Bond Investing in a Rising Interest Rate Environment

AAII Silicon Valley
June 13, 2015

Kevin Gahagan, CIMA®, CFP®
Mosaic Financial Partners, Inc.
www.MosaicFP.com

Setting the Stage …

- **The objective of fixed income in a portfolio**

- **The realities of the bond market**
  - **Equilibrium**
  - **Yield and risk are related**
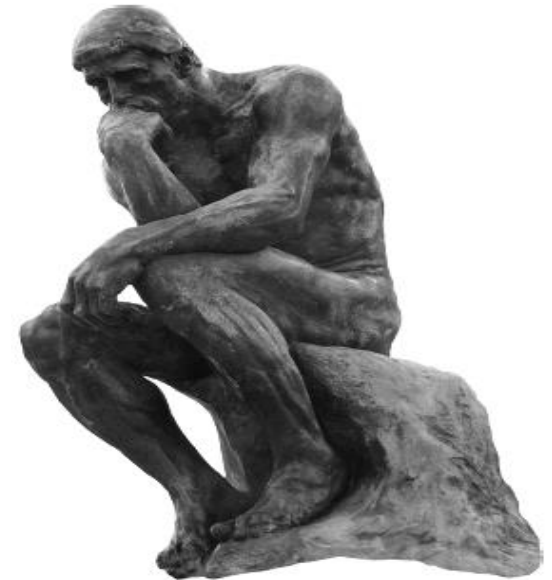
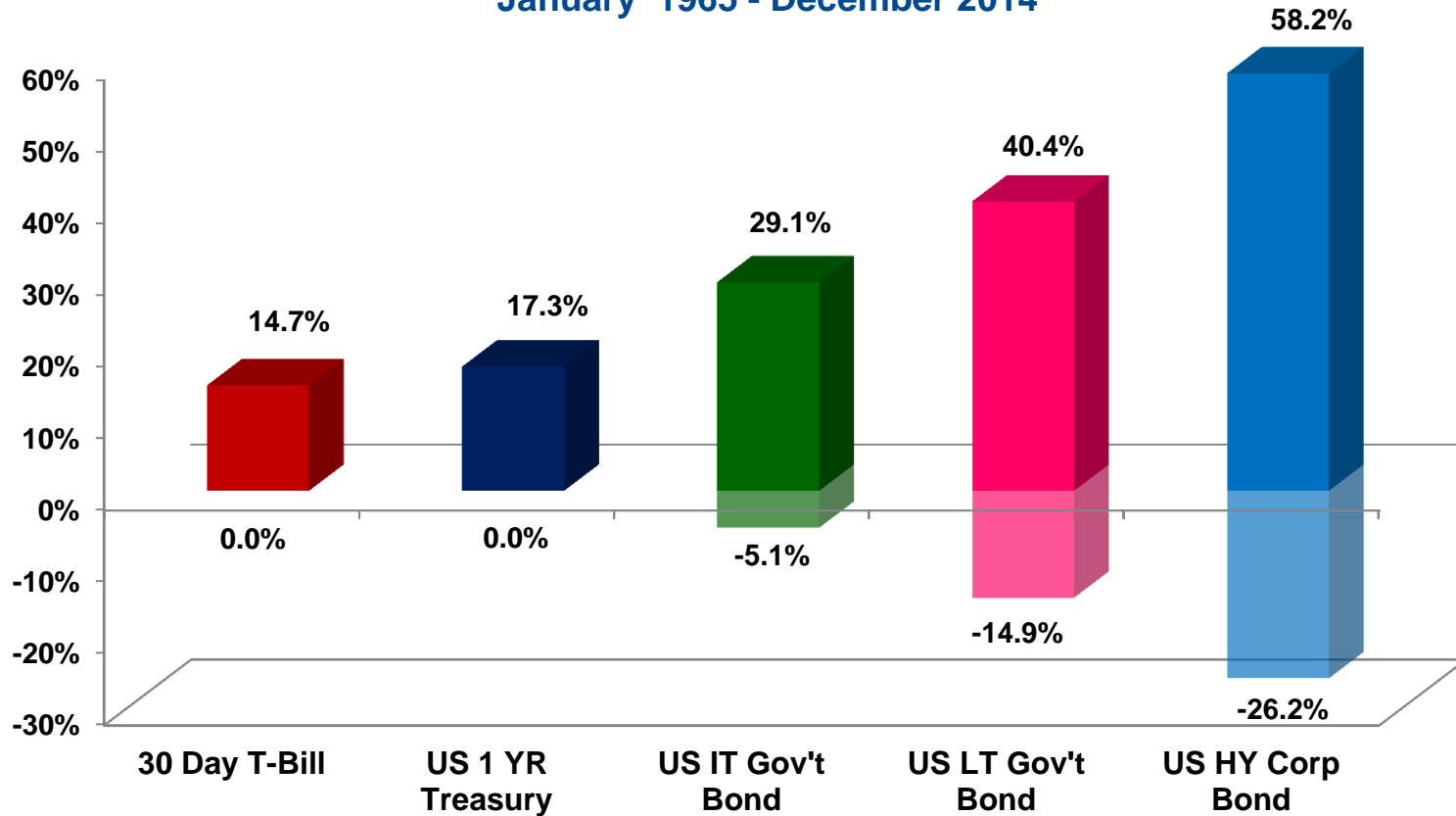# The Sources of Risk in Bonds

- **Credit quality of the issuer**

- **Bond term (the duration of the bond)**

- **The current interest rate environment**
  - **Market psychology**
  - **Supply and demand**

And on Wall Street today the markets generated another exciting day's worth of meaningless white noise

Credit quality and bond term drive "risk"

Range of Annual Returns
January 1965 - December 2014

	30 Day T-Bill	US 1 YR Treasury	US IT Gov't Bond	US LT Gov't Bond	US HY Corp Bond
High	14.7%	17.3%	29.1%	40.4%	58.2%
Low	0.0%	0.0%	-5.1%	-14.9%	-26.2%
Average	5.1%	5.7%	7.0%	7.6%	8.0%

Source: Ibbotson Associates / Morningstar Direct

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Considering high-yield bonds

Return

S&P 500 Index - TR   Barclays US High Yield - TR   US 1-Year Treasury

Source: Ibbotson Associates / Morningstar Direct

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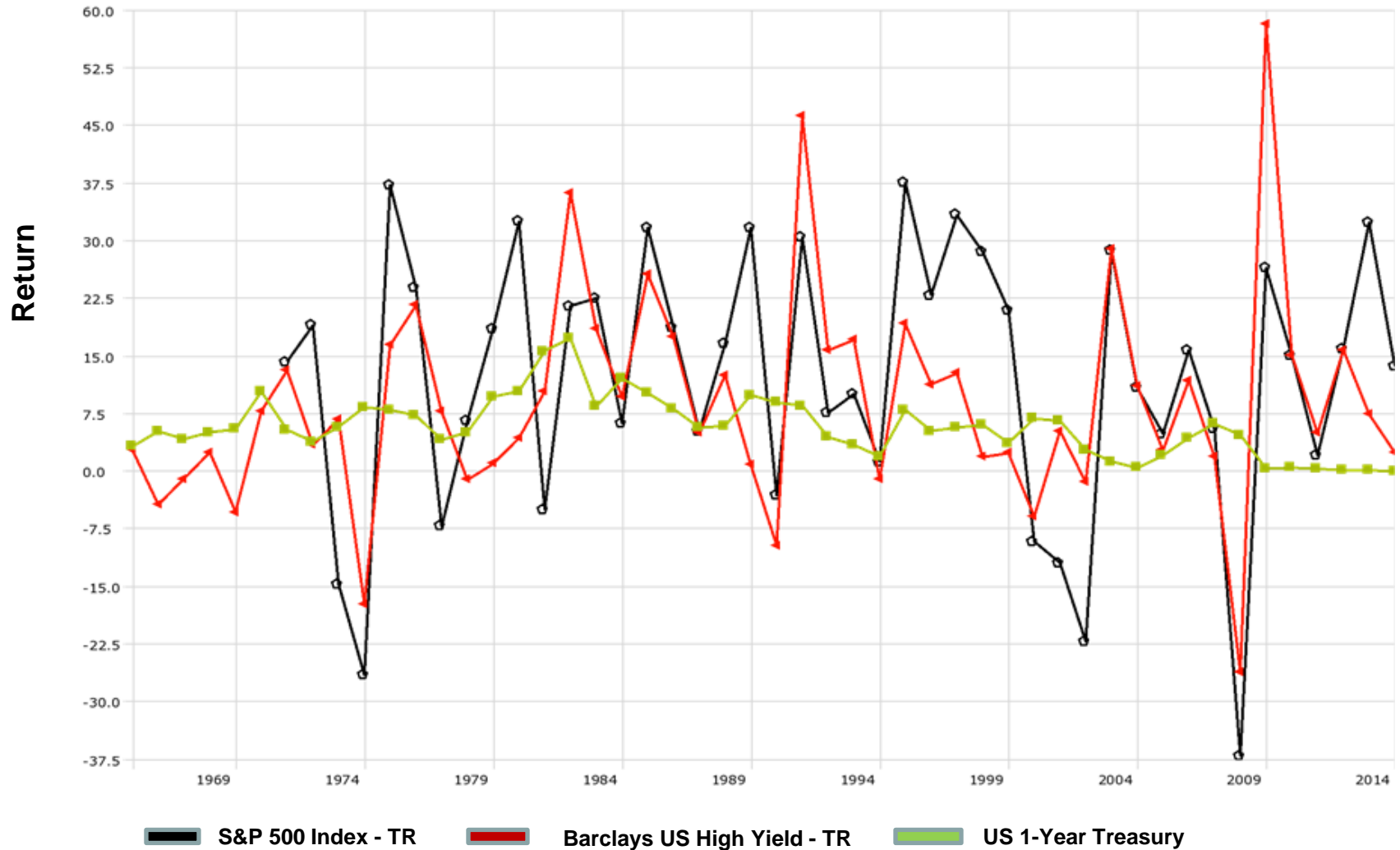
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Bond pricing relationships

- **Bond price and yield and inversely related**

- **Long bonds are more sensitive to changes in the interest rate environment**

- **Interest rate risk is inversely related to a bond's coupon rate**

- **As maturity increases, price sensitivity to changes in yield slows**

Price and yield are inversely related …

10-Year bond at 2.2%

YTM	2.20%	3%	4%	1.50%
Price	$1,000	$932	$854	$1,065
Difference	n/a	-$68	-$146	$65
Change		-6.8%	-14.6%	6.5%

Calculation assumes a single annual interest payment. Duration is treated as equal to bond maturity (figures rounded)

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Long bonds have greater sensitivity to interest rate changes

10-year bond 2.2% coupon:

YTM	2.2%	3%	4%	1.5%
Price	$1,000	$932	$854	$1,065
Difference	n/a	-$68	-$146	$65
Change		-6.8%	-14.6%	6.5%

20-year bond 2.5% coupon:

YTM	2.5%	3%	4%	1.5%
Price	$1,000	$926	$796	$1,172
Difference	n/a	-$74	-$204	$172
Change		-7.4%	-20.0%	17.0%

Calculation assumes a single annual interest payment. Duration is treated as equal to bond maturity (figures rounded).

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Interest rate risk is inversely related to a bond's coupon rate

All things equal, higher coupon bonds are less sensitive to increases in interest rates

What is the price impact of a 1% increase in YTM on bonds having different coupon rates? (20-year bond)

Coupon	2.0%	3%	4%	5%	6%
Price	$851	$864	$875	$885	$894
Change	-14.9%	-13.6%	-12.5%	-11.5%	-10.6%

Calculation assumes a single annual interest payment. Duration is treated as equal to bond maturity (figures rounded).

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As maturity increases, price sensitivity to changes in yield increases at a progressively slower rate

What is the price impact of a 1% increase in YTM on bonds having different coupon rates?

(3% coupon bond)

Term	5-year	10-year	15-year	20-year	30-year
Price	$955	$919	$889	$864	$827
% Change	-4.5%	-8.1%	-11.1%	13.6%	-17.3%

Calculation assumes a single annual interest payment. Duration is treated as equal to bond maturity (figures rounded).

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Defining Duration ...

- A measure of a bond's effective maturity. This is the time required for full repayment of the bond at the bond's stated yield.

- Duration is the sum of the PV of payments (both coupon and bond redemption) weighted for their relative importance to repayment.

Duration as a measure of risk
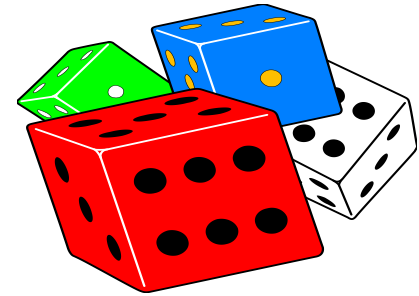
- **Duration is a proxy for volatility**

- **For each 1% movement in yield – duration measures the approximate percentage change in bond price**

- **Example – a bond portfolio with a duration of 8 years could be expected to rise or decline in value by 8% for every 1% change in yield**

- **All other factors equal, bonds of longer duration will experience greater volatility**

The relationship between yield and duration
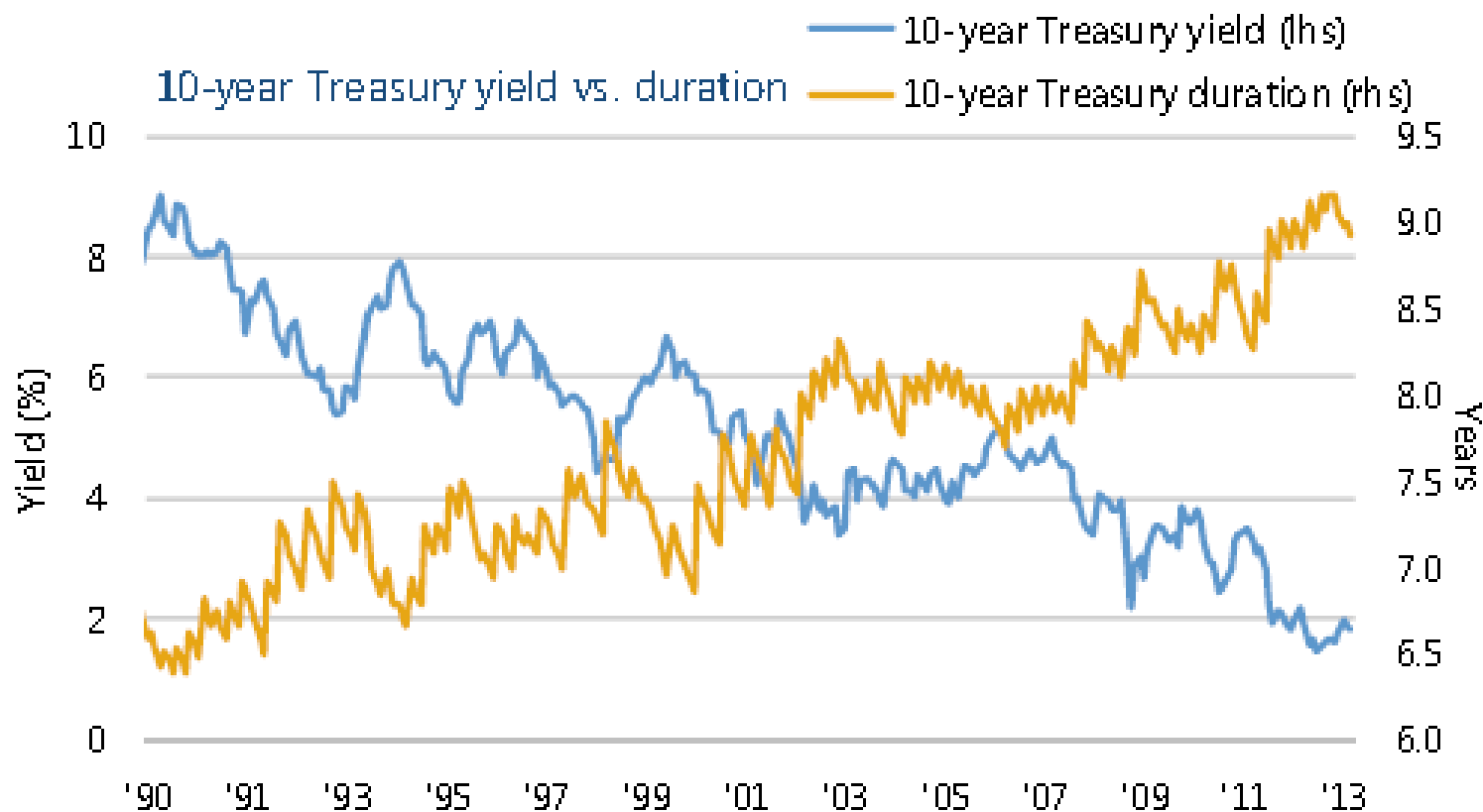
Source: PIMCO, Bloomberg, Barclays

Bond Performance in Past Interest Rate Environments …

A review of bond class returns in past periods of rising rates

50 Years of risk and return – the "classic" yield curve
January 1965 – December 2014

RETURN (y-axis)
Standard Deviation (volatility) (x-axis)

Data points:
- 30-day T-bills - TR (≈1.0, 5.0)
- US 1- Year Treasury - TR (≈1.8, 5.7)
- US Intermediate Gov't - TR (≈5.5, 7.0)
- Barclays US High Yield - TR (≈9.0, 8.0)
- US Long Term Gov't - TR (≈10.5, 7.5)

Source: Ibbotson Associates / Morningstar Direct

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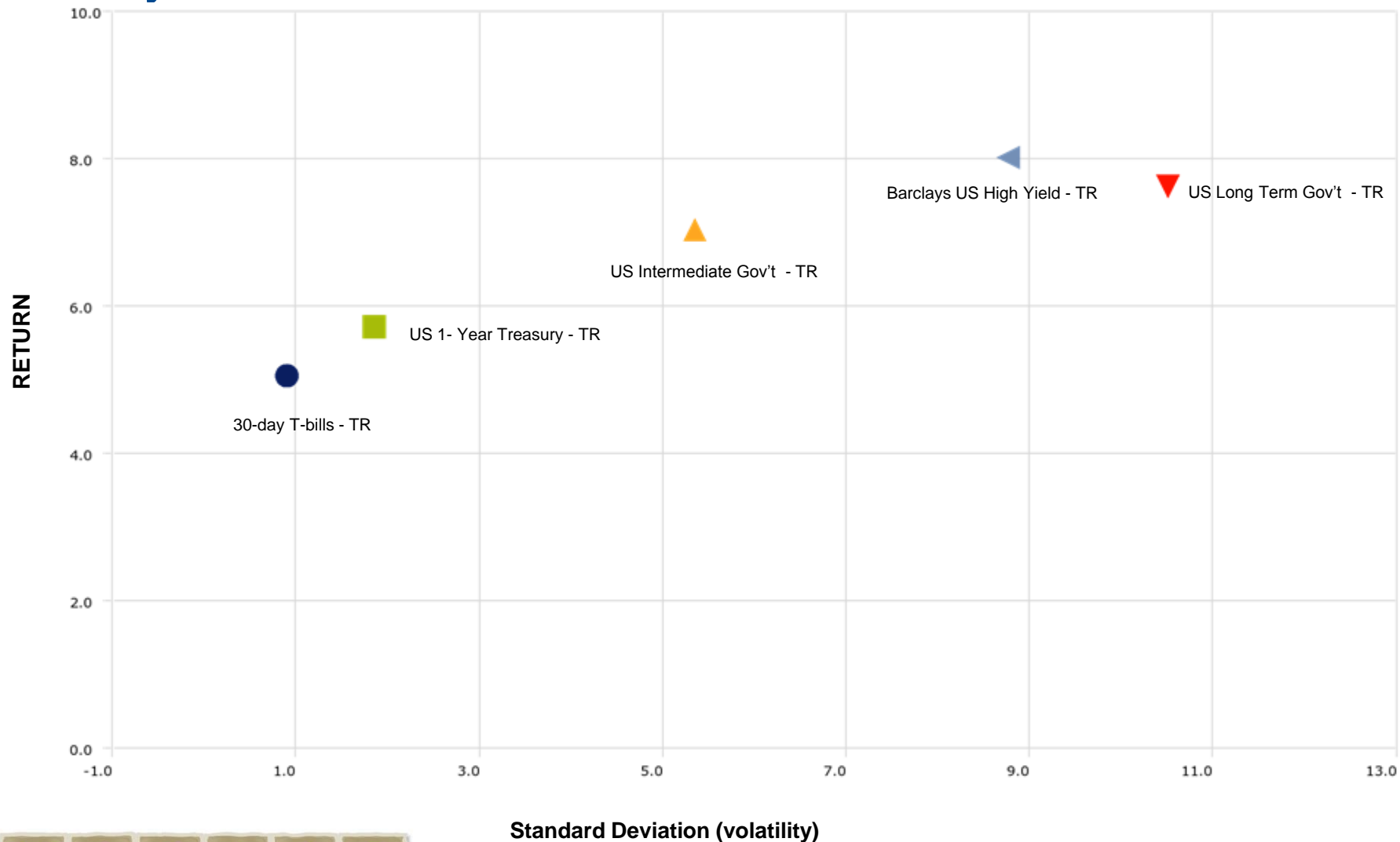
1-Year bond yield increase = 2% (beginning yield of 4%)

June 1, 1965 – September 30, 1966 (Long bond yield increase of 0.6% to 4.8%)
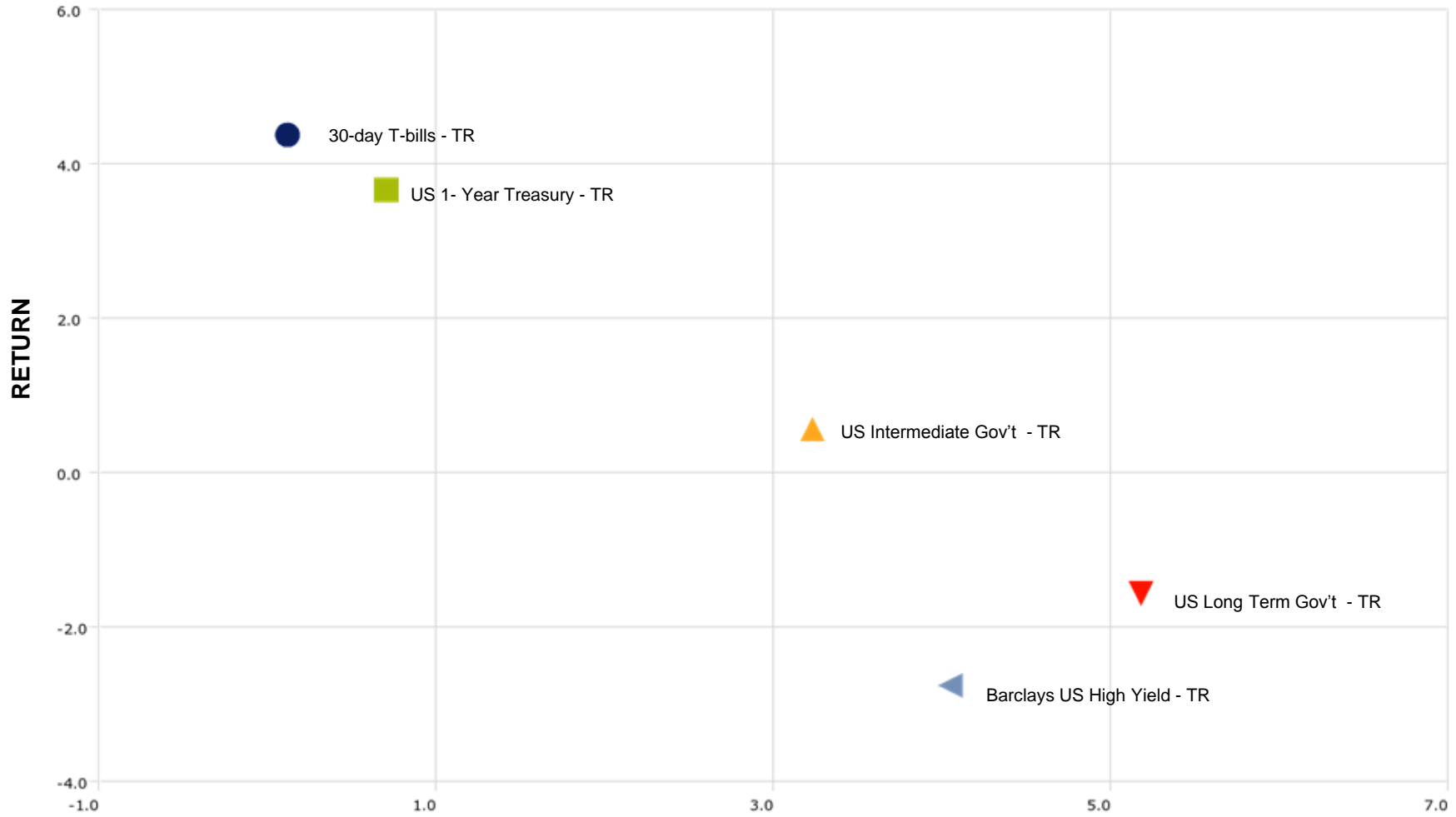
RETURN

- 30-day T-bills - TR
- US 1- Year Treasury - TR
- US Intermediate Gov't - TR
- US Long Term Gov't - TR
- Barclays US High Yield - TR

Standard Deviation (volatility)

Source: Ibbotson Associates / Morningstar Direct

1-Year bond yield increase = 1.8% (beginning yield of 4%)

May 1, 1967 – November 30, 1967   (Long bond yield increase of 0.9% to 5.7%)

Chart: RETURN (y-axis) vs Standard Deviation (volatility) (x-axis)

- 30-day T-bills - TR
- US 1- Year Treasury - TR
- US Intermediate Gov't - TR
- Barclays US High Yield - TR
- US Long Term Gov't - TR
- S&P 500 Index - TR
- CRSP 6-10 – Small Cap Index - TR

Source: Ibbotson Associates / Morningstar Direct

5 Year returns - June 1, 1965 – May 31, 1970

Inflation over the period 4.2%

RETURN

- CRSP 6-10 – Small Cap Index - TR
- US 1- Year Treasury - TR
- 30-day T-bills - TR
- US Intermediate Gov't - TR
- S&P 500 Index - TR
- Barclays US High Yield - TR
- US Long Term Gov't - TR

Standard Deviation (volatility)

Source: Ibbotson Associates / Morningstar Direct

1-Year bond yield increase = 2.8% (beginning yield of 7.3%)

January 1, 1974 – August 31, 1974   (Long bond yield increase of 1.2% to 8.6%)
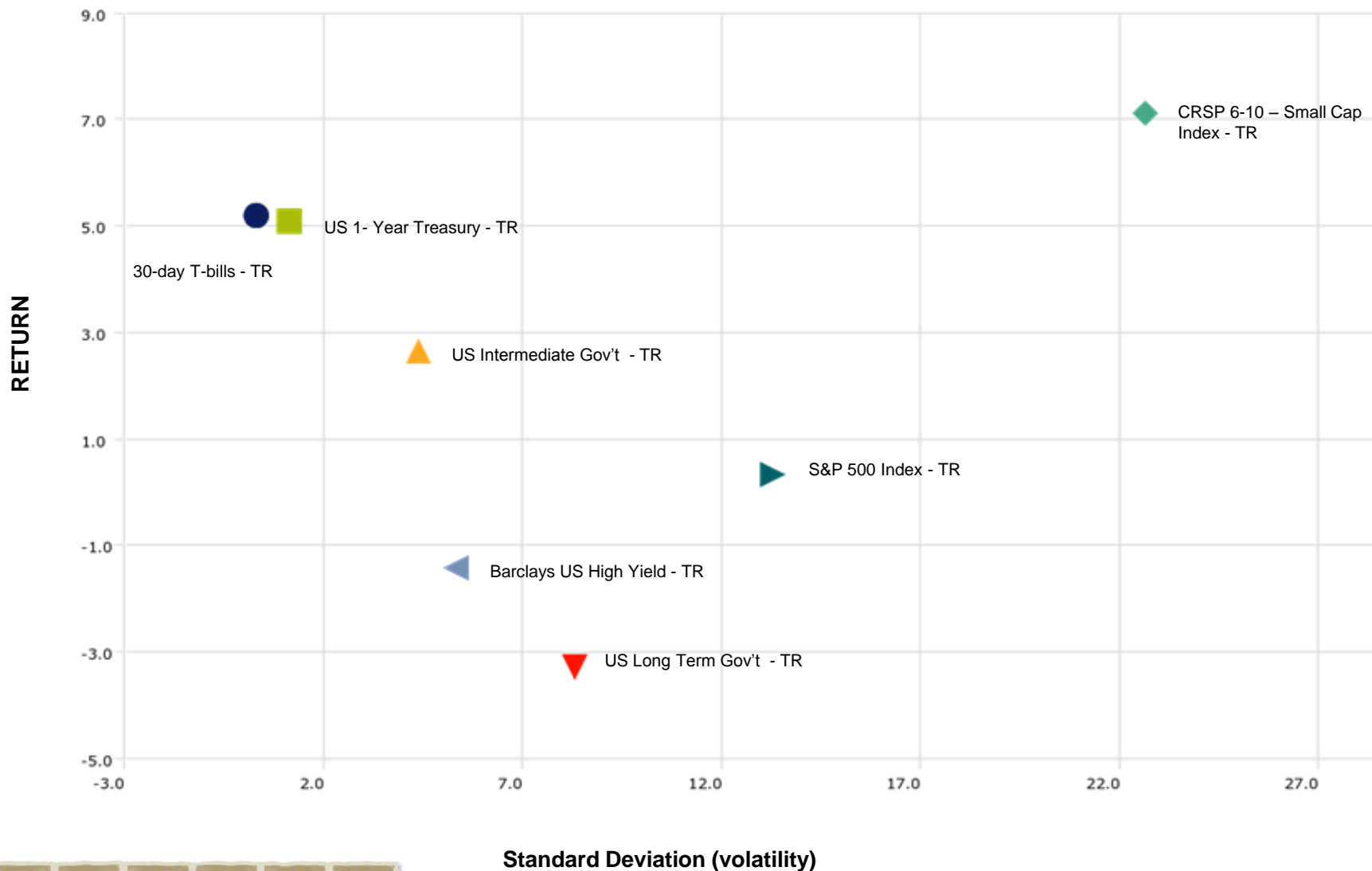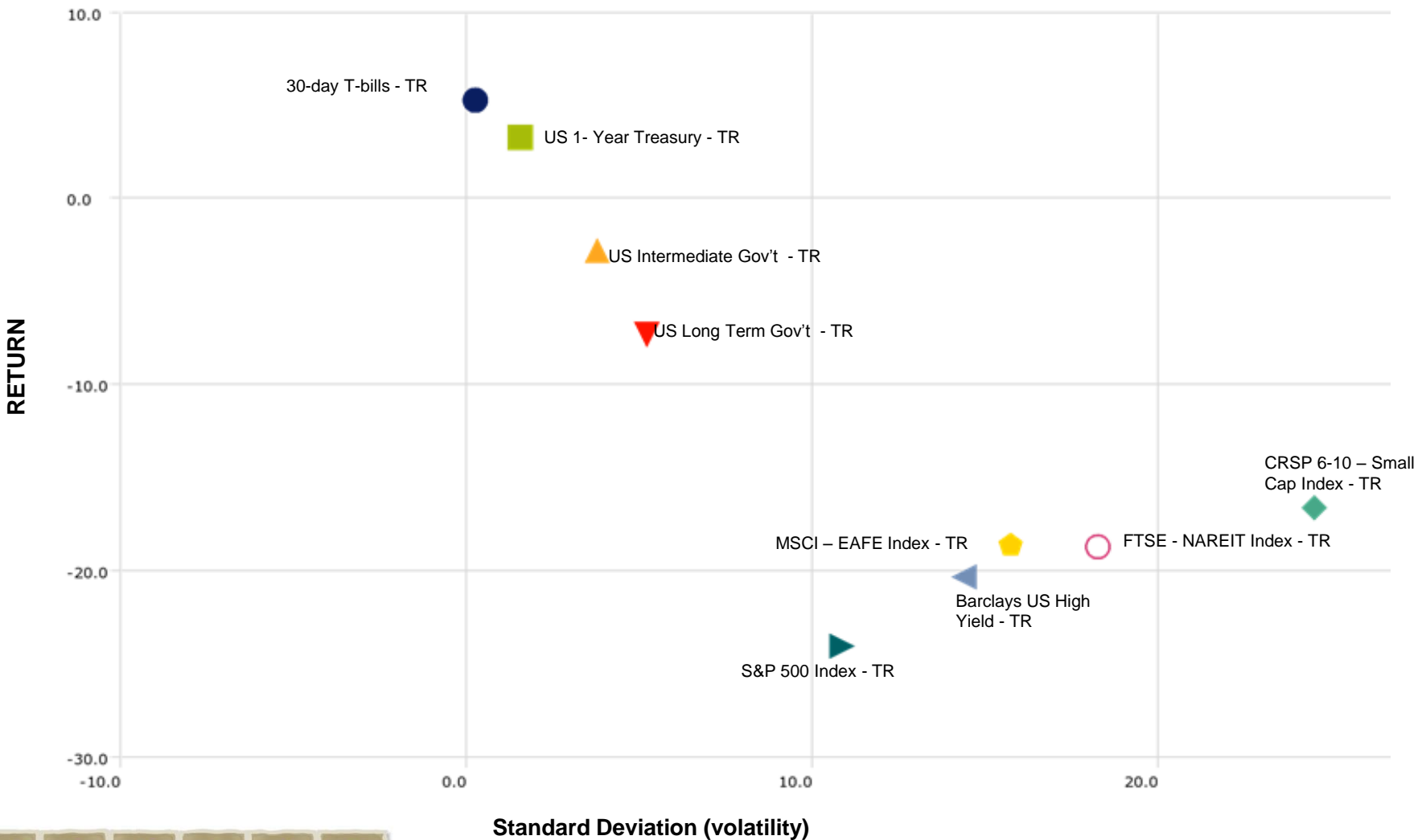

Source: Ibbotson Associates / Morningstar Direct

1-Year bond yield increase = 5.6% (beginning yield of 4.9%)

November 1, 1976 – December 31, 1978   (Long bond yield increase of 1.5% to 9.0%)

RETURN (y-axis, 0.0 to 8.0)

Standard Deviation (volatility) (x-axis, -1.0 to 5.0)

Data points:
- 30-day T-bills - TR
- US 1- Year Treasury - TR
- Barclays US High Yield - TR
- Mortgage-backed bonds - TR
- US Intermediate Gov't - TR
- US Long Term Gov't - TR

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Source: Ibbotson Associates / Morningstar Direct

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5 Year returns - January 1, 1974 – December 31, 1978

Inflation over the period 7.9%

RETURN (y-axis): 0.0 to 8.0

Standard Deviation (volatility) (x-axis): -1.0 to 11.0

- US 1- Year Treasury - TR
- US Intermediate Gov't - TR
- 30-day T-bills - TR
- US Long Term Gov't - TR
- Barclays US High Yield - TR

Source: Ibbotson Associates / Morningstar Direct

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5 Year returns - January 1, 1974 – December 31, 1978

Inflation over the period 7.9%

Scatter plot with x-axis "Standard Deviation (volatility)" ranging from -10.0 to 30.0 and y-axis "RETURN" ranging from 0.0 to 28.0.

Data points:
- CRSP 6-10 – Small Cap Index - TR (≈26, 21)
- FTSE - NAREIT Index - TR (≈15, 13.3)
- MSCI – EAFE Index - TR (≈18, 12.1)
- US 1- Year Treasury - TR (≈2, 6.5)
- 30-day T-bills - TR (≈0.5, 6)
- US Intermediate Gov't - TR (≈4, 6.2)
- US Long Term Gov't - TR (≈7, 5.5)
- Barclays US High Yield - TR (≈10, 4.3)
- S&P 500 Index - TR (≈18, 4.5)

1-Year bond yield increase = 6.2% (beginning yield of 9.5%)

June 1, 1979 – March 31,1980 **(Long bond yield increase of 3.6% to 12.4%)**

RETURN

- FTSE - NAREIT Index - TR
- 30-day T-bills - TR
- S&P 500 Index - TR
- US 1- Year Treasury - TR
- CRSP 6-10 – Small Cap Index - TR
- MSCI – EAFE Index - TR
- US Intermediate Gov't - TR
- Barclays US High Yield - TR
- Barclays US High Yield - TR

Standard Deviation (volatility)
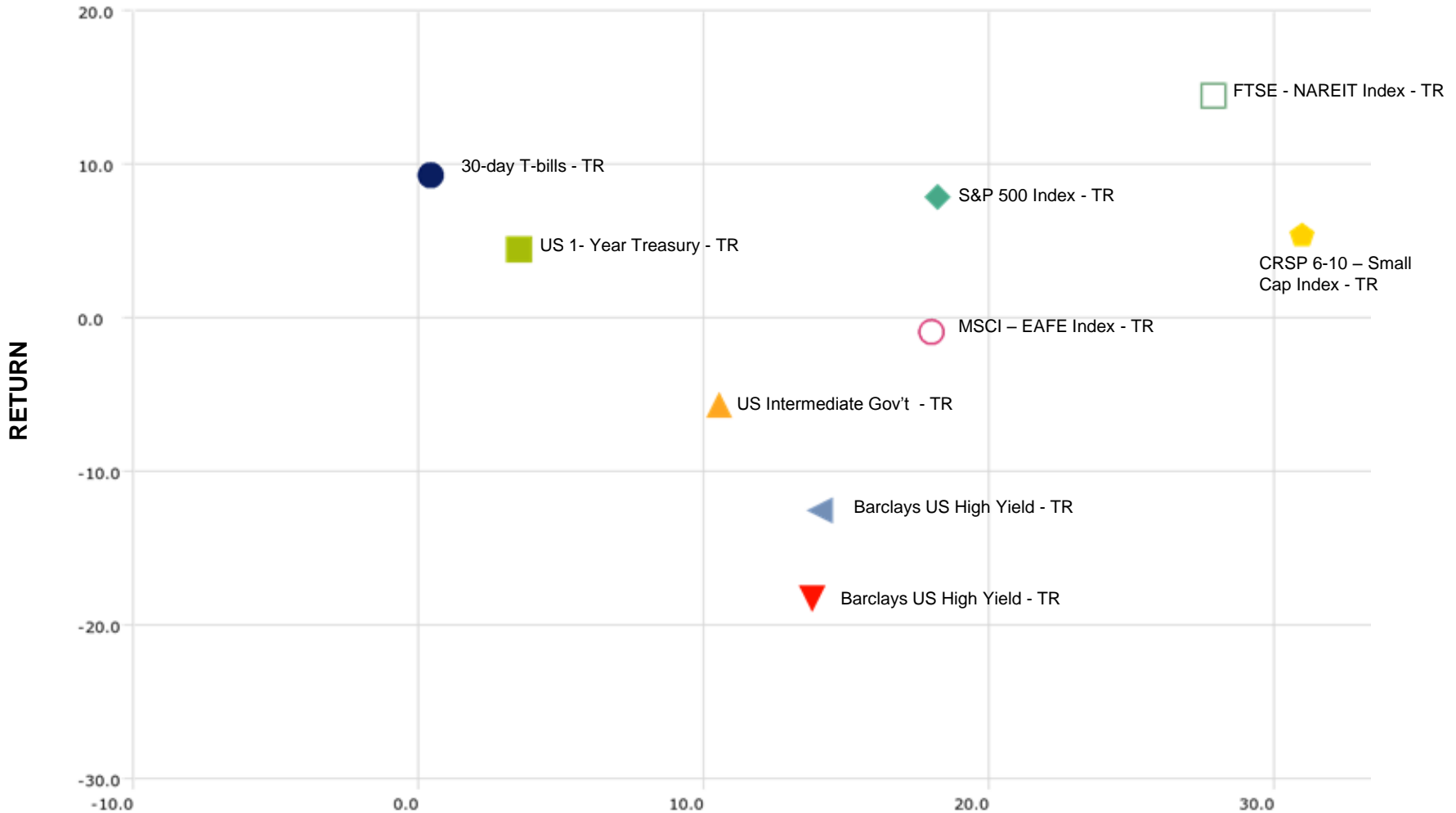
1-Year bond yield increase = 8.6% (beginning yield of 8.5%)

June 1, 1980 – August 31,1981   (Long bond yield increase of 4.4% to 14.5%)

RETURN

CRSP 6-10 – Small Cap Index - TR	
FTSE - NAREIT Index - TR	
S&P 500 Index - TR	
MSCI – EAFE Index - TR	
30-day T-bills - TR	
US 1- Year Treasury - TR	
Barclays US High Yield - TR	
US Intermediate Gov't - TR	
Mortgage-backed bonds - TR	US Long Term Gov't - TR

Standard Deviation (volatility)

Source: Ibbotson Associates / Morningstar Direct
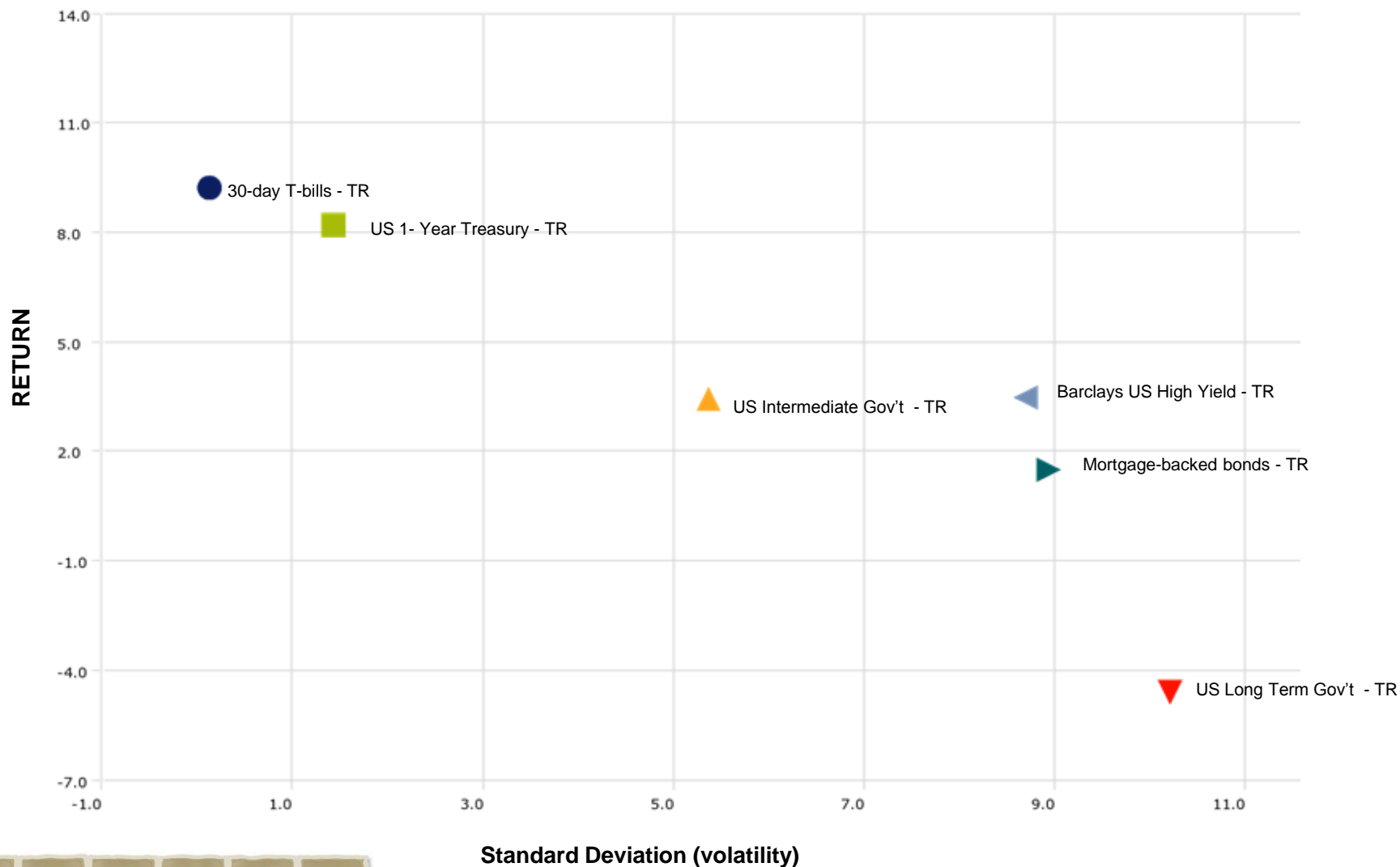
1-Year bond yield increase = 3.4% (beginning yield of 8.7%)

April 1, 1983 – June, 30,1984   (Long bond yield increase of 3.2% to 13.7%)

- ● 30-day T-bills - TR
- ■ US 1- Year Treasury - TR
- ▲ US Intermediate Gov't - TR
- ◄ Barclays US High Yield - TR
- ► Mortgage-backed bonds - TR
- ▼ US Long Term Gov't - TR

RETURN

Standard Deviation (volatility)

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5 Year Returns   June 1, 1979 – June 30, 1984.

Inflation over the period 7.7%

RETURN

- FTSE - NAREIT Index - TR
- CRSP 6-10 – Small Cap Index - TR
- S&P 500 Index - TR
- 30-day T-bills - TR
- US 1- Year Treasury - TR
- Barclays US High Yield - TR
- MSCI – EAFE Index - TR
- US Intermediate Gov't - TR
- US Long Term Gov't - TR

Standard Deviation (volatility)

Source: Ibbotson Associates / Morningstar Direct
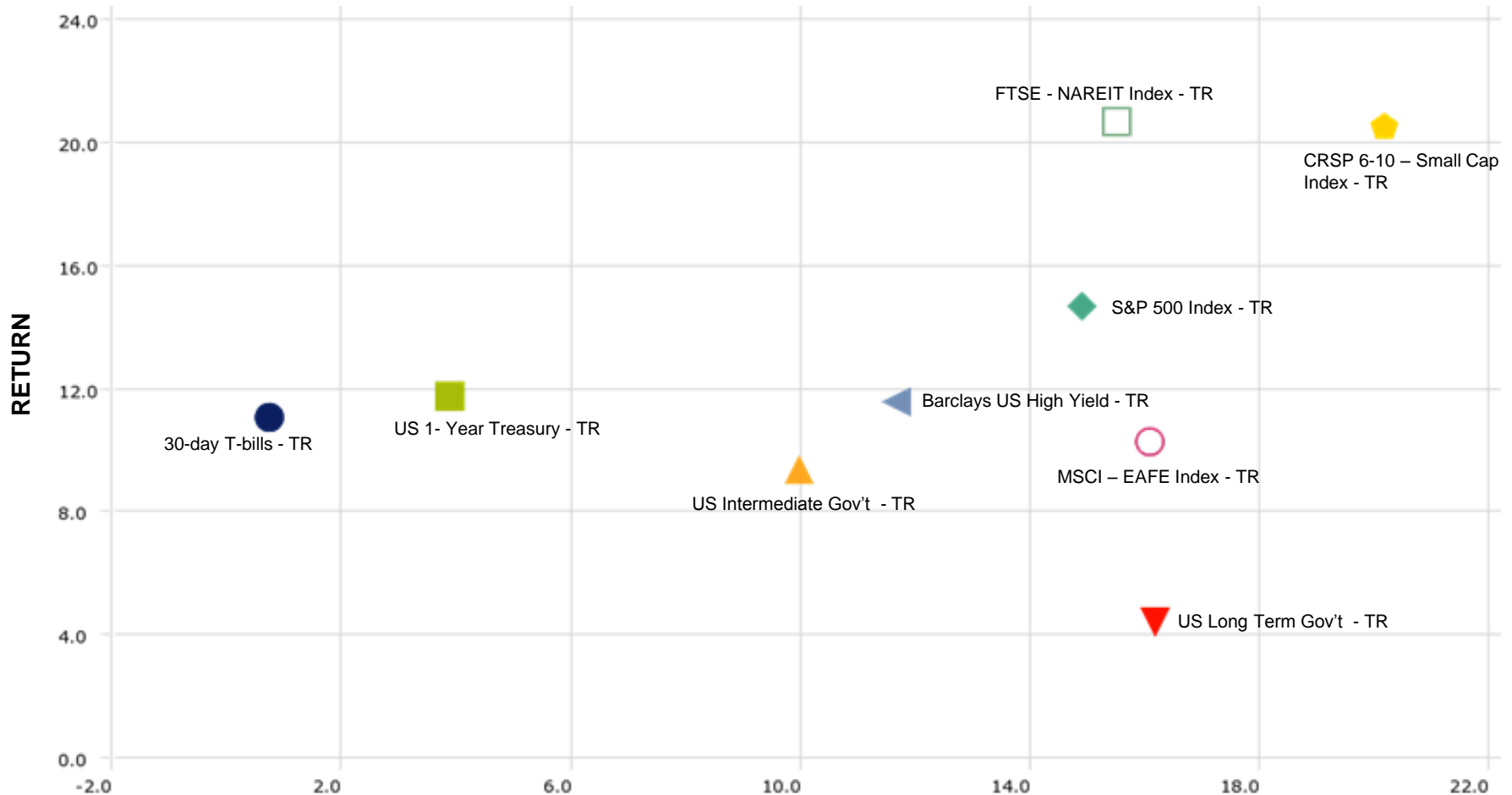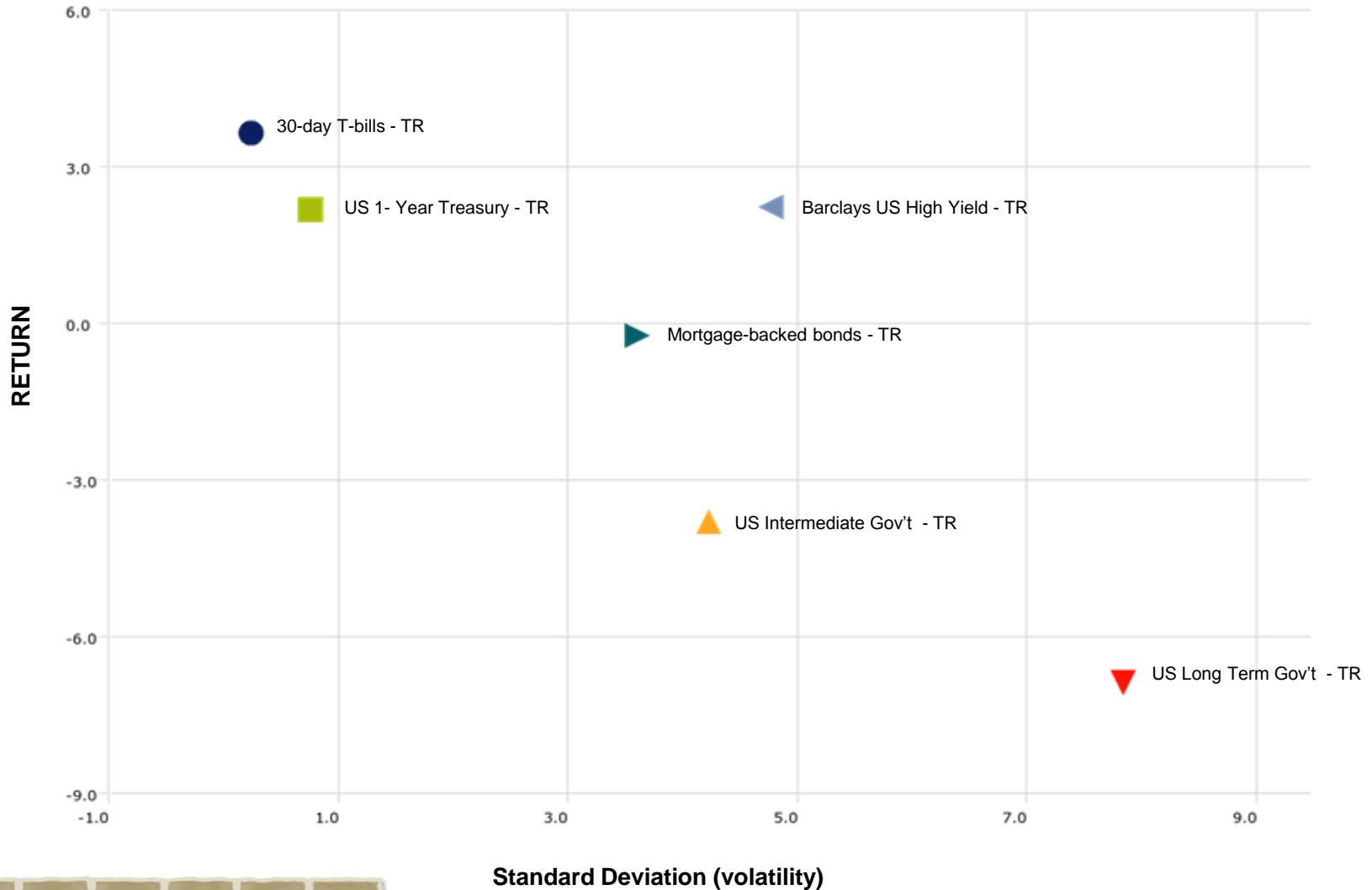
1-Year bond yield increase = 3.8% (beginning yield of 3.4%)
September 1, 1993 – December 31,1994   (Long bond yield increase of 1.7% to 8.0%)

RETURN

- 30-day T-bills - TR
- US 1- Year Treasury - TR
- Barclays US High Yield - TR
- Mortgage-backed bonds - TR
- US Intermediate Gov't - TR
- US Long Term Gov't - TR

Standard Deviation (volatility)

Source: Ibbotson Associates / Morningstar Direct

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1-Year bond yield increase = 2.1% (beginning yield of 4.2%)

October 1, 1998 – January 31, 2000   (Long bond yield increase of 1.3% to 6.7%)

RETURN

- 30-day T-bills - TR
- US 1- Year Treasury - TR
- Barclays US High Yield - TR
- Mortgage-backed bonds - TR
- US Intermediate Gov't - TR
- US Long Term Gov't - TR

Standard Deviation (volatility)

Source: Ibbotson Associates / Morningstar Direct

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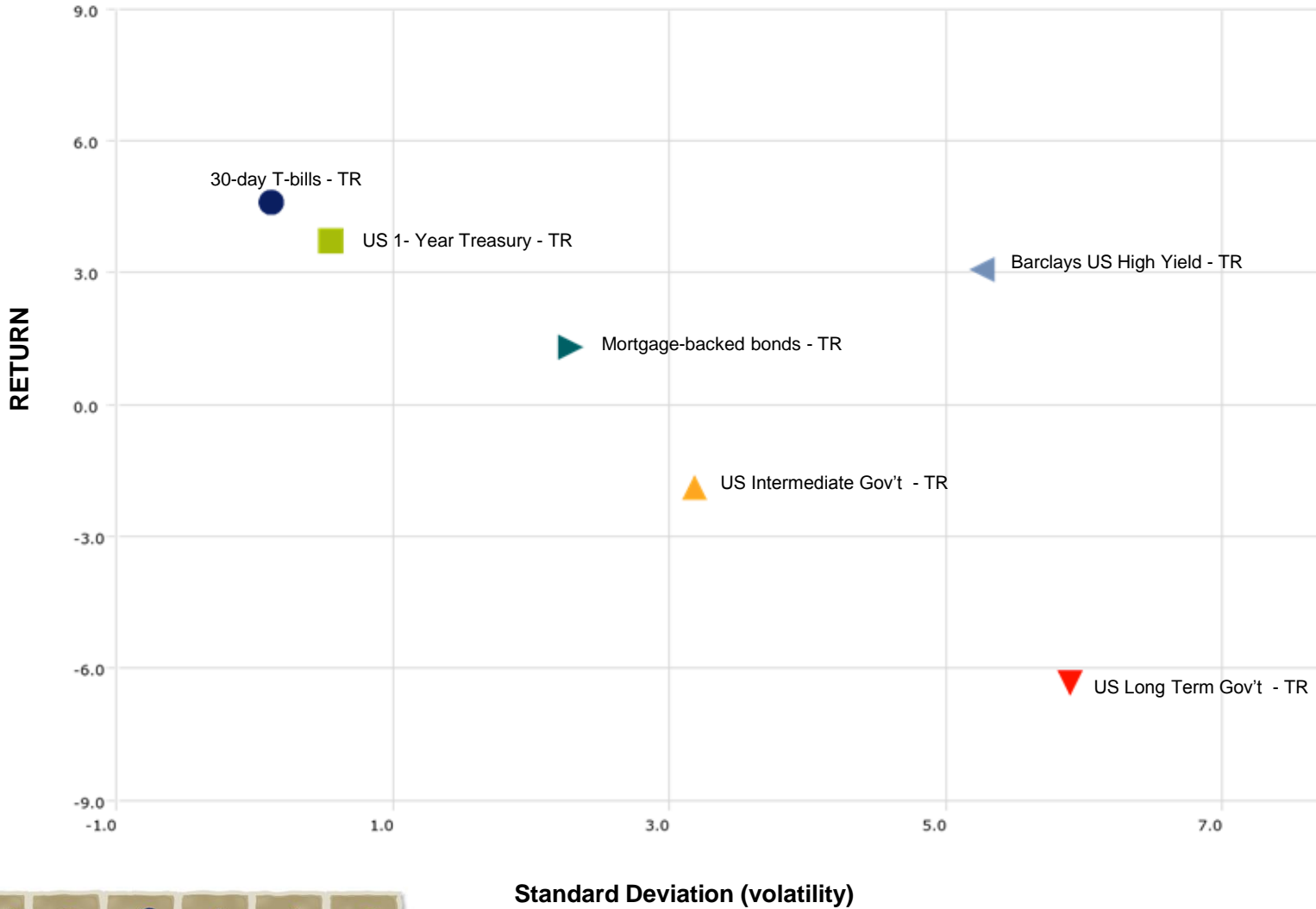
7 Year returns September 1, 1993 – January 31, 2000

Inflation over the period 2.5%
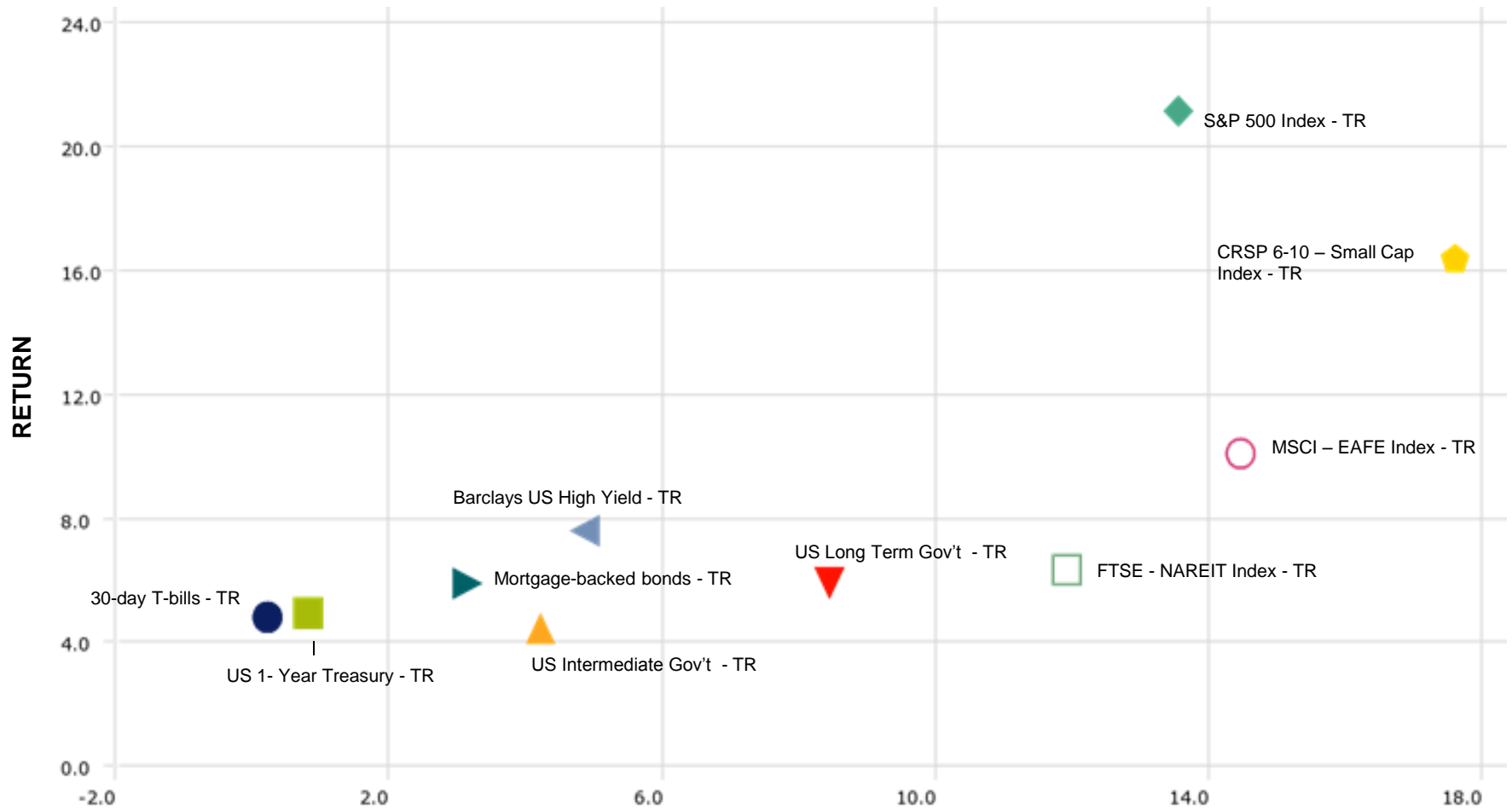
RETURN (y-axis, 0.0 to 24.0)

Standard Deviation (volatility) (x-axis, -2.0 to 18.0)

- S&P 500 Index - TR
- CRSP 6-10 – Small Cap Index - TR
- MSCI – EAFE Index - TR
- Barclays US High Yield - TR
- US Long Term Gov't - TR
- FTSE - NAREIT Index - TR
- 30-day T-bills - TR
- Mortgage-backed bonds - TR
- US 1- Year Treasury - TR
- US Intermediate Gov't - TR

Source: Ibbotson Associates / Morningstar Direct

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1-Year bond yield increase = 3.6% (beginning yield of 1.2%)

March 1, 2004 – June 30, 2005   (Long bond yield increase of 0.86% to 4.3%)

RETURN

FTSE - NAREIT Index - TR

MSCI – EAFE Index - TR

US Long Term Gov't - TR

Barclays US High Yield - TR

CRSP 6-10 – Small Cap Index - TR

Mortgage-backed bonds - TR

S&P 500 Index - TR

30-day T-bills - TR

US Intermediate Gov't - TR

US 1- Year Treasury - TR

Standard Deviation (volatility)

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Source: Ibbotson Associates / Morningstar Direct

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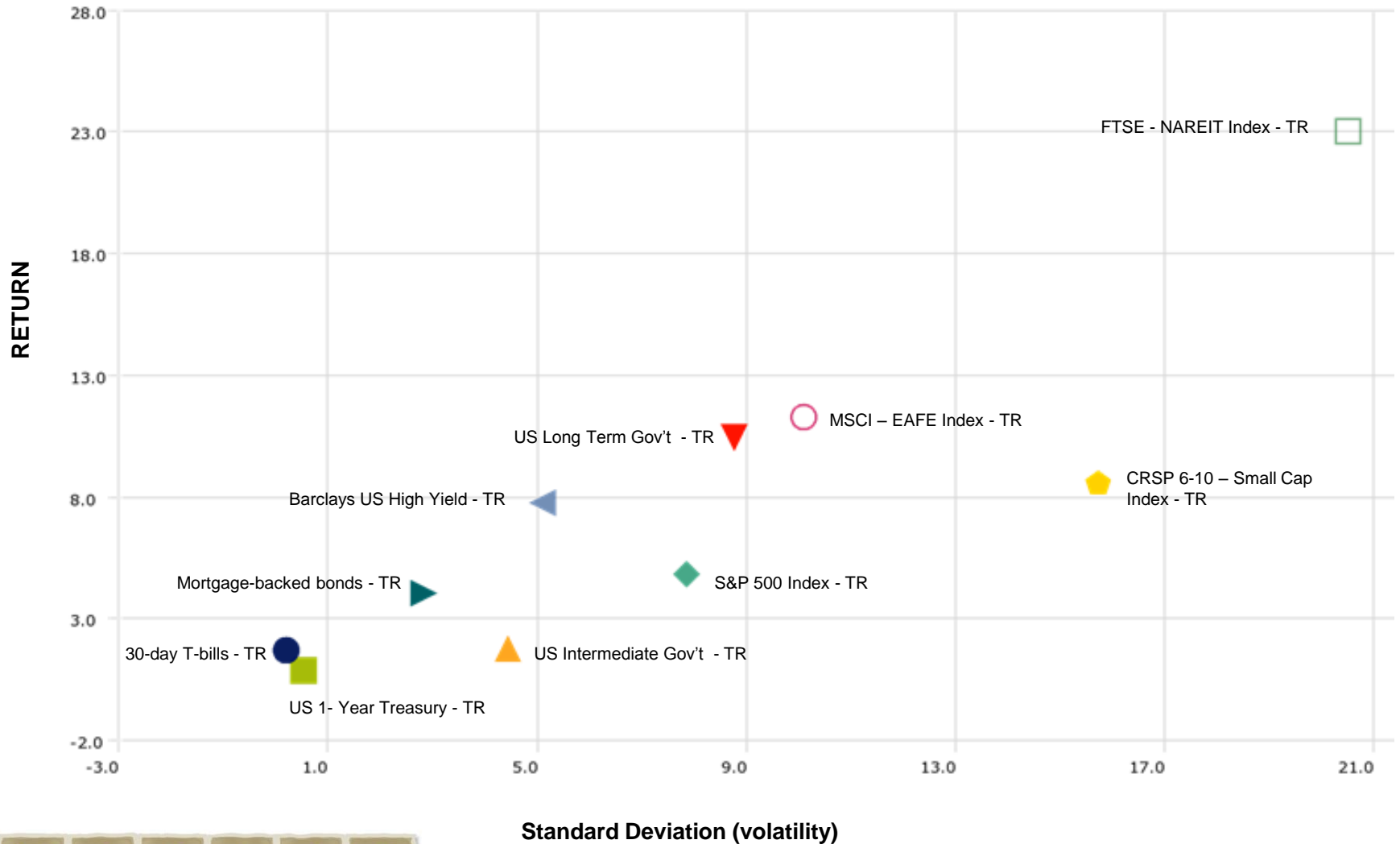
5 Year Returns   March 1, 2004 – February 28, 2009

Inflation over the period 2.6%

RETURN

Standard Deviation (volatility)

Plotted points:
- US Long Term Gov't - TR
- Mortgage-backed bonds - TR
- US Intermediate Gov't - TR
- 30-day T-bills - TR
- US 1- Year Treasury - TR
- Barclays US High Yield – TR
- MSCI – EAFE Index - TR
- S&P 500 Index - TR
- CRSP 6-10 – Small Cap Index - TR
- FTSE - NAREIT Index - TR

Y-axis values: 10.0, 7.0, 4.0, 1.0, -2.0, -5.0, -8.0, -11.0

X-axis values: -10.0, 0.0, 10.0, 20.0, 30.0

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Source: Ibbotson Associates / Morningstar Direct

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In a global credit crisis bonds aren't necessarily a "safe haven"
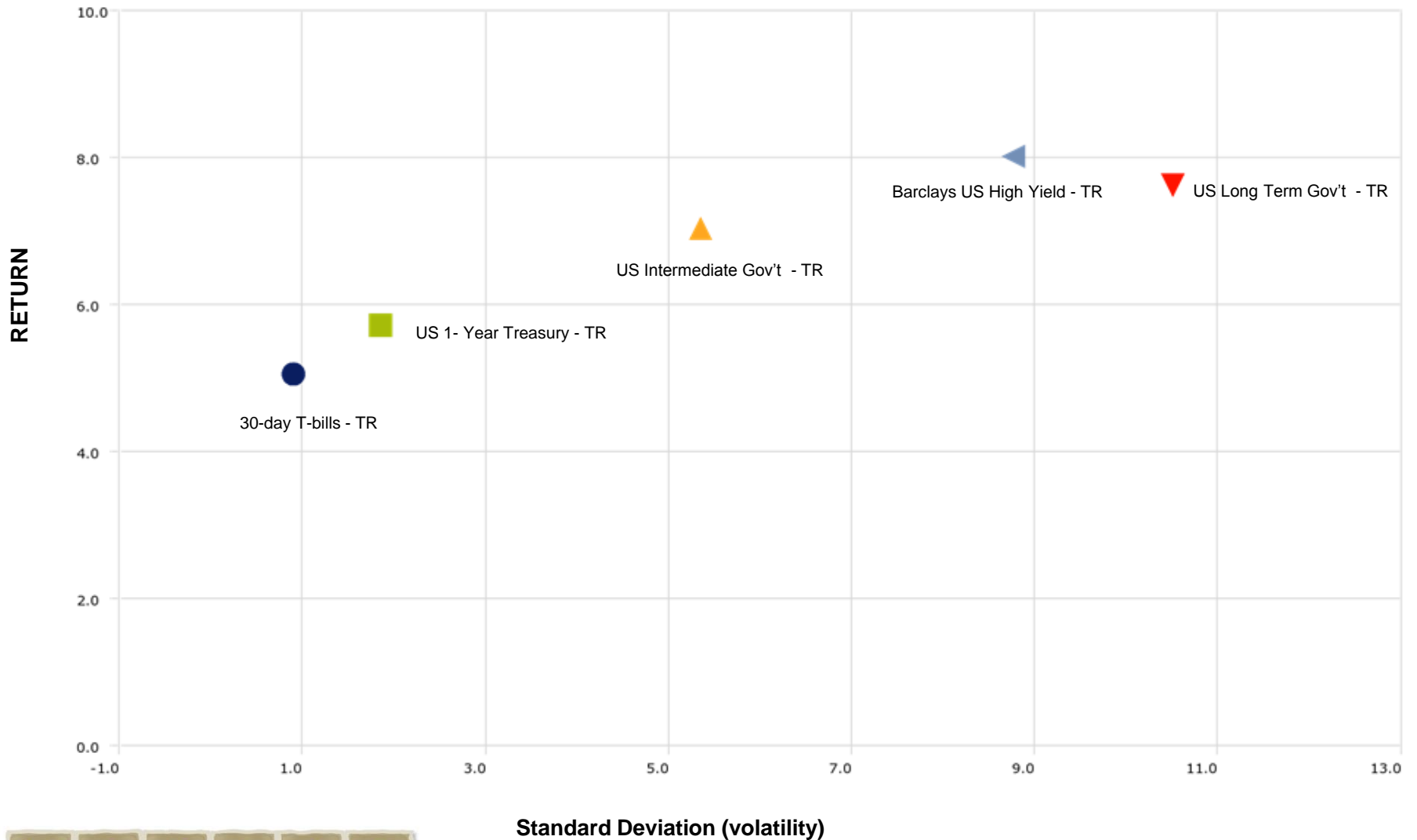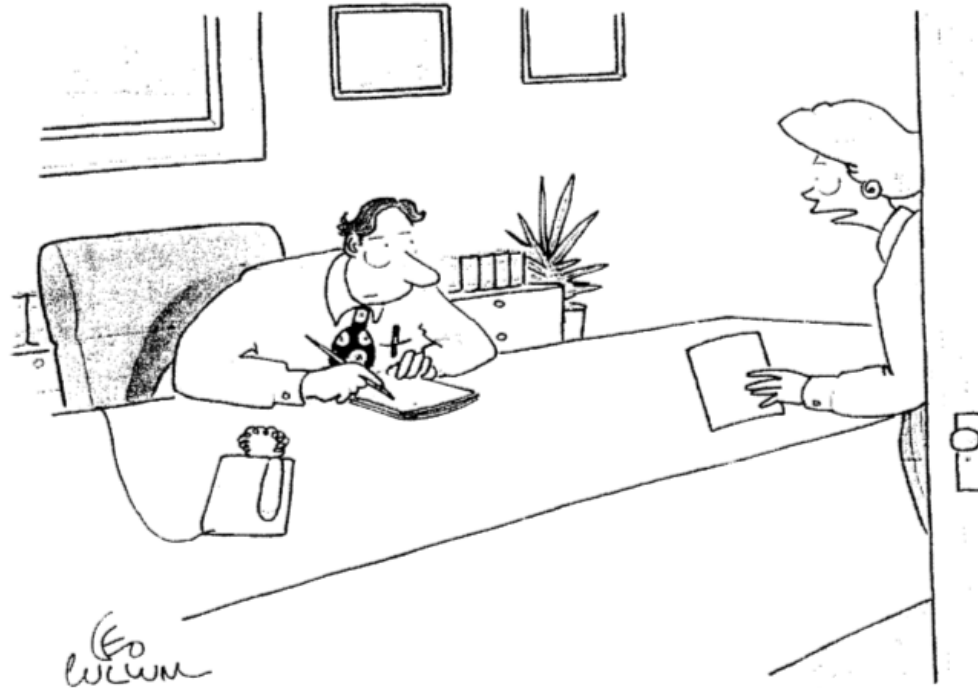

Risk vs. Return
January 2008 - December 2008

Return (GM) vs. Risk (STD)

- Cat:Long Government
- Cat:Short Government
- Cat:Intermediate Government
- Cat:Short-Term Bond
- Cat:Intermediate-Term Bond
- Cat:Inflation-Protected Bond
- Cat:High Yield Bond

Source: Morningstar Direct – Morningstar mutual fund category averages

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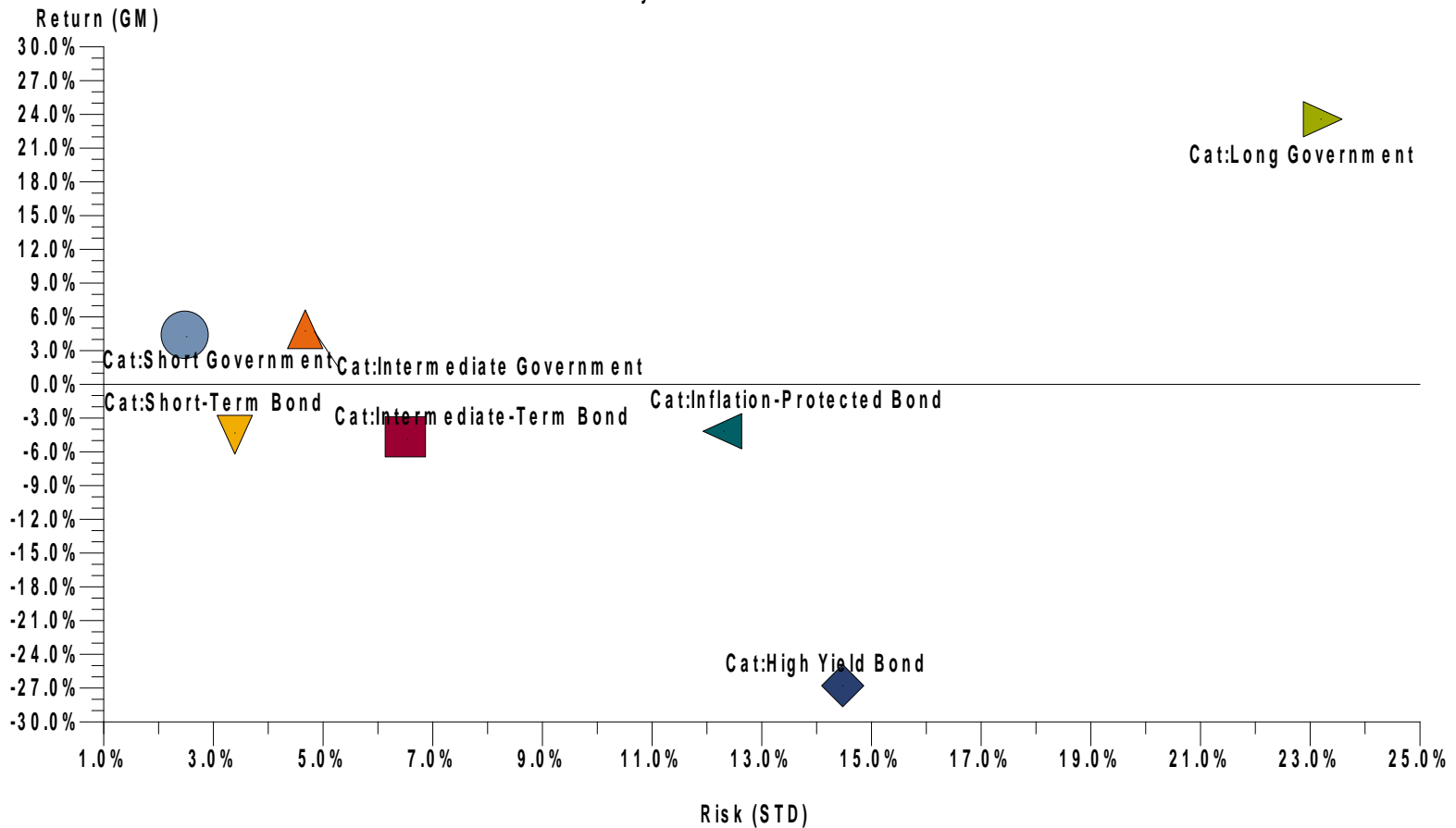
Bond portfolio strategy

- **Eliminate or substantially reduce the use of long term bonds**

- **Employ both intermediate and short term bonds in your bond allocation. Consider some allocation to other bond sectors (mortgage, foreign, TIPs)**

- **Given the volatility of high yield, consider replacing high yield with equity to enhance growth characteristics.**

- **Review and monitor portfolio duration**

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Considering the balance between risk and return ... shorter may be better January 1, 1965 – December 31, 2014
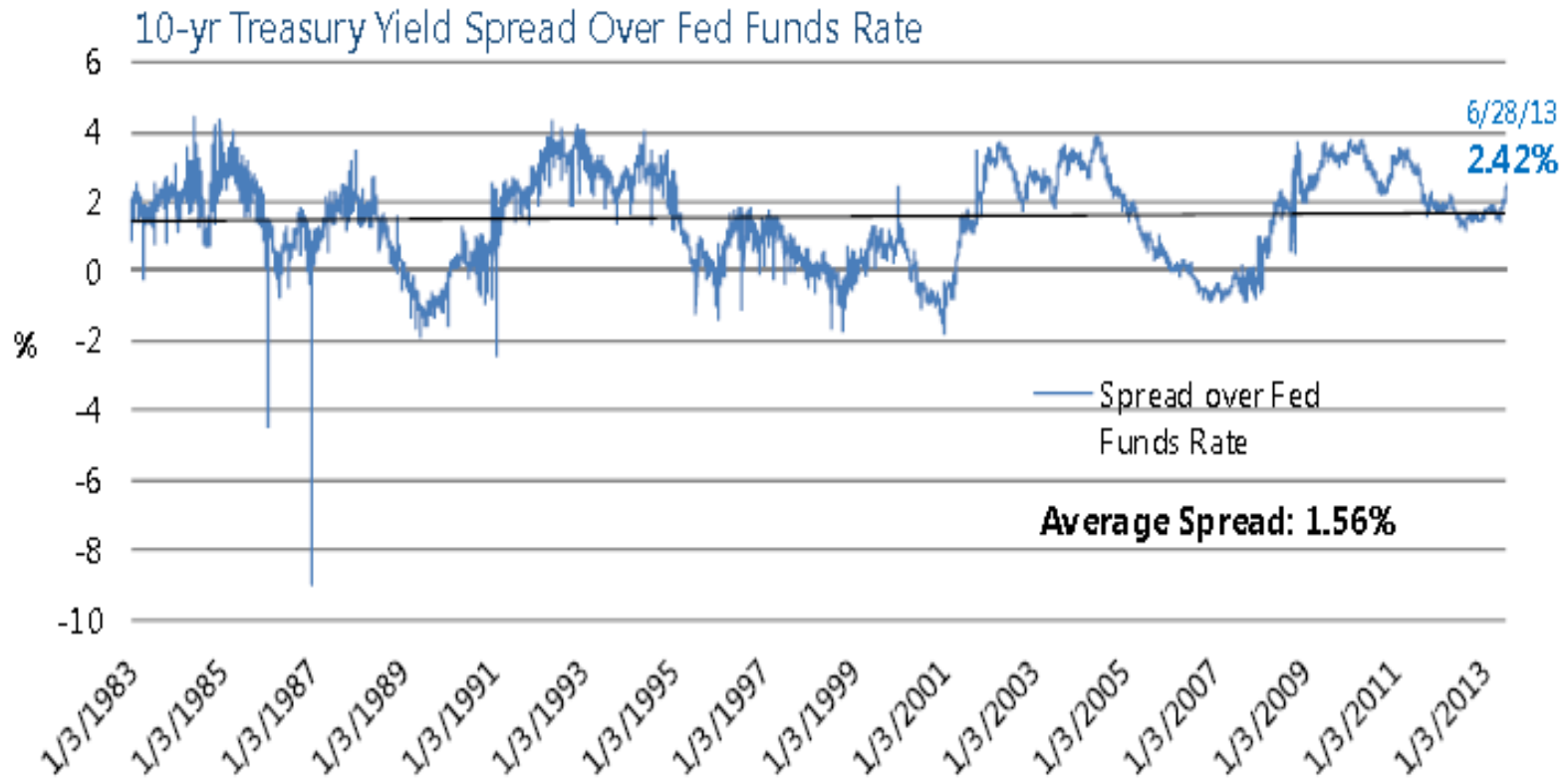

RETURN

Standard Deviation (volatility)

Barclays US High Yield - TR

US Long Term Gov't - TR

US Intermediate Gov't - TR

US 1- Year Treasury - TR

30-day T-bills - TR

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Source: Ibbotson Associates / Morningstar Direct

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The world may yet make sense …

News from accounting, sir. Two plus two is four again

But the adjustment <u>may</u> not be easy

10-yr Treasury Yield Spread Over Fed Funds Rate

6/28/13
2.42%

Spread over Fed Funds Rate

Average Spread: 1.56%

Source: Bloomberg, PIMCO   **As of June 2013**

But … when will rates change and by how much?

Federal Funds Rate Expectations
FOMC and market expectations for the Fed Funds rate

Legend:
— Federal Funds Rate
◆ FOMC Year-End Estimates
◆ Market Expectations
◆ FOMC Long Run Projection

FOMC March 2015 Forecasts*
Percent

	2015	2016	2017	Long Run
Change in real GDP, Q4 to Q4	2.5	2.5	2.2	2.2
Unemployment Rate, Q4	5.1	5.0	5.0	5.1
PCE Inflation, Q4 to Q4	0.7	1.8	2.0	2.0

Chart data labels: 0.25%, 0.63%, 1.88%, 3.13%, 3.75%, 0.56%, 1.38%, 1.86%

X-axis: '99, '03, '07, '11, '15, Long Run
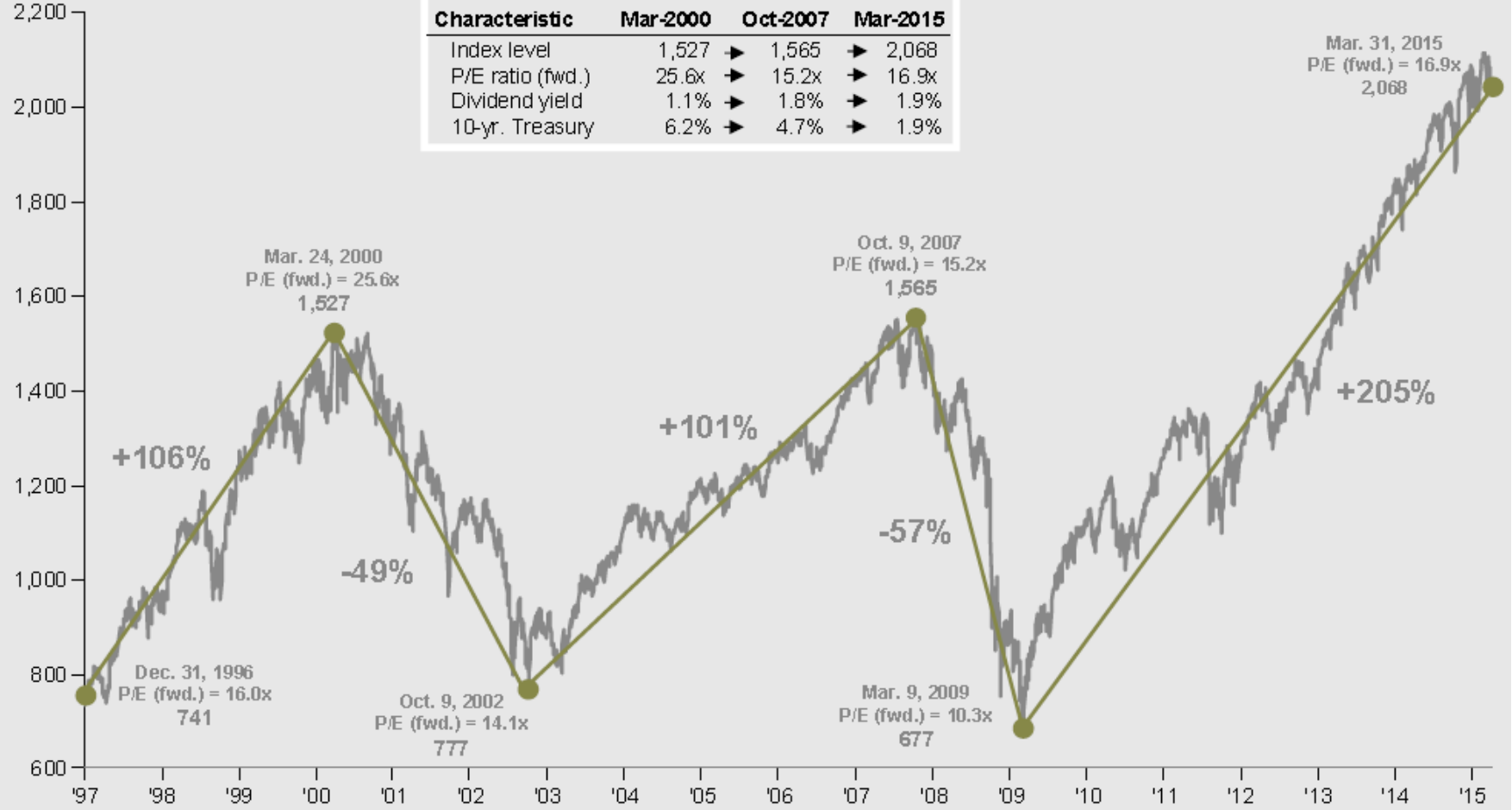
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Equity performance at past inflection points

A review of equity returns in past periods of economic or political turbulence

# The S&P 500 at inflection points
January 1997 – March 2015

S&P 500 Price Index

Characteristic	Mar-2000		Oct-2007		Mar-2015
Index level	1,527	➡	1,565	➡	2,068
P/E ratio (fwd.)	25.6x	➡	15.2x	➡	16.9x
Dividend yield	1.1%	➡	1.8%	➡	1.9%
10-yr. Treasury	6.2%	➡	4.7%	➡	1.9%

Mar. 31, 2015
P/E (fwd.) = 16.9x
2,068

Mar. 24, 2000
P/E (fwd.) = 25.6x
1,527

Oct. 9, 2007
P/E (fwd.) = 15.2x
1,565

Dec. 31, 1996
P/E (fwd.) = 16.0x
741

Oct. 9, 2002
P/E (fwd.) = 14.1x
777

Mar. 9, 2009
P/E (fwd.) = 10.3x
677

+106%

-49%

+101%

-57%

+205%

Source: Standard and Poor's, Compustat, FactSet, and JP Morgan Asset Management

The S&P 500 following major events
January 1926 – March 2015

### S&P 500 Composite Declines from All-Time Highs
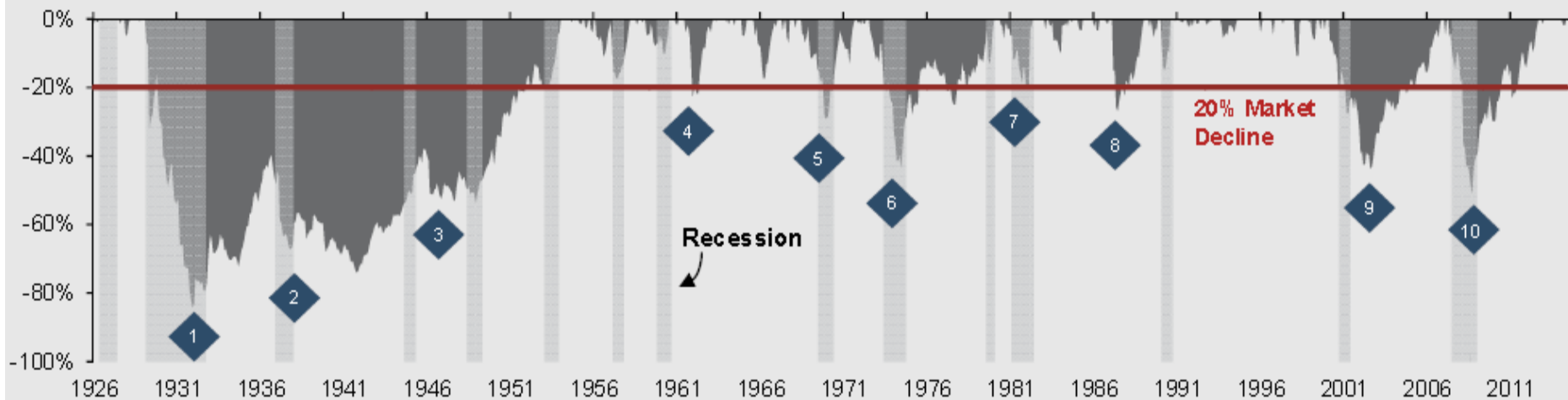
	Market Corrections	Cycle Peak	Bull Market Duration (Months)	Decline from All-time High	Recession	Commodity Shock	Fed Tightening	Extreme Valuations	Commentary
1	Crash of 1929	Aug 1929	37	-84%	●			●	Excessive leverage, irrational exuberance
2	1937 Fed Tightening	Feb 1937	22	-74%	●		●		Premature monetary tightening
3	Post WWII Crash	May 1946	48	-54%	●			●	Post-war demobilization, recession fears
4	Flash Crash of 1962	Dec 1961	14	-22%				●	Flash crash, Cuban Missile Crisis
5	Tech Crash of 1970	Dec 1968	73	-29%	●	●	●		Economic overheating, civil unrest
6	Stagflation	Dec 1972	29	-43%	●	●			OPEC oil embargo
7	Volcker Tightening	Nov 1980	31	-19%	●	●	●		Extremely high rates to reign in inflation
8	1987 Crash	Aug 1987	59	-27%					Program trading, overheated market
9	Tech Bubble	Aug 2000	118	-42%	●			●	Extreme valuations, mostly in tech stocks
10	Global Financial Crisis	Oct 2007	55	-51%	●	●	●		Leverage, housing, Lehman collapse

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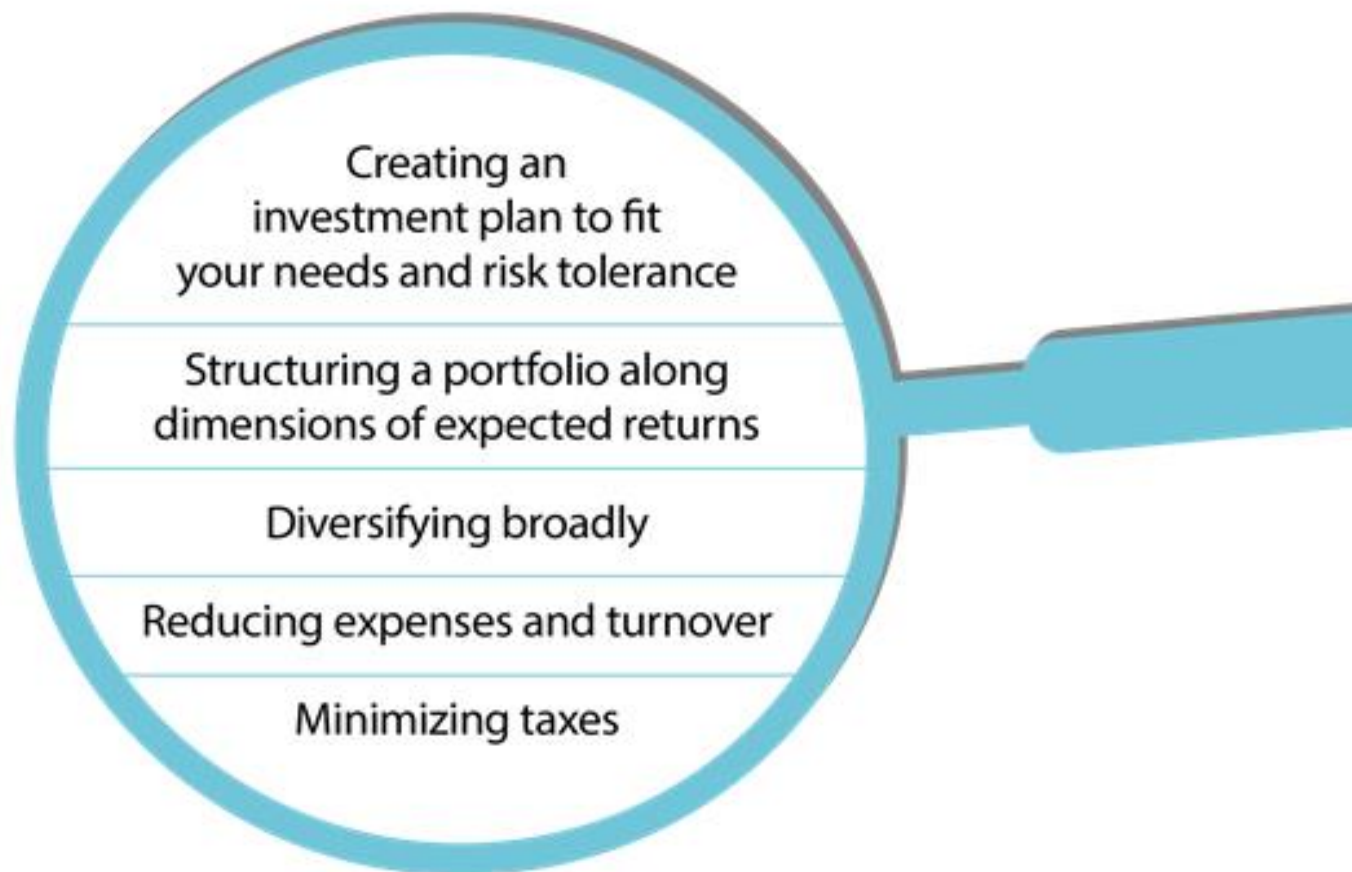
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The markets have rewarded investment discipline
The growth of a dollar (MSCI World Index in US dollars, net of dividends)
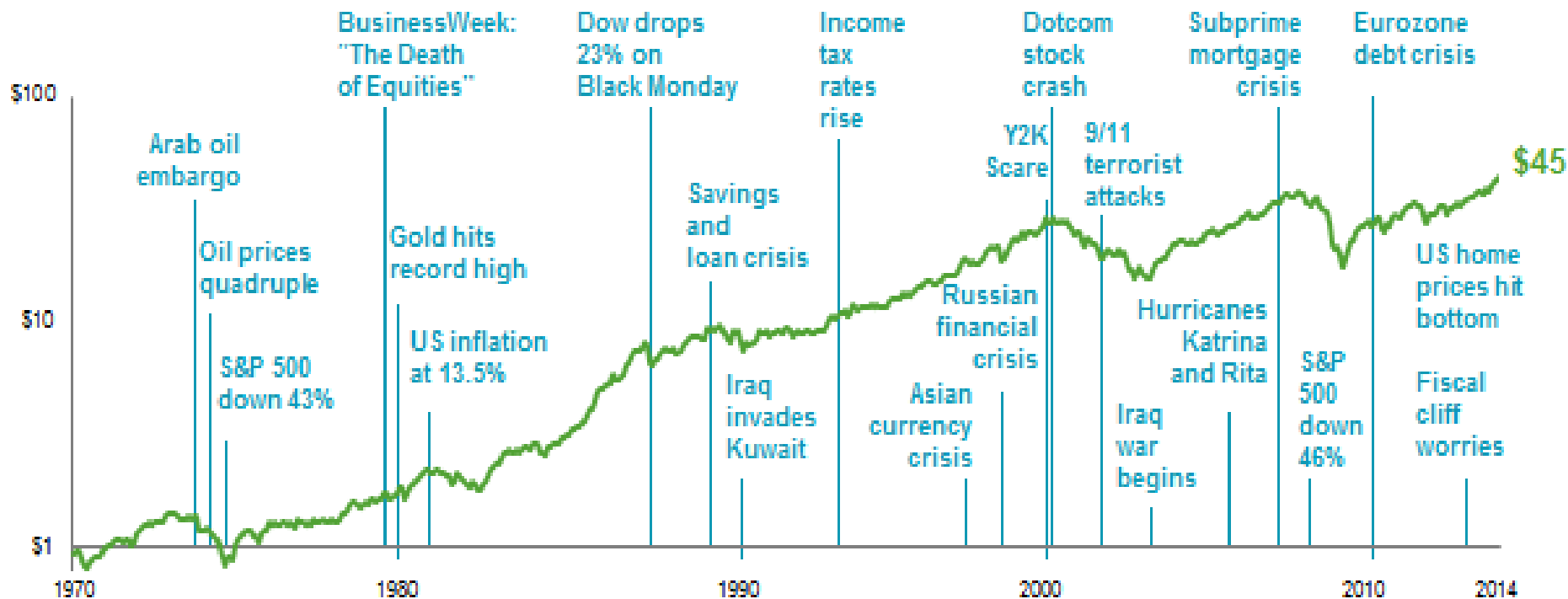
Source: MSCI – Morgan Stanley Capital International, Dimensional Fund Advisors,
Past performance does not guarantee future results.

The prescription? Ignore timing and focus on what you can control – consistent discipline is the key

Creating an investment plan to fit your needs and risk tolerance

Structuring a portfolio along dimensions of expected returns

Diversifying broadly

Reducing expenses and turnover

Minimizing taxes

Questions …

General information:

• The data reflected in the preceding charts and tables reflect the returns achieved by each bond class over the period of time noted.

• The returns reflect investment results for indices which do not have fund expenses or investment advisory fees.

• Actual returns achieved over this time period would differ due to differences in the actual securities held, cash flows into and out of the investments and expenses associated with investment (trading costs, funds expenses, etc.).

Important Note: The returns reflected in this review represent past investment returns. Past returns are not predictive of future investment performance.

Definitions:

Geometric Mean % - The annual *compound rate of return*

Arithmetic Mean % - The mean average rate of return

Standard Deviation - A measure of investment volatility. This figure expresses the variability of investment returns. The higher the number reflected, the more volatile the investment.

Kevin Gahagan, CIMA® CFP®
Principal, Mosaic Financial Partners, Inc

Kevin Gahagan is a Principal and Senior Advisor with Mosaic Financial Partners, Inc., a leading Bay Area wealth advisory firm. Kevin has been recognized by the San Francisco Business Times as one of "the Bay Area's Top Twenty-Five Independent Wealth Advisors." In 2007, he was named a "Top Advisor" by Reuters AdvicePoint and in 2008 was recognized by the Consumer Research Council of America as one of "America's Top Financial Planners."

Prior to establishing his financial advisory practice in 1995, Kevin enjoyed a successful twenty-year career with Wells Fargo Bank. He is a Certified Financial Planner® certificant, Certified Investment Management Analyst (CIMA®) and a Certified Estate Planner (CEP). Kevin is a past president of the local chapter of the Financial Planning Association and past Chairman of the association's Northern California Presidents' Council. He served for seven years on the board of the Estate Planning Council of Mount Diablo concluding his service as President and Chairman. He currently serves on San Francisco board of the American Association of Individual Investors. He is an active member of the Investment Management Consultants Association and the Financial Planning Association.

From 2000 through 2005, Kevin taught for the financial planning program at UC Berkeley. He continues to be involved with the program as a member of the program's advisory board. Often quoted in the national press and other media, Kevin is a frequent speaker on investment strategy, financial and retirement planning.