15/07/2015

RISK PREMIA STRATEGIES

Julien Turc Phone: + 33 1 42 13 40 90 julien.turc@sgcib.com

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RISK PREMIA STRATEGIES

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CROSS ASSET RESEARCH – QUANTITATIVE ANALYSIS GROUP


Julien Turc (Head)
(33) 1 42 13 40 90
julien.turc@sgcib.com


Sandrine Ungari
(33) 1 42 13 43 02
sandrine.ungari@sgcib.com


Lorenzo Ravagli
(33) 1 42 13 73 76
lorenzo.ravagli@sgcib.com


Raphael Dando
(33) 1 42 13 89 79
raphael.dando@sgcib.com


Shivaram Ramegowda
(91) 80 2803 7081
shivaram.ramegowda@socgen.com


Thomas Kovarcik
(33) 1 42 13 94 75
thomas.kovarcik@sgcib.com


Dobromir Tzotchev
(44) 20 7676 7241
dobromir.tzotchev@sgcib.com


Frederic Gu
(33) 1 57 29 03 60
frederic.gu@sgcib.com


Dheeraj Pandey
(91) 80 2802 4527
dheeraj.pandey@sgcib.com

CROSS ASSET RESEARCH – EQUITY QUANT GROUP

London


Andrew Lapthorne
(44) 20 7762 5762
andrew.lapthorne@sgcib.com


John Carson
(44) 20 7762 4979
john.carson@sgcib.com


Georgios Oikonomou
(44) 20 7762 5261
georgios.oikonomou@sgcib.com


Rui Antunes
(44) 20 7762 5875
rui.antunes@sgcib.com

New-York


Michael Suen, CFA
(1) 212 278 5455
michael.suen@sgcib.com

Seoul


Josh Cherian
(82) 2 2195 7431
josh.cherian@sgcib.com

Paris


Yohan Le Jallé
(33) 1 42 13 71 61
yohan.le-jalle@sgcib.com

CROSS ASSET RESEARCH – EQUITY DERIVATIVES GROUP


Vincent Cassot
(33) 1 42 13 59 55
vincent.cassot@sgcib.com


Aymen Boukhari
(33) 1 42 13 55 07
aymen.boukhari@sgcib.com

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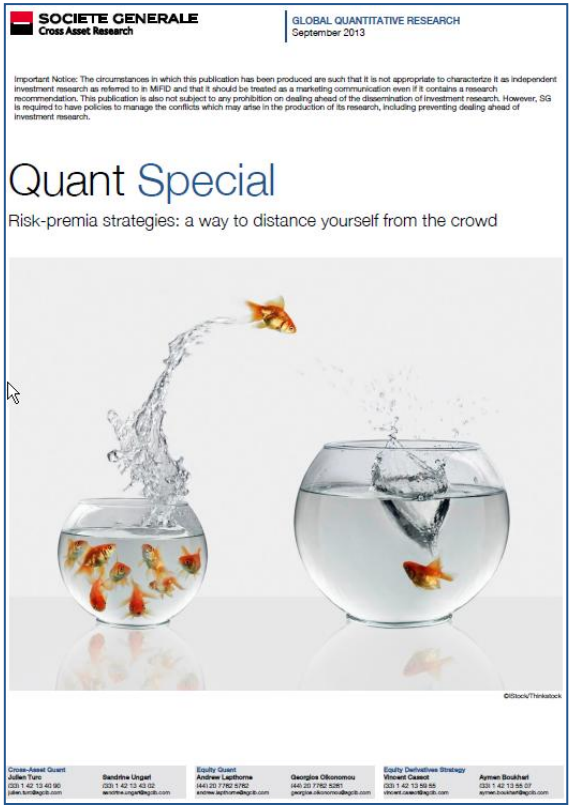
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September 2013

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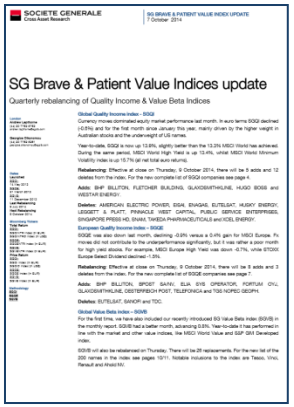
Quant Special

Risk-premia strategies: a way to distance yourself from the crowd

Cross-Asset Quant
Julien Turc (33) 1 42 13 40 90 julien.turc@sgcib.com
Sandrine Ungari (33) 1 42 13 43 02 sandrine.ungari@sgcib.com
Equity Quant
Andrew Lapthorne (44-20 7762 5782 andrew.lapthorne@sgcib.com
Georgios Oikonomou (44-20 7762 5281 georgios.oikonomou@sgcib.com
Equity Derivatives Strategy
Vincent Cassot (33) 1 42 13 55 55 vincent.cassot@sgcib.com
Aymen Boukhari (33) 1 42 13 55 07 aymen.boukhari@sgcib.com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SG Brave & Patient Value Indices update

Quarterly rebalancing of Quality Income & Value Beta Indices


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Global Quant Special

'Patient versus brave' value investors - Introducing our NEW global value index


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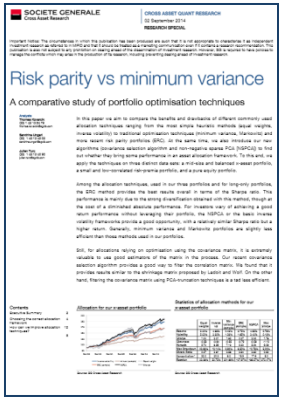
Risk premia rotation

A sensible idea or a step too far?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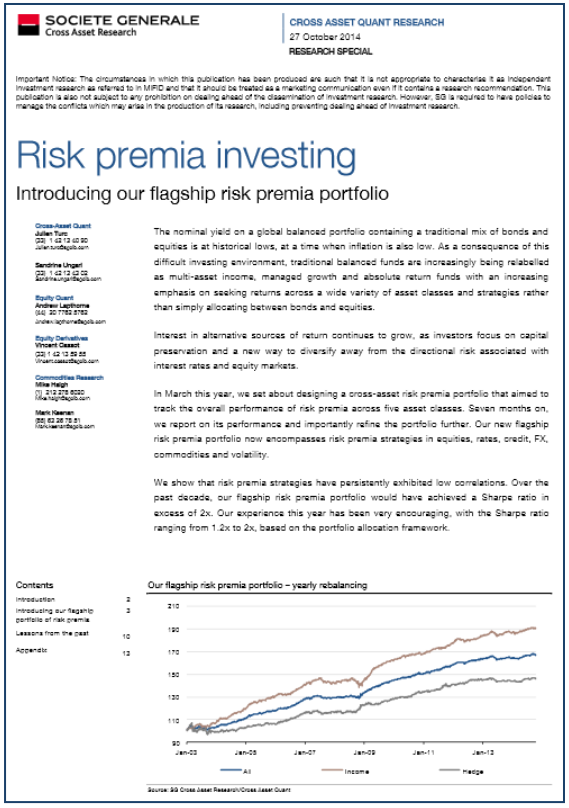
Risk parity vs minimum variance

A comparative study of portfolio optimisation techniques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Risk premia investing

Introducing our flagship risk premia portfolio

Cross-Asset Quant
Julien Turc (33) 1 42 13 40 90 julien.turc@sgcib.com
Sandrine Ungari (33) 1 42 13 43 02 sandrine.ungari@sgcib.com
Equity Quant
Andrew Lapthorne (44) 20 7762 5782 andrew.lapthorne@sgcib.com
Equity Derivatives
Vincent Cassot (33) 1 42 13 55 55 vincent.cassot@sgcib.com
Commodities Research
Mike Haigh (1) 212 278 6020 mike.haigh@sgcib.com
Mark Keenan (65) 62 26 76 81 mark.keenan@sgcib.com

The nominal yield on a global balanced portfolio containing a traditional mix of bonds and equities is at historical lows, at a time when inflation is also low. As a consequence of this difficult investing environment, traditional balanced funds are increasingly being relabelled as multi-asset income, managed growth and absolute return funds with an increasing emphasis on seeking returns across a wide variety of asset classes and strategies rather than simply allocating between bonds and equities.

Interest in alternative sources of return continues to grow, as investors focus on capital preservation and a new way to diversify away from the directional risk associated with interest rates and equity markets.

In March this year, we set about designing a cross-asset risk premia portfolio that aimed to track the overall performance of risk premia across five asset classes. Seven months on, we report on its performance and importantly refine the portfolio further. Our new flagship risk premia portfolio now encompasses risk premia strategies in equities, rates, credit, FX, commodities and volatility.

We show that risk premia strategies have persistently exhibited low correlations. Over the past decade, our flagship risk premia portfolio would have achieved a Sharpe ratio in excess of 2x. Our experience this year has been very encouraging, with the Sharpe ratio ranging from 1.2x to 2x, based on the portfolio allocation framework.

Contents

Our flagship risk premia portfolio – yearly rebalancing

Source: SG Cross Asset Research/Cross Asset Quant

Recent research

- January 2015: risk premia scorecard update
- March 2015: harvesting the volatility premium – a tactical approach
- April 2015: which strategies to buy in the wake of Eurozone QE?
- June 2015: Risk premia outlook

INVESTING INTO RISK PREMIA

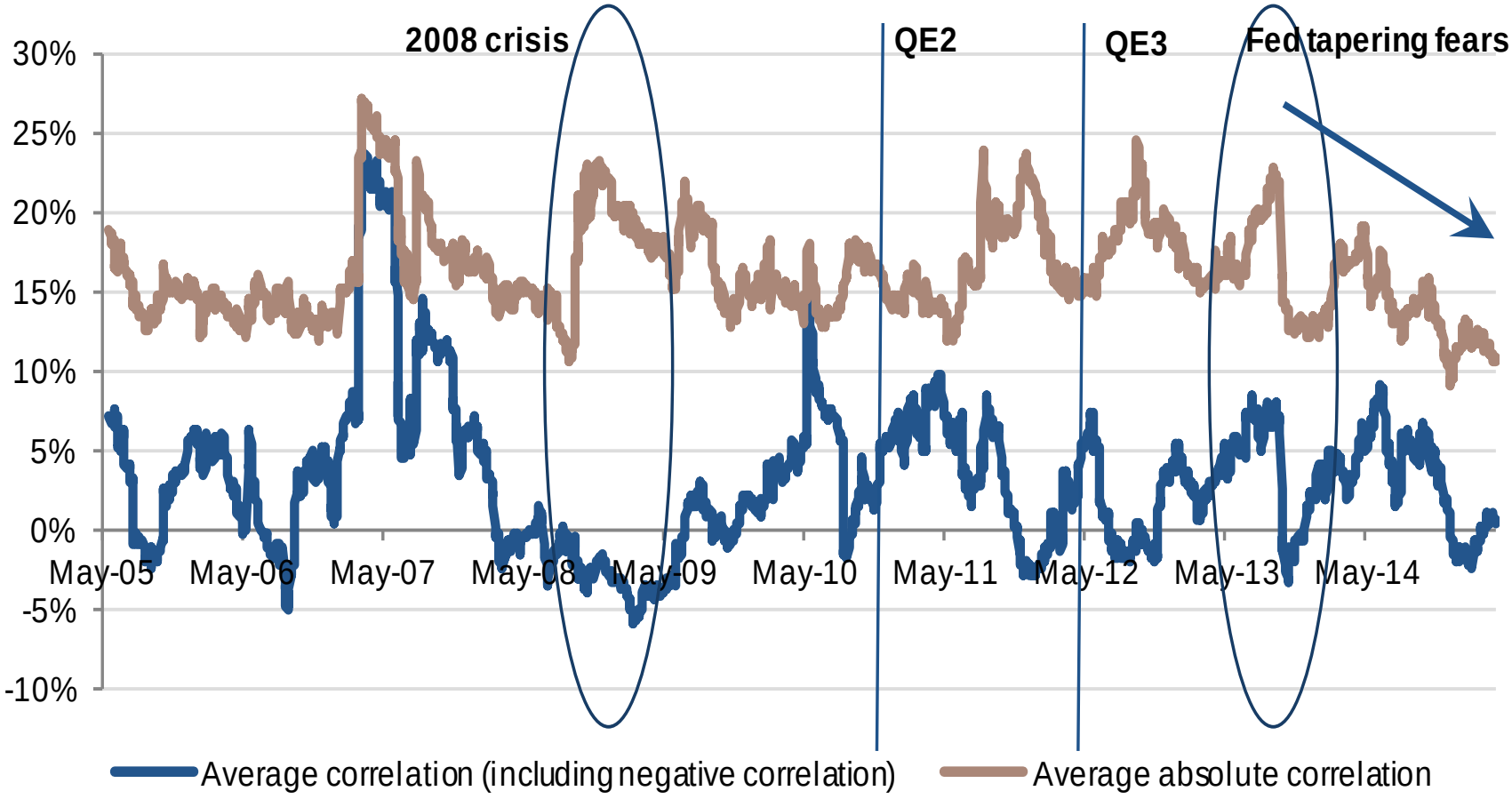
THE DEFINITION OF A RISK PREMIA

- **There is no formal definition of what constitutes a risk premium beyond the concept that investors should reap a reward for bearing some kind of risk. We've discovered there are just as many ways of classifying risk premia as there are suggestions for risk premia themselves.**

- **So to simplify, we have decided that a risk premium has:**
  - 1. Demonstrated an attractive positive historical return profile;
  - 2. A fundamental value that allows a judgement on future expected returns; and
  - 3. Diversification benefits when combined into a multi-asset portfolio.

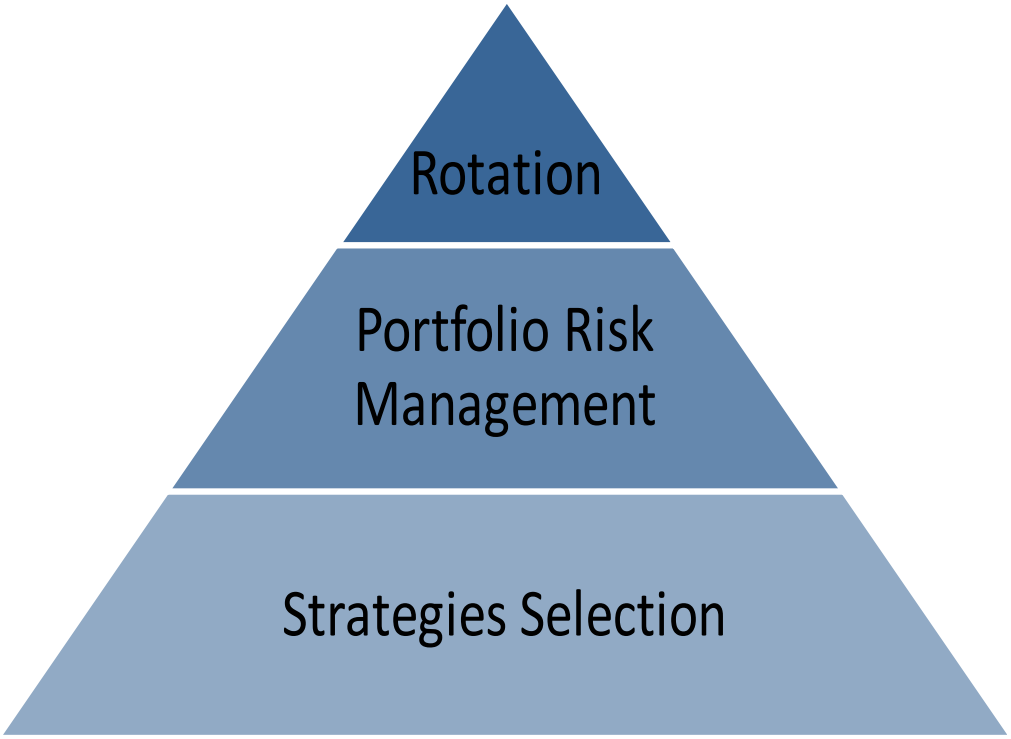
- **An important point here is that the investor gets paid, i.e. the understanding is that the returns generated through exposure to risk premia are in some way more useful and dependable than exposures to more traditional asset classes.**

DIVERSIFICATION IS KEY



Source: SG cross-asset research

3 CRITICAL STEPS FOR SUCCESSFUL PORTFOLIO MANAGEMENT



- Identify market regimes
- Idenity trends and relative value opportunities
- Pick up the most attractive risk premia

- Select a risk criterion
- Optimise the portfolio
- Manage leverage

- Identify clusters among strategies
- Identify risk factors
- Strive for balance in terms of clusters and risk factors exposure

Equity Factor Investing

From theory to implementation

Andrew Lapthorne Phone: (44) 207 762 5762

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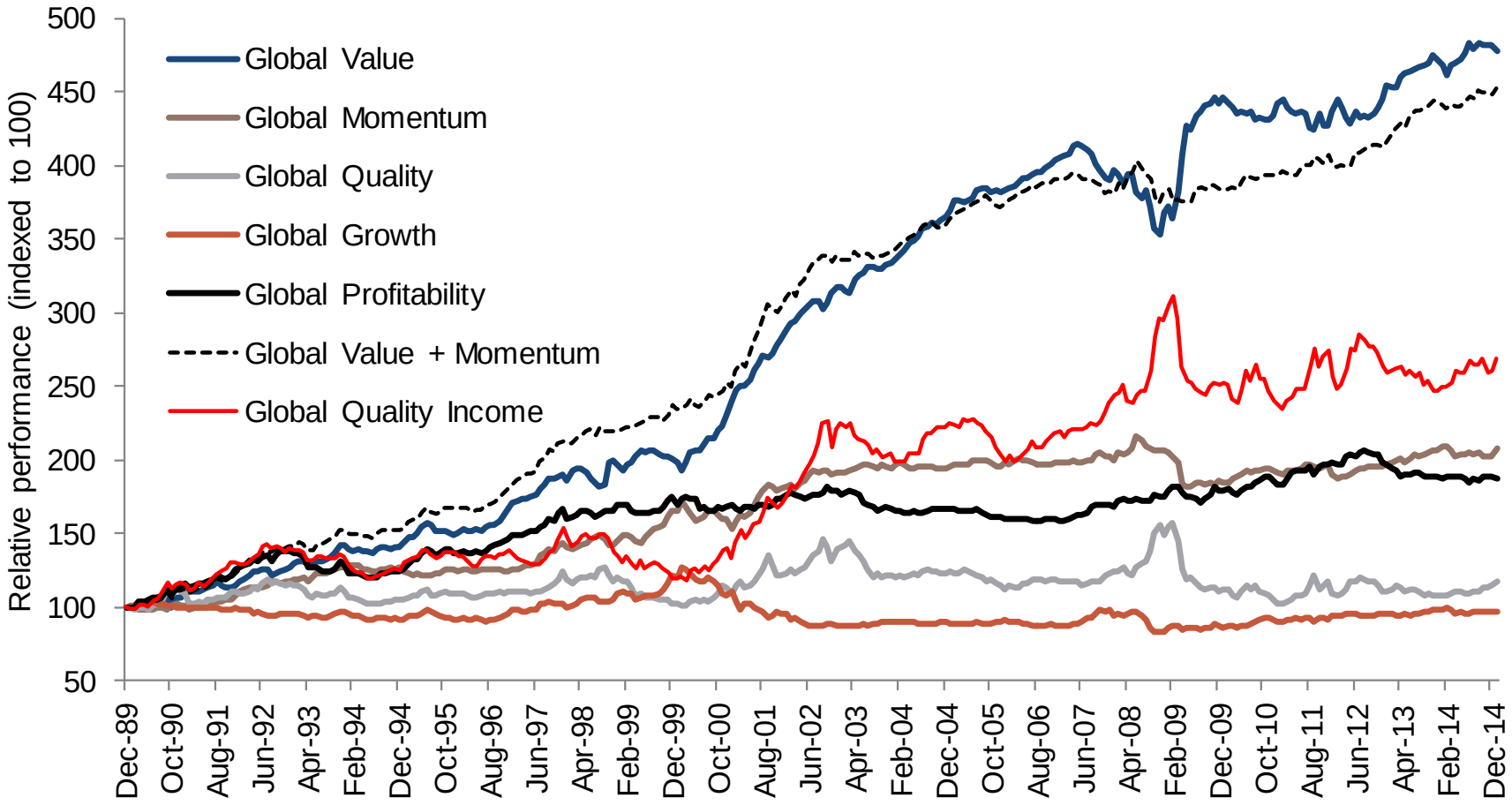
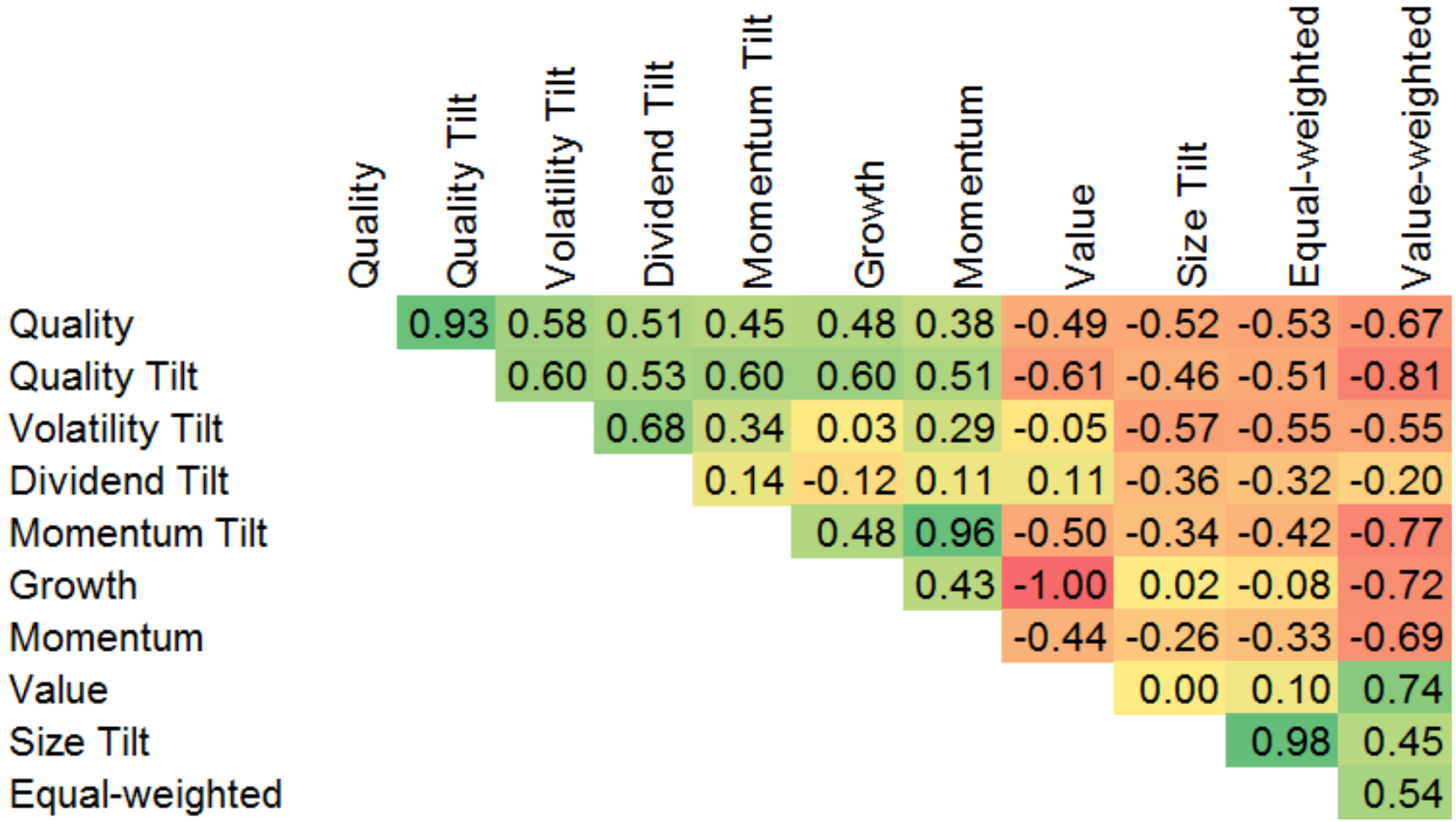
WE AGREE – GLOBALLY VALUE AND QUALITY INCOME WORK BEST



Source: SG Cross Asset Research/Equity Quant, Global Style Counselling factor indices

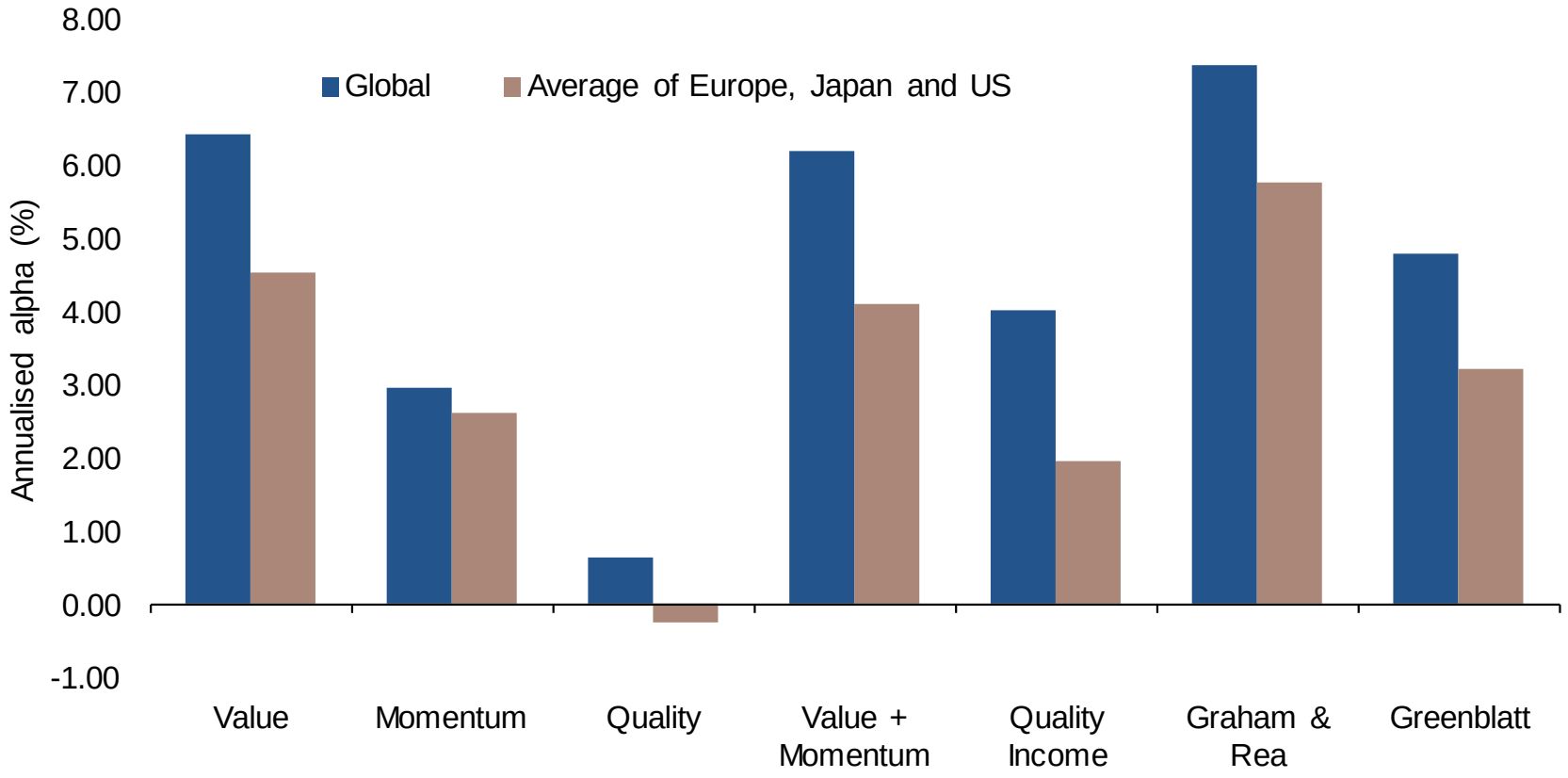
GLOBALLY IT IS LARGELY ABOUT QUALITY VERSUS VALUE



	Quality	Quality Tilt	Volatility Tilt	Dividend Tilt	Momentum Tilt	Growth	Momentum	Value	Size Tilt	Equal-weighted	Value-weighted
Quality	0.93	0.58	0.51	0.45	0.48	0.38	-0.49	-0.52	-0.53	-0.67	
Quality Tilt		0.60	0.53	0.60	0.60	0.51	-0.61	-0.46	-0.51	-0.81	
Volatility Tilt			0.68	0.34	0.03	0.29	-0.05	-0.57	-0.55	-0.55	
Dividend Tilt				0.14	-0.12	0.11	0.11	-0.36	-0.32	-0.20	
Momentum Tilt					0.48	0.96	-0.50	-0.34	-0.42	-0.77	
Growth						0.43	-1.00	0.02	-0.08	-0.72	
Momentum							-0.44	-0.26	-0.33	-0.69	
Value								0.00	0.10	0.74	
Size Tilt									0.98	0.45	
Equal-weighted										0.54	

Source: MSCI

INVEST GLOBALLY NOT REGIONALLY FOR THE BEST FACTOR RETURNS



Source: SG Cross Asset Research/Equity Quant, Global Style Counselling factor indices

SG VALUE BETA INDEX

Our index ranks companies relative to their sector peers on the basis of valuation. We define value using the equal-weighted quintile score of a set of five traditional value factors, which have all been associated with positive returns in academic literature:

- **Book to Price**
- **Earnings to Price**
- **One Year forward Earnings to Price**
- **EBITDA to Enterprise Value***
- **Free Cash Flow to Price***

**excludes financials*

The index consists of an equal-weighted basket of the cheapest 200 stocks based on the above value score. These are chosen from a universe of global developed market companies with a free float market capitalisation of US$1bn or more at today's prices and where average daily volume has exceeded US$3mn over the past six months.

SG QUALITY INCOME INDEX (SGQI)

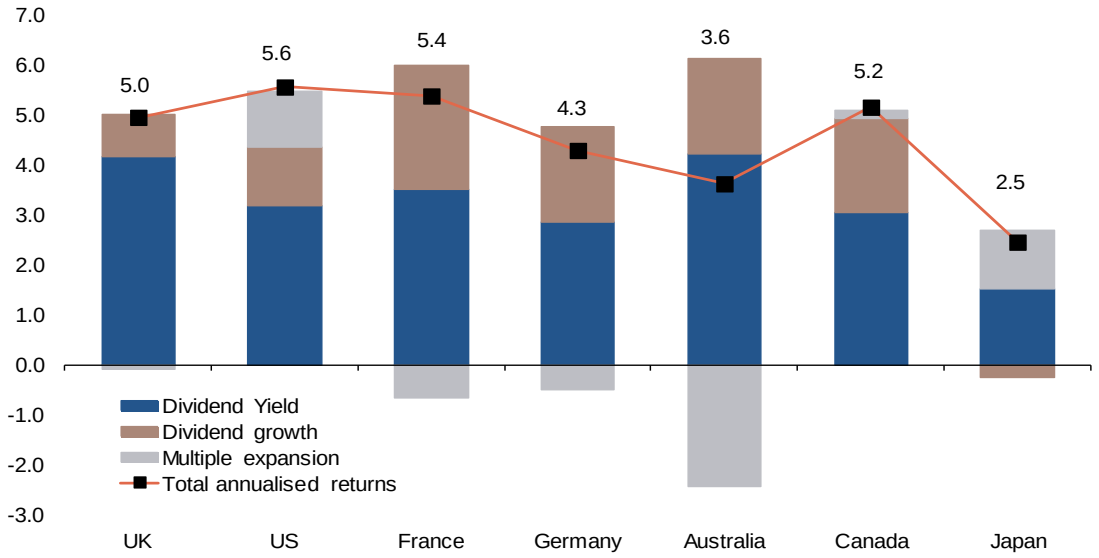
The index includes companies with attractive and sustainable dividends. The criteria are:

- **Top 40% of the universe by Merton's distance-to-default**
- **A score of 7 or better with Piotroski's fundamental score**
- **A high dividend yield of 4% or more, (consensus estimate for next-12-months).**

The universe is global developed, excluding all financial companies.

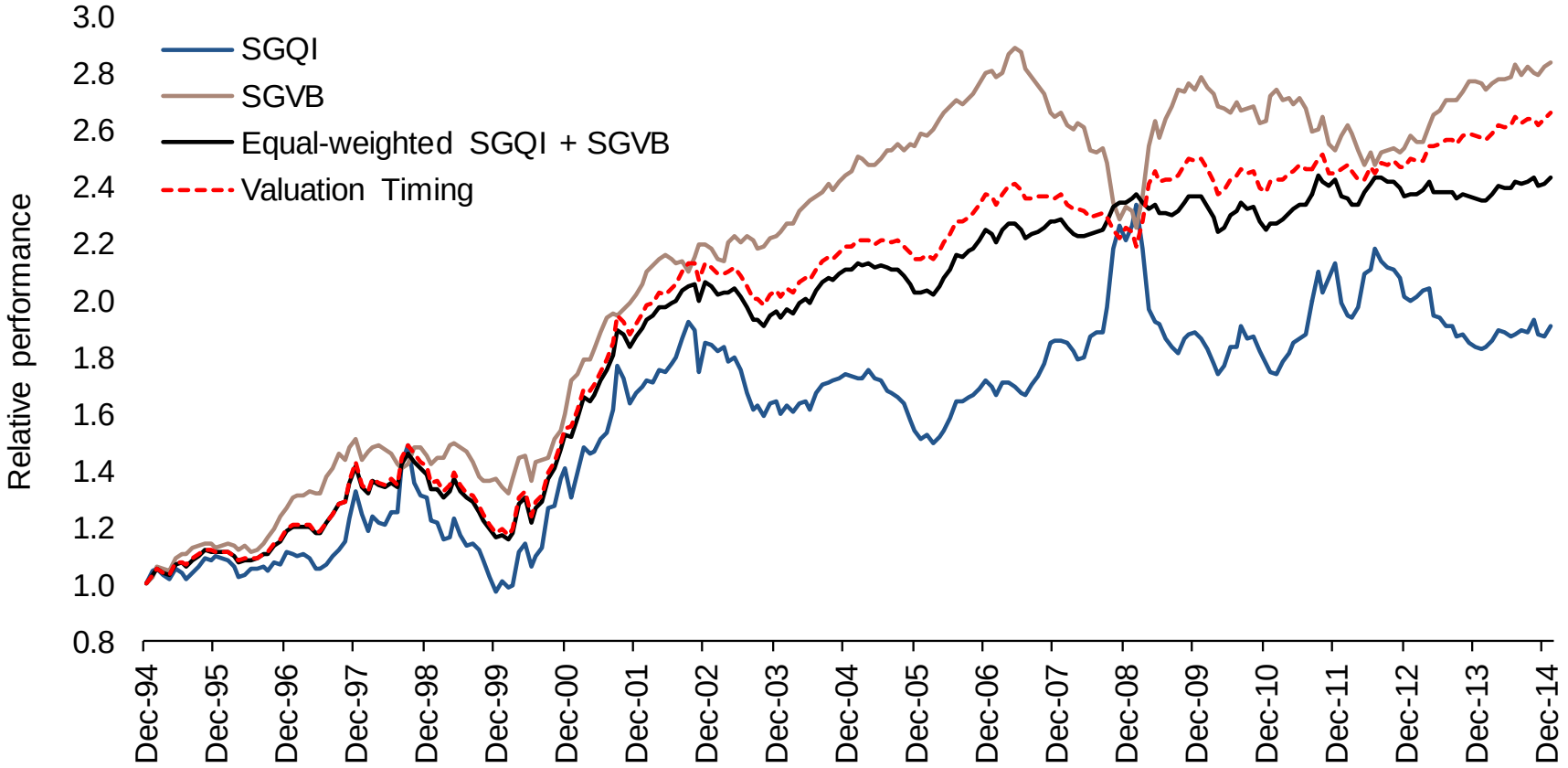
We also have a European version, **SGQE Index**.

Compounding effects of dividend yield dominates returns in the long term (1970-2011)



Source: SG Quantitative Research

COMBINING SGVB AND SGQI BASED ON THEIR RELATIVE VALUATION



Source: SG Quantitative Research/ Equity Quant, MSCI

Note: Past performance is not indicative of future performance. Portfolio presented assumes no transaction costs. For additional details on portfolio performance please contact us.

INTRODUCING OUR FLAGSHIP RISK PREMIA PORTFOLIO

DIVERSIFICATION IS KEY

- **To build our new flagship portfolio, we have followed two simple rules.**
- **Firstly, the portfolio is diversified across asset classes. We cover five traditional asset classes (equity, rates, credit, FX, and commodities) and consider volatility as one additional asset class. We include at least one strategy per asset class.**
- **Secondly, the portfolio is evenly balanced between income and hedging strategies and includes five income strategies and five hedging strategies.**

Asset class	Income portfolio	Research paper	Asset class	Hedge portfolio	Research paper
Equity	Value	Mar-14 ()	Equity	Quality Income	Sep-13 ()
Rates	Optimised carry	Oct-13 ()	Rates	IR futures momentum	Jul-13 ()
FX	FX carry	May-12 ()	Credit	Credit momentum	May-13 ()
Commodities	Commodities carry	Oct-14 ()	Commodities	Commodities futures curve	Oct-14 ()
Volatility	X-asset short volatility	Dec-12 ()	Volatility	VIX futures curve	Oct-14 (10)

Source: SG cross-asset research

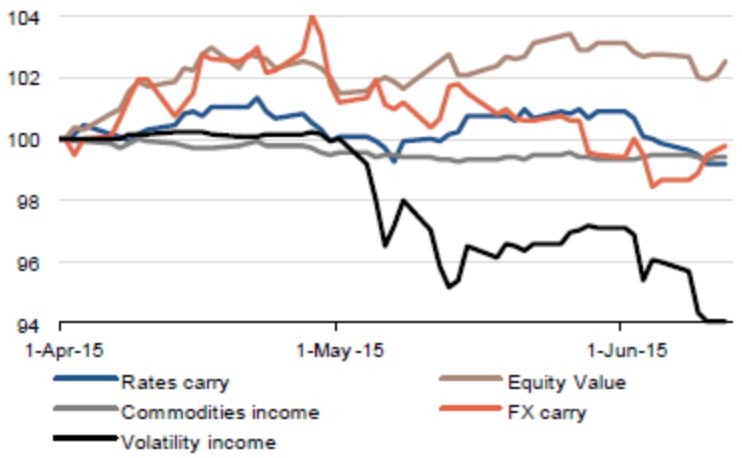
DIVERSIFICATION IS KEY

Performance statistics for the strategies in our current portfolio

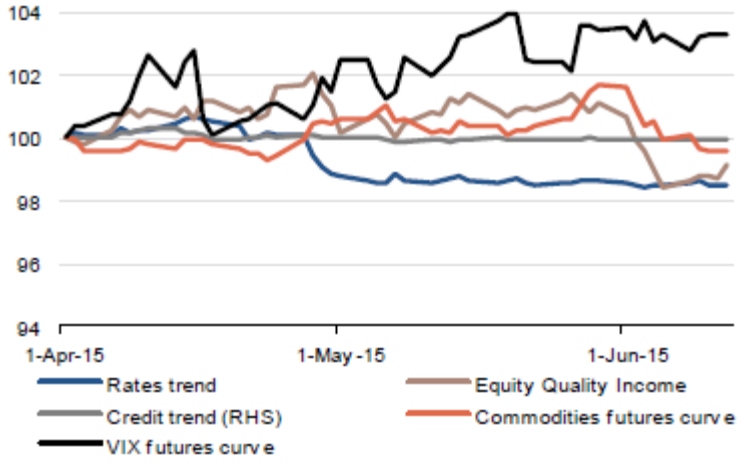
	Rates Carry	Equity Value	Commodities income	FX Carry	Volatility Income	Rates Trend	Equity Quality Income	Credit trend	Commodity futures curve	VIX futures curve
Return (p.a. 2002-2015)	6.1%	7.2%	4.8%	6.5%	5.5%	1.7%	3.4%	0.6%	5.1%	22.4%
Stdev (p.a. 2002-2015)	3.8%	7.8%	5.0%	9.9%	5.8%	2.8%	6.2%	1.7%	6.2%	25.6%
Sharpe (2002-2015)	1.63	0.92	0.97	0.66	0.95	0.63	0.54	0.37	0.82	0.87
Return (since Oct'14)	2.7%	8.7%	1.2%	0.9%	-5.1%	1.0%	-1.6%	0.2%	0.1%	-5.2%
Stdev (since Oct'14)	4.6%	5.3%	1.4%	8.9%	3.8%	2.6%	5.1%	0.7%	3.8%	8.4%
Sharpe (since Oct'14)	0.60	1.64	0.86	0.11	-1.31	0.41	-0.31	0.32	0.04	-0.62
Return (since 1st April 15)	-0.3%	2.3%	-0.7%	0.6%	-4.9%	-1.7%	-0.9%	0.0%	-0.3%	4.8%
Stdev (since 1st April 15)	1.9%	2.3%	0.5%	4.2%	3.3%	1.2%	2.7%	0.4%	1.9%	4.6%
Sharpe (since 1st April 15)	-0.17	0.99	-1.30	0.14	-1.50	-1.43	-0.33	-0.12	-0.14	1.04
MDD	8.6%	20.2%	14.9%	28.9%	17.0%	5.7%	24.3%	4.0%	9.6%	40.3%
MDD/stdev	2.27	2.58	3.00	2.92	2.92	2.04	3.93	2.27	1.54	1.58

Source: SG Cross Asset Research/Cross Asset Quant.

Income



Hedge

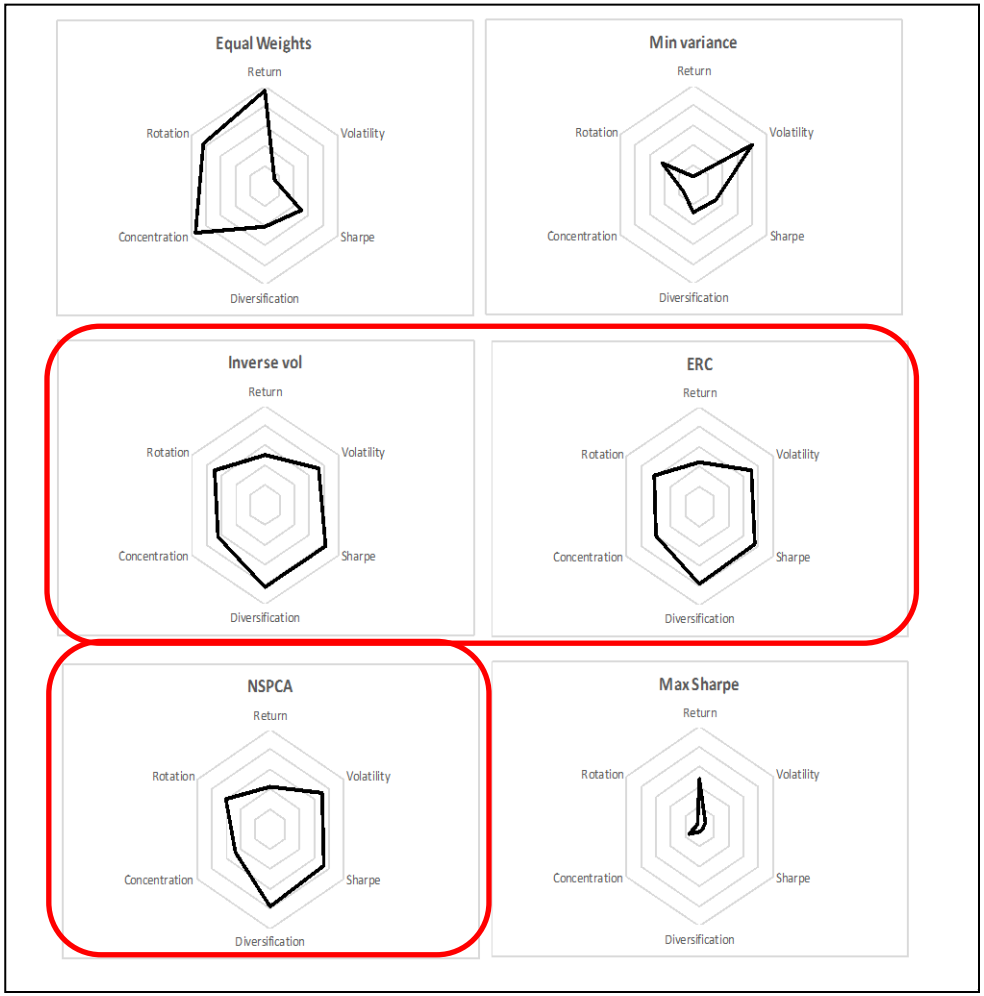


Source: SGcross-asset research

RISK PREMIA PORTFOLIO – COMPARING ALLOCATION TECHNIQUES

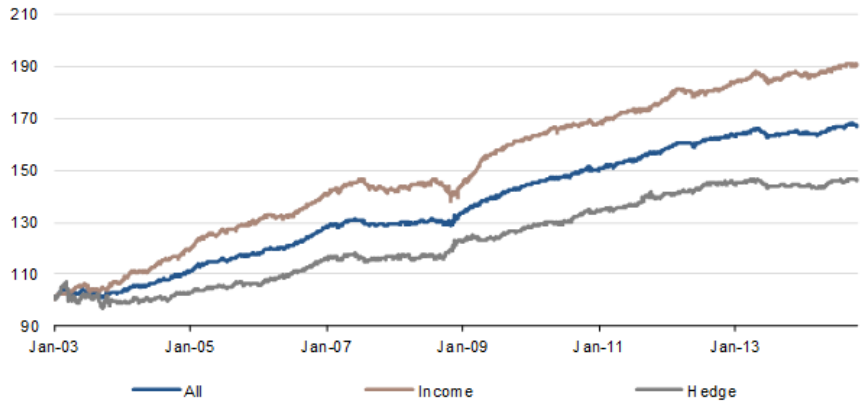
- **Allocation on a portfolio of 10 risk-premia strategies (low average correlation) balanced between income and hedging strategies.**
- Inverse vol, NSPCA and ERC are relatively similar.
- Inverse vol exhibits the best Sharpe ratio (1.98) closely followed by ERC (1.89) and NSPCA (1.87).
- Equal-weight portfolio has the lowest Sharpe ratio despite best returns (3.57%). This strategy is indeed the riskiest with a volatility of 2.14% and a 3.8% max drawdown

	Equal weights	Inverse vol	Min variance (sample)	ERC (sample)	NSPCA	Sharpe
avg	3.57%	2.60%	1.83%	2.52%	2.50%	2.58%
stdev	2.14%	1.31%	1.21%	1.34%	1.34%	2.29%
sharpe	1.67	1.98	1.51	1.89	1.87	1.13
skew	-0.71	-0.30	-0.06	-0.24	-0.24	-0.58
kurt	3.45	2.55	3.50	2.80	2.73	12.40
MDD	3.78%	2.20%	2.22%	2.19%	2.20%	3.58%
DR	2.46	2.84	2.33	2.79	2.78	2.00
rotation	17.54%	41.77%	76.61%	51.47%	54.39%	164.16%



REBALANCING OUR RISK PREMIA PORTFOLIO EVERY YEAR

In-sample performance (October'14 basket)

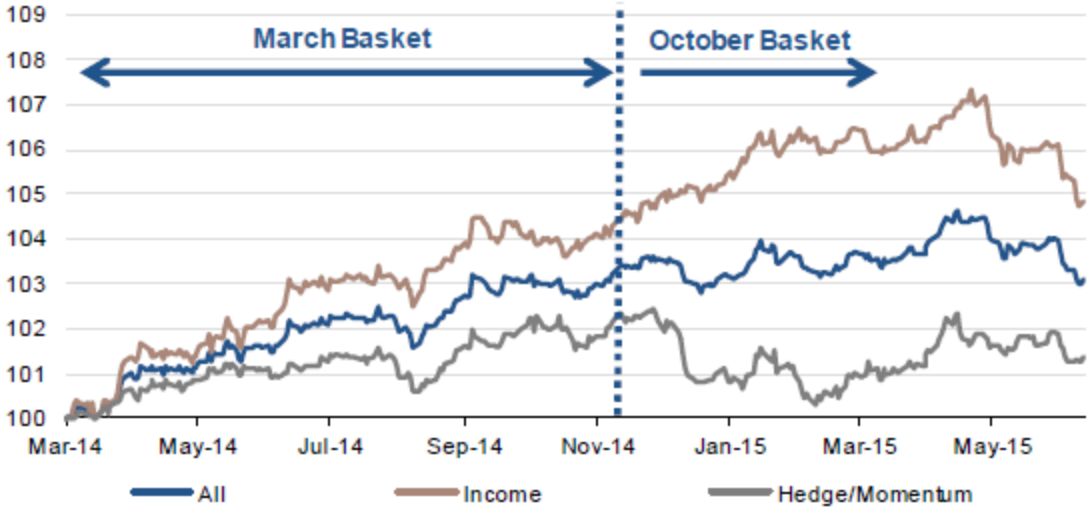


Performance statistics for our flagship risk premia portfolio – yearly rebalancing (excess return)

	Income	Hedge / Momentum	All
Return (p.a. 2002-2014)	4.2%	2.8%	3.5%
Stdev (p.a. 2002-2014)	2.7%	2.1%	1.7%
Sharpe (2002-2014)	1.6	1.3	2.1
Return (since Oct'14)	1.0%	-0.9%	0.0%
Stdev (since Oct'14)	1.8%	1.8%	1.3%
Sharpe (since Oct'14)	0.5	-0.5	0.0
MDD	9.8%	2.9%	3.0%
MDD/stdev	3.6	1.4	1.8

Source: SG Cross Asset Research/Cross Asset Quant

Out-of-sample performace

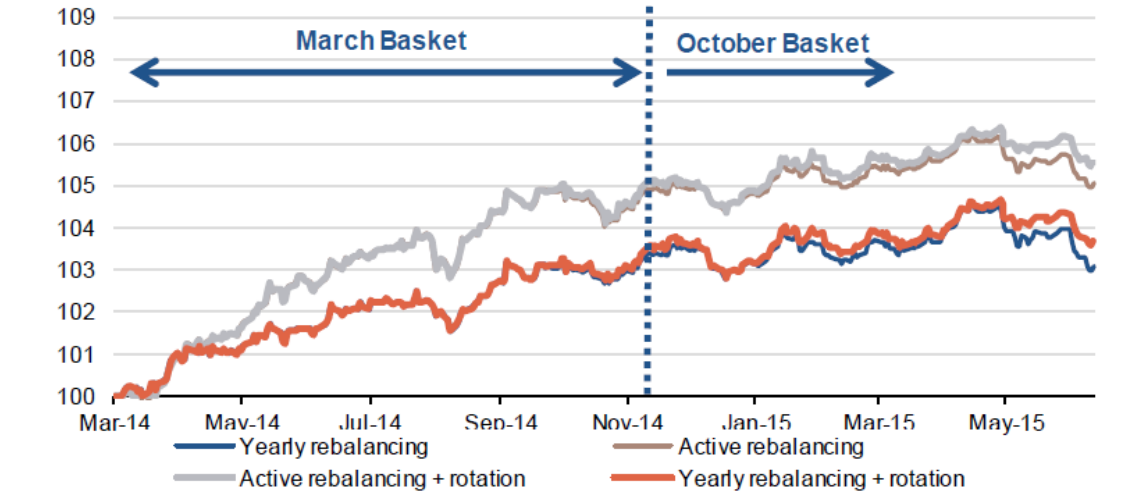


Source: SG Cross Asset Research/Cross Asset Quant

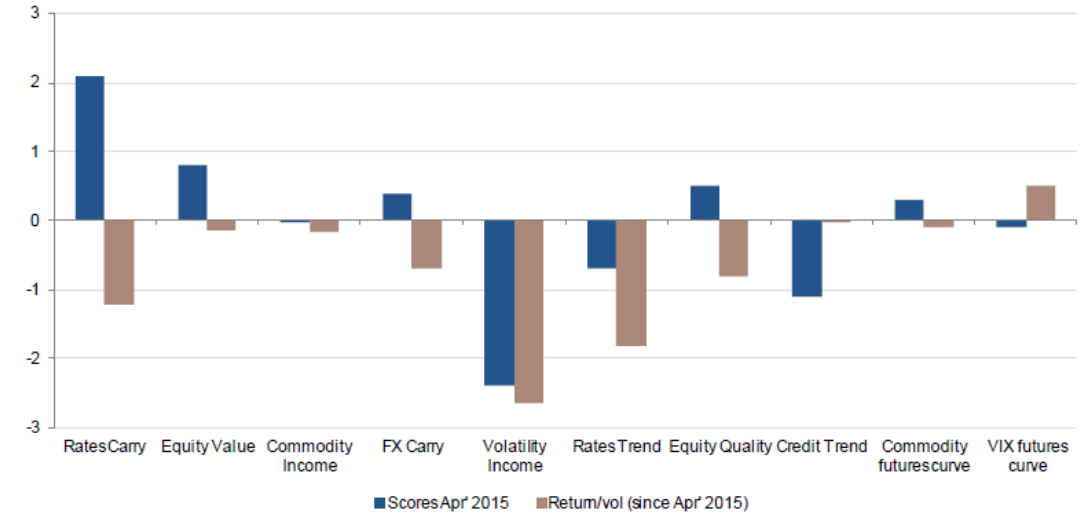
Source: SG cross-asset research

IN PRAISE OF WILLINGNESS

Performance with and without rotation



How our previous scorecard performed (starting on the 15th of April)



WHICH STRATEGIES TO BUY IN THE WAKE OF EUROZONE QE?

Our recommendations for Q3 2015

OUR RECOMMENDATIONS FOR Q3 2015

Commodities to the rescue

- The futures curve strategy may benefit from rising commodity prices.
- Those two strategies look cheap compared to other risk premia

Increase exposure to FX carry

- FX carry is less exposed to the global macro we monitor.
- FX carry tend to perform better when US rates are higher. This strategy remains relatively cheap

Aggregated Scorecard

Strategies	Regime Switching		Technical		Potential	Aggregate	Sharpe Ratio	Change in Sharpe	Score
	Macro	Financial	Relative Value	Time Patterns					
Rates Carry	+3.9	-4.5	-2.7	-1.7	-5.2	-2.6	1.34	↑ 0.05	--
Equity Value	-4.4	+2.9	-1.1	+0.4	+2.4	+0.4	0.46	↓ -0.01	
Commodities Income	-2.4	-0.5	+3.7	+3.6	+4.2	+2.1	1.63	↑ 0.26	++
FX Carry	+1.4	+1.6	+0.6	+2.8	+0.6	+1.2	0.28	↑ 0.00	+
Volatility Income	-3.0	-2.0	-0.3	-5.4	-0.7	-2.0	1.26	↑ 0.23	--
Rates Trend	+2.1	-3.8	-3.3	-0.5	--	-1.4	0.67	↑ 0.05	-
Equity Quality	+4.0	+0.4	+1.8	-1.3	-2.5	-0.01	0.65	↑ 0.02	
Credit Trend	+0.5	-1.6	-4.7	+1.8	--	-1.0	0.56	↑ 0.03	-
Commodities futures curve	-1.6	+3.0	+3.7	+4.0	--	+2.3	1.00	↓ -0.05	++
VIX futures curve	-0.5	+3.7	+2.2	-4.2	--	+0.3	0.61	↓ -0.03	

Source: SG Cross Asset Research

WHAT DOES THE MACRO PICTURE SUGGEST?

- **We have stepped into a new interest rates regime in euro rates. Our model has not yet identified a regime shift in the US.**
  - Judging from the past ten to 15 years, higher rates have almost inevitably been detrimental to most income strategies, with the exception of commodities income.
  - Equity value and volatility premium would be the most impacted. So it makes sense to shift out of Equity Value into Equity Quality.

Macro regime scorecard

Macro Variables	Low High	Rates Carry	Equity Value	Commodities Income	FX Carry	Volatility Income	Rates Trend	Equity Quality	Credit Trend	Commodities futures curve	VIX futures curve
US GDP Growth	High										
US Inflation	Low									-	+
US unemployment Rate	Low	+	+	+		--			--		
Change in US 10Y Rate	Low										
US 10Y Rate	Low		-								
US 10Y Real Yield	Low		--	+		-					
Equity Analysts' Upgrades/Downgrades	Low	+		--			+	-		--	--
Eco US Surprise Index	Low	++	-	-		-	+	++			
Eurozone GDP Growth	High										
Eurozone Inflation	Low	-					-		-		
Eurozone Unemployment Rate	High	-	---	---	-	++			+	-	-
Change in EUR 10Y Rate	High	-	--	+		--		+		+	--
EUR 10Y Rate	Low										
EUR 10Y Real Yield	Low					-					
Change in Sharpe		↓	↓	↓	↓	↑	↓	↑	↓	↑	↑
Current Rank		1	10	9	4	8	3	2	5	7	6
Performance adjusted scores		3.90	-4.37	-2.36	1.41	-2.99	2.08	3.98	0.45	-1.62	-0.53

Source: SG Cross Asset Research

WHAT ARE THE FINANCIAL MARKETS TELLING US?

- ***Our indicators are supportive for VIX futures curve and the Commodities future curves.***
  - The MSCI World Index and the VIX have remained in a bullish state, supporting Equity Value and the VIX futures curve strategy.
- **Other markets have switched to a new bearish regime.**
  - This is bad news for rates and credit trends that tend to be hurt at the beginning of a crisis

Financial markets regimes scorecard

Strategies	Relevant financial features	Low	High	Signal	Change in Sharpe		Current Rank	Performance adjusted scores
Rates Carry	Total Return FI G7	■■■		---	↓	0.00	10	-4.5
Equity Value	MSCI World Return		■■■■		↑	0.06	3	+2.9
Commodities Income	S&P Commodity		■■■■	-	↓	0.00	6	-0.5
FX Carry	DXY Return	■■■■			↑	0.03	4	+1.6
Volatility Income	Change in Agg Vol. Indicator		■■■	--	↓	-0.07	8	-2.0
Rates Trend	Total Return FI G7	■■■		---	↑	0.03	9	-3.8
Equity Quality	MSCI World Return		■■■■		↓	-0.07	5	+0.4
Credit Trend	Total Return Credit Index	■■■■		-	↑	0.02	7	-1.6
Commodities futures curve	S&P Commodity		■■■■		↓	-0.05	2	+3.0
VIX futures curve	Change in VIX	■■■■		+	↓	-0.07	1	+3.7

Source: SG Cross Asset Research

RELATIVE VALUE AND TIME PATTERNS

- **The commodities future curve, commodities income and FX carry look particularly cheap, when compared to other strategies . Our strongest mean-reversion signal is for the commodity futures curve rates trend.**

Time-patterns scorecard

Strategies	Auto-Correlation	Strength of Momentum	Change in Sharpe	Rank using signal	Performance adjusted scores
Rates Carry	+	-0.6	-0.13	8	-1.7
Equity Value	+	+0.3	-0.06	5	+0.4
Commodity Income	-	-0.7	0.18	3	+3.6
FX Carry	-	-1.1	-0.09	2	+2.8
Volatility Income	+	-1.9	0.09	10	-5.4
Rates Trend	-	+0.0	-0.01	6	-0.5
Equity Quality	+	-0.5	-0.04	7	-1.3
Credit Trend	-	-0.5	0.08	4	+1.8
Commodity futures curve	-	-1.4	-0.04	1	+4.0
VIX futures curve	+	-0.8	0.09	9	-4.2

Source: SG Cross Asset Research

- **The two futures curve strategies, in commodities and VIX, now look relatively cheap**

Relative value scorecard

Strategies	Residual	Half-Life (in quarters)	Z-score	Change in Sharpe	Rank using signal	Performance adjusted scores
Rates Carry	7.0%	3.7	+2.1	-0.17	10	-2.7
Equity Value	3.1%	2.8	+0.6	-0.11	7	-1.1
Commodities Income	-6.0%	5.0	-0.9	0.20	3	+3.7
FX Carry	-2.3%	1.7	-0.5	0.09	5	+0.6
Volatility Income	6.1%	10.0	+0.6	-0.14	6	-0.3
Rates Trend	2.5%	2.5	+1.2	0.14	8	-3.3
Equity Quality	-2.2%	1.7	-0.6	0.08	4	+1.8
Credit Trend	2.5%	2.5	+2.0	0.14	9	-4.7
Commodities futures curve	-6.0%	2.2	-1.8	-0.08	1	+3.7
VIX futures curve	-13.3%	2.9	-1.1	-0.16	2	+2.2

Source: SG Cross Asset Research

FACING THE YIELD CHALLENGE

- **In the wake of global QE, the hunt-for-yield has depressed the income potential in risk premia. Most of the strategies provide income below their historical averages.**
  - Commodity futures, with their steep contango, and Equity Value, look like the two most attractive sources of income.
  - Equity value stands out, as a lot of shares pass our equity quant team's value filter.

Income potential scorecard

Strategy	Current Potential	Avg Potential	Potential/Vol ratio	Z-score	Sharpe Ratio with Indicator	Change in Sharpe	Rank	Performance adjusted scores
Rates Carry	1.24%	1.78%	0.33	-0.8	1.43	↑ 0.06	10	-5.2
Equity Value	2.32	2.29	-	+0.1	0.52	↓ -0.02	3	+2.4
Commodity Income	0.32%	0.80%	0.31	+0.1	1.37	↓ -0.03	1	+4.2
FX Carry	3.52%	5.29%	0.49	-0.4	0.37	↑ 0.05	5	+0.6
Volatility Income	0.13%	1.21%	0.01	-0.6	1.20	↑ 0.18	6	-0.7
Equity Quality	2.60%	3.39%	0.45	-0.7	0.70	↓ -0.01	8	-2.5

Source: SG Cross Asset Research

INVESTIGATING THE VOLATILITY PREMIUM

- **Looking at implied and realised volatility, strategies involving equity options in the US and credit options look attractive, especially on the US market.**
  - FX is the only strategy that currently provides a negative income.

Income potential scorecard

Strategies	Current Potential	Avg Potential	Potential/Vol ratio	Z-score	Sharpe Ratio with Indicator	Change in Sharpe	Rank	Performance adjusted scores
Equity Vol (US)	4.54%	1.51%	2.14	+1.3	0.81	-0.04	1	+1.4
Equity Vol (EU)	0.79%	2.57%	0.17	-0.7	0.82	-0.06	4	-1.3
FX Vol	-6.94%	2.38%	-2.04	-1.2	1.10	0.09	5	-3.1
Rates Vol	0.17%	1.75%	0.03	-0.7	0.83	0.08	3	-0.6
Credit Vol	1.18%	1.64%	3.00	+0.6	0.94	0.04	2	+0.6

Source: SG Cross Asset Research

- **Putting all things together, the analysis confirms that equity options in US are the only volatility strategy with positive prospects. We are also neutral on credit volatility and we do not recommend exposure to the rest of the volatility strategies.**

Aggregated scorecard

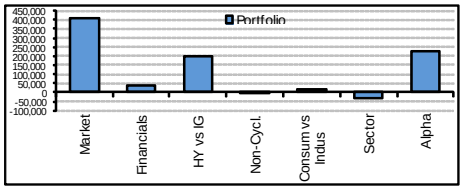
Strategies	Regime Switching		Technical		Potential	Aggregate	Score
	Macro	Financial	Relative Value	Time Patterns			
Equity Vol (US)	+1.3	+1.2	-0.5	-0.5	+1.4	+0.7	+
Equity Vol (EU)	+0.4	-2.8	+1.5	+0.3	-1.3	-0.5	-
FX Vol	-0.6	-0.5	-0.7	-1.9	-3.1	-1.6	-
Rates Vol	-1.8	-1.5	+0.5	-2.5	-0.6	-1.1	-
Credit Vol	-2.4	+0.4	-1.7	+1.9	+0.6	-0.1	

Source: SG Cross Asset Research

LOOKING FOR ALTERNATIVE INCOME STRATEGIES

- **Additional return can be already be harvested by considering innovative strategies that collect new sources of income.**
  - We would like, for example, to point to the fixed income model for forward trading in rates (DyFoT) – or our credit Spread Market Scoring (SMS) model. In the derivatives space, consider variance swaps and long dividend yield strategies as alternative sources of returns.
- **Given the good performance of equity styles, it is quite tempting to look for similar opportunities in the credit market.**
  - Investors may wish to identify statistical risk factors, and increase the exposure of their portfolios to the smaller, and more alternative, risk factors. We explored this idea with our SHARP model.

1) Fill portfolio description below (Name + Notional) → 2) Load Spread, DV01 (or enter manually) → 3) Load Betas (or enter manually) → 4) Compute Sensitivities

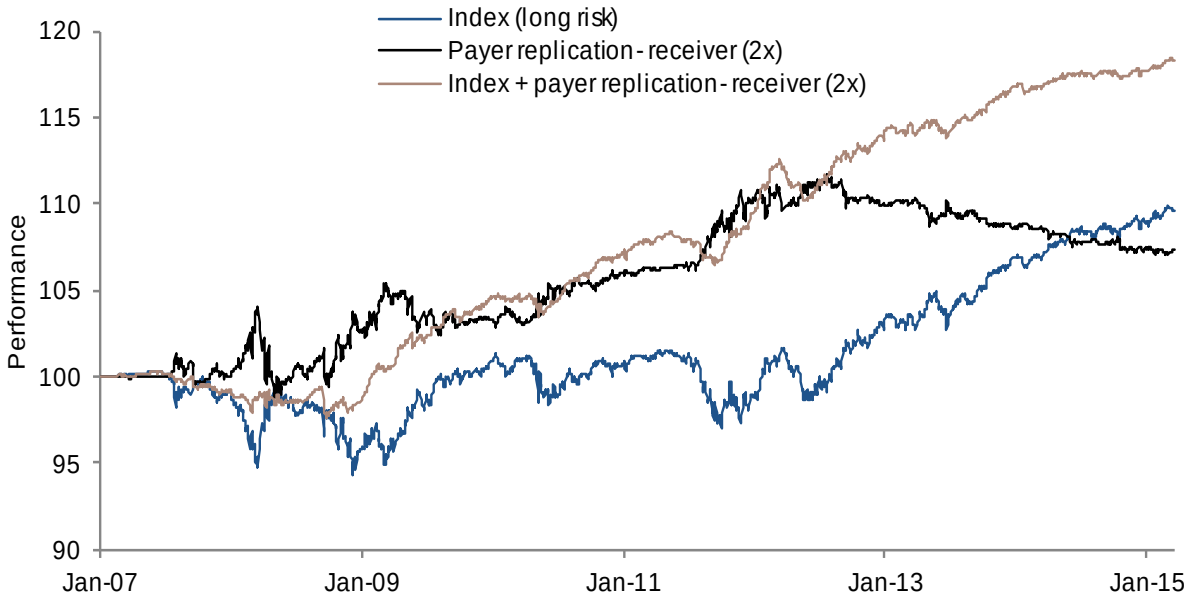


					BETAS (%)						SENSIVITIES (€/week)						
Name	Notional (€)	Maturity	Spread	DV01	Market	Fin. vs. Corp.	HY vs. IG	Non-Cyclicals Vs. Cyclicals	Consum. vs. Indust.	Sector	Market	Fin. vs. Corp.	HY vs. IG	Non-Cyclicals Vs. Cyclicals	Consum. vs. Indust.	Sector	Alpha
Portfolio	-9,500,000	08/05/2018	137	(49.71)	107%	13%	48%	-9%	27%	2%	410,276	35,717	195,499	-4,701	17,354	-32,156	229,092
Portfolio Description																	
Ahold	-9,000,000	20/06/2020	60	5.13	101%	-38%	-5%	25%	88%	-8%	-16,749	1,802	139	-654	-2,094	185	15,019
AXA	-9,000,000	20/06/2020	56	5.12	139%	108%	-95%	-25%	-37%	-59%	-21,507	-4,805	2,717	598	813	1,218	13,964
Barclays	-9,000,000	20/06/2020	59	5.11	148%	244%	-132%	-44%	17%	54%	-24,387	-11,597	4,015	1,150	-405	-1,173	14,933
BBVA sub	6,000,000	20/06/2020	126	5.04	148%	225%	14%	50%	-27%	115%	34,073	15,000	617	1,819	-901	3,524	20,870
BMW	10,000,000	20/06/2020	49	5.13	121%	-70%	-28%	2%	110%	187%	18,083	-3,018	-769	47	2,375	3,726	13,580
Cable & Wireless	-3,000,000	20/06/2020	135	5.04	83%	16%	52%	-41%	47%	-102%	-10,264	-578	-1,185	800	-828	1,666	11,127
Cadbury Schweppes	14,000,000	20/06/2020	27	5.17	92%	-47%	-111%	49%	84%	17%	10,773	-1,569	-2,381	903	1,403	268	10,550
Crédit Agricole	13,000,000	20/06/2020	63	5.11	139%	245%	-28%	60%	13%	147%	35,245	17,958	-1,315	2,389	489	4,961	23,021
Carrefour	-18,000,000	20/06/2020	50	5.14	106%	-85%	-23%	25%	147%	12%	-29,392	6,780	1,189	-1,083	-5,842	-439	25,057

Source: SG cross-asset research

KEEP A BALANCE BETWEEN RISK PROFILES

- **Hedge strategies may turn useful when the liquidity wave starts to break.**
- **Our first model portfolio included call overwriting as a way to buy some form of gap protection for a positive premium. Our latest article on credit hedging investigates a potent combination of call overwriting with a replication strategy.**



Source: SG cross-asset research

HOW TO HEDGE A PORTFOLIO? THREE SIMPLE STRATEGIES

Performance of the hedging strategies in different market conditions, positive in blue and negative in brown

Scenario	Payer	Payer replication	Short receiver	Short receiver + payer replication
Spread widening, crisis periods	Positive performance, but gains from spread widening are partly compensated by the high cost of the option	Good performance, particularly in extended periods of widening	It gains if spreads widen, the premium received provides a cushion to market downturns	Good hedge, it combines the positive premium of the short receiver and the gains from the long index protection
Gap event, sudden sharp widening of credit spreads	Good hedge against sudden jumps as there is no timing issue, benefits from the positive convexity of the option	Weak protection against gap risk as there is always a lag and timing issues	It gains if spreads widen sharply, but gains are capped at the amount of the premium	Partial hedge, there is the positive premium from the short receiver but timing issue from the payer replication
Range-bound market, no big change	Bad performance because of the negative time value of the option	Negative performance, penalised by the swings of the protection amount. But the time value is less negative than for payer options	Positive performance, benefits from the positive time value of the short receiver	Flat performance, the negative carry of the payer replication is compensated by the positive premium of the receiver
Spread tightening, bull market	Bad performance because of the high cost of the option but losses are floored	Negative time value but less negative than for payer options particularly in periods of low volatility and when spreads tighten sharply	It depends on the quickness of the tightening. It is exposed to losses in case of a sharp tightening while the premium may compensate the spread narrowing in case of a slow and extended bullish momentum	Negative performance, particularly if there is a sharp tightening of credit spreads

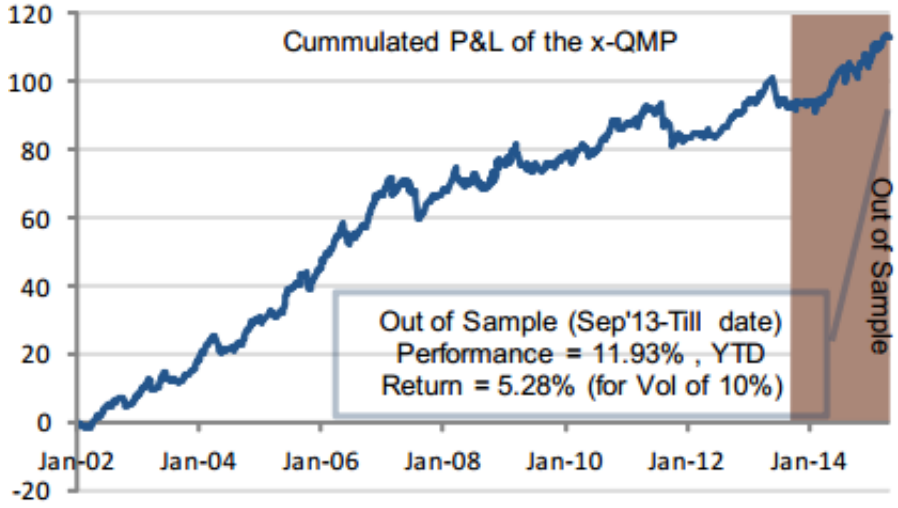
Source: SG Cross Asset Research/Cross Asset Quant

Source: SG cross-asset research

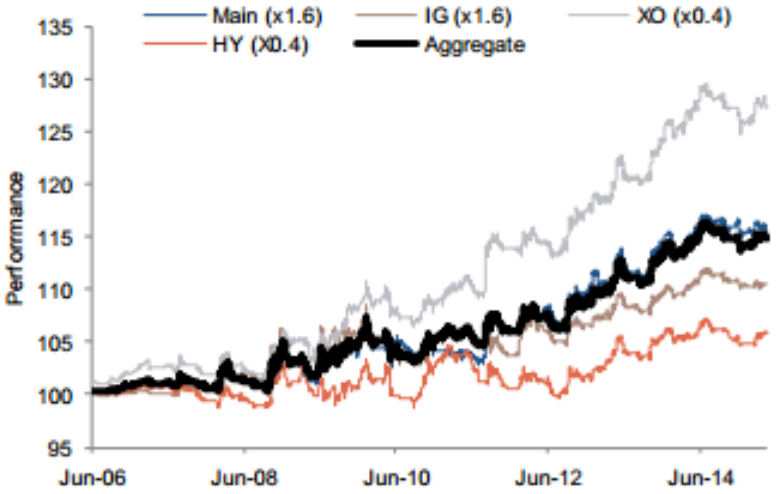
TRADING MOMENTUM

- **Trading momentum across a wide range of assets is another well-established means of diversifying an income portfolio.**
  - Our flagship risk premia portfolio considers a combination of trend in rates and credit, together with futures curves in commodities and VIX. The portfolio could be diversified even further.

A diversified momentum strategy



Our credit momentum strategy

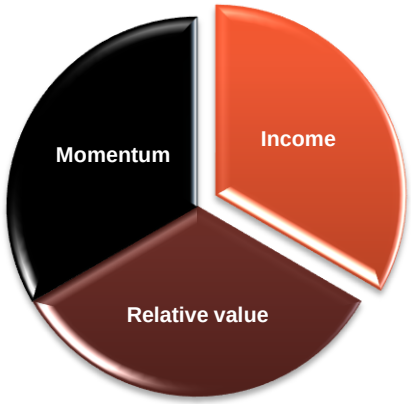


Source: SG cross-asset research

RISK PREMIA SELECTION

Sandrine Ungari, Thomas Kovarcik

UNDERSTANDING THE RISK PROFILE OF EACH STRATEGY



	Style	Name (SG Research)	Strategy	Performance	
				Normal Period	Crisis Period
Rates	Income	Term Income	IR flateners	++/--	++
	Momentum	Momentum	IR future momentum	++/--	++
	Relative Value	DyFoT	G10 payer vs. receiver	++	++
	Income	Roll-down	Slope IR curves	++	-
Credit	Income	Carry	Buy CDS indices	++	- - -
	Relative Value	SMS	Buy undervalued, sell overvalued CDS	++/-	- -
	Momentum	Momentum	Momentum +mean-reversion	+/-	+++
Equity derivatives	Income	Short VIX Contango	Vol term structure	++	- - -
	Income	Variance Swaps	Implied vs. historical Vol	++	- - -
	Income	Dividend Yield	Carry	+/-	- -
	Momentum	Overwriting	Short upside +short vol	++/--	+++
Equity	Income	Value	Buy undervalued, sell overvalued stocks	++/-	- - -
	Momentum	Momentum	Buy outperformers, sell underperformers	+	++
	Momentum	Quality	Buy defensive stocks	- -	++
	Income	Dividend	Buy high dividends stock	++/-	- - -
	Income	Size	Small cap vs. large cap	+/-	-
FX	Momentum	FX Quant fund	Momentum	+/-	+++
	Income	FX Quant fund	Carry	+++	- - -
X-Asset	Momentum	QMP	Second generation momentum	+/-	+++
FX, Rates, Credit volatility	Income	Volatility risk Income	Implied vs. historical Vol	++	- -
	Income	Tail event risk Income	Short vol	++	- - - -

Source: SG Cross Asset Research

YOU LEARN WHO YOUR TRUE FRIENDS ARE IN TIMES OF HARDSHIP

- **Momentum and income strategies correlate even further during crises**
  - Momentum strategies benefit
  - Income strategies are exposed to potential big losses
- **Relative value strategies appear to be very little correlated with the other strategies**

'normal' times

2007-08

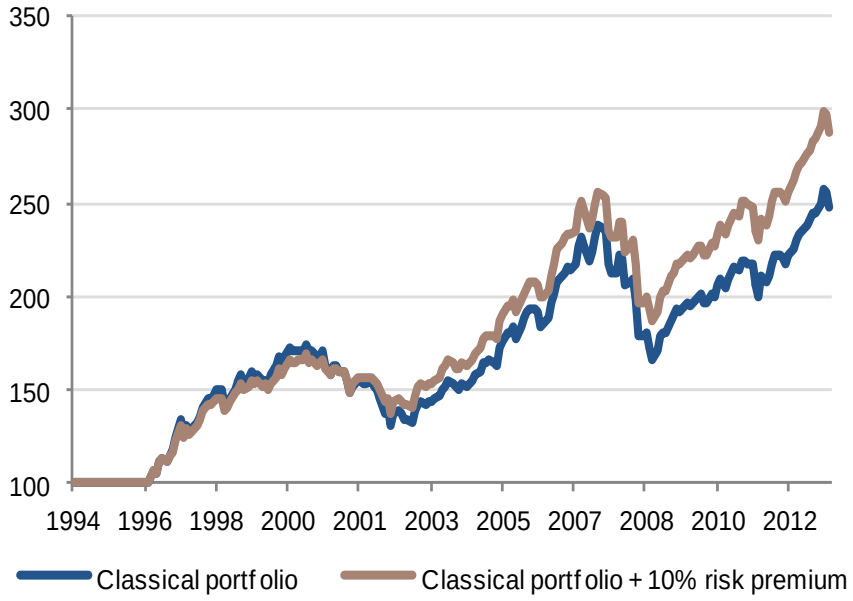
		Rates				Credit			Equity Derivatives				Equity					FX		2nd gen.	Vol.				
		Carry	Moment.	DyFoT	Roll-down	Carry	Alpha	Moment.	VIX Contango	Variance Swaps	Dividend Yield	Overwriting	Value	Moment.	Quality	Dividend	Size	Moment.	Carry	QMP	Rate tail-event	Credit tail-event	FX vol premium	Credit vol premium	Rate vol premium
Rates	Carry	0%	1%	3%	-2%	4%		5%	-16%	-3%	-4%	-7%	-6%	6%	**3%**	-4%	-7%	2%	1%	2%	4%	2%	-1%	1%	0%
	Momentum	-2%	0%	7%	-3%	4%		7%	-15%	-3%	-10%	-8%	-4%	4%	**0%**	0%	-3%	-1%	-1%	-9%	-1%	-8%	-7%	-6%	-2%
	DyFoT	-7%	-20%	0%	20%	2%		4%	-18%	-5%	-5%	3%	7%	-8%	-2%	14%	6%	3%	-5%	-14%	10%	-6%	5%	4%	7%
	Roll-down	9%	6%	-40%	0%	-2%		10%	8%	-20%	16%	-8%	-17%	3%	7%	-19%	-10%	-4%	-3%	25%	2%	-11%	-1%	-16%	16%
Credit	Carry	-11%	-17%	-3%	-5%	0%		11%	13%	-3%	4%	12%	-1%	-2%	0%	-3%	6%	7%	-3%	2%	4%	4%	1%	9%	3%
	Alpha							0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Momentum	-13%	-20%	-16%	-20%	-32%		0%	-1%	8%	3%	9%	20%	-23%	-7%	14%	10%	-8%	2%	-1%	1%	8%	6%	2%	3%
Equity Derivatives	VIX Contango	23%	19%	36%	-12%	-21%		-3%	0%	-20%	-28%	4%	-13%	-1%	2%	-15%	-23%	34%	-15%	12%	12%	33%	1%	12%	7%
	Variance Swaps	9%	3%	16%	7%	0%		-8%	8%	0%	8%	-5%	-14%	-9%	-5%	-2%	-13%	10%	-13%	12%	-4%	-13%	-6%	-22%	9%
	Dividend Yield	7%	21%	14%	-21%	-16%		-7%	32%	-9%	0%	11%	10%	-3%	8%	-1%	13%	8%	-13%	-41%	6%	18%	-3%	12%	-1%
	Overwriting	6%	29%	-20%	42%	-4%		-37%	12%	26%	-22%	0%	-23%	15%	**-6%**	-8%	-30%	-5%	6%	-3%	-11%	-19%	-21%	-18%	-1%
Equity	Value	39%	22%	-11%	12%	-14%		-37%	7%	13%	-15%	61%	0%	4%	8%	0%	-7%	20%	-10%	16%	2%	-15%	9%	-14%	3%
	Momentum	-49%	-37%	27%	-4%	12%		74%	2%	19%	7%	-60%	-36%	0%	4%	4%	0%	-5%	1%	-1%	1%	5%	4%	-1%	3%
	Quality	**-29%**	**6%**	6%	-2%	5%		21%	-2%	8%	-14%	**-8%**	-34%	-13%	0%	10%	4%	**-7%**	5%	**-8%**	-12%	-24%	-4%	-13%	0%
	Dividend	28%	-3%	-27%	17%	-2%		-30%	10%	-4%	-1%	30%	-3%	-33%	-58%	0%	-4%	14%	-4%	15%	1%	2%	12%	2%	-1%
	Size	41%	27%	-17%	18%	-27%		-25%	29%	27%	-23%	72%	52%	-3%	-36%	29%	0%	9%	-6%	13%	-5%	-10%	0%	-14%	3%
FX	Momentum	-11%	5%	-12%	8%	-21%		21%	-41%	-17%	-14%	3%	-48%	24%	**33%**	-42%	-31%	0%	14%	3%	-5%	-3%	1%	-5%	1%
	Carry	6%	7%	18%	-4%	-8%		-9%	23%	25%	28%	23%	14%	-3%	-13%	-2%	27%	-54%	0%	3%	2%	4%	-3%	-5%	3%
2nd gen.	QMP	0%	26%	14%	-24%	-11%		-2%	-10%	-18%	42%	16%	-37%	5%	**31%**	-40%	-32%	-3%	-12%	0%	14%	27%	-18%	13%	2%
Vol.	Rate tail-event	-21%	-21%	10%	57%	34%		-13%	4%	13%	-15%	1%	18%	-17%	-26%	11%	9%	-23%	9%	0%	100%	5%	-8%	-3%	8%
	Credit tail-event	1%	-11%	15%	28%	29%		-42%	20%	36%	-31%	9%	22%	-20%	-16%	11%	10%	-9%	18%	-2%	32%	100%	31%	8%	19%
	FX vol premium	2%	5%	3%	3%	-3%		-24%	22%	10%	33%	17%	17%	-12%	4%	5%	2%	2%	8%	15%	13%	31%	100%	0%	-2%
	Credit vol premium	-1%	1%	15%	22%	12%		-9%	24%	42%	-21%	10%	9%	-11%	-11%	0%	11%	-10%	13%	-9%	32%	71%	24%	100%	17%
	Rate vol premium	-17%	-10%	11%	28%	27%		-18%	10%	-6%	-1%	-8%	4%	-13%	-15%	10%	-6%	-23%	7%	7%	70%	5%	5%	-2%	100%

Source: SG Cross Asset Research

DIVERSIFYING A PORTFOLIO USING RISK PREMIA

- Risk premium strategies exhibit an average correlation of 16% between themselves. This compares with 50% observed across traditional benchmarks and 25% or so between benchmarks and risk premia

		Credit TR	Rates TR		Equity TR	
		Xover	Treasury	Bund	Stoxx 600	S&P
Rates	Carry	-50%	92%	94%	-36%	-44%
	Momentum	-47%	89%	72%	-40%	-44%
	DyFoT	10%	-2%	6%	9%	12%
	Roll-down	14%	-5%	-9%	27%	20%
Credit	Carry	90%	-39%	-39%	56%	57%
	Alpha	11%	13%	13%	-13%	-13%
	Momentum	8%	-18%	-20%	5%	4%
Equity Derivatives	VIX Contango	49%	-20%	-1%	65%	57%
	Variance Swaps	33%	-20%	-11%	45%	48%
	Dividend Yield	2%	4%	8%	-10%	-21%
	Overwriting	-29%	23%	33%	-42%	-43%
Equity	Value	26%	-7%	2%	16%	17%
	Momentum	-36%	12%	22%	-47%	-39%
	Quality	-67%	41%	37%	-82%	-78%
	Dividend	38%	-3%	-2%	30%	33%
	Size	2%	15%	11%	-2%	-2%
FX	Momentum	-12%	0%	-4%	-17%	-12%
	Carry	42%	-10%	-11%	33%	35%
2nd gen.	QMP	25%	7%	5%	-1%	0%
Vol.	Rate tail-event	27%	-25%	-18%	22%	18%
	Credit tail-event	26%	-8%	-2%	18%	15%
	FX vol premium	6%	4%	1%	-5%	-11%
	Credit vol premium	11%	-2%	6%	10%	10%
	Rate vol premium	30%	17%	9%	21%	15%
Average absolute value of correl		29%	20%	18%	27%	27%



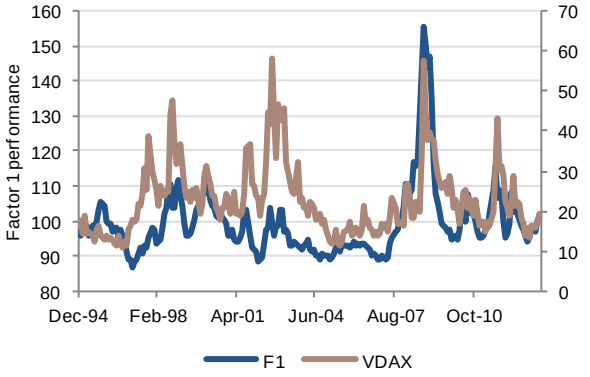
Source: SG Cross Asset Research

KNOW YOUR RISK

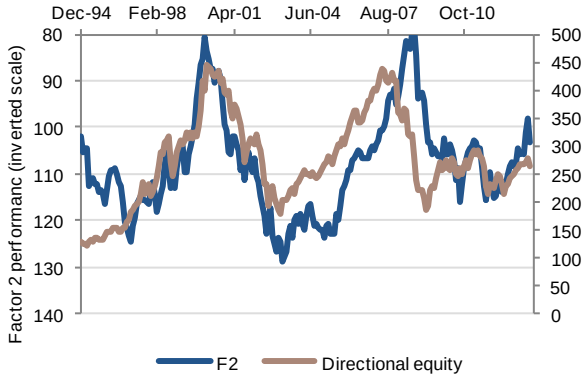
- **3 factors explain more than 50% of variance**
- **A crisis factor: long momentum, short income**
- **An equity factor**
- **One factor for volatility premia**

Crises stand out as the main risk factor

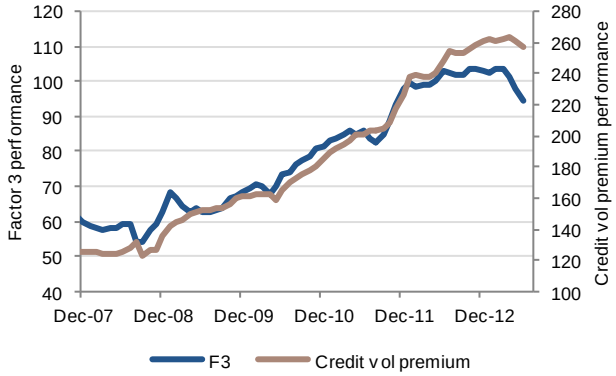
Factor 1: crises



Factor 2: equities



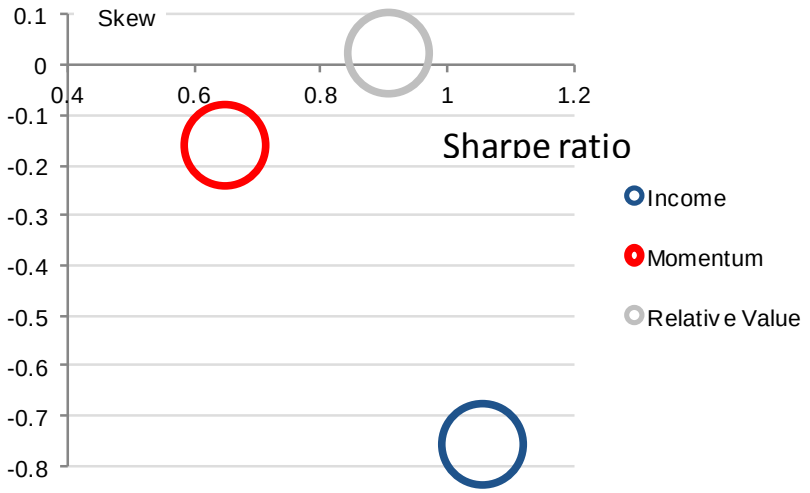
Factor 3: volatility premium

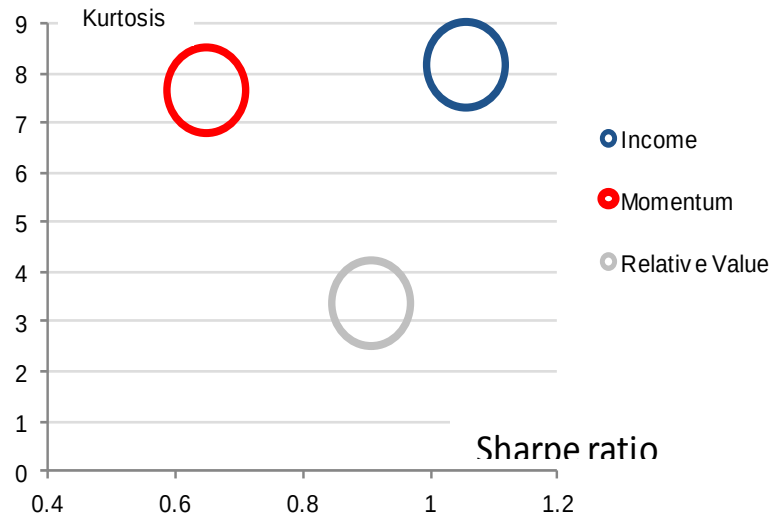


Source: SG Cross Asset Research

HISTORICAL RISK CHARACTERISTICS

- **The best strategies in terms of Sharpe ratio are income strategies**
  - But income strategies are exposed to higher downside risks (skewness, kurtosis)
  - The equity value, equity dividend and FX carry strategies delivered the strongest returns
- **Momentum strategies offer the safest risk profiles**
  - This comes at the cost of lower Sharpe ratios.
  - The skew of momentum and relative value strategies is close to zero, or in some cases positive

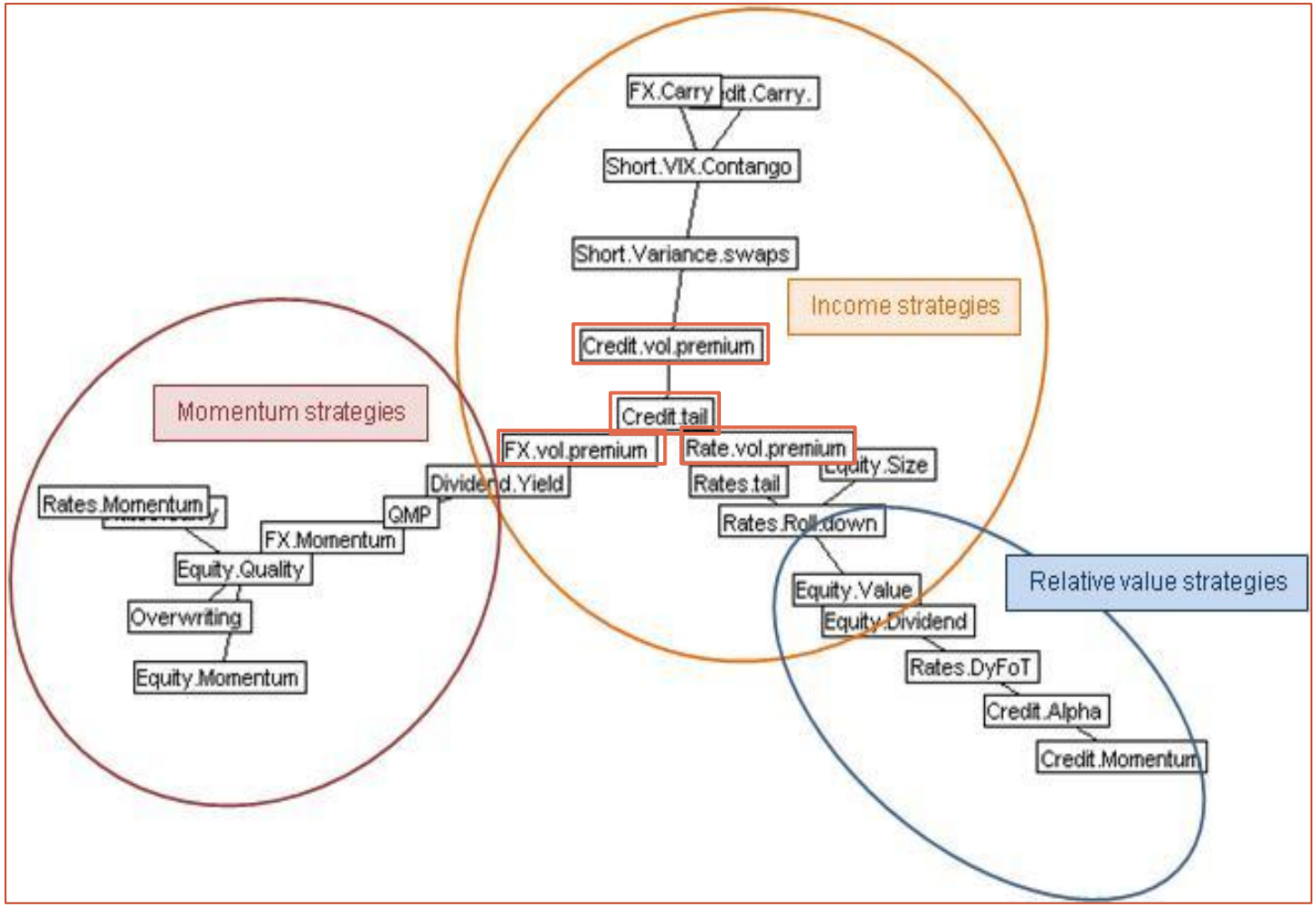




Source: SG Cross Asset Research

INVESTMENT STYLES MATTER

- **Spanning tree based on monthly correlations**

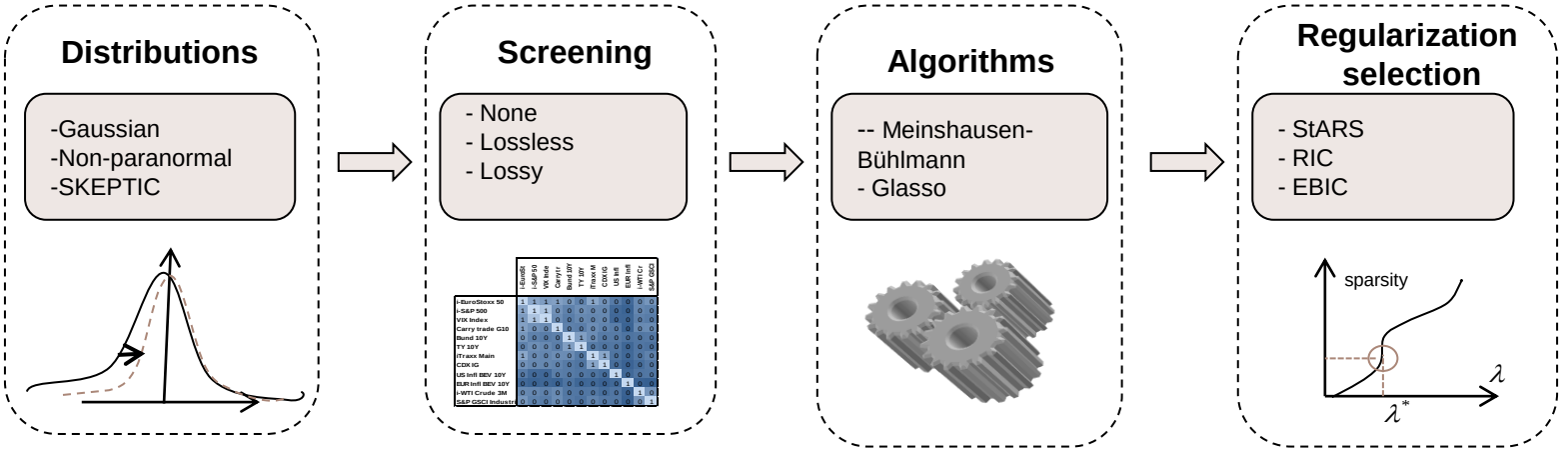


Source: SG Cross Asset Research

COVARIANCE SELECTION

Covariance selection:

- Sparsity created by a l1 penalization of the loglikelihood function. Similar to a lasso problem in regression-type optimization: named "graphical lasso"
- Advanced machine-learning methods (subsampling-based stability) to select the regularization parameter
- Extension to non-Gaussian variables

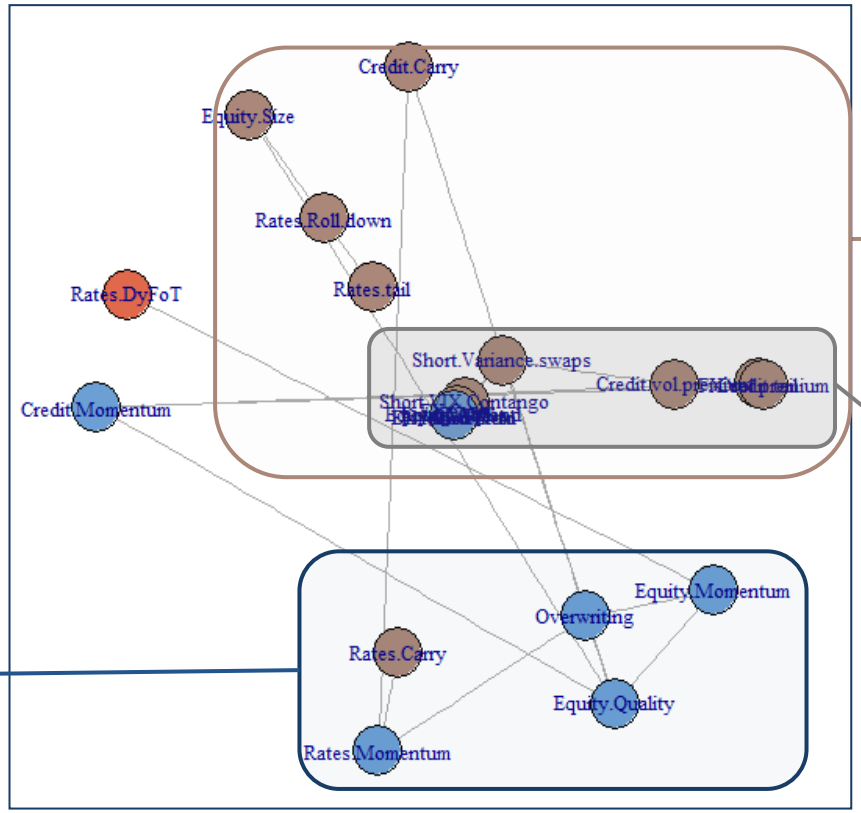


Applications of covariance selection

- Graphical representation: intuitive, simple, stable
- Clustering: several algorithms provide an automatic clustering based on the undirected graph edges.
- Covariance matrix cleaning: the resulting covariance matrix is cleaned, improving stability in the graph/clustering.
- Fair-value model: provides a fair-value based on the cleaned correlation matrix

USING STABLE CLUSTERING TECHNIQUES

- **Covariance selection reveals more information on the relationships between variables:**
  - Dependence mainly by asset-class
  - In each asset class: anti-correlated strategies (different behaviour in vol environment)

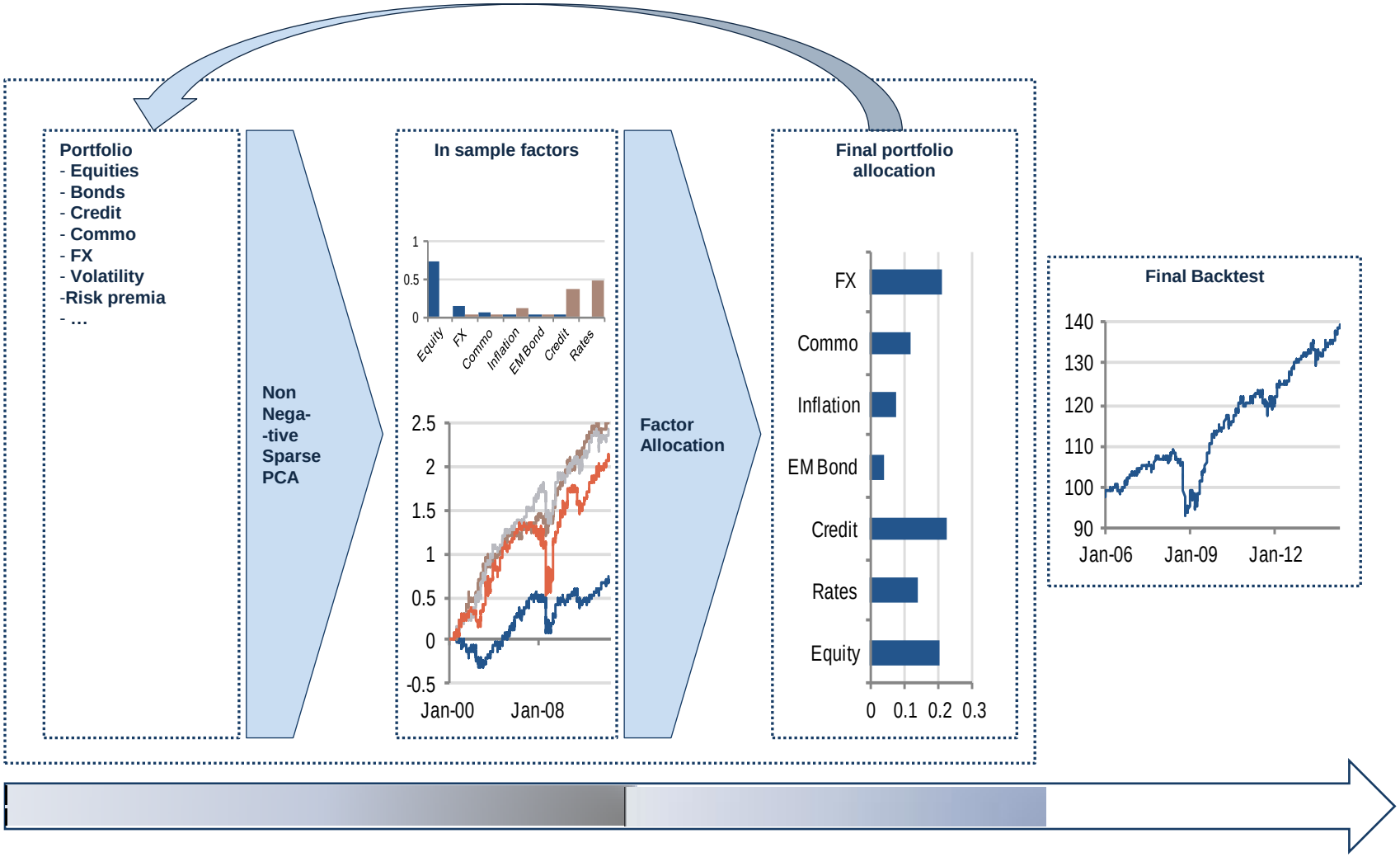


Income strategies: perform under normal and improving market conditions

Volatility strategies: are in the center of the graph. They constitute the archetypal risk premium strategies.

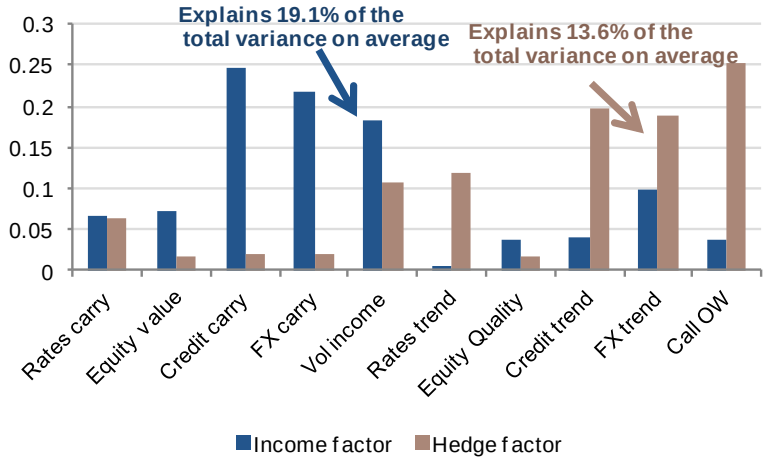
Momentum/Hedge strategies: struggle in sharply rising market but provide protection in market downturns

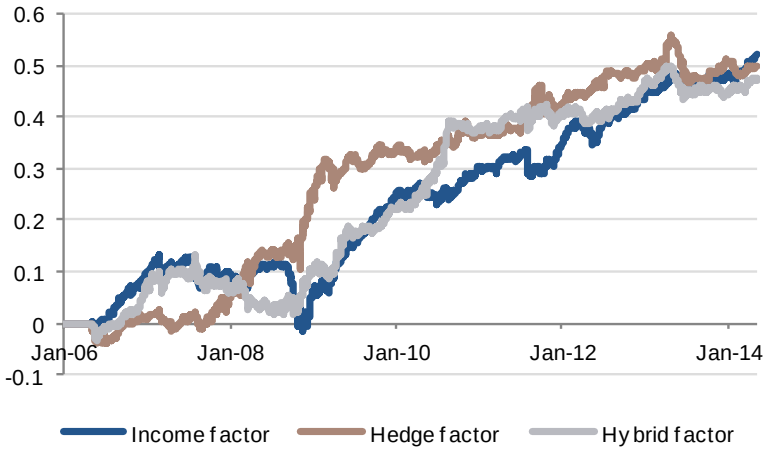
A LONG ONLY INVESTMENT FRAMEWORK – SPARSE PCA



Source: SG Cross Asset Research

NON NEGATIVE SPARSE PCA – FACTOR ANALYSIS





- **Implicit factors confirms its main characteristics.**
- **Two main factors: income/hedging split between**
- **Using NSPCA allows for a dynamic classification of the risk premia rather than a static, ex-post classification.**
- **This might be suitable when some risk premia have a versatile nature: for example, G10 rates carry in 2008 behaved more as a hedging strategy thanks to the safe-haven nature of G10 rates.**
- **Graph illustrates the out-of-sample times series of these two factors and of the additional third factor, which captures an average of 13% of the total variance**

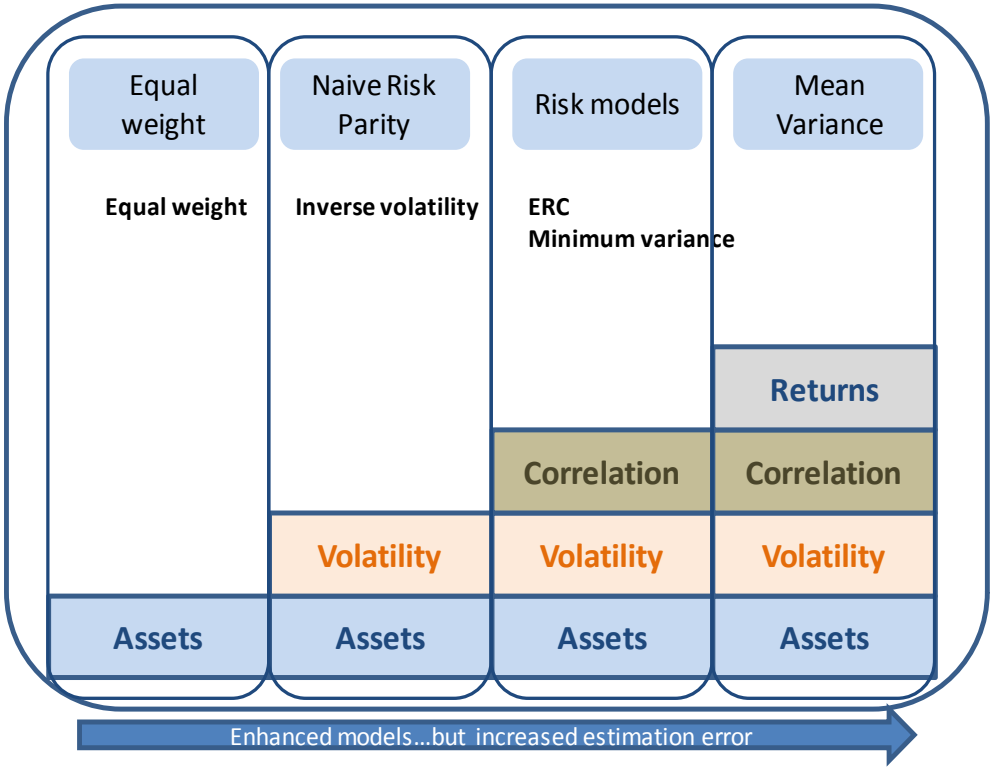
Source: SG Cross Asset Research

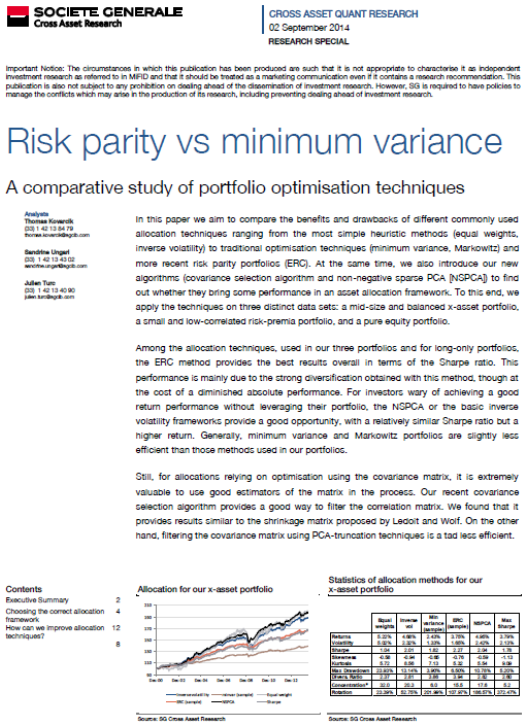
PORTFOLIO OPTIMISATION

Comparing filtering techniques

Thomas Kovarcik

RISK PARITY VS. MINIMUM VARIANCE: WHICH ONE TO CHOSE ?





SOCIETE GENERALE
Cross Asset Research

CROSS ASSET QUANT RESEARCH
02 September 2014
RESEARCH SPECIAL

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Risk parity vs minimum variance

A comparative study of portfolio optimisation techniques

Analysts
Thomas Kowalik
(33) 1 42 13 84 79
thomas.kowalik@sgcib.com

Sandrine Ungari
(33) 1 42 13 43 02
sandrine.ungari@sgcib.com

Julien Turc
(33) 1 42 13 40 90
julien.turc@sgcib.com

In this paper we aim to compare the benefits and drawbacks of different commonly used allocation techniques ranging from the most simple heuristic methods (equal weights, inverse volatility) to traditional optimisation techniques (minimum variance, Markowitz) and more recent risk parity portfolios (ERC). At the same time, we also introduce our new algorithms (covariance selection algorithm and non-negative sparse PCA [NSPCA]) to find out whether they bring some performance in an asset allocation framework. To this end, we apply the techniques on three distinct data sets: a mid-size and balanced x-asset portfolio, a small and low-correlated risk-premia portfolio, and a pure equity portfolio.

Among the allocation techniques, used in our three portfolios and for long-only portfolios, the ERC method provides the best results overall in terms of the Sharpe ratio. This performance is mainly due to the strong diversification obtained with this method, though at the cost of a diminished absolute performance. For investors wary of achieving a good return performance without leveraging their portfolio, the NSPCA or the basic inverse volatility frameworks provide a good opportunity, with a relatively similar Sharpe ratio but a higher return. Generally, minimum variance and Markowitz portfolios are slightly less efficient than those methods used in our portfolios.

Still, for allocations relying on optimisation using the covariance matrix, it is extremely valuable to use good estimators of the matrix in the process. Our recent covariance selection algorithm provides a good way to filter the correlation matrix. We found that it provides results similar to the shrinkage matrix proposed by Ledoit and Wolf. On the other hand, filtering the covariance matrix using PCA-truncation techniques is a tad less efficient.

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Allocation for our x-asset portfolio

Statistics of allocation methods for our x-asset portfolio

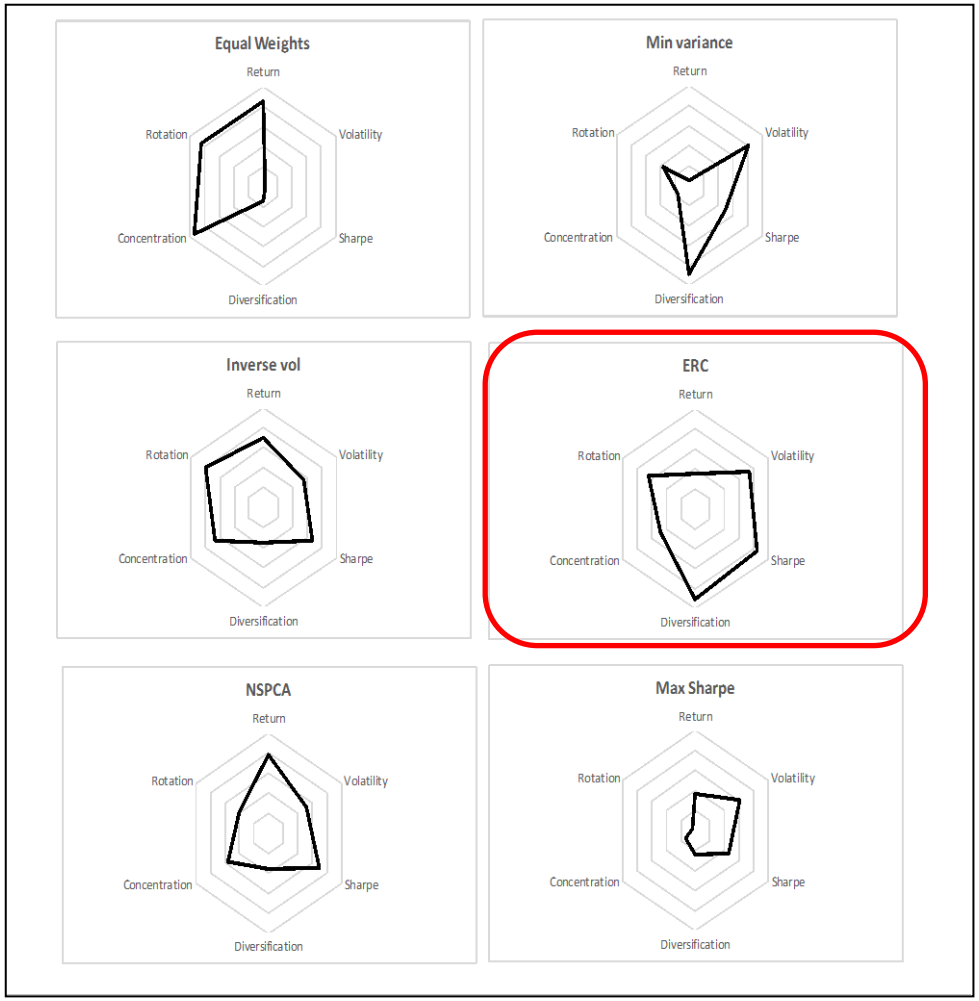
- **Comparison of allocation techniques:**
  - ranging from most simple heuristic methods (equal weights, inverse volatility)…
  - traditional optimisation techniques (minimum variance, Markowitz)…
  - To more recent risk parity portfolios (ERC)
  - and our latest non-negative sparse PCA (NSPCA).

- **We test the models on 3 data sets:**
  - **a x-asset portfolio**: 32 assets, 5 asset-classes, strong intra-correlation, low inter-correlation
  - **a risk-premia portfolio :** 10 almost uncorrelated strategies, two categories: hedging and income
  - **a pure equity portfolio:** larger portfolio, strong correlation

X-ASSET PORTFOLIO – COMPARING ALLOCATION TECHNIQUES

- **Allocation on a portfolio of 32 assets in 5 asset classes (equity, rates, credit, commodities, FX).**
- **ERC portfolio delivers the best Sharpe ratio (2.27) and is well diversified (DR=3.9). This performance comes at the cost of a diminished absolute performance (annualized return of 3.75%).**
- **NSPCA or inverse volatility are to be considered for investors seeking an enhanced return (4.9%) with a relatively similar Sharpe ratio (2) .**

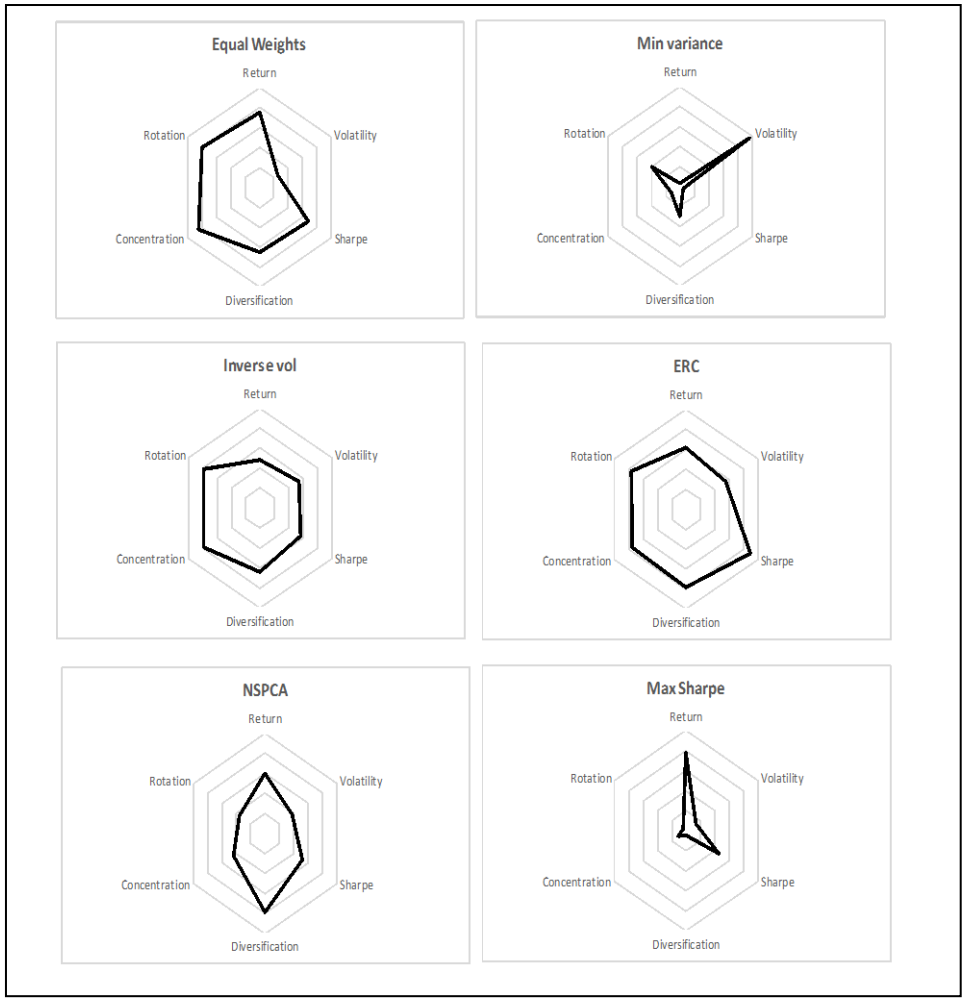
	Equal weights	Inverse vol	Min variance (sample)	ERC (sample)	NSPCA	Sharpe
avg	5.22%	4.68%	2.43%	3.75%	4.95%	3.79%
stdev	5.02%	2.32%	1.33%	1.65%	2.42%	2.13%
sharpe	1.04	2.01	1.82	2.27	2.04	1.78
skew	-0.58	-0.94	-0.65	-0.76	-0.59	-1.13
kurt	5.72	8.56	7.13	5.32	5.54	9.09
MDD	23.93%	13.14%	3.90%	6.50%	10.78%	5.20%
DR	2.37	2.81	3.86	3.94	2.82	2.60
rotation	23.39%	52.75%	201.99%	107.97%	186.57%	372.47%



EQUITY PORTFOLIO – COMPARING ALLOCATION TECHNIQUES

- **Allocation on a portfolio of 50 stocks chosen as the largest-caps in S&P 500.**
- **Differences between ERC, inverse vol, NSPCA and even equal weights are very slight.**
  - ERC slightly outperforms the equal weights with a Sharpe ratio of 0.61 but also a decrease in the max drawdown and a better diversification ratio.
  - NSPCA struggles to build stable synthetic factors: high turnover
  - The min variance portfolio based on the sample covariance matrix reduces considerably the volatility (from above 20% to 13.8%) but destroys the performance by more than half

	Equal weights	Inverse vol	Min variance (sample)	ERC (sample)	NSPCA
avg	12.03%	10.62%	6.89%	11.26%	11.19%
stdev	20.63%	18.54%	13.78%	18.40%	19.69%
sharpe	0.58	0.57	0.50	0.61	0.57
skew	0.05	0.12	0.46	0.15	0.30
kurt	11.08	11.83	18.07	12.61	14.85
MDD	52.66%	47.27%	37.77%	46.84%	43.28%
DR	1.66	1.65	1.57	1.69	1.70
rotation	42.53%	53.00%	258.20%	67.06%	279.37%

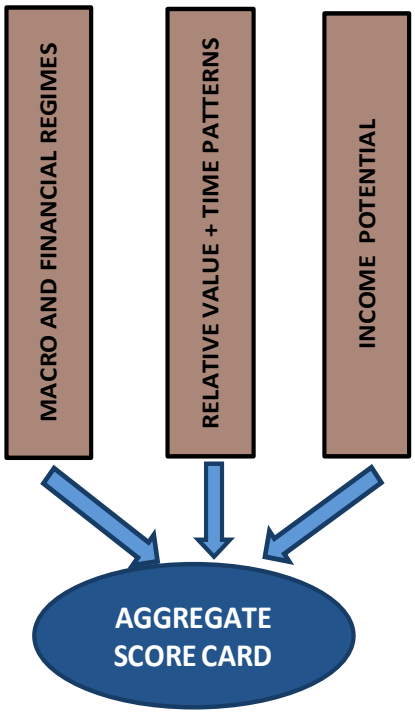


RISK PREMIA ROTATION

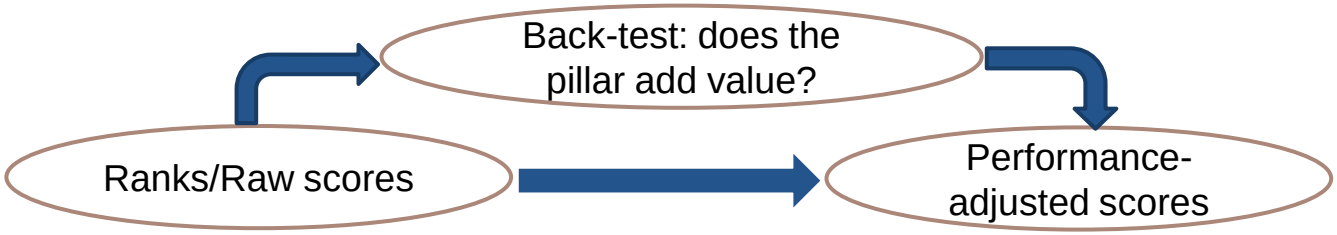
A sensible idea or a step too far?

Dobromir Tzotchev, Shivaram Ramegowda

INTRODUCING A RISK-PREMIA SCORECARD



- **Pillar 1: Macro-economic and financial market regimes:**
  - We identify the current **macro-economic and financial market regimes** using an econometric model.
  - Using historical data, we calculate **the expected impact** of the current regime on the performance of the risk-premia strategies
- **Pillar 2: Technical indicators**
  - **Time-series patterns- the trend-following** or **mean-reverting** nature of the strategies' returns
  - **Relative value** – the deviation of the strategies' returns from a model-based forecasted return
- **Pillar 3: Income-earning potential**
  - Relevant just for the income strategies
  - The size of the income (or carry, yield etc) that the strategy provide



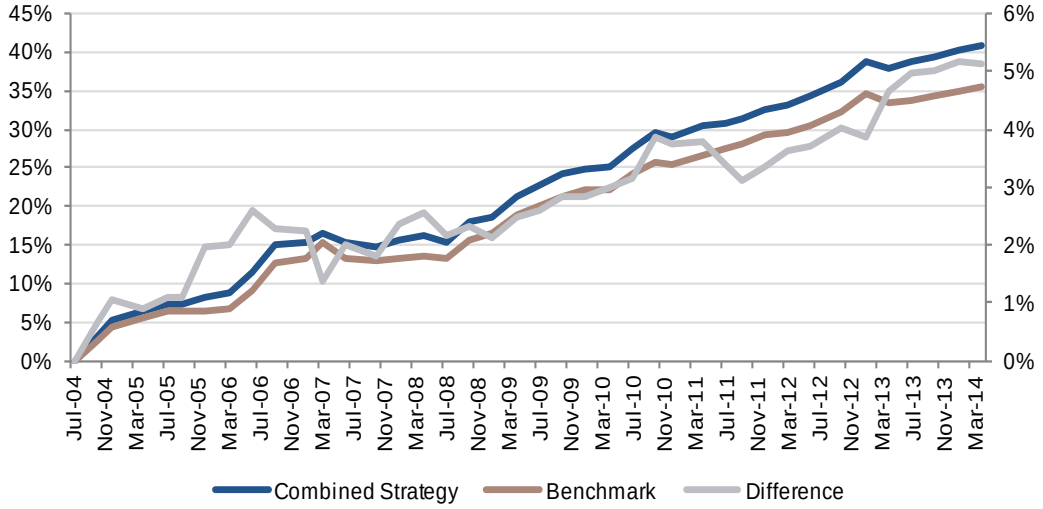
Source: SG Cross Asset Research

WHAT VALUE DOES THE SCORECARD APPROACH BRING?

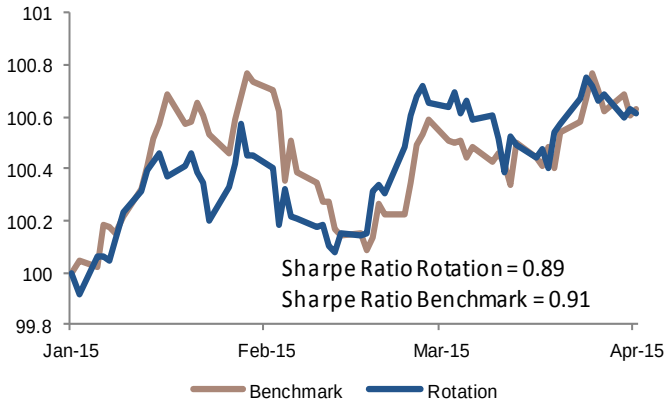
- **Over the approximately 10 years of backtest results, the aggregated scorecard improves performance by around 40bp annually**
  - and hence the proportional increase in the annualised return is approximately 10%.
- **The overall Sharpe ratio has been increased by around 0.2**
- **The maximum drawdown has been cut to 1.69% or just around 40% of the annualised return.**

	Benchmark strategy	Aggregated scorecard
Annualised return	3.59%	3.98%
Annualised volatilty	2.21%	2.21%
Sharpe ratio	1.62	1.80
Max. drawdown	2.2%	1.69%
Max. drawdown as % of avg return	61.8%	42.5%

In-sample performance

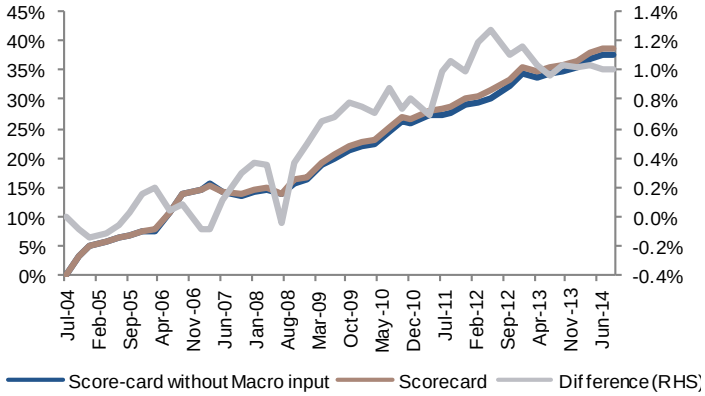


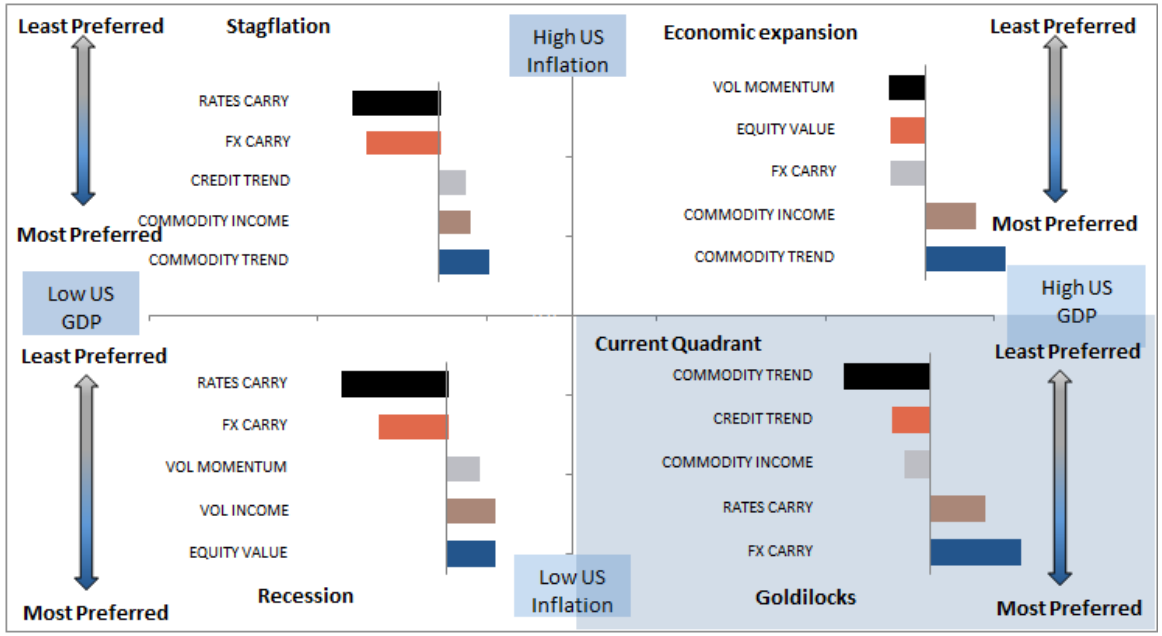
Out-of-sample performace - 2015



Source: SG Cross Asset Research

THE MACRO REGIME SCORECARD





Source: SG Cross Asset Research

RISK-PREMIA PERFORMANCE IN VARIOUS MACRO REGIMES

Performance in various regimes

Z-scores	States	Rates Carry	Equity Value	Commodities Income	FX Carry	Volatility Income	Rates Trend	Equity Quality	Credit Trend	Commodities futures curve	VIX futures curve
US GDP Growth	Low	---	++	++	---	++	+		+	++	
	High										
US Inflation	Low									-	+
	High					+		+		++	--
US unemployment Rate	Low	+	+	+		--			--		
	High	--	-	---	-	+++		+	++		
Change in US 10Y Rate	Low										
	High	---	+++	++				---	+++		++
US 10Y Rate	Low		-								
	High	+++	+++	-	++	+++	-		---		
US 10Y Real Yield	Low		--	+		-					
	High	+	+++	-		+++	++	--	-	++	+++
Equity Analysts' Upgrades/Downgrades	Low	+		--			+	-		--	--
	High	-	+	++			-	++		++	++
CitiSurprise G10 Index	Low	++	-	-		-	+	++			
	High	--	+	++		+	-	--			-
Eurozone GDP Growth	Low	---	++	+	---	+++		++		++	++
	High										
Eurozone Inflation	Low	-					-		-		
	High	++	++	++			+++		++	-	--
Eurozone Unemployment Rate	Low	+	++	+		-			-	+	+
	High	-	---	---	-	++			+	-	-
Change in EUR 10Y Rate	Low		+								+
	High	-	--	+		--		+		+	--
EUR 10Y Rate	Low										
	High										
EUR 10Y Real Yield	Low					-					
	High	---	+++	---	-	+++	-	--	--	+++	

Source: SG Cross Asset Research

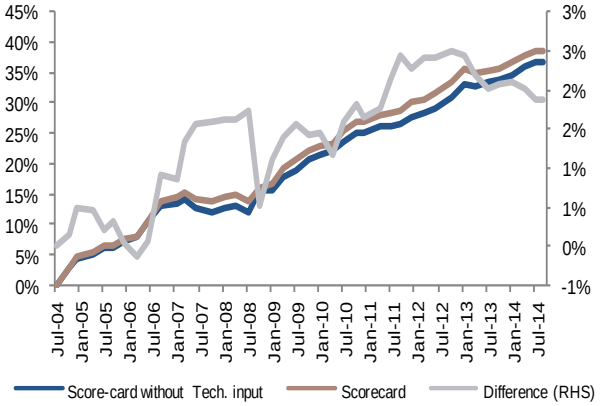
PERFORMANCE ANALYSIS

Results for performance impact of the various scorecard inputs

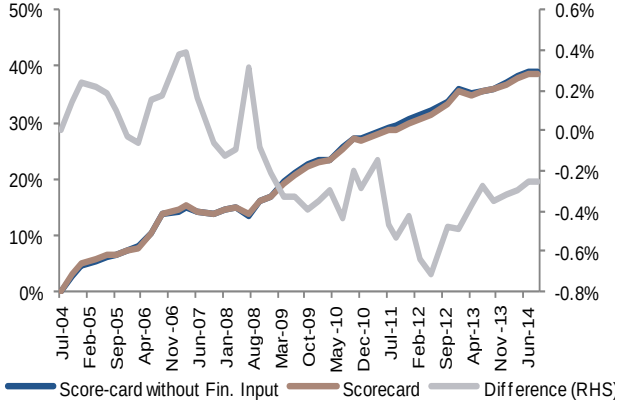
	Scorecard	Impact technicals input	Impact regimes input	Impact macro input	Impact financial input	Impact income-potential
Annualised return	3.79%	3.45% (▲0.33%)	3.56% (▲0.21%)	3.5% (▲0.28%)	3.87% (▼-0.08%)	3.55% (▲0.23%)
Sharpe ratio	1.83	1.72 (▲0.10)	1.78 (▲0.04)	1.74 (▲0.07)	1.86 (▼-0.03)	1.77 (▲0.05)
Max drawdown	1.63%	1.72% (▼-0.09%)	1.78% (▼0.16%)	2.09% (▼-0.47%)	1.19% (▲0.43%)	1.58% (▲0.037%)

Source: SG Cross Asset Research/Cross Asset Quant-

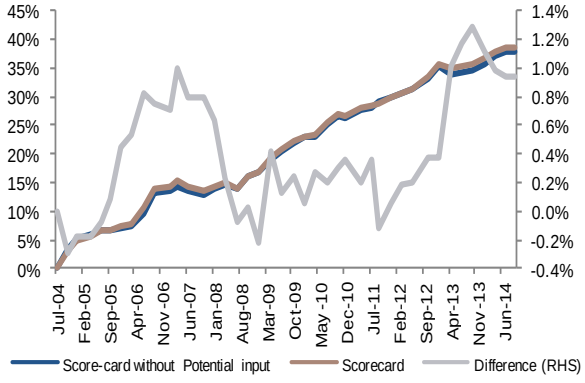
Relative value and time patterns



Market regimes



Income potential



Source: SG Cross Asset Research

INTRODUCING OUR CREDIT MOMENTUM STRATEGY

Harvesting credit momentum

Raphael Dando

FINDING THE RIGHT SOLUTIONS

Market patterns	Solutions
Fast changing market	Reactive signal
Strong movements	Binary trading
Periods of oscillation	Filtering
Regime switching	Adaptive mechanism

Solutions

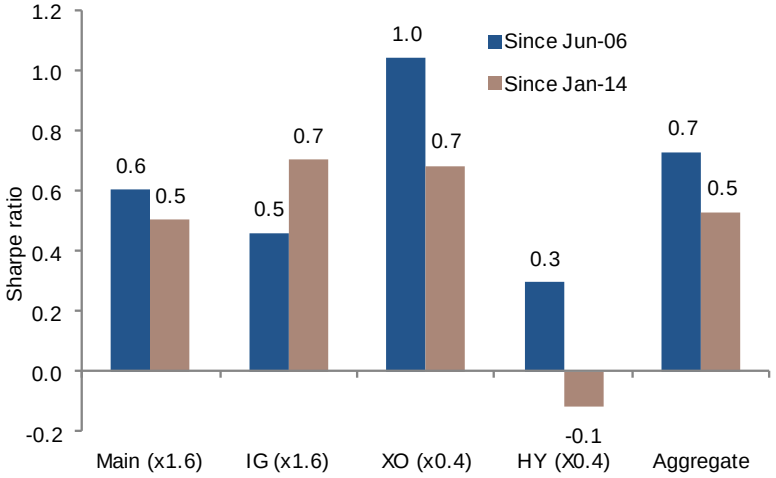
Source: SG Cross Asset Research

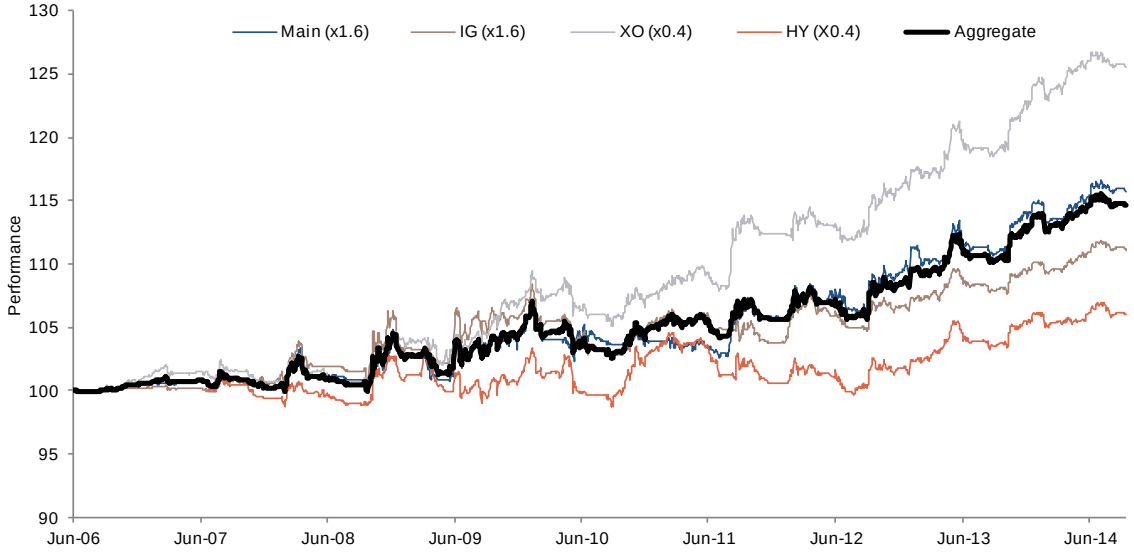
THE STRATEGY - DESCRIPTION

- **The trend signal is based on regression lines applied to total return time series**
  - More reactive than moving averages
- **Only significant signals are kept by comparing the beta of the regression with its 2-month standard deviation**
  - Upward signal: +1 if beta > 1.5 x Stdev
  - Downward signal: -1 if beta < -1.5 x Stdev
  - Neutral signal: 0 otherwise
- **25 "sub-strategies" are run:**
  - Five different time windows to calculate Exponential Weighted Moving Average (EWMA) of the total returns and smooth the time series: 1, 5, 10, 20 and 40 days
  - Five different time periods to estimate the historical regression slopes on the total returns: 20, 25, 30, 35 and 40 days
  - 1/5 of the exposure is rolled on a daily basis
- **The final trend signal is a weighted average of the signals of the 25 "sub-strategies"**
  - For each "sub-strategy" the weight is based on its 1Y historical Sharpe ratio
  - Gives more weight if the strategy performed well
- **A volatility target mechanism is used**
  - It increases the exposure of the strategy when the short-term volatility (20 days) is below the long-term one (1 year)
  - It decreases the exposure when the short-term volatility is higher than the long-term volatility

FINAL PERFORMANCE

- **The strategy is run on four credit indices**
  - iTraxx Main, iTraxx X-Over, CDX IG, CDX HY
  - Aggregate strategy: 0.4*Main + 0.4*IG + 0.1*XO+0.1*HY
- **Simulated performance is strong and persistent, starting in 2006**
- **Performance is positive on all indices**
- **Aggregate Sharpe ratio is 0.7**





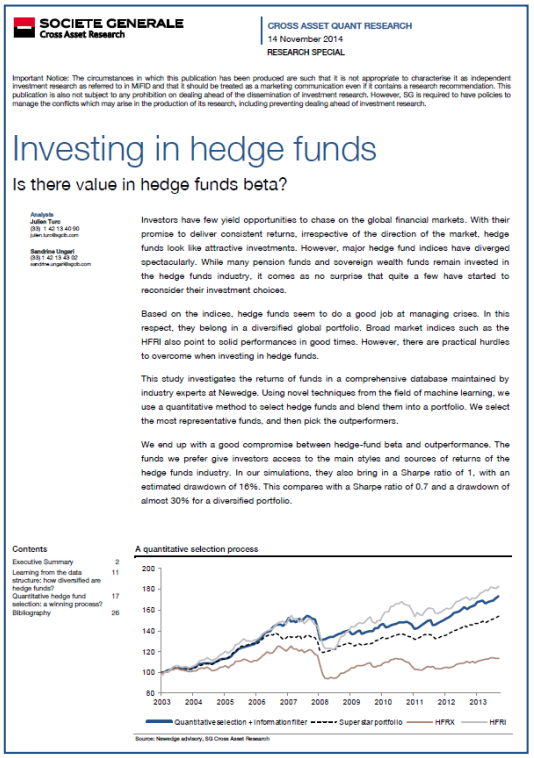
Source: SG Cross Asset Research/Cross Asset Quant, 17/09/14

IDENTIFYING FACTORS INHEDGE FUNDS

Sandrine Ungari

A TALE OF TWO INDICES

- **The two major hedge funds indices have diverged spectacularly**



SOCIETE GENERALE
Cross Asset Research

CROSS ASSET QUANT RESEARCH
14 November 2014
RESEARCH SPECIAL

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Investing in hedge funds

Is there value in hedge funds beta?

Analysts
Julien Turc
(33) 1 42 13 40 90
julien.turc@sgcib.com

Sandrine Ungari
(33) 1 42 13 49 02
sandrine.ungari@sgcib.com

Investors have few yield opportunities to chase on the global financial markets. With their promise to deliver consistent returns, irrespective of the direction of the market, hedge funds look like attractive investments. However, major hedge fund indices have diverged spectacularly. While many pension funds and sovereign wealth funds remain invested in the hedge funds industry, it comes as no surprise that quite a few have started to reconsider their investment choices.

Based on the indices, hedge funds seem to do a good job at managing crises. In this respect, they belong in a diversified global portfolio. Broad market indices such as the HFRI also point to solid performances in good times. However, there are practical hurdles to overcome when investing in hedge funds.

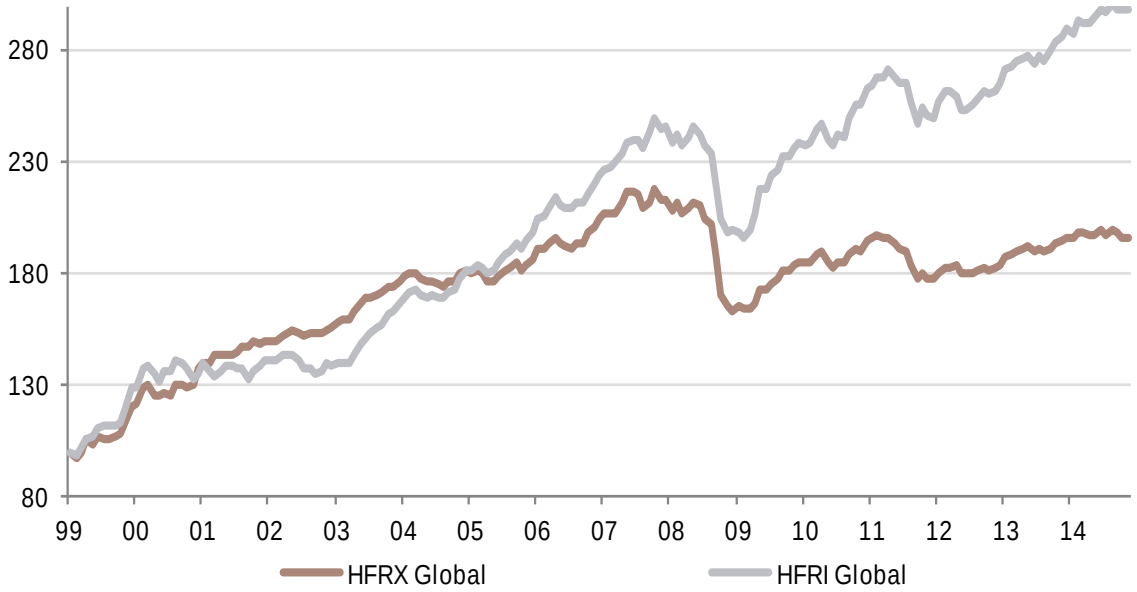
This study investigates the returns of funds in a comprehensive database maintained by industry experts at Newedge. Using novel techniques from the field of machine learning, we use a quantitative method to select hedge funds and blend them into a portfolio. We select the most representative funds, and then pick the outperformers.

We end up with a good compromise between hedge-fund beta and outperformance. The funds we prefer give investors access to the main styles and sources of returns of the hedge funds industry. In our simulations, they also bring in a Sharpe ratio of 1, with an estimated drawdown of 16%. This compares with a Sharpe ratio of 0.7 and a drawdown of almost 30% for a diversified portfolio.

Contents

A quantitative selection process

Source: Newedge advisory, SG Cross Asset Research

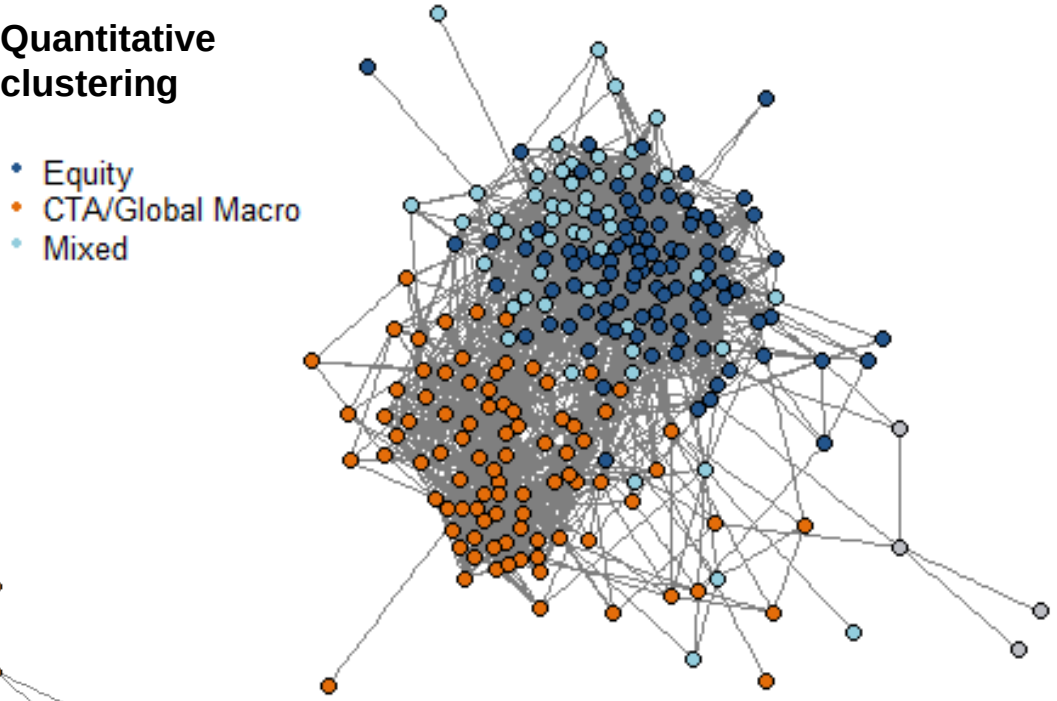


Source: HFR, SG cross-asset research

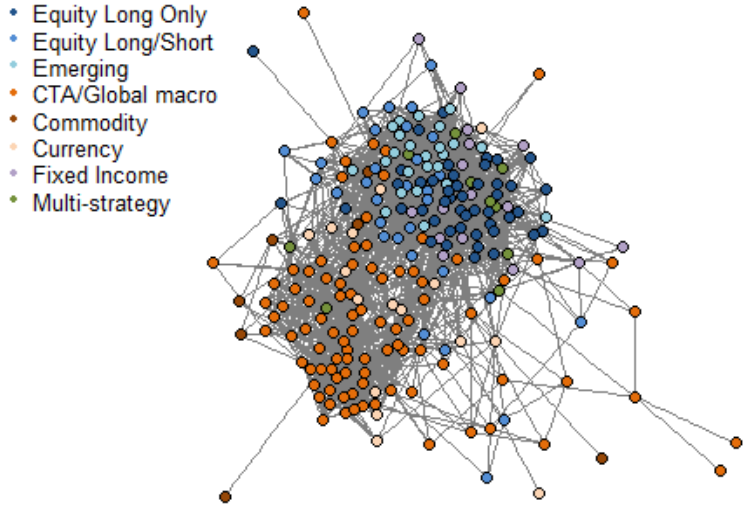
THERE ARE DATABASES, AND THERE ARE DATABASES…

- **We have worked with the Newedge Advisory group, which has long-standing experience in monitoring and investigating the performance of hedge funds.**
- **Most funds tend to cluster into three main groups.**

Quantitative clustering



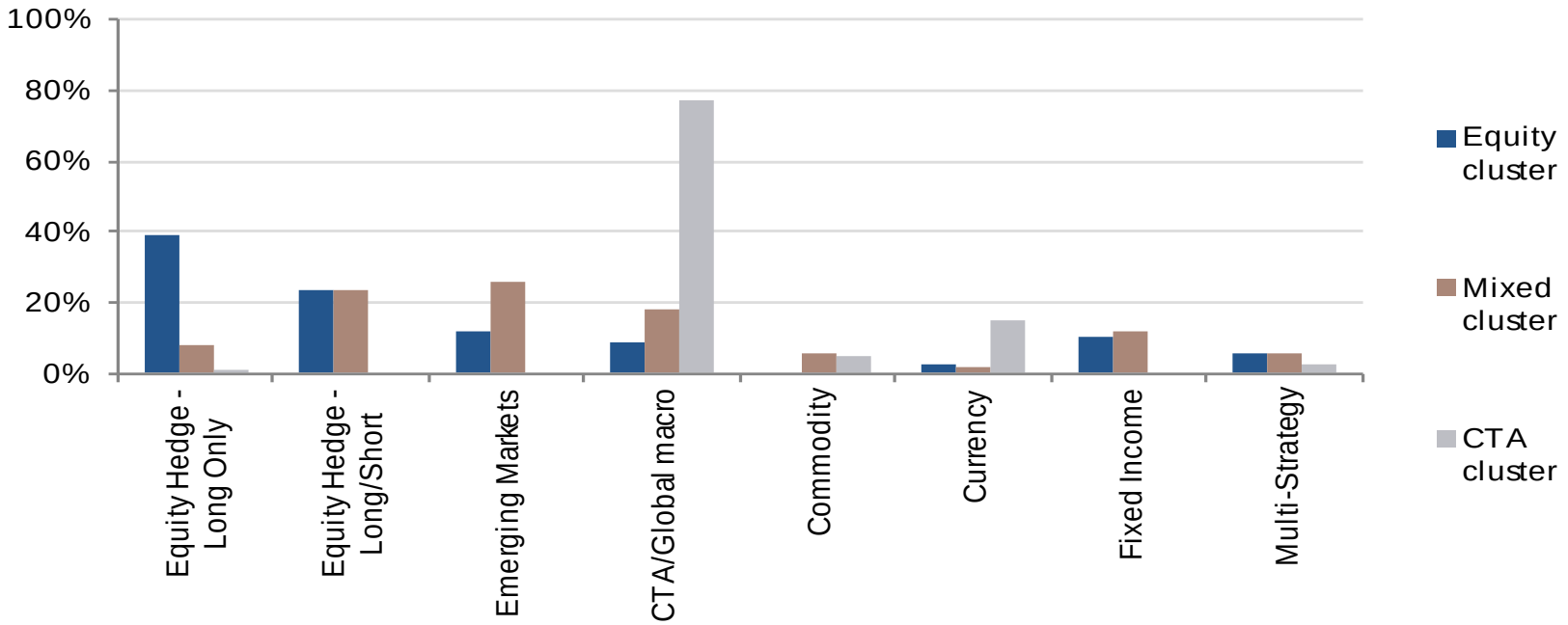
Newedge classification



Source: Newedge advisory, SG cross-asset research

IDENTIFYING CLUSTERS IN HEDGE FUNDS

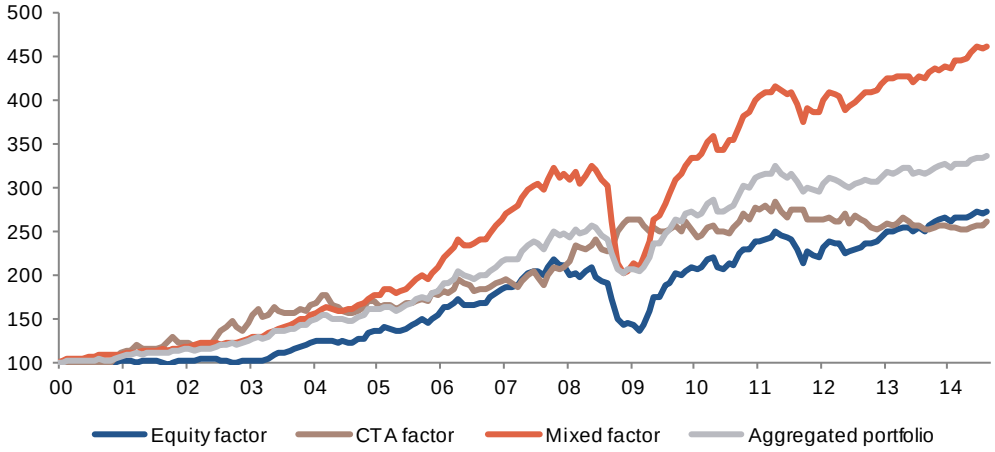
- **The vast majority of equity long-only funds fall into the equity cluster, whilst CTA funds fall into the CTA cluster.**
- **Equity long/short and fixed income funds may fall into either the equity or the mixed cluster.**

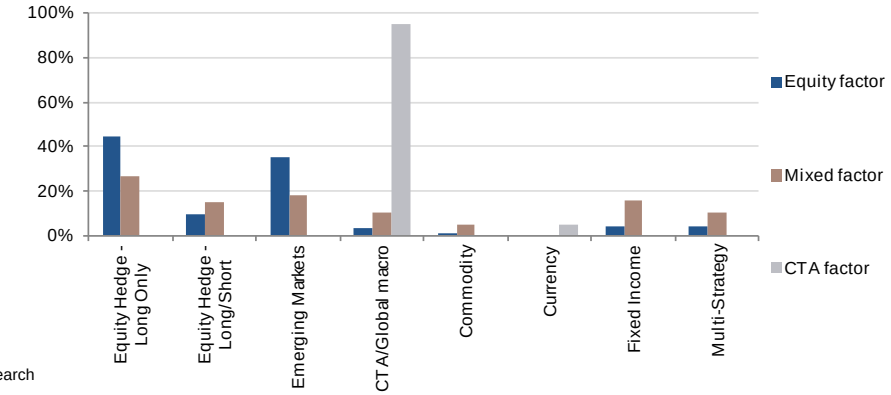


Source: Newedge advisory, SG cross-asset research

REPLICATING THE MAIN GROUPS OF FUNDS

- **With non-negative sparse PCA, the main portfolios are long-only and are invested in a limited number of funds. So, NSPCA looks very much like PCA made simple and investable.**
- **NSPCA gives us yet another way to identify the main groups of funds.**

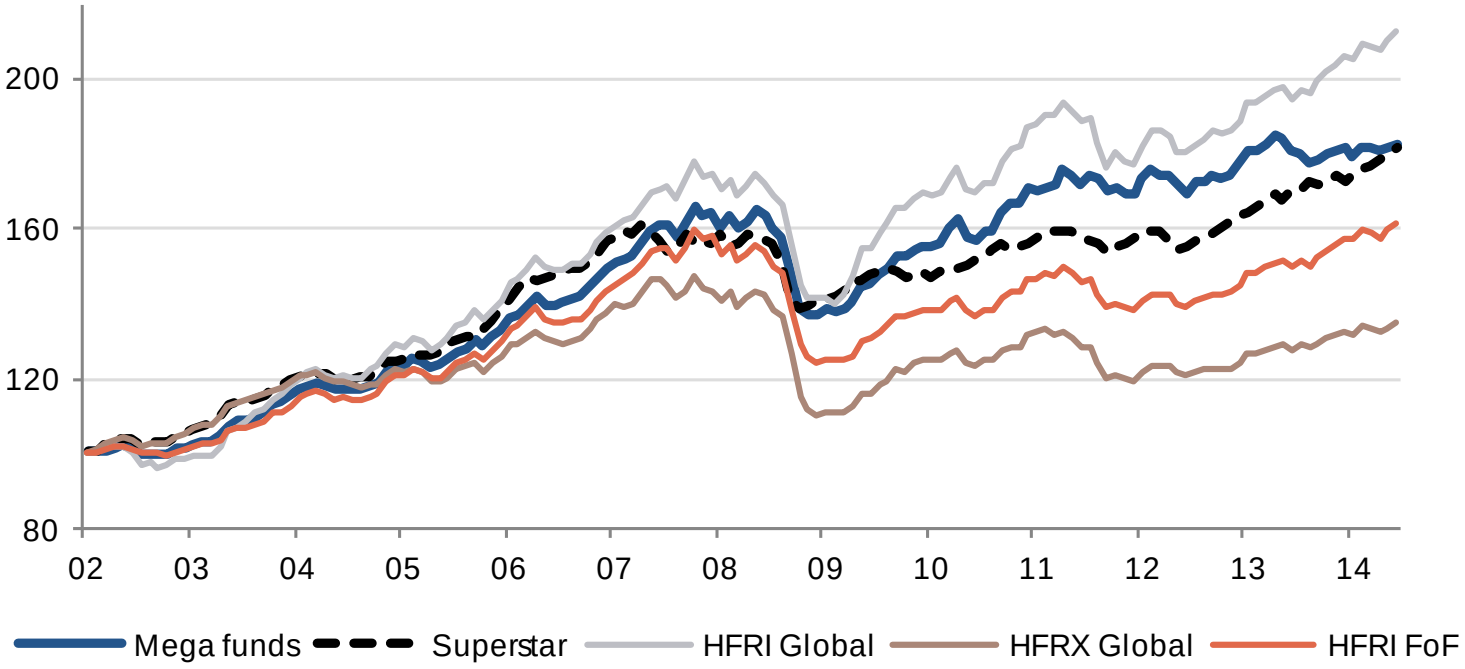




Source: Newedge advisory, SG cross-asset research

HOW TO CHOOSE THE RIGHT HEDGE FUNDS

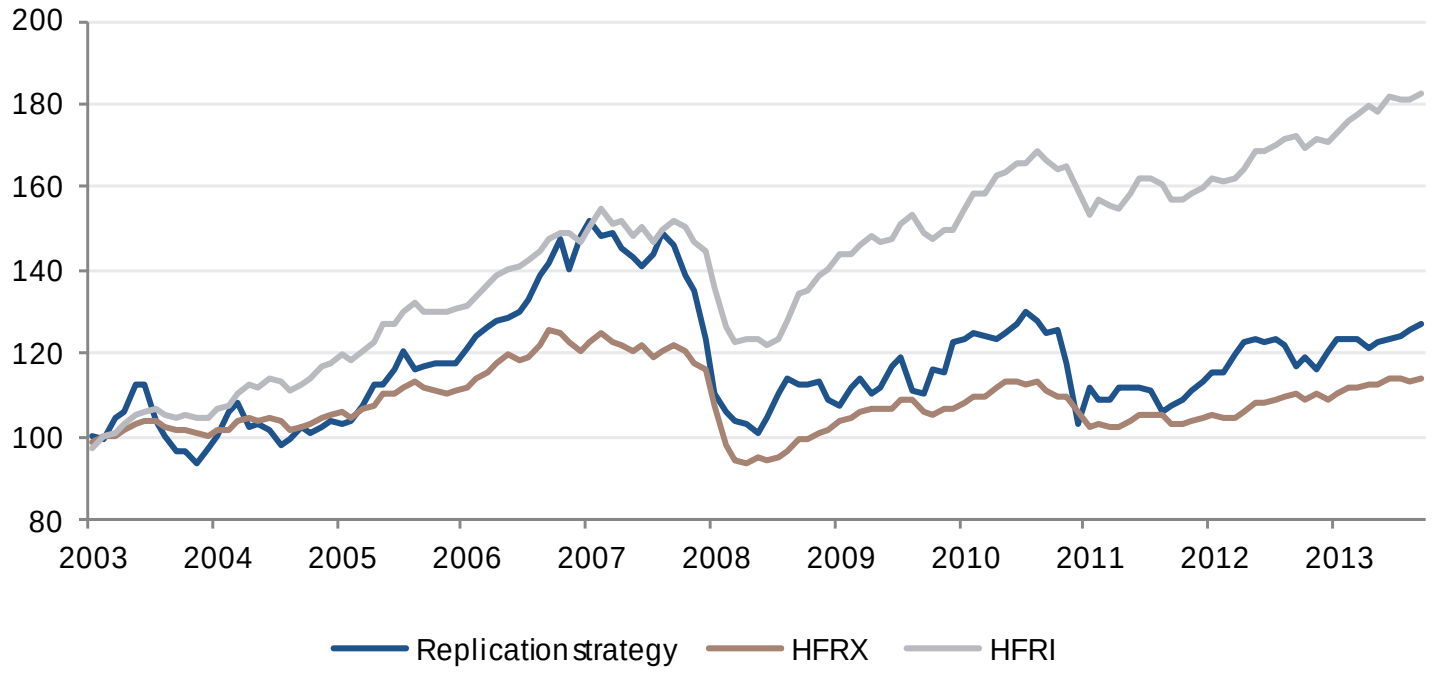
- **How to best select hedge funds has been the subject of intense debate.**
  - One way is to look at correlations.
  - Another approach consists in picking funds that meet certain criteria, like size or past performance.



Source: HFR, Newedge advisory, SG cross-asset research

REPLICATING A HEDGE FUND UNIVERSE

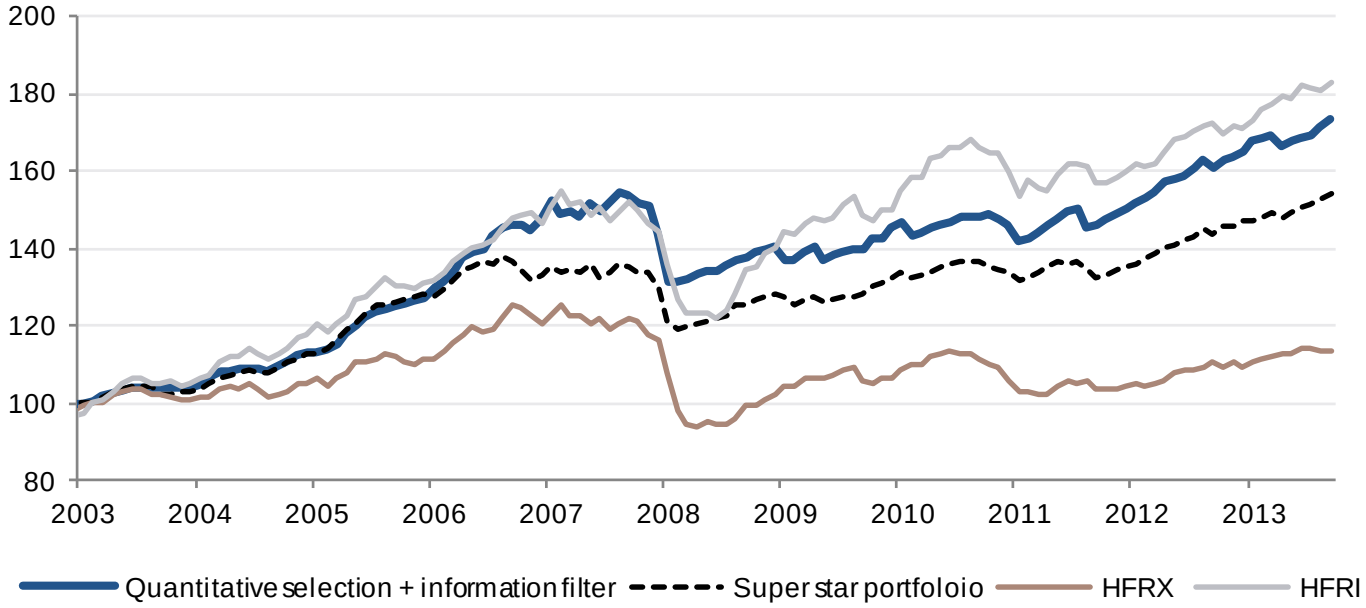
- **As a first step, we use our analysis of clusters and correlations to build a portfolio that best replicates the investment universe.**



Source: HFR, Newedge advisory, SG cross-asset research

A QUANTITATIVE SELECTION PROCESS

- **In a second step, we add a number of information filters to the strategy.**
- **Our quantitative strategy is a combination of superstars and replication. It benefits from the best of these two investment styles.**



	Quantitative strategy	Superstars	HFRX	HFRI	Diverdified potfolio
Return (p.a.)	5.1%	4.2%	1.5%	6.1%	6.5%
stdev	5.0%	4.0%	5.8%	6.3%	9.0%
Sharpe ratio	1.03	1.04	0.25	0.97	0.72
Max Drawdown	16%	14%	25.1%	21.4%	29%
MDD/vol	3.1	3.4	4.3	3.4	3.2

Source: HFR, Newedge advisory, SG cross-asset research

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