Index

Note: Italic page numbers refer to figures and tables. The letter n after a page number indicates a note.

ABC (Alessi, Barigozzi and Capasso) criterion, factor analysis, 81–2, 85–9
abnormal returns, 18, 24, 29, 33, 36, 44
ADF (Augmented-Dickey-Fuller) unit root test, 178, 182
agricultural markets
cointegration between agricultural commodities, 183–202
industrial production, 275, 277, 296, 297
inflation EU, 306, 310–11, 312
S&P 500, 248–9
log of time series, 182
reaction to economic news, 138–42
tent-shaped regression, 15
agriculture-energy linkage, 13, 15, 27–9, 29, 30, 61
oil and cocoa, 201–3
oil and corn, 196–8
oil and soybean, 198–9
oil and wheat, 199–201
aluminum, 129
cointegration relationships, 203, 205
copper, lead, zinc and industrial production US, 293–5
copper, nickel, zinc and lead, 205–7
common risk factors, 84
cross-commodities linkages, 70, 71, 73, 74, 84
Granger causality tests, 204, 224
log of time series, 183
reaction to economic news, 132, 133, 134
spillovers, 101, 102, 104
tent-shaped regression, 16
unit root test results, 186
AR (autoregressive) models see GARCH models; VAR models
arbitrage, 33, 78, 170, 172n, 173–4, 219
ARMA (autoregressive moving average) models
with exogenous inputs (ARMAX), 178
exponential (EGARCH), 44–5, 47, 118
GARCH, 4, 22
Asia
200% collapse in demand, 199
copper price, 203
oil and industrial metal prices, 275
see also China
asset allocation, 21
spillovers, 106–7, 109
strategies, 160–6
traditional funds, correlation between, 115–16
asset markets, 171–3
cointegration analyses, 241
exchange rates, 254–66
S&P 500 and US 10-Year rate, 241–54
asset prices, impact of price discovery on, 117–18
asset pricing models, 78
asymmetry, 3, 7, 22
and leverage, 43–4
news impact curve, 50
Augmented-Dickey-Fuller (ADF) unit root test, 178, 182, 186, 273
Australia (AU), 148
business cycles and commodities
performances, 152, 153, 154
industrial production, 275, 276, 277–80, 286–7
autocorrelation, 18–20, 178
backwardation, 9–10
balanced equity-bond portfolio, 162–3, 165
bear/bearish market, 20, 22, 47, 87, 173, 209
biofuels, 95, 103, 184, 187
Bloomberg, 119–21
bonds, 318
cointegration, 241–6, 248
investment strategies, 160–6
<table>
<thead>
<tr>
<th>bonds (Continued)</th>
<th>Commodity markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>risk factors, 84, 87, 88–90</td>
<td>agricultural products, 183–202</td>
</tr>
<tr>
<td>Sharpe ratios, 34, 36, 38</td>
<td>energy markets, 219–35</td>
</tr>
<tr>
<td>see also US 10-Year rate</td>
<td>industrial metals, 202–8</td>
</tr>
<tr>
<td>Brazil BOVESPA index, 5, 35, 37, 73, 75</td>
<td>precious metals, 208–19</td>
</tr>
<tr>
<td>factor identification, 88, 90, 92, 93, 94</td>
<td>econometrics</td>
</tr>
<tr>
<td>Brazil (BR)</td>
<td>Granger causality testing, 177</td>
</tr>
<tr>
<td>business cycle, 148, 149, 150, 151, 152, 153, 154</td>
<td>with structural breaks, 179–81</td>
</tr>
<tr>
<td>industrial production, 270, 271, 273, 284–6</td>
<td>without structural breaks, 177–9</td>
</tr>
<tr>
<td>inflation, 270, 272, 302, 303, 304, 305</td>
<td>exchange rates, 254–66</td>
</tr>
<tr>
<td>Tequila crisis, 149n3</td>
<td>with structural breaks, 177–9</td>
</tr>
<tr>
<td>breakout strategy, 33, 34, 37–8, 40, 42</td>
<td>industrial production, 269–300</td>
</tr>
<tr>
<td>breakpoint estimation, 180</td>
<td>inflation, 304–20</td>
</tr>
<tr>
<td>Brent crude oil, 5, 10, 12, 129</td>
<td>central bank rates see ECB refinancing rates; Fed target rate</td>
</tr>
<tr>
<td>cointegration relationships, 222, 223, 225</td>
<td></td>
</tr>
<tr>
<td>Gasoil, 227, 228</td>
<td></td>
</tr>
<tr>
<td>heating oil, 230, 231</td>
<td></td>
</tr>
<tr>
<td>cross-commodity links, 69, 70, 71, 73, 74</td>
<td></td>
</tr>
<tr>
<td>logarithm of time series, 185</td>
<td></td>
</tr>
<tr>
<td>reaction to economic news, 135, 136, 137</td>
<td></td>
</tr>
<tr>
<td>trends, 14, 15, 19, 35, 37</td>
<td></td>
</tr>
<tr>
<td>volatility and jumps, 47, 48, 58, 59</td>
<td></td>
</tr>
<tr>
<td>bubbles, 115, 209</td>
<td></td>
</tr>
<tr>
<td>bull/bullish market, 20, 22, 47, 173, 250</td>
<td></td>
</tr>
<tr>
<td>business cycle, 115–16</td>
<td></td>
</tr>
<tr>
<td>expansion and recession, 145–55</td>
<td></td>
</tr>
<tr>
<td>and impact of news, 123–4</td>
<td></td>
</tr>
<tr>
<td>link to GDP, 170</td>
<td></td>
</tr>
<tr>
<td>nature of each regime, 155–60</td>
<td></td>
</tr>
<tr>
<td>performance analysis, 160–6</td>
<td></td>
</tr>
<tr>
<td>regime estimation, 21–2</td>
<td></td>
</tr>
<tr>
<td>sensitivity of commodities to, 125–42</td>
<td></td>
</tr>
<tr>
<td>Canada (CA)</td>
<td></td>
</tr>
<tr>
<td>business cycles, 148, 149, 150, 151, 152–4</td>
<td></td>
</tr>
<tr>
<td>industrial production, 271, 275, 276, 277–9, 280, 287–90</td>
<td></td>
</tr>
<tr>
<td>inflation, 272, 302, 303, 304, 305</td>
<td></td>
</tr>
<tr>
<td>capacity utilization, 118</td>
<td></td>
</tr>
<tr>
<td>CAPM (Capital Asset Pricing Model), 78</td>
<td></td>
</tr>
<tr>
<td>cattle prices, 174–5</td>
<td></td>
</tr>
<tr>
<td>CBOT (Chicago Board of Trade), 94, 95, 129, 170, 184, 186</td>
<td></td>
</tr>
<tr>
<td>CCPAM (Consumption Capital Asset Pricing Model), 78</td>
<td></td>
</tr>
<tr>
<td>central bank rates see ECB refinancing rates; Fed target rate</td>
<td></td>
</tr>
<tr>
<td>China (CH)</td>
<td></td>
</tr>
<tr>
<td>business cycles, 148, 149, 150, 151, 152–4</td>
<td></td>
</tr>
<tr>
<td>industrial production, 121, 122, 124, 271, 276, 282–4, 299</td>
<td></td>
</tr>
<tr>
<td>inflation, 302, 303–5</td>
<td></td>
</tr>
<tr>
<td>news indices, 120, 121, 122, 123, 126, 127</td>
<td></td>
</tr>
<tr>
<td>China Industrial Production Index, 132, 135, 138, 140</td>
<td></td>
</tr>
<tr>
<td>Chinese CPI (Consumer Price Index), 120, 121, 138, 140, 142</td>
<td></td>
</tr>
<tr>
<td>Chinese PMI (Purchasing Managers Index), 120–4, 130–42</td>
<td></td>
</tr>
<tr>
<td>climate, 171</td>
<td></td>
</tr>
<tr>
<td>CME (Chicago Mercantile Exchange), 129</td>
<td></td>
</tr>
<tr>
<td>co-jumps, 61, 91</td>
<td></td>
</tr>
<tr>
<td>co-movement, 169, 173, 185</td>
<td></td>
</tr>
<tr>
<td>coal, 220</td>
<td></td>
</tr>
<tr>
<td>and electricity prices, 222, 223</td>
<td></td>
</tr>
<tr>
<td>futures contracts, 224</td>
<td></td>
</tr>
<tr>
<td>link with oil and gas prices, 221–2, 223</td>
<td></td>
</tr>
<tr>
<td>cocoa, 129</td>
<td></td>
</tr>
<tr>
<td>cointegration relationships, 188, 191, 202</td>
<td></td>
</tr>
<tr>
<td>coffee, 186–7, 194–5</td>
<td></td>
</tr>
<tr>
<td>coffee sugar and wheat, 192–4</td>
<td></td>
</tr>
<tr>
<td>Granger causality, 188, 189, 190</td>
<td></td>
</tr>
<tr>
<td>oil, 187, 201–2</td>
<td></td>
</tr>
<tr>
<td>cross-commodity linkages, 70–1, 75–6, 84</td>
<td></td>
</tr>
<tr>
<td>log of time series, 182</td>
<td></td>
</tr>
<tr>
<td>reaction to economic news, 139, 140, 141</td>
<td></td>
</tr>
<tr>
<td>tent-shaped regression, 15</td>
<td></td>
</tr>
<tr>
<td>coffee, 129</td>
<td></td>
</tr>
<tr>
<td>cointegration relationships, 188, 191, 202</td>
<td></td>
</tr>
<tr>
<td>cocoa, 186–7, 194–5</td>
<td></td>
</tr>
<tr>
<td>cocoa, sugar and wheat, 192–4</td>
<td></td>
</tr>
<tr>
<td>Granger causality, 188, 189, 190</td>
<td></td>
</tr>
<tr>
<td>oil, 187</td>
<td></td>
</tr>
<tr>
<td>cross-commodity linkages, 70–1, 75–6, 84</td>
<td></td>
</tr>
<tr>
<td>log of time series, 182</td>
<td></td>
</tr>
<tr>
<td>reaction to economic news, 138, 139, 141</td>
<td></td>
</tr>
<tr>
<td>tent-shaped regression, 15</td>
<td></td>
</tr>
<tr>
<td>cointegration, 169–70</td>
<td></td>
</tr>
<tr>
<td>asset markets, 241–54</td>
<td></td>
</tr>
<tr>
<td>commodity markets</td>
<td></td>
</tr>
<tr>
<td>agricultural products, 183–202</td>
<td></td>
</tr>
<tr>
<td>energy markets, 219–35</td>
<td></td>
</tr>
<tr>
<td>industrial metals, 202–8</td>
<td></td>
</tr>
<tr>
<td>precious metals, 208–19</td>
<td></td>
</tr>
<tr>
<td>econometrics</td>
<td></td>
</tr>
<tr>
<td>Granger causality testing, 177</td>
<td></td>
</tr>
<tr>
<td>with structural breaks, 179–81</td>
<td></td>
</tr>
<tr>
<td>without structural breaks, 177–9</td>
<td></td>
</tr>
<tr>
<td>exchange rates, 254–66</td>
<td></td>
</tr>
<tr>
<td>industrial production, 269–300</td>
<td></td>
</tr>
<tr>
<td>inflation, 300–20</td>
<td></td>
</tr>
</tbody>
</table>
commodity investing see investment strategies
see also commodity markets
see also agricultural markets; energy markets; industrial metals; precious metals
commodity prices, effect of business cycles on, 145–67
commodity risk premium, 9, 11–12, 13
common risk factors in commodities, 77–90
complementary relationships, 169
conditional density, 147
conditional skewness, 46
conditions for cointegration, 178, 181, 182, 296
consumer price indices (CPI), 119, 120
impact on commodity markets, 122–42
impact on standard assets, 121
see also inflation
consumption CAPM, 78
contagion effects, 91, 96, 128
contango, 9, 10
cconvenience yield, 4, 11
copper, 129
cointegration
industrial production, 274, 275, 276, 280
industrial production and industrial metals, 293–6
cross-commodity links, 69, 70, 71, 73, 74, 203–6
log of time series, 183
reaction to economic news, 132, 133, 134
tent-shaped regression, 16
Copula approach, 96
corn, 129
cointegration, 183, 187–8, 191, 202
exchange rates, 258
Granger causality, 188, 189, 190
industrial production, wheat and soybean, 296–7
oil, 196–8
oil, cotton, soybean and EUR–USD X-rate, 264–5
soybean, 196
soybean and sugar, 196
wheat and soybean, 190–2, 193
cross-commodity links, 69, 70–1, 75–6
impact of economic news, 138, 139, 141
log of time series, 182
spillovers, 101, 102, 103, 106
tent-shaped regression, 15
correlation
between commodities, 69–72
commodities and other markets, 72, 73–6, 77, 115–16
common risk factors, 77–90
cotton, 5, 129
cointegration relationships, 188
exchange rates, 256, 258
Granger causality tests, 189, 190
oil, EUR–USD X-rate, corn and soybean, 264–5
impact of economic news, 140, 142
log of time series, 182
spot and future price, 10
tent-shaped regression, 15
covariance, 18, 147, 161
covariance matrix, 80–1, 83, 97, 147, 160
CPI (Consumer Price Index), 119, 120
and business cycle, 122–42
see also inflation
crack spread, 219, 221
stationarity of, 225–6, 227, 228
CRB (Commodities Research Bureau) index, 274, 276, 300–1, 302, 310
crises see financial crises
cross-commodity linkages, 177
agricultural markets, 183–202
energy markets, 219–35
Granger causality testing and cointegration, 177–81
industrial metals markets, 202–8
precious metals markets, 208–19
unit root test results, 181–3
cross-hedging, 187–8
cross-market linkages, 92–3, 173, 299, 318–20
crude oil, 54
cointegration between energy markets, 219–23
and economic activity, 255
link to agricultural products, 187–8, 196–202
spot and futures prices, cointegration, 175
see also Brent; WTI
CSCE (Coffee Sugar and Cocoa Exchange), New York, 186–7
CTA (Commodity Trading Advisor), 13, 21, 33, 43
currencies, 6, 7, 33
correlation with commodities, 72, 74, 77
risk factors, 83, 84, 87
Sharpe ratios, 34, 38–9, 41, 42, 43
spillovers, 99, 100, 107–10
time series momentum strategy, 35
see also US Dollar (USD)
cyclical information, value of, 160–6
daily returns, estimating jumps from, 54–5
dairy products, 187, 188
data generating process, 45
DCC (dynamic conditional correlation) model, 96
density, 23–4, 47, 147
Index

descriptive statistics, 4, 7–8
agricultural products, metals and energy prices, 181
commodities, stocks, currencies and rates, 5–6
domestic business cycles, 149
equities, bonds and exchange rates, 242
estimated economic regimes, 156, 157
industrial production and inflation, 270
spillover index, 99–100
Dickey-Fuller test, 178
Augmented (ADF), 178, 182
directional shocks, 59
directional spillovers, 92–101, 107, 109
diversification effect, 30, 34–6, 59, 77, 83–4, 95–6
diversified portfolios, 2, 104–5, 145, 161
Dow Jones, 5, 8, 72, 73, 75, 82
AIG Commodity Index (DJ-AIG), 127
downtrend (bear market), 20, 22
dummy variables, 40, 118, 180
dynamic correlation models, 96
dynamic investment strategy, 161, 163, 164, 165
ECB refinancing rates, 120, 121, 122, 124, 130, 131
agricultural products, 138–42
energy, 135–8
industrial metals, 132–5
ECM (error-correction model), 179
vector ECM (VECM), 180–1
economic activity, 115–16, 170–1
industrial production, 269–300
inflation, 300–21
reaction to economic news, 117–18
worldwide business cycles, 145–67
economic news, reaction of commodity markets to, 117–43
economic surprises, 117–21, 143
efficiency, 174–5
EGARCH (exponential GARCH) model, 44–5, 47, 118
EGARCH-MN, 47, 48–9, 50
electricity, 220, 224–5
and fuel prices, 222, 223
EM filter, 148
EMU CPI, 120
EMU GDP, 120
energy markets
cointegration, 219–20, 223–5
EUR–USD exchange rate, 259–60
Granger causality tests, 222–3, 224
literature review, 220–2
oil and gas, 231–4
petroleum products, 225–31
with S&P 500, 252–3
log of time series, 185
reaction to economic news, 126, 135–8
tent-shaped regression, 15
equilibrium relationships, 169–75
equities, 6–7, 73
common components, 78
see also S&P 500
equity-bond-commodity portfolio, 160, 163
equity-bonds portfolio, 160, 162, 163
error-correction model (ECM), 179
vector ECM, 180–1
Euro–Dollar exchange rate, cointegration analyses, 257
agricultural products and metals, 257–8
agricultural products and oil, 264–5
energy, 259–60
gold prices, 261–2
gold, silver, platinum and oil, 260–1
log of time series, 243
oil (WTI), 262–4
European Union (EU)
business cycles, 132–4
industrial production, 270, 274, 277–9, 280, 290–1, 297–8, 299
inflation, 302–7, 310–15
see also Germany (GE)
Eurozone, 149
sovereign crisis, 2, 127
EVT (extreme value theory), 55n
excess co-movement, 173, 185
exchange rates, 19, 35, 37, 128, 241–5
cointegration analyses, 254–66
log of time series, 243
see also Euro–Dollar exchange rate
expansion periods, 123, 124–5
market-by-market analysis, 129–42
rolling analysis, 125–8
expectation-minimization (EM) algorithm, 148
exponential GARCH (EGARCH) model, 44–5, 47, 118
exponential utility function, 165–6
extreme events, 3, 7, 23, 31
see also tail events
factor models, 79, 80–2
empirical findings, 82–90
fat tails, 4, 22, 46
FAVAR (Factor-Augmented VAR) model, 175–6
Fed target rate, 118, 119, 120
impact on commodity prices, 122
according to business cycle, 123, 124
market-by-market analysis, 129–42
impact on standard assets, 121
indices performance and the NBER crises, 145–7
and nature of economic regime, 155–7
feedback mechanism, 284–5, 287–8, 293, 295, 298, 299–300
financial assets
impact of price discovery, 117–18
interaction of commodities with, 69–110
see also bonds; currencies; equities
financial crises
co-jumps during, 61, 91
and cross-commodities correlations, 95–6
leverage effect, 44
and price volatility of commodities, 7, 29, 30, 128
recessionary regimes, 156, 157
response of precious metals to, 126–7
volatility spillover index increase, 99, 105
see also recession
financialization, 127–8, 145–67
flight-to-quality episodes, 246–7
forecasting, 77
horizon, 149–55
optimal, 157–8
leverage effects, 45
term structure of futures, 12–13
variance decomposition, 97
forecasting errors, 97
French Business Confidence index, 120, 121, 123, 135, 138, 140
fuel prices and electricity, 222, 223
fund management, 160–6
fundamental value, 169, 177, 214, 216, 291
futures, 9–13, 18, 33, 54, 55
commodity prices database, 129
FX (foreign exchange) markets
cointegration analyses, 259–65
risk factors, 82, 83, 86
GARCH model, 4, 22, 55
exponential (EGARCH), 44–5, 47, 118
gas see natural gas
gasoil, 129
cointegration analyses, 223, 224, 225
with Brent, 227–8, 228
with WTI, 225–6, 226, 227
impact of economic news, 135, 136, 137, 138
links with other commodities, 70, 71
links with other markets, 73, 74
trends and risks, 10, 12, 14, 19, 35, 37, 48, 58
gasoline, 129, 175, 219
see also petroleum products
Gaussian distribution, 46–7, 50, 53–4, 55, 97, 147
GDP (gross domestic product), US
and business cycle, 170
correlation with economic news, 120
effect on commodity prices, 118, 122
agricultural products, 139–42
energy commodities, 136, 137
industrial metals, 132–5
precious metals, 130–2
impact on standard assets, 121
see also EMU GDP
generalized hyperbolic (GH) distribution, 46, 47
goodness-of-fit, 155
Granger causality tests, 177
Goldman Sachs Commodity Indices (GSCI), 4, 8, 27–32, 47, 50–2, 56–7, 59–61
cointegration relationships
bonds and equities, 241–54
exchange rates, 254–66
industrial production, 269–300
inflation and monetary indices, 300–20
long-term reaction to economic news, 122
volatility spillovers, 90–110
Goldman Sachs Commodity Indices sub-indices and exchange rates, 256, 257
Goldman Sachs Commodity Indices sub-indices and industrial production, 275–6, 277–9
Goldman Sachs Commodity Indices sub-indices, equities and bonds, 245, 246

Index 327
Granger causality tests (Continued)

GSCI sub-indices, inflation and monetary indices, 302, 303–5
industrial metals, 204
literature review, 274, 275
precious metals, 211
growth, 117, 120
and industrial production, 269–300
and precious metals, 130, 132, 151
regimes, 156, 158, 167
strong growth regime, 156, 167
GSCI see Goldman Sachs Commodity Indices

HAC estimator, standard deviation, 156
heating oil, 129
cointegration, 219, 223, 224, 225
Brent, 230–1
natural gas, 231–2, 233
WTI, 229–30
descriptive statistics, 5, 181
effects of backwardation and contango, 10
impact of economic news, 136, 137, 138
log of time series, 185
unit root test results, 186
hedging, 9–10, 45, 187–8, 219–20, 256
against inflation, 118, 132, 151, 159
hedging pressure, 10–11, 78, 79
Henry Hub (HH), natural gas price, 129, 221
herd behavior, 173
heterogeneity of commodities, 31, 38, 40, 43, 78, 79
HSFO (High Sulfur Fuel Oil), 223

Huang and Satchell, value of economic information, 166

ICE (InterContinental Exchange), 129, 221
idiosyncratic shocks, 172, 195, 232, 235
IFO expectations survey, Germany, 119, 120, 121, 122, 123, 124

IMF (International Monetary Fund) Commodity Indices, 274, 275, 276, 282, 287, 290
industrial metals
business cycles and regimes, 146, 151, 152–4, 158–60, 161, 164, 166
cointegration, 202–4
lead and zinc, 207–8
other industrial metals, 205–7
S&P 500, 249–51
traditional assets, 245–6
common risk factors, 84, 87, 88
cross-commodities linkages, 70–1, 72, 73–6
jumps, 59, 61
leverage effects, 45, 47
log of time series, 183

reaction to economic news, 122, 124, 126, 127, 132, 133, 134, 135
tent-shaped regression, 16
trends, 29–30, 31
volatility spillovers, 105, 107, 108, 109, 110
industrial production
and business cycles, 148–9
cointegration analyses, 269–73, 298–300
Australia, 286–7
Brazil, 284–6
Canada, 287–90
China, 282–4
dataset and unit root tests, 269, 270–3
EU oil, 297–8
European Union, 290–1
Germany, 291–3
Granger causality tests, 275–6, 277–9
literature review, 274–5, 276
United States, 279–82
US aluminum, copper, lead and zinc, 293–5
US copper, 295–6
US wheat, corn and soybean, 296–7
and nature of regimes, 155–7
inflation
cointegration relationships, 300, 306, 320–1
agriculture and EU inflation, 310–11
agriculture, US M2 and US inflation, 307–8
energy and EU inflation, 314–15
energy, US M2 and US CPI, 311
energy, US M2 and US inflation, 309–10
gold and US inflation, 315–16
Granger causality tests, 302–3, 303–5
literature review, 300–2
oil and US inflation, 316–17
precious and industrial metals and EU inflation, 311–13
precious and industrial metals, US M2 and US CPI, 307–9
commodity and consumer price, 171–3
descriptive statistics, 270
and economic regimes, 145, 146, 149, 155, 156, 157, 159, 161
gold as hedge against, 173
impact on commodity markets, 118–19, 126, 130, 132
log of time series, 272
unit root tests, 273
inter-commodity equilibrium, 169
interest rates, 6, 7, 8, 12, 13, 175, 254
and common risk factors, 82–3, 86–7
correlation with commodities, 72, 74
volatility spillovers, 99, 105
see also Fed target rate
International Petroleum Exchange (IPE), 94
inventory
costs/theory of storage, 11, 78, 79, 171–2, 175, 254
and economic regime, 155, 156, 157
levels, 4, 44, 170
investment managers, 87, 166, 217
investment strategies
crack spreads, 219, 221
performance analysis, 160–6
trend-following, 8, 13, 17–18, 32–40
investment universe, 83, 87–9, 165
investors, 1, 33, 43
cross-commodities spillovers, 95
economic regimes, 158–9
institutional, 77, 128
portfolio diversification, 2, 95–6, 244, 247
safety in precious metals, 219, 256, 301
spillover index, linear trend, 105
IPE (International Petroleum Exchange), 94
ISM (Institute for Supply Management) survey, 119, 122, 123
Jarque Bera (JB) test statistic, 181
jobless claims, 119
Johansen cointegration tests, 178–9
joint distribution, 156
jump to volatility channel, 59
jumps, 4, 51–61
KPSS unit root test, 182, 186, 244, 273
kurtosis, 3, 7–8, 181
law of one price (LOP), 173–4, 234
lead, 129
cointegration relationships, 203, 204
aluminum, copper, nickel and zinc, 205–7
Granger causality tests, 204, 224
industrial production, 274, 276, 280
industrial production, aluminum, copper, and zinc, 293–5
zinc, 207–8
cross-commodity links, 70, 71, 73, 74, 84
impact of economic news, 133, 134, 135
log of time series, 183
leverage effect, 43–50
LIFFE (London International Financial Futures Exchange), 185, 186
likelihood function, 23, 147
likelihood ratio test, 155
livestock, 174–5
LME (London Metal Exchange), 95, 129, 203, 206, 208, 274
loadings
factor models, 80, 85, 86
performance analysis, 160–4
log-likelihood function, 147
log-returns, 181, 182
London FOX (Future and Options Exchange), 186–7
long position, 18, 161–3
LOP (law of one price), 173–4, 234
LR (likelihood ratio) test, 155
LSFO (Low Sulfur Fuel Oil), 223
M2 see money
macroeconomic factors, 170–1
economic news, 117–42
economic regimes, 145–67
exchange rates, 254–66
industrial production, 269–300
inflation and monetary indices, 300–20
management fees, 165–6
market consensus, 117
market efficiency, 174–6
market movers, 119, 123, 126, 135, 138, 140, 142
Markov chain, 22, 148
Markov-switching (MS) model, 21–2
economic regimes, 147, 148–9, 150, 155, 156
multivariate, 96
number of regimes, 22–4
Markowitz optimal portfolio loadings, 160–1
matrix of cross-correlations, 177
maximum likelihood, 22, 23–4, 181
maximum score, 150–1, 152, 153, 154, 157
MCAPM (Money Capital Asset Pricing Model), 78
MCCAPM (Money Consumption Capital Asset Pricing Model), 78
mean reversion, 59–61
mixed equity–bond–commodity strategy, 160
mixture of Gaussian distributions, 46–7, 50, 51
momentum, 13, 15–18
MS model, 21–32
nature of, 20–1
persistence of shocks, 18–20
time series, 32–43
monetary policy, 78, 118, 126, 135, 145–6
Money CAPM, 78
Money CCAPM, 78
money (US M2), 301
cointegration analyses, 306, 306
agricultural products and inflation US, 307, 308
energy and inflation US, 309–10, 311
Granger causality tests, 302, 303–5
metals and inflation US, 307–9
log of time series, 272
natural gas, 129
cointegration relationships, 220, 223, 224, 225
heating oil, 231–2
oil and coal, 221–2
WTI, 232–4
cross-commodity links, 69, 70, 71, 73, 74, 84
natural gas (Continued)
- impact of economic news, 136, 137, 138
- log of time series, 185
- spillovers, 101, 102
NBER (National Bureau of Economic Research), 123–5, 145–7
- net spillover index, 98, 100–10
- Newey-West HAC estimator, 13, 24, 156
- news database, 119–21
- news impact curves, 50, 51
- news, reaction of commodity markets to, 117–43
  - nickel, 129
    - cointegration with other industrial metals, 205–6
    - log of time series, 183
    - reaction to economic news, 132, 133, 134, 135
    - tent-shaped regression, 16
- North America see USA
- NYMEX (New York Mercantile Exchange), 94–5, 129, 221
- OECD inflation index, 269, 302, 303–5
- oil, cointegration analysis
  - agricultural markets, 187–8
  - cocoa, 201–2
  - corn, 196–7
  - soybean, 198–9
  - wheat, 199–200
- electricity price, 222
- exchange rates, 262–5
- gas and coal prices, 221–2, 223
- gas prices, 231–4
- gold, 210, 211, 217–18
- industrial production EU, 297–8
- inflation US, 316–17
- see also Brent; crude oil; gasoil; heating oil; WTI
- oil price swings, 197, 202, 218, 253
- oil shocks, 95, 274
- OPEC, 256
- option pricing, 46, 52–3
- order of integration, time series, 177, 178, 181, 182, 241, 269
- ordinary least squares (OLS) regression, 8, 13, 83, 178
  - of Sharpe ratios, 36–43
  - overfitting, 81, 156, 165
- palladium, 209
  - gold and platinum, 210, 211
  - passive investor, 244
- PBOC (Public Bank of China), 115, 135
- PCA (principal component analysis), 79–90
  - performance analysis, 160–6
  - persistence, commodity returns, 3, 8, 13, 18–20
  - petroleum products, 169, 170, 219, 225
    - Brent and gasoil, 227–8
    - Brent and heating oil, 230–1
  - literature review, 220–1, 223
  - WTI and gasoil, 225–7
  - WTI and heating oil, 229–30
- PJM (US Pennsylvania–New Jersey–Maryland Interconnection), 222
- platinum, 129
  - cointegration, 209, 211, 212
  - gold, 214–15
  - gold and palladium, 210
  - gold and silver, 215–17
  - gold, silver, WTI and EUR–USD X-rate, 260–1, 262
  - cross-commodity links, 70, 71, 73, 74, 84
  - reaction to economic news, 130, 131, 132
- PMI (Purchasing Managers Index), China, 120
- PnL (profits and losses), 161, 162, 164, 165
- portfolio managers, 209–10
- portfolios, 160–6
  - diversified, 2, 104–5, 145, 161
- Power ARCH model, 45
- power plants/production, 220, 225
- PP (Phillips–Peron) tests, 178
- PPICM (Producer Price index for crude materials), 300, 302
- Prebisch–Singer hypothesis, 17
- precious metals
  - cointegration, 208–19
  - EUR–USD exchange rate, 260–2
    - with S&P 500, 251–2
  - log of time series, 184
  - reaction to news, 126, 127
- price discovery, 117–18
- pricing
  - asset pricing, 78
  - options, 46, 52–3
- principle component analysis (PCA), 79
  - estimation of number of common components, 80–90
- purchasing power parity (PPP), 254–5
- pure commodity portfolio, 160, 161–2, 165, 166
- QML (quasi maximum likelihood) estimation, 46
- range trading episode/period, 20–1, 23, 24, 30
- raw materials, cointegration with inflation, 300–2, 310
- RBOB (Reformulated Regular Gasoline Blendstock), 129
- recession
  - and commodities performances, 145, 146
    - dependence on nature of regime, 155–60
    - emerging and developing countries, 148–55
commodity market reaction to, 123–5
impact on commodity markets, 128–42
recovery from recession and commodity price rises, 146–7
recursive estimation approach, 46–7
regime and commodity markets as an asset class, 145, 167
business cycle-commodity market link, 148–55
business cycle measurement, 147–8
commodity performance and nature of regimes, 155–60
indices performances, Fed monetary policy and NBER crises, 145–7
investment strategies, 160–6
regime number and nature
estimation results, 24–32
estimation using MS model, 21–4, 25
expectations and volatilities across, 27
persistence, 26, 27, 29, 31, 33, 36, 39–40
time series in S&P 500, 39
time series in US 10Y rates, 40
time series, GSCI, 29, 30, 31, 32
time series momentum, 27, 28, 29, 30, 31, 36
Vuong’s test, 155–6
regression, 8, 12–13, 14, 15–16
and factor models, 80–4
Granger causality testing, 177–8
Johansen cointegration tests, 178–9
news analysis, 117–18
rolling analysis, 125–8
of Sharpe ratios, 36–43
structural shift estimation, 180
retail sales, US, 119, 120
and business cycle phase, 131
impact on agricultural commodities, 138–42
impact on commodity indices, 122, 124
impact on energy prices, 135–8
impact on industrial metals, 132–5
impact on precious metals, 130–2
impact on standard assets, 121
rice, 129
impact of economic news, 140, 142, 142
log of time series, 182
net spillover to soybean, 102, 103
pairwise Granger causality tests, 188, 190
unit root test results, 186
risk aversion, 9
management fees, 165–6
precious metals, 110, 126–7
risk exposure, 1, 9, 33, 34
risk factors, 77
empirical findings, 82–90
factor models, 80–2
literature review, 78–9
risk management, 45, 219–20
risk patterns
jump activity, 51–61
spillover effects, 43–51
risk premium, 3, 4, 7, 8, 9, 11–12, 13
robust estimation, 13, 50, 55, 56–7
robustness checks, 118
rolling analysis, 125–8
Russell 3000, 115, 116
S&P 500 index
cointegration, 241–4
agricultural products, 248–9
energy, 252–3
gold, oil and US-10Y, 246–8
Granger causality tests, 245–6
industrial metals, 249–51
precious metals, 251–2
impact of economic news, 121
regimes, 27, 28, 39
safe haven assets, precious metals as, 131, 132, 151, 158, 217, 219, 256
SDF (stochastic discount factor), 78
seasonality, 221, 256
sensitivity index, 125–8
Sharpe ratios, 34, 39–40, 43
breakout strategy, 34, 37–8, 42
business cycle phase, 150–1
performance analysis, 161–6
time series momentum strategy, 41
trend following strategy, 34, 43
shocks, 127–8, 274
idiosyncratic, 172, 195, 232, 235
persistence of, 18–20, 22
volatility spillovers, 90–2, 95, 97–8, 99, 105
short position, 161, 163
silver, 129
cointegration, 208–9, 256, 258
gold, 209–10, 211, 212–13
gold and platinum, 215–17
gold, platinum, oil and EUR–USD X-rate, 260–1, 262
platinum, 214–15
cross-commodity links, 69, 70, 71, 72, 73, 74, 84
reaction to economic news, 130, 131–2
tent-shaped regression, 16
skewness, 5–6, 7, 181
slowdown period, 149, 157, 158
and performance analysis, 161, 162, 163, 164, 166
SMI (Swiss Market Index), 6, 72, 73, 75
South America see Brazil
sovereign crisis, Eurozone, 127

Index
Index

soybean, 129
cointegration
  corn, 196
  corn and sugar, 196
  corn and wheat, 190–2
  industrial production, wheat and corn, 296–7
  oil, 198–9
  impact of economic news, 140
  log of time series, 182
spillover effects
  empirical findings, 47–51
  leverage effect, 43–4
  literature review, 44–5
  modeling approach, 46–7
spillover index, 96–8
spillover volatility, cross-asset analysis, 90–6
spot-futures relationship, 9–13
spot prices, 10, 35–6, 38–9, 174, 175
stalling regimes, 156, 157, 158, 159, 161, 163–4, 166
standard deviation, 24, 47, 48–9, 82, 97, 117, 155–6, 181, 242, 270
standard deviation (Std. Dev.), 181
stationarity, 182, 282, 287
  crack spread, 225–6, 227, 228
  departures from, 195, 200, 253, 295, 298, 315
stochastic discount factor (SDF), 78
stochastic volatility, 4, 22, 53, 54
stop-and-reverse strategies, 33
storage costs/theory of storage, 11, 78, 79, 171–2, 175, 254
strong expansion periods, 157, 158, 159, 161, 162, 163, 164
strong growth regime, 156, 167
structural break, cointegration analysis, 177–81
  stylized facts, 125–8
  substitute relationships, 103, 169, 185, 198, 208–9, 220, 232
sugar, 129
  cointegration
  cocoa, coffee and wheat, 192–4
  corn and soybean, 196
  impact of economic news, 139
surveys, economic news, 119–21
Swiss Market Index (SMI), 6, 72, 73, 75
tail events, 4, 23, 50–1
  distributions describing, 46–7
  modeled by jumps, 51–61
  tent-shaped regression, futures’ maturities, 12, 13, 15, 16
Tequila crisis, Brazil, 149n3
term structure of futures, 8, 9, 11–13, 54
terms of trade argument, 77
TGE (Tokyo Grain Exchange), 94, 187
time series momentum, 32–43
time varying volatility, 4, 118
tin, 174, 203, 274, 276
TOCOM (Tokyo Commodity Exchange), 95, 173, 209
Tokyo Grain Exchange (TGE), 94, 187
traditional asset classes, interaction of commodities with, 69–110
  transition matrices, 22, 23, 27, 28, 147, 157
  transition probabilities, 21–2, 23, 149, 150
trend followers, 13
trend-following strategies, 8, 13, 17–18, 24, 29–31
time series momentum, 32–43
’trend regimes’, 23
trends in commodities
  energy markets, 221, 235
  measurement of, 13–43
  performance analysis, 160–6
  persistent, 8
types of, 22, 23
unconditional skewness, 46, 50
unemployment, 300
  commodity price reaction to, 131, 132, 135, 138
  and economic regime, 156, 157
  literature, 118, 119
unit root test results, 181–3, 241, 269
  agricultural products, metals and energy, 186
  equities, bonds and exchange rates, 244
  industrial production, money and inflation, 273
unit root tests, 178, 182
uptrends (‘bull’ markets), 22
uranium, 222, 223
US 10-Year rate
  cointegration relationships
    commodities, industrial production and inflation, 318–20
    GSCI sub-indices and S&P 500 index, 241–8
  impact of economic news on, 121
  volatility spillovers, 50, 51, 52, 55–6, 60, 108
US Dollar (USD), 7, 173
  commodity prices labeled in, 72, 77, 83, 129, 148
  factor identification, 87–90
  impact of economic news, 121
  optimal forecasting horizon, 158
  regime correlations, 159
  volatility spillovers and jumps, 49, 51, 52, 55–6, 56, 58, 60
US M2 see money
USA
  business cycles, 148, 149, 149, 150, 151, 152–4
  economic news dataset, 119–20
  see also industrial production; inflation
USD trade-weighted index, 121, 211, 224, 241, 242, 244, 256, 257

VaR (value-at-risk), 45
VAR (vector autoregressive) models, 128, 301
  FAVAR (Factor-Augmented VAR) model, 175–6
  volatility spillovers, 96–8
  variance covariance matrix, 179
  variance decomposition, 97–8
  variance shares, 97
vector error-correction model (VECM), 180–1
  volatility, 1–3, 5, 6, 7, 20–1
  cross-asset spillovers, 90–6
  index, 96–8
  measuring, 98–110
  and financial crisis, 127–8, 269
returns to spillovers, 43–51
volatility spillover index, 96–8, 105
Vuong’s test, number of regimes, 155–6

WCE (Winnipeg Commodity Exchange), 94, 255
weather, 171, 172, 221
West Texas Intermediate crude oil see WTI crude oil
wheat, 129
  cointegration, 183–8
  cocoa, coffee and sugar, 192–4
  corn and soybean, 190–2
  Granger causality tests, 188–9
  and industrial production US, 296–7
  with oil prices, 199–200
  impact of economic news, 138, 139, 141
white noise, 179, 180
World Bank (WB) commodity prices, 274–5, 276, 299
WTI crude oil, 115–16, 129
  cointegration analyses
    agricultural products, 196–202
    EUR–USD exchange rates, 262–5, 266
    gold market, 210–11, 217–18
    Granger causality tests, 222–3, 224
    S&P 500 and US 10-Year, 246–8
    correlation with other commodities, 69–74
    and crack spread, 221
    and inflation (US CPI), 316–18
    net spillovers, 102, 103, 106
ZEW economic sentiment survey, 119, 120, 121, 132, 135, 139
zinc, 129
  cointegration relationships
    other industrial metals, 202–8
    US industrial production, 293–5
    impact of economic news, 133, 134, 135
log of time series, 183