

Group 6 Finance Report

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ETF Summary (as of 15/04/22) - 1/2

Fixed income

	currency	Asset Class	Net Assets	Yield	YTD Daily Total Return	Expense Ratio (net)	Inspection date	Beta
AGG	USD	USIGFI	82.57B	1.95%	-9.34%	0.04%	2003-09-22	-0.052
SCHP	USD	TIPFI	18.7B	1.97%	-5.34%	0.05%	2010-08-05	0.085
VCSH	USD	USSTCorpFI	48.63B	1.77%	-4.84%	0.07%	2009-11-19	0.167
BNDX	USD	GFI	91.83B	0.91%	-7.59%	0.13%	2013-05-31	0.011
VWOB	USD	EMFI2	3.23B	4.01%	-14.39%	0.20%	2013-05-31	0.544

Real Estate Investment Trust

	currency	Asset Class	Net Assets	Yield	YTD Daily Total Return	Expense Ratio (net)	Inspection date	Beta
1343.T	JPY	JREIT	3.4B	3.10%	-2.61%	0.12%	2008-09-17	1.276
VNQ	USD	USREIT	86.33B	2.19%	-9.90%	0.12%	2004-09-23	1.136
VNQI	USD	GREIT	5.39B	0.87%	-9.42%	0.11%	2010-11-01	1.911

ETF Summary (as of 15/04/22) - 2/2

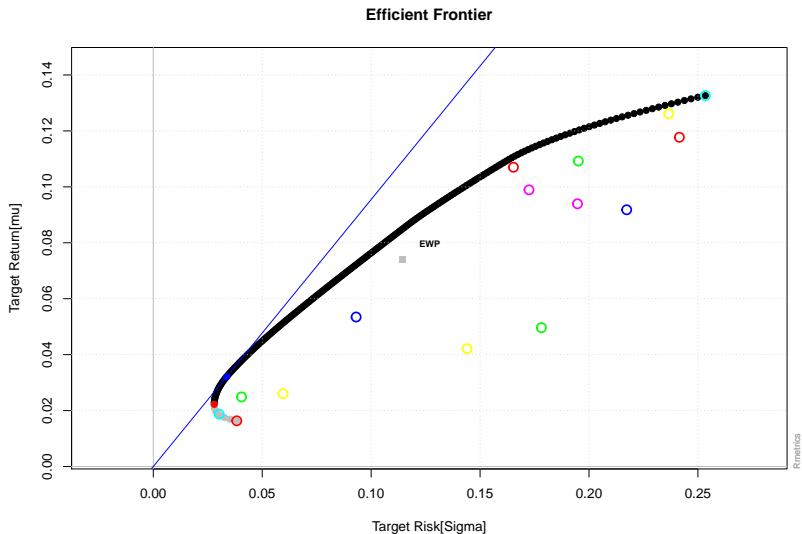
Equity

	currency	Asset Class	Net Assets	Yield	YTD Daily Total Return	Expense Ratio (net)	Inspection date	Beta
1306.T	JPY	JEQ	79.41B	1.61%	-4.07%	0.05%	2001-07-11	1.530
VOO	USD	USEQ	806.52B	1.34%	-9.39%	0.03%	2010-09-07	1.550
VSS	USD	WexUSsEQ	10.11B	2.96%	-12.92%	0.07%	2009-04-02	2.052
VGK	USD	EUREQ	23.73B	3.32%	-12.83%	0.08%	2005-03-04	1.773
VWO	USD	EMEQ	102.56B	2.74%	-10.47%	0.08%	2005-03-04	1.996

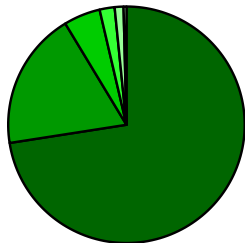
Gold and Commodity

	currency	Asset Class	Net Assets	Yield	YTD Daily Total Return	Expense Ratio (net)	Inspection date	Beta
IAU	USD	GOLD	31.97B	0.00%	2.31%	0.25%	2005-01-21	0.068
BCI	USD	COMMO	1.12B	0.57%	32.36%	0.25%	2017-03-30	0.732

Efficient Frontier



Low Risk Portfolio



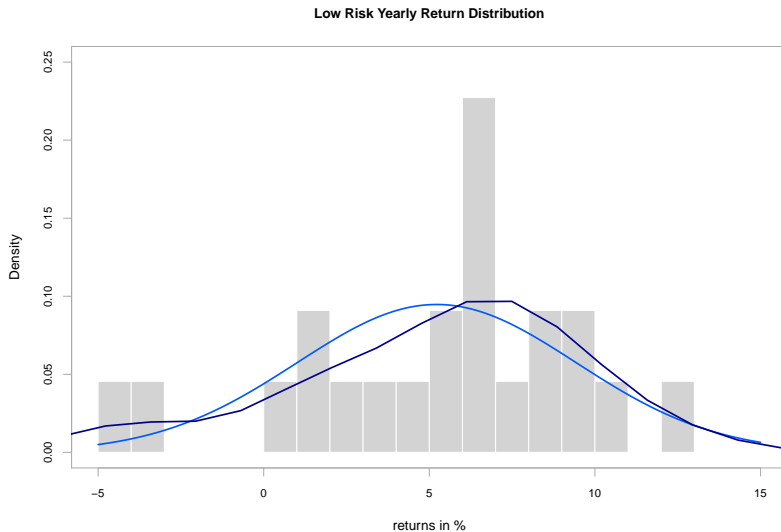
Composition

BNDX	+ 72.54 %
VOO	+ 18.81 %
IAU	+ 5 %
1306.T	+ 2.05 %
VNQ	+ 1.21 %
BCI	+ 0.39 %

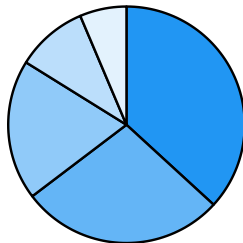
Returns	Risks	Sharpe Ratio
3.91 %	4.21 %	0.692

USD	JPY	Fixed.Income	REIT	Equity	Comodity.
97.95 %	2.05 %	72.54 %	1.21 %	20.86 %	5.39 %

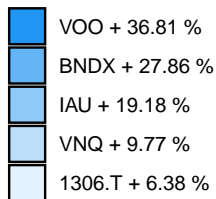
Histogram of Low Risk Yearly Return



Mid Risk Portfolio



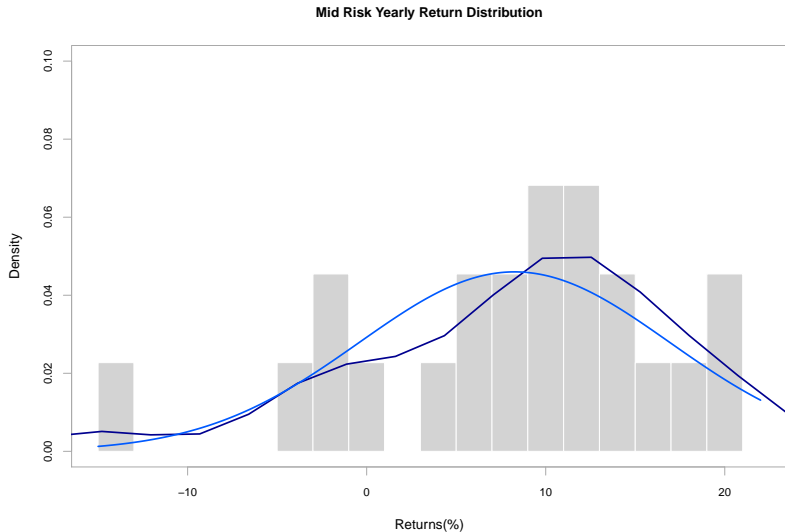
Composition



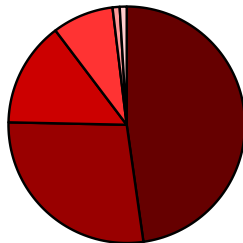
Returns	Risks	Sharpe Ratio
6.83 %	8.68 %	0.673

USD	JPY	Fixed.Income	REIT	Equity	Comodity.
93.62 %	6.38 %	27.86 %	9.77 %	43.19 %	19.18 %

Histogram of Mid Risk Yearly Return



High Risk Portfolio



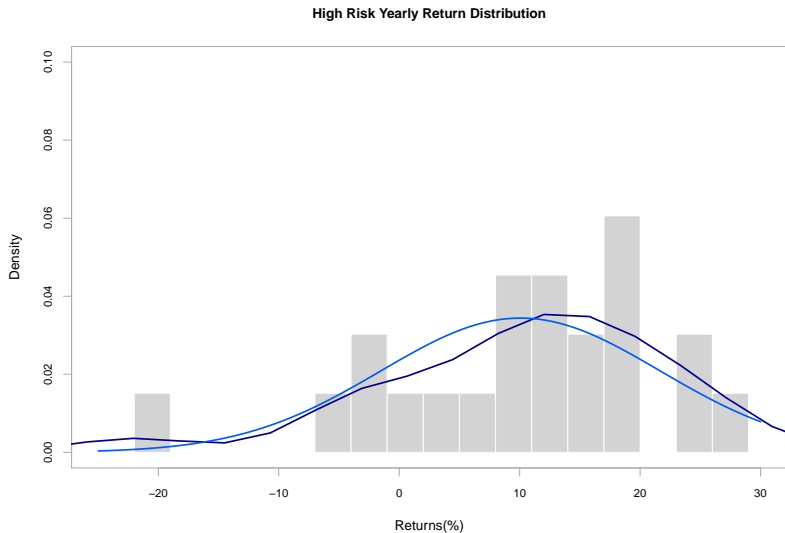
Composition

VOO + 47.74 %
IAU + 27.59 %
VNQ + 14.37 %
1306.T + 8.38 %
1343.T + 0.97 %
BNDX + 0.95 %

Returns	Risks	Sharpe Ratio
8.59 %	11.6 %	0.654

USD	JPY	Fixed.Income	REIT	Equity	Comodity.
90.65 %	9.35 %	0.95 %	15.34 %	56.12 %	27.59 %

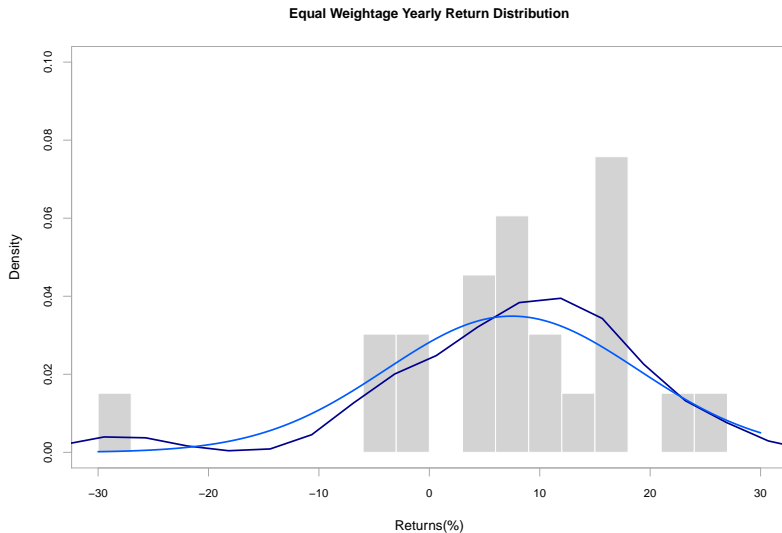
Histogram of High Risk Yearly Return



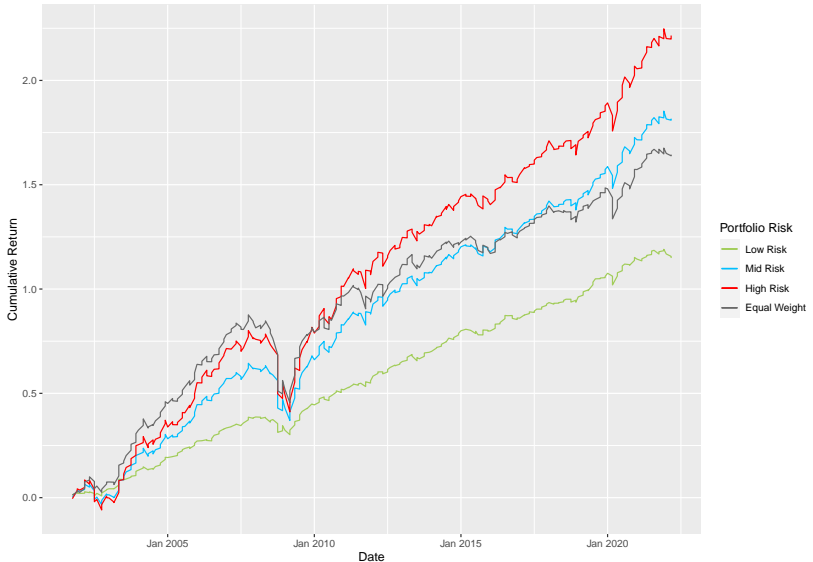
Equal Weights Portfolio

		Returns	Risks	Sharpe Ratio	
		7.39 %	9.54 %	0.67	
USD	JPY	Fixed.Income	REIT	Equity	Comodity.
86.7 %	13.3 %	33.3 %	20 %	33.3 %	13.3 %

Histogram of Equal Weightage Yearly Return

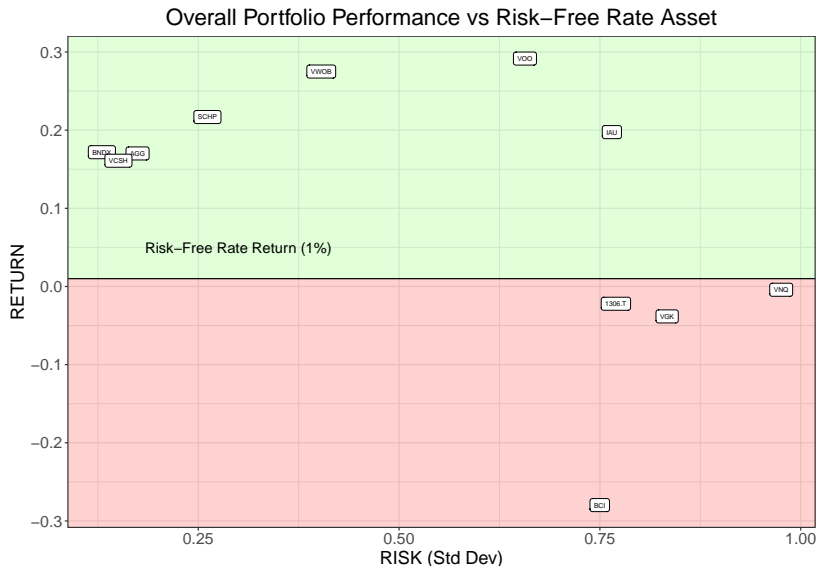


Performance of Portfolios Overtime (Monthly)



Appendix

Label plot for all the chosen ETFs



Methodology 1/2

1. Identification of suitable ETFs for examination

- ▶ Identify ETFs such as Bonds, REITs, Equities, Gold/Commodities to ensure a diversification of portfolio allocation to minimize risk
- ▶ Omit ETFs that are highly correlated or have similar portfolio composition

2. Gathering of relevant statistics for ETFs and market

- ▶ Compute yearly and monthly return of each ETF (source: ETFfxreturns.xlsx)
- ▶ Compute R_m for market (source: ETFfxreturns.xlsx)
- ▶ Obtain ETF composition (source: Yahoo Finance)
 - ▶ Converted all Net Assets into USD
- ▶ Compute standard deviation for each ETF

Methodology 2/2

3. Perform CAPM(TS) Regression for each ETF

- ▶ Obtain β_i from regression coefficient
 - ▶ CAPM regression: $R_{i,t}^* = \alpha_i + \beta_i R_{m,t}^*$
- ▶ Compute μ_i
 - ▶ Using $R_f = 0.01$
 - ▶ $\mu_i = E(R_{i,t}) = R_f + \beta_i E(R_{m,t}^*)$
- ▶ Compute Aggregated μ using μ_i and Aggregation of historical mean
 - ▶ $\mu_{aggregated} = \frac{2}{3}\mu_i + \frac{1}{3}\mu_{hist}$

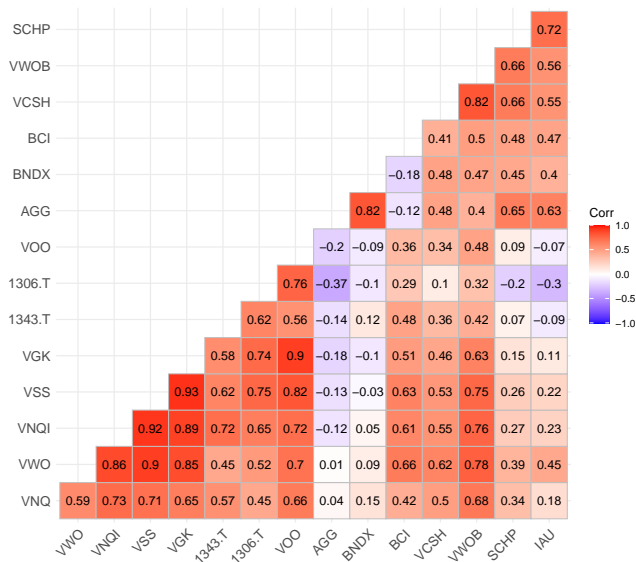
4. Obtain portfolio weights

- ▶ Generate efficient frontier
- ▶ Modified constraints to take in $\mu_{aggregated}$
- ▶ Select Low, Mid, High risk portfolio from the efficient frontier

5. Back-test to observe portfolio performance

- ▶ Included Equal Weight portfolio as benchmark for comparison

Correlation Matrix



Correlation between VOO and VO

	VOO	VO
VOO	1.00000000	0.9630928
VO	0.9630928	1.00000000

- ▶ Omit VO
 - ▶ VO was omitted due to high correlation with VOO even though it is one of the given ETFs in the excl
 - ▶ VO's Holding is also very similar with VOO