

Defining the Right Benchmark for Fixed Income

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Summary

- **The traditional focus on interest rate and credit sensitivity need to expand to include a measure of the portfolio's liquidity exposure in greater detail using a credit and maturity combined approach.**
- **Our comparison of Bloomberg Barclays US Corporate Index (USCORP) and Nasdaq LadderRite IG 0-10Y Index (LDRIG010) has revealed USCORP's unfavorable liquidity exposure in low quality and long duration buckets.**
- **Nasdaq LadderRite's rigorous bond selection and laddering approach help to avoid over-concentration of duration risk and preserve better liquidity and investability.**
- **Using LadderRite and BulletShares, investors can easily deploy a passive fixed income strategy either starting from a selected liquid universe such as LDRIG010, or directly employ Invesco sponsored LadderRite and BulletShares ETFs to tailor-make their portfolios with predefined risk profiles.**

Portfolio construction for retail and institutional investors is based on a combination of different asset classes, primarily equity and fixed income. The asset class weights and specific allocations vary based on the client's specific needs and risk profile. Equities are often slotted with providing the long term appreciation needed for a portfolio's longevity. Equities have high variability (Standard Deviation), which makes them ideal for long term exposure but troublesome from shorter time frames or current income. Fixed income exposure is added to the portfolio to help control the variability associated with equity markets as well as current income. On their own, each asset class has its specific set of risks, some can be controlled while others are market dependent. Classic bond indexes with longer durations, which have been successful in falling rate environments, may have trouble in the face of an uncertain rate environment

Equity Risks versus Fixed Income Risks

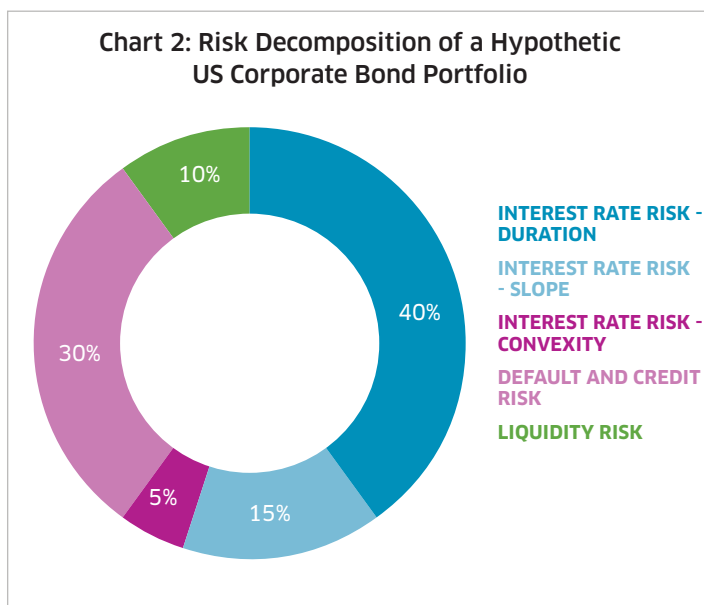
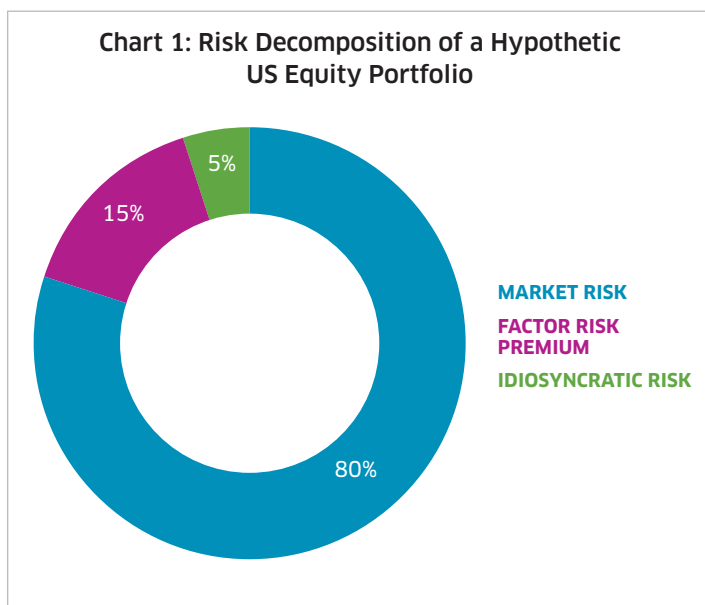
Fixed income as a whole is the largest investable asset class in the market. However, the risk return characteristics of the subsets in the market vary tremendously. This pushes fixed income investors to be more selective than equity investors when benchmarking their portfolios. The mandate of an investor or index increases or decreases the portfolio exposure to different measures of risk.

Equity risks are usually dominated by market beta, the measure of systematic risk relative to the market as a whole. Value, growth and other equity factor risks are also important to explaining the returns but in much smaller scales. All remaining unexplained equity risks belong to idiosyncratic or company specific risk.

Bonds are characteristically a different type of asset class than equities. Because of the relatively more certain future cash distribution streams, bond valuations are more sensitive to the macro level risk factors, such as interest rates, stage of the business cycle and currency fluctuations. Interest rate risk can be further broken down into three levels - duration, slope and convexity, which reflect the risks that different yield curve movements that can cause the bond prices to fluctuate. Duration is the primary risk factor to measure the overall changes of the interest rate yield curve. Slope is the secondary and another significant source of interest rate risk to measure if the long term interest rate will rise higher (yield curve steepening) or less (yield curve flattening) than the short term rate. While convexity measures the shape of the middle part of the yield curve (belly) to make adjustment based on the nonlinearity feature of the yield curve.

Default and credit risk are the other types of risk bond holders will face at the individual issuer level. They measure the likelihood bond holders will receive future payments. When a bond defaults, investors will obviously lose a large part or all of the held securities' present values and future payments. Even if an issuer hasn't defaulted or been downgraded but the risk has increased, the market will price the expectation and the issuer's bond prices will drop and credit spread will widen. Default and credit risks are usually idiosyncratic among different bond issuers but sometimes they can be simultaneously impacted by the shifting of economic trends.

Unlike most equities, bonds are thinly traded instruments. The thin volume can impact the bid ask spread, increasing the true the transaction costs traders pay to execute an order. Liquidity risk varies among different issuers, issue types, and sometimes among different market conditions. For example, treasuries are more liquid than municipal bonds, and bonds from large issuers are more liquid than those from small issuers. All else equal, senior bonds are more liquid than the subordinated bonds from the same issuers. Trading long dated bonds usually costs more than the short dated bonds, especially under an inflation environment with interest rates under the pressure to go up.



Credit and Maturity based Fixed Income Risk Comparison

Because of the multi-dimensional features of a bonds' risk profile and the significant liquidity impact to bond trading, fixed income managers have greater incentives to build a more diversified, risk balanced investment portfolio. The best risk management practices ask fixed income managers to deviate from the simplified measures of duration, yield or credit spread but to a more detailed approach to monitor the liquidity impact to their fixed income portfolios by credit and maturity matrixes in parallel.

Now let us look at two popular US based fixed income benchmarks: Bloomberg Barclays US Corporate Index (**USCORP**) and Nasdaq LadderRite IG 0-10Y Index (**LDRIGO10**). We will compare them using the traditional risk measures as well as the credit and maturity matrix in order to demonstrate the difference in risk profiling under the new framework.

Basic Bond Statistics

First, let's have a glance using some basic bond statistics such as rating, yield and duration. The comparison results are displayed in the following (table 1):

Table 1: Basic Bond Statistics

	USCORP	LDRIG010
Total Number of Bonds	5,832	2,784
Market Value	\$ 891	\$ 944
Rating	3.4 (A3/A-)	3.4 (A3/A-)
Maturity	10.6	4.6
Yield to Worst	3.91	3.48
Modified Duration	7.25	4.26

Source: Bloomberg and NASDAQ data as of 2019-2-28.

Calculations are based on index weighted averages.

The two bond indexes both have an average numerical rating of 3.4, which is equivalent to A3 in Moody's or A- in S&P. USCORP yields higher, 3.91% versus the 3.48% offered by LDRIG010. USCORP seems to enjoy a favorable yield pickup of 43 bps with bearing the same level of credit risk. USCORP's yield pickup however is offset by the more duration risk it bears: USCORP has an average maturity of 10.6 years and average duration of 7.25 years. It is much longer than LDRIG010's average 4.6 in maturity and 4.26 in duration.

1ST OBSERVATION: USCORP OFFERS A HIGHER YIELD BECAUSE OF THE LONGER DURATION.

Maturity based Bond Statistics

Our next step goes more granular to look at the statistics by maturity buckets (table 2a & 2b).

Table 2a: USCORP Breaks Down across Maturity Buckets

MATURITY	NUMBER	WEIGHT	MV \$MIL
0-3Y	1633	28.01	\$ 892
4-7Y	1607	28.50	\$ 922
8-10Y	699	11.78	\$ 876
>10Y	1893	31.72	\$ 871
Total	5832	100	\$ 892

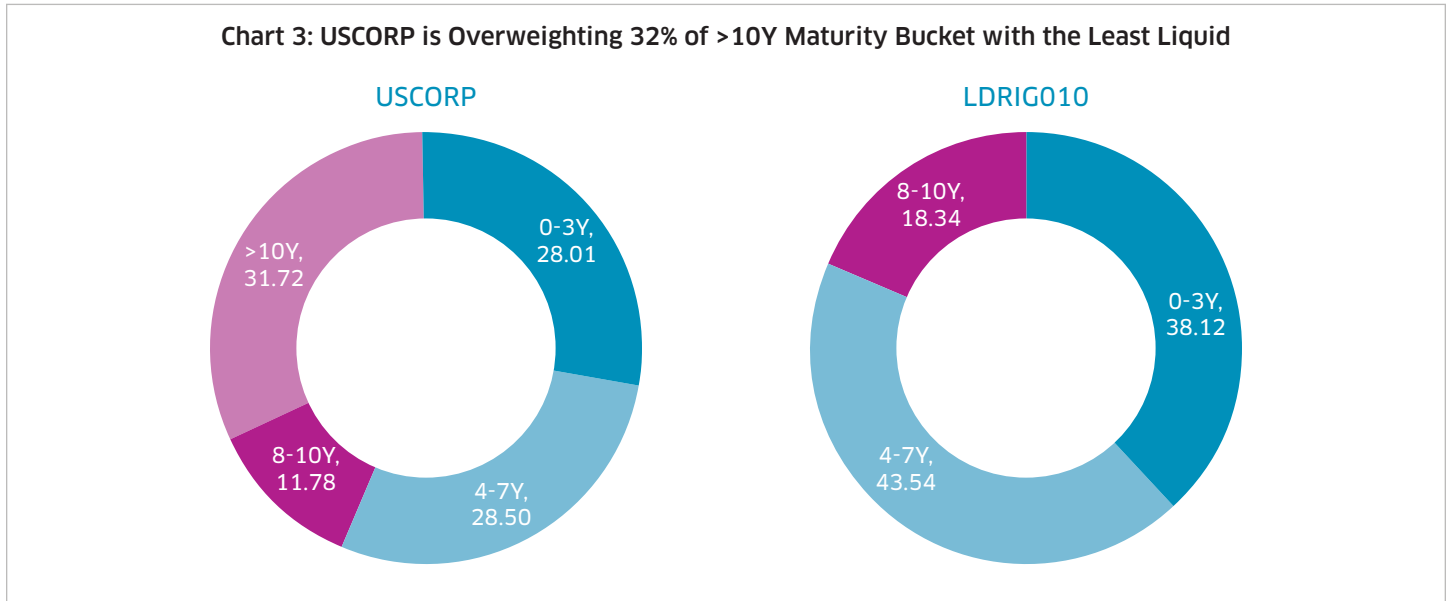
Table 2b: LDRIG010 Breaks Down across Maturity Buckets

MATURITY	NUMBER	WEIGHT	MV \$MIL
0-3Y	1441	38.12	\$ 695
4-7Y	1044	43.54	\$ 1,096
8-10Y	299	18.34	\$ 1,612
Total	2784	100	\$ 944

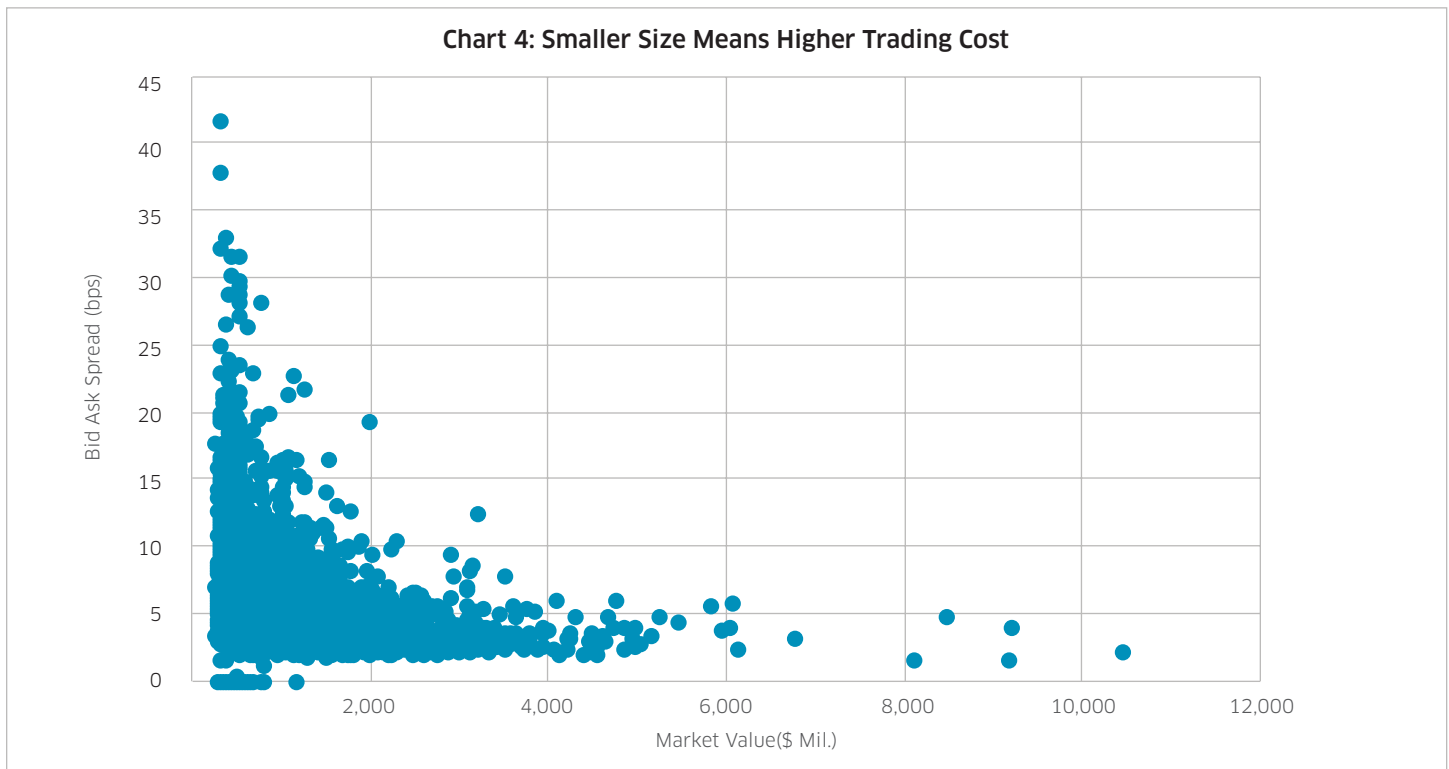
Source: Bloomberg and NASDAQ data as of 2019-2-28.

Calculations are based on index weighted averages.

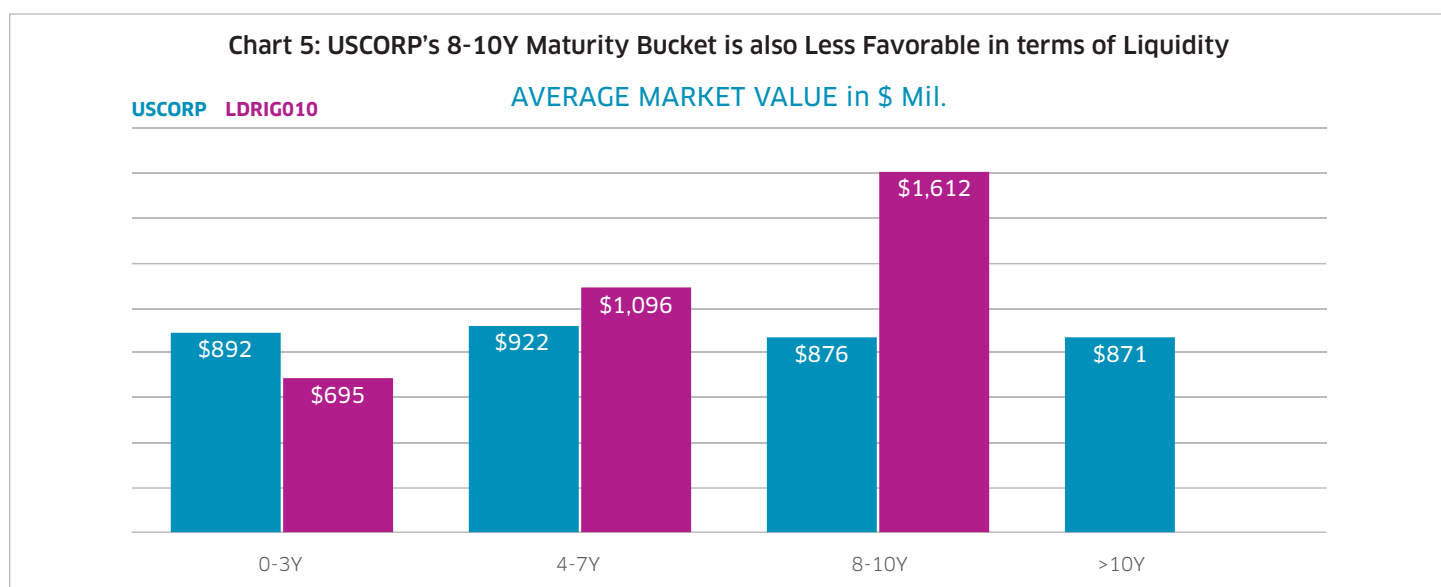
It is clear to our attention that USCORP holds nearly 32% of the bonds with maturities longer than 10 years (chart 3). Long term credit bonds are generally much less liquid than the short or intermediate term bonds with otherwise similar credit characteristics.



While lacking an explicit measure of liquidity, we can use market size, or equivalently the total amount outstanding, as a reasonable relative measure for liquidity. The relationship between bond’s market value and trading cost can be illustrated using the chart 4 below. The smaller the size, the wider the spread, and the less liquid the bond is. When comparing the average market values across maturity buckets, we found that LDRIG010 enjoys a more favorable liquidity than USCORP, especially in the 8 to 10 years bucket (chart 5).



Source: Bloomberg, USCORP data as of 2019-2-28



With the combined 32% overweight in the over 10Y bucket that has the lowest level of liquidity and the 12% 8-10Y bucket with smaller size and less attractive liquidity, it's easy for us to draw the conclusion that at least 44% of the USCORP bonds are less liquid than LDRIG010.

2ND OBSERVATION: USCORP'S LONG DURATION EXPOSURE BEARS MORE LIQUID RISK.

Credit and Maturity Matrix based Bond Statistics

Apart from the size of the issuance, credit quality is another major concern for a bonds' liquidity. For example, the investment grade corporate bond market is much larger and more liquid than the high yield market. Bonds with withdrawn rating (WR) or not rated (NR) will suffer with much worse liquidity problem because they can be excluded from many large investors' portfolios due to the fund obligations.

In our next experiment we are going to look at the exposure across credit ratings as well as maturities (table 3). We are especially interested in the long duration, lower quality buckets, because that's where liquidity is most scarce when it is needed the most.

Table 3: Breakdown by Credit and Maturity Matrix

CREDIT MATURITY MATRIX	WEIGHT (%)		MV (US\$ MIL)	
	USCORP	LDRIG010	USCORP	LDRIG010
AAA	2.20	1.81	1,301	3,390
AA	9.05	8.59	949	1,046
A	37.53	38.87	972	980
BBB	0-3Y	11.66	760	610
	4-7Y	13.89	830	1,002
	8-10Y	5.85	793	1,646
	>10Y	15.49	891	
BB	0-3Y	0.62	870	508
	4-7Y	0.86	913	701
	8-10Y	0.41	921	1,231
	>10Y	1.22	930	
WR/NR	1.22		592	
Total	100	100	892	944

Source: Bloomberg and NASDAQ data as of 2019-2-28. Calculations are based on index weighted averages.

USCORP has in total 32% of >10Y exposure and more than half are either BBB (15.49%) or BB (1.22%) rated. In contrast, LDRIO10's long duration, lower quality exposure appears to be less risky. It does not contain any exposure in >10Y bucket and its long duration low quality bonds are comparably more liquid because of the larger issuance size. For example, LDRIO10's BBB 8-10Y average size is US\$ 1646 million, approximately 2 times of the similar USCORP bonds. For BB 8-10Y bucket, LDRIO10 has average size of US\$ 1231 million and are also more favorable than USCORP's size of US\$ 921 million.

3RD OBSERVATION: LDRIG010 PRESERVES BETTER LIQUIDITY IN LOW QUALITY LONG DURATION BUCKETS.

Liquidity Rules for LadderRite Construction

All in all, our comparison analysis in the different lens of fixed income risk matrix suggested that LDRIG010 seems to be more successful in preserving liquidity, and eventually the investability.

LDRIG010 is weighted by a market capitalization targeting approach and has employed several rules in the security selection and portfolio construction steps to ensure adequate liquidity and investability:

1. Bonds must have minimum rating of BBB- Fitch or S&P or Baa3 by Moody's in order to be included in the eligible universe.
2. Bonds also must have an outstanding face value of at least \$500 million at the initiation stage.
3. Certain unpopular bond types are specifically excluded to ensure adequate investability¹.
4. Allocations are equally weighted across maturity buckets at the beginning of every rebalance. This laddering approach avoids the over-concentration of duration risk.
5. Within each maturity bucket, the individual positions in LDRIO10 are still weighted by market value to preserve the liquidity and investability.

CONCLUSION: LDRIG010'S RIGOROUS BOND SELECTION AND LADDERING APPROACH HELP TO AVOID OVER-CONCENTRATION OF DURATION RISK AND PRESERVE BETTER LIQUIDITY AND INVESTABILITY.

Re-benchmarking with LadderRite and BulletShares

Not only LadderRite, Nasdaq's BulletShares family were also constructed using similar security selection criteria. With the combination of LadderRite and BulletShares, it's easier to model out any fixed income portfolio with similar risk profile but a more liquid and investable universe.

Table 4: Summary Bond Statistics of Nasdaq BulletShares Index Family

	MATURITY YEAR	TOTAL NUMBER OF BONDS	MARKET VALUE (\$MIL.)	CREDIT RATING	MATURITY IN YEARS	YIELD TO WORST	MODIFIED DURATION
BSCBJ	2019	276	\$ 1,121	2.9 (A1/A+)	0.01	2.76	0.35
BSCBK	2020	385	\$ 1,077	3.3 (A3/A-)	1.00	2.97	1.27
BSCBL	2021	406	\$ 1,072	3.3 (A2/A)	2.00	3.11	2.14
BSCBM	2022	388	\$ 1,021	3.5 (A3/A-)	2.99	3.23	3.07
BSCBN	2023	324	\$ 1,021	3.5 (A3/A-)	3.99	3.39	3.85
BSCBO	2024	250	\$ 969	3.5 (A3/A-)	4.98	3.63	4.68
BSCBP	2025	242	\$ 1,141	3.6 (A3/A-)	5.98	3.74	5.47
BSCBQ	2026	249	\$ 1,135	3.5 (A3/A-)	6.97	3.88	6.28
BSCBR	2027	215	\$ 983	3.5 (A3/A-)	7.96	4.00	6.98
BSCBS	2028	147	\$ 956	3.7 (Baa1/BBB+)	8.94	4.09	7.50

Source: Nasdaq data as of 2019-2-28. Calculations are based on index weighted averages.

¹ Interested reader can read Appendix A for full disclosure of the index exclusion rule.

Suppose a fixed income manager has targeted a portfolio to track USCORP. Instead of fully replicating USCORP which has a large total number of securities, many with a small number of outstanding bonds and less favorable liquidity, they can leverage LadderRite and BulletShares' transparent, prudent security selection process to benchmark to a very liquid bond portfolio. For example, the investor can have 70% weighted in LDRIG010 and 30% weighted in BSCBS. Chart 6 has the remodeled benchmark maturity breakdown. You can see that the allocation is now much in line with the target. The aggregated yield and duration are tilted towards the target analytics without sacrificing too much the liquidity standard.

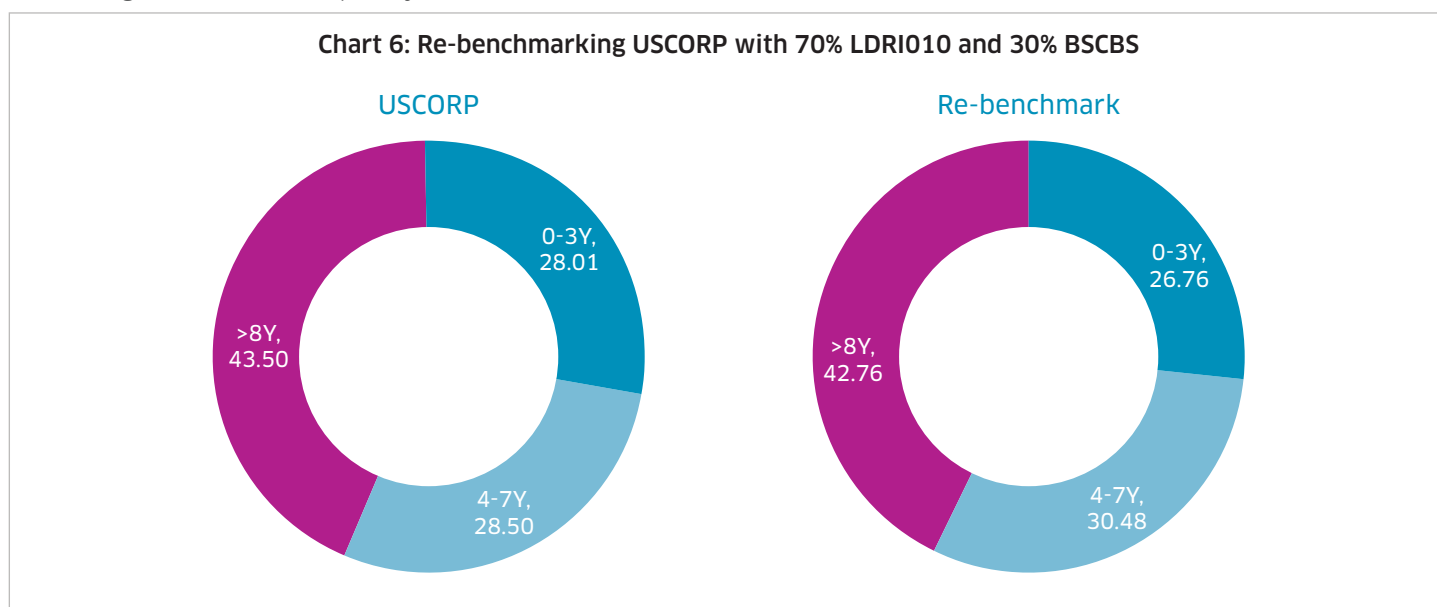


Table 5: Basic Bond Statistics Comparison

	USCORP	LDRIG010	RE-BMK
Total number of bonds	5,832	2,784	2,784
Average market value	\$ 892	\$ 944	\$ 944
Average Rating	3.4 (A3/A-)	3.4 (A3/A-)	3.5 (A3/A-)
Average Maturity	10.6	4.6	5.9
Yield to Worst	3.91	3.48	3.67
Modified Duration	7.25	4.26	5.23

Table 6: Credit and Maturity Matrix Comparison

CREDIT MATURITY MATRIX	WEIGHT (%)		MV (US\$ MIL)		
	USCORP	RE-BMK	USCORP	RE-BMK	
AAA	2.20	1.66	1,301	3,390	
AA	9.05	7.20	949	1,046	
A	37.53	35.18	972	980	
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	4-7Y	0.86	1.14	913	701
	>8Y	1.62	1.59	928	1,231
WR/NR	1.22	-	592		
Total	100	100	892	944	

Source: Bloomberg and NASDAQ data as of 2019-2-28. Calculations are based on index weighted averages.

Conclusion

Fixed income investments are subject to a spectrum of risks that are not often associated with equities. The need for risk management motivates fixed income managers to deviate from the simplified measures of duration, yield or credit spread to include a more detailed approach to measure the liquidity exposure by credit and maturity matrixes in parallel.

For example, our investigation of the two popular fixed income benchmarks, Bloomberg Barclays US Corporate Index (**USCORP**) and Nasdaq LadderRite IG 0-10Y Index (**LDRIG010**), has revealed the following observations:

1. USCORP offers a marginally higher current yield than LDRIG010 through the use of longer duration bonds, resulting in a portfolio duration two times longer than LDRIG010.
2. USCORP's longer duration bonds bear higher levels of liquidity risk than LDRIG010.
3. Comparatively, LDRIG010 preserved better liquidity in the most risky portfolio bucket with bonds made of longest durations and lowest credit qualities.

The Nasdaq LadderRite Exclusion rule (see **APPENDIX A**) has listed all the unfavorable security types that Nasdaq tried to avoid in order to preserve better liquidity in the portfolio. In addition, equal weighting across maturity buckets avoids the over-concentration of duration risk. Overall we have concluded that LDRIG010's rigorous bond selection and laddering approach help to avoid over-concentration of duration risk and preserve better liquidity and investability.

Nasdaq BulletShares family were constructed using the similar exclusion rule as LadderRite so they also maintain the same superior liquidity standard. For investment managers trying to deploy cost efficient passive fixed income strategies but are aware of the liquidity risk, the investment manager can implement the re-benchmarking in the following two ways:

The first approach is to start with a selected liquid universe such as the Nasdaq LadderRite IG 0-10Y Index (**LDRIG010**) and fix the remaining duration bias using individual bonds or BulletShares ETFs with defined maturities. This is the approach we've shown in the previous section.

The second approach is to directly employ market available ETFs to tailor-make portfolio with predefined risk profiles. Invesco launched ETFs tracking the Nasdaq USD Corporate Bond LadderRite and BulletShares Indexes.

Table 7: LadderRite and BulletShares ETFs

INDEX NAME	ETF NAME	TICKER
The NASDAQ LadderRite 0-5 Year USD Corporate Bond Index (LDRIG05)	Invesco LadderRite 0-5 Year Corporate Bond ETF	LDRI
The NASDAQ BulletShares USD Corporate Bond 2019 Index (BSCJ)	Invesco BulletShares 2019 Corporate Bond ETF	BSCJ
The NASDAQ BulletShares USD Corporate Bond 2020 Index (BSCK)	Invesco BulletShares 2020 Corporate Bond ETF	BSCK
The NASDAQ BulletShares USD Corporate Bond 2021 Index (BSCL)	Invesco BulletShares 2021 Corporate Bond ETF	BSCL
The NASDAQ BulletShares USD Corporate Bond 2022 Index (BSCM)	Invesco BulletShares 2022 Corporate Bond ETF	BSCM
The NASDAQ BulletShares USD Corporate Bond 2023 Index (BSCN)	Invesco BulletShares 2023 Corporate Bond ETF	BSCN
The NASDAQ BulletShares USD Corporate Bond 2024 Index (BSCO)	Invesco BulletShares 2024 Corporate Bond ETF	BSCO
The NASDAQ BulletShares USD Corporate Bond 2025 Index (BSCP)	Invesco BulletShares 2025 Corporate Bond ETF	BSCP
The NASDAQ BulletShares USD Corporate Bond 2026 Index (BSCQ)	Invesco BulletShares 2026 Corporate Bond ETF	BSCQ
The NASDAQ BulletShares USD Corporate Bond 2027 Index (BSCR)	Invesco BulletShares 2027 Corporate Bond ETF	BSCR
The NASDAQ BulletShares USD Corporate Bond 2028 Index (BSCS)	Invesco BulletShares 2028 Corporate Bond ETF	BSCS

Appendix A:

Nasdaq LadderRite IG 0-10Y Index (LDRIG010) Exclusion Rule

To ensure adequate investability, the following bond types are specifically excluded:

- Bonds with an initial term of less than one year.
- Reg S bonds, 144A bonds, Eurodollar bonds and EuroMTN bonds.
- Retail bonds.
- Floating rate bonds.
- Zero coupon bonds.
- Convertible bonds.
- Bonds cum or ex-warrant.
- Bonds with one cash flow only.
- New bonds that have already been called.
- Bonds that permit issuers to make coupon payments either in cash or in new debt securities (i.e., PIK-toggle bonds).
- Inflation or other index-linked bonds.
- Bonds guaranteed by an agency, national or supranational government (including FDIC or TLGP).
- Perpetual securities (including Trust Preferred).
- Securities for which the Index Provider is unable to, or is prohibited from providing an evaluated price.

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