A Passive Approach to Risk Parity

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S&P Dow Jones Indices
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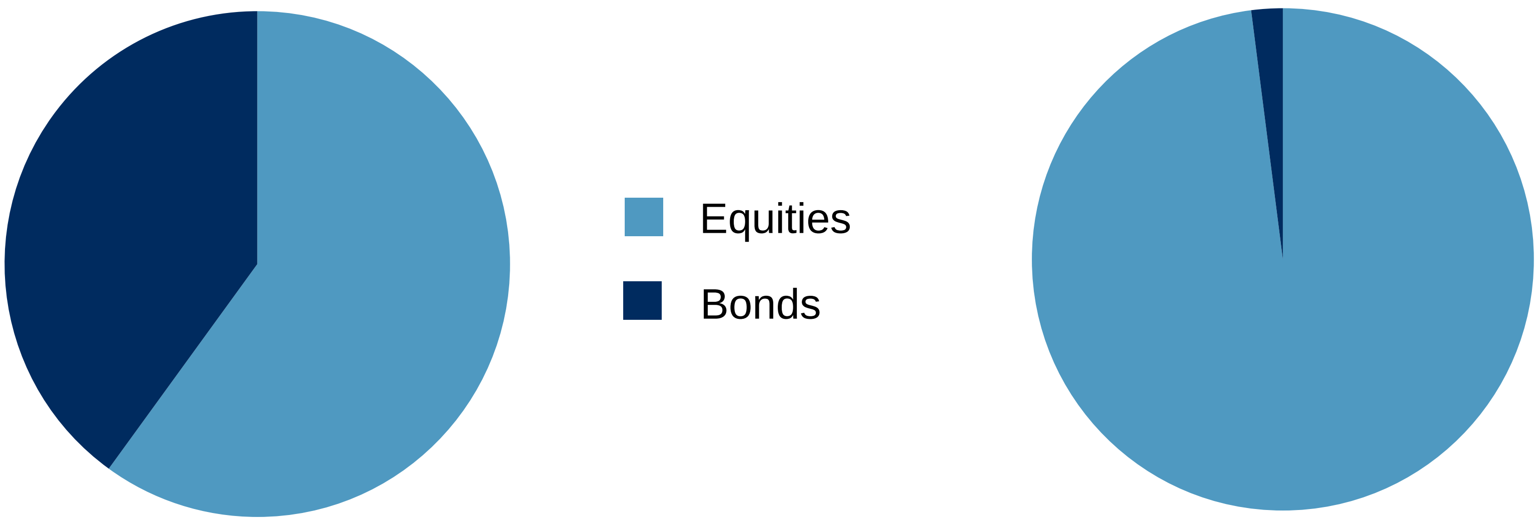
Introduction
What is risk parity?

Broad Definition	Portfolio allocation strategy attempting to balance the risk contribution across complementary asset classes
Goal	To generate stable returns across defined economic regimes
Market Size	An estimated USD 150 billion to USD 175 billion of assets in risk parity funds
Why Popular?	Offers attractive long-term risk-adjusted returns and outperformance across large equity market drawdowns

Traditional asset allocation
Most portfolios are dominated by equity risk

Capital Allocation

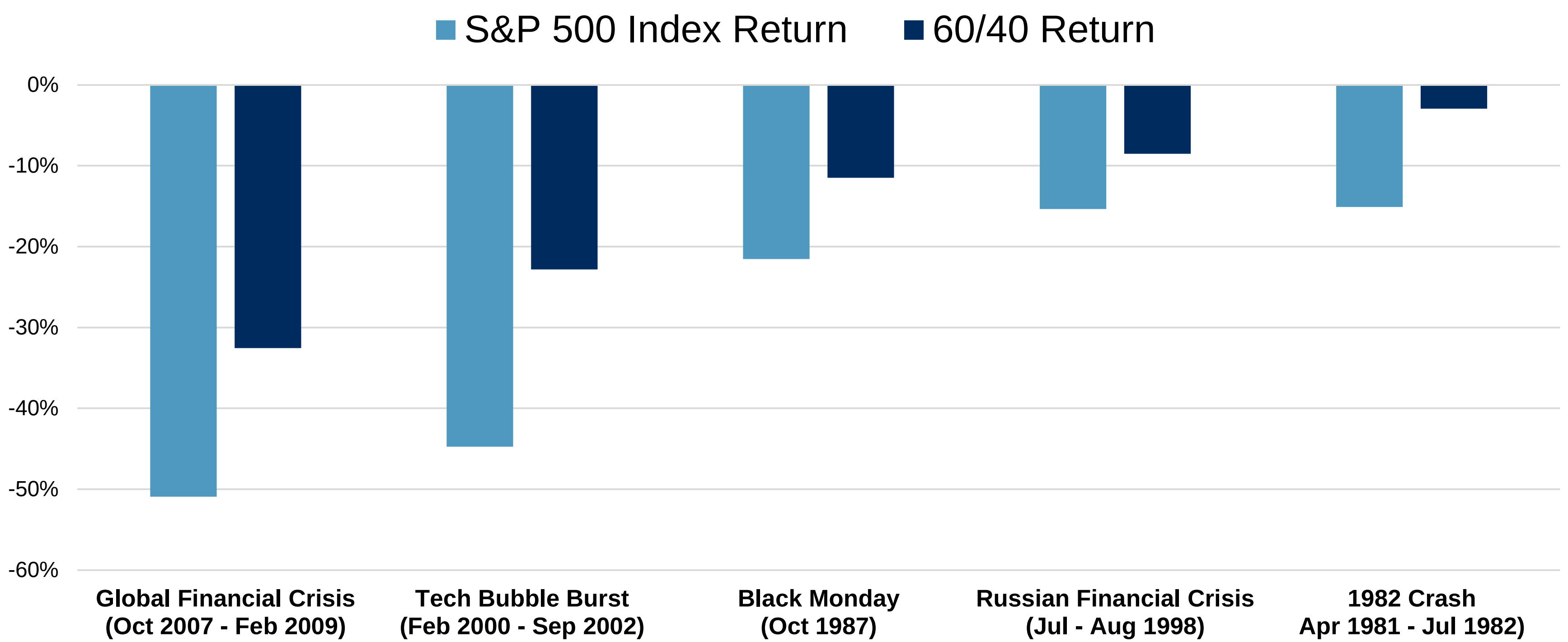
Risk Allocation



Source: S&P Dow Jones Indices LLC. Charts are provided for illustrative purposes.

Traditional asset allocation
Most portfolios tend to suffer as equities fall

Top five worst S&P 500 drawdowns since 1980 with corresponding 60/40 return



The 60/40 equity/bond portfolio is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from January 1980 to March 2019. Index performance based on monthly total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

Constructing a Risk Parity Portfolio

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Constructing a risk parity portfolio
Core objectives

- **Generate stable returns across defined economic regimes**
  – Via appropriate asset class selection

- **Maximize diversification benefits**
  – Via appropriate weighting scheme

- **Achieve a more stable risk profile**
  – Via risk targeting

Asset class selection
Select asset classes that satisfy the following criteria

1. Positive expected long-term performance

2. Low or negative correlation to other asset classes

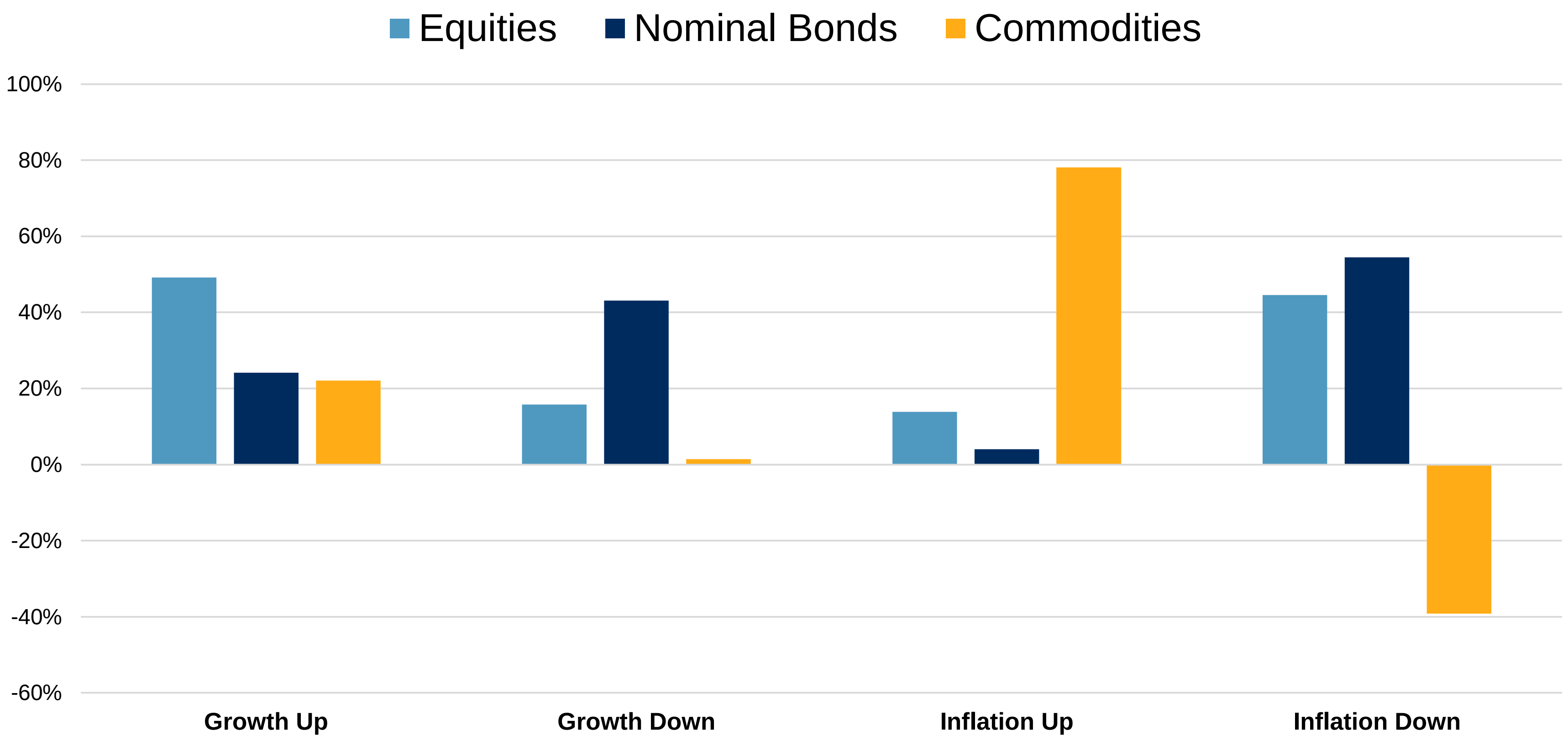
3. Diversify across a range of defined economic environments
   - Growth and inflation

Asset class selection
Complementary characteristics

EQUITIES	NOMINAL BONDS	COMMODITIES
• Harvest equity risk premium	• High quality bonds provide interest rate premium	• Harvest inflation risk premium
• Expected to perform well during periods of rising growth	• Downside protection during periods of falling growth	• Expected to perform well during periods of rising growth
• Expected to perform well during periods of low or falling inflation	• Expected to perform well during periods of low or falling inflation	• Protection during periods of rising inflation

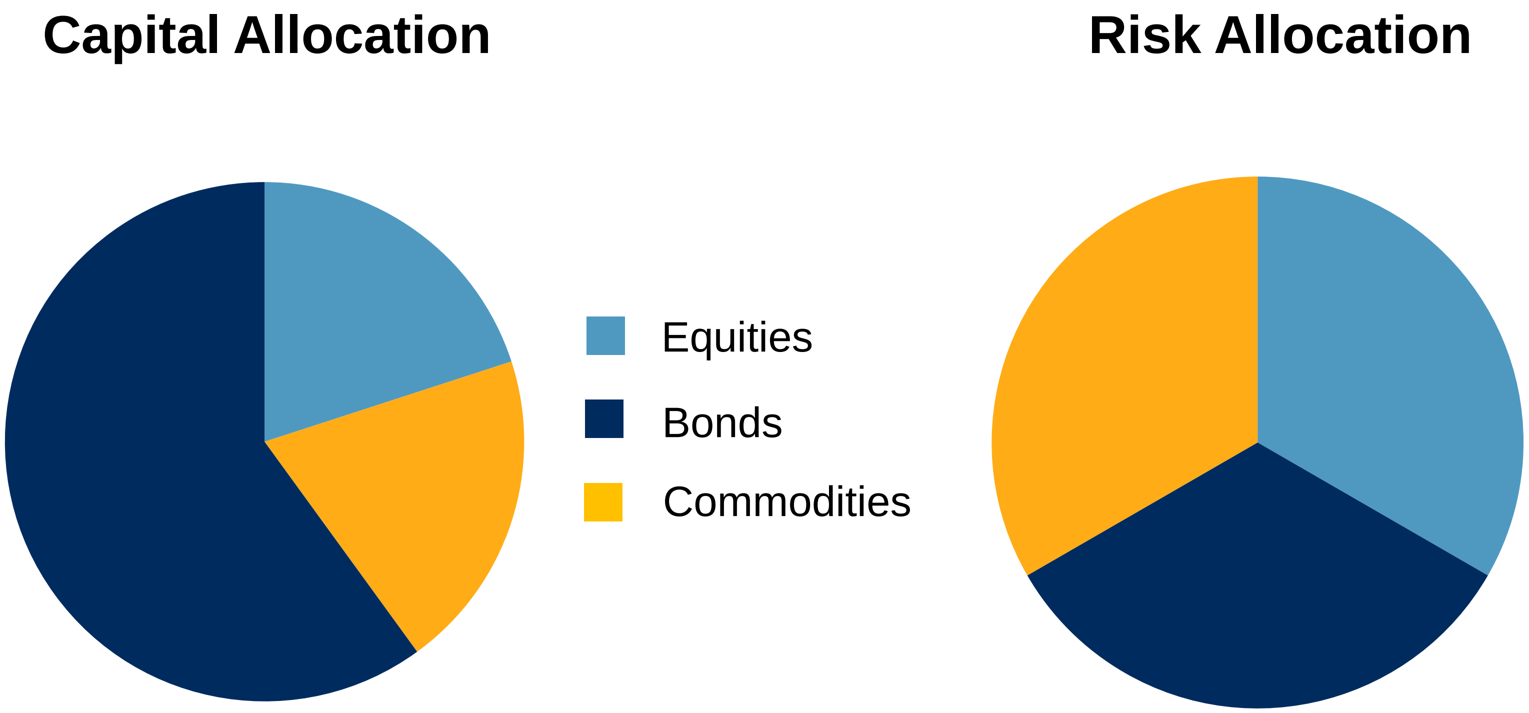
Asset class selection
Balanced across growth and inflation

Risk-adjusted performance across four economic environments since 1973



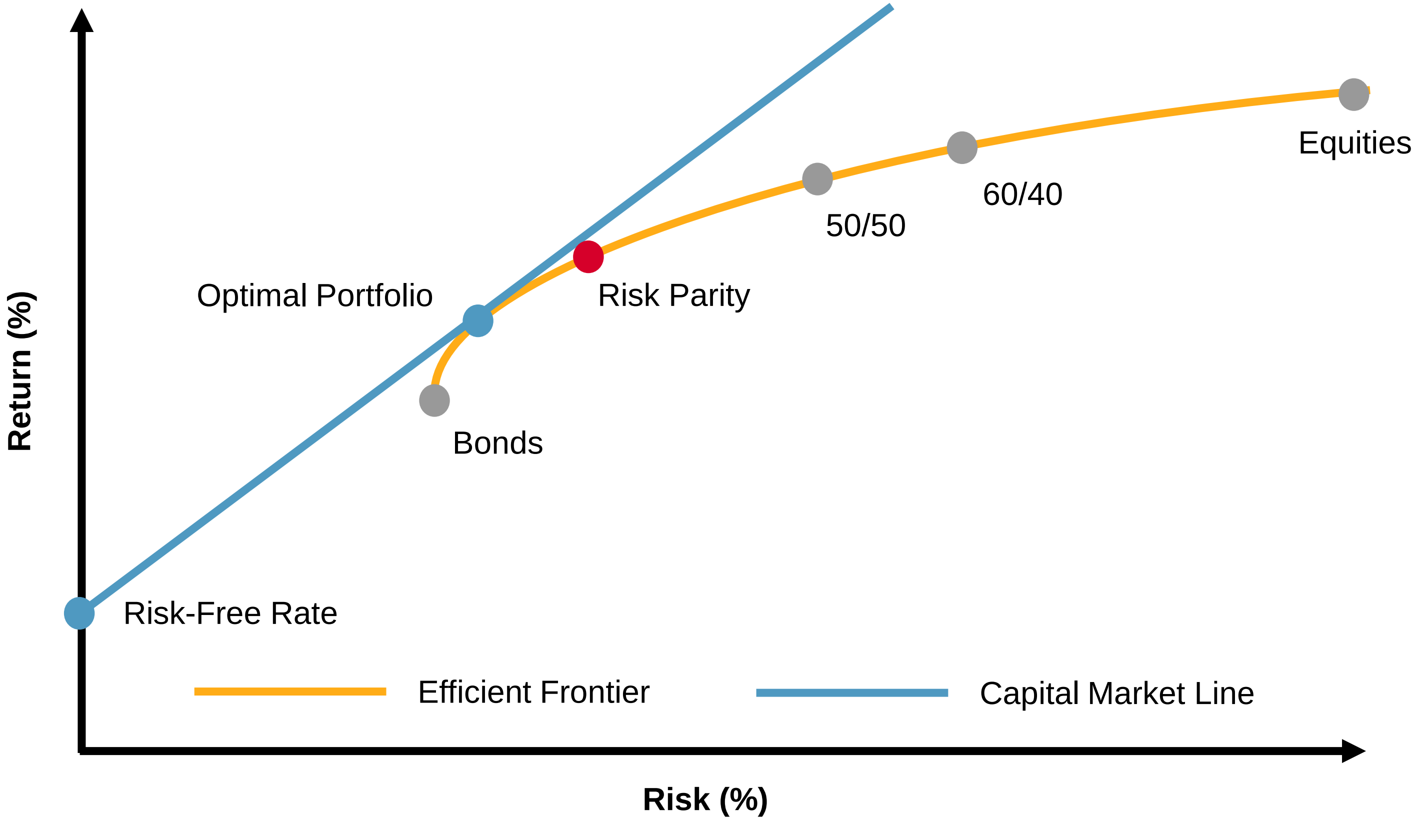
Source: S&P Dow Jones Indices LLC and Bloomberg. Data from January 1973 to March 2019. Equities are represented by the S&P 500 TR. Bonds are represented by the Bloomberg Barclays US Treasury Total Return Unhedged Index. Commodities are represented by the S&P GSCI TR. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

Weighting scheme
Risk parity targets a risk balanced approach



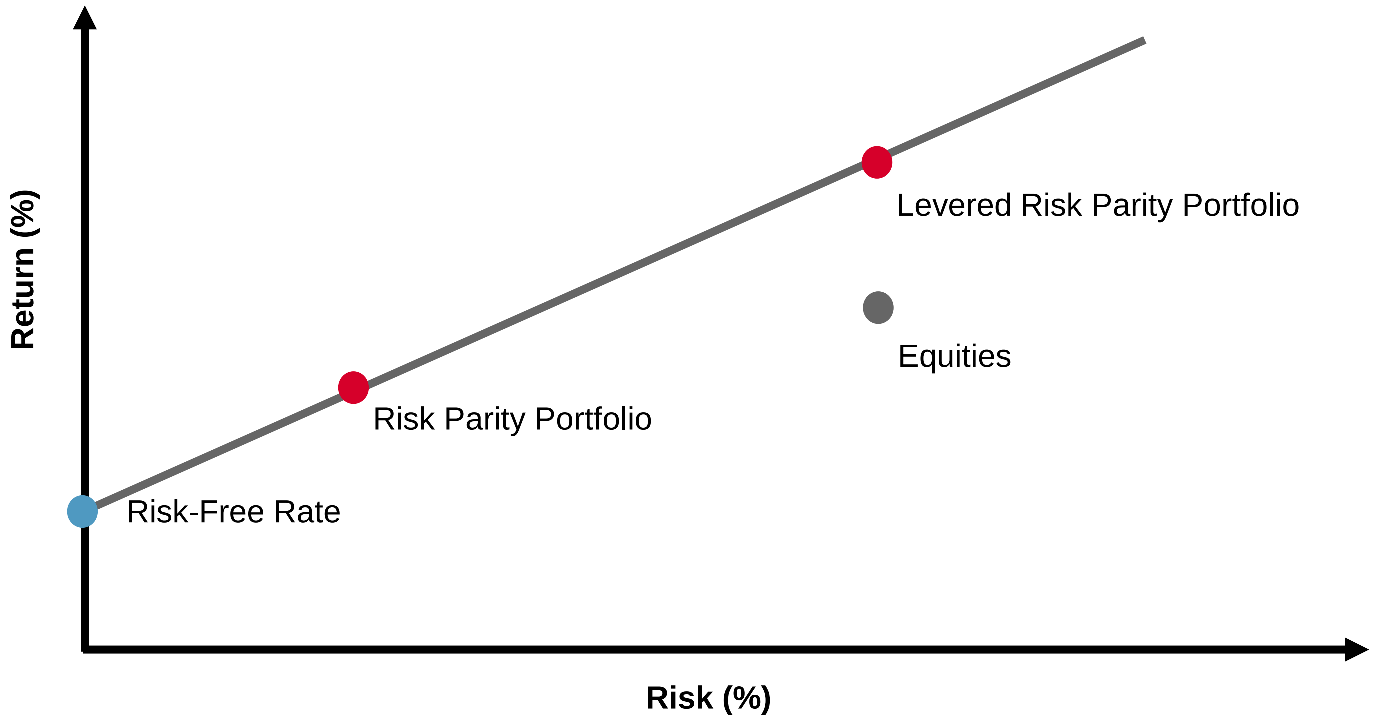
Source: S&P Dow Jones Indices LLC. Charts are provided for illustrative purposes.

Weighting scheme
Risk parity portfolios are typically more efficient



Source: S&P Dow Jones Indices LLC. Chart is provided for illustrative purposes.

Risk targeting
Risk parity portfolios typically require leverage



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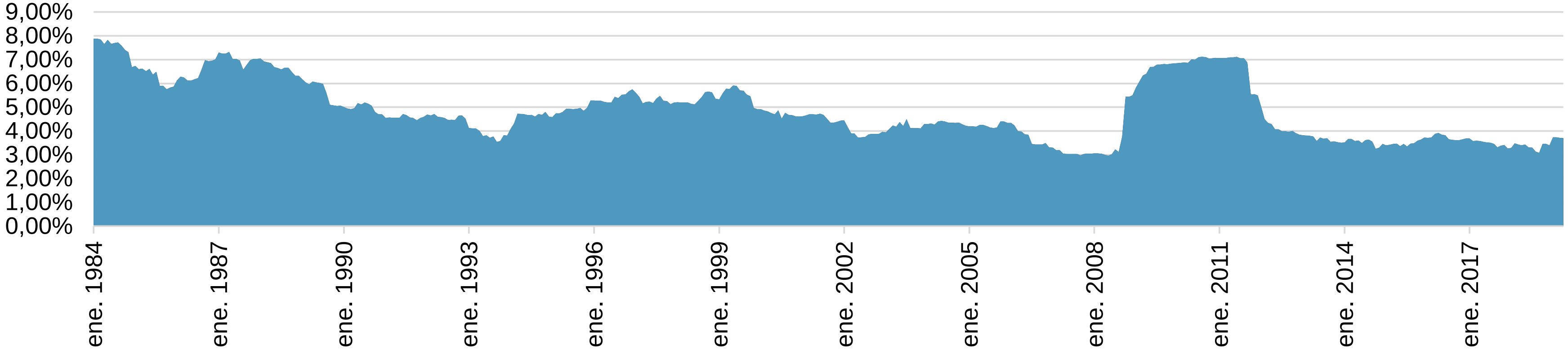
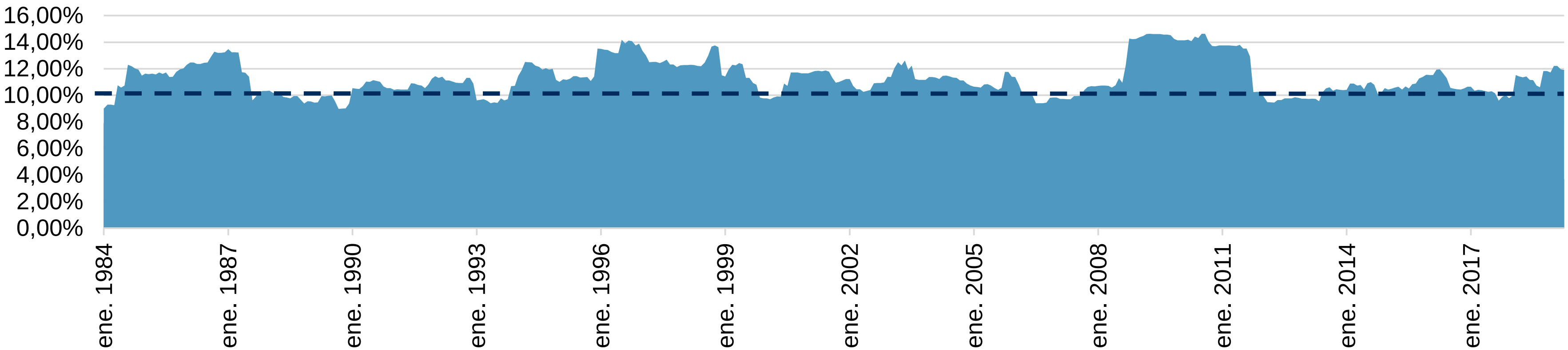
Risk targeting
Risk parity are typically volatility targeted

Simple risk parity with no volatility targeting



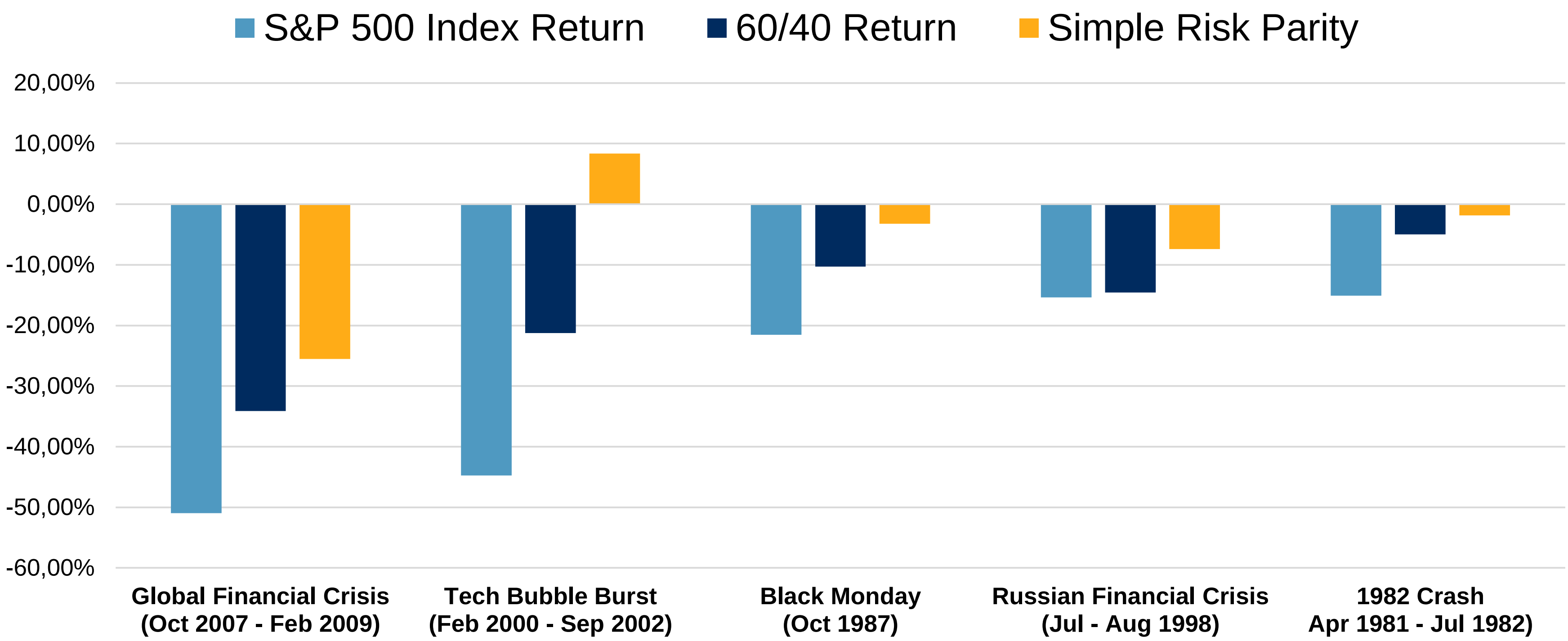
Simple risk parity with volatility targeting



Source: S&P Dow Jones Indices LLC. Data from January 1980 to April 2019. Simple Risk Parity is constructed by allocating equal risk, rebalanced monthly, across three asset classes (stocks, bonds, and commodities) based on each asset class' previous 12-month realized volatility. Charts are provided for illustrative purposes.

Drawdown analysis
Risk parity is less dominated by equity risk

Top five worst S&P 500 drawdowns since 1980 with corresponding 60/40 and risk parity return



The 60/40 equity/bond portfolio is a hypothetical portfolio.

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Performance analysis
Does risk parity outperform in every environment?

Period	Simple Risk Parity	60/40 Portfolio	Outperformance
1982 Bull Market, *Sep 1982 - Mar 1984*	29.0%	35.1%	**-6.1%**
Black Monday, *Oct 1987*	-3.2%	-10.3%	**7.0%**
Surprise Fed Rate Hike, *Feb – Mar 1994*	-10.0%	-9.8%	**-0.2%**
Tech Bubble, *Jan 1999 – Mar 2000*	13.1%	23.8%	**-10.8%**
Tech Bubble Burst, *Apr 2000 – Feb 2003*	50.7%	-6.6%	**57.3%**
Easy Credit, *Aug 2002 – Mar 2004*	49.6%	36.4%	**13.3%**
Global Financial Crisis, *Jul 2007 – Mar 2009*	-10.1%	-21.6%	**11.5%**
Europe/Greek Debt Crisis, *Apr – June 2010*	-1.3%	-7.6%	**6.3%**
2016-2018 Bull Market, *Mar 2016 - Jan 2018*	58.6%	68.9%	**-10.3%**
Fourth Quarter 2018, *Oct – Dec 2018*	-12.9%	-17.0%	**4.1%**

The 60/40 equity/bond portfolio is a hypothetical portfolio.
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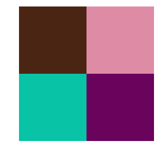
Investing in risk parity
Implementation choices

Allocation Approach

Equal Volatility Contribution

Equal Risk Contribution

Balanced across Economic Environments



Weighting within Asset Classes

Market Cap Weighting

- Market Index Weighted

Alternative Weighting

- GDP Index Weighted
- Risk Weighted
- Valuation Weighted

Liquidity Weighting

- Production Weighted
- Trading Volume Weighted

Risk Measurement

Static Risk Model

Dynamic Risk Model

Investing in Risk Parity

Investing in risk parity
Institutional approaches to using risk parity

Core/Satellite Approach	Risk/return characteristics could qualify risk parity to be the core holding of an investment portfolio
Alternative Investments	Use of leverage and derivatives led many investors to place risk parity within alternatives bucket
Opportunistic	Some institutional investors have this bucket and not uncommon to place here
Global Tactical Asset Allocation	Similar peer group to risk parity given it uses a wide range of asset classes and shifting weights

Investing in risk parity
Risk parity for Latin American investors

Tailoring	Risk parity implementation can be tailored
Asset Class Selection	The key is to select investments that behave differently across economic environments
Asset Allocation	Allocation scheme can applied across a range of investments

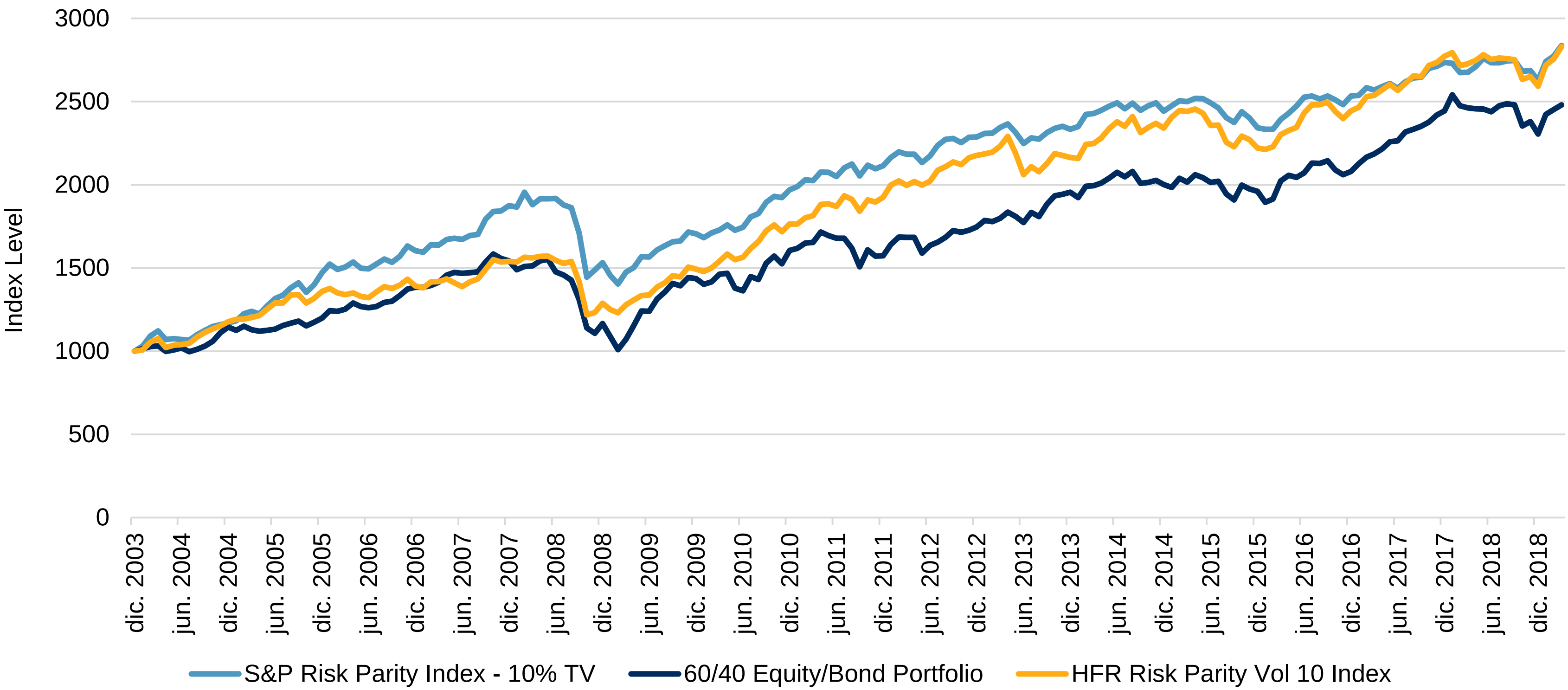
Indexing Risk Parity

Indexing risk parity
S&P Risk Parity Indices

- **Applications:**
  - Benchmark or trackable index
- **Exposure:**
  - Invests across equities, fixed income, and commodities
  - Utilizes futures contracts
- **Weighting:**
  - Inverse-volatility (i.e. equalize volatility contribution)
  - Long-term lookback window
  - Three volatility targets: 10%, 12%, and 15%

Indexing risk parity
S&P Risk Parity Indices

Performance versus the 60/40 Portfolio and Fund Based Benchmark – January 2003 through March 2019



The 60/40 equity/bond portfolio is a hypothetical portfolio.

Source: S&P Dow Jones Indices LLC. Data from January 2003 to March 2019. Index performance based on monthly total return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Indexing risk parity
S&P Risk Parity Indices

Performance versus the 60/40 Portfolio and Fund Based Benchmark – January 2003 through March 2019

	S&P Risk Parity Index - 10% Target Volatility	**HFR Risk Parity Vol 10 Index**	**60/40 EQUITY/BOND PORTFOLIO**
Annual Return	7.08%	7.06%	6.14%
Annual Volatility	8.26%	8.34%	10.05%
Sharpe Ratio	0.707	0.694	0.506
Maximum Peak-to-trough Drawdown	-28.17%	-22.43%	-36.42%
Return to Maximum Drawdown	25.12%	31.47%	16.93%
Annualized Tracking Error	3.93%		
Select Periods: *Cumulative Returns*			
Global Financial Crisis, *Oct 2007 - Feb 2009*	-23.6%	-20.6%	-36.4%
Europe/Greece Debt Crisis, *Mar - June 2010*	0.9%	1.5%	-7.2%
Downgrade of U.S. Debt, *Aug - Nov 2011*	-1.4%	-0.8%	-2.2%
China's Black Monday, *May - Sept 2015*	-5.7%	-8.2%	-6.1%
Inflation Fears, *Jan 2018 - Mar 2018*	-2.0%	-2.4%	-3.4%
Fourth Quarter 2018, Oct *2018 - Dec 2018*	-4.4%	-5.7%	-7.0%

Source: S&P Dow Jones Indices LLC., HFR Index, LLC. Data as of March 29, 2019. Index performance based on monthly total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Performance Disclosure

The S&P Risk Parity Index – 10% Target Volatility, S&P Risk Parity Index – 12% Target Volatility, and S&P Risk Parity Index – 15% Target Volatility were launched on July 11, 2018. All information presented prior to an index's Launch Date is hypothetical (back-tested), not actual performance. The back-test calculations are based on the same methodology that was in effect on the index Launch Date. Complete index methodology details are available at www.spdji.com.

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Past performance of the Index is not an indication of future results. Prospective application of the methodology used to construct the Index may not result in performance commensurate with the back-test returns shown. The back-test period does not necessarily correspond to the entire available history of the Index. Please refer to the methodology paper for the Index, available at www.spdji.com for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations.

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