The substance in styles

Looking at alternative return sources in fixed income and equities

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Identifying risk premia in fixed income markets

Investment styles in fixed-income are not new

Asset managers often position based on themes…

Global asset allocation

| Asset class	Theme	Investment opportunity
Interest rates	Depressed yield levels	Short global government bond markets
Currencies	Low rates, deficit concerns	Short US$
Commodities	Falling gold	Short gold
Corporate credit	Global slowdown, rising risk aversion	Short credit markets
Interest rate volatility	High implied volatility	Sell swaption straddles

Source: Nomura Research.

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Global asset allocation

Asset class	Theme	Investment opportunity	Investment style
Interest rates	Depressed yield levels	Short global government bond markets	*Value*
Currencies	Low rates, deficit concerns	Short US$	*Carry, Macro Momentum*
Commodities	Falling gold	Short gold	*Price Momentum*
Corporate credit	Rising risk aversion	Short credit markets	*Macro Momentum*
Interest rate volatility	High implied volatility	Sell swaption straddles	*Volatility selling*

Investors can formalise this linkage across fixed income

Investment styles *across* asset classes

Interest rates
Currencies
Commodities
Credit
Emerging Markets (FI)

Price Momentum
Persistence in asset returns

Macro Momentum
Persistence in macro/corporate fundamentals

Carry
Higher yielding assets tend to outperform

Value
Assets below "fair value" tend to outperform

Volatility Selling
Option sellers tend to earn "insurance" premia

Source: Nomura Research. List of styles not exhaustive.

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Recent long-only performance is better than equities, maybe leading to complacency

Recent long-only experience of equities vs. bonds

Defining investment styles in fixed income
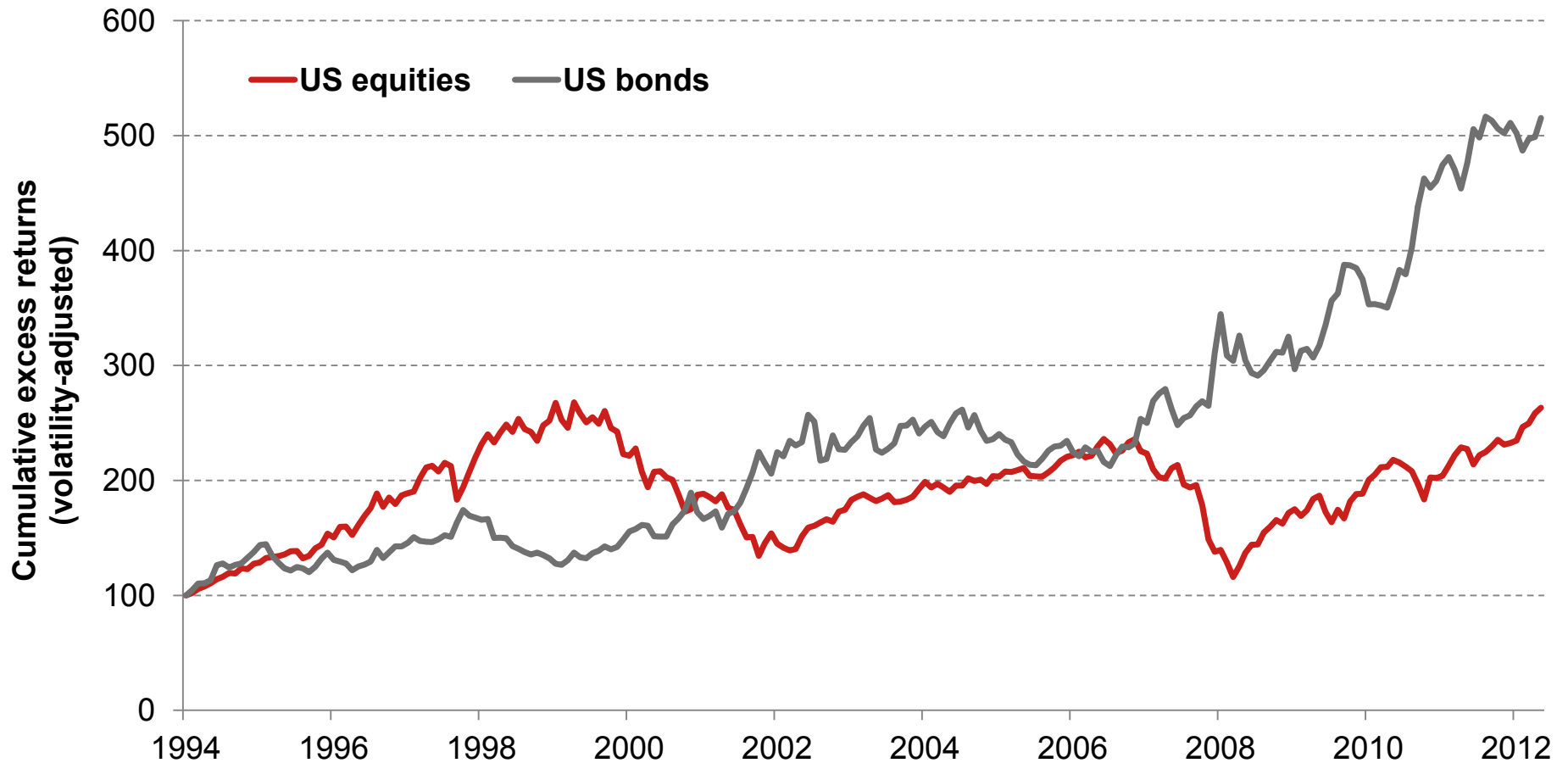
Defining investment styles

Styles are a way of understanding and systematising good practices, not something new

- **Price momentum**

  – Long assets with strong returns and short those with weak returns

- **Macro momentum**

  – Long risky assets given economic strength and short risky ones given economic weakness

- **Carry**

  – Rates: Long duration when yield curves are steep

  – Credit: Long corporate credit in benign risk environments

  – Currencies (G10, EM): Long currencies with high interest rates against those with low interest rates

  – Commodities: Long more backwardated commodities

- **Value**

  – Long assets significantly below fair value and short those above

  – Essentially a mean-reversion, "rich-cheap" trade

- **Volatility**

  – Short implied volatility in rates (selling delta-hedged swaption straddles) and FX markets (selling delta-hedged straddles)

Cross-sectional vs. time-series

Cross-sectional approached developed for equities, may not be suitable in fixed income

Cross-sectional approach

- **Relative to its peers** within the asset class

- **Highly sensitive** to the universe of assets

- **Constrained** to be long and short equal notionals

- Approach **more suited for equities**

  - **Large number** of individual stocks available

  - Stocks tend to have **similar volatilities**. Any volatility differences further become muted due to averaging across a large number of stocks

  - **Liquidity** of individual stocks are **similar**

  - **High cross-sectional dispersion** of the ranked metric

Time-series approach

- **Relative to its own past**

- **Independent** of the universe of assets

- **No constraint** of equal long and short notionals

- Approach **more suited for fixed income**

  - **Number** of tradeable assets is significantly **lower**.

  - **Large differences in volatilities** between assets e.g. UST vs. JGB post 1995, natural gas vs. gold

  - **Liquidity** of fixed income assets **differs** e.g. WTI vs. Live Cattle, UST vs. AUD 10yr

  - **Lower cross-sectional dispersion** of the ranked metric e.g. in G4 rate markets, with all short rates close to zero, all markets look similar on metrics like carry

Why bother with investment styles?

1 Performance

Eurostoxx and Nikkei – the same downward trend

Nikkei 225 — Eurostoxx 50

Cumulative excess returns
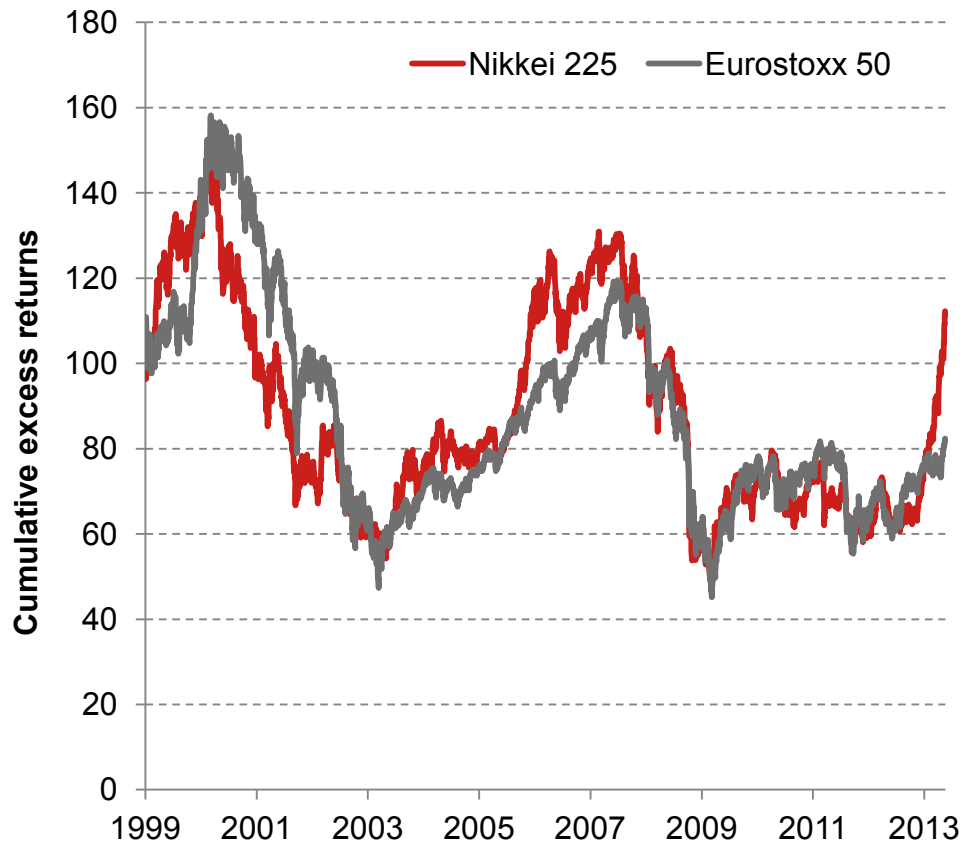
Stripped of duration, credit returns are close to zero

US Corporates - Total Return

US Corporates - Excess Return over Government Bonds

Cumulative excess returns

Source: Bloomberg, Nomura Research
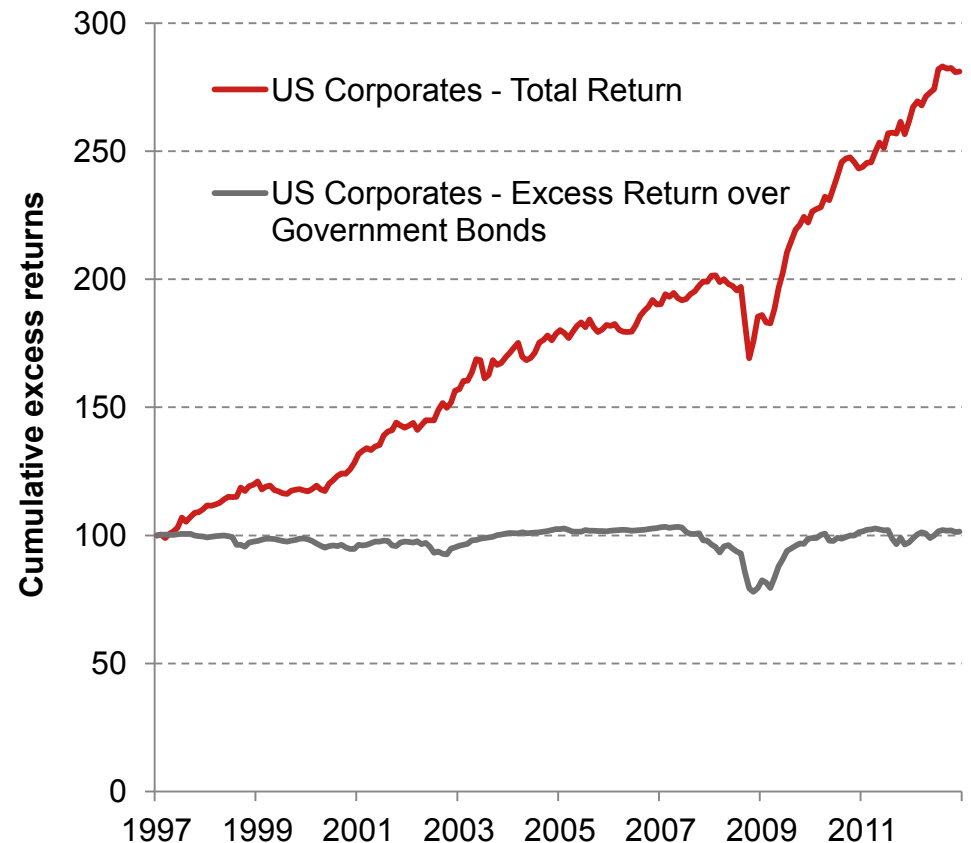
Long-only returns can depend on where you start

The rates super cycle – past performance is not indicative of future returns

Long-only bond indices start here

Excess returns (LHS) — US 10Y Yield (RHS)
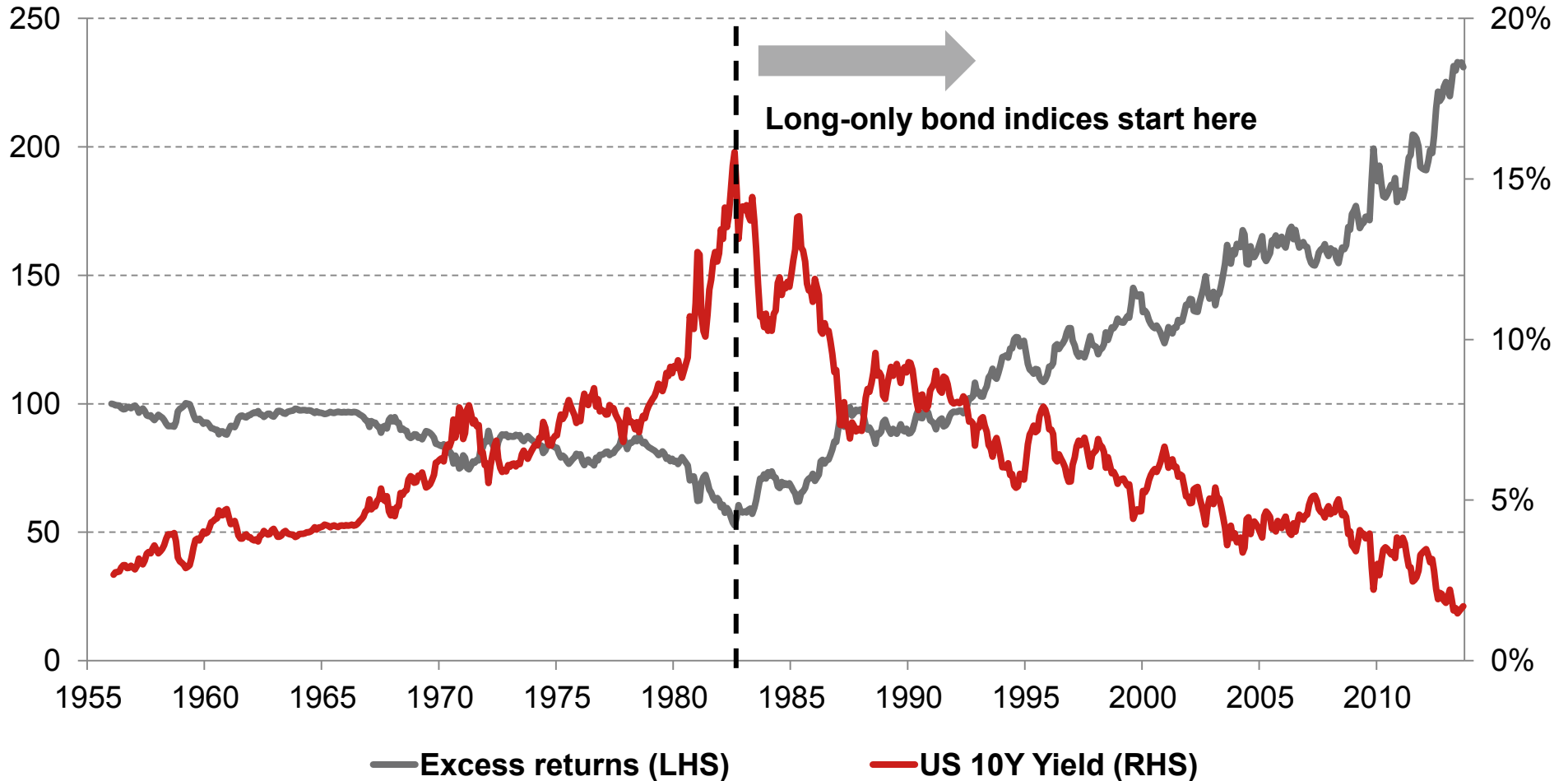
All styles are unconditionally strong in fixed income

Performance of style portfolios: 1974–2012

	Price momentum	Macro momentum	Carry	Value	Vol Selling[2]
1974–2012					
Average excess returns (p.a., %)	10.14	6.36	8.72	4.31	8.43
Annualised information ratio	**1.39**	**0.89**	**1.18**	**0.61**	**1.31**
Skew	0.29	0.59	0.29	-0.02	-0.90
Hit ratio[1]	65%	62%	66%	57%	66%
1990–2012					
Average excess returns (p.a., %)	9.11	7.83	9.65	6.17	8.43
Annualised information ratio	**1.25**	**1.06**	**1.31**	**0.84**	**1.31**
Skew	0.54	1.00	-0.20	0.05	-0.90
Hit ratio[1]	62%	63%	68%	60%	66%

Source: Nomura Research.
Note: All performance numbers are for volatility-adjusted investment strategies and are before transactions costs.
1. Hit ratio is defined as the proportion of months with strictly positive excess returns.
2. Vol selling results from June 1994

Performance is relatively stable across different regimes

Annualised information ratios of style portfolios

1974–2012		Price momentum	Macro momentum	Carry	Value	Volatility Selling
Full sample unconditional		**1.39**	**0.89**	**1.18**	**0.61**	1.31
Expansion periods		**1.51**	**0.92**	**1.15**	**0.57**	**1.36**
	Early expansions	1.39	0.77	1.34	0.71	1.72
	Late expansions	1.65	1.10	0.93	0.39	0.94
Recession periods		**0.95**	**0.95**	**1.30**	**0.85**	**1.33**
	Early recessions	0.86	0.97	1.22	1.50	0.22
	Late recessions	1.03	0.92	1.50	0.27	3.42

Styles are complementary

Style portfolios in periods of high vs. low risk aversion regimes

1974–2011		Price momentum	Macro momentum	Carry	Value	Vol Selling
Falling risk aversion	Average quarterly excess return (bp)	67	29	85	46	62
	Annualised information ratio	1.15	0.57	1.51	0.85	1.35
Rising risk aversion	Average quarterly excess return (bp)	109	108	59	34	26
	Annualised information ratio	1.45	1.37	0.84	0.51	0.62

Style performance is robust to rising and falling rates

A balance of long/short styles in rates has delivered robust performance[1]
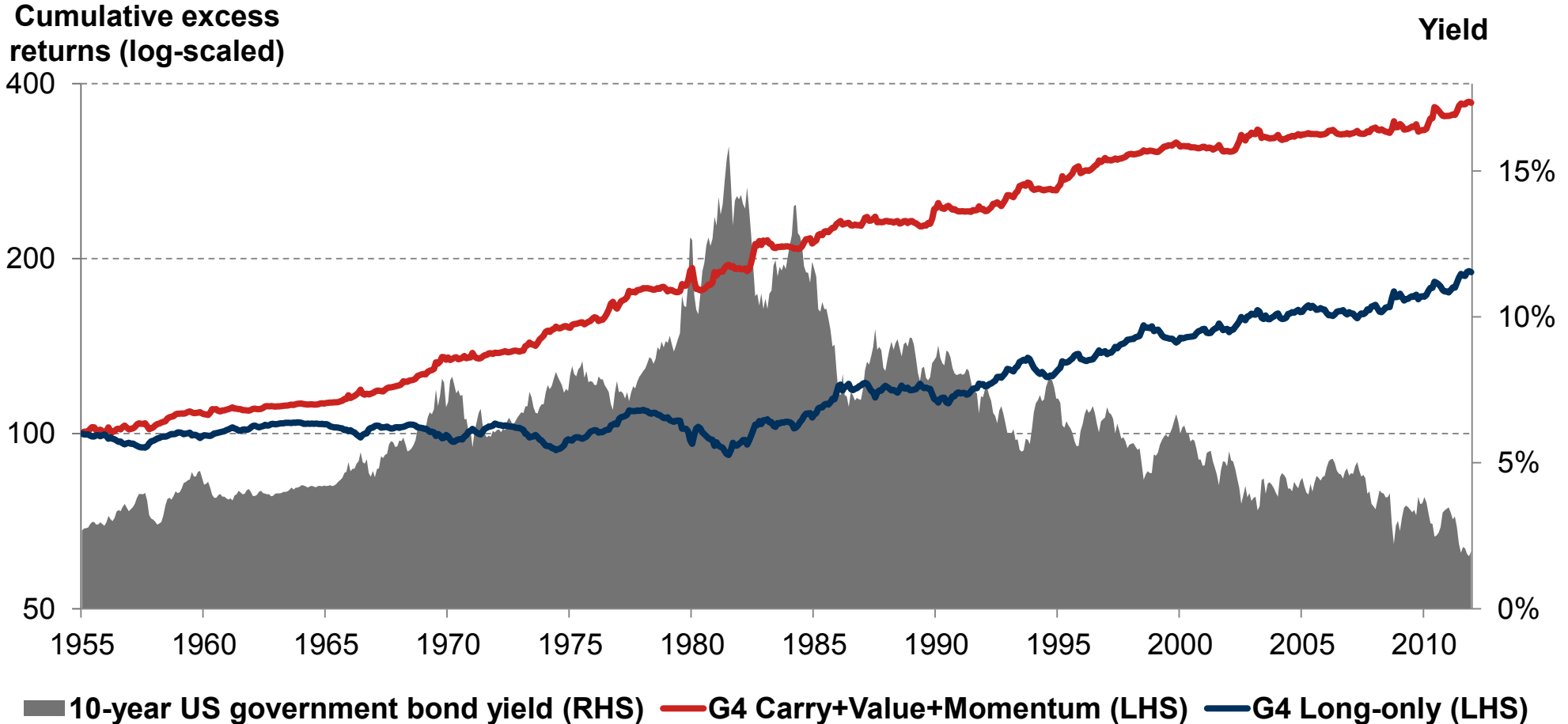
Cumulative excess returns (log-scaled)

Yield

Legend:
- **10-year US government bond yield (RHS)**
- **G4 Carry+Value+Momentum (LHS)**
- **G4 Long-only (LHS)**

Why bother with investment styles?

 # 2 Diversification

Asset classes become highly correlated during times of crises

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During crashes risk-assets tend to move together

Legend:
- Risk-off
- FX G10 Carry
- Rates
- FX EM Carry
- Credit
- Commodities
- Equities

Y-axis: Cumulative excess returns (log-scaled) — 50, 100, 200, 400, 800, 1600

X-axis: 1974, 1979, 1984, 1989, 1994, 1999, 2004, 2009
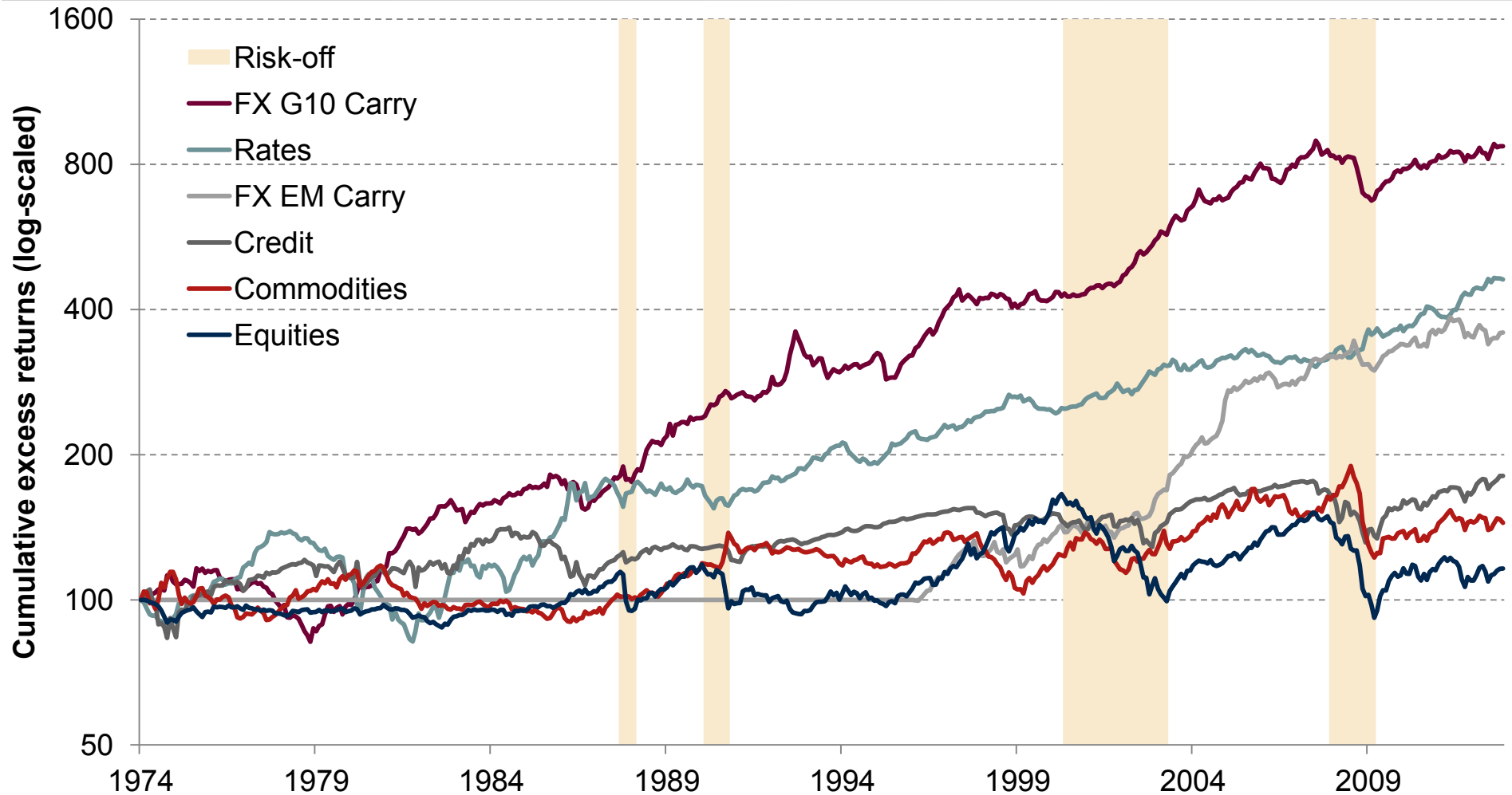
Sources: Bloomberg, Nomura Research. Risk-off periods have been defined as times of sustained market stress where global equities underperformed by 15% or more over a six-month period.

Bear market overlap can show what correlations often hide

Bear market overlap and correlations of different fixed income asset classes with MSCI World

■ Bear Market Overlap (-15%)   ■ Correlation

Bear-market overlap is defined as MSCI World and the fixed income asset class experiencing a 15% draw down from the most recent peak during the same month after volatility scaling each asset class to 15% annual volatility.
Source: Bloomberg. Nomura research
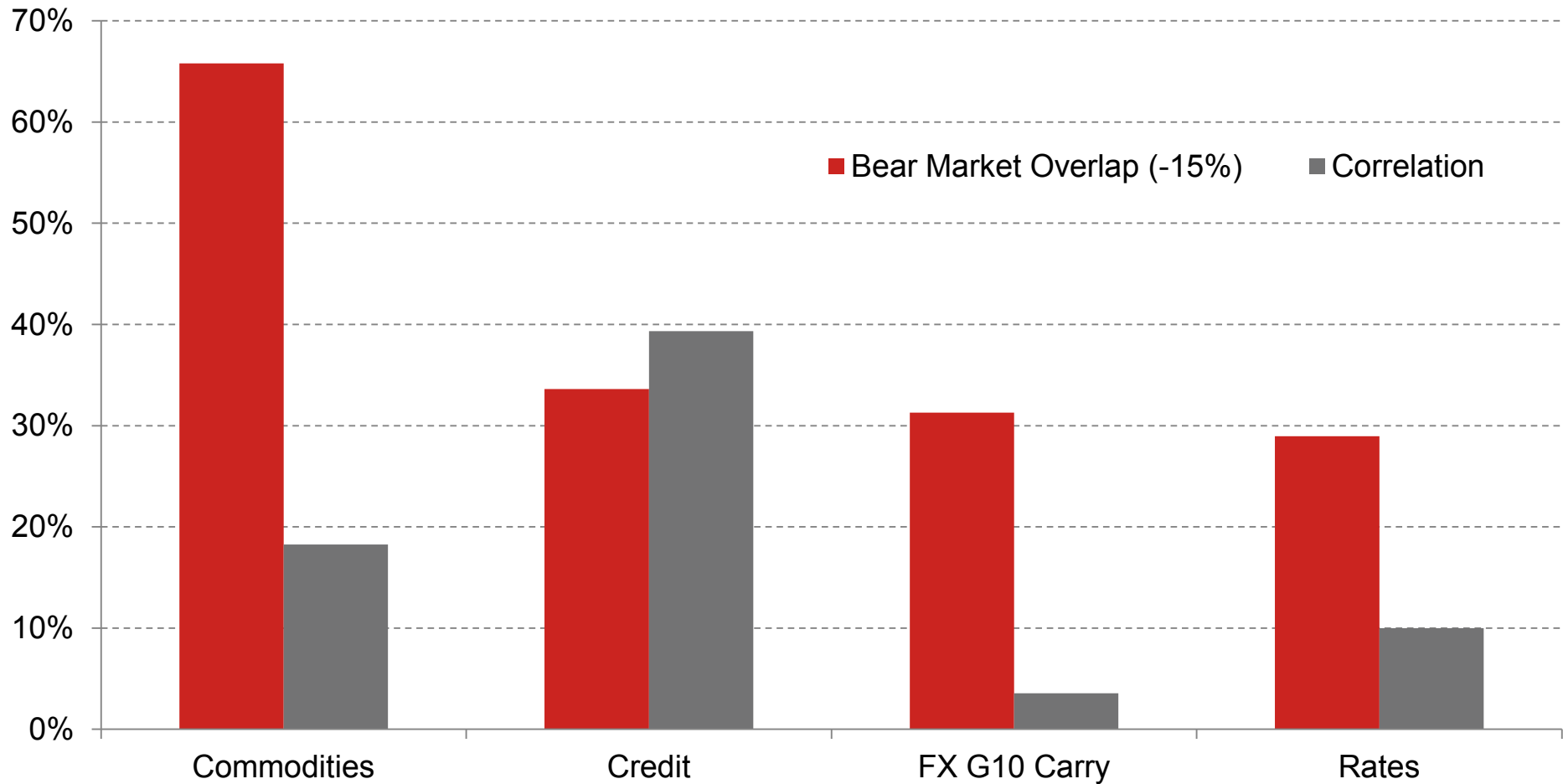
Styles offer diversification even during crisis...

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Asset correlations increase during times of market stress

Legend: Non-crisis, Crisis

Categories: Eq/Cmd, Eq/Credit, Eq/FX Carry, Credit/Cmd, Credit/FX Carry, FX Carry/Cmd, Cmd/Rates, Eq/Rates, Credit/Rates, FX Carry/Rates
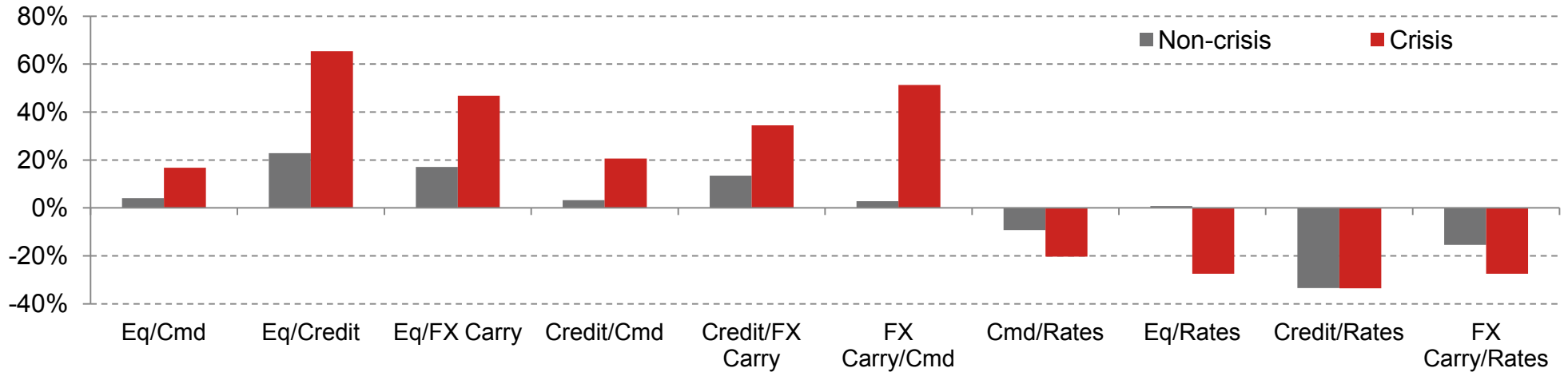
Style correlations generally decrease during times of market stress

Legend: Non-crisis, Crisis

Categories: Mmtm/Carry, Mmtm/Value, Mmtm/Macro, Carry/Value, Carry/Macro, Value/Macro, Vol/Mmtm, Vol/Macro, Vol/Carry, Vol/Value

Asset classes sell-off together in times of crises

Legend: ■ Non-crisis periods ■ Crisis periods

X-axis: Commodities, G10 FX, EM FX, Credit, Equities, Rates
Y-axis: Sharpe ratio (-4 to 3)
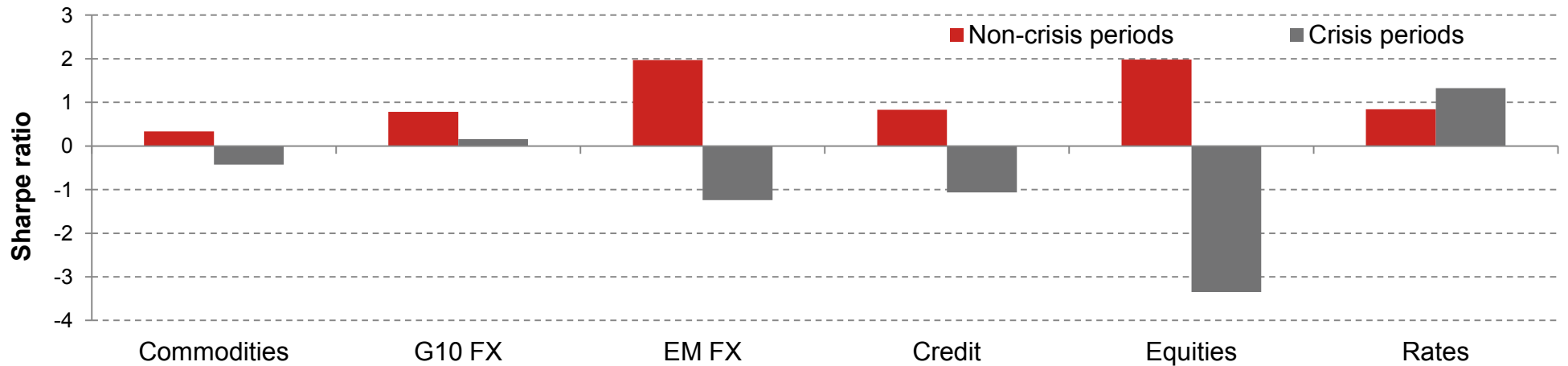
Styles performance remains robust across regimes

Legend: ■ Non-Crisis periods ■ Crisis periods

X-axis: Momentum, Carry, Value, Macro, Vol
Y-axis: Sharpe ratio (-4 to 3)
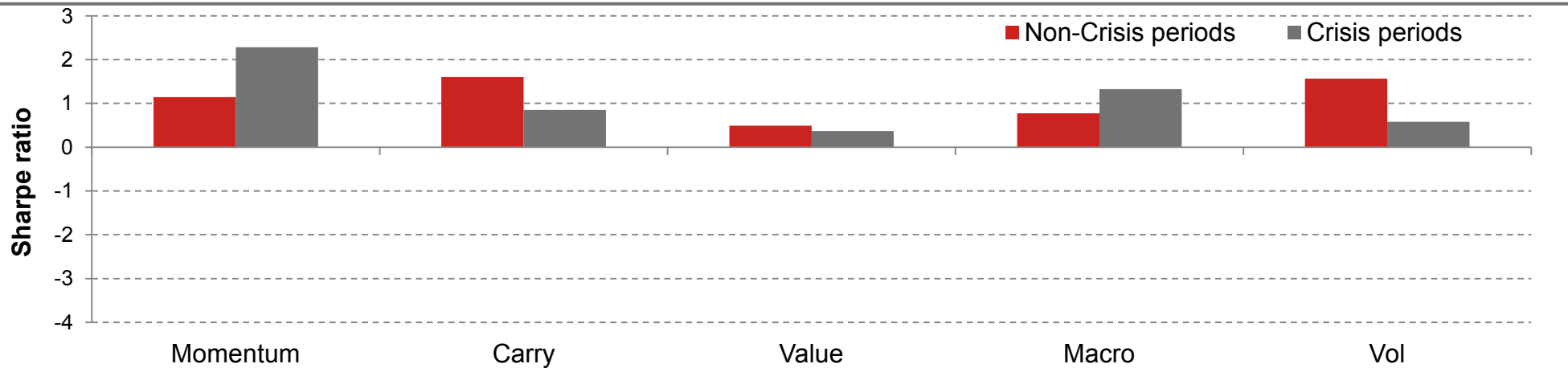
Sources: Bloomberg, Nomura Research. Global equity excess returns from 1974-2012 were used to define crisis/non-crisis periods. Crisis periods have been defined as periods when global equity excess returns were in the bottom decile and non-crisis periods when returns were in the top half.

Why bother with investment styles?

3 Coherence – how styles are substance

Theory *before* 1973

- CAPM derived in one-period context
- Static framework
- Volatility and risk premia taken as given, constant
- Even if risk premia change over time, such changes are not predictable
- Random walk assumed

Theory *after* 1973

- Single period to multi-period
- Static to dynamic
- Endogenous risk premia and volatility
- **Risk premia are time-varying** and predictable
- **Random walk not necessary** for efficient markets, even in theory

INTERNATIONAL ECONOMIC REVIEW
Vol. 14. No. 2, June, 1973

RISK AVERSION AND THE MARTINGALE PROPERTY OF STOCK PRICES*

By STEPHEN F. LEROY

1. INTRODUCTION AND SUMMARY OF CONCLUSIONS

RECENT EMPIRICAL STUDIES of the random properties of stock prices[1] have supported the conclusion that rates of return on stock follow a martingale—i.e., that the expected rate of return on stock conditional on past realized rates of return is always equal to its unconditional expectation. In addition, the martingale property has received theoretical support from recent work by Samuelson [10].[2] However, Samuelson's result depends on the assumption that investors require an exogenously given expected rate of return. It is natural to inquire whether the martingale property can be derived when the assumption of a given expected rate of return is relaxed. That question will be discussed in this paper.

If it is no longer assumed that the expected rate of return may be taken as given, then it becomes necessary to consider how the expected rate of return is determined, and this involves analyzing the relation between the riskiness of stock and the risk-aversion of investors. We are led to consider models of portfolio selection of the type developed by Tobin [13], [14] and Markowitz [6], and the associated models of capital market equilibrium of Sharpe [12] and Lintner [5], since these deal explicitly with this question. However, it is apparent that models of the Sharpe-Lintner type, though they do relate the expected rate of return to the optimizing behavior of risk-averse investors, can cast no light on the martingale question. This is so because these models assume a one-period

Notes: In 1973 Stephen LeRoy published "Risk aversion and the martingale property of stock prices" in International Economic Review.

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Momentum can be explained by rational and behavioural reasons

Drivers of price and macro momentum

- Success of momentum can be linked to the existence of **time-varying risk premia**. This in turn is driven by the trends in economic cycle.

- Macro-momentum captures this directly by trend-following in economic data; price momentum captures this indirectly

- On the behavioural side, momentum has also been linked to investor behavior like **under-reaction to new information**

Inflation

US CPI y-o-y
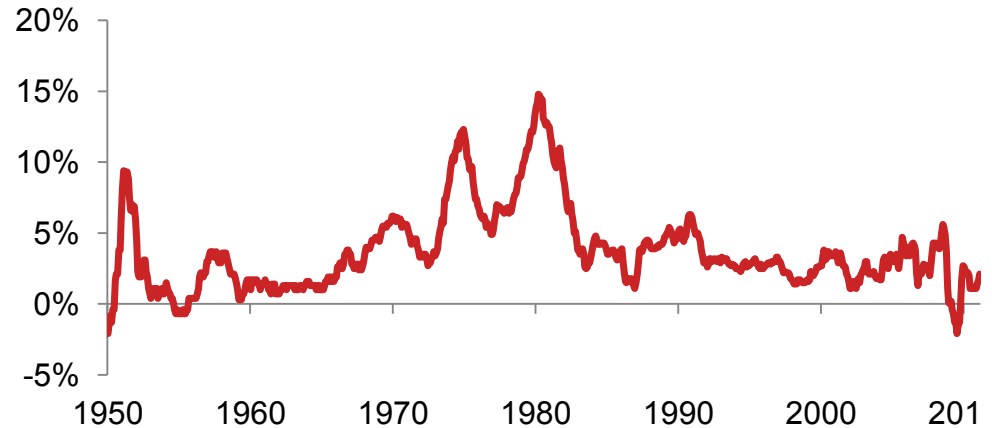
Unemployment

US Unemployment rate
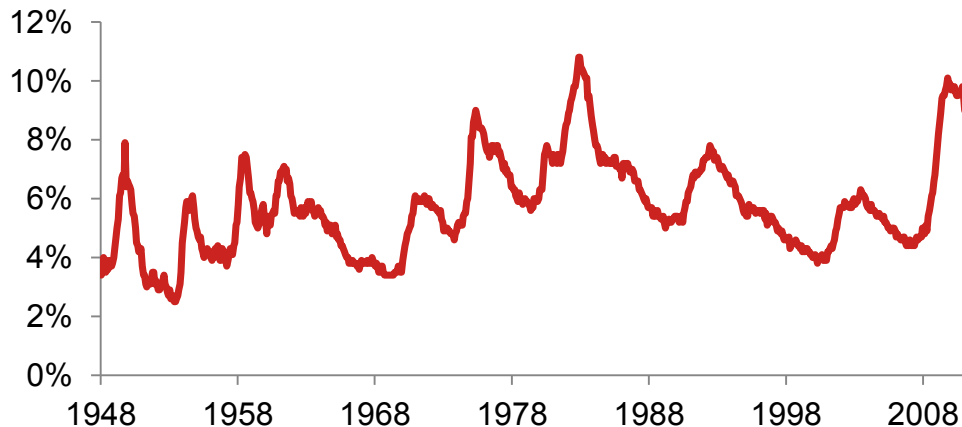
Copper inventories

Tons (m)

Carry is linked to fundamentals in each asset class
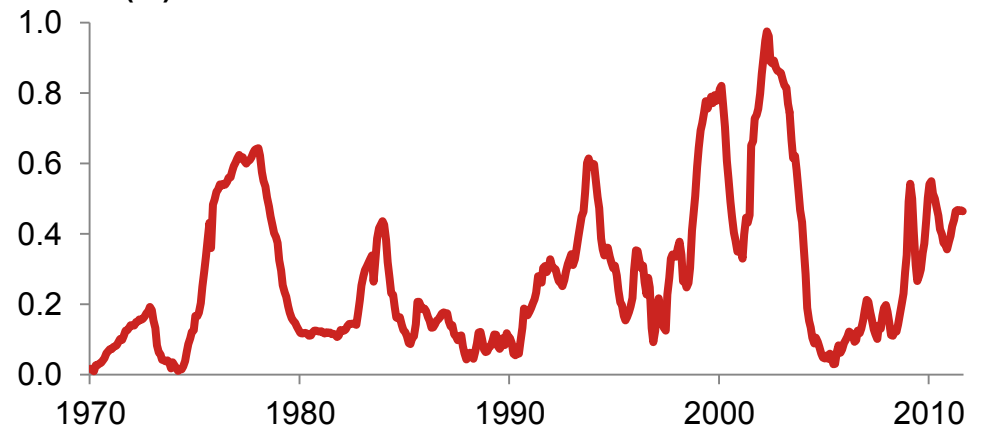
Carry in interest rate markets are closely linked with the economic cycle

Slope of the US 10y–1y curve (recessions shaded)
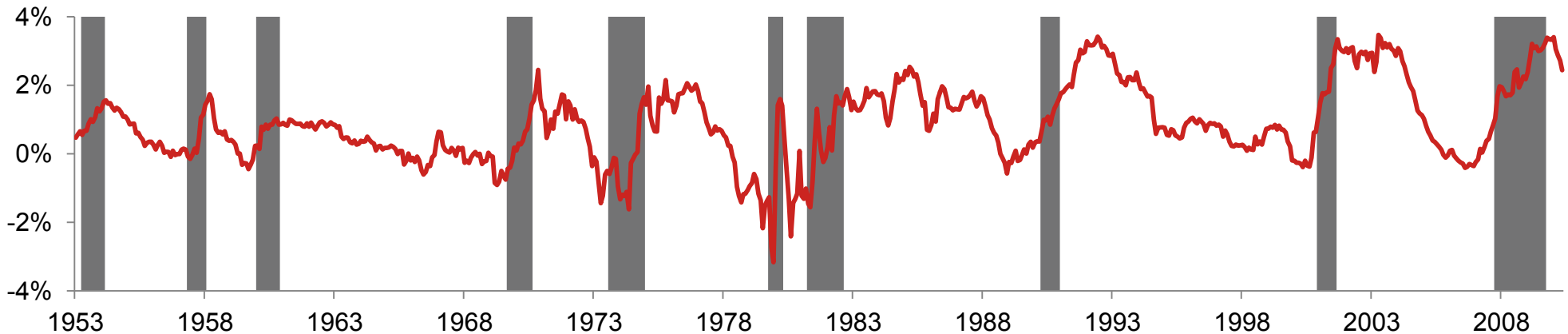
Supply risk factors drive carry in commodities

Average annualised carry (%)	WTI Crude	Natural Gas	Wheat	Corn	Copper
Rising inventories	-3.4	-18.3	-11.0	-10.5	1.0
Falling inventories	9.6	0.8	2.3	-6.4	10.3

Real yields (nominal yields adjusted for inflation) exhibit mean-reversion

Legend: Range (+/-1 stdev), US 10-year real yield, Average (5-year)
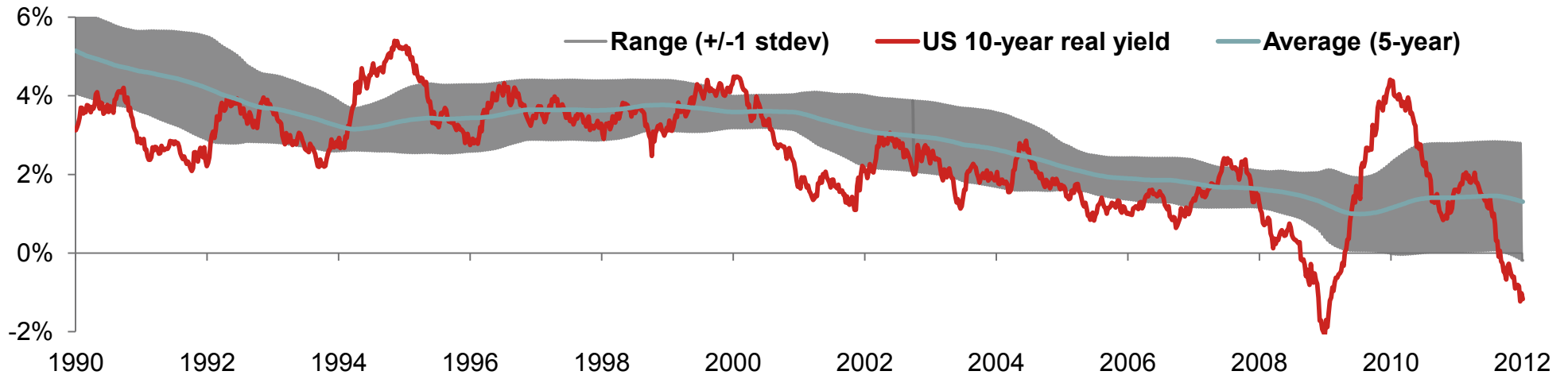
Mean reversion is observed in FX markets too

Legend: EUR/USD Spot, EUR/USD PPP adjusted

Selling volatility to earn risk premium
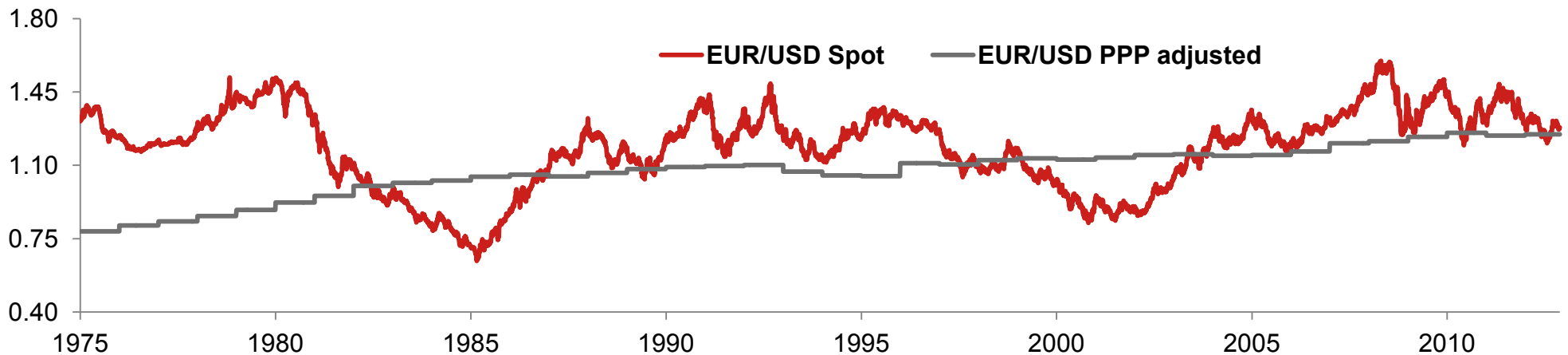
Volatility selling is a pro-cyclical strategy like unconditional FX carry and long equities

Legend: Volatility Selling — FX Carry (unfiltered) — S&P 500

Y-axis: Cumulative excess returns (0 to 300)

X-axis: 2001 to 2012
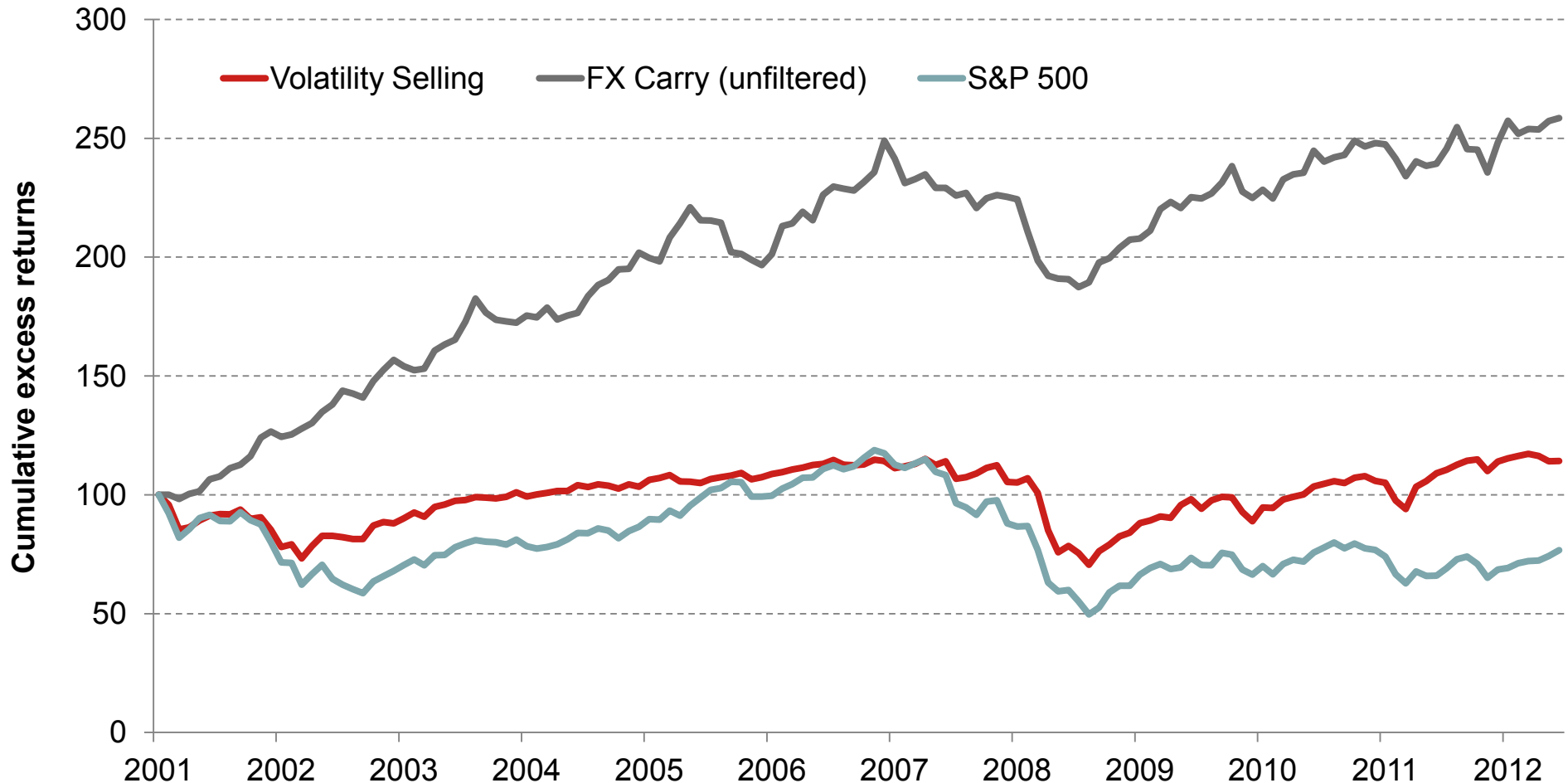
Applying fixed-income tools to equity markets

The similarities between equity indexes and soybeans

Poor long-only returns in grains do not surprise many
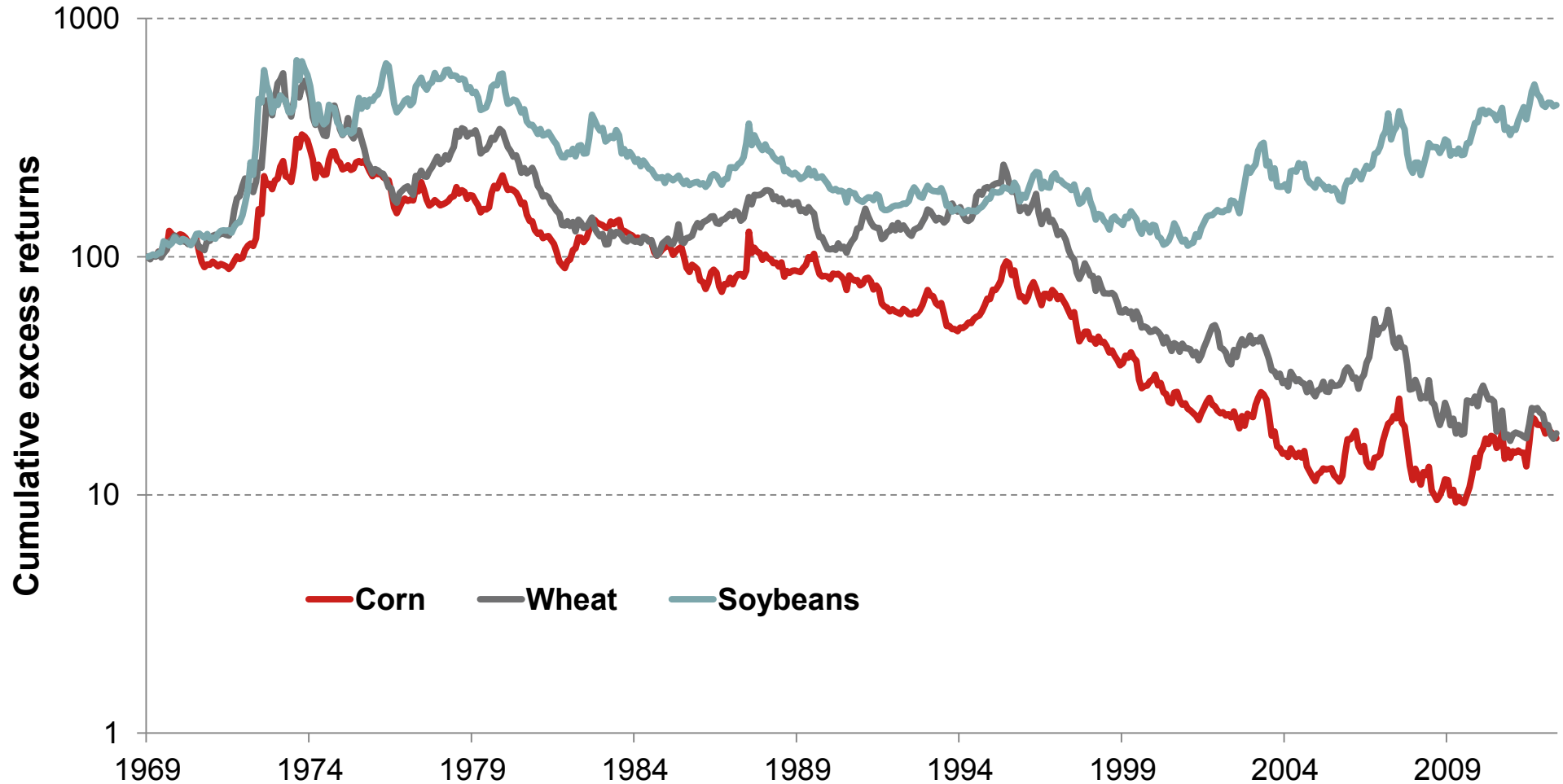
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Long-only performance of equities has been equally bad in many cases

Nikkei : equities can underperform cash over decades
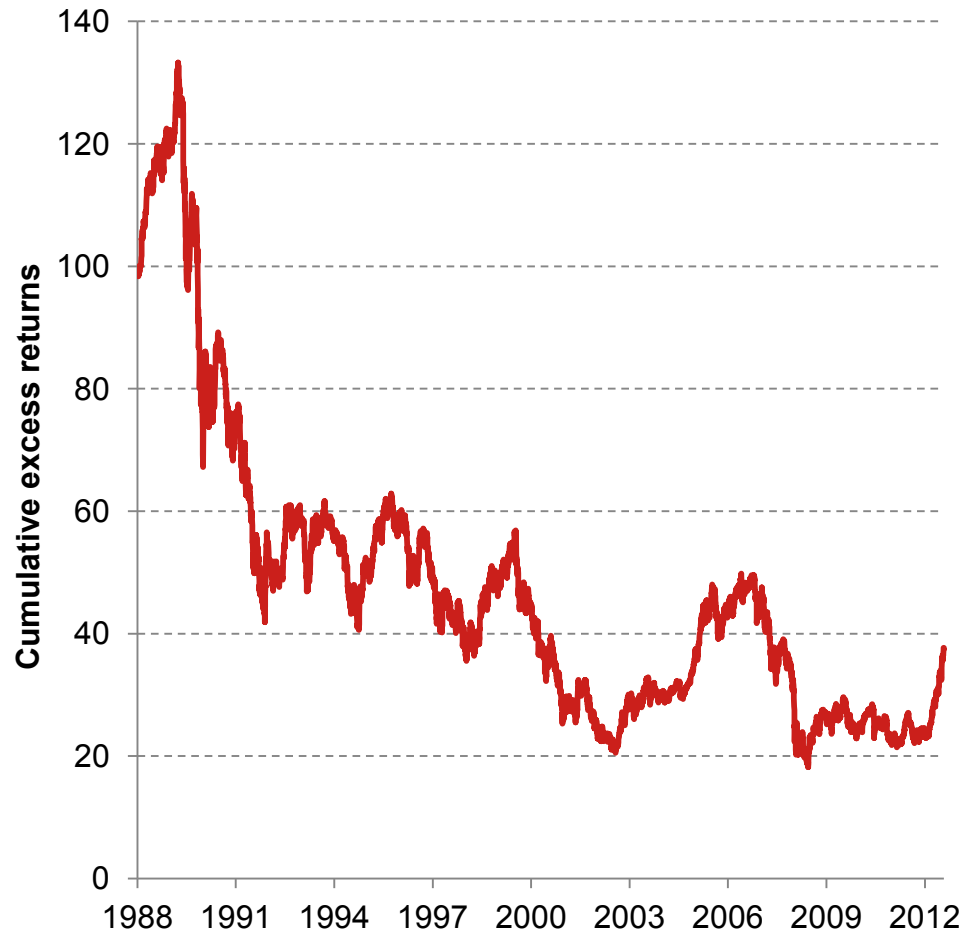
Eurostoxx are looking more and more like Nikkei
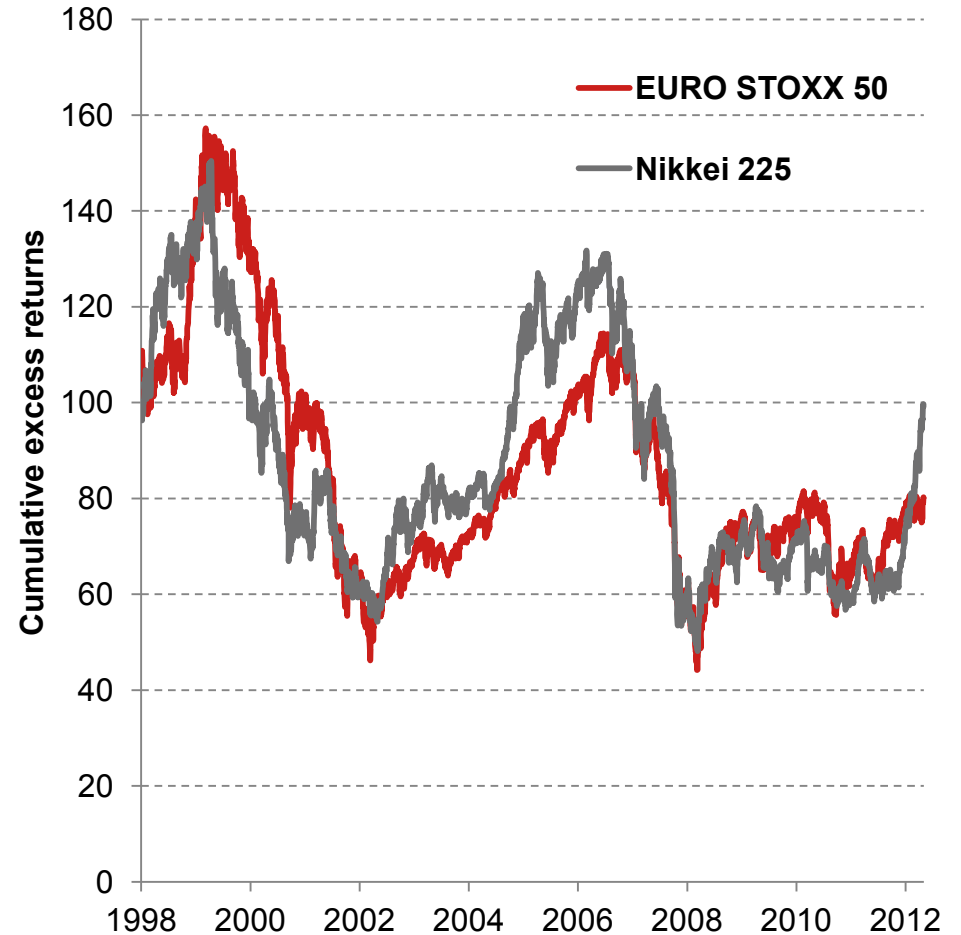
Bovespa futures: solid GDP growth does not mean solid equity returns
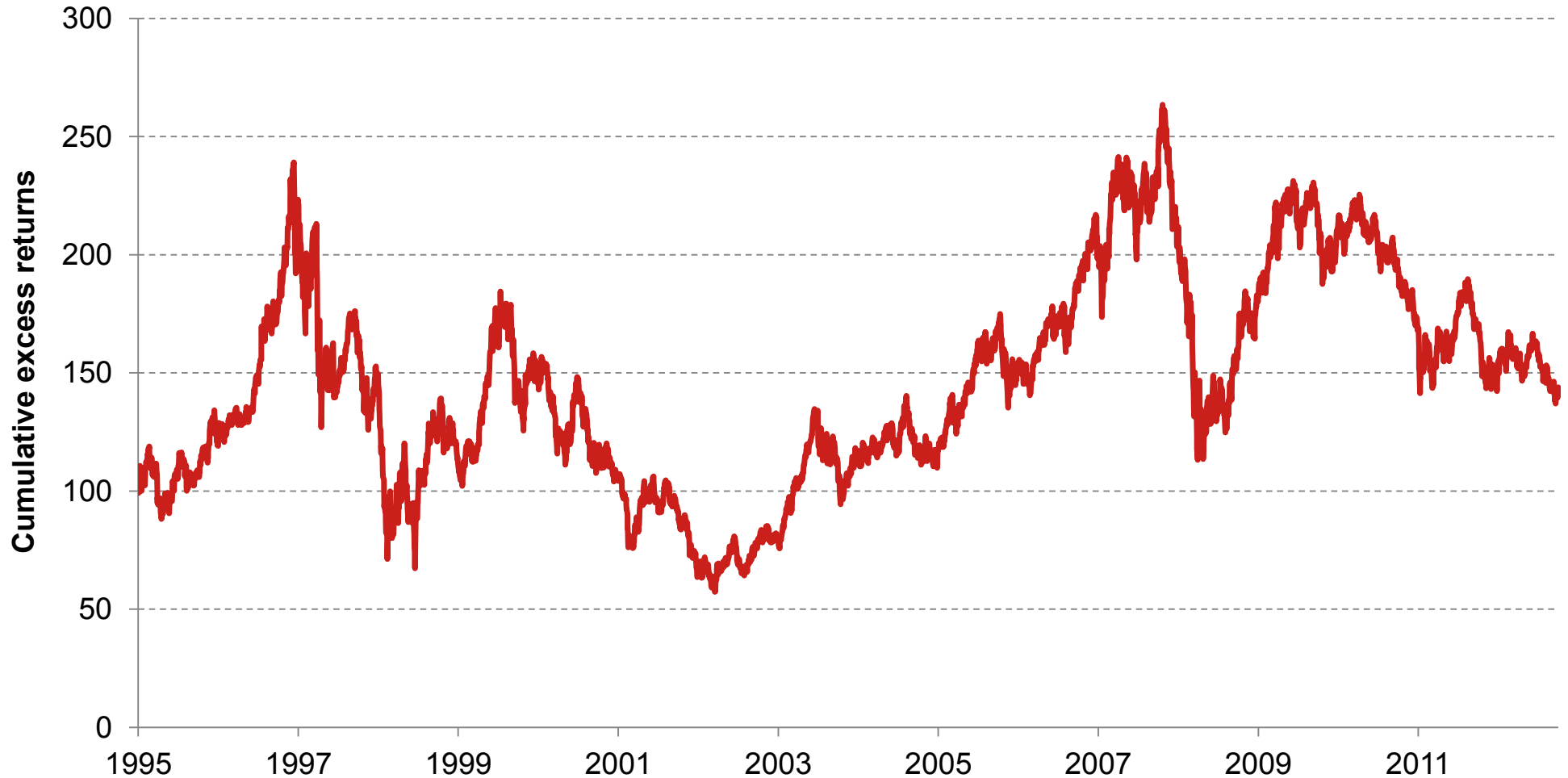
Performance of fixed-income styles in equity markets

Applying long-short styles can add value in both asset classes

Styles outperform long-only in grains ...

... and in equities

Source: Bloomberg, Nomura Research. Excess returns have been scaled to a volatility of 10% for easy comparison.
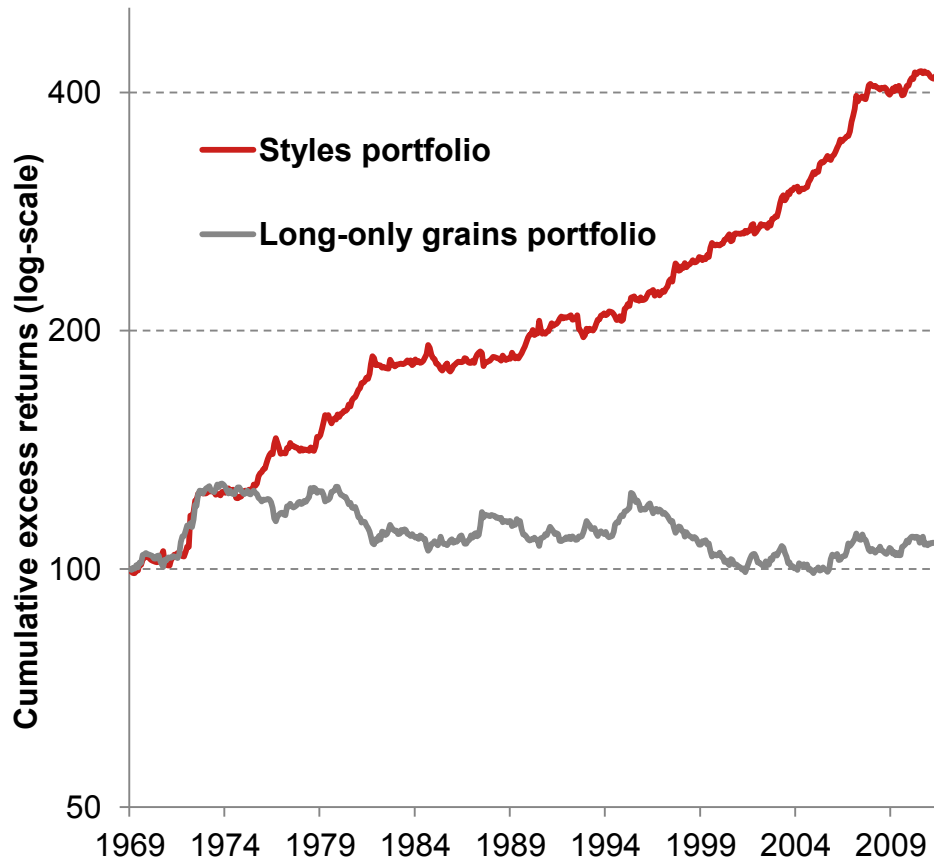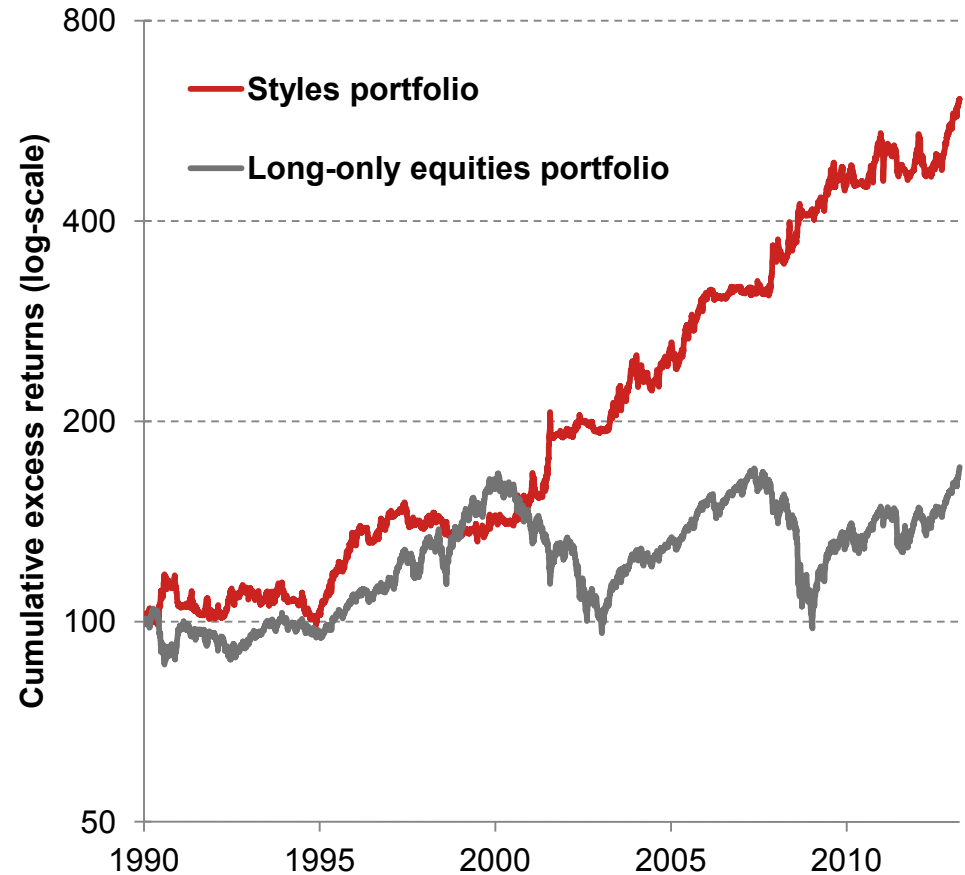
Sharpe ratio comparison of styles with long-only
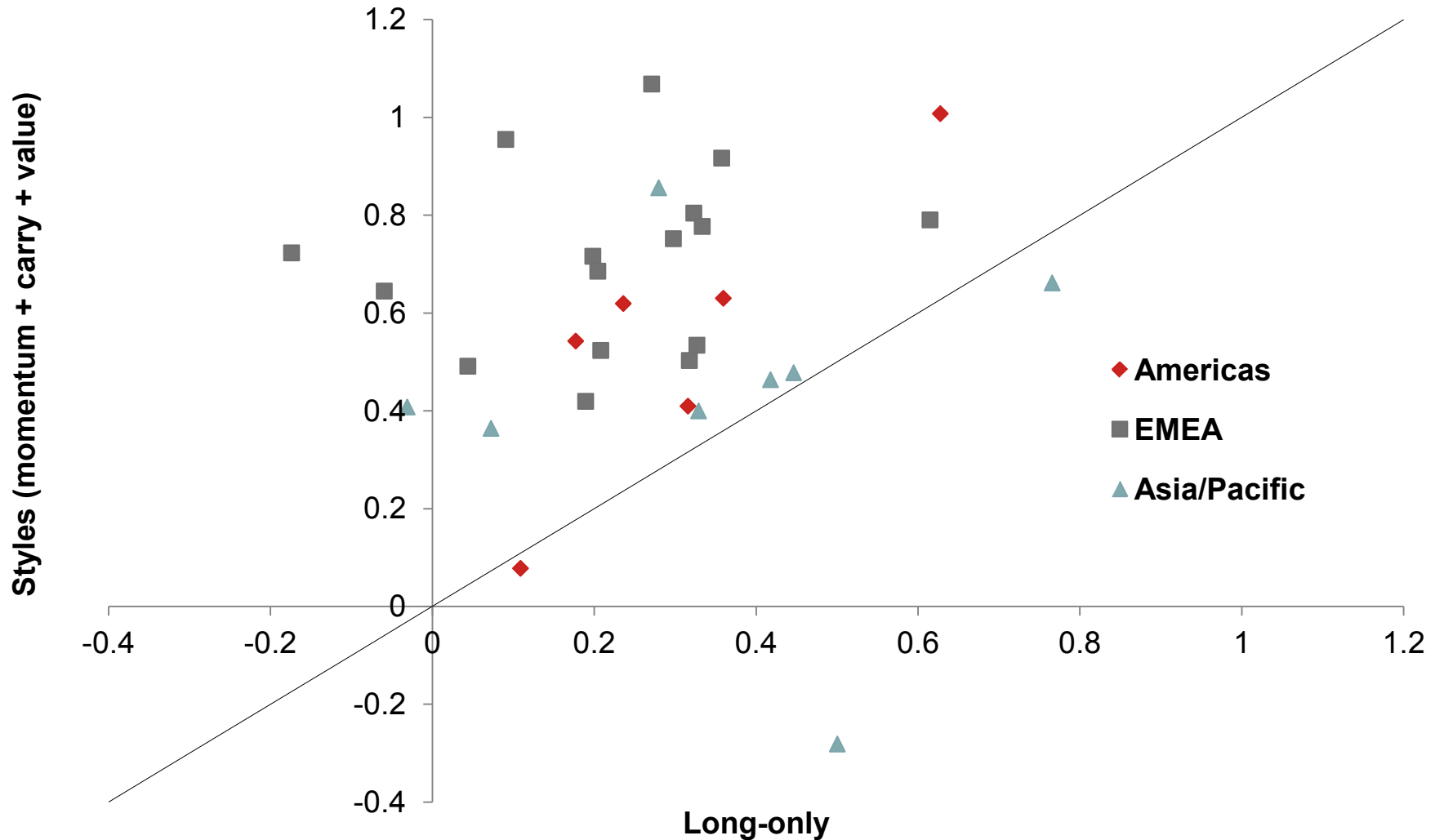
Nikkei 225
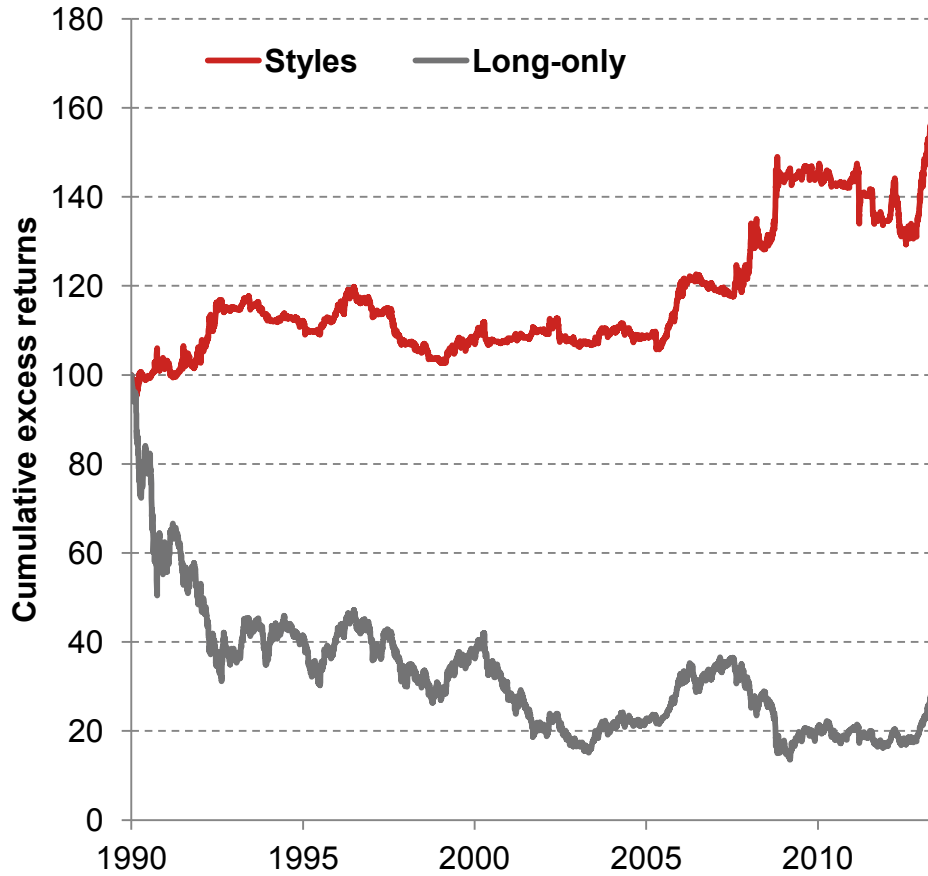
Eurostoxx 50
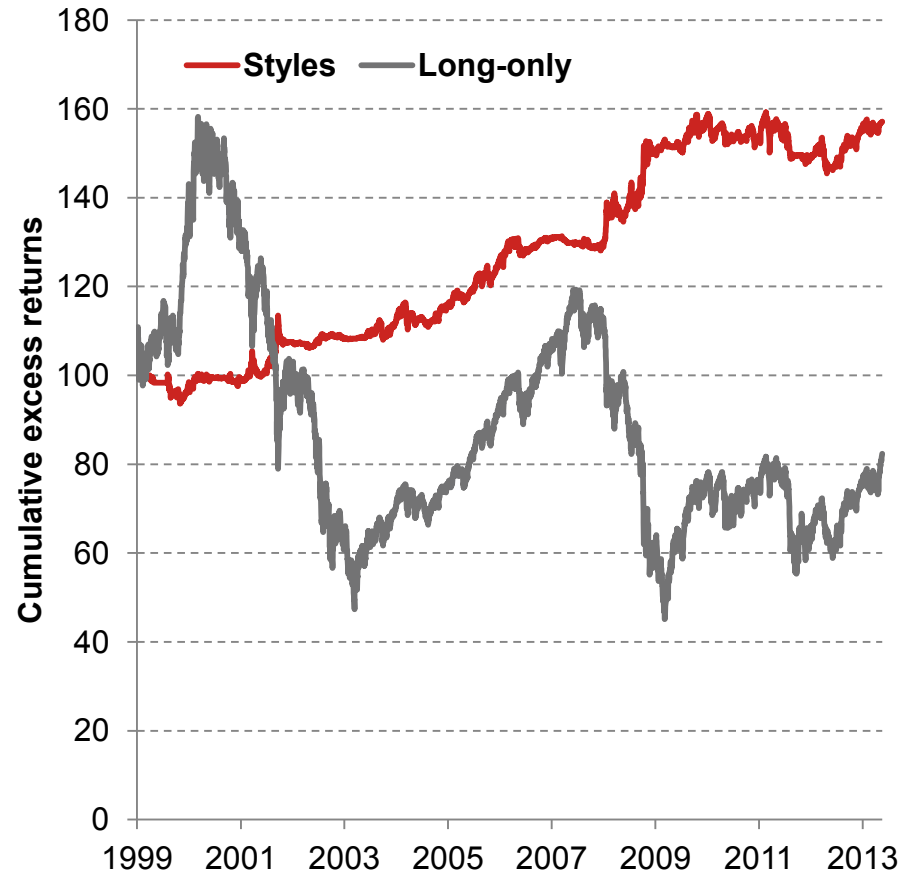
Equity styles performance is robust to bear markets

Performance during crisis and non-crisis periods

■ Non-crisis ■ Crisis

Y-axis: Sharpe ratio (from -4 to 4)

Categories: Equities, FX Carry, Commodities, Hedge Funds, Equity Styles

Source: Bloomberg, Nomura Research
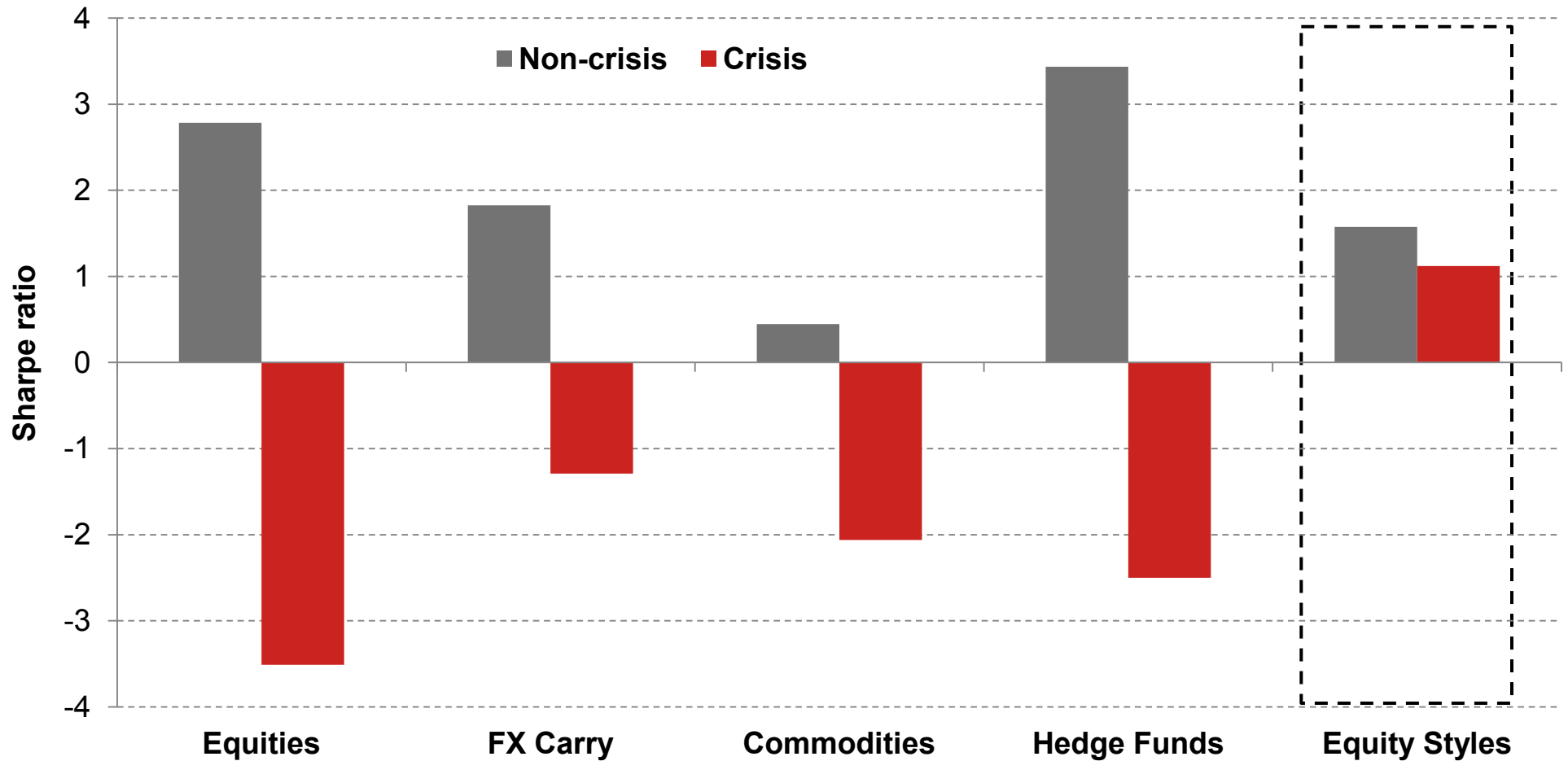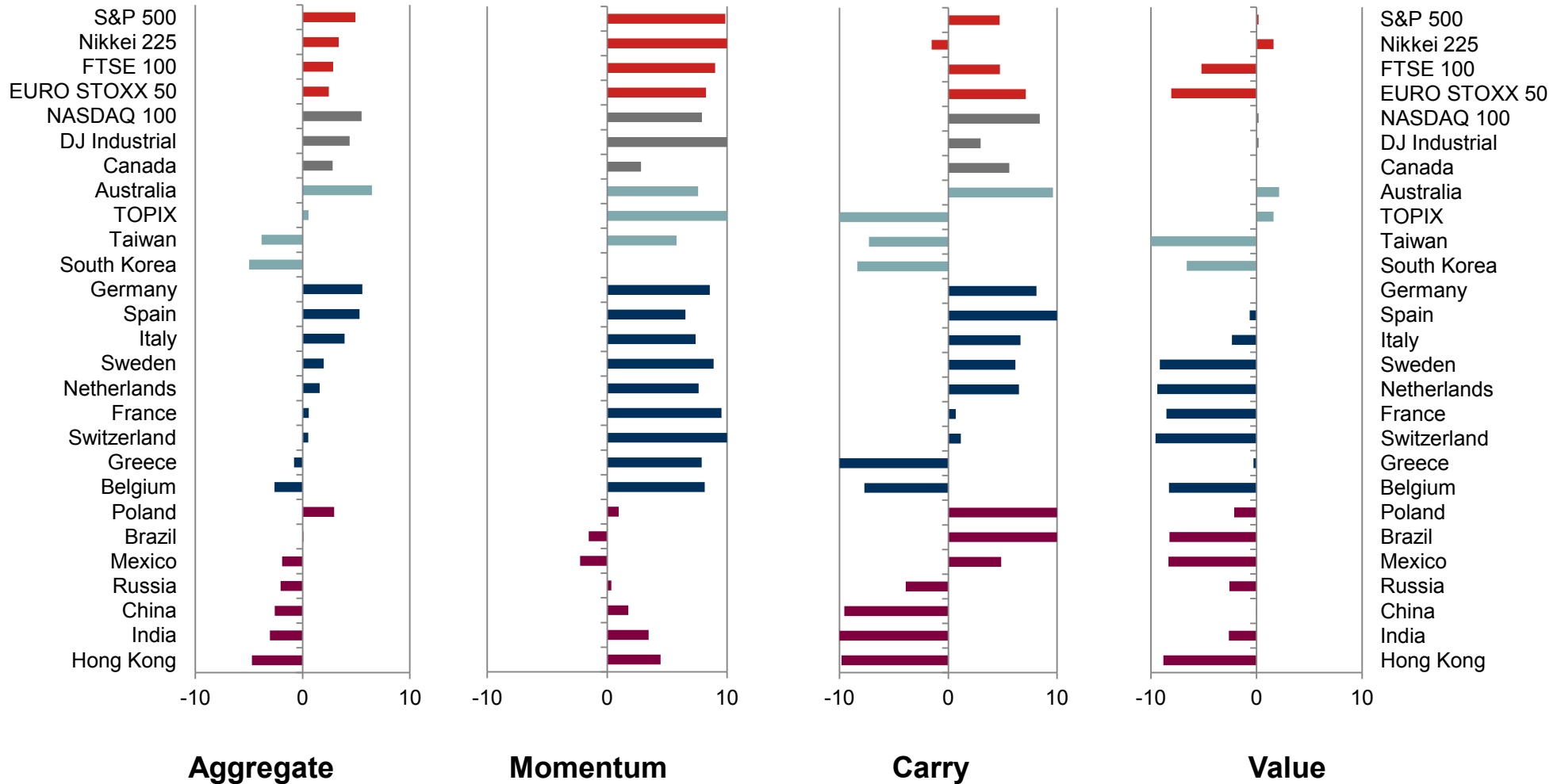
Equities

Fixed-income
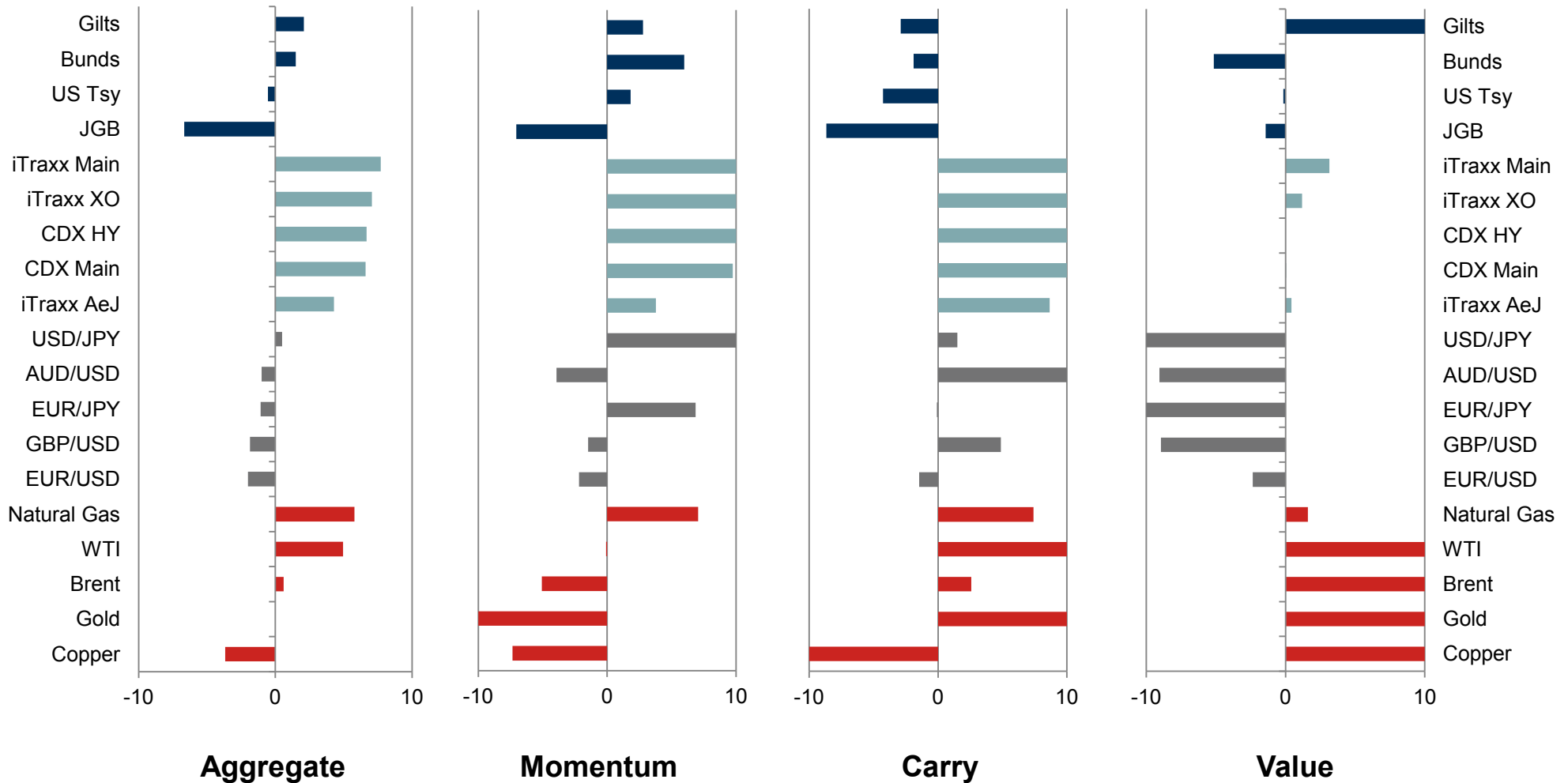
Using economic momentum to switch between equities and bonds

Economic indicator based switching has worked in the US in the long sample
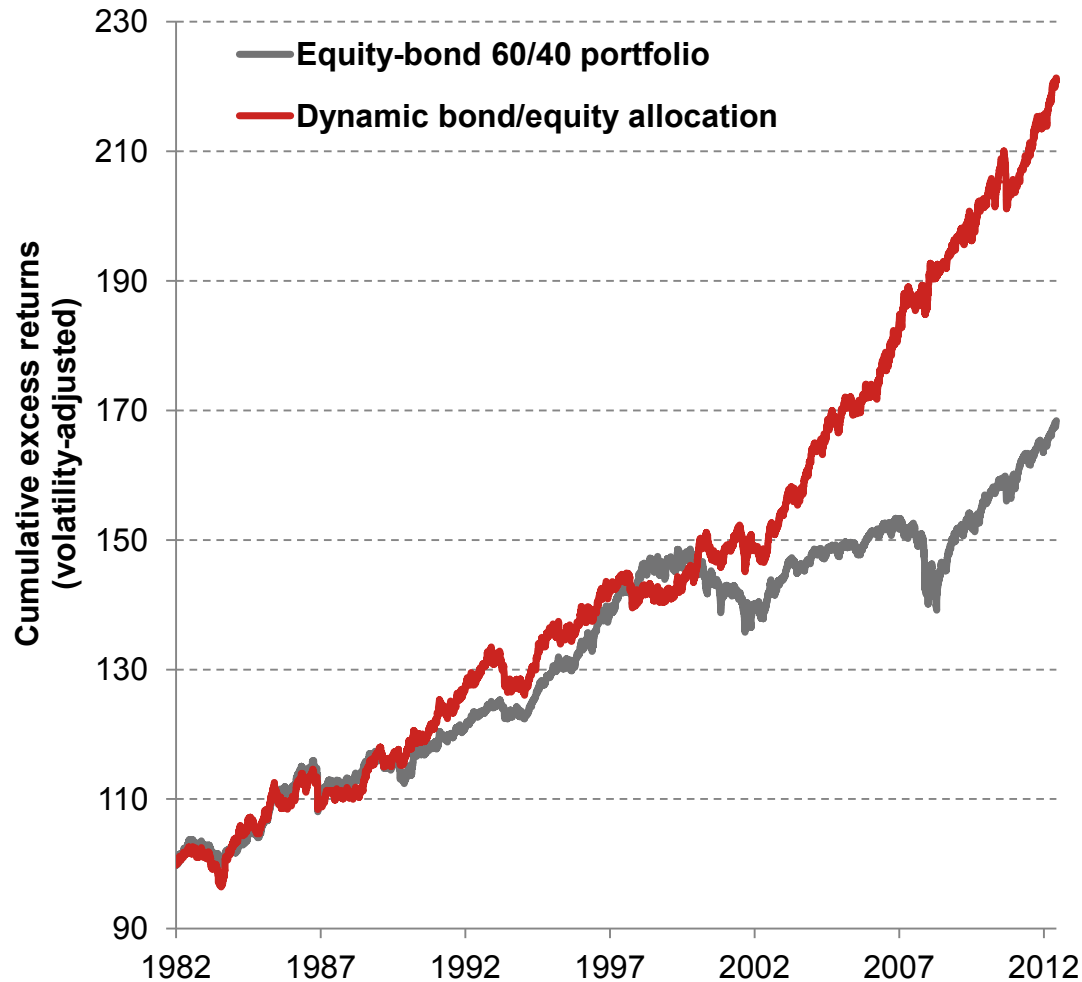
	60/40 portfolio	Dynamic allocation
Average(%, p.a)	6.52	2.75
Volatility (%, p.a.)	11.21	3.12
Sharpe ratio	**0.58**	**0.88**
Max drawdown	32.02	6.27
Calmar ratio	0.20	0.44

Source: Bloomberg, Nomura Research. In the charts, both series have been vol-targeted to 3% volatility for ease of comparison

It has also worked in the zero-yield environment in Japan
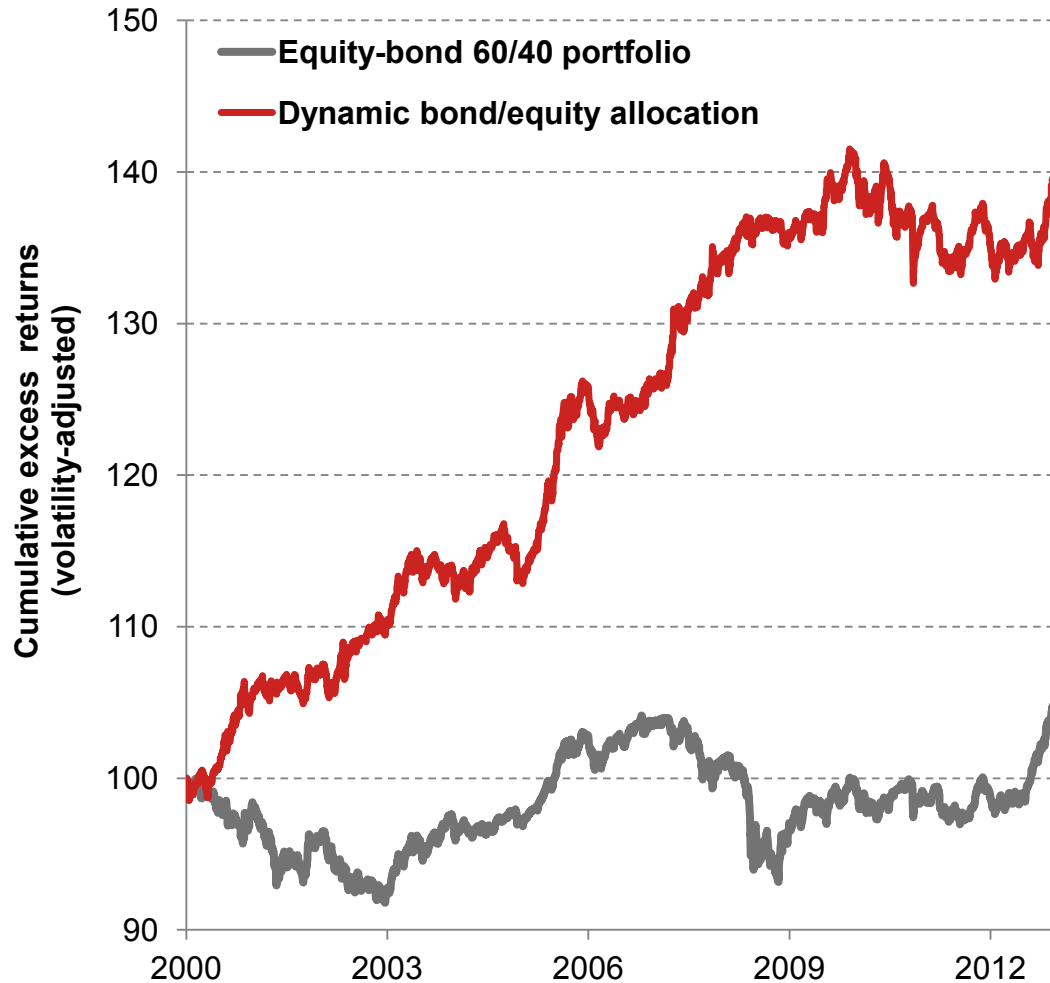
	60/40 portfolio	Dynamic allocation
Average(%, p.a)	1.91	4.45
Volatility (%, p.a.)	13.85	5.21
Sharpe ratio	**0.14**	**0.85**
Max drawdown	41.53	10.73
Calmar ratio	0.05	0.41

Source: Bloomberg, Nomura Research. In the charts, both series have been vol-targeted to 3% volatility for ease of comparison

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And despite all the turmoil, it has also been working well in Germany
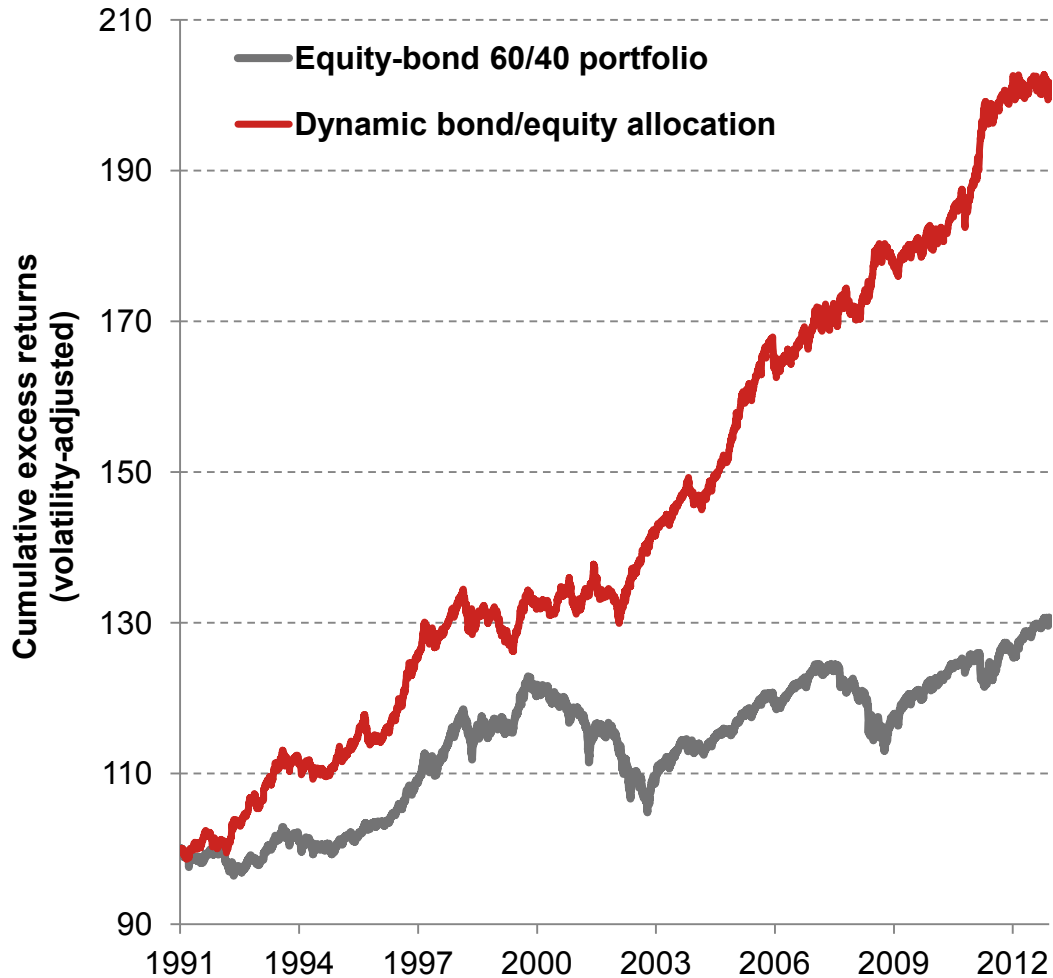
	60/40 portfolio	Dynamic allocation
Average(%, p.a)	5.41	5.55
Volatility (%, p.a.)	13.17	5.31
Sharpe ratio	**0.41**	**1.04**
Max drawdown	52.16	10.74
Calmar ratio	0.10	0.52

Source: Bloomberg, Nomura Research. In the charts, both series have been vol-targeted to 3% volatility for ease of comparison

Appendix

Asset-wise performance

Equities

		long only	vol-scaled	momentum	carry	value	MC	CV	MV	MCV
DJ Industrial	since Oct, 99	0.18	0.31	0.25	0.42	0.53	0.46	0.56	0.43	0.54
S&P 500	since Dec, 89	0.32	0.41	0.36	0.15	0.38	0.36	0.28	0.45	0.41
NASDAQ 100	since Apr, 98	0.24	0.39	0.40	0.58	0.26	0.66	0.55	0.43	0.62
Canada	since Nov, 01	0.36	0.48	0.37	0.35	0.50	0.50	0.58	0.51	0.63
Mexico	since May, 01	0.63	0.68	0.74	0.70	0.57	0.87	0.93	0.87	1.01
Brazil	since Oct, 97	0.11	0.09	0.25	-0.04	-0.07	0.13	-0.08	0.13	0.08
EURO STOXX 50	since Jun, 00	-0.06	-0.06	0.43	0.43	0.65	0.55	0.62	0.60	0.64
FTSE 100	since Feb, 90	0.19	0.24	0.21	0.48	0.14	0.46	0.45	0.20	0.42
France	since Dec, 90	0.20	0.20	0.39	0.60	0.54	0.61	0.70	0.56	0.69
Germany	since Nov, 92	0.32	0.41	0.53	0.71	0.54	0.72	0.81	0.68	0.80
Spain	since Jul, 94	0.32	0.32	0.44	0.11	0.43	0.39	0.36	0.51	0.50
Italy	since Jun, 06	-0.17	-0.30	0.46	0.67	0.35	0.70	0.71	0.52	0.72
Netherlands	since Jan, 91	0.30	0.31	0.56	0.56	0.41	0.75	0.61	0.63	0.75
Sweden	since Feb, 07	0.21	0.20	0.49	0.24	0.27	0.51	0.31	0.54	0.52
Switzerland	since Sep, 00	0.09	0.18	0.70	0.76	0.76	0.91	0.85	0.89	0.95
Austria	since Jul, 95	0.33	0.47	0.59	0.12	0.90	0.50	0.62	0.86	0.78
Belgium	since Nov, 95	0.27	0.45	0.82	0.89	0.68	1.04	0.95	0.95	1.07
Portugal	since Apr, 00	-0.14	-0.05	0.87	0.86	1.01	1.01	1.16	1.16	1.20
Russia	since Aug, 07	0.04	0.01	0.11	0.69	0.25	0.51	0.57	0.23	0.49
Poland	since Jun, 02	0.33	0.35	0.40	0.60	0.32	0.57	0.53	0.41	0.53
Finland	since Dec, 01	0.36	0.45	0.69	0.91	0.33	0.99	0.80	0.69	0.92
Greece	since Sep, 01	0.20	0.36	0.70	0.44	0.41	0.72	0.57	0.64	0.72
S. Africa	since Jul, 97	0.61	0.60	0.78	0.61	0.08	0.87	0.53	0.67	0.79
Nikkei 225	since Sep, 90	-0.03	-0.06	0.33	0.25	0.23	0.39	0.30	0.38	0.41
TOPIX	since May, 92	0.07	0.10	0.40	0.06	0.26	0.31	0.18	0.45	0.36
Hong Kong	since Apr, 94	0.33	0.39	0.26	0.15	0.43	0.30	0.32	0.39	0.40
China	since Dec, 05	0.50	0.62	0.74	-0.70	-0.42	0.02	-0.82	0.31	-0.28
Australia	since May, 02	0.28	0.48	0.78	0.63	0.48	0.84	0.70	0.81	0.86
S. Korea	since Jun, 02	0.45	0.46	0.36	0.13	0.56	0.33	0.41	0.53	0.48
India	since Jun, 02	0.77	0.88	0.59	0.24	0.54	0.49	0.48	0.79	0.66
Taiwan	since Jun, 02	0.42	0.45	0.21	0.29	0.53	0.37	0.46	0.41	0.46

Style-wise performance in fixed-income assets (1/3)

Price Momentum

	Rates	Credit	FX	Commodities	Portfolio
Average	6.03	3.85	8.24	5.48	9.77
Volatility	7.88	7.02	7.10	7.16	7.26
Sharpe	0.77	0.55	1.16	0.77	1.35
MDD	17.94	29.13	8.24	8.91	9.74
Calmar	0.34	0.13	1.00	0.62	1.00
Skew	0.24	2.25	0.73	0.68	0.39

Macro Momentum

	Rates	Credit	FX	Commodities	Portfolio
Average	7.01	5.42	3.49	3.71	7.26
Volatility	8.31	9.51	7.09	7.53	7.22
Sharpe	0.84	0.57	0.49	0.49	1.01
MDD	17.59	34.08	25.57	20.28	10.19
Calmar	0.40	0.16	0.14	0.18	0.71
Skew	2.67	4.37	0.17	0.38	0.74

MDD (maximum draw down) is maximum peak to trough draw down. Source: Nomura research

Style-wise performance in fixed-income assets (2/3)

Carry

	Rates	Credit	FX	Commodities	Portfolio
Average	4.76	1.65	6.36	3.82	9.03
Volatility	7.55	6.22	7.12	7.00	7.40
Sharpe	0.63	0.27	0.89	0.55	1.22
MDD	35.44	23.65	22.49	24.60	13.99
Calmar	0.13	0.07	0.28	0.16	0.65
Skew	-0.18	1.64	0.11	0.13	0.34

Value

	Rates	Credit	FX	Commodities	Portfolio
Average	1.97	2.42	2.26	4.40	4.81
Volatility	7.52	6.66	7.05	6.96	7.11
Sharpe	0.26	0.36	0.32	0.63	0.68
MDD	26.23	37.94	22.87	24.17	21.29
Calmar	0.08	0.06	0.10	0.18	0.23
Skew	-0.36	-0.86	0.12	0.00	0.06

MDD (maximum draw down) is maximum peak to trough draw down. Source: Nomura research

Volatility

	Rates	FX	Portfolio
Average	8.23	9.15	6.26
Volatility	8.34	8.91	5.73
Sharpe	0.99	1.03	1.09
MDD	14.07	26.14	11.53
Calmar	0.58	0.35	0.54
Skew	-0.54	-1.24	-1.06

MDD (maximum draw down) is maximum peak to trough draw down. Source: Nomura research

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