



Risk Parity

An Application of Finance 101 (plus low beta investing)

Cliff Asness

Managing and Founding Principal

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Introduction

Traditional Portfolios are Concentrated in Equity Risk

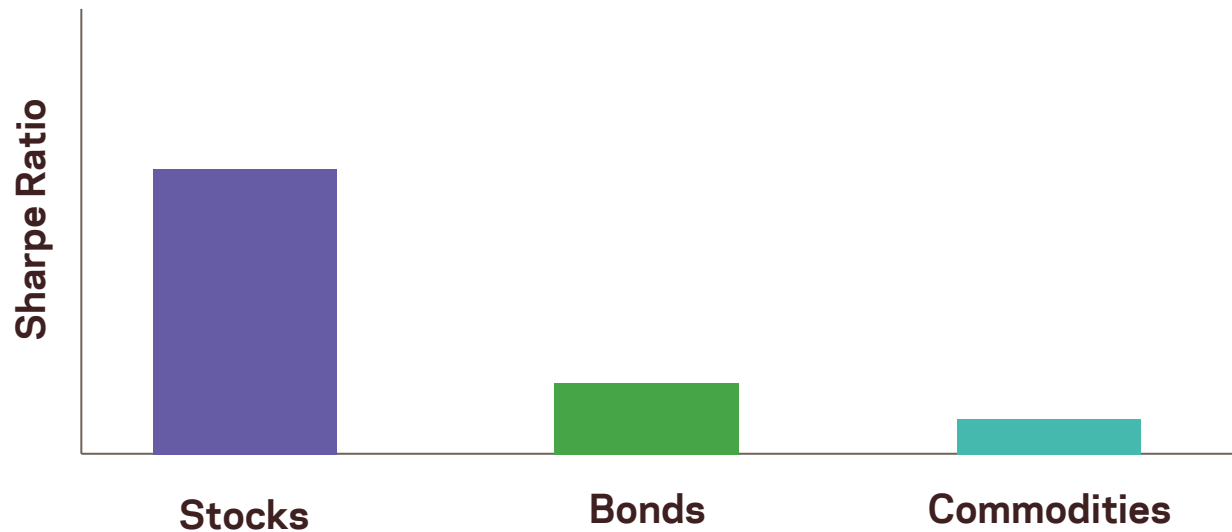
Traditional Allocation



Charts are for illustrative purposes only. Based on AQR volatility and correlation estimates. Please see risk disclosures in the Appendix. The Alternatives and Credit Risk is attributed to the equity risk category in the second chart.

Embedded Belief in Traditional Portfolios Is This...

Equity Domination can Imply a Uniquely High Required Sharpe Ratio



Note: These are Sharpe ratios, not expected returns

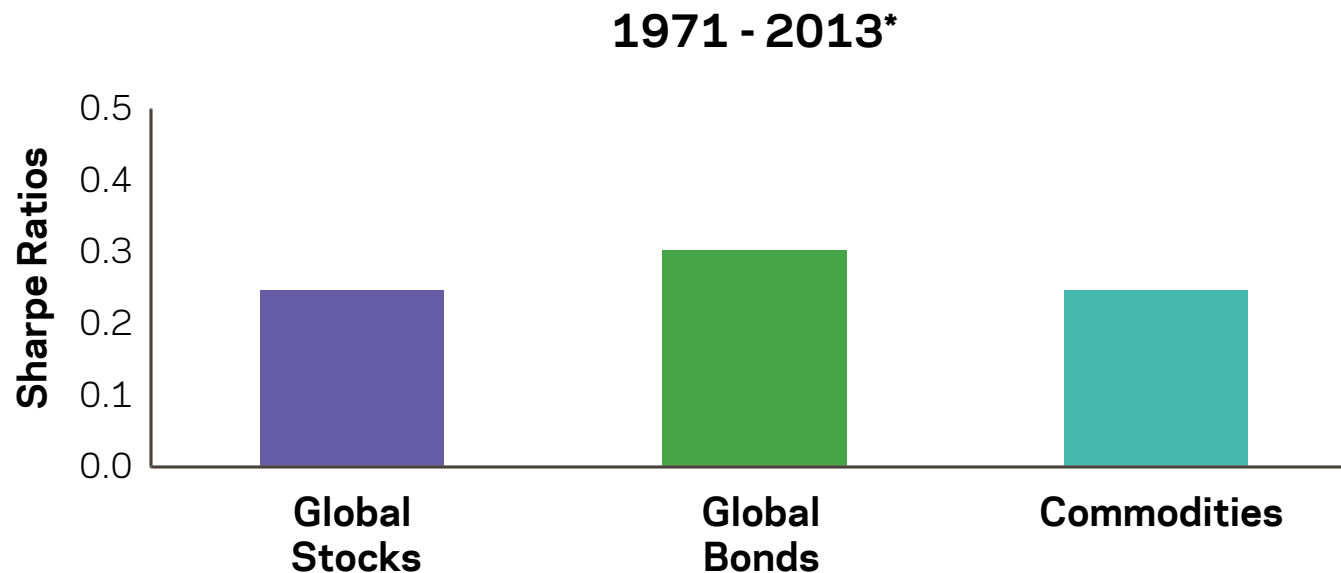


A stylized chart, for illustrative purposes only.

...While the Empirical Experience is This

Similar Sharpe Ratios Suggest that a Balanced Risk Allocation can be a Good Strategic Base

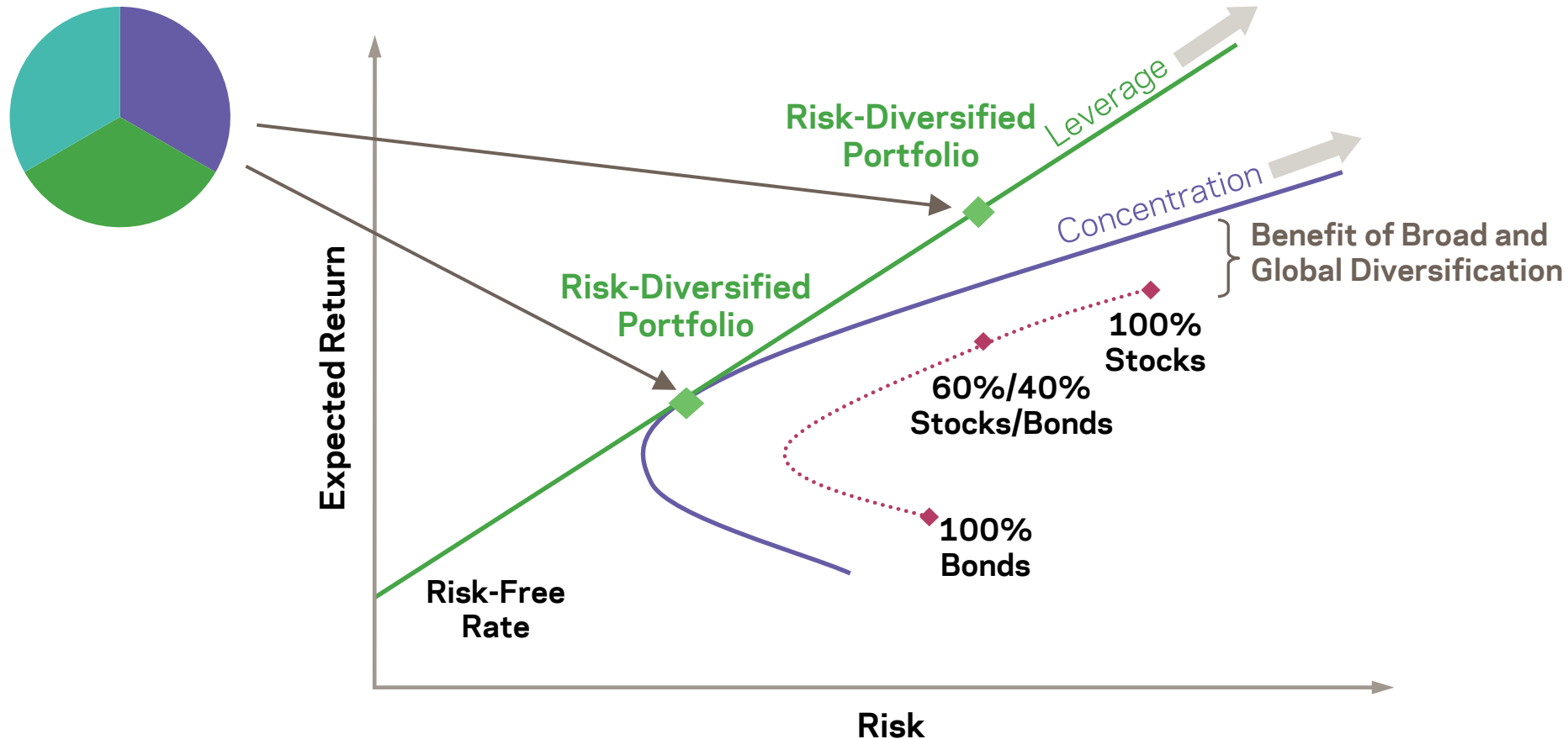
While equities have outperformed bonds, they are riskier, and adjusted for risk they have only barely kept pace, and this is not unique to the last 40 years



* These are the realized Sharpe Ratios based on monthly returns in excess of the 3 month T-bill returns for the MSCI World Index (stocks), the Barclays US Aggregate Government Bond Index (bonds), and the S&P GSCI Index (commodities). We begin in 1971, as that is when all three data series are available. Returns data is through July 2013. Please see important risk disclosures in the Appendix.

The Goal of Risk Diversification

A Risk-Diversified Portfolio Can Have Higher Expected Returns

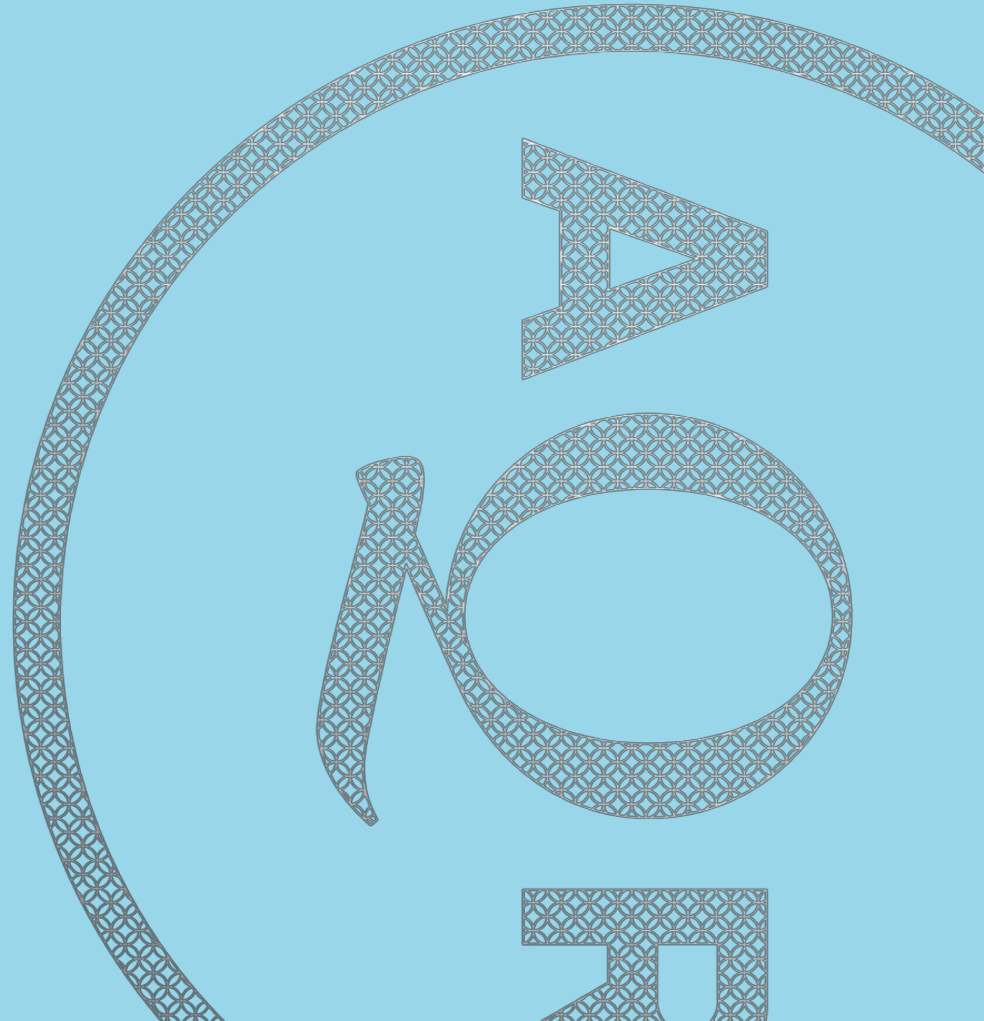


Source: AQR. Chart is for illustrative purposes only. Diversification does not eliminate the risk of experiencing investment losses. Please see important risk disclosures in the Appendix.



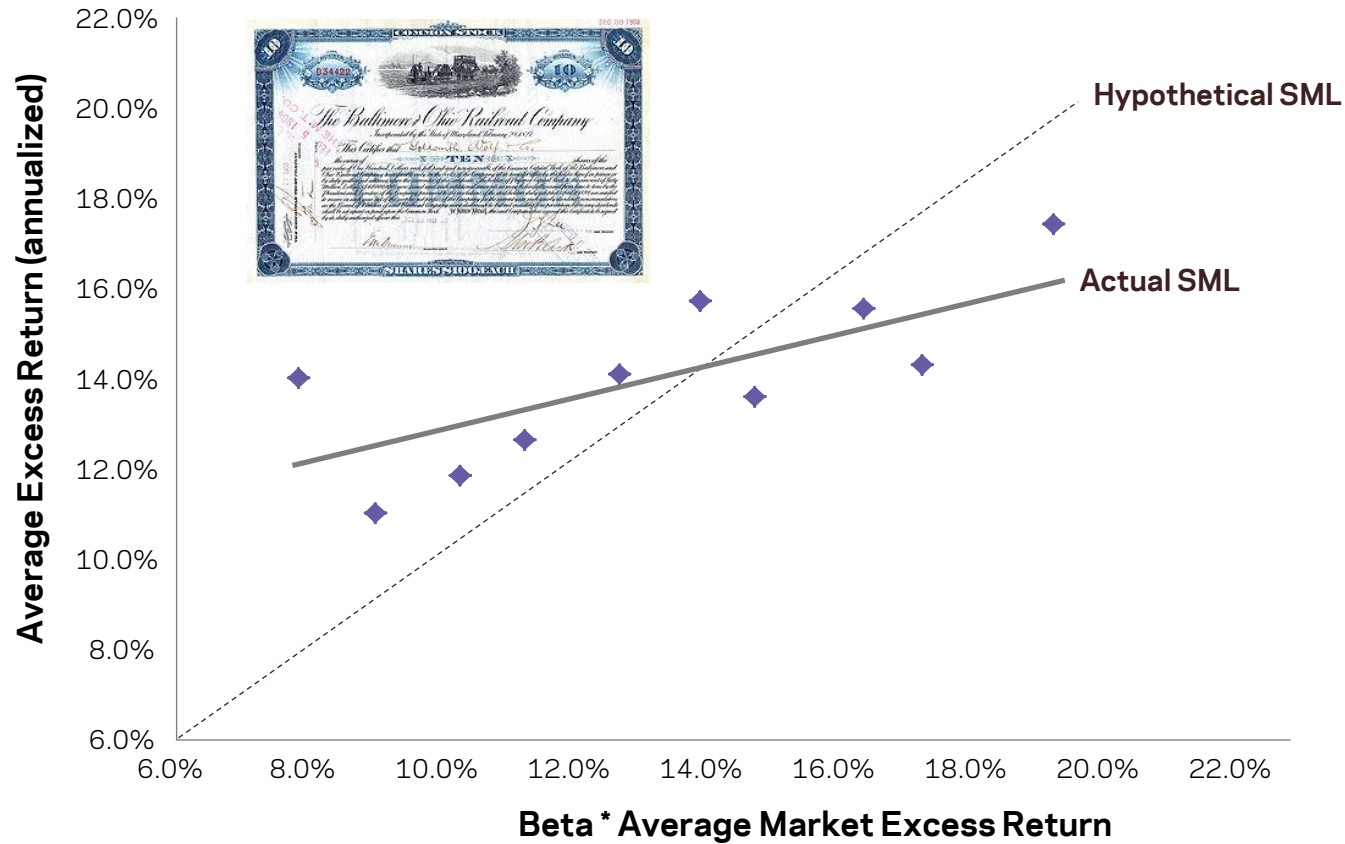
Why Risk Parity

Theories and Evidence



High Beta is Low Alpha: The Original Evidence

Theoretical and Empirical Security Market Lines (SML) of Ten Beta-Sorted U.S. Equity Portfolios (1931 to 1965)

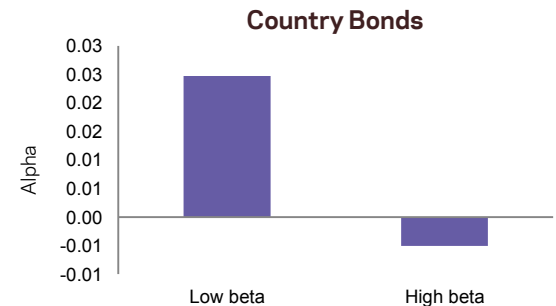
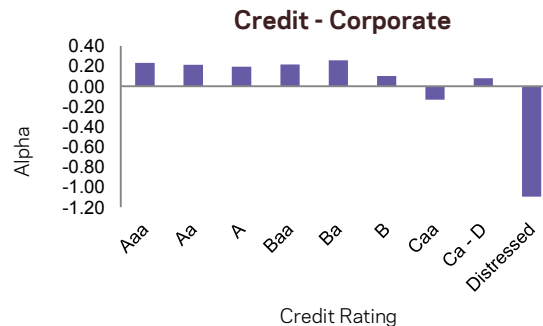
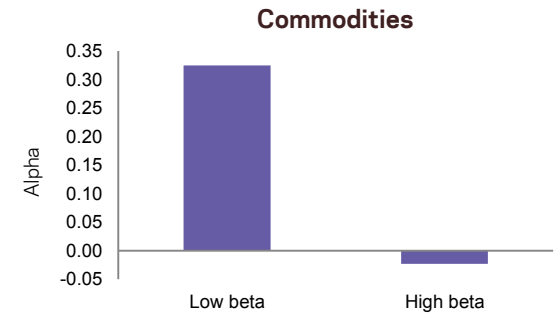
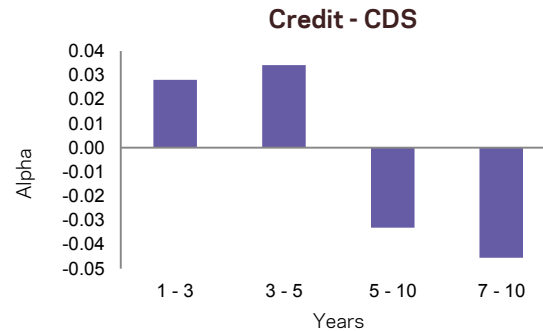
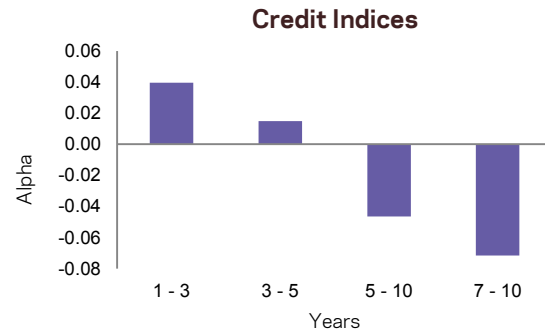
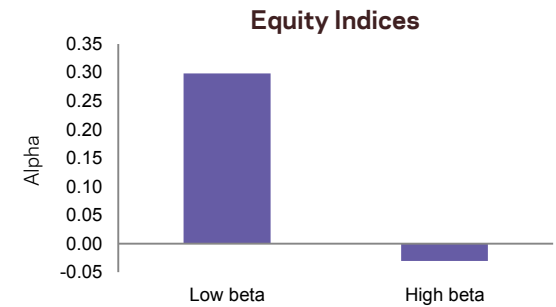
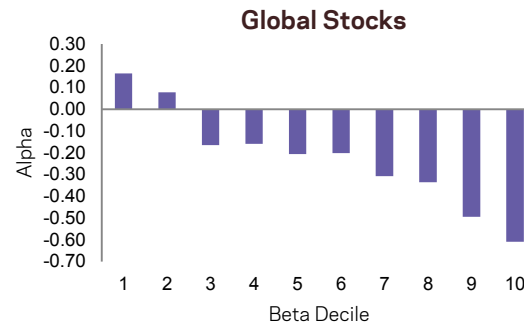
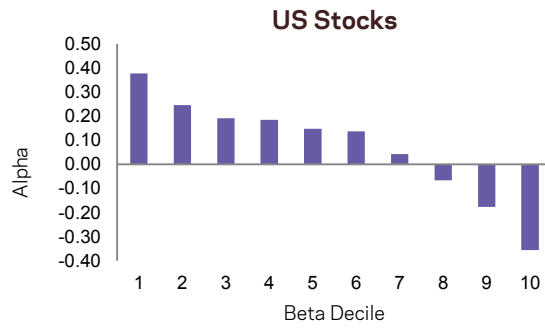


Source: Black, Jensen, and Scholes (1972)



A Low-Beta Premium Everywhere

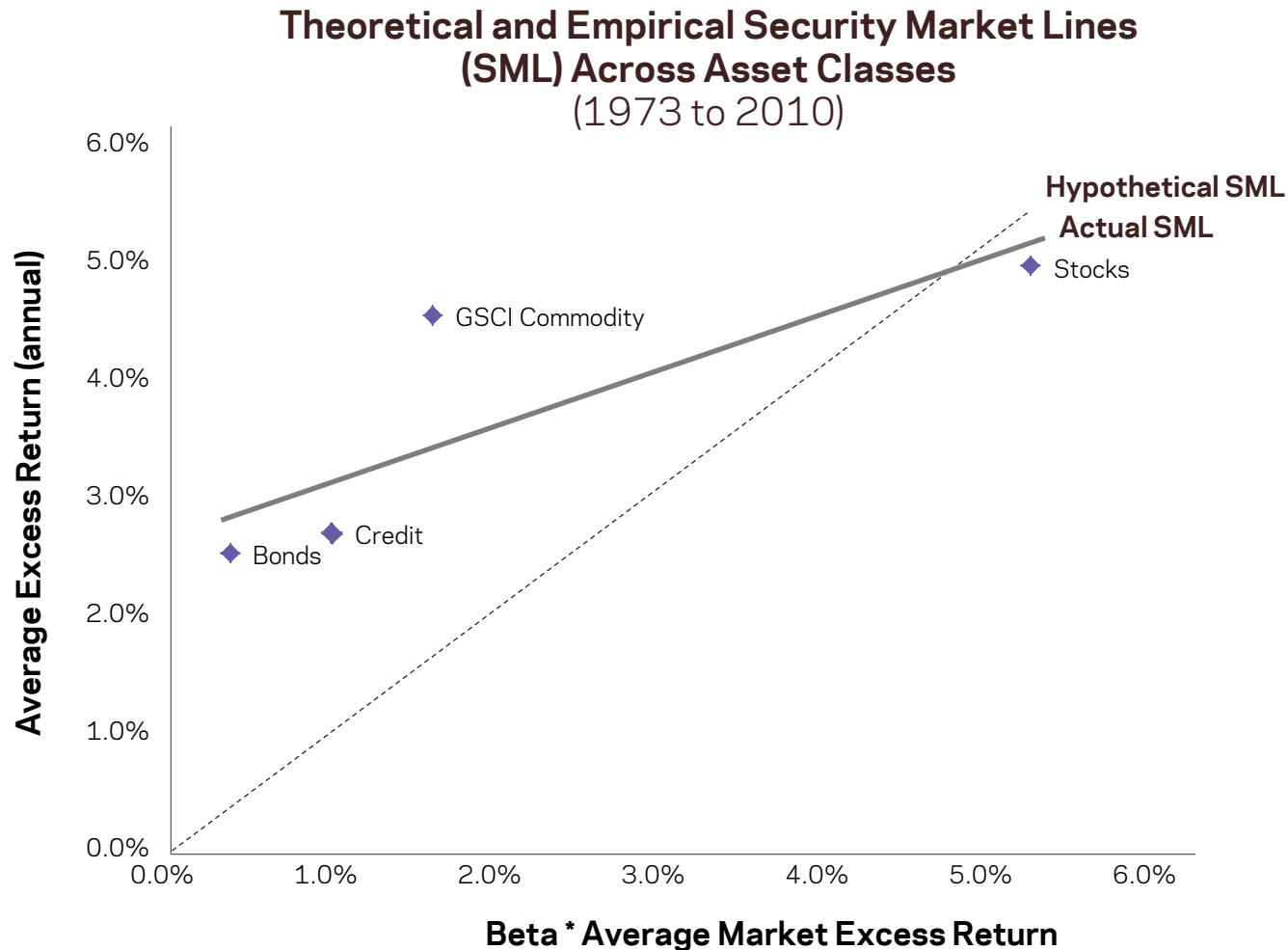
Evidence Within Many Markets



Source: Frazzini and Pedersen (2010), all data 1964 to 2009. The above show monthly alphas. The test assets are beta-sorted portfolios. At the beginning of each calendar month instruments are ranked in ascending order on the basis of their estimated beta at the end of the previous month. The ranked instruments are assigned to beta-sorted portfolios. This figure plots alphas from low beta (left) to high beta (right). Alpha is the intercept in a regression of monthly excess return. For equity portfolios the explanatory variables are the monthly returns from Fama and French (1993) mimicking portfolios and the momentum factor used in Carhart (1997). For all other portfolios the explanatory variables are the monthly returns on the market factor. Alphas are in monthly percent.

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"Betting Against Beta" Across Major Asset Classes



Source: Asness, Frazzini, Pedersen (2011). Notes: This figure shows the theoretical and empirical security market lines (SMLs) of portfolios of stocks, bonds, credit, and commodities in our broad sample. Average market excess return is the excess return of a market portfolio weighted by total capitalization and rebalanced monthly to maintain value weights. Beta is the slope of a regression of monthly excess Returns on the market excess return. The empirical SML is the fitted value of a cross-sectional regression of average excess returns on realized betas.



Risk Parity Is Low Beta Applied to Asset Classes

What Leverage Aversion can Mean for Portfolios

- If leverage aversion, or other theories like lottery preferences or investor focus on relative returns, predicts that higher-risk portfolios have lower risk-adjusted returns, then a portfolio that overweights low-risk assets and underweights high-risk assets should act to capture some of this premium

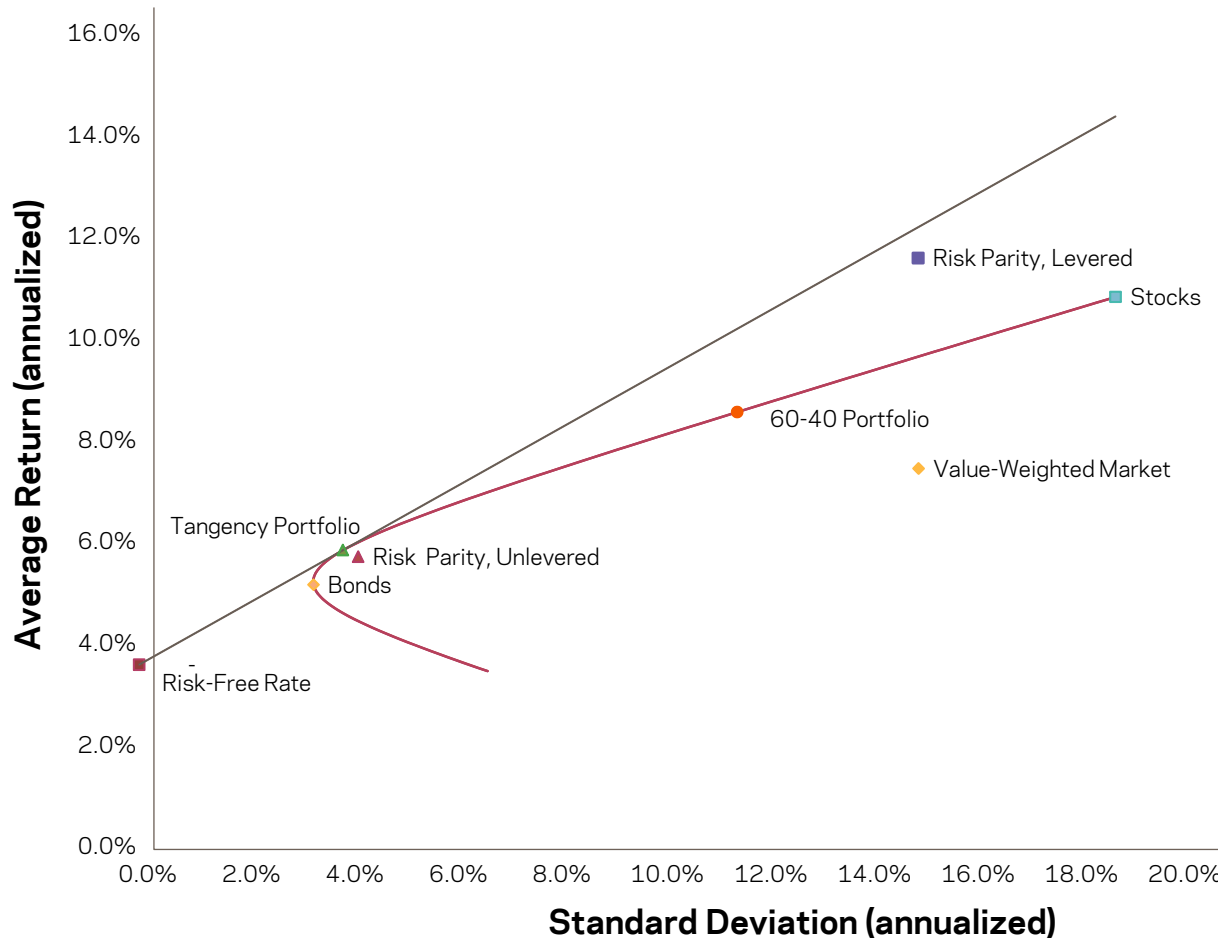
Sounds like risk parity!

- We see risk parity as just low beta investing combined, again, with Finance 101, though we agree that it is sometimes oversold as a magic answer to a precise optimization



What's the Evidence Look Like?

Efficient Frontier, 1926–2010



Source: "Leverage Aversion and Risk Parity," Asness, Frazzini, and Pedersen (2011).



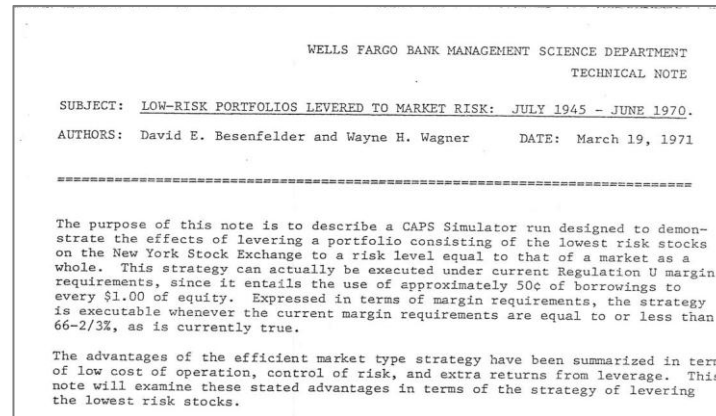
We Don't Claim To Have Invented This Idea!

In the late 60s we knew a flat SML was a big deal

Wells Fargo Quants: the dream team of empirical finance

- Black, Scholes, Booth, Vasicek, McQuon, Wagner
- A reason it was not done is it **required leverage to matter** and the world was not ready

PPC	SUBJ
JKD	AUTH
RLK	
RJC	
JOE	=====
LHE	
LM	
PNE	
GAH	Intro
JJK	
JRV	This
WLF	Model
IEJ	✓ of the
JC	
WJ	list
HJN	
DP	the v
RFS	
PMc	
EAH	This
HVB	effec
MM	"alph
RLB	
MS	✓ prici
FB	✓ of po
JT	same
JJG	
PH	weight
DJD	
RMH	The B
DAL	✓ equal
DEB	
DOB	✓ greater
APC	
LJC	✓
SG	
RJL	✓ This
SCL	✓ secur
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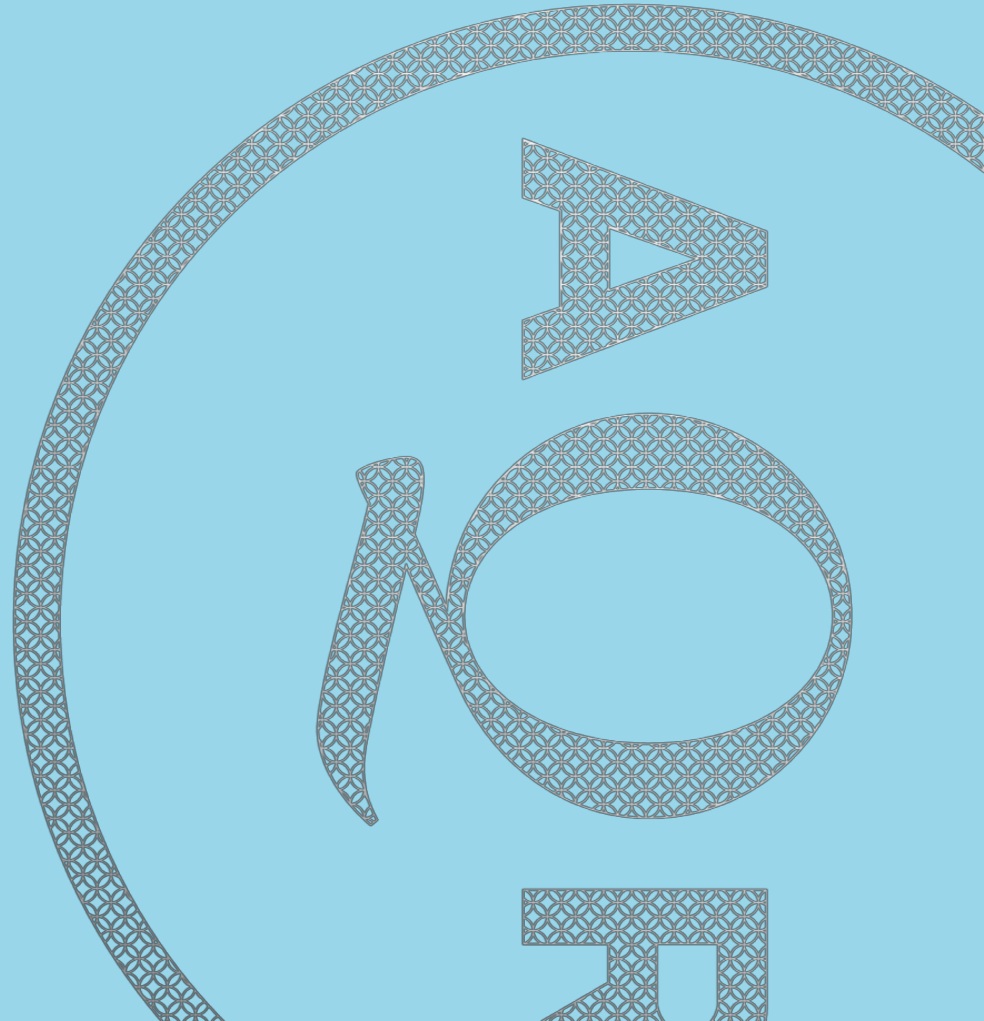


Source: Provided to the Author by Wayne Wagner.



Question 1

What Happened This Year?



What Happened This Year?

A Bad Period $\neq$ A Broken Period

We need to make judgments, but we do so too frequently

The second quarter of 2013 was a sharp drawdown

- But the magnitude was not outside of a reasonable guess of what can (and will) happen on occasion
- Year-to-date returns are unexceptional compared to expectations and history
- Yet, recent results feel pretty particularly bad because investors didn't lose money the way they usually lose money – in stocks; losing unconventionally always hurts more

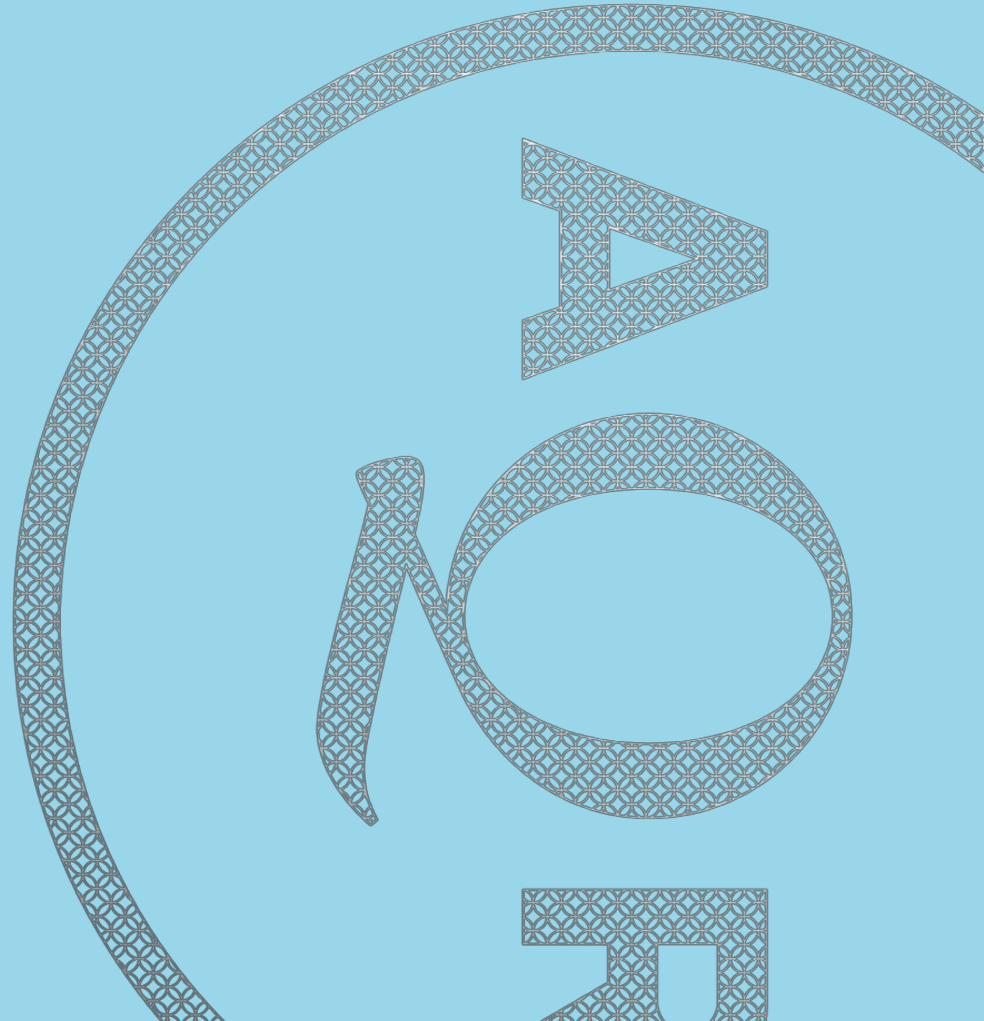
We believe, and both theory and data support, that risk parity's edge over traditional portfolios is modest but real

- A “little bit better” can add up to quite a bit better over time
- But unfortunately, also implies **sometimes** it is quite a bit worse
- If you can forecast those times, and get the timing down with great precision (otherwise it doesn't help) more power to you!



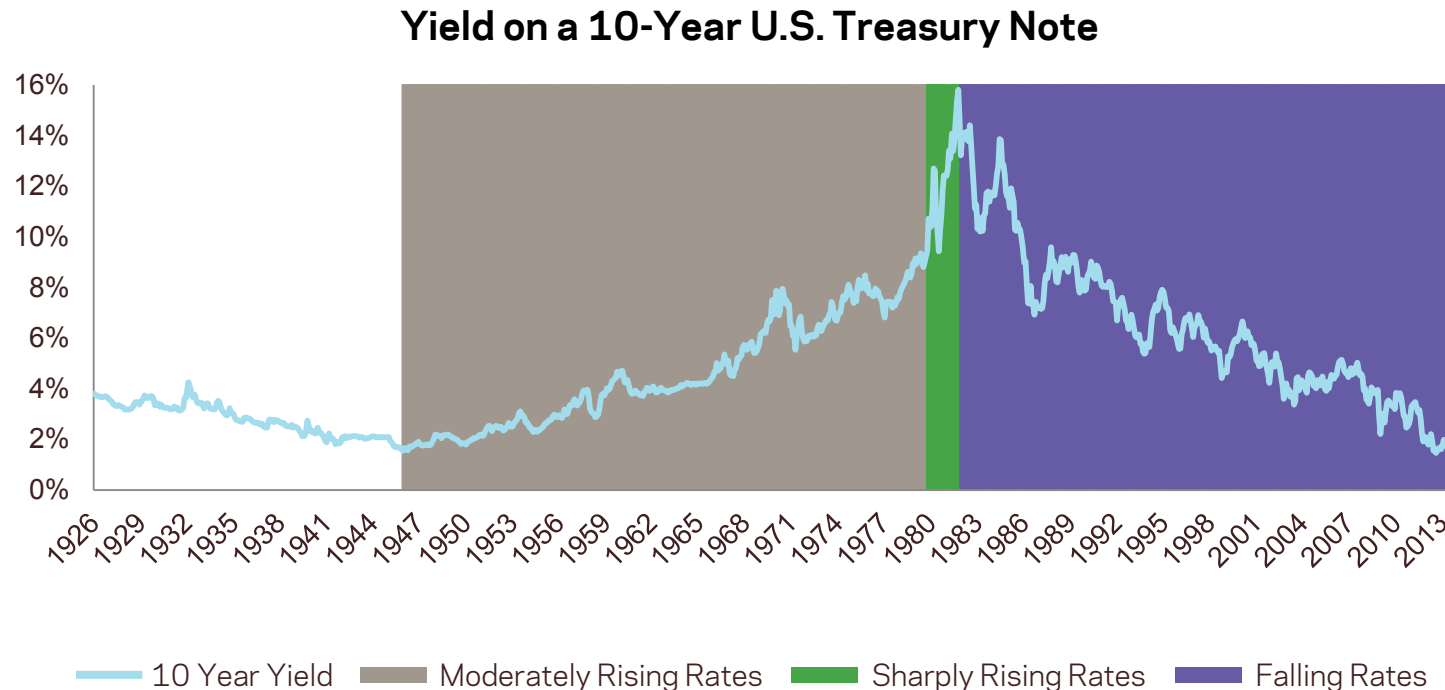
Question 2

What About Rates?



What About Rates?

We Focus on the Shaded Sub-Periods, Over Which Yields Have Moved a Full “Round Trip”



All data and analysis from AQR Whitepaper, “Can Risk Parity Outperform If Yields Rise?”

Source: AQR; see Appendix for data sources.



What About Rates?

- The simple risk parity strategy outperformed the U.S. and Global 60/40 portfolios, in both total and risk-adjusted returns, during rising rate and falling rate sub-periods

	Total Annualized Gross Returns			Volatility			Sharpe Ratios		
	60-40 US	60-40 Global	Hypothetical Risk Parity	60-40 US	60-40 Global	Hypothetical Risk Parity	60-40 US	60-40 Global	Hypothetical Risk Parity
By Sub-Period:									
Rising Rates: 1947-1981	7.0%	8.3%	10.7%	9.0%	7.2%	10.3%	0.30	0.57	0.62
Falling Rates: 1981-2013	11.0%	10.5%	12.8%	10.1%	9.7%	9.3%	0.65	0.63	0.90
Full Sample	8.9%	9.4%	11.7%	9.6%	8.5%	9.9%	0.48	0.59	0.74
By Decade:									
1947-1949	6.9%	3.4%	14.9%	8.7%	7.3%	9.1%	0.67	0.32	1.52
1950-1959	11.8%	13.2%	14.1%	7.2%	5.1%	10.7%	1.37	2.20	1.14
1960-1969	5.5%	6.7%	8.3%	7.9%	5.5%	10.5%	0.19	0.49	0.41
1970-1979	5.0%	7.1%	11.3%	11.0%	9.2%	10.0%	-0.12	0.09	0.50
1980-1989	15.3%	17.2%	14.1%	12.3%	10.4%	10.3%	0.53	0.81	0.52
1990-1999	13.8%	10.8%	13.3%	9.3%	9.2%	10.1%	0.96	0.65	0.84
2000-2009	2.5%	3.4%	9.9%	9.5%	9.7%	8.5%	-0.02	0.08	0.85
2010-2013	11.2%	8.6%	7.5%	7.6%	8.6%	7.8%	1.47	0.99	0.94

- While risk parity has outperformed in backtests, including the long period of rising rates, it is vital to point out that risk parity can underperform other asset allocation methods for extended periods, as seen in the table above. It, like most honest strategies, should not be oversold. Again, a modest edge over a long period adds up but must be stuck with!

Source: AQR and publically available information; the simulated Simple Risk Parity Strategy is based on a hypothetical portfolio. See the Appendix for data sources. Please see Appendix for disclosures relating to hypothetical results. The US 60/40 portfolio consists of a 60% allocation to US Equities and a 40% allocation to US 10 year treasuries, rebalanced monthly. The global 60/40 portfolio consists of a 60% allocation to GDP-weighted global equity markets and 40% GDP-weighted global 10 year treasury markets, rebalanced monthly up until January of 1970 at which we use the MSCI World Equity index for the equity portion. Prior to 1970 we did not have market capitalization figures for all of the global equity markets. We incorporate whatever global markets we have data for at each point in time, and the bond portion of the global portfolio is currency hedged as is more common investment practice. The risk parity portfolio is currency hedged throughout as that is the standard implementation. We do not subtract here historical financing or transaction costs or claim investability of all instruments through the history, but note that subtracting today's costs would not materially change the results shown.

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What About Rates?

Rising Rates—Speed Matters

- Both the simple risk parity and traditional 60/40 portfolios tend to suffer in periods of rapid, unexpected rate increases (1979 – 1981) with risk parity suffering the most...

	Total Annualized Gross Returns				Volatility			Sharpe Ratios			% of Months
	60-40 US	60-40 Global	Risk Parity	Cash	60-40 US	60-40 Global	Risk Parity	60-40 US	60-40 Global	Risk Parity	
By Sub-Period:											
Moderately Rising Rates: August 47-September 79	7.5%	8.7%	11.9%	3.8%	8.8%	6.8%	10.0%	0.42	0.72	0.81	49%
Sharply Rising Rates: October 79-September 81	0.0%	3.1%	-6.7%	12.7%	13.0%	11.7%	14.4%	-0.98	-0.82	-1.35	3%
Falling Rates: October 81-June 13	11.0%	10.5%	12.8%	4.4%	10.1%	9.7%	9.3%	0.65	0.63	0.90	48%
Full Sample	8.9%	9.4%	11.7%	4.3%	9.6%	8.5%	9.9%	0.48	0.59	0.74	100%

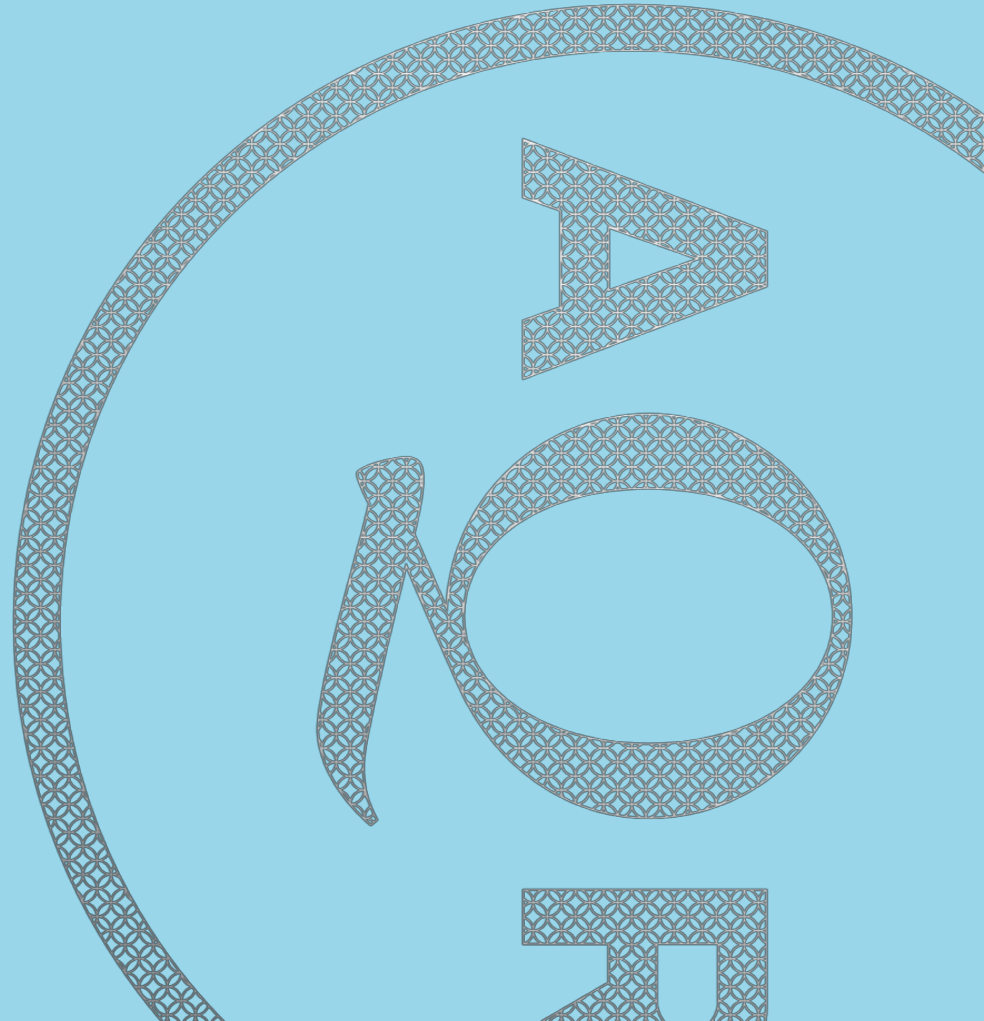
- Still, the simple risk parity strategy outperforms the traditional 60/40 portfolios in the moderately rising rate environment (1947 – 1979) and during the full rising rate period (1947-1981) that includes the tail end of sharply rising rates (we do NOT exclude that pain!)

Source: AQR and publically available information; the simulated Simple Risk Parity Strategy is based on a hypothetical portfolio. See the Appendix for data sources. Please see Appendix for disclosures relating to hypothetical results. The US 60/40 portfolio consists of a 60% allocation to US Equities and a 40% allocation to US 10 year treasuries, rebalanced monthly. The global 60/40 portfolio consists of a 60% allocation to GDP-weighted global equity markets and 40% GDP-weighted global 10 year treasury markets, rebalanced monthly up until January of 1970 at which we use the MSCI World Equity index for the equity portion. Prior to 1970 we did not have market capitalization figures for all of the global equity markets. We incorporate whatever global markets we have data for at each point in time, and the bond portion of the global portfolio is currency hedged as is more common investment practice. The risk parity portfolio is currency hedged throughout as that is the standard implementation. We do not subtract here historical financing or transaction costs or claim investability of all instruments through the history, but note that subtracting today's costs would not materially change the results shown.

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Closing Thoughts



Closing Thoughts

- Risk Parity is not radical, leveraging the best risk-adjusted portfolio is basic financial theory that very few people seem to actually implement
 - Risk parity has excelled when equities, and most people's overall portfolio as dominated by equities, suffer. Now, 5 years after the crisis, perhaps we're getting complacent about that again
- It is one answer to a world with leverage constraints, our favorite theory, or other behavioral biases that lead to similar results, and is supported empirically (data from 1926 and across many other places than U.S. stocks or asset classes)
 - It is not, and should not, be taken as an **exact** answer, we think some of the confusion lies here, the choice of the word **parity** implies too much precision or a magic formula!
 - It is a tilt towards a solid (theory and data) factor, and whether that factor works for rational or irrational reasons, such a tilt can improve the Sharpe of a portfolio
 - How much to tilt? We find the answer comes out to about “parity” and thus it’s a convenient marketing term for us 😊 Again, some people read too much into this word
 - How much risk parity should you actually do? Well, that depends on real world concerns like what if you get bad luck at the start of a good process, if so your career (and ours) can suffer! (note we don’t forecast bad luck but you should choose an allocation to withstand it). Please note this isn't different from any other form of alpha that differs from the crowd. Our advice is do it, but at a survivable amount
- After choosing to do some risk parity lots of implementation choices remain – financial instruments used, volatility and correlation calculations, breadth of investments globally and across asset classes



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Past performance is not an indication of future performance.

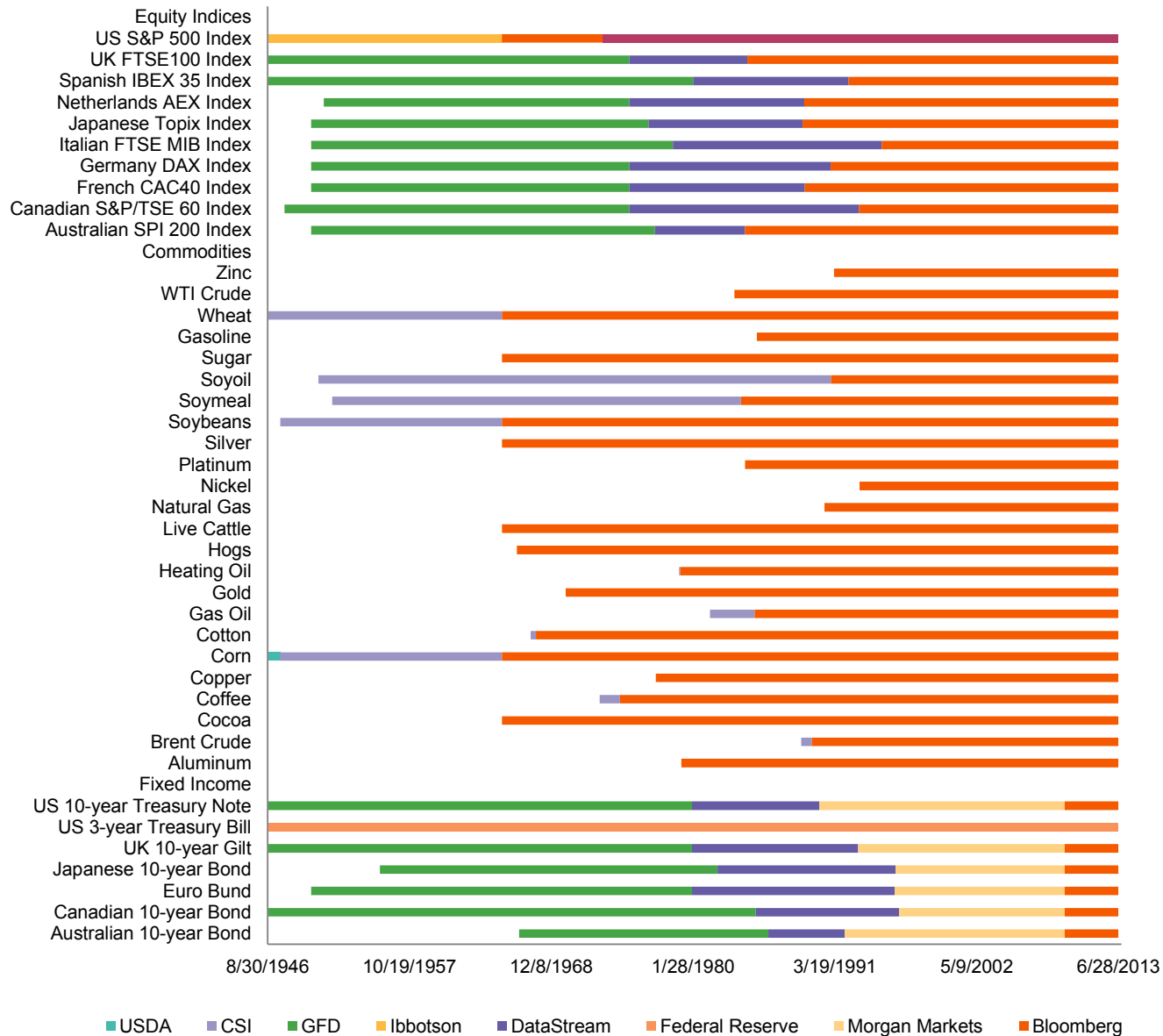
Hypothetical performance results (e.g., quantitative backtests) have many inherent limitations, some of which, but not all, are described herein. No representation is being made that any fund or account will or is likely to achieve profits or losses similar to those shown herein. In fact, there are frequently sharp differences between hypothetical performance results and the actual results subsequently realized by any particular trading program. One of the limitations of hypothetical performance results is that they are generally prepared with the benefit of hindsight. In addition, hypothetical trading does not involve financial risk, and no hypothetical trading record can completely account for the impact of financial risk in actual trading. For example, the ability to withstand losses or adhere to a particular trading program in spite of trading losses are material points which can adversely affect actual trading results. The hypothetical performance results contained herein represent the application of the quantitative models as currently in effect on the date first written above and there can be no assurance that the models will remain the same in the future or that an application of the current models in the future will produce similar results because the relevant market and economic conditions that prevailed during the hypothetical performance period will not necessarily recur. There are numerous other factors related to the markets in general or to the implementation of any specific trading program which cannot be fully accounted for in the preparation of hypothetical performance results, all of which can adversely affect actual trading results. Discounting factors may be applied to reduce suspected anomalies. This backtest's return, for this period, will vary depending on the date it is run. Hypothetical performance results are presented for illustrative purposes only.

Gross performance results do not reflect the deduction of investment advisory fees, which would reduce an investor's actual return. For example, assume that \$1 million is invested in an account with the Firm, and this account achieves a 10% compounded annualized return, gross of fees, for five years. At the end of five years that account would grow to \$1,610,510 before the deduction of management fees. Assuming management fees of 1.00% per year are deducted monthly from the account, the value of the account at the end of five years would be \$1,532,886 and the annualized rate of return would be 8.92%. For a ten-year period, the ending dollar values before and after fees would be \$2,593,742 and \$2,349,739, respectively. AQR's asset based fees may range up to 2.85% of assets under management, and are generally billed monthly or quarterly at the commencement of the calendar month or quarter during which AQR will perform the services to which the fees relate. Where applicable, performance fees are generally equal to 20% of net realized and unrealized profits each year, after restoration of any losses carried forward from prior years. In addition, AQR funds incur expenses (including start-up, legal, accounting, audit, administrative and regulatory expenses) and may have redemption or withdrawal charges up to 2% based on gross redemption or withdrawal proceeds. Please refer to the Fund's Private Offering Memoranda and AQR's ADV Part 2A for more information on fees. Consultants supplied with gross results are to use this data in accordance with SEC, CFTC, NFA or the applicable jurisdiction's guidelines.

There is a risk of substantial loss associated with trading commodities, futures, options, derivatives and other financial instruments. Before trading, investors should carefully consider their financial position and risk tolerance to determine if the proposed trading style is appropriate. Investors should realize that when trading futures, commodities, options, derivatives and other financial instruments one could lose the full balance of their account. It is also possible to lose more than the initial deposit when trading derivatives or using leverage. All funds committed to such a trading strategy should be purely risk capital.



Appendix: Data Sources



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