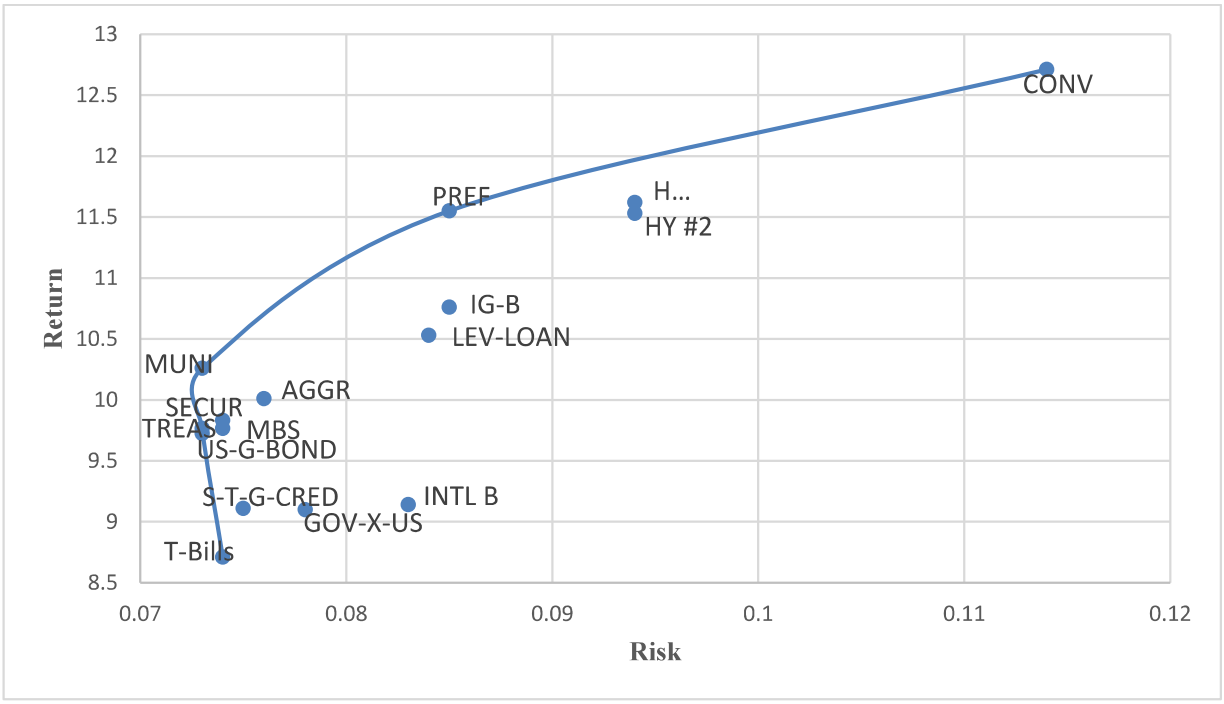

FIGURE 4
SCATTER PLOT OF THE RISK/ RETURN COORDINATES OF THE 50/50 PORTFOLIO.

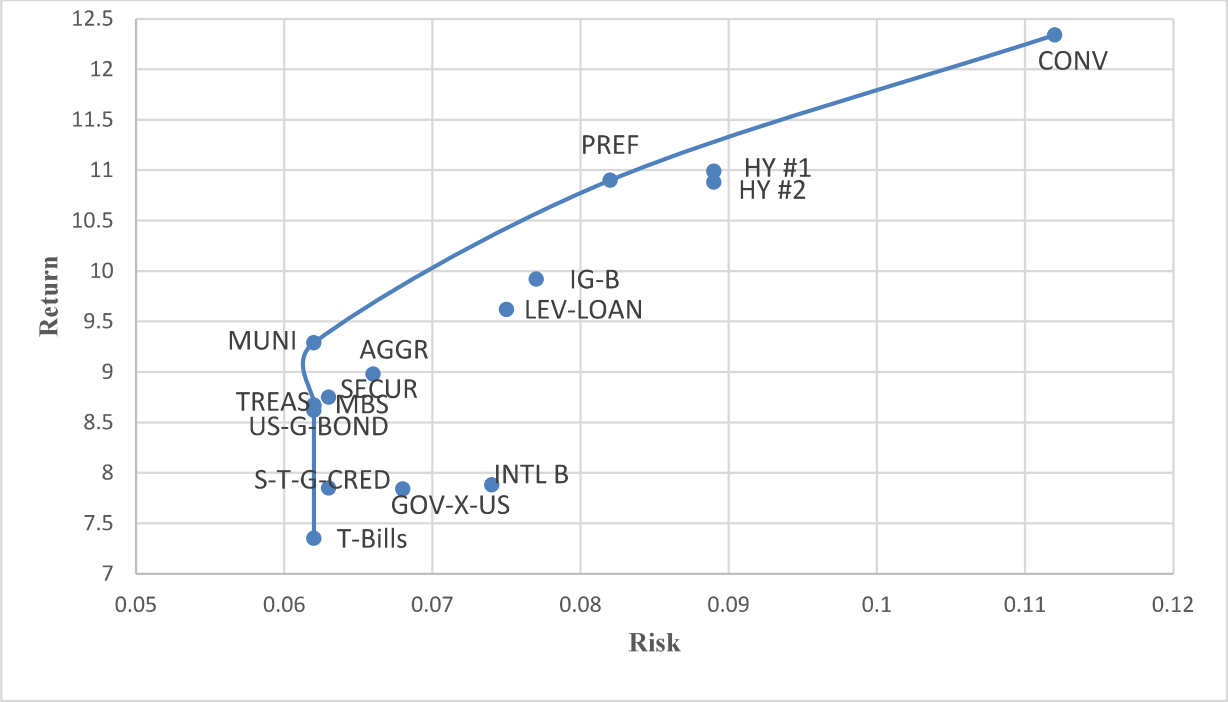

FIGURE 5
SCATTER PLOT OF THE RISK/ RETURN COORDINATES OF THE 40/60 PORTFOLIO

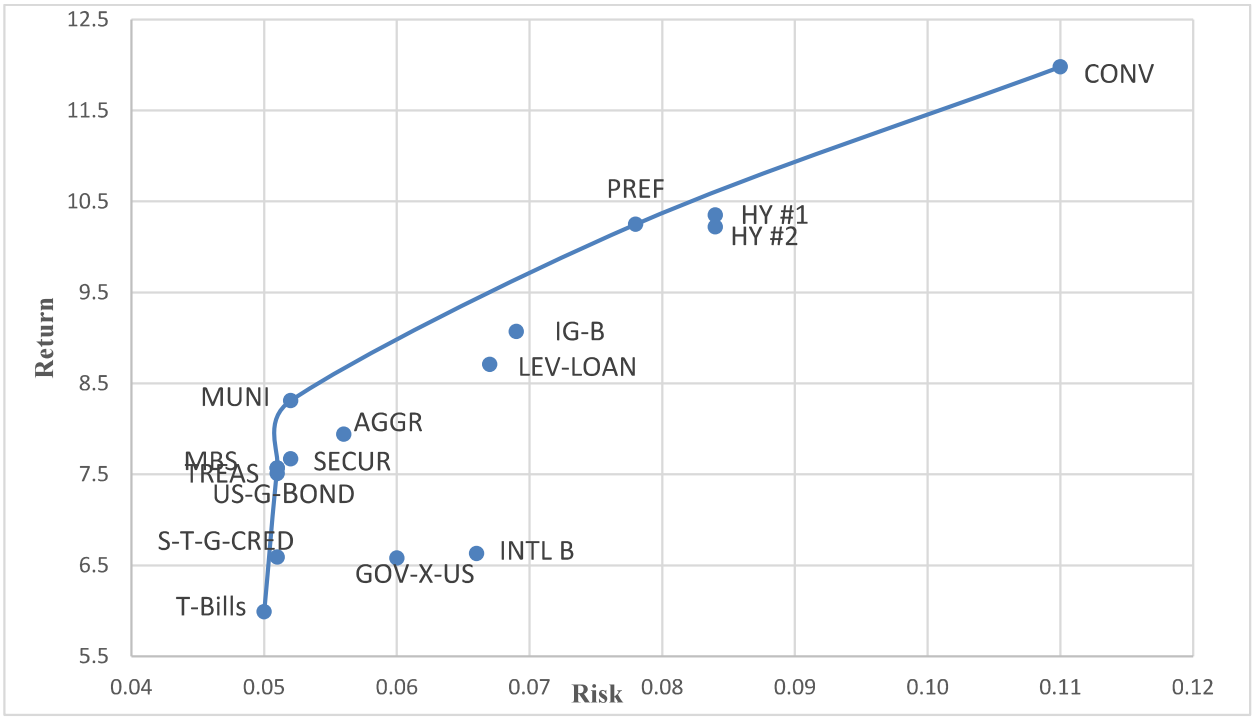

TABLE 1
RESULTS OF 2010-2019 DATA STOCK TO BOND RATIOS FOR S&P500 INDEX WITH VARIOUS FIXED INCOME / BOND CATEGORIES

Stk/Bd Ratio	80/20		70/30		60/40		50/50		40/60	
	Risk/ Return	**CV**	**Risk/ Return**	**CV**	**Risk/ Return**	**CV**	**Risk/ Return**	**CV**	**Risk/ Return**	**CV**
Municipal Bonds	0.097/ 12.21	0.798	0.085/ 11.23	0.758	0.073/ 10.26	0.715	0.062/ 9.29	0.670	0.052/ 8.31	0.628
Treasuries	0.097/ 11.96	0.814	0.085/ 10.86	0.783	0.073/ 9.767	0.748	0.062/ 8.67	0.711	0.051/ 7.57	0.673
US Gov-Bond	0.098/ 11.94	0.817	0.085/ 10.83	0.787	0.073/ 9.724	0.754	0.062/ 8.62	0.717	0.051/ 7.51	0.679
Securitized Bonds	0.098/ 11.99	0.819	0.086/ 10.91	0.790	0.074/ 9.832	0.757	0.063/ 8.75	0.718	0.052/ 7.67	0.675
MBS	0.098/ 11.96	0.820	0.086/ 10.86	0.792	0.074/ 9.766	0.759	0.062/ 8.67	0.721	0.051/ 7.57	0.677
US Bond Aggregate	0.099/ 12.08	0.821	0.088/ 11.05	0.794	0.076/ 10.01	0.764	0.066/ 8.98	0.732	0.056/ 7.94	0.701
Preferred Stock	0.104/ 12.85	0.810	0.096/ 12.20	0.785	0.085/ 11.55	0.766	0.082/ 10.90	0.755	0.078/ 10.25	0.758
US Investment Grade Corp-Bond	0.103/ 12.46	0.826	0.094/ 11.61	0.806	0.085/ 10.76	0.787	0.077/ 9.92	0.772	0.069/ 9.07	0.763
Leveraged Loans	0.103/ 12.34	0.836	0.093/ 11.43	0.819	0.084/ 10.53	0.801	0.075/ 9.62	0.784	0.067/ 8.71	0.768
US High Yield #1	0.108/ 12.89	0.835	0.101/ 12.25	0.822	0.094/ 11.62	0.813	0.089/ 10.99	0.810	0.084/ 10.35	0.814
US High Yield #2	0.107/ 12.84	0.837	0.101/ 12.19	0.826	0.094/ 11.53	0.819	0.089/ 10.88	0.818	0.084/ 10.22	0.826
S-T Gov-Credit	0.099/ 11.63	0.849	0.087/ 10.37	0.837	0.075/ 9.11	0.822	0.063/ 7.85	0.803	0.051/ 6.59	0.777
T-Bills	0.098/ 11.43	0.860	0.086/ 10.07	0.855	0.074/ 8.71	0.850	0.062/ 7.35	0.842	0.050/ 5.99	0.832
Gov-x-US	0.099/ 11.63	0.859	0.089/ 10.36	0.858	0.078/ 9.10	0.863	0.068/ 7.84	0.877	0.060/ 6.58	0.913
Convertibles	0.118/ 13.43	0.877	0.116/ 13.07	0.884	0.114/ 12.71	0.893	0.112/ 12.34	0.903	0.110/ 11.98	0.915
Intl-Bonds	0.102/ 11.65	0.875	0.092/ 10.39	0.886	0.083/ 9.14	0.904	0.074/ 7.88	0.936	0.066/ 6.63	0.993