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The Low Vol. Phenomena across Assets: Bonds vs. Equities of HY-rated Issuers

Americas Advisory Council

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Low Vol. Across Asset Classes: High-Yield Bonds vs. Stocks

- The ‘Low Vol.’ phenomena – the tendency of lower-risk stocks to outperform high-risk stocks on a risk-adjusted basis is widely documented (Ang, Hodrick, Xing, and Zhang 2006; Frazzini and Pedersen 2014)
- A similar pattern was also detected within bonds: short-maturity bonds had better risk-adjusted performance than long-maturity bonds (Ambastha, Ben Dor, Dynkin, and Hyman 2008)
- For the first time, we are evaluating the ‘Low Vol.’ phenomenon across asset classes, focusing on HY bonds vs. equities because their returns have a high correlation
- **What’s challenging about the analysis?**
 1. Need mapping between bonds and equities
 2. Need effective ways to match risk to make sure that any difference in performance is not attributable to risk difference

Outline

Mapping between Bonds and Equities



Risk Measures used in Matching



Performance in Sub-Samples and Europe



Evaluate Pair-wise Differences



Analysis in IG and using Indices

Mapping between Bonds and Equities

Debt – Equity Sample Construction

- All issuers in the US credit (Jan 1990 – Dec 2017) and Pan Euro credit indices (May 2002 – Dec 2017) were linked to accounting and equity data from COMPUSTAT
- **Key challenges: Lack of common firm identifiers and corporate events**
- Mapping is based on methodology used in BEAM (Bonds in Equity Asset Momentum)*

Results

- Mapping success (IG and HY) increased consistently over time
- In recent years, mapped sample covered 90% in mkt cap, almost 100% for US IG
- Most unmapped HY issuers had no identifiers (private firms)

Matching of Corporate and High Yield Index Constituents to COMPUSTAT											
Year End Market Value	US (\$ Bln)						Pan Euro (Euro Bln)				
	1994	1999	2004	2009	2013	2017	2003	2007	2011	2014	2017
Corporate Index	560	914	1,697	2,555	3,727	5,192	1,003	1,205	1,607	1,930	2,330
Mapped	85%	87%	94%	98%	97%	98%	77%	90%	86%	87%	88%
HY Index	144	351	610	747	1,270	1,339	63	77	154	348	330
Mapped	68%	65%	83%	82%	80%	85%	56%	67%	66%	74%	73%
Agg. Universe (IG+HY)	704	1,265	2,307	3,302	4,996	6,531	1,065	1,282	1,761	2,279	2,660
Mapped	82%	81%	91%	94%	93%	96%	76%	89%	84%	85%	86%

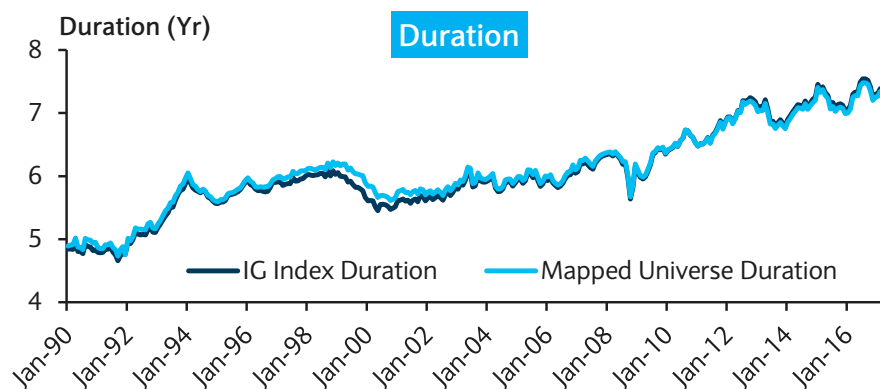
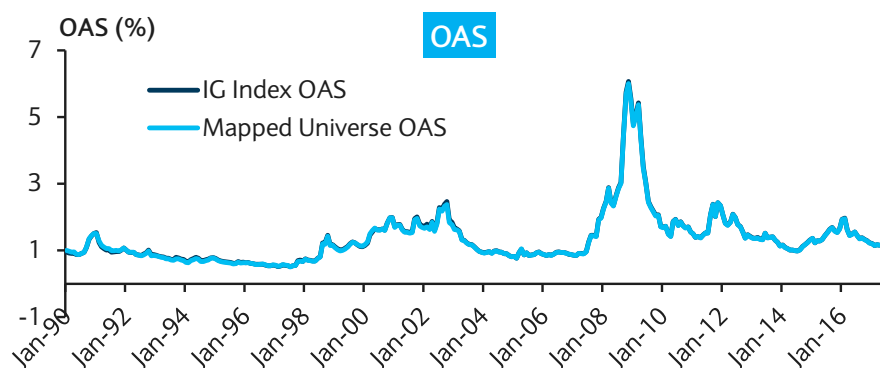
Source: Compustat, Barclays Research

*Ben Dor, A., and Xu, J., [BEAM \(Bonds in Equity Asset Momentum\) Value of Bond Market Information in Equity Momentum Strategies](#), Barclays Capital, 5 June 2014

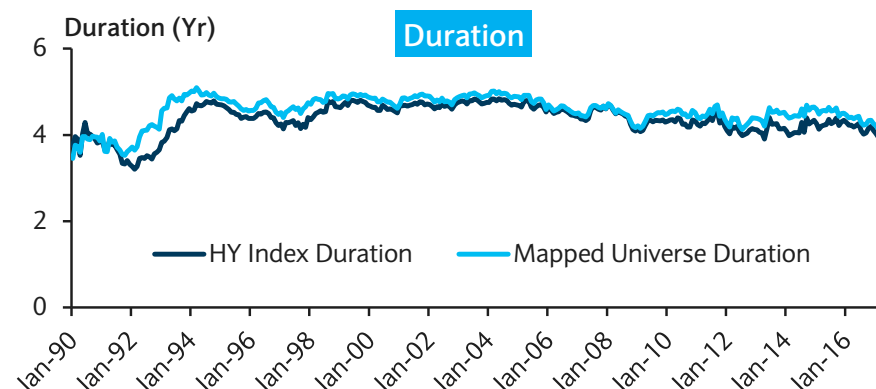
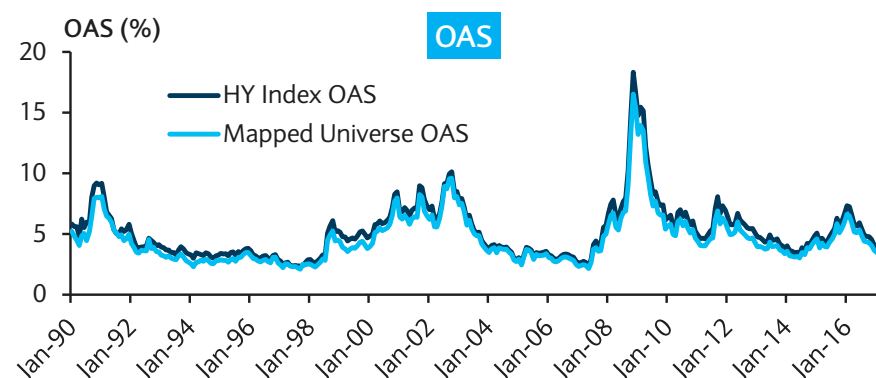
Mapped Samples Are Similar to IG and HY Indices

- Our mapped bond universe was similar to the IG and HY indices in terms of spread and duration

Mapped Univ. vs. Index – US IG



Mapped Univ. vs. Index – US HY



Source: Compustat, Barclays Research

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Mapped HY Equity Universe vs. Russell Indices

- On average, 41% of the mapped HY equity sample was in the RS1000 and 31% was in the RS 2000
- The mapped HY equity sample had similar characteristics as the Russell 2000, but the median individual stock performance (ret and S.R.) was better than either index

% of Mapped HY Equity that are in Russell Indices

		RS1000	RS2000	Other
Jan. 2018	% of Stocks that are in	38%	27%	35%
	% of Equity MV that are in	75%	4%	21%
Historical Avg. (Jan. 1990 - Jan. 2018)	% of Stocks that are in	41%	31%	28%
	% of Equity MV that are in	78%	5%	17%

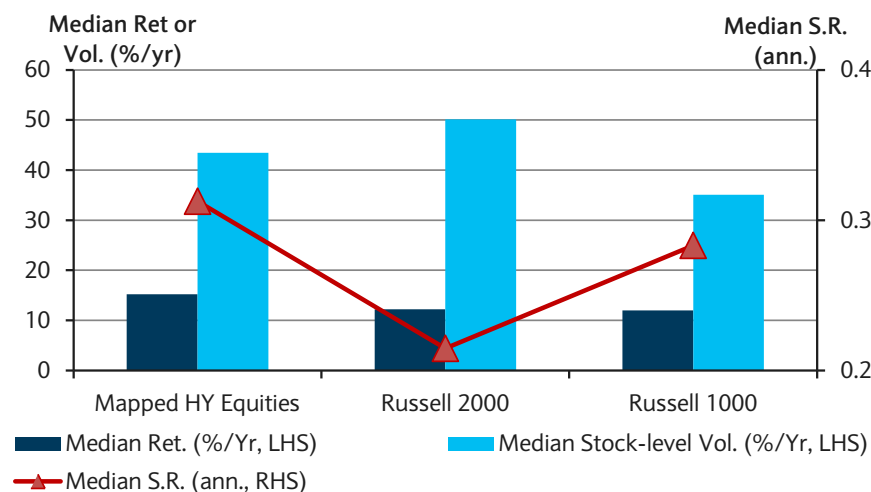
Source: Bloomberg, Compustat, Barclays Research

Characteristics (Jan. 1990 – Jan. 2018)

Universe	Avg. Mkt Cap (\$MI)	B/M Ratio	$\beta_{S\&P500}$	Dividend Yield (%/y)	% Paying Dividend
Mapped HY Equities	3,139	0.61	1.26	1.61	39%
Russell 2000	581	0.55	1.26	1.38	40%
Russell 1000	11,759	0.43	1.03	2.04	69%

Note: B/M, beta, and dividend yield were calculated as value-weighted average for each month. Avg. Mkt cap and % paying dividend were calculated as equally-weighted average each month. The time-series averages were reported in the table.
Source: Bloomberg, Compustat, Barclays Research

Median Individual Stocks Performance (Jan. 1990 – Jan. 2018)



Note: Average return, vol. and S.R. were calculated for each individual security for their entire duration in the sample and the cross-section medians are reported.
Source: Bloomberg, Compustat, Barclays Research

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Risk Measures Used in Matching

Methodology

- Risk Measures

- ❖ Primary – matching total Volatility of bonds and equities

- ❖ We also use two other risk measures:

- 1. Factor Sensitivities

- 2. Income

- Comparison Methodology

- 1. Portfolio Analysis

- Same Constituents: Mapped HY bonds and equities

- Same Weights: bond and equity returns were aggregated using four weighting schemes: *equal weights, bond MV, equity MV, and total MV* (bond+equity)

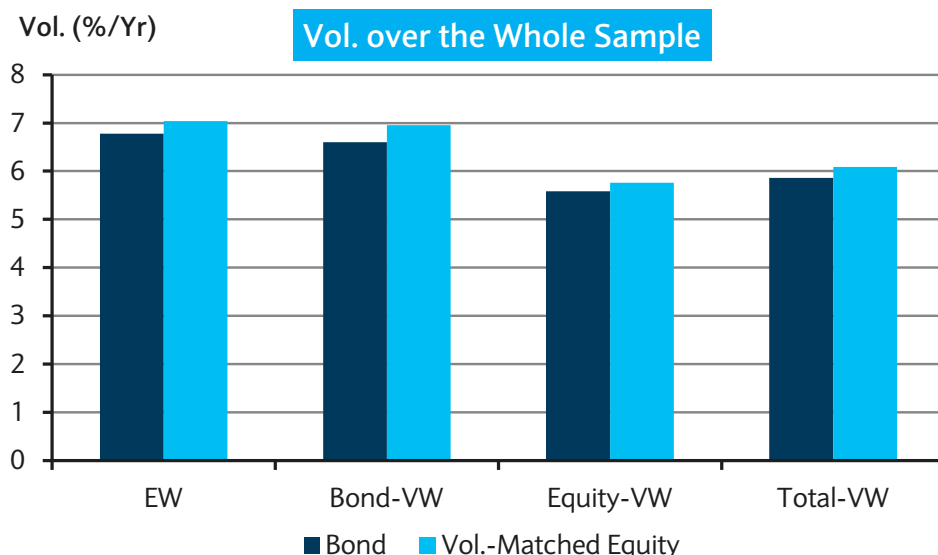
- 2. Pair-wise Comparison

1. Volatility Matching

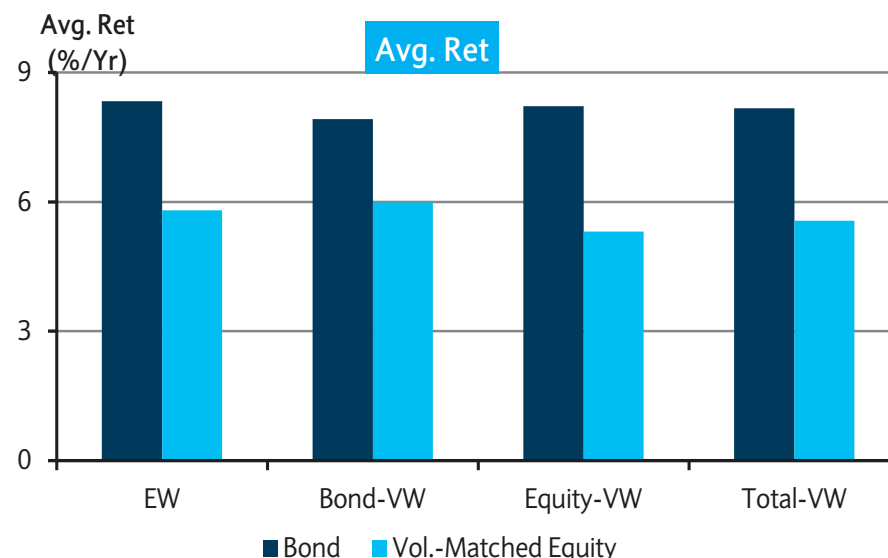
HY Bonds Had Higher Avg. Returns than Equities Matched by Vol.

- Scaling equity returns using the ratios of trailing 36m vol. generated equity portfolios with almost identical vol. as the HY bond portfolio post-formation
 - ❖ Any excess weight is allocated to T-bills
- With similar vol., HY bond portfolios had higher average returns than the vol-matched equity portfolios, regardless of the weighting scheme

**Vol. of Bonds vs. Vol.-matched Equity
(Jan. 1993 – Jan. 2018)**



**Avg. Ret. of Bonds vs. Vol.-matched Equity
(Jan. 1993 – Jan. 2018)**



Note: the mapped HY bond universe has a price filter of \$40 to exclude bonds traded on recovery. Results were similar using no price filter

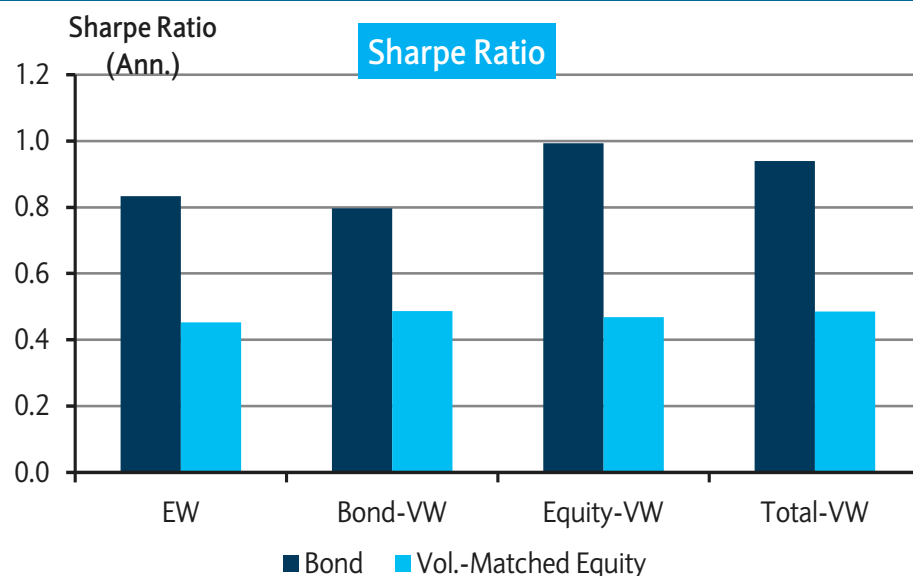
Source: Compustat, Barclays Research

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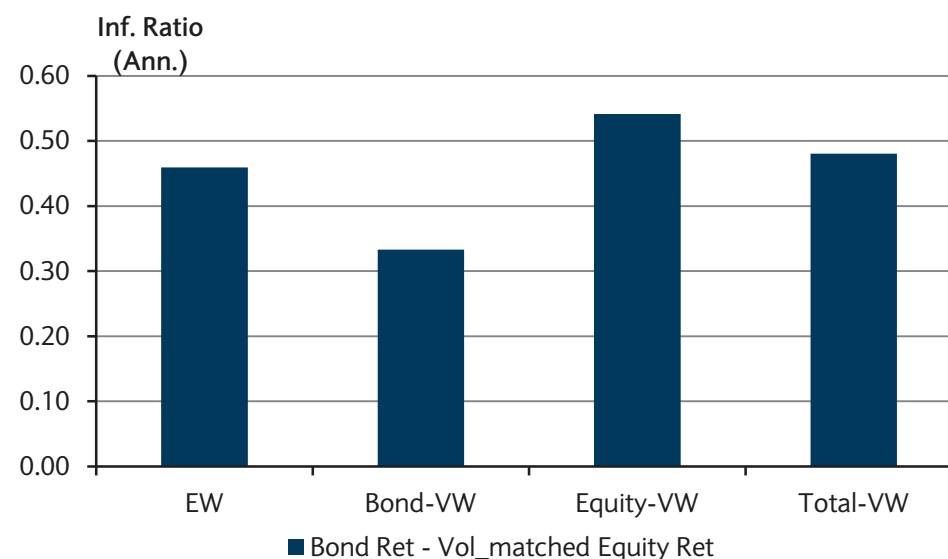
HY Bonds Portfolios Had Higher S.R. than Vol.-Matched Equity

- Regardless of the weighting scheme, high yield bonds had higher S.R. on average than equities of the same company
- The I.R. of bonds over vol-matched equity ranged from 0.33 to 0.54 with different weighting schemes

**Sharpe Ratios of Bonds vs. Equity
(Jan. 1993 – Jan. 2018)**



**Inf. Ratios of Bonds over Vol-matched Equity
(Jan. 1993 – Jan. 2018)**

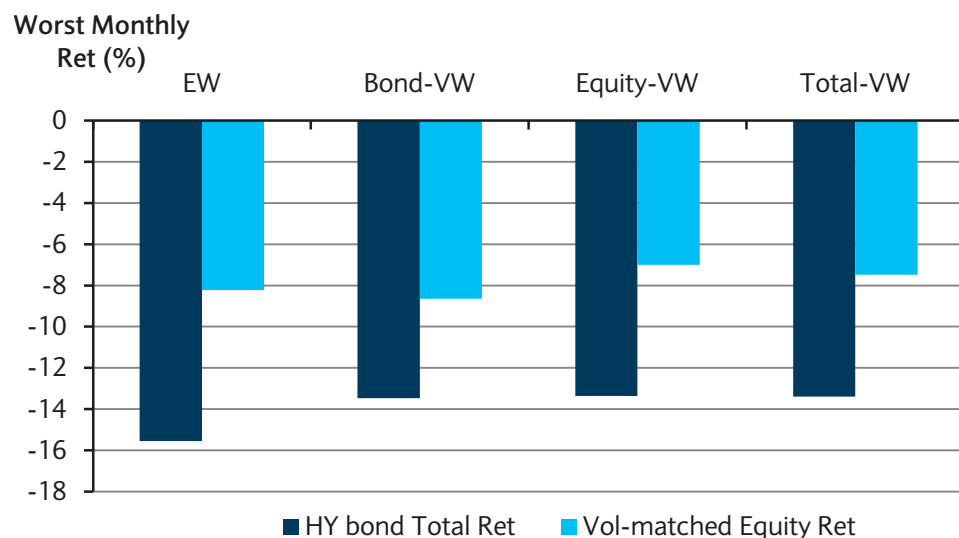


Source: Compustat, Barclays Research

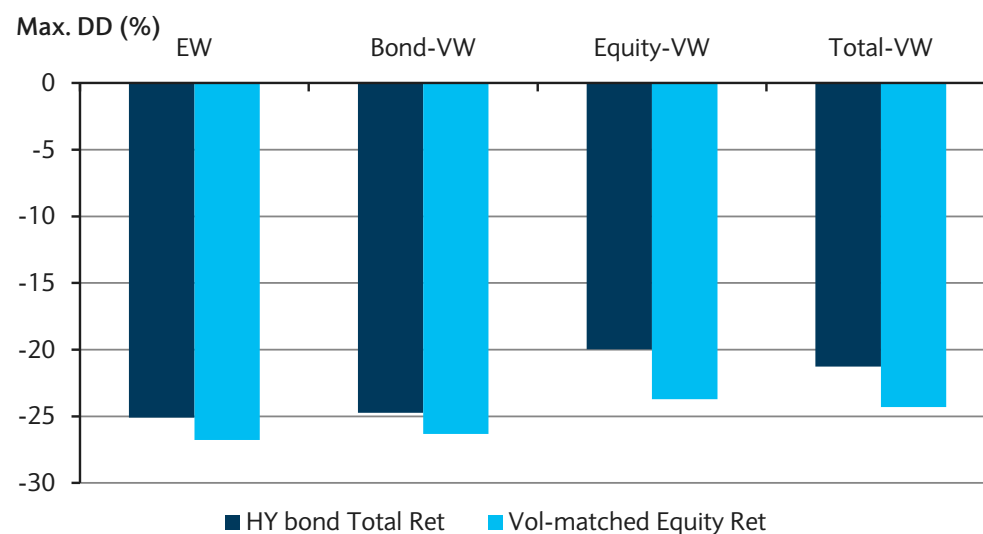
What about Tail Risk Measures?

- HY bonds had more negative worst monthly returns, but slightly better max. DD compared to vol-matched equity portfolio returns

Worst Monthly Ret. of Bonds vs. Vol.-matched Equity (Jan. 1993 – Jan. 2018)



Max. DD of Bonds vs. Vol.-matched Equity (Jan. 1993 – Jan. 2018)



Source: Compustat, Barclays Research

Performance Statistics of HY Bonds vs. Vol.-Matched Equities

Performance Statistics of Bonds vs. Equity (Jan. 1993 – Jan. 2018)							
Weighting Scheme	Return Series	Avg. Ret (%/Yr)	Vol. (%/Yr)	Sharpe (Inf.) Ratio (Ann.)	Worst Monthly Ret (%)	Max. DD (%)	Corr. with HY bond tot ret
EW	Bond	8.34	6.78	0.83	-15.55	-25.09	
	Vol-matched Equity	5.81	7.04	0.45	-8.23	-26.78	0.68
Bond-VW	Bond	7.93	6.60	0.80	-13.48	-24.74	
	Vol-matched Equity	5.99	6.96	0.49	-8.64	-26.32	0.64
Equity-VW	Bond	8.22	5.58	0.99	-13.36	-19.98	
	Vol-matched Equity	5.31	5.76	0.47	-7.00	-23.72	0.55
Total-VW	Bond	8.17	5.86	0.94	-13.39	-21.26	
	Vol-matched Equity	5.56	6.08	0.49	-7.48	-24.31	0.59
EW		2.53	5.51	0.46	-7.33	-13.49	
Bond-VW	Bond over Vol.-Matched Equity	1.93	5.79	0.33	-6.24	-20.77	
Equity-VW		2.91	5.37	0.54	-6.36	-15.51	
Total-VW		2.61	5.43	0.48	-5.91	-16.75	

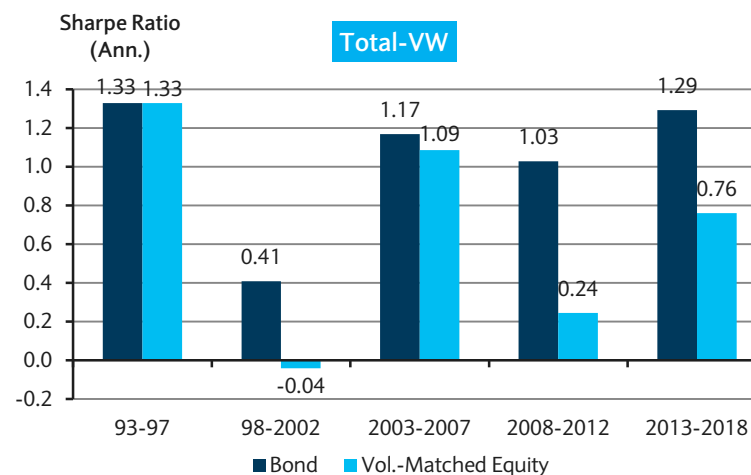
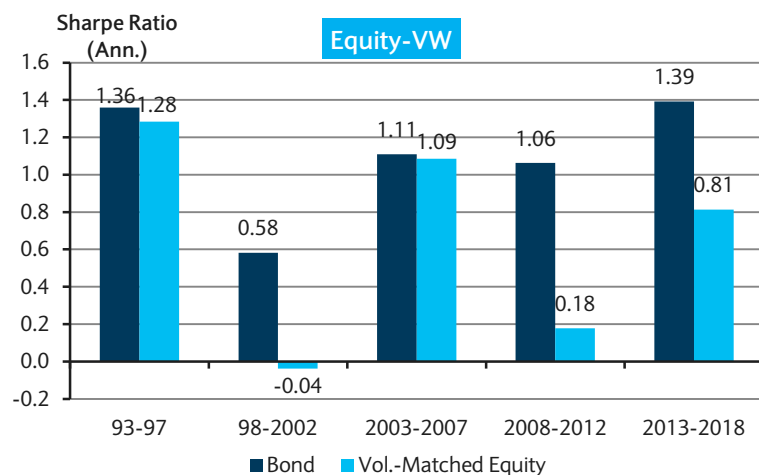
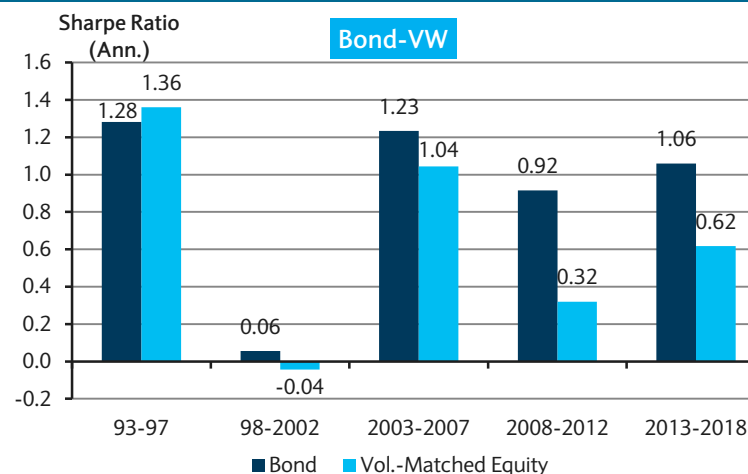
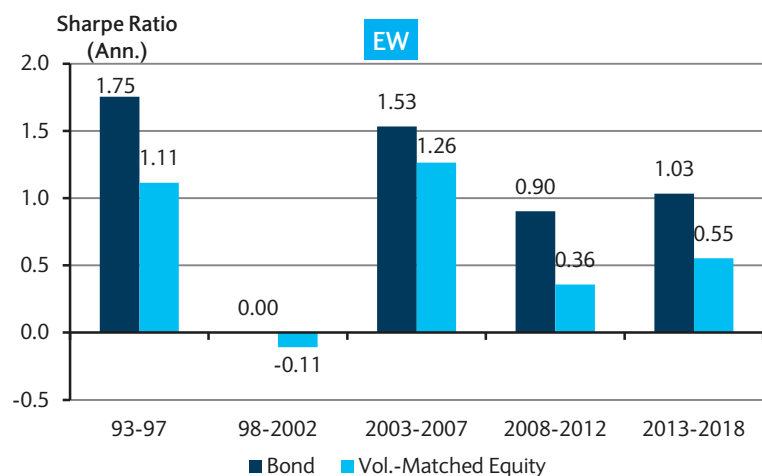
Source: Compustat, Barclays Research

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Bonds Had Higher S.R. in All Sub-Periods

- HY bonds had higher S.R. than vol-matched equity portfolios in sub-period regardless of weighting schemes

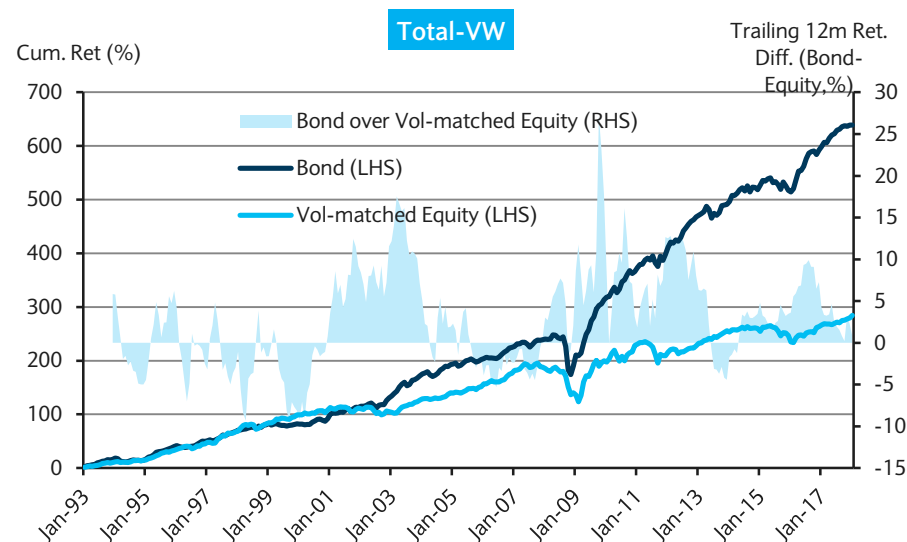
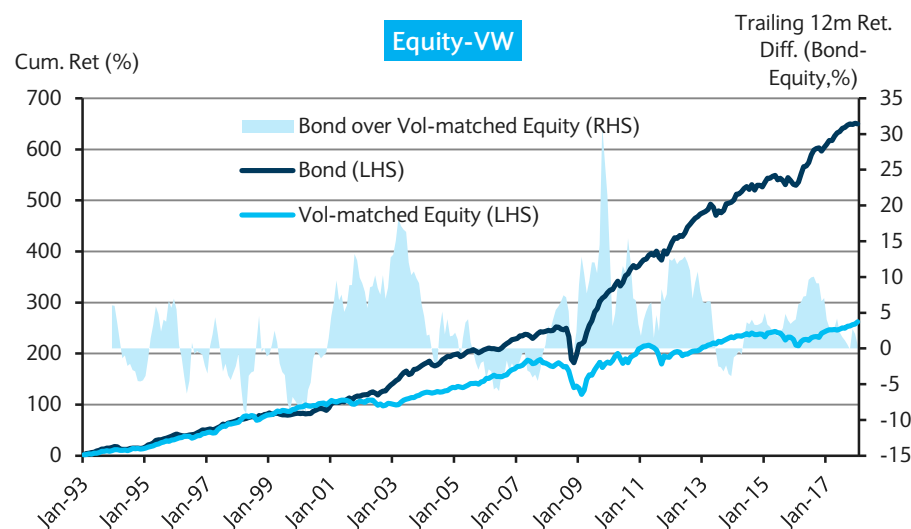
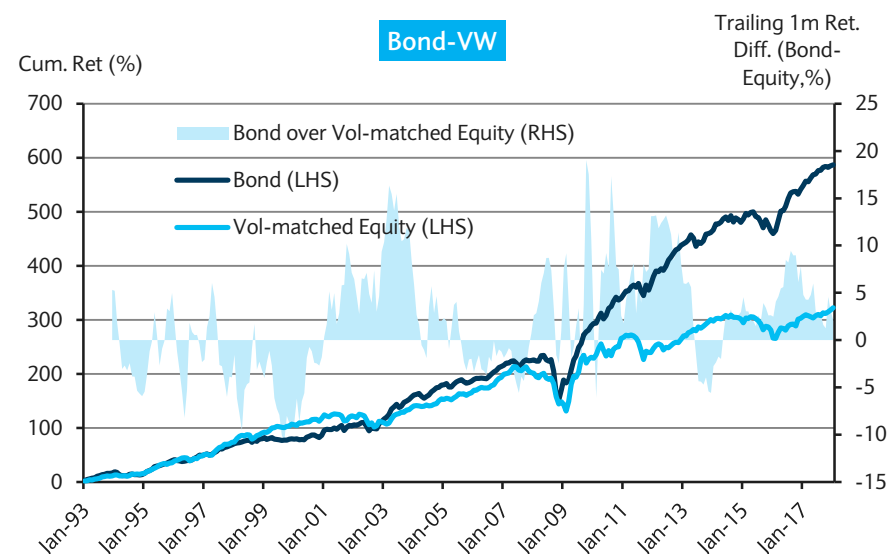
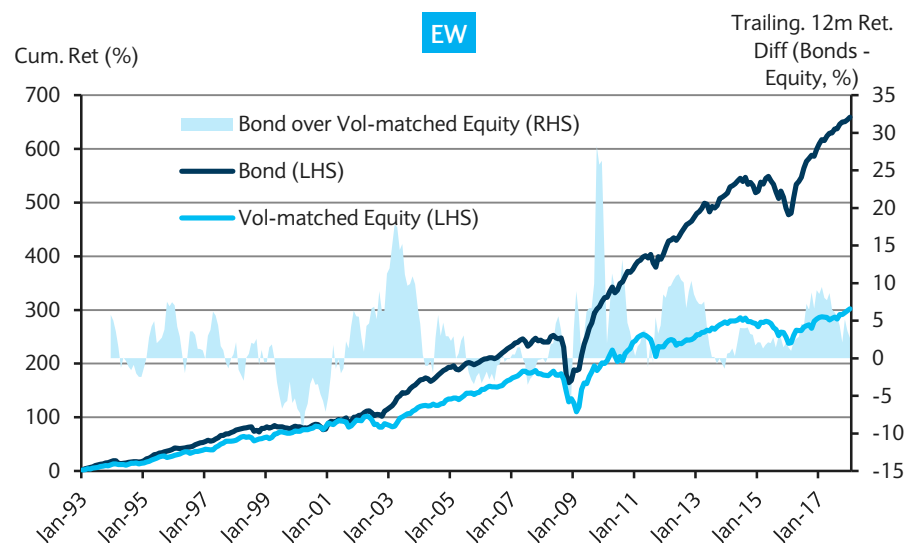
Sharpe Ratios of Bond vs. Equity in Sub-Periods



Source: Compustat, Barclays Research

Bond Portfolios Showed Persistent Outperformance

- Bond portfolios showed persistent outperformance over equities, especially using equity MV or total MV as weights



Source: Compustat, Barclays Research



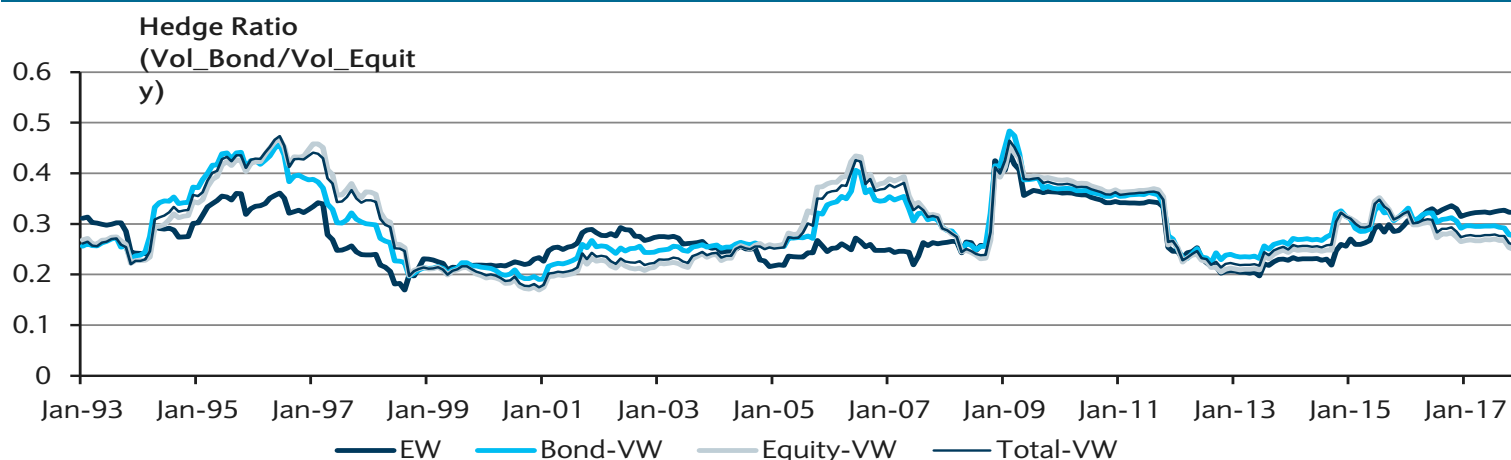
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Hedge Ratio Insensitive to Weighting Schemes

- The equity portfolio HR varied between 0.2 to 0.5 over time with an average of 0.3
- The avg. HR is very similar across different weighting schemes
- In most months, the difference in HR using different weighting schemes was small

Hedge Ratio (Jan. 1993 – Jan. 2018)				
	EW	Bond-VW	Equity-VW	Total-VW
Avg. HR (Vol_Bond/Vol_Equity)	0.28	0.30	0.30	0.30
Stdev. (HR)	0.05	0.07	0.08	0.07

Hedge Ratio over time (vol_bond/vol_equity, Jan. 1993 – Jan. 2018)



Source: Compustat, Barclays Research

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Bond Outperformance Was Not Driven by Risk Matching

- Bond portfolios had higher S.R. compared with the equity portfolios without scaling

HY bonds and equity indices and portfolio returns using different weighting schemes (Jan. 1990 – Jan. 2018)

		Avg. Ret (%/Yr)	Vol. (%/Yr)	Sharpe Ratio (Ann.)	Worst Monthly Ret (%)	Max. DD (%)
Bond	Bloomberg Barclays U.S. HY Index*	8.70	7.62	0.75	-15.81	-31.86
	EW	9.01	6.82	0.88	-15.55	-25.09
	Bond-VW	8.53	6.47	0.86	-13.48	-24.74
	Equity-VW	8.92	5.55	1.07	-13.36	-19.98
	Total-VW	8.83	5.79	1.01	-13.39	-21.26
Equity	Russell 2000 Index	11.19	18.68	0.44	-20.80	-52.89
	EW	12.87	22.82	0.43	-29.80	-68.20
	Bond-VW	13.04	21.53	0.47	-27.30	-66.32
	Equity-VW	10.54	18.61	0.41	-26.61	-63.77
	Total-VW	11.43	19.41	0.44	-26.80	-64.23

Note: the HY bond index and mapped bond universe have a price filter of \$40 to exclude bonds traded on recovery.
Source: Compustat, Bloomberg, Barclays Research

2. Sensitivity Matching

Matching Portfolios by Factor Sensitivities

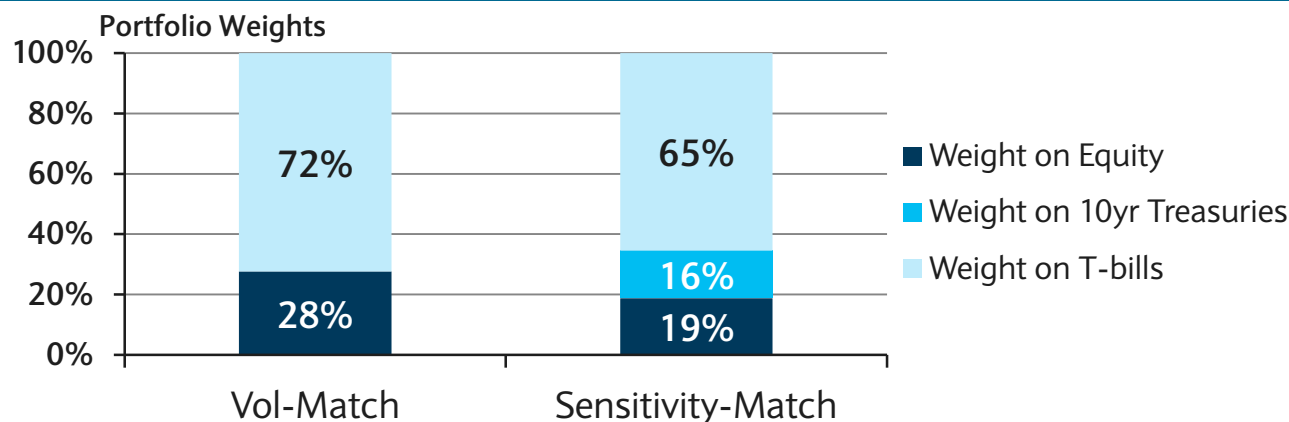
- Each month, we constructed a sensitivity-matched portfolio using equity and 10y OTR Treasuries by matching their $\beta_{\text{S\&P 500}}$ and $\beta_{\text{10yr Treasuries}}$, estimated from trailing 36m data
- Excess weights were allocated to T-Bills
- Ex-ante sensitivities were similar across all weighting schemes

Pre-Formation Avg. Sensitivities

(Trailing 36m Regression, Avg. across time series from Jan. 1993 - Jan. 2018, EW)

Portfolio	$\beta_{\text{S\&P 500}}$	% of month with 5%-significance	$\beta_{\text{10y Treasury ret.}}$	% of month with 5%-significance	Adj. R2
Bond	0.25	87%	0.08	43%	41%
Equity	1.29	100%	-0.39	24%	67%

Average Portfolio Weights (Jan. 1993 – Jan. 2018, EW)



Source: Compustat, Barclays Research

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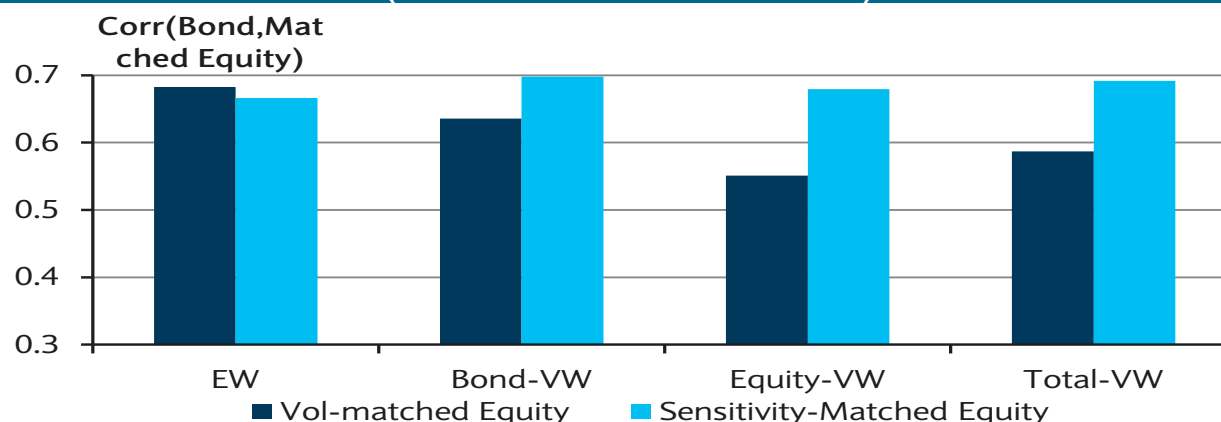
Post-Formation, Bond and Matched Equity Had Same Exposure

- Post-formation, bond and sensitivity-matched equity portfolios had no difference in their factor exposures
- Bond and sensitivity-matched equity portfolio also had correlation close to 0.70
- Similar results across weighting schemes

Post-Formation Portfolio Return Sensitivities (Jan. 1993 - Jan. 2018, EW)

Portfolio	Intercept	T-Stat	$\beta_{\text{S\&P500}}$	T-Stat	$\beta_{\text{10y Treasury ret.}}$	T-Stat	adj. R2
Bond over Sensitivity Matched Equity	0.36	2.40	-0.04	-0.80	-0.04	-0.48	0.6%
Bond	0.48	2.99	0.28	4.26	0.01	0.10	31%
Sensitivity-Matched Equity	0.12	1.54	0.32	11.93	0.05	1.02	59%

Post-Formation Correlation b/w Bond and Matched-Equity Portfolios (Jan. 1993 - Jan. 2018)



Source: Compustat, Barclays Research

Bond Outperformed Sensitivity-Matched Equities

- Compared with over vol.-matched equities, the bond outperformance over sensitivity-matched portfolio is
 - ✓ larger in magnitude
 - ✓ lower in vol. and higher in I.R.

Performance of HY Bonds vs. Matched Portfolios (Jan. 1993 – Jan. 2018)

Weighting Scheme	Return Series	Avg. Ret (%/Yr)	Vol. (%/Yr)	Inf. Ratio (Ann.)	Worst Monthly Ret (%)	Max. DD (%)	Corr (Bond, Matched Equity)
EW	Bond over Sensitivity-Matched Equity	3.39	5.15	0.66	-6.91	-15.02	0.67
Bond-VW		2.45	4.79	0.51	-4.46	-11.81	0.70
Equity-VW		3.37	4.13	0.82	-5.94	-9.61	0.68
Total-VW		3.10	4.26	0.73	-5.55	-10.22	0.69
Avg. across weighting		3.08	4.58	0.68	-5.71	-11.66	0.68
EW	Bond over Vol.-matched Equity	2.53	5.51	0.46	-7.33	-13.49	0.68
Bond-VW		1.93	5.79	0.33	-6.24	-20.77	0.64
Equity-VW		2.91	5.37	0.54	-6.36	-15.51	0.55
Total-VW		2.61	5.43	0.48	-5.91	-16.75	0.59
Avg. across weighting		2.50	5.53	0.45	-6.46	-16.63	0.61

Source: Compustat, Barclays Research

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3. Income Matching

Income Matching using Yield

- We constructed replicating portfolios for HY bonds using equities and 2y OTR Treasuries by matching both yield and vol. (trailing 36m)
- HY bond portfolios had advantages as income-generating instruments
 - ❖ For about 30% of the months, it is impossible to match the yield level of bond portfolio while maintaining the same vol. (for these months, we match vol. while maximize yield)
 - ❖ Constructing the replicating portfolio requires high leverage*

Note: we assumed the borrowing cost for 2yr treasuries is Fed. Fund Rate + 15bps/yr

- Results were similar across weighting schemes and using coupon returns as measure of income

Average Yield (Jan. 1993 – Jan. 2018)								Average Portfolio Weights (Jan. 1993 – Jan. 2018)		
Equity			Avg. Yield (%)						Weight on Equity	Weight on 2yr Treasuries
	Avg. Dividend Yield (%/yr)	% of Companies Paying Dividends	2y Treasuries	Bond	Yield-Matched Portfolio	Bond - Yield Matched Portfolio				
Mapped Bond and Equity Sample	EW	1.23	3.04	8.41	6.68	1.72	35%	EW	23%	266%
	Bond-VW	1.62		7.31	6.17	1.14	28%	Bond-VW	27%	271%
	Equity-VW	1.39		6.82	5.68	1.14	33%	Equity-VW	25%	244%
	Total-VW	1.46		6.96	5.79	1.18	32%	Total-VW	26%	249%
	Across Weighting	1.43		7.37	6.08	1.30	32%	Average across Weighting Schemes	25%	257%
Indices (HY and RS2000)		1.45	40%	8.83	7.18	1.65	34%			

Source: Compustat, Barclays Research

Income-matched equities generated similar results as bonds

- Despite the high leverage that the matched equity portfolio had, it did not generate higher returns except in the case of using bond-VW weighting

Performance of HY Bond vs. Income Matched Portfolios (Jan. 1993 – Jan. 2018)

Weighting Scheme	Avg. Ret (%/Yr)	Vol. (%/Yr)	Sharpe Ratio (Ann.)	Worst Monthly Ret (%)	Max. DD (%)	Corr. with bond portfolio
EW	0.06	7.08	0.01	-13.59	-36.93	0.50
Bond-VW	-0.93	6.44	-0.14	-11.79	-39.93	0.55
Equity-VW	0.67	5.52	0.12	-11.47	-18.75	0.54
Total-VW	0.19	5.75	0.03	-11.43	-21.40	0.55

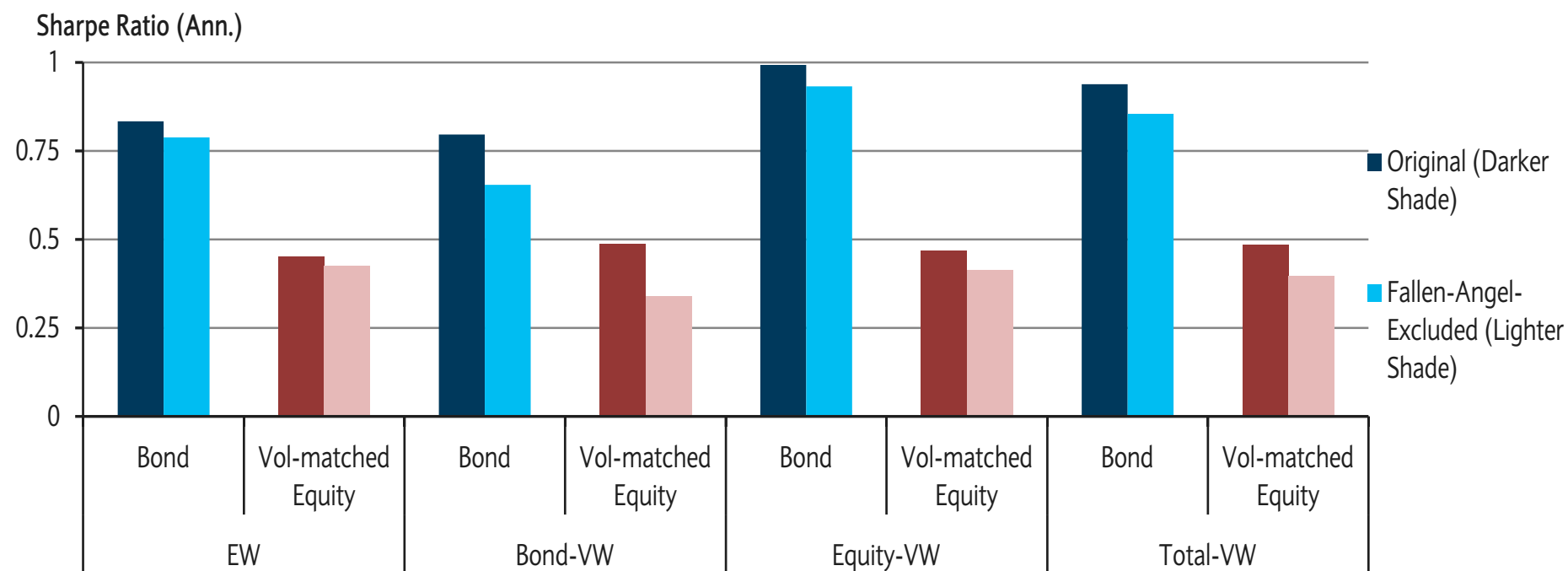
Note: we assumed the borrowing cost for 2y Treasuries is Fed. Fund Rate + 15bps/yr
Source: Compustat, Barclays Research

Evaluating Bond Performance over Equity in Sub-Samples and Europe

Were Bond returns Driven by Fallen Angels?

- No. Excluding Fallen Angels (bonds that were in IG in any month during previous 24m-period) had **no material effect** on the outperformance of HY bonds over equities

Sharpe Ratios of Original Sample vs. Sample excluding Fallen Angels (Jan. 1993 – Jan. 2018)

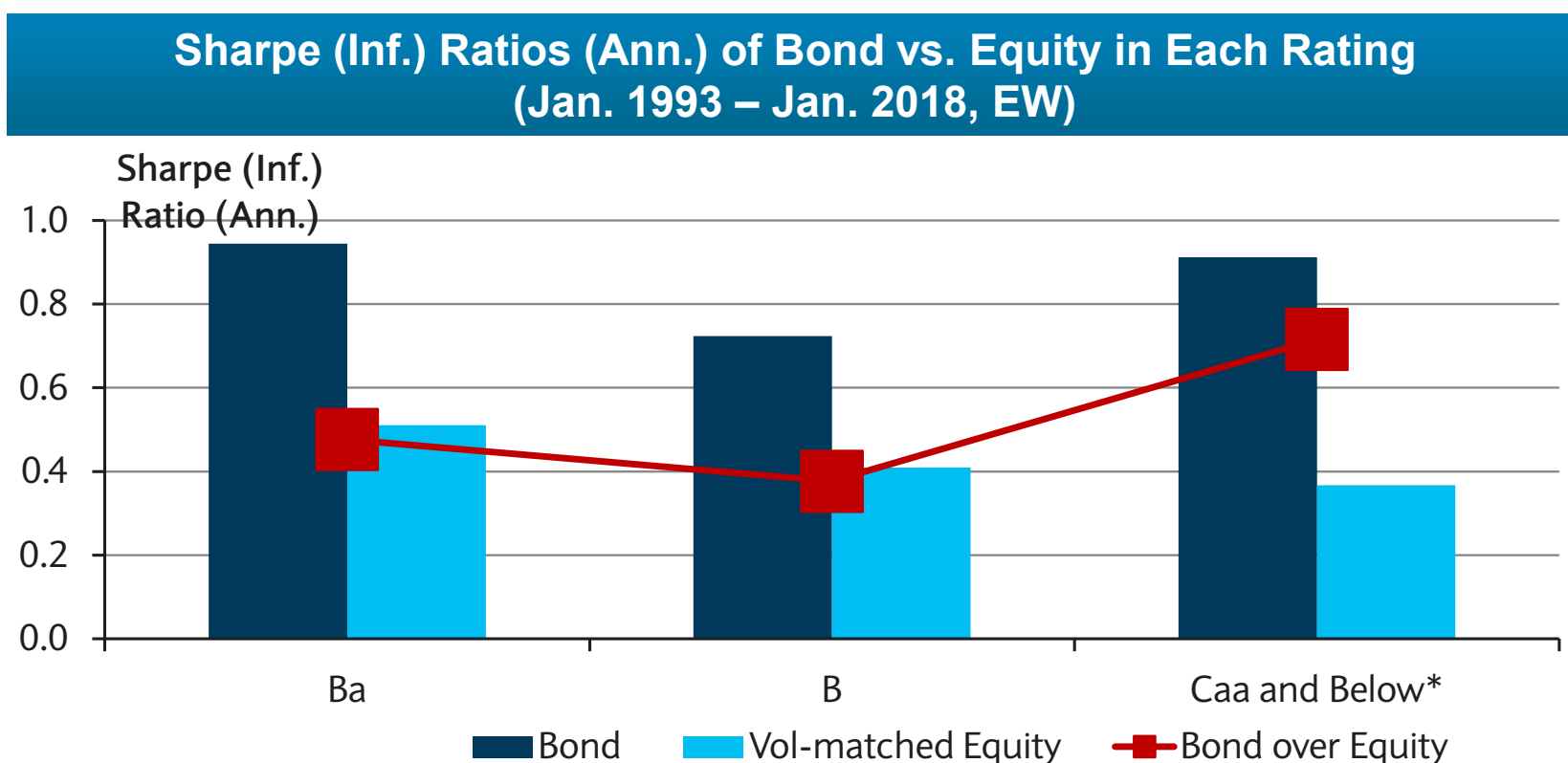


Source: Compustat, Barclays Research

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HY Bonds had Higher S.R. than Equities across all HY Ratings

- In all rating categories
 - ✓ HY bonds had higher S.R. than their equity counterparts
 - ✓ The bond over equity return diff. also had positive I.R around 0.4
- Results hold regardless of weighting schemes



Note: The statistics shown for Caa and below are from Jan. 2002 – Jan. 2018 due to lack of observation in this rating bucket from 1993-2001.

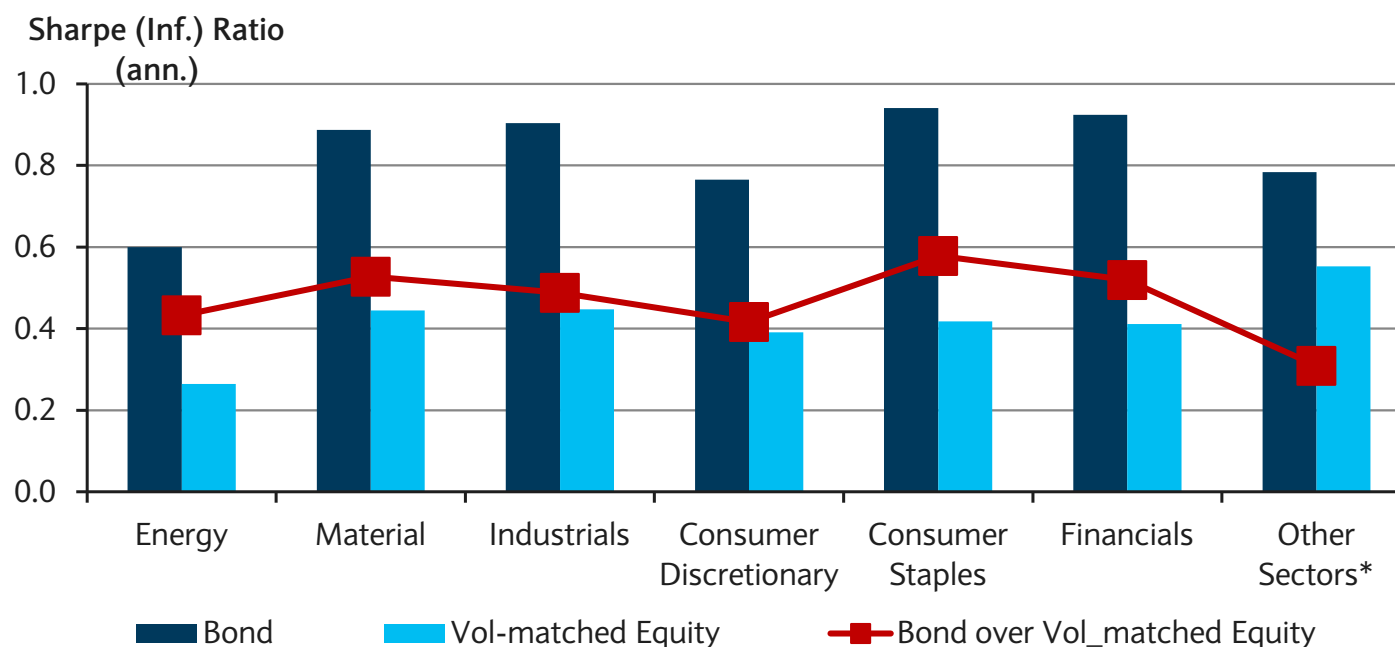
Source: Compustat, Barclays Research

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HY Bonds had Higher S.R. than Equity in all Sectors

- In all GICS sectors, the HY bond portfolios had higher S.R. than corresponding vol-matched equity portfolios, regardless of weighting scheme
- The difference of bond over equity returns also had positive I.R. ranging from 0.31 to 0.58 with equal weighting

Sharpe Ratios of Bonds vs. Equities by Sector (EW, Jan. 1993 – Jan. 2018)



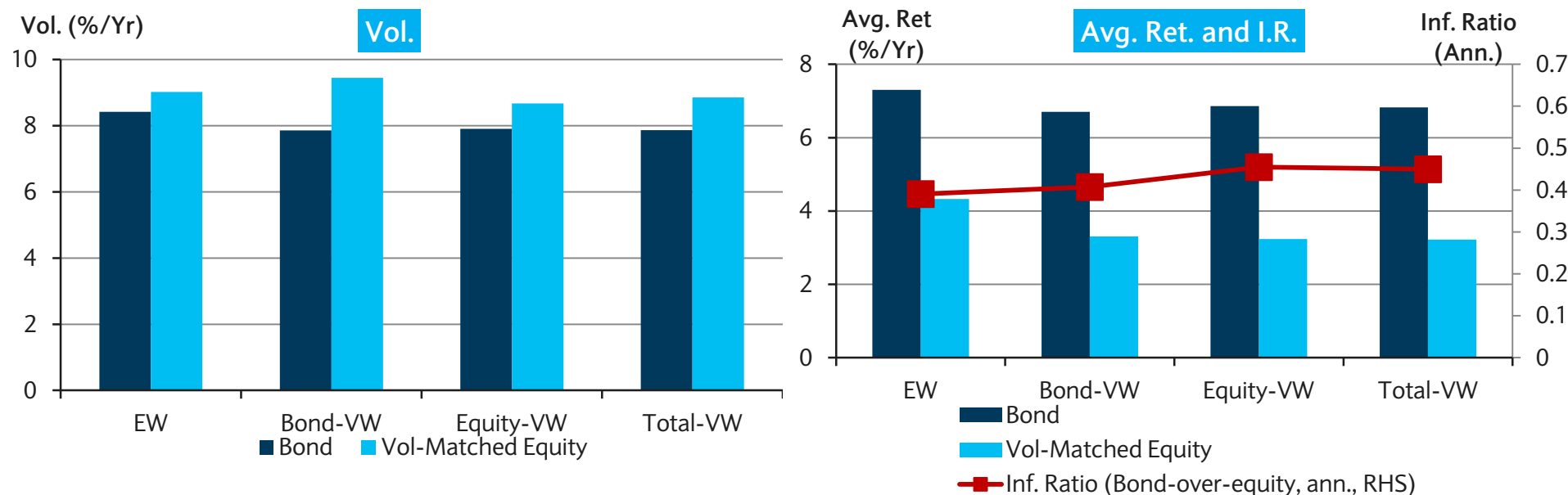
Note Other sectors include utilities, health care, information technology, and telecommunications. These sectors did not have enough observations on their own, so they were grouped together. Source: Compustat, Barclays Research

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Similar HY Bond Outperformance in European Markets

- Similarly in European Markets, bond portfolios had similar vol. as vol-matched equity portfolios, but higher avg. ret for May 2005 – Jan. 2018
- The Inf. Ratio of bond over matched equity is around 0.4
- The results are consistent across different weighting schemes

Bond vs. Vol.-Matched Equity Portfolio Performance in European Markets (May. 2005 – Jan. 2018)

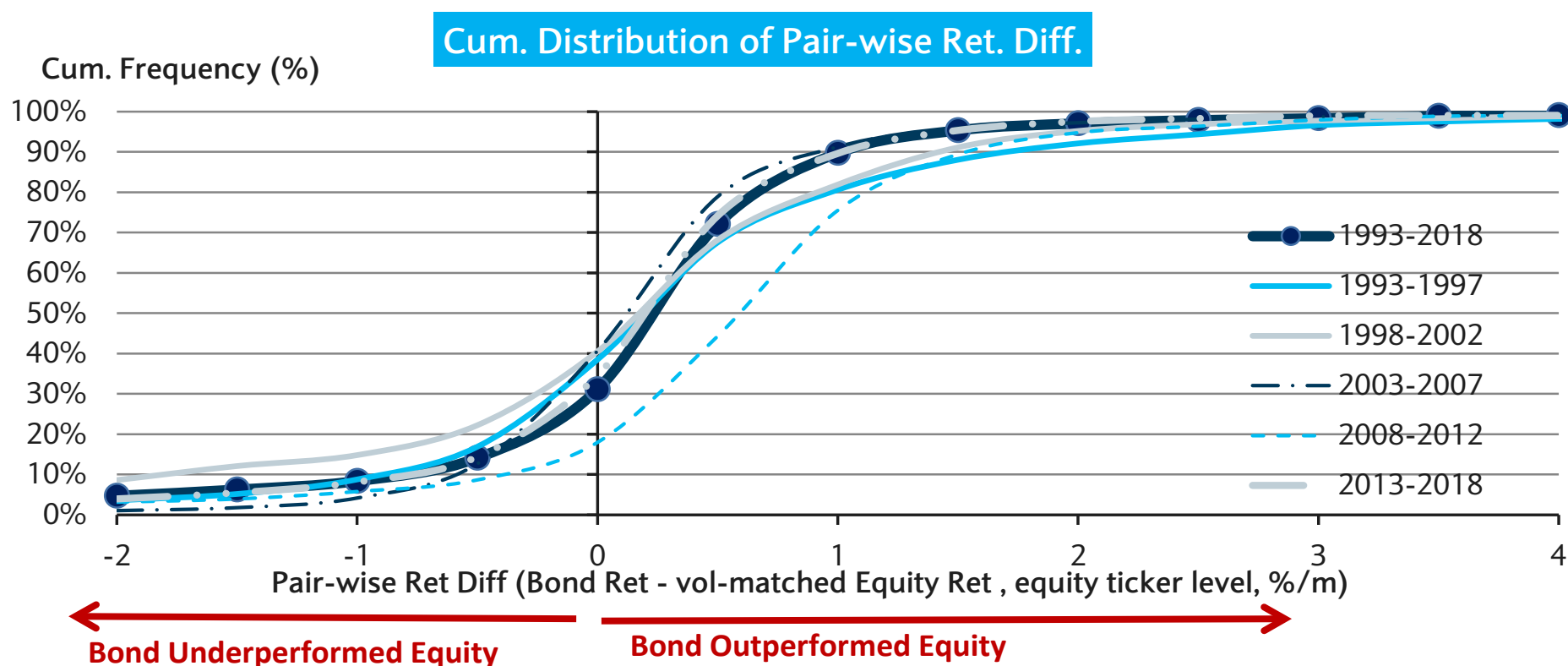


Source: Compustat, Barclays Research

Evaluate Pair-wise Difference

More than 70% of Companies Had Higher Avg. Bond Ret.

- For each company, we looked at the diff. in avg. ret. between its bond and vol-matched equity (scaled uniformly by the ratio of agg. trailing 36m bond-vol. over equity-vol.)*
- In over 70% of companies. bond avg. returns were higher than the scaled equity ret. In 1993-2018. The fraction of companies with higher bond returns ranged from 60% (03-2007) to 80% (2008-2012) in the sub-periods

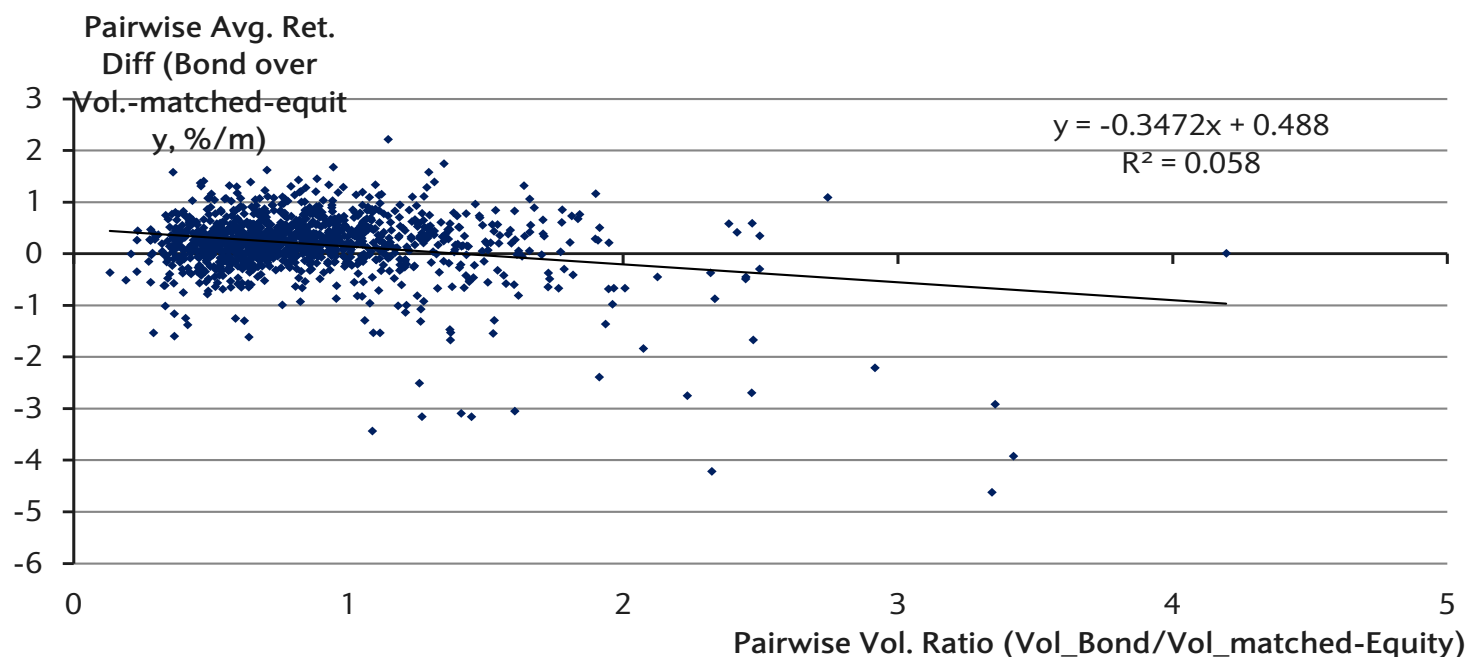


Note: scale factor calculated from EW portfolio Vol. Ratio. Source: Compustat, Barclays Research

Scatter-Plot of Pair-wise Vol. Ratio vs. Ret. Diff

- We applied the same scaling factor to all individual equities every month
- In reality, different companies might need different scaling factors for their equity to have the same vol. as the bond
- The positive diff in ret could be driven by bonds having higher vol.
- Scatter-plot shows that bonds with higher vol. than equity did not have higher ret.

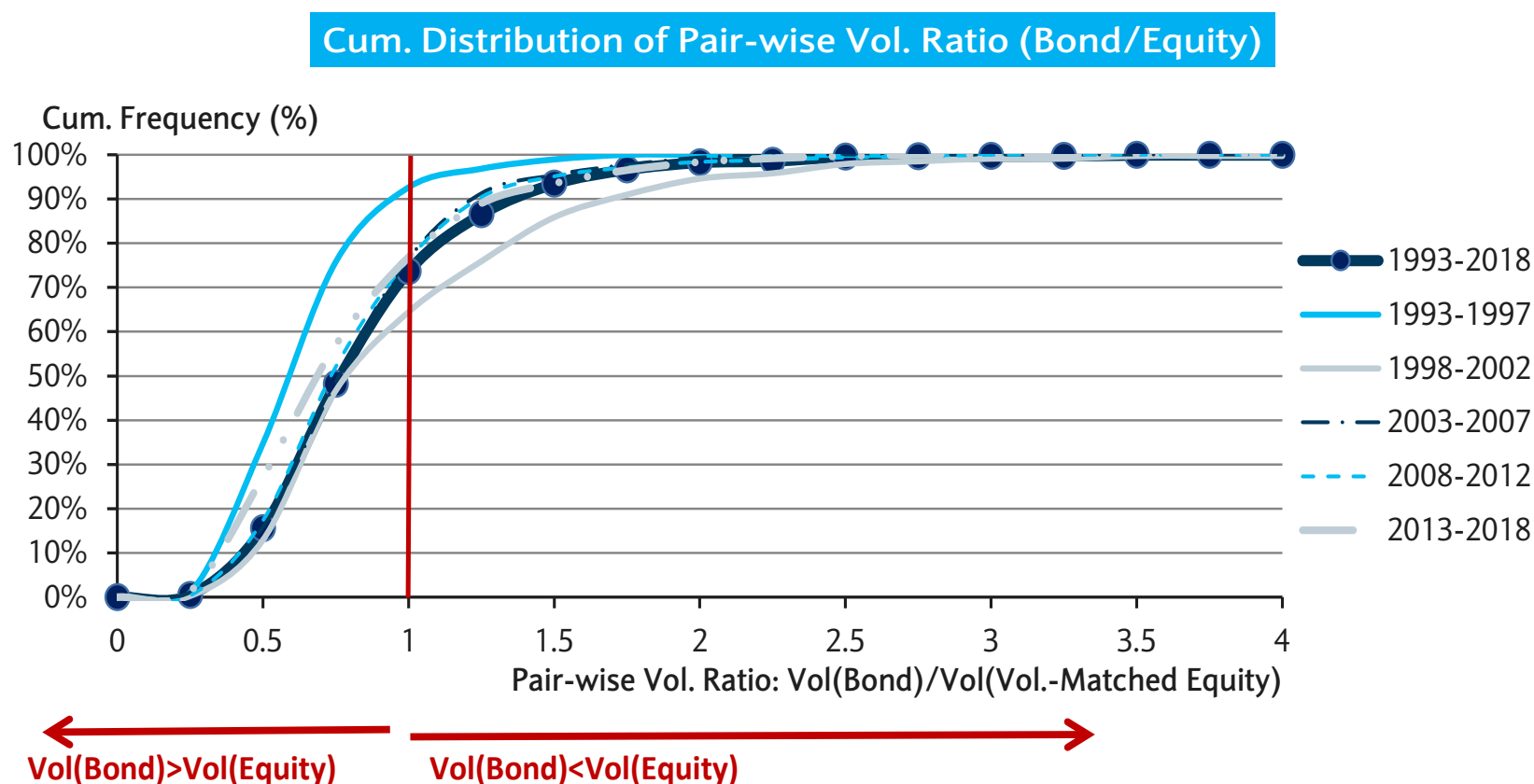
Pair-wise Vol. Ratio vs. Ret Diff (Bond over Equity, Jan. 1993 – Jul. 2017)



Note: scale factor calculated from EW portfolio Vol. Ratio, Source: Compustat, Barclays Research

70% of Companies Had Lower Vol. in Bonds

- 70% of companies had lower vol. in bonds than vol-matched equities, indicating that the return difference was not driven by bonds having higher risk. For these 70% of companies, we should have scaled down equity even more, which would have given bonds even more outperformance in terms of returns
- Also, equity vol. is skewed



Note: scale factor calculated from EW portfolio Vol. Ratio, Source: Compustat, Barclays Research

Extending to IG and using Indices

IG bonds Outperformed Sensitivity-Matched Equities

- In IG, sensitivity-matching works the best at matching risk since IG bonds have a substantial Treasury component
 - ✓ Sensitivity-matched equity had the highest corr. with IG bond portfolio
- Bond outperformed sensitivity-matched equities by 1.51%/year with an I.R. of 0.48
- Results were similar across weighting schemes

Performance of IG Bond over Matched Equity Portfolios (EW, Jan. 1993 – Jan. 2018)						
Matching Method	Avg. Ret (%/Yr)	Vol. (%/Yr)	Sharpe (Inf.) Ratio	Worst Monthl y Ret	Max. DD (%)	Corr(Bond, Matched Equity)
Vol-matched	-0.02	6.45	0.00	-5.19	-34.74	0.26
Sensitivity-Matched	1.51	3.13	0.48	-3.06	-15.29	0.80
Income-Matched	-1.07	5.33	-0.20	-5.12	-38.99	0.49

Source: Compustat, Barclays Research

Similar Bond Outperformance with Indices

Performance of Bond vs. Risk-Matched Equity Indices (Jan. 1993 – Jan. 2018)

Return Series	Avg. Ret (%/Yr)	Vol. (%/Yr)	Sharpe (Inf.) Ratio (Ann.)	Worst Monthly Ret (%)	Max. DD (%)	Corr. with Bond Index
Panel A: HY						
Bloomberg Barclays HY Index*	7.99	7.73	0.69	-15.81	-31.86	1.00
Russell 2000	10.97	18.56	0.45	-20.80	-52.89	0.61
Sensitivity-Matched Russell 2000	5.55	6.61	0.44	-11.01	-24.29	0.61
Bond over Sensitivity.-Matched Equity	2.44	6.41	0.38	-5.19	-20.58	
Panel B: IG						
Bloomberg Barclays IG Index	6.21	4.96	0.72	-5.83	-12.43	1.00
S&P 500	10.49	14.19	0.55	-16.79	-50.95	0.22
Sensitivity-Matched S&P 500	5.02	4.44	0.55	-5.88	-8.86	0.81
Bond over Sensitivity.-Matched Equity	1.18	2.93	0.40	-4.29	-9.94	

Note: the HY bond index has a price filter of \$40 to exclude bonds traded on recovery. Source: Compustat, Barclays Research

Key Takeaways

Summary

■ What we know so far?

- ✓ On average, HY bonds have higher S.R. than equities of the same company, regardless of weighting scheme used
- ✓ The outperformance of bonds held across sub-periods, all ratings within HY, sectors, and whether fallen angels were included or not
- ✓ In the cross-section, more than 70% of companies had higher average bond returns than scaled equity returns in the 1993-2018 period
- ✓ The same cross-asset low vol. phenomena existed in IG and indices as well

■ Possible Explanations

- ☐ Liquidity/transaction costs
- ☐ Yield dynamics

■ Applications

- ☐ Combine equity and bond portfolio to benefit from diversification

APPENDIX

Bond Outperformed Sensitivity-Matched Equities

Performance of HY Bonds vs. Sensitivity-Matched Portfolios (Jan. 1993 – Jan. 2018)

	Weighting Scheme	Return Series	Avg. Ret (%/Yr)	Vol. (%/Yr)	Sharpe (Inf.) Ratio (Ann.)	Worst Monthly Ret (%)	Max. DD (%)	Corr. with HY bond tot ret
Portfolio Returns	EW	Bond	8.34	6.78	0.83	-15.55	-25.09	
		Sensitivity Matched Equity	4.95	5.48	0.42	-8.65	-21.07	0.67
	Bond-VW	Bond	7.93	6.60	0.80	-13.48	-24.74	
		Sensitivity Matched Equity	5.48	5.39	0.53	-9.02	-19.33	0.70
	Equity-VW	Bond	8.22	5.58	0.99	-13.36	-19.98	
		Sensitivity Matched Equity	4.85	4.30	0.52	-7.42	-14.89	0.68
	Total-VW	Bond	8.17	5.86	0.94	-13.39	-21.26	
		Sensitivity Matched Equity	5.08	4.58	0.54	-7.85	-15.72	0.69
	10yr OTR Treasury returns		5.30	7.12	0.38	-7.07	-10.43	
Bond over Matched Equity	EW	Bond over Sensitivity- Matched Equity	3.39	5.15	0.66	-6.91	-15.02	
	Bond-VW		2.45	4.79	0.51	-4.46	-11.81	
	Equity-VW		3.37	4.13	0.82	-5.94	-9.61	
	Total-VW		3.10	4.26	0.73	-5.55	-10.22	
	Avg. across weighting		3.08	4.58	0.68	-5.71	-11.66	
	EW	Bond over Vol.-matched Equity	2.53	5.51	0.46	-7.33	-13.49	
	Bond-VW		1.93	5.79	0.33	-6.24	-20.77	
	Equity-VW		2.91	5.37	0.54	-6.36	-15.51	
	Total-VW		2.61	5.43	0.48	-5.91	-16.75	
	Avg. across weighting		2.50	5.53	0.45	-6.46	-16.63	

Source: Compustat, Barclays Research

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Income-matched equities generated similar results as bonds

Performance of HY Bond vs. Income Matched Portfolios (Jan. 1993 – Jan. 2018)

Weighting Scheme			Return Series	Avg. Ret (%/Yr)	Vol. (%/Yr)	Sharpe Ratio (Ann.)	Worst Monthly Ret (%)	Max. DD (%)	Corr. with bond portfolio
Portfolio Returns	EW	Bond		8.34	6.78	0.83	-15.55	-25.09	
		Yield-matched Equity		8.28	7.34	0.77	-8.34	-15.82	0.50
		Coupon-matched Equity		7.74	7.19	0.71	-8.34	-14.14	0.51
	Bond-VW	Bond		7.93	6.60	0.80	-13.48	-24.74	
		Yield-matched Equity		8.85	6.98	0.89	-6.22	-11.45	0.55
		Coupon-matched Equity		8.08	7.12	0.77	-6.22	-11.03	0.59
	Equity-VW	Bond		8.22	5.58	0.99	-13.36	-19.98	
		Yield-matched Equity		7.55	5.86	0.84	-6.61	-12.31	0.54
		Coupon-matched Equity		7.34	5.75	0.82	-6.61	-11.48	0.55
	Total-VW	Bond		8.17	5.86	0.94	-13.39	-21.26	
Yield-matched Equity			7.99	6.20	0.86	-6.30	-12.09	0.55	
Coupon-matched Equity			7.75	6.14	0.83	-6.30	-11.27	0.55	
2yr OTR Treasury Returns				3.51	1.67	0.60	-1.11	-1.62	
Bond over Income-Matched Equity	EW			0.06	7.08	0.01	-13.59	-36.93	
	Bond-VW	Bond over Yield-Matched Equity		-0.93	6.44	-0.14	-11.79	-39.93	
	Equity-VW			0.67	5.52	0.12	-11.47	-18.75	
	Total-VW			0.19	5.75	0.03	-11.43	-21.40	
	EW			0.60	6.94	0.09	-13.59	-31.96	
	Bond-VW	Bond over Coupon-Matched Equity		-0.15	6.25	-0.02	-9.82	-32.97	
	Equity-VW			0.88	5.40	0.16	-11.47	-17.32	
	Total-VW			0.43	5.69	0.08	-11.43	-20.39	

IG bonds Outperformed Sensitivity-Matched Equities

Performance of IG Bond vs. Matched Equity Portfolios (Jan. 1993 – Jan. 2018)

Weighting	Return Series	Avg. Ret (%/Yr)	Vol. (%/Yr)	Sharpe (Inf.) Ratio (Ann.)	Worst Monthly Ret (%)	Max. DD (%)	Corr. with bond portfolio
Panel A: Portfolio Returns							
EW	Bond	6.52	5.11	0.76	-8.23	-13.82	
	Vol-matched Equity	6.53	5.51	0.72	-6.77	-22.25	0.26
	Sensitivity-matched Equity	5.01	4.64	0.52	-5.60	-9.00	0.80
	Yield-Matched Equity	7.59	5.45	0.92	-6.57	-17.04	0.49
	Coupon-Matched Equity	7.39	5.51	0.87	-6.57	-16.63	0.52
Bond-VW	Bond	6.19	5.24	0.68	-6.84	-14.23	
	Vol-matched Equity	5.92	5.76	0.58	-6.87	-30.27	0.27
	Sensitivity-matched Equity	4.83	4.76	0.47	-7.92	-13.71	0.78
	Yield-Matched Equity	6.97	5.64	0.78	-7.38	-26.10	0.47
	Coupon-Matched Equity	6.60	5.65	0.71	-7.10	-24.53	0.49
Equity-VW	Bond	6.40	5.14	0.73	-6.73	-12.07	
	Vol-matched Equity	6.23	5.60	0.65	-7.07	-24.47	0.19
	Sensitivity-matched Equity	4.93	4.75	0.49	-6.71	-9.75	0.84
	Yield-Matched Equity	7.39	5.44	0.88	-6.85	-21.27	0.45
	Coupon-Matched Equity	7.14	5.38	0.85	-5.74	-17.36	0.44
Total-VW	Bond	6.38	5.15	0.73	-6.58	-12.39	
	Vol-matched Equity	6.18	5.63	0.64	-7.08	-25.63	0.21
	Sensitivity-matched Equity	4.91	4.75	0.49	-6.97	-10.19	0.83
	Yield-Matched Equity	7.33	5.48	0.87	-6.82	-22.48	0.46
	Coupon-Matched Equity	7.08	5.42	0.83	-6.09	-18.19	0.45

Source: Compustat, Barclays Research

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IG bonds Outperformed Sensitivity-Matched Equities

Performance of IG Bond over Matched Equity Portfolios (Jan. 1993 – Jan. 2018)

Weighting	Return Series	Avg. Ret (%/Yr)	Vol. (%/Yr)	Sharpe (Inf.) Ratio (Ann.)	Worst Monthly Ret (%)	Max. DD (%)
EW	Bond over Vol -matched Equity	-0.02	6.45	0.00	-5.19	-34.74
Bond-VW		0.27	6.66	0.04	-5.09	-36.12
Equity-VW		0.17	6.82	0.02	-4.93	-38.95
Total-VW		0.20	6.79	0.03	-4.91	-38.67
EW	Bond over Sensitivity -Matched Equity	1.51	3.13	0.48	-3.06	-15.29
Bond-VW		1.37	3.36	0.41	-5.45	-10.31
Equity-VW		1.47	2.82	0.52	-3.59	-9.99
Total-VW		1.47	2.90	0.51	-3.88	-9.97
EW	Bond over Yield -Matched Equity	-1.07	5.33	-0.20	-5.12	-38.99
Bond-VW		-0.77	5.61	-0.14	-5.79	-31.86
Equity-VW		-0.99	5.55	-0.18	-4.40	-31.05
Total-VW		-0.95	5.53	-0.17	-4.48	-31.27
EW	Bond over Coupon -Matched Equity	-0.87	5.22	-0.17	-5.12	-34.24
Bond-VW		-0.41	5.53	-0.07	-5.79	-30.33
Equity-VW		-0.74	5.55	-0.13	-4.40	-29.13
Total-VW		-0.70	5.57	-0.13	-5.05	-29.38

Source: Compustat, Barclays Research

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