Look up™

Thematic Baskets Using Machine Learning

Feb 2022

Methodology overview

Expertise

Original research in optimization and Bayesian noise modelling

Prof Michael Hobson, Cambridge University

World leading authority on Machine Learning & Bayesian inference. 600+ published research papers and 6 textbooks.

Michael's IP has been used by the European Space Agency to get the Juno probe to Jupiter & by CERN in the Large Hadron Collider to discover the Higgs-Boson ("God particle")
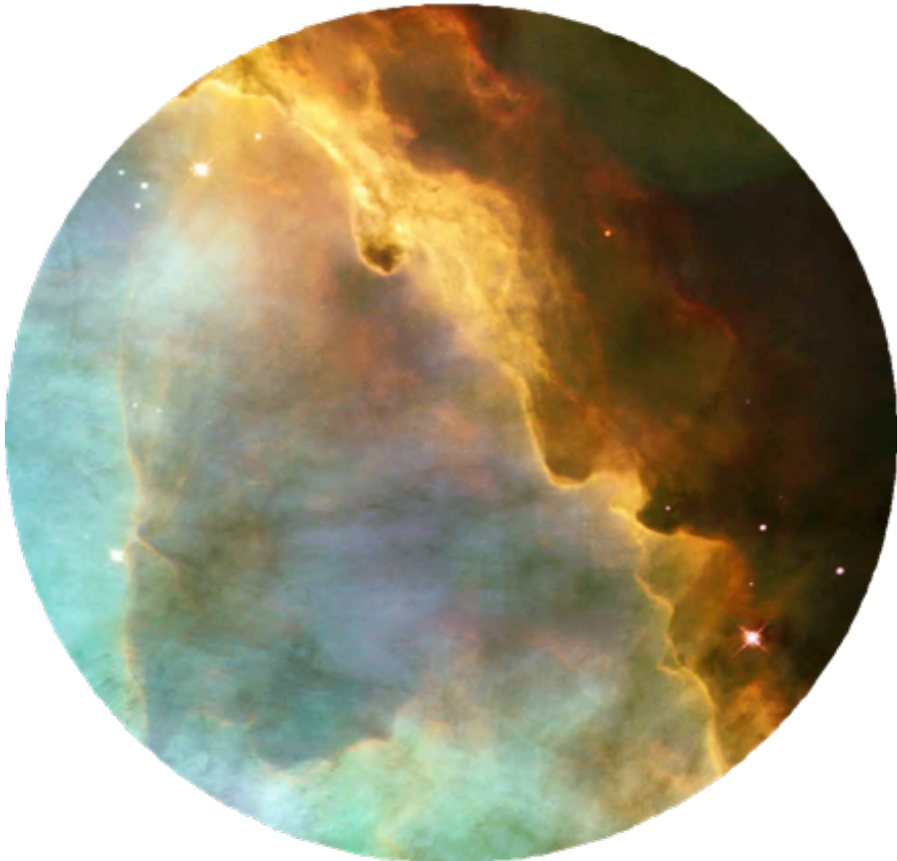
Michael ran the famous Cavendish Astrophysics Labs where he was Chief Data Scientist and was Vice master of Trinity Hall.

Post Doctorate, Cambridge Research Fellow

Supervised by Michael Hobson.

Theoretical cosmologist & machine learning specialist.

Cambridge PhD Physics, Research Fellow & multiple award winner

# Methodology overview

Select parameters

Pick a universe of assets (e.g. 500 of the most liquid global stocks). Pick a basket size (50-100 typically). Set a diversity constraint (e.g. max weight 5% for any stock). Select Long only, Long/Short or Short only

Optimisation

Optimisation over asset universe finds the combination of stocks (basket), subject to constraints/parameters above, that maximises daily correlation between basket and target variable (e.g. inflation) in the training window. Training window is dynamic and internal to the optimisation

Out-of-sample tracking

"Walk forward" or "blind" backtest shows how the basket would have performed using only information that was known at the time of each monthly rebalancing. A machine learning framework avoids back fitting or use of hindsight and maximises "out-of-sample" tracking. Historicals all show how the baskets actually tracked (real life simulation)
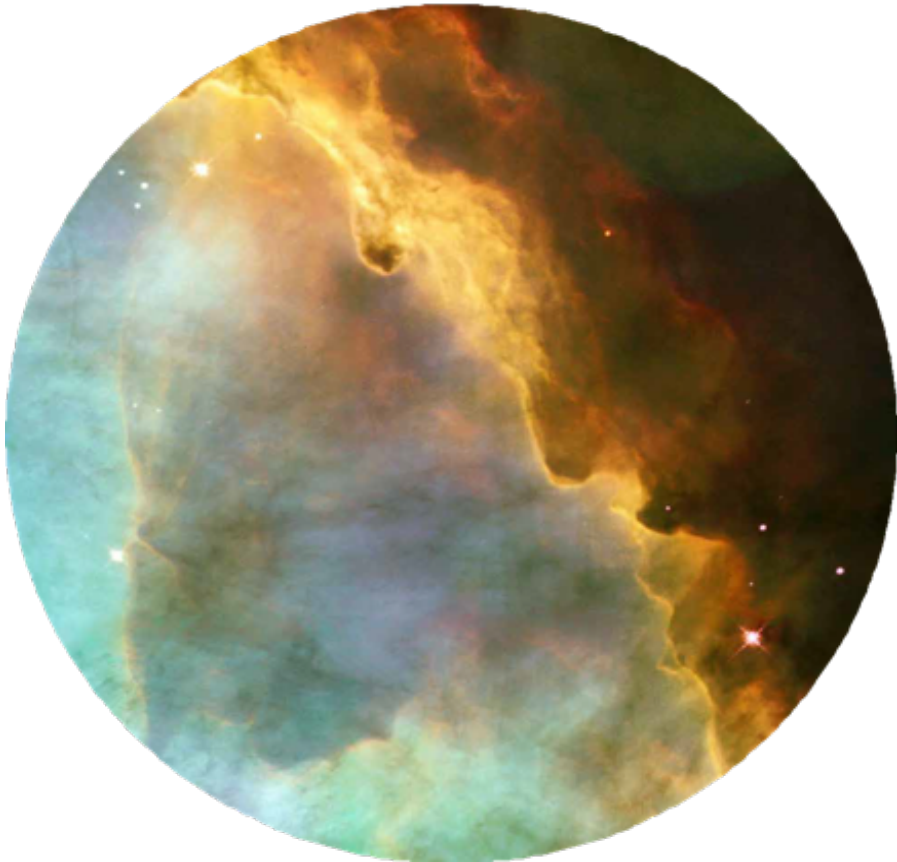
US inflation basket

1yr Out-of-Sample Correlation: 94%
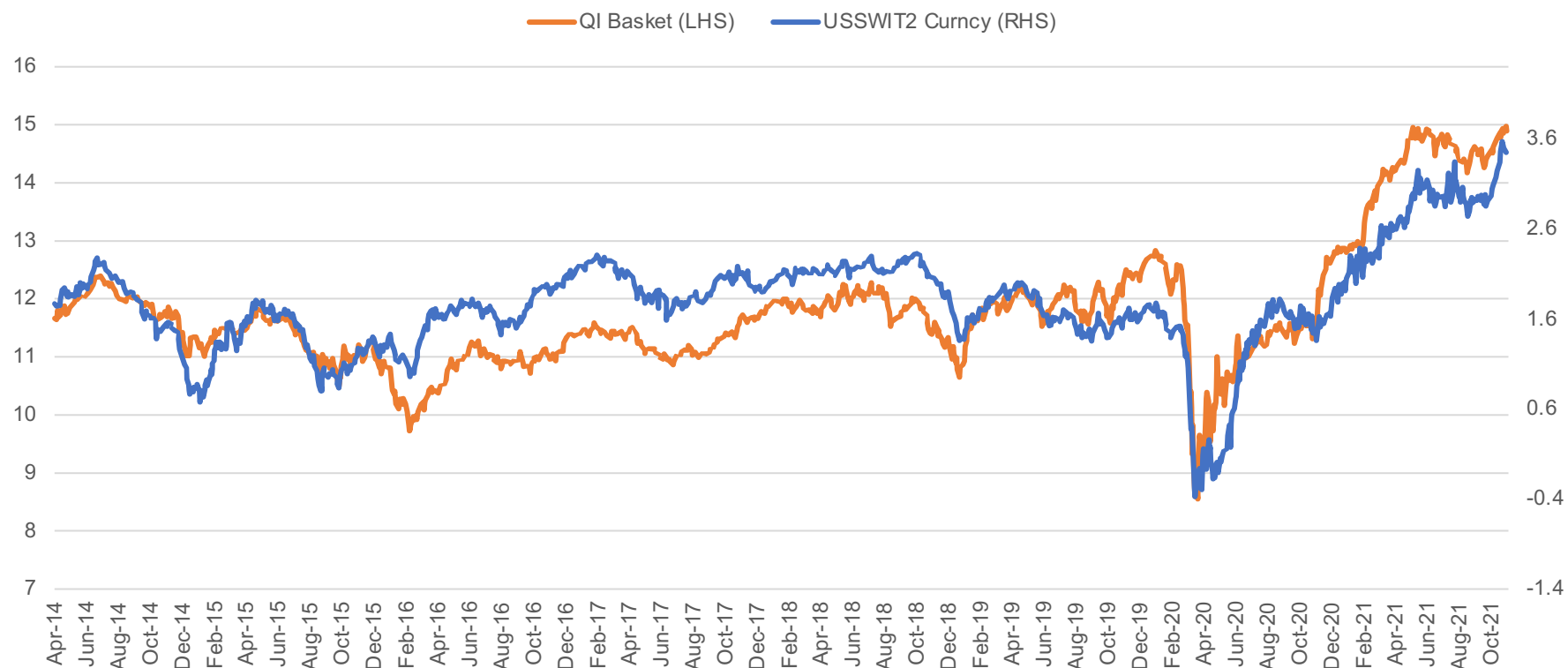
US inflation basket

Parameters
Universe: Global liquid stocks
Target: US 2yr Infl. Expectations (USSWIT2 Curncy)
Maximum weight: 5%
Maximum number of constituents: 60
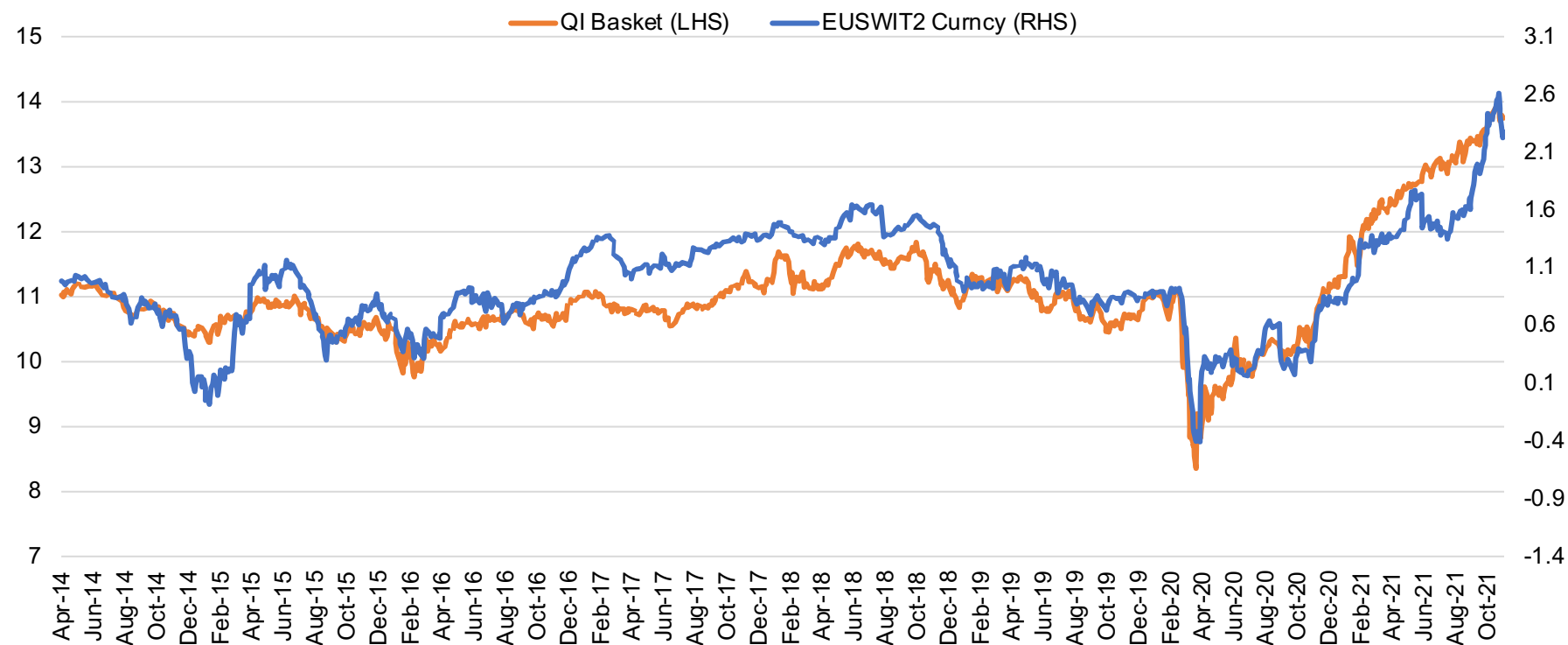Long/Short notional split: unconstrained

Ticker	Name	Sector Name	Weight
SAP GY Equity	SAP SE	Information Technology	5.00%
UPS UN Equity	UNITED PARCEL SERVICE-CL B	Industrials	5.00%
FCX UN Equity	FREEPORT-MCMORAN INC	Materials	5.00%
FDX UN Equity	FEDEX CORP	Industrials	5.00%
HAL UN Equity	HALLIBURTON CO	Energy	5.00%
AAPL UW Equity	APPLE INC	Information Technology	5.00%
BNP FP Equity	BNP PARIBAS	Financials	5.00%
CAP FP Equity	CAPGEMINI SE	Information Technology	5.00%
MB IM Equity	MEDIOBANCA SPA	Financials	4.96%
CZR UW Equity	CAESARS ENTERTAINMENT INC	Consumer Discretionary	4.87%
MO UN Equity	ALTRIA GROUP INC	Consumer Staples	4.25%
EA UW Equity	ELECTRONIC ARTS INC	Communication Services	4.06%
NOKIA FH Equity	NOKIA OYJ	Information Technology	3.92%
SWEDA SS Equity	SWEDBANK AB - A SHARES	Financials	3.75%
ETSY UW Equity	ETSY INC	Consumer Discretionary	3.58%
F UN Equity	FORD MOTOR CO	Consumer Discretionary	3.20%
LOW UN Equity	LOWE'S COS INC	Consumer Discretionary	2.99%
JCI UN Equity	JOHNSON CONTROLS INTERNATION	Industrials	2.98%
SPG UN Equity	SIMON PROPERTY GROUP INC	Real Estate	2.93%
PXD UN Equity	PIONEER NATURAL RESOURCES CO	Energy	2.41%
UAL UW Equity	UNITED AIRLINES HOLDINGS INC	Industrials	2.34%
SYF UN Equity	SYNCHRONY FINANCIAL	Financials	2.16%
FRE GY Equity	FRESENIUS SE & CO KGAA	Health Care	2.12%
SGO FP Equity	COMPAGNIE DE SAINT GOBAIN	Industrials	2.04%
TSCO UW Equity	TRACTOR SUPPLY COMPANY	Consumer Discretionary	1.62%
EBAY UW Equity	EBAY INC	Consumer Discretionary	1.48%
HES UN Equity	HESS CORP	Energy	1.14%
OXY UN Equity	OCCIDENTAL PETROLEUM CORP	Energy	1.04%
MRO UN Equity	MARATHON OIL CORP	Energy	0.81%
KINDSDB SS Equity	KINDRED GROUP PLC	Consumer Discretionary	0.72%
ADM UN Equity	ARCHER-DANIELS-MIDLAND CO	Consumer Staples	0.40%
FTNT UW Equity	FORTINET INC	Information Technology	0.09%
SLB UN Equity	SCHLUMBERGER LTD	Energy	0.09%

Ticker	Name	Sector Name	Weight
INTC UW Equity	INTEL CORP	Information Technology	5.00%
SBUX UW Equity	STARBUCKS CORP	Consumer Discretionary	5.00%
FISV UW Equity	FISERV INC	Information Technology	5.00%
STM IM Equity	STMICROELECTRONICS NV	Information Technology	5.00%
ULTA UW Equity	ULTA BEAUTY INC	Consumer Discretionary	5.00%
WYNN UW Equity	WYNN RESORTS LTD	Consumer Discretionary	5.00%
LVS UN Equity	LAS VEGAS SANDS CORP	Consumer Discretionary	5.00%
BIIB UW Equity	BIOGEN INC	Health Care	5.00%
MCHP UW Equity	MICROCHIP TECHNOLOGY INC	Information Technology	5.00%
SYK UN Equity	STRYKER CORP	Health Care	5.00%
CI UN Equity	CIGNA CORP	Health Care	5.00%
ROST UW Equity	ROSS STORES INC	Consumer Discretionary	5.00%
NOVOB DC Equity	NOVO NORDISK A/S-B	Health Care	5.00%
AMD UW Equity	ADVANCED MICRO DEVICES	Information Technology	5.00%
REL LN Equity	RELX PLC	Industrials	5.00%
TKWY NA Equity	JUST EAT TAKEAWAY	Consumer Discretionary	4.83%
ROG SE Equity	ROCHE HOLDING AG-GENUSSCHEIN	Health Care	4.47%
ENPH UQ Equity	ENPHASE ENERGY INC	Information Technology	4.42%
SO UN Equity	SOUTHERN CO/THE	Utilities	2.97%
PAYC UN Equity	PAYCOM SOFTWARE INC	Information Technology	2.10%
IFF UN Equity	INTL FLAVORS & FRAGRANCES	Materials	1.90%
RR/ LN Equity	ROLLS-ROYCE HOLDINGS PLC	Industrials	1.78%
CTXS UW Equity	CITRIX SYSTEMS INC	Information Technology	1.12%
ITX SQ Equity	INDUSTRIA DE DISENO TEXTIL	Consumer Discretionary	1.09%
ALL UN Equity	ALLSTATE CORP	Financials	0.26%

EUR inflation basket

1yr Out-of-Sample Correlation: 91%

EUR inflation basket

Parameters
Universe: Global liquid stocks
Target: EU 2yr Infl. Expec (EUSWIT2 Curncy)
Maximum weight: 5%
Maximum number of constituents: 60
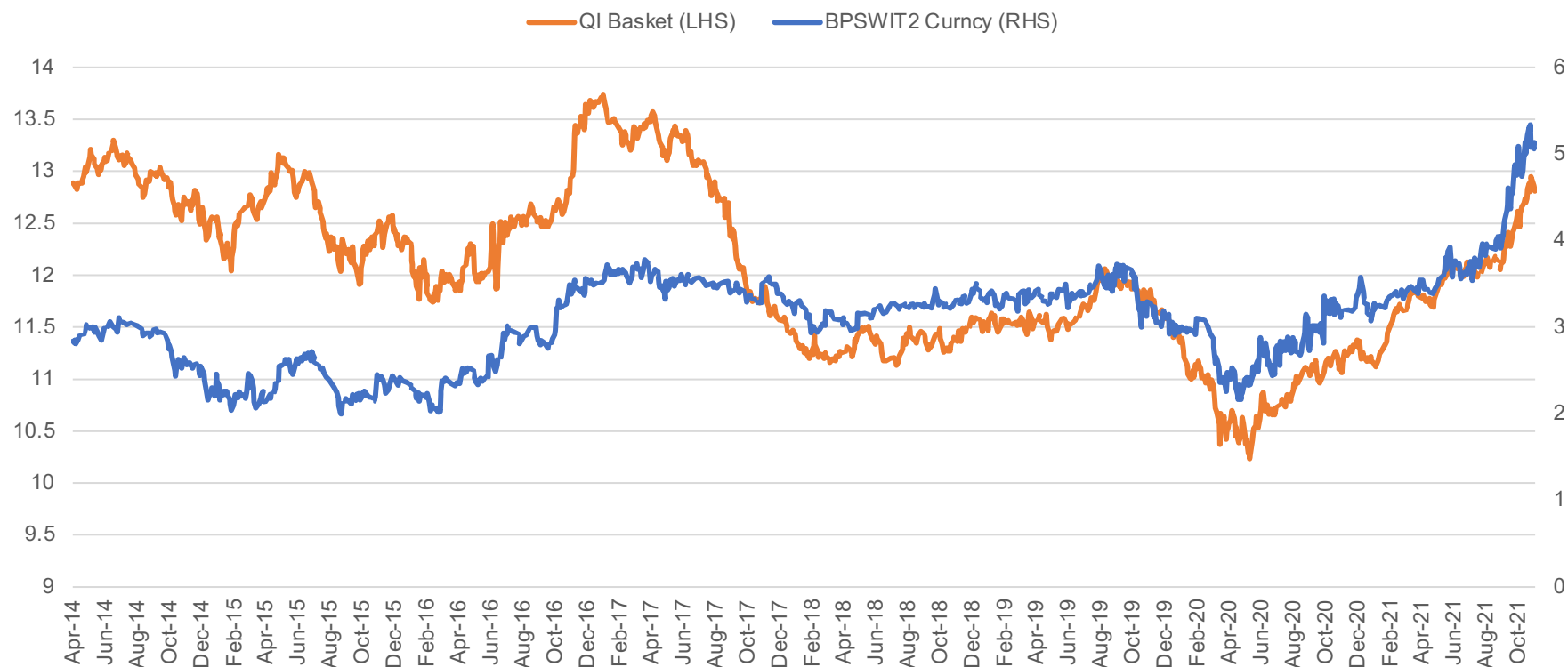Long/Short notional split: unconstrained

Ticker	Name	Sector Name	Weight
DVN UN Equity	DEVON ENERGY CORP	Energy	5.00%
AON UN Equity	AON PLC-CLASS A	Financials	5.00%
SIVB UW Equity	SVB FINANCIAL GROUP	Financials	5.00%
LH UN Equity	LABORATORY CRP OF AMER HLDGS	Health Care	5.00%
IT UN Equity	GARTNER INC	Information Technology	5.00%
AGN NA Equity	AEGON NV	Financials	5.00%
FANG UW Equity	DIAMONDBACK ENERGY INC	Energy	5.00%
MRO UN Equity	MARATHON OIL CORP	Energy	5.00%
EQNR NO Equity	EQUINOR ASA	Energy	5.00%
CF UN Equity	CF INDUSTRIES HOLDINGS INC	Materials	4.88%
VIV FP Equity	VIVENDI SE	Communication Services	4.53%
MO UN Equity	ALTRIA GROUP INC	Consumer Staples	3.92%
TEN IM Equity	TENARIS SA	Energy	3.69%
SIE GY Equity	SIEMENS AG-REG	Industrials	3.57%
CTRA UN Equity	COTERRA ENERGY INC	Energy	3.49%
GLEN LN Equity	GLENCORE PLC	Materials	3.39%
TSLA UW Equity	TESLA INC	Consumer Discretionary	3.20%
NOC UN Equity	NORTHROP GRUMMAN CORP	Industrials	3.05%
ALGN UW Equity	ALIGN TECHNOLOGY INC	Health Care	2.67%
ENT LN Equity	ENTAIN PLC	Consumer Discretionary	2.66%
GLE FP Equity	SOCIETE GENERALE SA	Financials	2.61%
ERICB SS Equity	ERICSSON LM-B SHS	Information Technology	2.60%
ULTA UW Equity	ULTA BEAUTY INC	Consumer Discretionary	1.89%
PXD UN Equity	PIONEER NATURAL RESOURCES CO	Energy	1.74%
HIG UN Equity	HARTFORD FINANCIAL SVCS GRP	Financials	1.49%
HCA UN Equity	HCA HEALTHCARE INC	Health Care	1.48%
NFLX UW Equity	NETFLIX INC	Communication Services	1.13%
ALB UN Equity	ALBEMARLE CORP	Materials	0.76%
HAL UN Equity	HALLIBURTON CO	Energy	0.67%
ENPH UQ Equity	ENPHASE ENERGY INC	Information Technology	0.60%
TWTR UN Equity	TWITTER INC	Communication Services	0.60%
RR/ LN Equity	ROLLS-ROYCE HOLDINGS PLC	Industrials	0.36%

Ticker	Name	Sector Name	Weight
ENEL IM Equity	ENEL SPA	Utilities	5.00%
REGN UW Equity	REGENERON PHARMACEUTICALS	Health Care	5.00%
VRTX UW Equity	VERTEX PHARMACEUTICALS INC	Health Care	5.00%
LHA GY Equity	DEUTSCHE LUFTHANSA-REG	Industrials	5.00%
CCL UN Equity	CARNIVAL CORP	Consumer Discretionary	5.00%
BHP LN Equity	BHP GROUP PLC	Materials	5.00%
TEMN SE Equity	TEMENOS AG - REG	Information Technology	5.00%
PAYC UN Equity	PAYCOM SOFTWARE INC	Information Technology	5.00%
TDG UN Equity	TRANSDIGM GROUP INC	Industrials	5.00%
LOGN SE Equity	LOGITECH INTERNATIONAL-REG	Information Technology	5.00%
RIO LN Equity	RIO TINTO PLC	Materials	5.00%
CA FP Equity	CARREFOUR SA	Consumer Staples	5.00%
ROG SE Equity	ROCHE HOLDING AG-GENUSSCHEIN	Health Care	5.00%
ILMN UW Equity	ILLUMINA INC	Health Care	4.78%
ADS GY Equity	ADIDAS AG	Consumer Discretionary	4.51%
VFC UN Equity	VF CORP	Consumer Discretionary	4.32%
TMUS UW Equity	T-MOBILE US INC	Communication Services	3.86%
INTC UW Equity	INTEL CORP	Information Technology	3.83%
WYNN UW Equity	WYNN RESORTS LTD	Consumer Discretionary	3.12%
LLY UN Equity	ELI LILLY & CO	Health Care	3.06%
BIIB UW Equity	BIOGEN INC	Health Care	1.74%
MU UW Equity	MICRON TECHNOLOGY INC	Information Technology	1.62%
HOLN SE Equity	HOLCIM LTD	Materials	1.41%
LVS UN Equity	LAS VEGAS SANDS CORP	Consumer Discretionary	0.89%
AAL UW Equity	AMERICAN AIRLINES GROUP INC	Industrials	0.71%
UAL UW Equity	UNITED AIRLINES HOLDINGS INC	Industrials	0.48%
GPN UN Equity	GLOBAL PAYMENTS INC	Information Technology	0.35%
DD UN Equity	DUPONT DE NEMOURS INC	Materials	0.34%

UK inflation basket

1yr Out-of-Sample Correlation: 91%

UK inflation basket

Parameters
Universe: Global liquid stocks
Target: UK 2yr Infl. Expec. (BPSWIT2 Curncy)
Maximum weight: 5%
Maximum number of constituents: 60
Long/Short notional split: unconstrained

Ticker	Name	Sector Name	Weight
DVN UN Equity	DEVON ENERGY CORP	Energy	5.00%
SWEDA SS Equity	SWEDBANK AB - A SHARES	Financials	5.00%
PSA UN Equity	PUBLIC STORAGE	Real Estate	5.00%
AIG UN Equity	AMERICAN INTERNATIONAL GROUP	Financials	5.00%
VIV FP Equity	VIVENDI SE	Communication Services	5.00%
MPWR UW Equity	MONOLITHIC POWER SYSTEMS INC	Information Technology	5.00%
CF UN Equity	CF INDUSTRIES HOLDINGS INC	Materials	5.00%
SOON SE Equity	SONOVA HOLDING AG-REG	Health Care	5.00%
CRM UN Equity	SALESFORCE.COM INC	Information Technology	5.00%
EL FP Equity	ESSILORLUXOTTICA	Consumer Discretionary	5.00%
EXPE UW Equity	EXPEDIA GROUP INC	Consumer Discretionary	5.00%
IFX GY Equity	INFINEON TECHNOLOGIES AG	Information Technology	5.00%
ASM NA Equity	ASM INTERNATIONAL NV	Information Technology	4.68%
XLNX UW Equity	XILINX INC	Information Technology	4.66%
RR/ LN Equity	ROLLS-ROYCE HOLDINGS PLC	Industrials	4.56%
F UN Equity	FORD MOTOR CO	Consumer Discretionary	4.22%
CZR UW Equity	CAESARS ENTERTAINMENT INC	Consumer Discretionary	4.01%
SPG UN Equity	SIMON PROPERTY GROUP INC	Real Estate	2.76%
ORCL UN Equity	ORACLE CORP	Information Technology	2.50%
TWTR UN Equity	TWITTER INC	Communication Services	2.42%
INGA NA Equity	ING GROEP NV	Financials	2.31%
UPS UN Equity	UNITED PARCEL SERVICE-CL B	Industrials	2.14%
EQNR NO Equity	EQUINOR ASA	Energy	1.27%
NDA FH Equity	NORDEA BANK ABP	Financials	1.22%
1COV GY Equity	COVESTRO AG	Materials	1.17%
TSLA UW Equity	TESLA INC	Consumer Discretionary	1.11%
LOW UN Equity	LOWE'S COS INC	Consumer Discretionary	0.42%
DBK GY Equity	DEUTSCHE BANK AG-REGISTERED	Financials	0.34%
NOVOB DC Equity	NOVO NORDISK A/S-B	Health Care	0.12%
AON UN Equity	AON PLC-CLASS A	Financials	0.10%

| Ticker	Name	Sector Name	Weight
WYNN UW Equity	WYNN RESORTS LTD	Consumer Discretionary	5.00%
LVS UN Equity	LAS VEGAS SANDS CORP	Consumer Discretionary	5.00%
LHA GY Equity	DEUTSCHE LUFTHANSA-REG	Industrials	5.00%
HOLN SE Equity	HOLCIM LTD	Materials	5.00%
GPN UN Equity	GLOBAL PAYMENTS INC	Information Technology	5.00%
TKWY NA Equity	JUST EAT TAKEAWAY	Consumer Discretionary	5.00%
QRVO UW Equity	QORVO INC	Information Technology	5.00%
VRTX UW Equity	VERTEX PHARMACEUTICALS INC	Health Care	5.00%
IAG LN Equity	INTL CONSOLIDATED AIRLINE-DI	Industrials	5.00%
SAND SS Equity	SANDVIK AB	Industrials	5.00%
BIIB UW Equity	BIOGEN INC	Health Care	5.00%
ILMN UW Equity	ILLUMINA INC	Health Care	4.74%
URW NA Equity	UNIBAIL-RODAMCO-WESTFIELD	Real Estate	4.70%
WLN FP Equity	WORLDLINE SA	Information Technology	4.00%
LOGN SE Equity	LOGITECH INTERNATIONAL-REG	Information Technology	3.92%
SWKS UW Equity	SKYWORKS SOLUTIONS INC	Information Technology	3.79%
PRU LN Equity	PRUDENTIAL PLC	Financials	3.27%
DHER GY Equity	DELIVERY HERO SE	Consumer Discretionary	3.00%
HFG GY Equity	HELLOFRESH SE	Consumer Staples	2.73%
LLY UN Equity	ELI LILLY & CO	Health Care	2.35%
BESI NA Equity	BE SEMICONDUCTOR INDUSTRIES	Information Technology	2.29%
CTXS UW Equity	CITRIX SYSTEMS INC	Information Technology	2.21%
ALGN UW Equity	ALIGN TECHNOLOGY INC	Health Care	1.97%
TMUS UW Equity	T-MOBILE US INC	Communication Services	1.88%
KINDSDB SS Equity	KINDRED GROUP PLC	Consumer Discretionary	1.09%
CI UN Equity	CIGNA CORP	Health Care	0.89%
CAH UN Equity	CARDINAL HEALTH INC	Health Care	0.80%
IFF UN Equity	INTL FLAVORS & FRAGRANCES	Materials	0.79%
ULTA UW Equity	ULTA BEAUTY INC	Consumer Discretionary	0.41%
BMY UN Equity	BRISTOL-MYERS SQUIBB CO	Health Care	0.16%

US Composite PMI basket
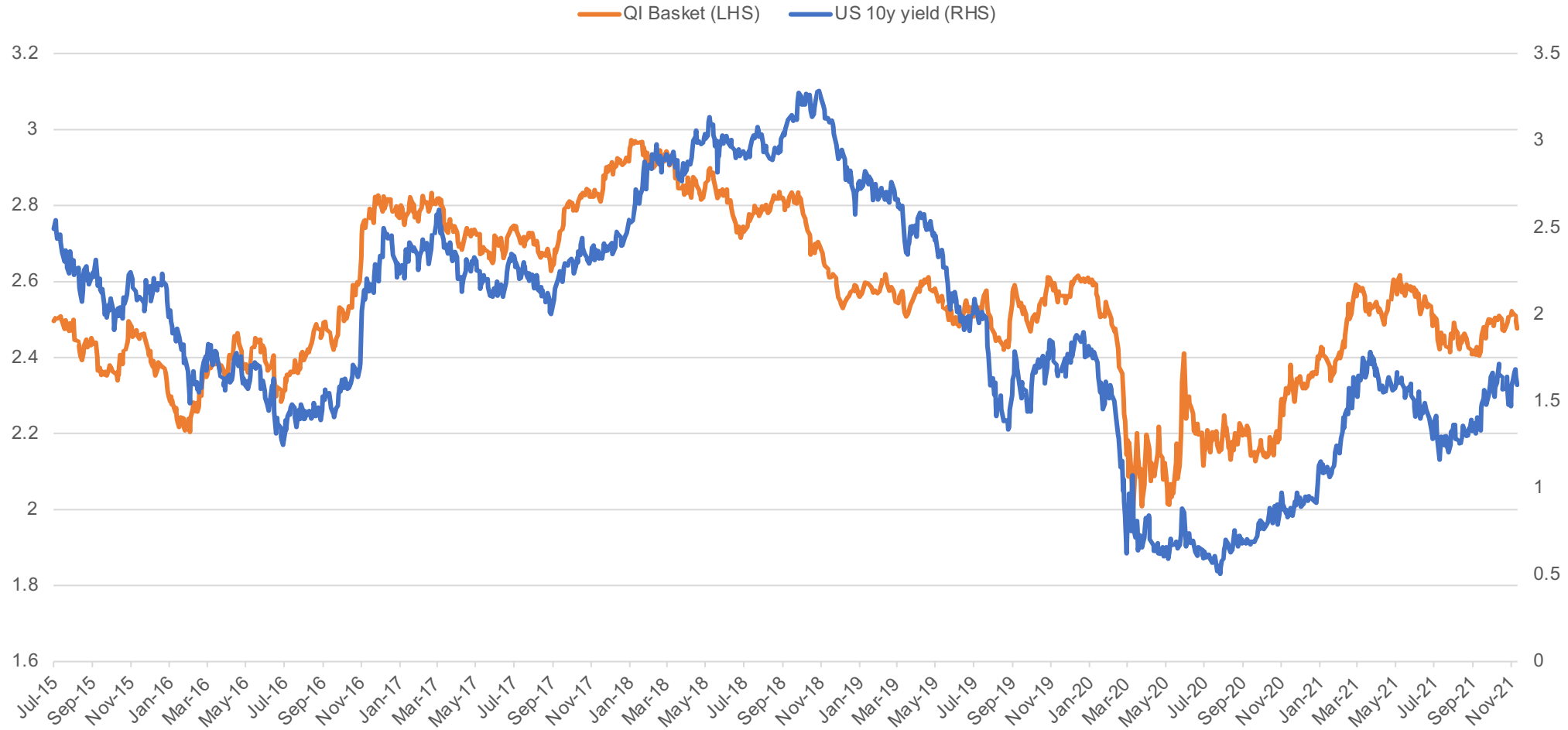
1yr Out-of-Sample Correlation: 74%
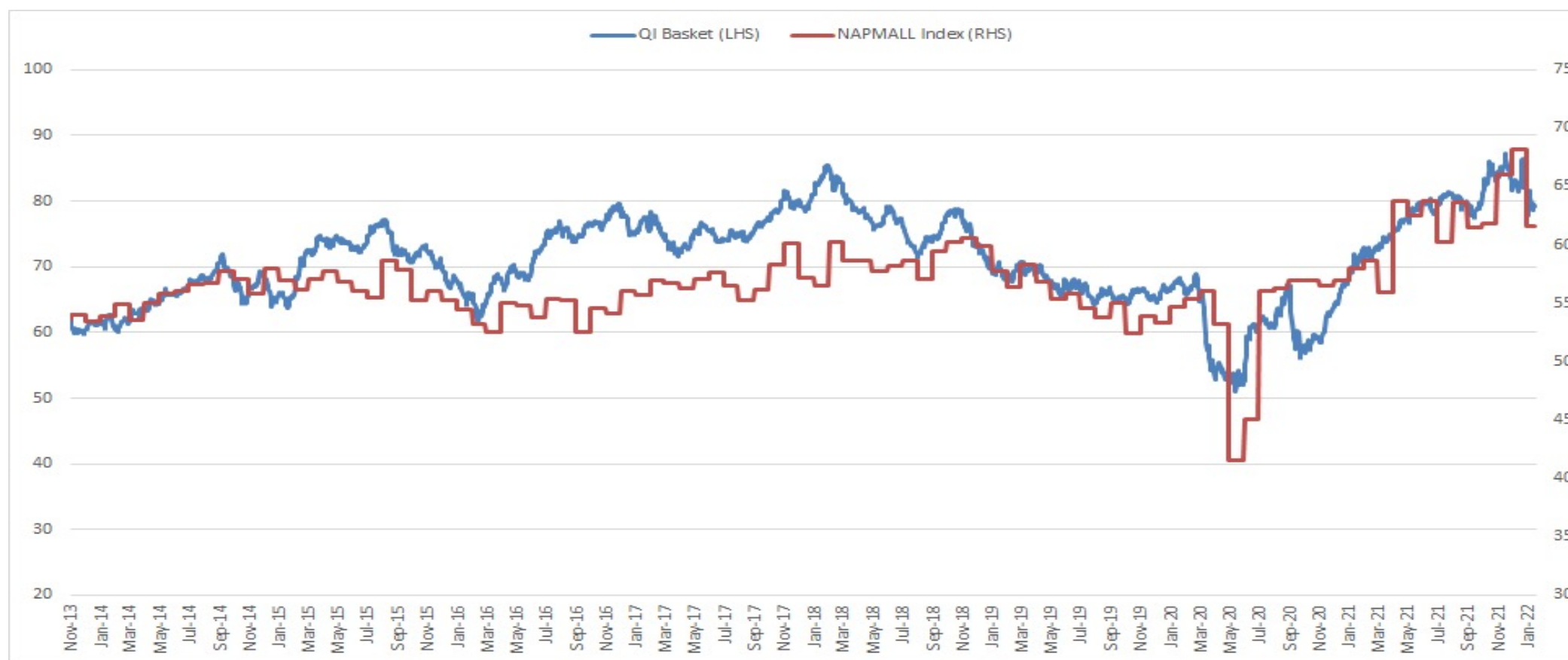
UK Housing basket

1yr Out-of-Sample Correlation: 74%
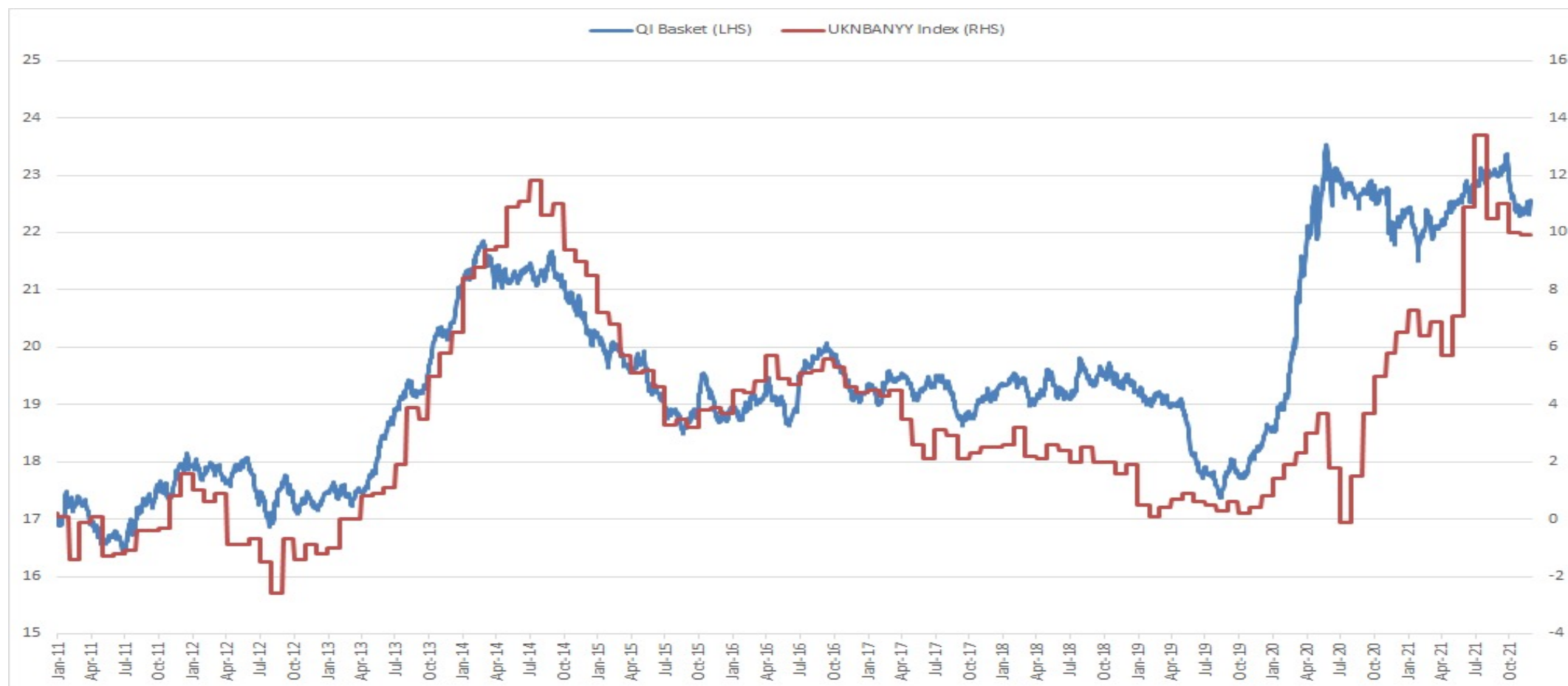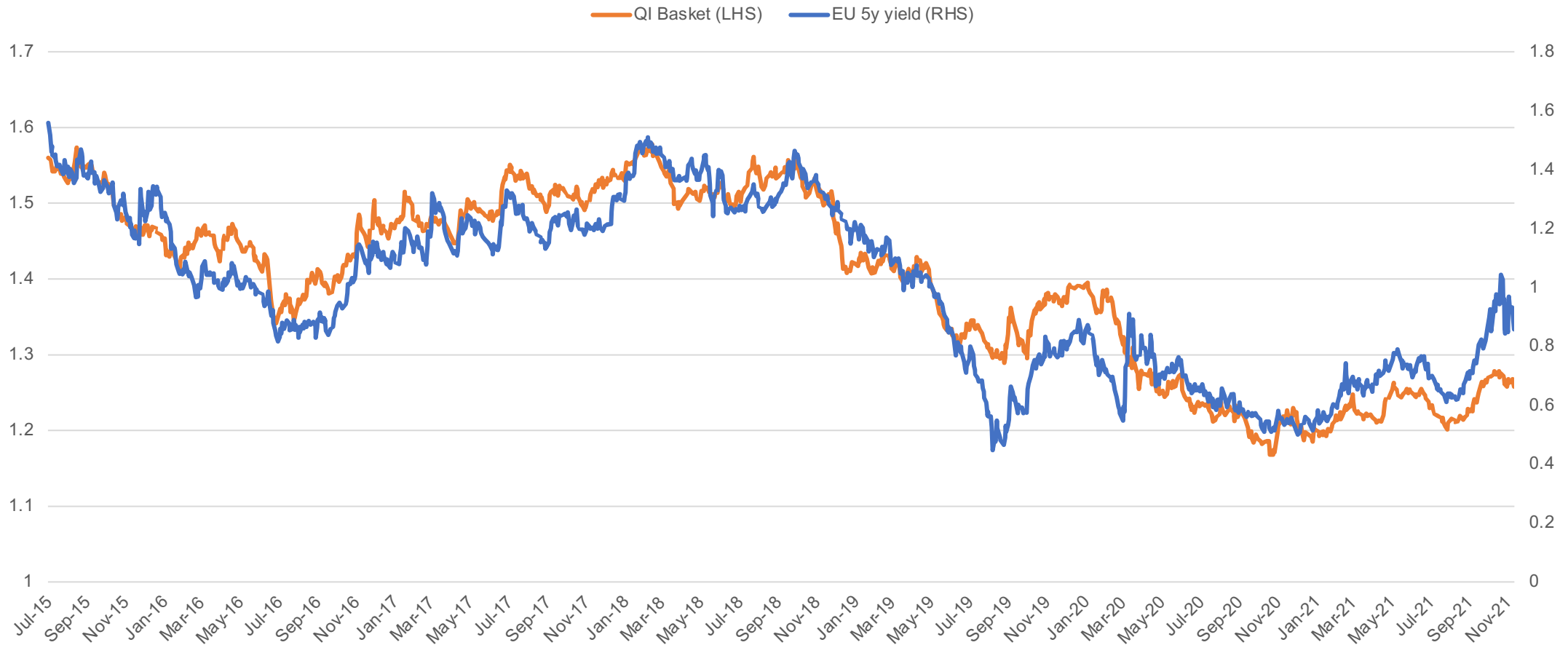
US 10y Yield basket
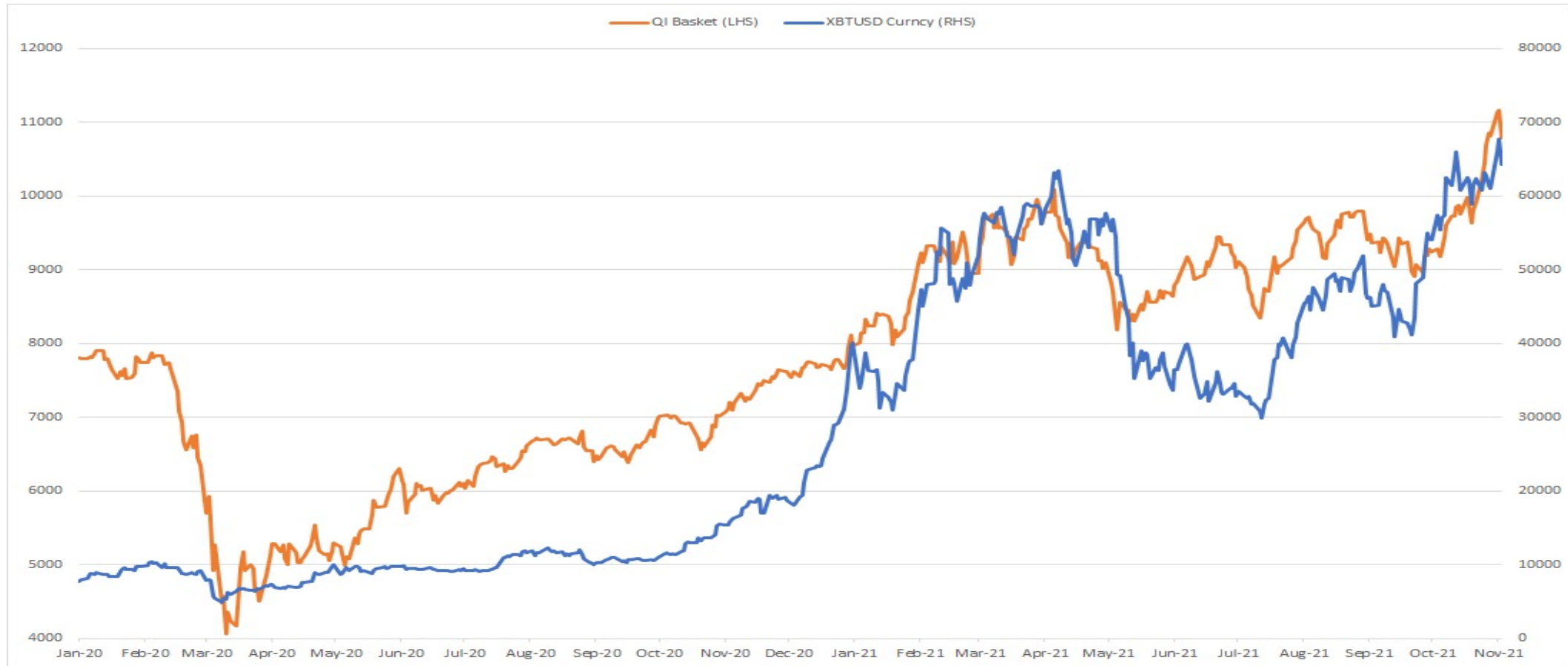
1yr Out-of-Sample Correlation: 86%

EUR 5y Yield basket

1yr Out-of-sample Correlation: 92%

Bitcoin basket

1yr Out-of-sample Correlation: 84%

Further basket examples

US & EUR High Yield Credit baskets
Track high yield credit spreads. Much lower carry cost compared to paying credit spreads

"SPX+" Outperformance basket
Basket trained to select S&P500 stocks in order to outperform the index

China basket
Developed with Goldman Sachs in 2020

ESG Basket
Draws from high ESG scoring stocks and designed to minimize tracking error with S&P500 index. Can use other benchmarks such as MSCI World

Further basket examples

Goldman Sachs offers 'basket' for bets against Chinese stocks

Bank launches product based on US shares that mirrors CSI 300 benchmark

China's equity market is one of the biggest in the world, with the main CSI 300 index boasting an overall market capitalisation of $4.5tn © EPA

Robin Wigglesworth in Oslo FEBRUARY 17 2020

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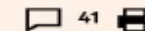
Goldman Sachs and a research boutique have constructed a "synthetic" way for investors to bet more cheaply against Chinese stocks.

China's equity market is one of the biggest in the world, with the main CSI 300 index boasting an overall market capitalisation of $4.5tn. But "shorting", or taking negative bets on the stocks, is tricky, as the costs and regulations involved are too onerous.

Quant Insight, a London-based research group, has therefore built a basket of about 40 US stocks with Chinese exposure designed to closely mirror the performance of China's CSI 300 benchmark. Goldman Sachs has added the index to Marquee, its digital platform, which means it can sell clients derivatives known as total return swaps based on the basket.

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