Index

Actuarial risk, 257, 376, 414
Amaranth, 3
Argus, 19, 226

Bachelier model, 209
Backwardation, *see* Forward curves, Backwardation
Banks
  Energy trading activities, 433
  Risk metrics requirements, 413
Basis, 12, 13, 40, 42
Benchmarks, 12, 30
  Bonds, 12
  Crude oil, 12, 20, 38, 40, 79
  Natural gas, 12, 20, 79
  Power, 79
BFOE basket, 17
Bid cap, 283
Bid week, *see* Natural gas markets, Bid week
Black-76, *see* Models, Black-76
Bonds
  Cheapest-to-deliver (CTD), 7
  On-the-run, 8, 20
  Repo, 8
  Swap spreads, 8
  Treasury, 2, 4
  Yield versus duration, 7
Brent, *see* Crude oil, Brent
Brownian motion, 244, 458
  Arithmetic, 209
  Geometric (GBM), 82, 174, 190, 207, 215, 224, 241, 258, 271, 354, 374, 447

Calendar rolls, 121, 467
Calendar spread options (CSOs), *see* Options, Calendar spread
Calendar spreads, 121, 467
Calendar strip, 5, 21
Capacity charge, 125
Capacity payments, 189
Carry, 14, 26, 30, 100, 209
  Basic arbitrage, 25, 94, 258
  Convenience yield, 27, 100
  Funding, 26, 100
  Futures, 82
  Options premia, 89
  Spot returns, 233
  Storage costs, 27
  Theory of storage, 259
Carry-out function, 290
Cash desk, 3, 331
Coal, 2, 436
  Electricity generation, 70
Cointegration, 354
Collars, *see* Options structure, Collars
Collateral, 6, 423
  Assets as, 189
  Futures margin, 101
  Lien-based, 425, 428, 433, 442
  Margining
    Thresholds, 423, 424
  Netting, 423
  Repo, 26
Commodities Futures Trading Commission (CFTC), 95, 442
  Commitment of Traders Report, 95
Commodities indices
  Contract roll, 96
  Forward prices, 98
  Performance, 97
Consensus service providers, 407
Contango, *see* Forward curves, Contango
Convenience yield, 27, 100, 258
  Modified, 94, 264
  Reduced-form models, 264
  Theory of storage, 260
Cooling-degree day (CDD), 394
Copper, 291
  Price dynamics, 437
    Inventory effects, 262, 292
Correlation
  Between asset classes, 440
  Between commodity prices and interest rates, 86
  Cross-commodity, 229, 340
    Asymptotic behavior, 337, 341
    Empirical, 198
    Skew, 220
    Spread options, 191, 205
    Term structure, 229
  Default versus commodity price, 426

Correlation (*cont.*)
  Forward returns, *see* Forward price dynamics, Correlation
  Fundamental market changes, 438
  Implied, 192, 354
  Inventory effects, 114
  Load versus price, 385
  Price versus convenience yield, 265
  Seasonal effects, 112
  Shaping coefficients with temperature, 384
  Spot returns, *see* Spot price dynamics, Correlation
  Spread options, 187, 195, 199
  Term correlation, 143
Cost of carry, *see* Carry
Crack spread, *see* Refined products, Crack spread
Crack spread options, *see* Crude oil markets, Options, Crack spread
Credit crisis of 2008–2009, 9, 23, 25, 28, 34, 60, 63, 100, 153, 260, 262, 293, 391, 396, 403, 412, 428
Credit default swaps (CDSs), 425, 426
  Indices, 429
  Liquidity, 429
  Mechanics, 425
Credit risk, 6, 16, 135, 189, 422
  Close-out provisions, 424
  Collateral, *see* Collateral
  Credit valuation adjustment (CVA), 423
  Default, 424
    Cross-acceleration, 424
    Cross-default, 424
  Default time, 425
    Correlation with price, 426
    Hazard rate, 425
  Delivered-not-paid (DNP), 423
  Documentation
    Credit-support annex (CSA), 423
    ISDA Master aggreements, 423
    Netting agreements, 423
  Hedging, 425
    Impact of volatility, 429
    Limitations of indices, 430
    Transaction costs, 429
  Right-way, 426
  Seniority, 424
  Termination, 424
  Wrong-way, 426
Credit-support annex (CSA), 423
Cross-acceleration, 424
Cross-default, 424
Crude oil, 2, 35, 39
  API density, 39
    Relationship to sulfur content, 39
  Brent, 5, 20, 40
  Density, 40
  Dubai, 40
  Global statistics
    Consumption, 35, 38
    Imbalances, 35
    Production, 35
  Gravity, 39
  Heavy, 39
  Inventory, 28
    Limitations in data, 260, 262
    PADD2, 43
  Light, 39
  Maya, 40
  Refining, 44
  Shale production, 32, 35
  Sour, 39
  Streams, 16, 39
  Sulfur content, 39, 40
    Relationship to density, 39
  Sweet, 39
  Units, 33
  WTI, 1, 5, 12, 20, 38, 40, 42, 43
Crude oil markets
  Basis, 40, 42
  Benchmarks, *see* Benchmarks, Crude oil
  Brent Index, 17
  Brent index, 465
  Brent/WTI spread, 43
  Crack spread, 45
  Forwards
    WTI, 14
  Futures
    Brent, 464
    ICE Brent, 5, 12, 17
    NYMEX WTI, 5, 12, 17, 20, 464
  Options, 22
    Asian, 22, 469
    Crack spread, 190, 470
    Monthly, 469
    Nonstandard expiration, 141
  Spot price, 38, 226
  Swaps, 18, 465

Daily options, *see* Options, daily
Dark spread, 119
Default, *see* Credit risk, Default
Delivered-not-paid (DNP), 423
Delivery, 16
Delta
  Definition, 16
  Effect of skew, 170
  Equivalent, 134
  Forward contract, 16
  Futures contract, 85
  Gas delta equilvalent, 129
  Gas equivalent delta, 347
  Load swaps, 383, 402
  Spread options, 201
  Swaps books, 123
Delta hedging, *see* Hedging, Delta, 448
Demand response, 378
Department of Energy (DOE), 51

Electricity, 62
  Demand, *see* Load
  Distribution, 64
  Generation, *see* Generation
  Global production, 63
  Kilowatt-hour (kWh), 33
  Load, *see* Load
  Megawatt-hour (MWh), 33
  Stack, *see* Generation stack
  Supply, 64
  Transmission, 64
  U.S. generation by source, 72

U.S. installed capacity, 71
Units, 33
Electricity markets, 68
Ancillary services, 76, 385
Basis, 400
Bid cap, 283
Bus bars, 68
Congestion, 76
Congestion zones, 76
Dark spread, 119
Day-ahead market, 76
Delivery buckets, 67, 466
Off-peak, 68
Peak (“5×16”), 68
Peak (“6×16”), 68
Demand response, 70
Deregulation, 1, 64
ERCOT, 65, 132
Wind generation, 436
Forwards, 74
Gas delta equivalent, 129
Heat rate
Gas price dependence, 130, 354
Market, 129
Spot, 69
Heat rate options, *see* Tolling deals
Implied volatility, 180
Versus natural gas, 355
Independent system operator (ISO), 65
Load, *see* Load
Locational marginal pricing (LMP), 76
Market types, 64
Bilateral, 65
Exchange, 65
Pool, 65
Nodes, 68
Options
Calendar swaptions, 179
Daily, 180, 469
Monthly, 179, 469
Swaptions, 468
PJM, 6, 65, 129, 180, 196, 229, 270, 339, 388, 408
Real-time market, 76
Regional transmission organization (RTO), 65
Security-constrained optimal dispatch, 76
Skew, 180
Spark spread, 69, 119, 189
Versus natural gas, 215
Spot heat rate
Versus natural gas, 357
Spot price, 129
Daily, 234
Negative values, 381
Versus load, 73
Swaps, 67, 465
Unit-contingent, *see* Unit-contingent swaps
Tolling deals, *see* Tolling deals
Transmission systems operator (TSO), 65
U.S. and Canada, 65
Energy
Geographic imbalances, 33
Global statistics
Consumption by region, 34
Consumption by source, 33, 34
Household consumption, 33
Units and conversion, 33
Enron, 3, 280
Equivalent martingale measure, 83
Money-market, 83, 85, 90
T-Forward, 83, 84, 90
ERCOT, *see* Electricity markets, ERCOT
Euro, 4
European Central Bank (ECB), 9
Exchange-traded funds (ETFs), 96, 265
Options, 139
Exchange-for-physical (EFP), 18
Exchanges, 6, 16, 84, 406, 433
Chicago Mercantile Exchange (CME), 1, 88
Clearing, 433
Intercontinental Exchange (ICE), 12, 17, 43, 88, 464
Listed products, 16
New York Mercantile Exchange (NYMEX), 1, 465

Factor analysis, *see* Principal-components analysis (PCA)
Federal Energy Regulatory Commission (FERC), 3, 51
Federal Reserve, 9
Financial settlement, 16
Forward contracts, 14, 16, 30, 118
Alphabetic prefix, 15
Balance-of-month, 15
Delta, 16
Nearby
Contract, 15
Price series, 91
Returns series, 93
Present value, 16
Prompt contract, 15
Forward curves, 14
As yield curve, *see* Forward yields
Backwardation, 23, 27, 91, 92, 94, 100
Commodities indices, 98
Constant maturity (CM), 93
Contango, 23, 91, 92, 100
Daily, 248, 305
Normal backwardation, 94
Forward price dynamics
Correlation, 91
As related to hedging, 92, 102
As related to storage valuation, 331
Copper, 292
Empirical, 101, 227
Factor analysis, 107
Impact of fuel switching, 366, 367
Inventory effects, 292
Surface, 106
Term structure, 93, 106, 141, 258, 333
Theory of storage, 290
Cross-commodity cointegration, 354
Factor analysis, 107
Martingale property, 81, 84, 266
Returns
Distribution, 115
Kurtosis, 115
Mixture of distributions, 117
Statistics, 5
Volatility
Backwardation, 91, 92, 103, 143, 153

Forward price dynamics (*cont.*)
Seasonality, 112
Versus forward yields, 260
Forward prices, 14
Notation, 14
Versus futures, 81
Forward yields, 23, 30
Inventory effects, 28, 95, 100, 292
Statistics, 100
Versus price level, 265
Forwards versus futures, 81
Conditions for equivalence, 85, 86
Frobenius norm, 227
Fuel charge, 125
Fuel switching, *see* Generation, Fuel switching
Futures contracts, 14, 16, 30, 118, 464
Bond, 20
Cheapest-to-deliver (CTD), 7
CME Gold, *see* Gold, Futures
ICE Brent, *see* Crude oil markets, Futures, ICE Brent
Liquidity, 21
Margining, 84, 101
NYMEX NG, *see* Natural gas markets, Futures, NYMEX NG
NYMEX WTI, *see* Crude oil markets, Futures, NYMEX WTI
Open interest, 20
Settlement, 84
Futures exchanges, *see* Exchanges
Futures prices
Martingale property, 85
Versus forwards, 81

Gaussian exponential models (GEM), *see* Models, Gaussian exponential (GEM)
Generation, 64, 187
As a fixed-price option, 69
As a spread option, 68
Bidding behavior, 76, 354
Capacity, 69, 189, 282, 335
Capacity payments, 189
Coal, 70
Coal switching, 71, 364
Dispatch, 53, 70, 76, 196, 285, 335, 376
Forced outage, 74, 375, 399
Fuel oil, 70
Fuel switching, 368
Fuel-driven, 68
Heat rate, 69, 336
Hydro, 70
Minimum downtime, 69
Natural gas, 70
Nuclear, 68, 70
Availability, 74, 287, 399
Refueling, 400
Operating costs, 69
Operating limits, 69, 368
Peakers, 70, 196
Production tax credits, 70
Pump storage, 373
Ramp rates, 69, 368
Reserve, 375
Stack, 70, 71, 74, 76, 282
Effect of coal switching, 364
Start costs, 69, 368
Thermal effects on capacity, 69
Variable operation and maintenance (VOM), 69, 206, 336
Variation in heat rate, 69
Wind, 70, 287, 381, 436
Geometric Brownian motion (GBM), *see* Brownian motion, Geometric
Gigajoule (gJ), 33
Gold, 14, 27
Futures, 4
Volatility, 5

Heat rate, 130
Market, *see* Electricity markets, Heatrate
Heat rate options, *see* Tolling deals
Heating-degree day (HDD), 394
Hedging
Cross-commodity risk, 129
Delta, 448
Contract size impact, 202
Slippage, 149
Gamma, 149
Locational spread risk, 123
Minimum-variance, 102, 120, 277, 456
Price risk, 119
Price-based methods, 123, 131
Returns-based methods, 120, 457
Stack-and-roll, 92, 102, 119, 122
Time-spread risk, 119
Vega, 147, 155, 163, 270, 349
Henry Hub, *see* Natural gas, Henry Hub
Heston model, 184
Hierarchical risk representation, 133
Hierarchical risk representations, 417

Independent system operator (ISO), *see* Electricity, Independent system operator
Index products, *see* Commodities indices
Index providers
Argus, 19, 226
Platts, 19, 123, 226
Indicator function, 180
Intercontinental Exchange, (ICE), *see* Exchanges, Intercontinental Exchange (ICE)
Inventory, 10
Credit-crisis effect, 60
Crude oil, *see* Crude oil, Inventory
Effect on basis, 42
Effect on correlation, 114, 262
Effect on forward yields, 56
Effect on skew, 175
Natural gas, *see* Natural gas, Inventory
Physical storage, 299
Relationship to forward yields, 23, 28, 56, 95, 100, 260
Structural models, 288
Theory of storage, 95, 259
ISDA
Master Agreements (ISDAs), 423

Jensen's inequality, 88
Jump diffusions, *see* Models, Jump diffusions, 217

Kilowatt-hour (kWh), 33
Kurtosis, 115
Estimator, 235

Letters-of-credit (LCs), 6
Levy approximation, 207, 248
Levy processes, 271
Liquified natural gas (LNG), *see* Natural gas, Liquified natural gas (LNG)
Listed, 16
Load, 66
  Attrition, 378, 385
  Auctions, 378
  Demand destruction in 2009, 63
  Demand response, 378
  Growth rate, 379, 396
  Hourly variation, 378
  PJM Classic, 66
  Temperature effects, 66, 375
  Tranches, 378
  Weekday versus weekend, 66
Load swaps, 280, 296, 378, 395, 398
  Attrition, 385
  Capital requirements, 395
  Fixed-shape, 380
  Hedging, 379, 393
    Weather derivatives, 394
  Load growth risk, 397
  Midmarket price, 386, 392
  Shaping coefficients, 380
    Temperature dependence, 384
  Valuation
    Econometric models, 387
    Price uplift, 384, 386
    Structural models, 386
  Variable quantity, 385
Local volatility, *see* Volatility, local
London Interbank Offered Rate (LIBOR), 26
Longstaff-Schwartz methods, 321, 370
Look-alike, 246
Lot, 16
  Crude oil, 17
  Natural gas, 18

Margrabe, *see* Spread options, Margrabe
Martingale, 81, 83, 84, 137
Mean-variance optimization, 455
Megawatt-hour (MWh), 33
Metallgesellschaft, 6
Metals, 262
  Gold, 4
Metric ton oil equivalent (toe), 34
Minimum-variance
  Hedging, *see* Hedging, Minimum-variance
  Optimization, 456
MMBtu, 33
Models
  Big-T paradigm, 151, 225, 249
    Versus little-t, 157
  Black-76
    Call and put values, 448
    Forward price, 447
  Black-76, 80, 82, 83, 137, 258, 447
    Time-varying volatility, 143, 448
  Computational limits, 435
  Econometric, 264, 272, 273
    Heat-rate, 357
    Limitations, 279
    Load, 390
    Natural gas basis, 273
  Equivalence of spot and factor models, 267
  Fundamental, 264
  Gaussian exponential (GEM), 225, 244, 458
    Calibration, 246
    Correlation surface, 227
    Finite-dimensional dynamics, 459
    Forward price, 458
    Heat rate distribution, 355
    Returns covariance, 461
    Returns variance, 458
    Separable volatility structure, 459
    Spot price dynamics, 461
    Spot returns correlation, 463
  Heston, 184
  HJM-style, 264, 270
  Hybrid volatility parameterization, 153
  Inventory-based, 288
    Carry-out function, 290
    Price dynamics, 290
  Jump diffusions, 184, 271
    Compensator, 185
  Little-t paradigm, 151, 153, 225, 249
    Applied to CSOs, 193
    Failure to calibrate, 158
    Versus big-T, 157
  Local volatility, 183
  Multifactor, 221, 223, 225
    Covariance structure, 227
    General Gaussian, 224
    HJM models, 225
    Motivations, 223
    Spot models, 224
    Time scales, 225
  Physical measure, 190, 273, 277, 281, 293, 358, 362
  Reduced-form, 263, 264
    Empirical inconsistencies, 279
    Empirical tests, 279
    Limitations, 279
  Spot-convenience yield, 264
    Calibration, 268
    Extensions, 269
    Gibson-Schwartz two-factor, 265, 268, 279
    Jump diffusions, 270
    Schwartz one-factor, 265
    Schwartz three-factor, 268
  Stack, 283
    Barlow, 283, 386
    Combining stacks, 286
    Nonparametric, 287
    Parametric, 283, 286
    Skew, 284
  Stochastic volatility, 184, 269
    Jump diffusions, 185
  Structural, 264, 282, 354, 366, 386
  Two-factor caricature, 240, 337, 340
Money-market measure, 83
Monthly options, *see* Options, Monthly
Mortgages
  Prepayment options, 187
Multifactor models, *see* Models, Multi-factor

National Balancing Point (NBP), 60
Natural gas, 33, 48, 436
  Electricity generation, 70

Natural gas (*cont.*)
Futures, 465
Geographic segmentation, 51
Global statistics
Consumption, 49
Imbalances, 51
Production, 49
Hydraulic fracturing, 60
Inventory, 53
Normal, 54
Residual, 55
Temperature effects, 59
Liquified natural gas (LNG), 52, 60
MMBtu, 33
Pipelines, 187
Seasonality, 9, 56
Shale production, 32, 51, 60, 70, 100, 158, 162, 364, 436
Transport
As an option, 125
Capacity charge, 125
Fuel charge, 125
Variable charge, 125
U.S. production, 53
Natural gas markets, 49
Algonquin City Gate (ALGC), 414
Basis, 12, 62, 123, 128, 273, 375, 419
Seasonality, 127, 274
Temperature effects, 274, 375
Versus price level, 125
Basis swaps, 128, 466
Benchmarks, *see* Benchmarks, Natural gas
Bid week, 128, 231
Deregulation, 1
Future
ICE NBP, 60
Futures
NYMEX NG, 5, 9, 12, 18, 132, 417
Henry Hub, 10, 18, 19, 60, 119, 130, 196, 232, 253, 260, 338
Index swaps, 128, 467
March-April spread, 56
National Balancing Point (NBP), 60
Oil index pricing, 62
Options, 22
Daily, 22
Forward-starting, 182, 470
Gas Daily/IFERC, 231
Monthly, 469
Peaking, 253
Swaptions, 22, 468
Temperature triggers, 398
Park-and-loan, 26
Price ratio to crude oil, 60
Seasonal strips, 21
Spot price, 10, 19, 55
Gas Daily, 19, 128, 414
Swaps, *see* Swaps, Natural gas
Gas Daily, 19, 123
L3D, 465
Penultimate, 18, 465
TETM3, 12, 123, 414
Title Transfer Facility (TTF), 62
Natural gas storage, 53, 187, 295
Aquifer, 53, 298
Base gas, 298
Capacity constraints, 299
Cyclability, 299
Extrinsic value, 310, 316
Spot price volatility, 328
General valuation problem, 309
Hedging, 327, 330
Limited CSO liquidity, 332
Intrinsic value, 309
Dynamic programming, 310
Linear programming, 310
Inventory constraints, 299
Inventory trajectories, 316
Pad gas, 53
Path-dependent constraints, 299
Ratchets, 299
Rate constraints, 299
Reservoir, 298
Salt caverns, 53, 298
U.S. capacity, 53, 298
Valuation, 297, 300
CSO subordination, 324
Effect of mean reversion rates, 308
Longstaff-Schwartz methods, 321
Rolling intrinsic, 323
Stochastic dynamic programming, 312
Value surface, 315
Value versus cyclability, 318
Virtual storage, 301, 306
Working storage, 53, 298
Natural markets
Spot price
Gas Daily, 254
Nearby
contract, 91
Normal backwardation, 94
Relation to backwardation, 95, 99
North American Electric Reliability Council (NERC), 196, 466
Notional, 16

Option structures
Collars, 160, 165
Costless, 161
Fences, 160
Knock-out swaps, 165, 166, 169
Hedging, 168
Price hold, 140
Skew-dependent, 160
TARN, 140, 169, 223
Temperature triggers, 398
Options, 22
American, 469
Forwards, 81, 87
Futures, 81, 88
Asian, 469
Calendar spread (CSOs), 188, 226, 470
As storage, 300
Broker chat, 191
Valuation, 191
Cross-commodity, 470
Daily, 22, 231, 469
Forward-starting, 231, 250, 304
Hedging, 252
Heat rate, *see* Tolling deals
Listed, 469
Equity-style, 81, 88

Futures-style, 81, 88
Monthly, 22, 231, 469
Multiple time scales, 223
On indices, 139
Peaking, 253
Hedging, 256
Valuation, 254
Spark spread, *see* Tolling deals
Spread options, *see* Spread options
Structural limitations, 23, 139
Swaptions, 188, 231, 468
Tolling, *see* Tolling deals
Organization of the Petroleum Exporting Countries (OPEC), 9, 441
Ornstein-Uhlenbeck (OU) process, 245, 250, 254, 265, 268, 270, 280, 303, 314, 460
Autocorrelation, 460
Expected value, 460
Simulation, 463
Stationary variance, 460
Variance, 460
Over-the-counter (OTC), 6, 16, 433

Park-and-loan, 26
Petroleum Administration for Defense Districts (PADD), 42
Physical settlement, 16
Pipeline tariffs
Capacity charge, 125
Fuel charge, 125
Variable charge, 125
PJM, *see* Electricity markets, PJM
Planning year, 122
Platts, 19, 123, 226
Poisson process, 12
Portfolio analysis, 455
Portfolio mathematics
Mean-variance, 455
Minimum-variance, 456
Power, *see* Electricity
Price hold structures, 140
Price ratio, 162
Price testing, 406
Broker sheets, 406
Consensus service providers, 407
Exchange-listed products, 406
Exchange settlements, 407
Historical market data, 406
Portfolio auctions, 407
Statistical methods, 408
Transactional data, 406
Volatility surfaces, 409
Principal-components analysis (PCA), 107
Application to hedging, 121
Extension to seasonal returns, 110, 416
Factor extrapolation, 121
Profit and loss attribution, 134

Refined products, 39, 44
Crack spread, 45, 46, 119, 190
Demand, 46
Distillates, 44
Fuel oil, 39
Gas oil, 44
Gasoline, 39, 44
Heating oil, 44
Inventory, 46
Residual fuel oil (resid), 44
Units, 33
Regional transmission organization (RTO), 65
Regulation, 441
CFTC, *see* Commodities Futures Trading Commission (CFTC)
Deregulated markets, 49, 64, 376, 432
Dodd-Frank, 95, 441, 442
Capital requirements, 442
Clearing requirements, 442
Client reporting, 442
OTC regulation, 442
Position limits, 442, 443
Federal Energy Regulatory Commission (FERC), 3
Regulated markets, 49, 64, 376, 432
Volker rule, 442
Repo, 8
Reverse, 8, 26
Retail energy providers (REPs), 6, 7, 95, 397
Returns, 4
Forward
Constant maturity, 93
Nearby contracts, 93
Locational, 274
Spot, 232, 233, 462
Alternative definition, 234
Risk metrics
Coherent, 411
Hierarchical representations, 133, 417
Illiquid positions, 421
Marking, 412
Specific risks, 406, 421
Value-at-risk (VaR), 135, 403, 411
Exact valuation, 415
Historical, 415
Illiquid portfolios, 413
Limitations, 411, 413
MVaR, 415
Risk mappings, 412, 420
Seasonality, 416
Taylor series, 415
Variance-covariance method, 415
Risk types, 119
Actuarial, 257, 376, 414
Basis, 119, 123, 133
Credit, 422
Cross-commodity, 119
Portfolio level
High-dimensional, 133, 403, 405
Price level, 119
Time-spread, 119
Uncommoditized, 280, 281, 403, 414, 421
Load, 280, 376
Unit-contingent, 377
Volumetric, 376
Risk-neutral pricing, 83

S&P 500 ETF (SPY), 4
S&P GSCI index, 440
Samuelson effect, *see* Volatility, Backwardation
Scalars, 380
Seasonal strip, 21
Settlement, 16
Shale gas, *see* Natural gas, Shale production

Shale oil, *see* Crude oil, Shale production
Shaping coefficients, 372
Shoulder months, 66
Skew, 160–162, 164
  Dynamics, 162, 169
    Empirical results, 171
    Floating, 170
    Impact on delta, 170
    Sticky, 170
  Estimator, 235
  Grid, 164
  Inventory effects, 175
  Modelling, 168
    Heston model, 184
    Hybrid models, 185
    Jump diffusions, 184
    Local volatility, 183
    Stochastic volatility, 184
  Normalized, 177
  Parameterizing
    By delta, 174
    By price ratio, 162, 174
  Tenor dependence, 177
  Volatility level dependence, 174
  Volatility look-up heuristic, 164
    Applied to CSOs, 193
    Applied to tolls, 197, 217, 249, 342
Spark spread, *see* Electricity markets, Spark spread, 353
Spark spread options, *see* Tolling deals
Specialness, 2, 7, 13, 21
  Locational, 10, 12
Spot price, 10, 19
Spot price dynamics
  Autocorrelation, 235, 239
  Correlation, 339
  Expected future value, 94
  Implied volatility, 242
  Kurtosis, 232
  Mean reversion, 82
  Negative values, 381
  Returns, 10
  Risk-neutral dynamics, 267, 461
  Skew, 232
  Spikes, 185, 271
  Volatility, 127, 181, 232, 240
  Weather as a driver, 235
Spread options, 187
  Deltas, 201
  Gamma, 201
  Impact of volatilty-lookup heuristic, 217
  Margrabe, 190, 209, 449, 450, 453
    Applied to CSOs, 192
    Applied to tolls, 196
    Implied correlation, 220
    Price-ratio distribution, 453
    Vega, 204
  Nonzero strikes
    Moment methods, 207
    Numerical methods, 205
    Spread models, 209
  Vega, 204
Stack models, *see* Models, Stack
Stack-and-roll, *see* Hedging, Stack-and-roll
Stochastic volatility, 184, 269
Stochastic volatility jump diffusion, 185
Storage
  Cost, 28, 258
  Theory of, *see* Theory of storage, 259
Strips, 21
  Calendar, 5, 21
  Fair-value, 21
  Planning year, 122
  Seasonal, 21
Swap spreads, 8
Swaps, 14, 16, 30, 118
  Basis, 128
    Natural gas, *see* Natural gas markets, Basis swaps
  Crude oil, *see* Crude oil markets, Swaps
  Electricity, *see* Electricity markets, Swaps
  Index, 128
  Knock-out, 165, *see* Options structures, Knock-out swaps
  Listed, 16
  Load, *see* Load swaps
  Natural gas, *see* Natural gas markets, Swaps
  Penultimate settlement, 18
  Unit-contingent, *see* Unit-contingent swaps, 399
  WTI, *see* Crude oil markets, Swaps
Swaptions, *see* Options, Swaptions

T-forward measure, 83
Take-or-pay contracts, 364
Temperature
  Autocorrelation, 235, 237, 378
  Daily average, 66
  Estimation, 236
    Drift, 237
    Fourier modes, 237
  Expected value, 74
  Historical, 235
Term correlation, 143
  Asymptotics, 337
Term volatility, 143
TETM3, *see* Natural gas, TETM3
Theory of storage, 95, 259
  Convenience yield perspective, 259
  Equilibrium perspective, 259
  Forward dynamics
    Postulated consequences, 260
Time scales, 225
  Long-time-scale markets, 226
  Short-time-scale markets, 226
Title Transfer Facility (TTF), 62
Tolling deals, 189, 196, 295, 335, 471
  Autoexercise, 189
  Complex tolls, 367
    Exercise constraints, 369
    Hourly time scales, 372
    Multiple fuels, 368
  Correlation
    Effect of spot correlation, 344
    Term structure, 337, 341
    Volatility dependence, 344
  Deltas, 201
  Gamma, 201
  Hedging, 346
    Calendar strip limitations, 347
    Impact of contract size, 202
    Vanilla option limitations, 347, 361
  Mechanics, 189, 336

Cambridge University Press
978-1-107-03684-0 — Valuation and Risk Management in Energy Markets
Glen Swindle
Index
More Information

Nonzero strikes
Moment methods, 207
Numerical methods, 205
Spread models, 209
Unit heat rate, 336
Valuation, 196, 339
Consistency with options markets, 353
Dynamic programming, 370
Econometric models, 355, 358
Effect of coal switching, 366
Impact of volatility-look-up heuristic, 217
Myopic optimization, 373
Structural models, 364
Subordinating methods, 368, 370
Valuation problem, 337
Value surface, 199
Value versus correlation, 199
Variable operation and maintenance (VOM), 336
Vega, 204
Correlation-induced, 341, 349
Trade attributes
Delivery, 16
Financial settlement, 16
Notional, 16
Physical settlement, 16
Settlement, 16
Underlying, 16
Treasury bonds, 2, 4

Uncommoditized risks, *see* Risk types, Uncommoditized
Unit-contingent (UC) swaps, 296, 377, 399
Hedging, 399
Outage process, 400
Valuation, 400

Value-at-risk (VaR), *see* Risk metrics, Value-at-risk (VaR)
Variable charge, 125
Variable-quantity swaps, 296
Very large crude carriers
VLCCs, 30
Volatility, 2, 5, 13, 137, 142, 143, 160
Backwardation, 91, 92, 103, 143, 153, 162
Comparison of asset classes, 4
Electricity versus natural gas, 355
Historical, 4
Impact on collateral, 2, 6
Impact on deal pricing, 2, 5
Implied, 160, 161
Local, 103, 140, 142, 183, 227, 315, 316, 409, 416
Backwardation, 144
Lookup heuristic, *see* Skew, Volatility–look-up heuristic
Parameterization, 104
Realized, 4
Seasonality, 112
Spot, 232
Realized, 232
Surface, 162, 164
Grid, 164
Parametric forms, 164
Term, 143
Versus forward yields, 260
Volatility–look-up heuristic, *see* Skew, Volatility–look-up heuristic
Volumetric risk, 376
Volume-price correlation, 377

Weather derivatives, 66, 236
As load swap hedges, 394
Cooling-degree day (CDD), 394
Heating-degree day (HDD), 394
Western power crisis, 65
WTI, *see* Crude oil, WTI