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Review of Risk & Volatility

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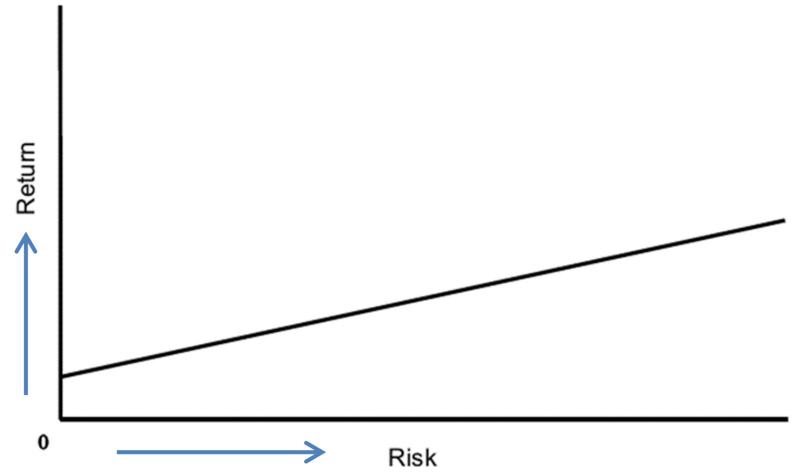
DAHAB ASSOCIATES

Origins of Risk Concepts

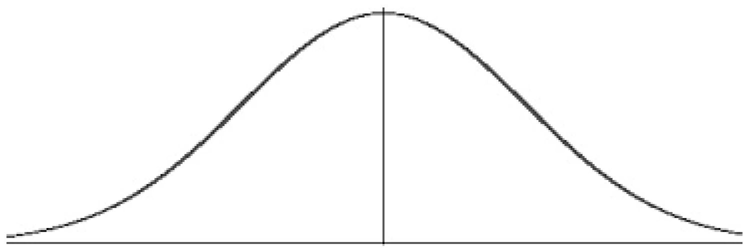
- Harry Markowitz defined risk as short-term volatility in 1952
- His definition served the academic need for simplicity and precision
- Wall Street adopted it to sell “risk-adjusted” investment products
- Many investors have long time horizons not suited to this definition
- Higher returns may be earned by accepting greater short-term risk

Origins of Risk Concepts

- Standard way of viewing risk/return – increasing risk, increasing return



- Distribution of outcomes – bell shaped curve

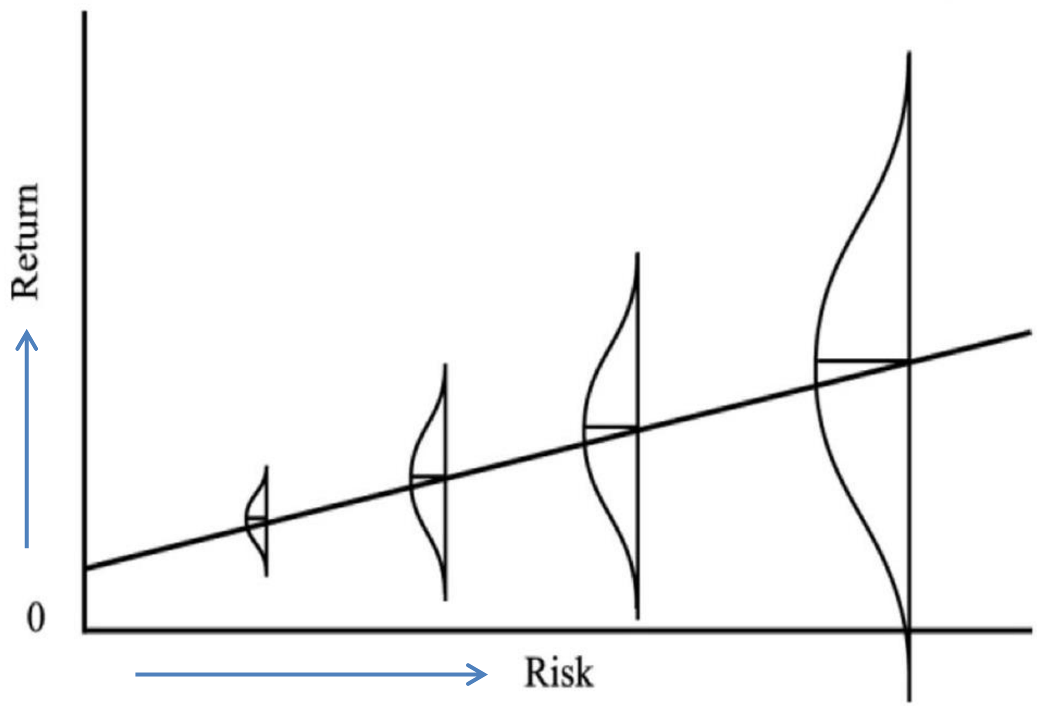


What is Risk?

Uncertainty

"Risk means more things can happen than will happen"
– Elroy Dimson, professor at the London Business School

- The future…..really just the possibility of an infinite number of events



Oaktree Capital Management, L.P.

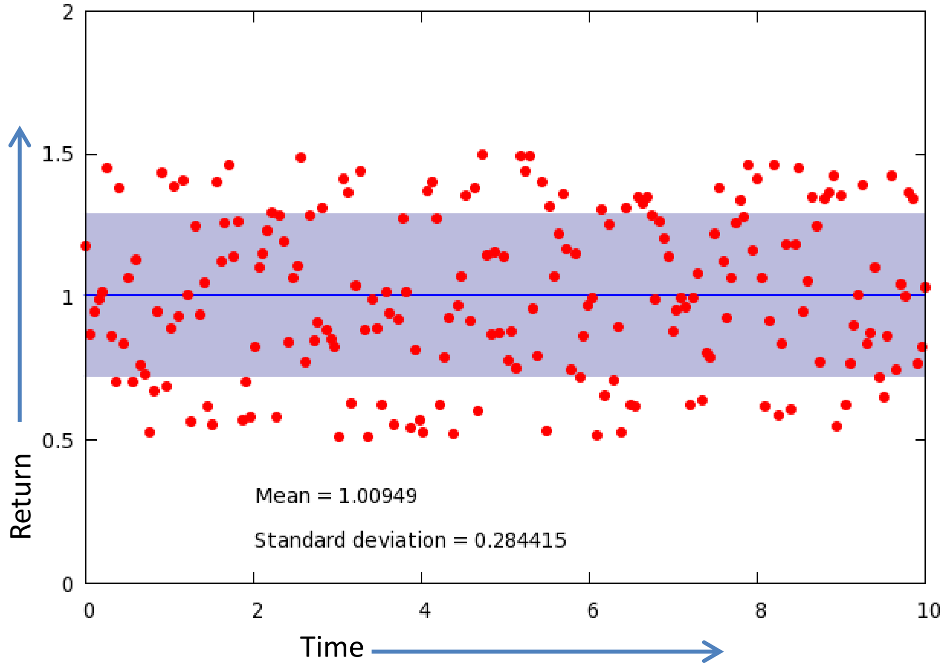
A Little Bit About Risk

- Short-term risk: The chance of having a very poor return in any given year
  – Volatility, standard deviation, market risk
- Long-term risk: The chance that we will not make our actuarial assumptions
  – The plan will run out of money
- Entity Risk: Unique political and demographic situation that a Plan Sponsor inhabits
  – Required rate of return, cash flow, funding status
- Liquidity Risk: Associated with having too many illiquid assets
  – We must maintain sufficient liquidity to meet all obligations
- Unknown Risk:
  – Not everything that can happen has happened, and what has not happened may escape imagination

Types of Investment Risk

Risks we are aware of:

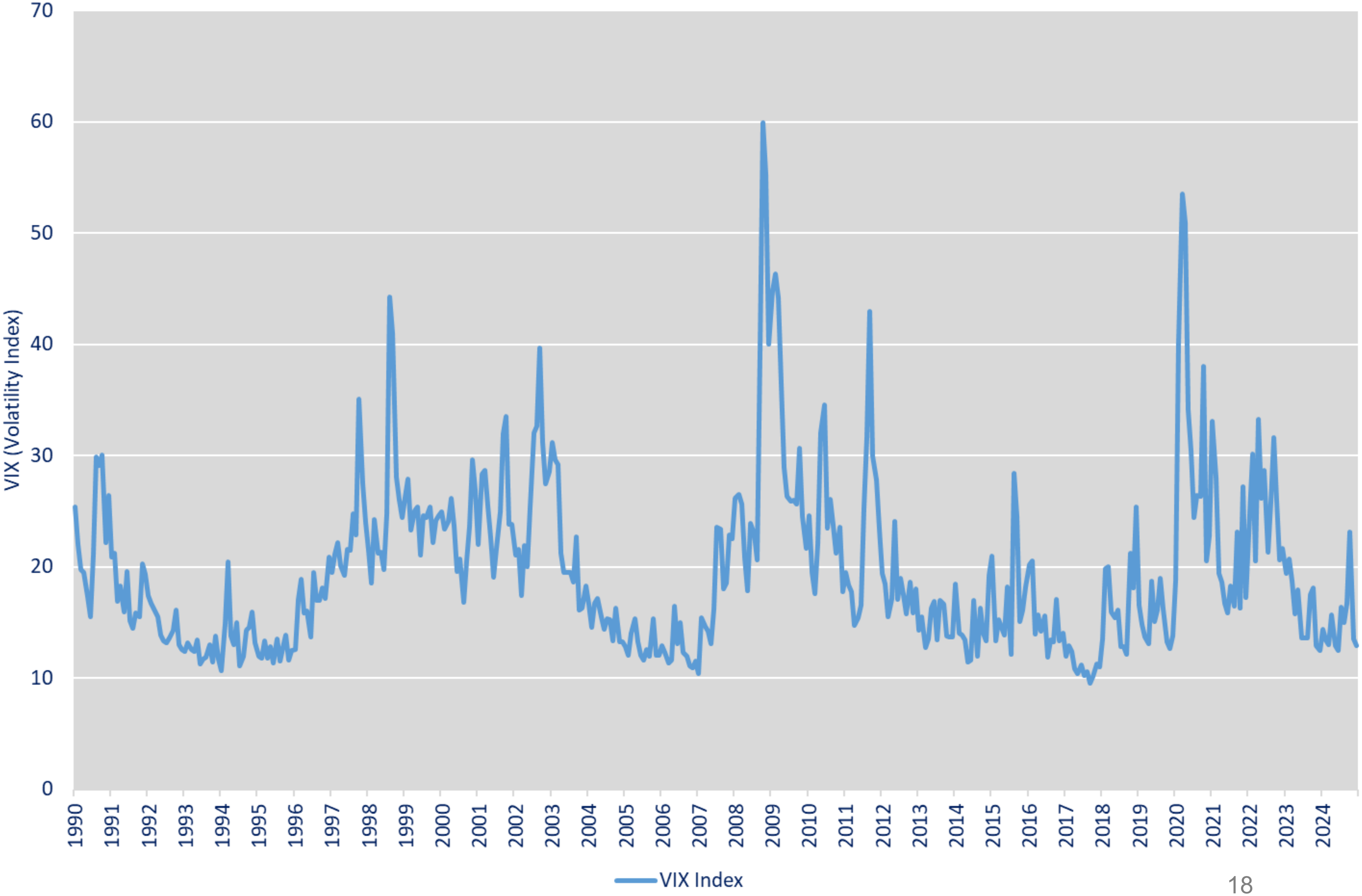
- Volatility (standard deviation)
  - Academic's (& Wall St.) choice for defining risk because this is measurable
  - BUT….Illusion of control
  - Falls short of the definition of investment risk
- Active management
- Credit/Interest rate
- Liquidity
- Leverage
- Concentration
- Valuation
- Currency
- Sovereign
- Counter party
- Other (Pandemic)



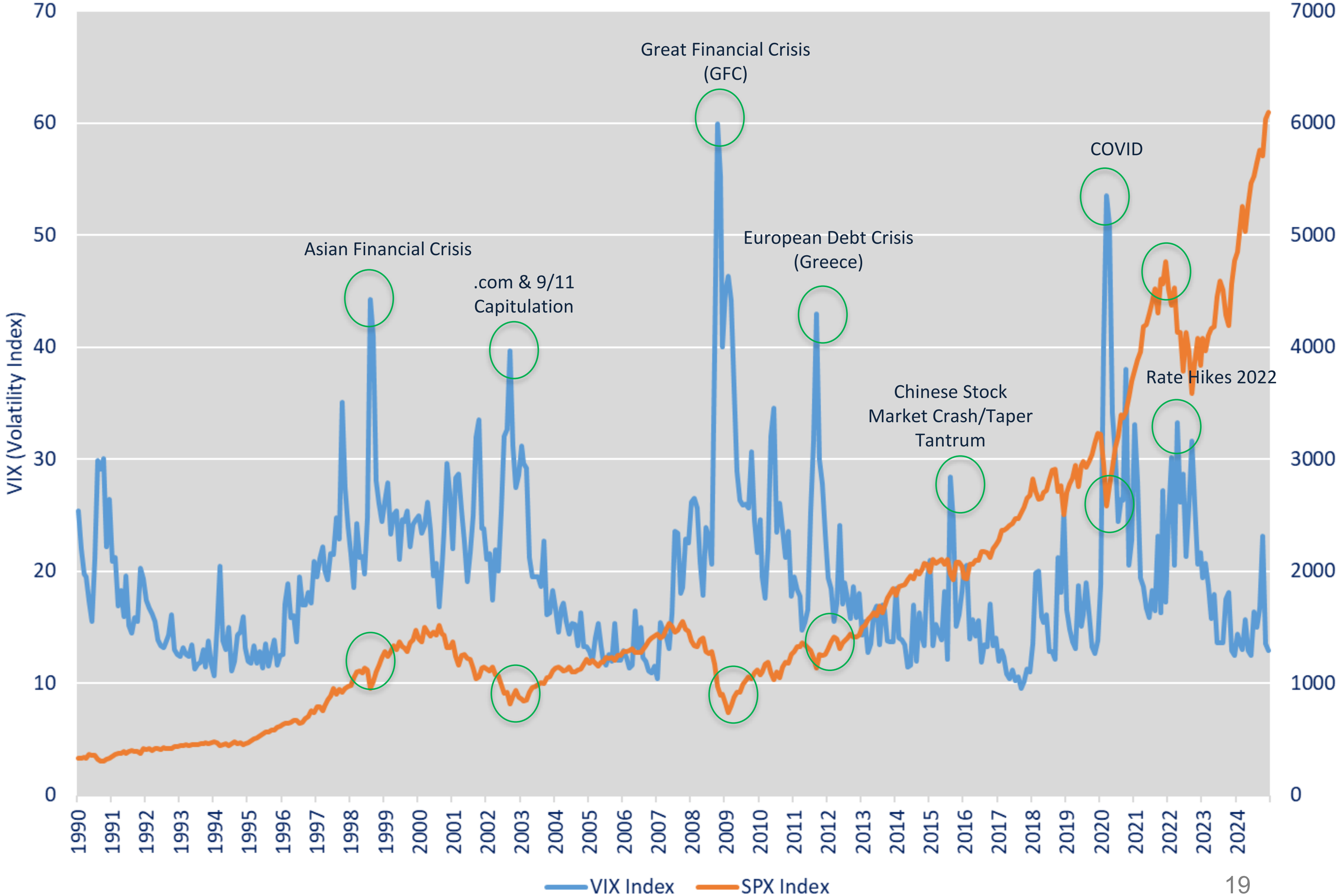
Risks we focus on:

- Not reaching our long-term return objectives
- Permanent loss of capital
  - Both are very different from volatility (or return fluctuation)
- Problem: These risks cannot be measured

Illusion of Control - Volatility Changes



Volatility vs. S&P 500



The Stock Market in a Nutshell

Known Known's	Known Unknown's (+)
Known Unknown's (-)	Unknown Unknown's

Learning from the Past

Most forms of risk cannot be measured

- The future is unknown
  - We don't know what will happen in the future, nobody does - but we can know something about the possible outcomes

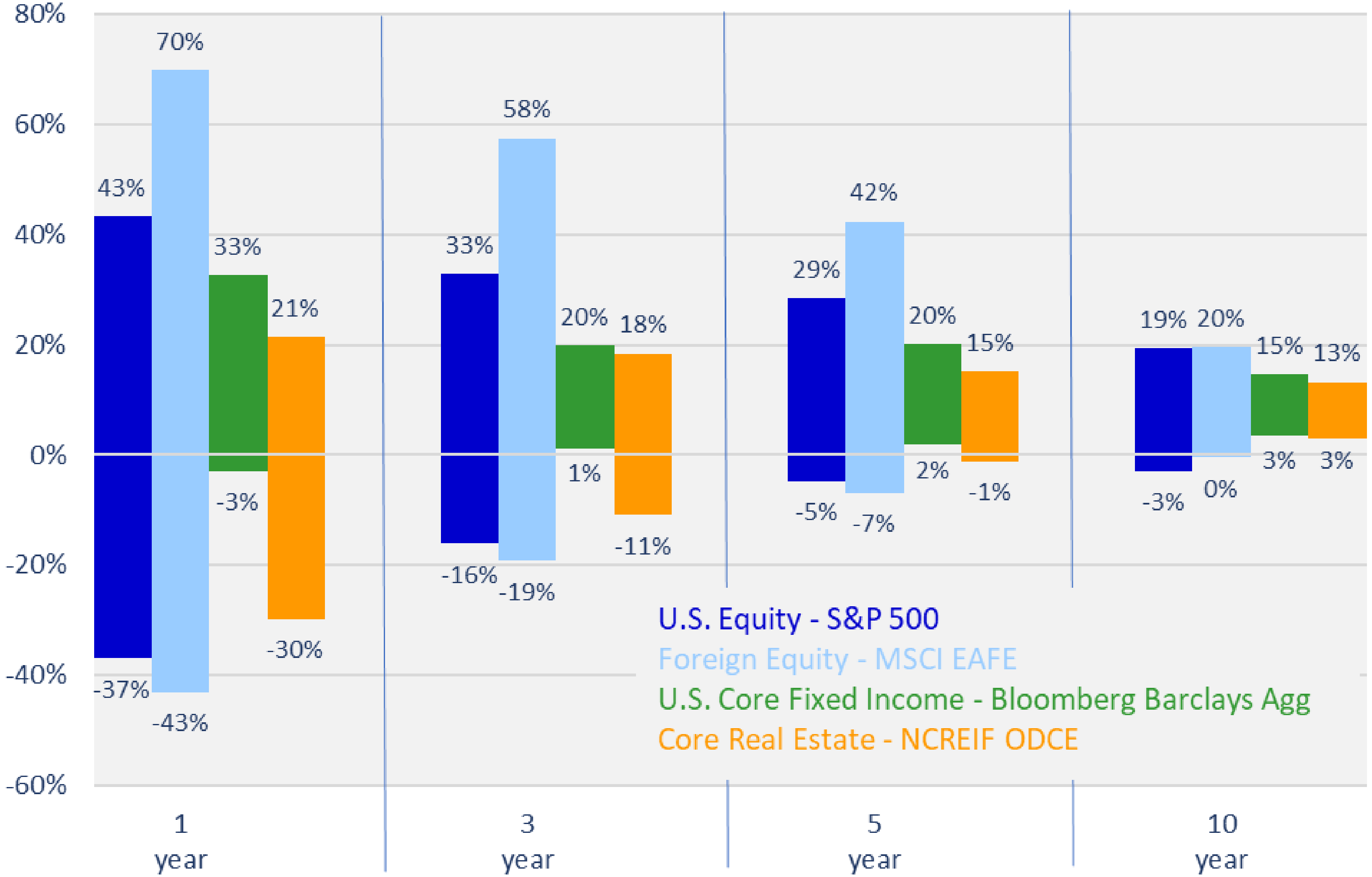
S&P 500: 1926-2023*

Time Frame	Positive	Negative
Daily	54%	46%
Monthly	63%	37%
Quarterly	69%	30%
1 Year	76%	24%
5 Years	92%	8%
10 Years	98%	2%
20 Years	100%	0%

	1 Year	5 Year	10 Year	15 Year	20 Year
Average	11%	10%	10%	10%	10%
Standard Deviation	20%	9%	7%	6%	5%
Maximum Return	52%	20%	18%	16%	15%
Minimum Return	-47%	-17%	-4%	-1%	3%

* Rolling periods as of December 31, 2023

Time Diversification



- Returns since 1981. Rolling returns for 3-year, 5-year, 10-year

Water Balloon View of Risk/Reward

- Risk Free: 4% Return
  - Low risk (tough to pop), low return (not a big splash)

- Core Fixed Income: 5% Return
  - Slightly more risk, Slightly more return (usually)

- Large Cap Equity: 7-10% Return
  - More risk, more return

- Rarely can you eliminate risk for a given return
  - The water stays in the balloon, it just moves elsewhere

No Free Lunch Society

Risk/Return/Correlation Comparison

Risky Assets

Asset Class	Benchmark	20 Year*			2008	1Q20	First 3 Quarters 2022
		Return	Standard Deviation	Correlation			
Large Cap	Russell 1000	10.5%	16.6	1.00	-37.6%	-20.2%	-24.6%
Mid Cap	Russell Mid Cap	10.3%	18.7	0.96	-41.5%	-27.1%	-24.3%
Small Cap	Russell 2000	9.8%	21.6	0.91	-33.8%	-30.6%	-25.1%
International	MSCI EAFE	7.8%	18.6	0.89	-43.1%	-22.7%	-26.8%
Emerging Markets	MSCI EM	9.6%	22.7	0.79	-53.2%	-23.6%	-26.9%
High Yield	Bloomberg HY	7.8%	10.4	0.78	-26.2%	-12.7%	-16.2%
Private Credit	S&P Leveraged Loan	4.8%	13.3	0.64	-29.1%	-13.0%	-3.3%
Commodity	Bloomberg Commodity	0.9%	18.1	0.48	-35.7%	-23.3%	13.6%
MLP	Alerian MLP	8.8%	26.9	0.65	-36.9%	-57.2%	18.9%
Private Equity	Cambridge PE	12.5%	10.1	0.82	-24.6%	-8.1%	-5.5%
Hedge Fund	HFRI Fund-of-Funds	3.5%	6.2	0.80	-21.4%	-8.8%	-6.9%
REIT	NAREIT	11.2%	21.4	0.72	-37.0%	-23.4%	-27.9%

Safety Assets

Asset Class	Benchmark	20 Year*			2008	1Q20	First 3 Quarters 2022
		Return	Standard Deviation	Correlation			
Core Fixed Income	Bloomberg Barclays Agg	3.2%	3.4	-0.26	5.2%	3.2%	-14.6%
Core Real Estate	NCREIF ODCE	8.2%	6.7	0.15	-10.0%	1.0%	13.1%
Timber	NCREIF TIMBER	7.0%	4.5	-0.04	9.5%	0.1%	7.6%
Farmland	NCREIF Farmland	12.6%	6.9	0.09	15.0%	-0.1%	6.2%

* As of June 30, 2024

Equity Correlations: 2001 – 2023

“Normal” Conditions

	Large Cap	Small Cap	Intl. Equity	Emerging Markets	High Yield	Commodity	Private Equity	Hedge Funds	REITS	Core Fixed Income	Core Real Estate	Timber	Farmland
Large Cap	1.00	0.93	0.90	0.81	0.75	0.47	0.78	0.79	0.70	-0.32	0.12	-0.08	0.11
Small Cap	0.93	1.00	0.86	0.79	0.72	0.44	0.70	0.76	0.73	-0.34	0.09	-0.09	0.10
International Equity	0.90	0.86	1.00	0.90	0.74	0.55	0.76	0.85	0.67	-0.23	0.10	0.03	0.15
Emerging Markets	0.81	0.79	0.90	1.00	0.79	0.60	0.69	0.83	0.59	-0.16	0.01	-0.04	0.09
High Yield	0.75	0.72	0.74	0.79	1.00	0.57	0.59	0.78	0.67	-0.05	-0.13	-0.17	-0.05
Commodity	0.47	0.44	0.55	0.60	0.57	1.00	0.52	0.69	0.39	-0.14	0.16	-0.06	-0.08
Private Equity	0.78	0.70	0.76	0.69	0.59	0.52	1.00	0.75	0.57	-0.36	0.37	0.20	0.32
Hedge Funds	0.79	0.76	0.85	0.83	0.78	0.69	0.75	1.00	0.60	-0.18	0.11	0.05	0.12
REITS	0.70	0.73	0.67	0.59	0.67	0.39	0.57	0.60	1.00	0.03	0.18	-0.08	0.02
Core Fixed Income	-0.32	-0.34	-0.23	-0.16	-0.05	-0.14	-0.36	-0.18	0.03	1.00	-0.18	0.03	-0.14
Core Real Estate	0.12	0.09	0.10	0.01	-0.13	0.16	0.37	0.11	0.18	-0.18	1.00	0.25	0.15
Timber	-0.08	-0.09	0.03	-0.04	-0.17	-0.06	0.20	0.05	-0.08	0.03	0.25	1.00	0.75
Farmland	0.11	0.10	0.15	0.09	-0.05	-0.08	0.32	0.12	0.02	-0.14	0.15	0.75	1.00

Markets move similarly, but diversification still reduces risk

Equity Correlations: Jan 2020 - Sep 2020

Great COVID Crises (GCC)

	Large Cap	Small Cap	Intl. Equity	Emerging Markets	High Yield	Commodity	Private Equity	Hedge Funds	REITS	Core Fixed Income	Core Real Estate	Timber	Farmland
Large Cap	1.00	1.00	1.00	1.00	1.00	0.93	0.94	0.99	1.00	-0.32	-0.84	-0.63	-0.03
Small Cap	1.00	1.00	0.99	0.98	0.99	0.89	0.91	0.98	1.00	-0.24	-0.88	-0.56	-0.03
International Equity	1.00	0.99	1.00	1.00	1.00	0.93	0.95	0.99	1.00	-0.41	-0.83	-0.65	0.00
Emerging Markets	1.00	0.98	1.00	1.00	1.00	0.95	0.97	1.00	0.99	-0.41	-0.79	-0.70	0.13
High Yield	1.00	0.99	1.00	1.00	1.00	0.94	0.95	1.00	1.00	-0.37	-0.81	-0.67	-0.01
Commodity	0.93	0.89	0.95	0.95	0.94	1.00	1.00	0.96	0.90	-0.67	-0.56	-0.88	0.23
Private Equity	0.94	0.91	0.97	0.97	0.95	1.00	1.00	0.98	0.92	-0.63	-0.60	-0.86	0.10
Hedge Funds	0.99	0.98	1.00	1.00	1.00	0.96	0.98	1.00	0.99	-0.44	-0.76	-0.72	0.05
REITS	1.00	1.00	0.99	0.99	1.00	0.90	0.92	0.99	1.00	-0.28	-0.85	-0.59	0.01
Core Fixed Income	-0.32	-0.24	-0.41	-0.41	-0.37	-0.67	-0.63	-0.44	-0.28	1.00	-0.24	0.94	-0.32
Core Real Estate	-0.84	-0.88	-0.83	-0.79	-0.81	-0.56	-0.60	-0.76	-0.85	-0.24	1.00	0.10	0.24
Timber	-0.63	-0.56	-0.65	-0.70	-0.67	-0.88	-0.86	-0.72	-0.59	0.94	0.10	1.00	0.33
Farmland	-0.03	-0.03	0.00	0.13	-0.01	0.23	0.10	0.05	0.01	-0.32	0.24	0.33	1.00

Correlations Converge

Trade-Offs

Large Cap to Small Cap

Asset Class	Benchmark	20 Year* Return	20 Year* Standard Deviation	20 Year* Correlation	2008	1Q20	First 3 Quarters 2022
Large Cap	Russell 1000	10.5%	16.6	1.00	-37.6%	-20.2%	-24.6%
Small Cap	Russell 2000	9.8%	21.6	0.91	-33.8%	-30.6%	-25.1%

Portfolio Impact
(Assets stay in Risk Bucket)

- Risk
  - Increased Risk: Volatility (expect higher highs and lower lows)
  - Decreased Risk: None

- Return
  - Increase long-term return expectations

* As of June 30, 2024

Trade-Offs

Equity to Core Fixed Income

Asset Class	Benchmark	20 Year* Return	20 Year* Standard Deviation	20 Year* Correlation	2008	1Q20	First 3 Quarters 2022
Large Cap	Russell 1000	10.5%	16.6	1.00	-20.2%	-37.6%	-24.6%
Small Cap	Russell 2000	9.8%	21.6	0.91	-30.6%	-33.8%	-25.1%
International	MSCI EAFE	5.0%	19.2	0.90	-43.1%	-22.7%	-26.8%
Emerging Markets	MSCI EM	9.4%	23.9	0.81	-53.2%	-23.6%	-26.9%
Core Fixed Income	Bloomberg Barclays Agg	4.8%	3.4	-0.32	5.2%	3.2%	-14.6%

Portfolio Impact
(Assets move from Risk to Safety Bucket)

- Risk
  - Increased risk: Interest rate (measured by duration), inflation
  - Decreased risk: volatility, economic sensitivity
- Return
  - Decrease long-term return expectations

* As of June 30, 2024

Trade-Offs

Core Fixed Income to High Yield / Private Credit

Asset Class	Benchmark	20 Year*			2008	1Q20	First 3 Quarters 2022
		Return	Standard Deviation	Correlation			
Core Fixed Income	Bloomberg Barclays Agg	3.2%	3.4	-0.26	5.2%	3.2%	-14.6%
High Yield	Bloomberg HY	7.8%	10.4	0.78	-26.2%	-12.7%	-16.2%
Private Credit	S&P Leveraged Loan	4.8%	13.3	0.64	-29.1%	-13.0%	-3.3%

Portfolio Impact
(Assets move from Safety to Risk Bucket)

- Risk
  - Increased risk: volatility, economic sensitivity, interest rate (depending on strategy), illiquidity & leverage (private credit)
  - Decreased risk: interest rate (floating rate funds)
- Return
  - Increase long-term return expectations

* As of June 30, 2024

Trade-Offs

Core Fixed Income to Core Real Estate

Asset Class	Benchmark	20 Year*			2008	1Q20	First 3 Quarters 2022
		Return	Standard Deviation	Correlation			
Core Fixed Income	Bloomberg Barclays Agg	3.2%	3.4	-0.26	5.2%	3.2%	-14.6%
Core Real Estate	NCREIF ODCE	8.2%	6.7	0.15	-10.0%	1.0%	13.1%

Portfolio Impact
(Assets remain in Safety Bucket)

- Risk
  - Increased risk: volatility, economic, illiquidity, leverage
  - Decreased risk: interest rate, and inflation

- Return
  - Increase long-term return expectations

* As of June 30, 2024

Key Takeaways

- Academic theory and fiduciary responsibility require portfolio diversity
  - Spreads out risk, doesn't eliminate it
- Risk takes many forms and, as a rule of thumb, the higher the return, the greater the amount of risk
- Remember the water balloons
  - Core fixed income should return low single digits (2-4%) – **Risk:** Low Return, Inflation, rising interest rates
  - Large cap core equity should return high single digits (7-10%) – **Risk:** Volatility
  - Any "target" or "expected returns" higher than these goal posts (core fixed income/large cap equity) will be adding more risk….somewhere
- Avoid permanent loss of capital
  - How did the strategy do in 1Q20 and 2008?

Key Takeaways

"It's not necessary to do extraordinary things to get extraordinary results"

– Warren Buffett