



Alternative Thinking

Good Strategies for Tough Times

Historically high valuations in major stock and bond markets, and meaningful recent losses across global equities have increased investors' concerns about downside risk.

In this *Alternative Thinking*, we show how different investments performed amid the worst quarters for stock and bond markets in recent decades. We find that certain long/short strategies have been not only market-neutral in the long run, but also during these tail events — suggesting a valuable role over the long-term, and when it really counts. We additionally document strong complementary behavior from two strange bedfellows — private equity and trend-following — which have each tended to do well when the other has fared poorly.

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Executive Summary

- We document the performance of major asset classes, portfolios and several long/short strategies amid the worst quarters for stocks and bonds over recent decades.
- We find long/short style premia tend to be market-neutral, not just on average but also in these worst quarters, thereby suggesting valuable diversification potential.
- Although direct hedging strategies such as put buying have also, not surprisingly, performed well during the worst quarters for traditional assets, they have unattractive long-run performance.
- Empirical comparison of option trading and trend-following strategies suggests that investors require especially large compensation for protection against sudden market falls, as provided by index puts — and not protracted slower falls, as has been historically provided by trend-following strategies.
- Finally, we show that private equity and trend-following strategies have been excellent complements historically, each tending to perform well when the other has fared poorly.

Performance During the Worst Quarters

As perennial fans of diversification, we strongly advocate investing across a wide variety of low correlated (with uncorrelated the holy grail) assets and strategies for the long run. But how do these investments perform during the worst times for traditional assets, when investors arguably need the benefits of diversification the most?

To answer this, we take a straightforward and empirical approach: we identify the 10 worst quarters for stocks and bonds in recent decades and study the performance of many assets and

investment strategies during these events.¹ While what has tended to work in the past is no guarantee of the future, the strategies we highlight here are economically intuitive, and have much research arguing for, and showing, their persistence.²

Exhibit 1 focuses on the 10 worst quarters for global equities since 1972.³ The top row gives the key statistic, the average excess of cash return across the 10 worst quarters for equities. The next row annualizes these returns and divides this value by full-sample volatility (third row) to distinguish between investments with very different volatility levels. The last row shows the full-sample Sharpe ratio for comparison.

Equities and the equity-dominated 60/40 portfolio suffered from double-digit losses, on average. Hedge funds had a disappointing -6% average loss.⁴ A simple risk parity portfolio (consisting of risk-balanced equity, bond and commodity allocations), and the credit premium (corporate bond returns in excess of risk-matched Treasuries) had mild average losses, while commodities and equity index puts had mild average gains.⁵ The largest winners were global

¹ To save space and reader patience, we present the returns during the 10 worst quarters for global equities (series described in the Appendix) between 1972 and 2014 for a set of 20 investments (and then analyze the worst quarters for bonds). It's also appropriate to focus on equities, as we believe they contribute most to the volatility of wealth for most investors. We also studied a much larger set of investments and will comment on some relevant results. We also analyzed the 10 worst quarters and 12-month windows between 1927 and 2014 for a narrower available set of investments, as well as the worst quarters between 1990 and 2014 for a much broader set of investments. The main results we describe here appear robust. Past performance is not indicative of future results.

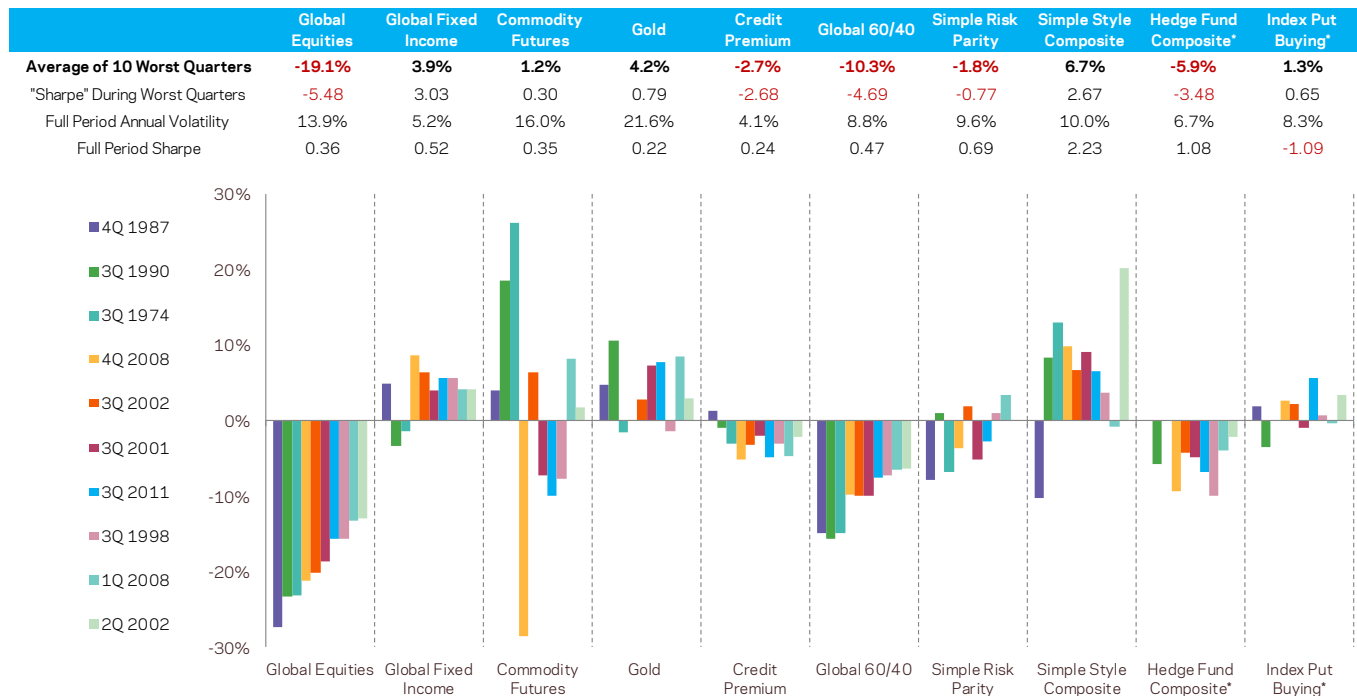
² Of course, past market-neutrality is no guarantee that these strategies will remain as market-neutral going forward, as described in "[How Can a Strategy Still Work If Everyone Knows About It?](#)" (found on www.aqr.com/cliffs-perspective).

³ Before turning to the results, we can lightheartedly wonder what makes those third quarters so depressing for equities, where the incipient Fall too often seems associated with a market fall. Here six of the 10 worst equity quarters occurred in 3Q...and the dubious honorable mentions (places 11-13) include 3Q 2008 and 3Q 1981!

⁴ The hedge fund return series starts in 1990, so only eight quarters are covered. Among hedge fund subsectors, only two — dedicated short-bias and managed futures (i.e., trend-followers) — had positive average returns in equity tail quarters. These results reflect the empirical tendency for hedge funds to have positive equity market betas (for more on this topic, see "[Hotel California: You Can Never Leave, Until You're Asked To](#)," and "[Hedge Funds: The \(Somewhat Tepid\) Defense](#)," found on www.aqr.com/cliffs-perspective).

⁵ The index put buying return series starts in 1984, so only nine quarters



Exhibit 1 | Major Asset Classes and Other Portfolios During the 10 Worst Global Equity Quarters, 1972–2014

Sources: Long-only asset class series (global equities, global fixed income, commodity futures, gold, global 60/40) are from Hurst, Ooi and Pedersen (2014). Credit Premium is a hypothetical long/short series of U.S. long-term corporate bond returns minus risk-matched U.S. government bond returns, as described in Asvanunt and Richardson (2015). Simple Risk Parity is a risk-balanced portfolio of developed equities, developed bonds and 24 commodity futures as described in Hurst, Mendelson and Ooi (2013). Simple Style Composite is a hypothetical long/short strategy consisting of five broadly recognized and dynamically traded sources of returns which can be systematically harvested in multiple asset classes, as described in Ilmanen, Maloney and Ross (2014). Hedge Fund Composite is the HFRI Fund-Weighted Composite. Index Put Buying is a hypothetical delta-hedged equity index put option buying strategy, which targets 5% out-of-the-money put options and is levered to cover 400% of underlying index NAV. The underlying index is the S&P 100 from Sept. 1984 to Jan. 1996, simulated using data from Commodity Systems Inc., and the S&P 500 from Feb. 1996 to Dec. 2014, simulated using data from OptionMetrics. For the period using S&P 100 returns, the backtest simulates delta-hedging with the underlying index as opposed to S&P 100 futures contracts. All long/short series are gross of both fees and trading costs, except for the HFRI Fund Weighted Composite, which is net of both. More details on each series appear in the Appendix. Returns are shown excess of cash. Full period annual volatility and Sharpe are based on monthly returns. Full period Sharpe ratios are arithmetic and use U.S. Treasury bills as the risk-free rate. "Sharpe" during worst quarters refers to the annualized average return during the 10 worst quarters for global equities over the full period annual volatility. *Hedge Fund Composite has data available only since Jan. 1990, and Index Put Buying only since Sept. 1984; other series are available over the full period Jan. 1972–Dec. 2014. Hypothetical data has inherent limitations, some of which are discussed in the disclosures attached hereto. Past performance is not indicative of future results.

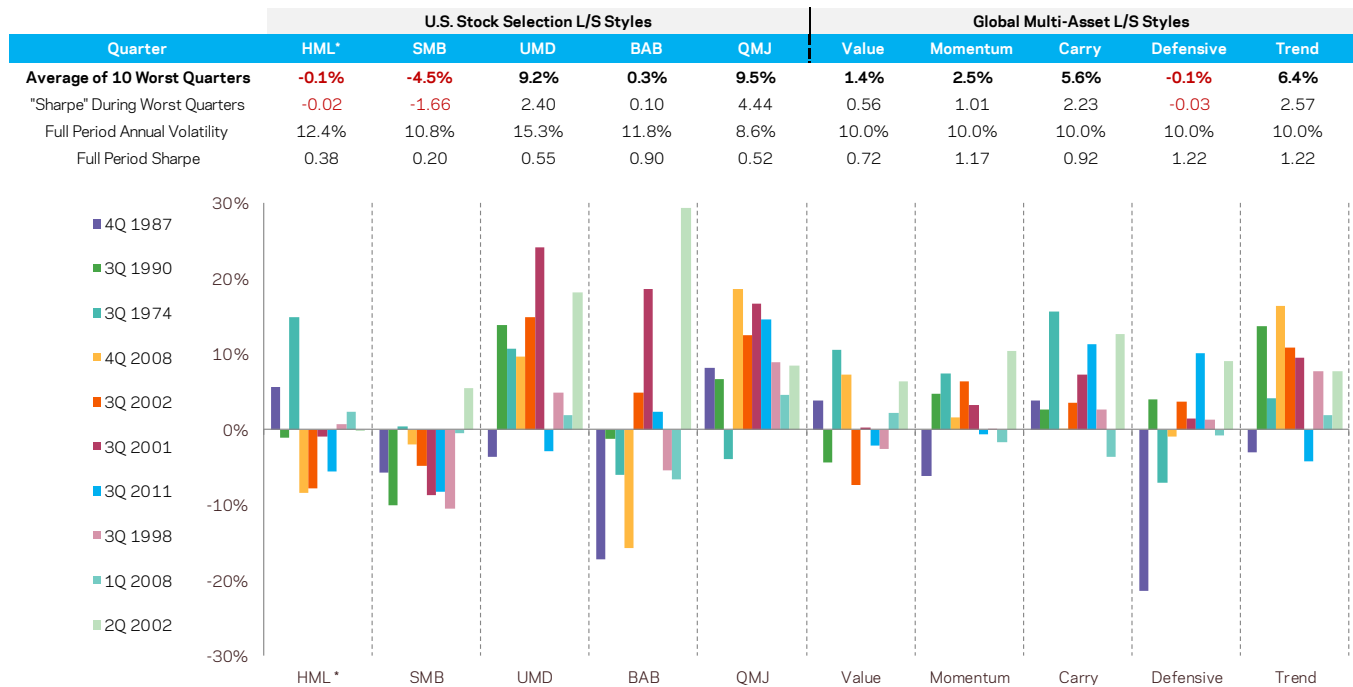
government bonds, gold and a composite of five

are covered. Also, for comparability to the other series, we have levered the strategy by 4x to cover 400% of underlying index NAV, as the unlevered strategy has a full sample annual volatility of only 2.1%. Seeing only mild gains for the archetypal out-of-the-money option-based tail hedge strategy is disappointing. In fact, three of the nine observations had (mild) negative returns because early-quarter gains were spent on expensive option premia after a tail event. It should be noted, however, that 3Q 2008 with the Lehman event just misses the Top 10 list; in that quarter, the index put buyer would have earned almost 29%. We believe that index put buying offers the most reliable downside protection against short-term tail events; the problem is its cost. Consistent with this, the last row in Exhibit 1 shows that the index put buying strategy has a -1.1 long-run Sharpe ratio (before trading costs). Note these costs are so great that they don't need the long-term to matter but, if not avoided or ameliorated, can even eat into the quarters you most needed put protection. (Of course, some managers claim to have active strategies that can gather the benefits of puts during downturns and not give much of it back by purchasing more puts at very high implied volatilities. We evaluate only the index strategy here, to provide more of a baseline for these hedging strategies.)

long/short style premia (a balanced combination of Value, Momentum, Carry, Defensive and Trend); all three were up in 8 of 10 tail quarters, a hit rate that may not be a realistic expectation for the future.

Exhibit 2 drills deeper into style premia. First, it shows five long/short U.S. stock selection strategies identified in the academic literature: value stocks (HML), small-cap stocks (SMB), high-momentum stocks (UMD), low-beta stocks (BAB) and quality stocks (QMJ). Next it shows five long/short style premia that comprise the "Simple Style Composite" in Exhibit 1. Four of them — Value, Momentum, Carry and Defensive — are market-neutral stock selection and macro allocation strategies applied in



Exhibit 2 | Major Long/Short Styles During the 10 Worst Global Equity Quarters, 1972–2014

Sources: *HML is based on the HML series from Ken French's website but uses timely rather than lagged market values in book-to-market ratios, as described in Asness and Frazzini (2013). SMB and UMD are from Ken French's website. BAB is a hypothetical long/short strategy which is long low-beta U.S. equities and short high-beta U.S. equities as described in Frazzini and Pedersen (2013). QMJ is a hypothetical long/short strategy that goes long high-quality U.S. equities and short low-quality U.S. equities, as described in Asness, Frazzini and Pedersen (2014). The five global multi-asset styles (Value, Momentum, Carry, Defensive, Trend) are hypothetical series which represent broadly recognized and dynamically traded sources of returns, systematically harvested across multiple asset classes, as described in Ilmanen, Maloney and Ross (2014). HML, BAB and QMJ are available through AQR's online data library. All series are gross of both fees and trading costs. More details on each series appear in the Appendix. Returns are shown excess of cash. Full period annual volatility and Sharpe ratios are based on monthly returns. Full period Sharpe ratios are arithmetic and use U.S. Treasury bills as the risk-free rate. "Sharpe" during worst quarters refers to the annualized average return during the 10 worst quarters for global equities over the full period annual volatility. More details on each series appear in the Appendix. Hypothetical data has inherent limitations, some of which are discussed in the disclosures attached hereto. Past performance is not indicative of future results.

four liquid asset classes, while the fifth (Trend) is a directional trend-following strategy applied in four liquid asset classes. All of these returns are for hypothetical strategies expressed gross of trading costs and fees, so realistic net returns and Sharpe ratios are lower. The last five style premia and their composite are scaled to 10% full-sample volatility, which would require leverage. (More details below Exhibit 2 and in the Appendix.)

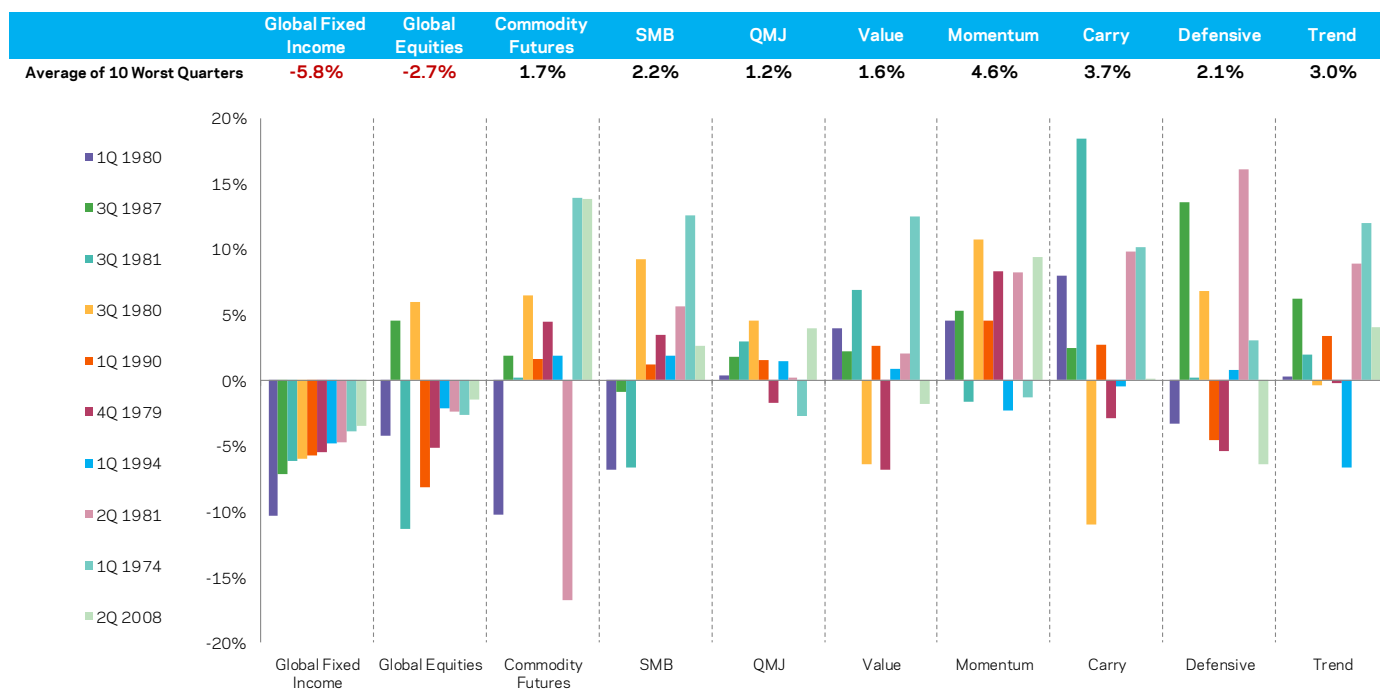
Among these long/short strategies, only the small-cap stock strategy (SMB) had a clearly negative average return in tail quarters. Value stock (HML), Value multi-asset, low-beta stock (BAB) and Defensive multi-asset strategies had a near-zero average return in tail quarters.⁶ The strongest

positive performance came from the quality stock strategy (QMJ), trend-following and momentum strategies (including UMD), as well as the Carry strategy.⁷ Overall, we can see that long/short style premia appear uncorrelated with equity markets not only on average but also during these worst quarters, and that long/short quality strategies and trend-

long/short strategies do not provide significant positive returns in tail scenarios, given the strategy names. The explanation is that these strategies involve buying a larger amount of low-risk assets than high-risk assets are sold, so as to retain beta-neutrality. The goal of these strategies is not to reduce risk but to capitalize on the low-risk assets' better Sharpe ratios.

⁷ The last result is surprising for those who associate the Carry strategy with currency carry, which has often suffered in equity tail events. However, currency carry is only one of several carry strategies in this composite, and the only one to experience systematic unattractive tail properties.

⁶It may seem surprising that that the low-beta (BAB) and Defensive

Exhibit 3 | Selected Asset Classes and Long/Short Styles During 10 Worst Global Fixed Income Quarters, 1972–2014

following strategies may even tend to deliver positive returns in equity tail events.⁸

Drilling into the subsets of both quality and trend-following strategies (not shown) is encouraging. Among the four groups of quality indicators in Asness et al. (2014), three — Safety, Profit and Payout — earned clearly positive average tail returns, while Growth earned near zero.

Trend was on average profitable in all asset classes during these equity tail events; essentially trend-followers tended to be short equities, long duration in bonds, long gold in commodities and anti-carry in currencies (all “risk-off” trades) at the right times.

We now turn to the 10 worst quarters in bond markets. For brevity, Exhibit 3 shows only the results for a subset of investments (three asset classes and seven long/short strategies, as well as SMB and QMJ which are not covered well by the

five multi-asset style premia). The worst quarters for global bonds are mainly older events; the two most recent ones were 2Q 2008 and 1Q 1994.

We see that equities were not usually good hedges for bond “tail events” (even if the reverse has been true): stocks were down in 8 out of the worst 10 bond quarters. In contrast, commodities and each of the long/short strategies shown were down in “only” 2 to 4 of these quarters and earned positive average returns in bond tail quarters.

Protecting Against Fast vs. Slow Bear Markets

As noted, Trend has often performed well in the worst equity quarters. Taking a longer stance, Hurst, Ooi and Pedersen (2014) shows that Trend has been a surprisingly good equity tail hedge for more than a century, so long as the bear market has been gradual (giving trend-followers time to turn from bullish to bearish).⁹ Most of these historical events were

⁸ Also see Asvanunt, Nielsen and Villalon (2015).

⁹ Exhibit 7 of Hurst, Ooi and Pedersen (2014) focuses on the 10 worst peak-to-trough drawdowns since 1880 for a 60/40 portfolio; these



gradual (8 of 10); only in 1937 and 1987 did markets fall so fast that trend-followers lost money (not very big losses even then — but if the next bear market is even faster, the losses could be larger).

It is somewhat puzzling that markets have allowed Trend to earn a positive long-run Sharpe ratio despite this valuable ability to hedge (slow-moving) bear markets. It is especially interesting to contrast this strategy with the most effective protection against fast crashes: buying out-of-the-money equity index puts. Regular put-buying strategies would have been a powerful hedge in fast bear markets but they are very expensive (especially after a bad event).¹⁰ This contrast suggests that investors are especially averse to fast bear markets and pay much higher prices to reduce this risk than they do to hedge the risk associated with gradual bear markets.

Private Equity and Trend — A Match Made in Heaven?

Trend has a promising ability to hedge against equity bear markets, particularly when those market losses are gradual. Trend might be an even more effective complement with private equity (PE) than with public equity — both tend to help when the other is in trouble. PE and Trend returns are (mildly) negatively correlated, but especially so in left-tail episodes for each, when it matters most.

It is well-known that PE returns are artificially smooth because there is no easy way to find quarterly mark-to-market values for private assets. Regardless, or perhaps heedless, we use here the industry-standard Cambridge Associates data on PE performance, without trying to desmooth it or modify it in any way.¹¹ Granted, if investors look

through the artificial smoothness and instead use public market equities to proxy PE performance, the complementarity of Trend is still good, just not as exceptional. But there is the notion that institutional investors do care about the reported numbers, even if they are “too” smooth. Some investors may be conscious of their ability to stick with their positions longer when mark-to-market valuations are not available and there are high costs for liquidating a PE fund investment with a multi-year lock-up. According to this logic, PE investing can help institutional investors to act more like the patient long-horizon investors they aspire to be (but sometimes fail to be when bad times hit).

Illiquidity and smoothed returns are then a real benefit for investors *as long as the market declines are temporary*. The main risk for such PE investors is that equity market declines do not revert but keep going for years (cf. Japan after the 1980s Nikkei bubble, very unlike most equity markets’ quick recovery after the 2008 Global Financial Crisis). Trend should be helpful in exactly those scenarios, as it has performed well during long, gradual bear markets. Conversely, as discussed above, the main risk for trend-followers comes from sudden market drops. Their impact will be more muted for PE than for public equity, so PE, in turn, helps Trend when most needed.

This intuition is supported by data. Exhibit 4 uses quarterly data since 1986 (when the Cambridge PE Indices begin). Trend was up meaningfully in 7 of the 10 worst quarters for PE and was down modestly in the other 3 episodes. Turning around, PE was an even better ‘tail hedge’ — profitable in 9 of the 10 worst quarters for Trend, with one small loss. And if we look at the (non-overlapping) five worst 12-month windows (basically the only losing periods for each), the other asset gave a perfect hedging performance: up 5 out of 5 just when needed.

Thus, the PE-Trend pairing could really be a match made in heaven. Of course two investments could hardly be more different than Private Equity and Managed Futures, and most investors would be

episodes were also major equity bear markets. Earlier, Ilmanen (2011, Figure 28.1) shows that Trend made money in 13 of the 15 worst months for global equities between 1985 and 2009, suggesting that these months often come in mature bear markets.

¹⁰ See Berger, Nielsen and Villalon (2011) and Asvanunt, Nielsen and Villalon (2015) for the returns to systematic protective put strategies and recall the Sharpe ratio of -1.1 in Exhibit 1.

¹¹ Specifically, we use a 70/30 combination of Cambridge’s U.S. and non-U.S. developed market PE index returns (though the results are similar if we use U.S.-only data).

Past performance is not indicative of future results.



Exhibit 4 | Performance of Private Equity and Trend in the 10 Worst Quarters (and 5 Worst Non-Overlapping 12-Month Periods) for Each, 1986-2014

10 worst quarters for PE				10 worst quarters for Trend			
		PE	Trend		PE	Trend	
1	Q4 2008	-17.6%	20.3%	1	Q2 2009	5.6%	-11.4%
2	Q3 2008	-9.9%	-1.6%	2	Q2 2004	3.8%	-9.6%
3	Q1 2001	-6.6%	5.7%	3	Q1 1999	3.9%	-8.6%
4	Q3 2001	-5.8%	7.0%	4	Q3 2007	2.5%	-6.6%
5	Q3 2011	-5.6%	7.3%	5	Q1 1994	4.2%	-4.6%
6	Q1 2009	-4.8%	-0.5%	6	Q1 1992	2.8%	-4.6%
7	Q3 2002	-4.1%	11.2%	7	Q1 2014	3.2%	-4.5%
8	Q3 1998	-3.6%	7.7%	8	Q1 2002	-0.7%	-3.8%
9	Q4 2000	-2.9%	9.6%	9	Q3 2003	4.3%	-3.1%
10	Q4 1990	-2.7%	-0.5%	10	Q2 1992	4.0%	-2.7%
Average		-6.3%	6.6%	Average		3.3%	-5.9%

5 worst 12-month Periods for PE				5 worst 12-month Periods for Trend			
	Ending	PE	Trend		Ending	PE	Trend
1	3/31/2009	-29.6%	17.0%	1	12/31/2009	14.2%	-6.2%
2	9/30/2001	-13.0%	22.9%	2	3/31/2005	25.7%	-5.9%
3	9/30/2002	-4.9%	8.6%	3	9/30/1999	26.5%	-4.9%
4	6/30/1991	-3.0%	16.6%	4	3/31/2014	20.0%	-1.6%
5	9/30/1988	-0.7%	6.6%	5	6/30/1992	18.1%	-1.1%
Average		-10.2%	14.4%	Average		20.9%	-3.9%

Sources: AQR, Cambridge Associates. Private equity is a 70/30 combination of the Cambridge Associates U.S. Private Equity Index and the Cambridge Associates Global Ex-U.S. Developed Markets Private Equity Index. Trend is a combination of 1/3/12 month trend-following strategies across global equities, fixed income, commodities, and currencies scaled to 10% volatility as described in Hurst, Ooi and Pedersen (2014). Trend is net of trading costs, a 2% annual management fee and a 20% performance fee. More details on each series appear in the Appendix.

stretched to view them as a pair. Still, we hope this evidence makes a few of them seek new ways of exploiting this complementarity.

Concluding Remarks

Historically high valuations in many stock and bond markets, and recent losses in equities have led many investors to renew their focus on downside risk. Investors may attempt to time the markets but timing is hard, and few organizations have the patience to stay in cash if a major market decline does not materialize swiftly.¹² Other investors might

buy tail protection in option markets, but such strategies lose money in the long run.

We believe that the better choice for long-term investors is to incorporate assets and strategies that have positive expected returns and that have historically been less sensitive to (or even hedged) tough times for their portfolios.

¹² For more on the challenges of market timing, see the 4Q 2014 Alternative Thinking, *Challenges of Incorporating Tactical Views*.



Appendix: Details on Series Used in Exhibits 1–3

Series Name	Source	Description
Global Equities	Hurst, Ooi and Pedersen (2014)	GDP-weighted composite of 10 equity indices from U.S., U.K., Netherlands, Japan, Italy, France, Spain, Canada, Germany and Australia.
Global Fixed Income	Hurst, Ooi and Pedersen (2014)	GDP-weighted composite of 10-year government bonds from U.S., U.K., Japan, Italy, France, Canada, Germany and Australia.
Commodity Futures	Hurst, Ooi and Pedersen (2014)	Equal-weighted composite of 29 commodities.
Gold	Hurst, Ooi and Pedersen (2014)	Gold futures contracts.
Global 60/40	Hurst, Ooi and Pedersen (2014)	60% Global Equities and 40% Global Fixed Income.
Credit Premium	Asvanunt and Richardson (2015)	Hypothetical long/short series of U.S. long-term corporate bond returns minus empirical duration-matched U.S. government bond returns. Empirical durations are estimated using rolling 10 year regressions.
Simple Risk Parity	Hurst, Mendelson and Ooi (2013)	A hypothetical risk-balanced portfolio of developed equities, developed bonds, and 24 commodity futures. Global Equities is a GDP-weighted composite of 10 equity indices from U.S., U.K., Netherlands, Japan, Italy, France, Spain, Canada, Germany and Australia. Global Bonds is a GDP-weighted composite of Australian, German, Canadian, Japanese, U.K. and U.S. 10-year government bonds. Commodities is an equal-dollar-weighted index of 24 commodities. Simple Global Risk Parity uses trailing 12-month volatility and long-term correlation assumptions to target equal risk-contributions from each asset class.
Simple Style Composite	Ilmanen, Maloney and Ross (2014)	A hypothetical composite of 5 long/short style premia (applied in several asset classes): Value, Momentum, Carry, Defensive and Trend (which are also referenced individually in Exhibit 2). Each style is a broadly recognized, empirically tested, dynamically traded, historically lowly correlated sources of returns, which can be systematically harvested across multiple asset classes. In this case, Trend is the Moskowitz, Ooi and Pedersen (2012) specification, somewhat simpler than, but highly correlated with, the Hurst, Ooi and Pedersen (2014) specification. The former assesses trends based on past 12-month returns, the latter on an average of 1-, 3-, and 12-month returns.
Hedge Fund Composite	Hedge Fund Research Inc.	An asset-weighted composite of net hedge fund returns in the Hedge Fund Research database.
Index Put Buying	AQR Internal Backtest	A hypothetical gross of transaction costs, delta-hedged equity index put option buying strategy, which targets 5% out-of-the-money put options and is levered to cover 400% of underlying index NAV. The series is levered to achieve volatility comparable to that of the other series we test, as unlevered annual volatility for the strategy covering 100% of underlying index NAV is only 2.1%. The underlying index is the S&P 100 from Sept. 1984 to Jan. 1996, simulated using data from Commodity Systems Inc., and the S&P 500 from Feb. 1996 to Dec. 2014, simulated using data from OptionMetrics. For the period using S&P 100 returns, the backtest simulates delta-hedging with the underlying index as opposed to S&P 100 futures contracts.
High Minus Low (HML)	Asness and Frazzini (2013)	A variation on the academic equity value factor first described by Eugene Fama and Ken French. The standard method calculates book-to-price (B/P) at portfolio formation using lagged book data, aligns price data using the same lag (ignoring recent price movements), and holds these values constant until the next rebalance. This version substitutes lagged market data for timely market prices in book-to-price ratios.
Small Minus Big (SMB)	Ken French's data library	Equity size factor first described by Eugene Fama and Ken French.
Up Minus Down (UMD)	Ken French's data library	Equity momentum factor first described by Eugene Fama and Ken French.
Betting Against Beta (BAB)	Frazzini and Pedersen (2013)	A hypothetical beta-neutral long/short strategy which is long low-beta U.S. equities and short high-beta U.S. equities.
Quality Minus Junk (QMJ)	Asness, Frazzini and Pedersen (2014)	A hypothetical long/short strategy which is long high-quality U.S. equities and short low-quality U.S. equities.



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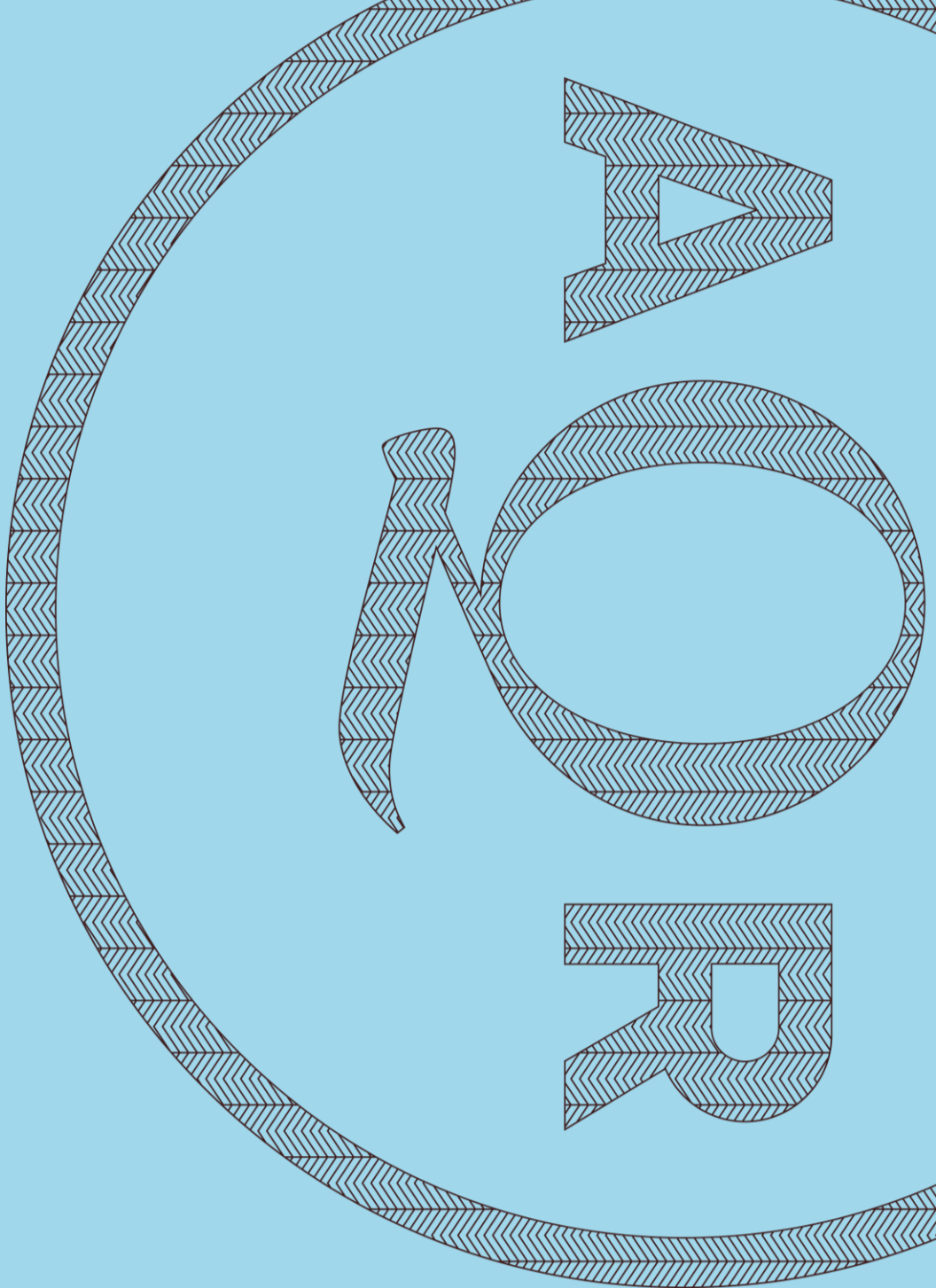
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