Exploratory Analysis of Various Assets

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1 Description

1.1 US Equity

- AGG: iShares Core US Aggregate Bond
  Date ranges: 2003-09-29 to 2015-12-31
  Components:
  Description:

- HYG: iShares iBoxx $ High Yield Corporate Bd
  Date ranges: 2007-04-12 to 2015-12-31
  Components:
  Description:

- TIP: iShares TIPS Bond
  Date ranges: 2003-12-08 to 2015-12-31
  Components:
  Description:

1.2 Index

- BCOM: Bloomberg Commodity Index
  Date ranges: 1991-01-03 to 2015-12-31
  Description: Bloomberg Commodity Index (BCOM) is calculated on an excess return basis and reflects commodity futures price movements. The index rebalances annually weighted 2/3 by trading volume and 1/3 by world production

and weight-caps are applied at the commodity, sector and group level for diversification. Roll period typically occurs from 6th-10th business day based on the roll schedule.[1]

- BUHY: Bloomberg USD High Yield Corporate Bond Index
  Date ranges: 2010-01-04 to 2015-12-31
  Description: The Bloomberg USD High Yield Corporate Bond Index is a rules-based, market-value weighted index engineered to measure publicly issued non-investment grade USD fixed-rate, taxable, corporate bonds. To be included in the index a security must have a minimum par amount of 250MM.[2]

- G0O1: 3-month U.S. Treasury Bill Index
  Date ranges: 1992-04-01 to 2015-12-31
  Components:
  Description:

- LTP5TRUU:
  Date ranges: 2010-06-03 to 2015-12-31
  Components:
  Description:

- MXEA: MSCI EAFE Index
  Date ranges: 1970-01-07 to 2015-12-31
  Components:
  Description:

- MXEF: MSCI Emerging Markets Index
  Date ranges: 1988-01-01 to 2015-12-31
  Components:
  Description:

- RAY: Russell 3000 Index
  Date ranges: 1979-01-02 to 2015-12-31
  Description: The Russell 3000 Index is composed of 3000 large U.S. companies, as determined by market capitalization. This portfolio of Securities represents approximately 98% of the investable U.S. equity market. The Russell 3000 Index is comprised of stocks within the Russell 1000 and the Russell 2000

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[1]http://www.bloomberg.com/quote/BCOM:IND
[2]http://www.bloomberg.com/quote/BUHY:IND

Indices. The index was developed with a base value of 140.00 as of December 31, 1986.[3]

- RMZ: MSCI US REIT Index
  Date ranges: 2005-06-20 to 2015-12-31
  Components:
  Description:

- SPX: S&P 500 Index
  Date ranges: 1950-01-04 to 2015-12-31
  Description: Standard and Poor's 500 Index is a capitalization-weighted index of 500 stocks. The index is designed to measure performance of the broad domestic economy through changes in the aggregate market value of 500 stocks representing all major industries. The index was developed with a base level of 10 for the 1941-43 base period.[4]

- USGG10YR: US Generic Govt 10 Year
  Date ranges: 1962-01-03 to 2015-12-31
  Components:
  Description:

2 Statistical summary

2.1 Annualized return

Annualised return are calculated based on the daily returns.

$$R_a = (1 + R_d)^N - 1 \tag{1}$$

where R_a is the annualized returns, R_d is the daily returns, N is the number of trading days in one year (N = 252).

2.2 Sharpe Ratio, Standard deviation, Skewnes and Kurtosis

- Sharpe Ratio

  Here we let $Rf = 0$

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[3]http://www.bloomberg.com/quote/RAY:IND
[4]http://www.bloomberg.com/quote/SPX:IND

- Standard deviation

- Skewnes

- Kurtosis

3   Risk diagnostics

In this section, all the risk diagnostics are calculated based on daily returns.

3.1   VaR & ES

- VaR

- ES

3.2   CED

Three month CED.

4   Time varying risk diagnostics

Time series diagnostics: time varying risk diagnostics over a 6-month (and then 1-year) rolling window

5   Appendix: Tables and Plots

Table 1: Statistical Summary of Assets

Asset	Sharpe	Sd.	Skewnes	Kurtosis
AGG	0.0516	0.0032	-2.5102	81.3606
HYG	0.0250	0.0084	0.8657	36.7430
TIP	0.0402	0.0041	0.0954	6.4866
BCOM	0.0008	0.0094	-0.2718	4.3366
BUHY	0.1237	0.0019	-1.7849	11.2806
G0O1	0.7167	0.0001	0.6853	26.7670
LTP5TRUU	0.0402	0.0011	0.1615	1.7925
MXEA	0.0300	0.0097	-0.3153	10.7456
MXEF	0.0307	0.0113	-0.3933	7.7139
RAY	0.0360	0.0109	-0.6614	17.2216
RMZ	0.0162	0.0230	0.3566	13.6886
SPX	0.0348	0.0097	-0.6493	21.1192
USGG10YR	0.0031	0.0127	0.1159	8.8116

Table 2: VaR and ES under various probabilities

	VaR(%)			ES(%)		
Asset	0.9	0.95	0.99	0.9	0.95	0.99
AGG	-0.2906	-0.4011	-0.6911	-0.5014	-0.6641	-1.2317
HYG	-0.6189	-1.0301	-2.5006	-1.4125	-2.0298	-4.0129
TIP	-0.4417	-0.6220	-1.0146	-0.7178	-0.9100	-1.4712
BCOM	-1.0405	-1.4740	-2.6157	-1.7128	-2.1974	-3.5476
BUHY	-0.1634	-0.2910	-0.6573	-0.3690	-0.5252	-0.9751
G0O1	-0.0003	-0.0020	-0.0126	-0.0056	-0.0099	-0.0313
LTP5TRUU	-0.1233	-0.1800	-0.2922	-0.1979	-0.2476	-0.3501
MXEA	-1.0210	-1.4619	-2.5908	-1.7372	-2.2568	-3.7602
MXEF	-1.2088	-1.7587	-3.3164	-2.1061	-2.7544	-4.6707
RAY	-1.1064	-1.6239	-2.9659	-1.9500	-2.5554	-4.4182
RMZ	-1.9079	-3.0008	-7.5575	-3.9925	-5.6189	-9.9890
SPX	-0.9889	-1.4350	-2.5757	-1.7055	-2.2255	-3.7960
USGG10YR	-1.2640	-1.9492	-3.5935	-2.2764	-2.9939	-4.8875

Table 3: CED under 3-month rolling window

Asset	CED(%) 0.9	0.95	0.99
AGG	-5.5963	-7.7247	-12.8352
HYG	-18.4178	-24.0716	-29.4005
TIP	-7.4759	-9.8950	-13.0980
BCOM	-18.1428	-22.5428	-38.0340
BUHY	-5.8071	-6.2709	-7.5793
G0O1	-0.0913	-0.1435	-0.2550
LTP5TRUU	-2.0623	-2.3847	-2.9234
MXEA	-20.3911	-23.7284	-33.3246
MXEF	-26.2108	-30.8033	-46.7422
RAY	-20.6454	-25.6426	-35.9454
RMZ	-37.3016	-48.4088	-63.4499
SPX	-18.3513	-22.6740	-32.4618
USGG10YR	-23.2767	-28.1128	-41.8330