

**Purpose:** This study is intended to evaluate fixed income ETFs and to compare their performances with respect to risk and return. Our perspective is in terms of long term investing (i.e. 5+ years).

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### Data and methodology

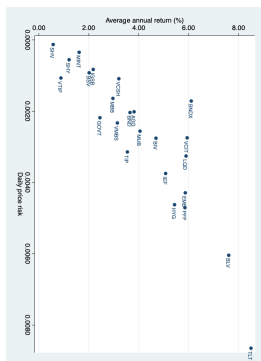
The list of ETFs are obtained from Nasdaq (<https://www.nasdaq.com/etfs>). Daily prices, dividend payments, inception dates, expense ratios and net assets are downloaded from Yahoo! Finance (<http://finance.yahoo.com>). **Study period starts on January 1<sup>st</sup>, 2010.** The initial list includes 226 fixed income ETFs and filtered down as follows: 1) Six ETFs do not have inception dates, 2) Three have inception dates within the past 100 days, and 3) 70 have assets less than \$100 million. Remainder list includes **147 fixed income ETFs**.

Following variables are used for the calculation of return:  $P_{last}$ : most recent daily closing price,  $P_{first}$ : price that is 90 days after the inception date,  $D_{total}$ : total dividend payments and  $t$ : number of calendar days since the inception date.

The **return (R)** is calculated as:  $R = (P_{last} - P_{first} + D_{total}) / P_{first}$ . **Average annual return** is calculated as:  $AR = (1 + R)^{1/t/365} - 1$ . **Risk ( $\sigma$ )** is calculated as the standard deviation of daily returns ( $r$ ).

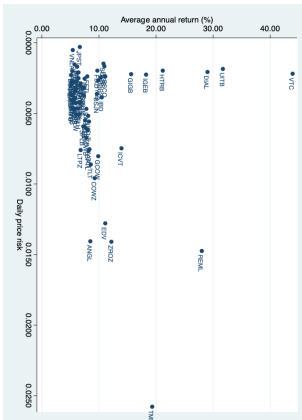
### Biggest ETFs (\$10B+)

Symbol	Assets (\$M)	t (days)	AR %	$\sigma$
BND	232,159	3,071	3.64	0.0020
BNDX	134,544	1,738	6.08	0.0017
AGG	64,353	3,071	3.80	0.0020
BSV	48,539	3,071	2.00	0.0009
LQD	36,225	3,071	5.87	0.0033
BIV	33,145	3,071	4.68	0.0028
VTIP	30,215	1,969	0.86	0.0011
VCSH	29,957	3,027	3.18	0.0011
VCIT	25,853	3,027	5.92	0.0028
SHV	24,539	3,071	0.55	0.0001
TIP	20,106	3,071	3.52	0.0032
HYG	19,529	3,071	5.42	0.0046
MBB	18,303	3,071	2.95	0.0017
SHY	16,741	3,071	1.19	0.0006
IEF	16,540	3,071	5.07	0.0038
PFF	15,972	3,071	5.83	0.0047
EMB	15,270	3,071	5.84	0.0043
TLT	14,619	3,071	8.48	0.0087



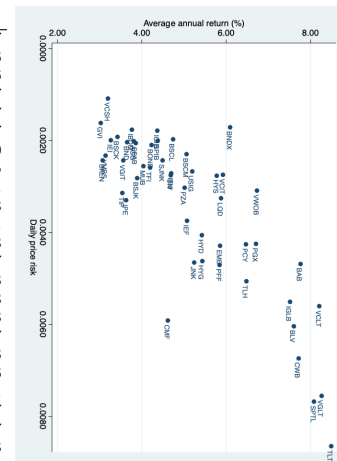
### Winner ETFs (AR > 5%)

Symbol	Assets (\$M)	t (days)	AR %	$\sigma$
VTC	208	117	43.82	0.0022
UITB	295	131	31.64	0.0019
DIAL	133	143	28.90	0.0021
REML	117	599	27.91	0.0148
HTRB	590	158	21.13	0.0020
TMF	159	3,071	19.21	0.0258
IGEB	101	236	18.17	0.0023
GIGB	478	271	15.57	0.0022
ICVT	378	1,006	13.84	0.0075
ZROZ	265	3,047	12.12	0.0141
BSCQ	127	537	11.01	0.0024
EDV	2,565	3,071	10.99	0.0128
JPGB	193	335	10.89	0.0017
SUSB	110	236	10.68	0.0015
IBD	122	237	10.40	0.0039
JPHY	163	535	10.25	0.0025
GCOW	216	741	9.82	0.0081
HYLB	3,070	453	9.79	0.0027
FIXD	763	383	9.64	0.0020
BSJN	229	879	9.58	0.0036
COWZ	259	443	9.16	0.0096
TLT	14,619	3,071	8.48	0.0087
ANGL	1,146	2,154	8.42	0.0141



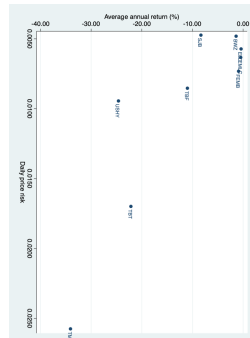
### ETFs with AR > 3%, t > 1,000 days, $\sigma < 0.01$ and net assets > \$1B

Symbol	Assets (\$M)	t (days)	AR %	$\sigma$
TLT	14,619	3,071	8.48	0.0087
VGLT	2,847	3,027	8.25	0.0076
VCLT	5,025	3,027	8.20	0.0056
SPTL	2,404	3,071	8.07	0.0077
BAB	1,214	3,029	7.75	0.0047
CWB	3,976	3,071	7.70	0.0067
BLV	12,186	3,071	7.59	0.0060
IGLB	1,201	3,008	7.50	0.0055
VWOB	1,752	1,738	6.72	0.0031
PGX	5,210	3,071	6.70	0.0043
TLH	1,045	3,071	6.47	0.0051
PCY	3,543	3,071	6.46	0.0043
BNDX	134,544	1,738	6.08	0.0017
VCIT	25,853	3,027	5.92	0.0028
LQD	36,225	3,071	5.87	0.0033
EMB	15,270	3,071	5.84	0.0043
PFF	15,972	3,071	5.83	0.0047
HYS	1,456	2,453	5.77	0.0028
HYG	19,529	3,071	5.42	0.0046
HYD	2,928	3,071	5.41	0.0041
JNK	9,639	3,071	5.23	0.0047
USIG	3,454	3,071	5.18	0.0027
IEF	16,540	3,071	5.07	0.0038
BSCM	1,326	1,692	5.05	0.0023



### Loser ETFs (AR < 0)

Symbol	Assets (\$M)	t (days)	AR %	$\sigma$
TMV	165	3,071	-34.12	0.0258
USHY	1,442	130	-24.70	0.0095
TBT	890	3,071	-22.19	0.0170
TBF	310	3,071	-11.07	0.0086
SJB	114	2,540	-8.43	0.0047
BWZ	294	3,071	-1.46	0.0048
FEMB	127	1,216	-0.95	0.0073
EMLC	5,490	2,782	-0.55	0.0064
ELD	200	2,764	-0.51	0.0057



### \$1M invested on June 4<sup>th</sup>, 2013

Symbol	Name	Value (\$)
CWB	SPDR Bloomberg Barclays Convertible Securities	2,029,397
PGX	Invesco Preferred	2,012,960
VCLT	Vanguard Long-Term Corporate Bond	1,924,805
PFF	iShares Preferred and Income Securities	1,867,822
IGLB	Shares Long-Term Corporate Bond	1,846,388
BLV	Vanguard Long-Term Bond	1,809,270
BAB	Invesco Taxable Municipal Bond	1,807,706
PCY	Invesco Emerging Markets Sovereign Debt	1,791,561
JNK	SPDR Bloomberg Barclays High Yield Bond	1,786,559
HYG	iShares iBoxx High Yield Corporate Bond	1,766,055
EMB	iShares J.P. Morgan USD Emerging Markets Bond	1,737,474
HYD	VanEck Vectors High Yield Municipal Index	1,734,843
TLT	iShares 20+ Year Treasury Bond	1,733,235
VGLT	Vanguard Long-Treasury	1,720,388
HYS	PIMCO 0-5 Year High Yield Corporate Bond Index	1,717,734
SPTL	SPDR Portfolio Long Term Treasury	1,712,475
SJNK	SPDR Bloomberg Barclays Short Term High Yield	1,696,584
VWOB	Vanguard Emerging Markets Government Bond	1,694,699
LQD	iShares iBoxx Investment Grade Corporate Bond	1,630,001
BSJK	Invesco BulletShares 2020 High Yield Corporate	1,616,630
PZA	Invesco National AMT-Free Municipal	1,588,572
VCIT	Vanguard Intermediate-Term Corporate	1,585,552
USIG	iShares Broad USD Investment Grade Corporate	1,579,485
BOND	PIMCO Active Bond	1,514,056
TLH	iShares 10-20 Year Treasury	1,485,113
BKLN	Invesco Senior Loan	1,480,004
BNDX	Vanguard Total International Bond	1,463,124

The yield on a five year Treasury note was 1.05% on June 4<sup>th</sup>, 2013 (<https://www.treasury.gov/resource-center/data-chart-center/interest-rates/>).

### Market risk ( $r_{ETF} = \alpha + \beta r_{SP500} + \epsilon$ )

Symbol	$\beta$	$R^2$
COWZ	0.9999	0.7901
CWB	0.6733	0.7603
HYLB	0.2324	0.5362
HYG	0.3194	0.4790
JNK	0.3082	0.4628
SJNK	0.2001	0.4251
HYS	0.2179	0.4097
PHB	0.2247	0.3791
ICVT	0.5019	0.3466
BSJN	0.2690	0.3395
JPHY	0.1732	0.3139
BSJJ	0.1569	0.3027

Symbol	$\beta$	$R^2$
BSJM	0.2405	0.2967
BSJK	0.1729	0.2650
GCOW	0.7710	0.2637
BKLN	0.1152	0.2470
BSJL	0.1861	0.2423
PFF	0.1866	0.2242
GHYG	0.2359	0.2221
REML	0.8224	0.1936
EMB	0.2029	0.1543
EMHY	0.2131	0.1510
FFTI	0.1012	0.1504
PCY	0.2006	0.1374

Symbol	$\beta$	$R^2$
PGX	0.1440	0.1282
HYEM	0.1705	0.1231
TLH	-0.1843	0.1222
IHY	0.1627	0.1214
VGIT	-0.0916	0.1192
VGLT	-0.2888	0.1182
PLW	-0.1870	0.1178
SPTL	-0.2922	0.1165
VWOB	0.1367	0.1158
IEF	-0.1372	0.1155
TLT	-0.3023	0.1110
TMF	-0.8871	0.1089

Symbol	$\beta$	$R^2$
IEI	-0.0740	0.1081
EDV	-0.4228	0.1063
ZROZ	-0.4614	0.1055
PSK	0.1393	0.1049
YLD	0.1612	0.0743
GVI	-0.0452	0.0630
VTEB	-0.0456	0.0612
BAB	-0.1151	0.0593
FIXD	-0.0563	0.0558
BIV	-0.0695	0.0517
GBF	-0.0644	0.0512
SPAB	-0.0530	0.0481

Symbol	$\beta$	$R^2$
JPGB	0.0414	0.0451
LTPZ	-0.1907	0.0418
BND	-0.0491	0.0409
BLV	-0.1307	0.0397
VBMS	-0.0386	0.0353
VBND	-0.0493	0.0324
ILTB	-0.1135	0.0306
AGGY	-0.0419	0.0305
MUNI	-0.0387	0.0292
AGG	-0.0411	0.0291
TPI	-0.0436	0.0286
IPE	-0.0604	0.0260