Index

401(k) plans, 67
4:15 report, 270
5/30 transaction, 118, 120

AAA-rated tranches, 133, 134–136
ABACUS, 6,11, 613
ABCP. See Asset-backed commercial paper
ABS CDOs, 134–137, 540, 613
ABSs. See Asset-backed securities (ABS)
Abu Dhabi Investment Authority, 43
Accounting:
  accrual, 40
  banks, 40–42
  fair value, 356, 580
Accrual accounting, 40
Accumulation value, 32
Additional Tier 1 capital, 382
Add-on factor, 351
Adjoint differentiation, 467
Adjustable rate mortgages (ARMs), 129
Adoboli, Kweku, 121, 643, 645
ADRs. See American Depository Receipts
Advanced IRB approach, 360, 367
Advanced measurement approach (AMA), 370, 519–520, 521
Adverse selection, 62, 70, 532–533
Advisory services, 34–36
Agency costs, 139

AIG, 65–66, 438
Akerlof, George, 631
Alibaba, 625, 626, 638
Allied Irish Bank, 1, 527, 643, 644
Almgren, R., 543
Alpha, 11–13
Alpha multiplier, 469
Alternative investments, 84. See also Hedge funds
Alman, Edward, 432
AMA. See Advanced measurement approach
Amaranth, 87
Amazon, 626, 640
American Depository Receipts (ADRs), 92
American International Group (AIG), 65–66, 438
American options, 110, 112, 677–679
Amihud, Y., 545
Anchoring, 615
Annual renewable term policy, 48
Annuity contracts, 51–52
Apple, 625, 638, 640
Arbitrage, 118
  convergence, 649
  convertible, 91
  fixed income, 91–92
  merger, 90–91
  regulatory, 139
Arbitrage pricing theory, 3, 14
ARCH. See Autoregressive conditional heteroscedasticity (ARCH)
INDEX

AR(\(m\)) model, 225
ASF. See Available stable funding (ASF)
Ashanti Goldfields, 550, 551
Asian Monetary Crisis, 560
Asian options, 117, 119
Asset-backed commercial paper (ABCP), 549
Asset prices, volatility and, 146–147, 156
Assets:
  liquid, 545, 546
  long and short positions in, 99–101
  risk-weighted, 350, 352, 356, 360, 363, 366, 373, 384, 638
Asset swaps, 443
Asymmetric information, 439
Asymmetric news, 227
AT1 capital. See Additional Tier 1 capital
At-the-money option, 110
Audits, 533
Autocorrelation, 280–281
Auto insurance, 60–61, 634
Automation, 622, 629
Autoregressive conditional heteroscedasticity (ARCH), 213
Availability bias, 615
Available stable funding (ASF), 386–387, 552
Average price call option, 117, 179
A.W.Jones & Co., 84
Back-end load, 78
Back office, 161, 647
Balance sheet, 28
Bankers Trust, 118, 120, 610–611, 644, 648, 652
Bank exposures, 365–367
Bank failures, 31
Bank for International Settlements (BIS), 101, 102, 350, 438
Bank holding companies, 27, 385
Bank Holding Company Act, 27
Bank of America, 39
Bank of England, 547, 549, 550
Bankruptcy, 15, 412
Bankruptcy costs, 15–17
Banks and banking, 25–43, 258, 621. See also
  Financial institutions accounting by, 40–42
  commercial, 25, 26–30, 38–39, 549
  consolidation of, 28
  credit crisis of 2007 and, 131, 138
cyber attacks on, 515–516
deposit insurance, 30–31, 348, 392
investment, 25, 31–36, 40, 549, 621
large, 39–42
money center, 26
OECD, 350, 356
potential conflicts of interest for, 38–39
  reserve requirements, 191, 551–552
risks facing, 42–43
securities trading by, 36–38
services offered by, 38–39, 629–631, 632, 640
shadow, 614, 635
supervisory review process, 360, 370, 504, 506
systemically important, 383, 388–389, 393, 394
Barings Bank, 1, 121, 349, 643, 644, 645, 647
Barrier options, 117, 179
Basel Accord, 347, 350–353, 355, 359, 373
  1996 Amendment, 347, 356–359
Basel IA, 359
Basel II.5, 377, 378–381, 416, 417, 422, 423, 425
  Basic indicator approach, 369, 519
  Basis points, 192, 193
  Basket options, 118, 119
  Bayesian networks, 510
  BBA. See British Bankers’ Association (BBA)
  BBB-rated bonds, 133, 135, 137, 140, 141
  Bear Stearns, 39, 188, 549
  BEICFs. See Business environment and internal control factors
  Berkowitz, J., 508
Berkshire Hathaway, 62, 84
Best efforts public offering, 32
Beta, 9–10, 11, 13, 148, 604, 605–606
Beta-neutral fund, 89
Betterment, 632
Bid-offer spreads, 538–539, 540–541, 543, 554
Bid price, 98
Bilateral clearing, 400, 403, 405, 406, 409, 411
Binary options, 118, 150
Binomial tree, 677–679
Biometrics, 625–626, 641
BIS. See Bank for International Settlements (BIS)
1996 Amendment, 347, 356–359
Bitcoin, 624, 626–627, 632
Bitcoin exchanges, 627, 628
Bivariate normal distribution, 249–250, 255
Bivariate Student's $t$-distribution, 256–257
Black, Fischer, 633
Black swans, 653
Blankfein, Lloyd, 611
Blockchain, 623–624
Bogle, John, 77, 632
Bond funds, 77, 78
Bonds:
CAT, 58–59
cheapest-to-deliver, 439–440
contingent convertible, 390
convertible, 91
convexity for, 197–198
corporate, 63, 431–432, 434, 441–442
coupon-bearing, 194, 203
credit ratings and, 19–20
Eurobonds, 92
junk, 19, 89
local currency, 92
pricing, 663
Treasury, 546
zero–coupon, 194, 203, 326, 573, 663–664
Bond yields, 442, 443–444, 444, 445, 663
Bonuses, 395–396, 612–614, 646, 648
Bootstrap method, 306, 664, 665
Boudoukh, J., 301
Bowman, E. H., 607
Bowman paradox, 607
“Breaking the buck,” 72
Brent crude oil, 115
Brokerage services, 39
Brokers, 37
Bucket deltas, 203
Buffett, Warren, 62, 84
Bunching, 288
Business days, 215
Business disruption, 518
Business environment and internal control factors (BEICFs), 525
Business indicator, 526
Business practices, 518
Business risk, 587, 589–590, 653
Calendar days, 215
Calibrating instruments, 579
Calibration, 577
Calibration test, 372
Call options, 110–111, 112, 115, 117–118
Canada, health care in, 60
Capital, 410
adequacy, 29
economic (See Economic capital)
equity (See Equity capital)
regulatory, 483, 504, 519–520, 585, 587, 588, 638
Tier 1, 30, 353, 358, 366, 372, 382–383, 389
Tier 2, 30, 353, 358, 372, 382–383
Tier 3, 358, 372, 382
Capital asset pricing model, 3, 8–13, 148
Capital conservation buffer, 383–384, 389
Capital gains, 77
Capital requirements, 388–389
insurance companies, 63–64, 371
Capital Requirements Directive 2 (CRD2), 394
Cap rate, 113
Caps, 113
Cascade approach, 423
Case-Shiller Index, 128
Cash, 626
Cash flow, 326
Cash needs, 545
Casualty insurance, 57–59
Catastrophe (CAT) bonds, 58–59
Catastrophic risks, 57–58
Causal relationships, 528–529
Cayman Islands, 84
CBOE. See Chicago Board Options Exchange
CCAR. See Comprehensive Capital Analysis and Review
Index

- definition of, 243–243
- dependence vs., 244–245
- matrix, 322–324, 325
- monitoring, 245–247
- multivariate normal distributions, 250–252

Correlation model, 487–488

Costs of mutual funds, 78

Countercyclical buffer, 384

Counterparty credit risk, 388, 421, 460–461

Countrywide, 548

Coupon-bearing bond, 194, 203

Covariance, 244, 264
- consistency condition for, 249
- matrix, 322–324, 325
- Covariance rate, 246–247

Creation units, 80

Credit correlation, 480, 482

Credit crisis of 2007, 28, 39, 120, 127–142, 188, 377, 381, 404, 412, 537, 547, 566
- causes of, 138–140, 651

Credit events, 140
- securitization and, 131–137
- U.S. housing market and, 128–131

Credit default swaps (CDs), 369, 437–442, 444, 455, 693–695

Credit derivatives, 19, 369–370

Credit equivalent amount, 351–352, 355, 373

Credit event, 437

CreditGrades, 454

Credit indices, 440–441

CreditMetrics, 486–487, 488, 489, 589

Credit rating agencies, 19, 133, 136, 137–138, 393, 431–432, 454

Credit ratings, 19–20, 89, 393, 431–433, 434, 447, 452, 452, 586, 630

Credit risk, 18, 19, 42–43, 64, 350–369, 372–373, 381, 382, 388, 425–426, 403, 520, 560, 591, 592
- economic capital, 589
- loss probability density function for, 590, 591

Credit Risk Plus, 483–485, 486, 488, 589

Credit-sensitive products, 488–90

Credit spread risk, 421, 425, 488–490

Credit spreads, 137, 442–444, 455, 460, 488–490, 558–559

Credit substitution approach, 369

Credit Suisse, 389, 390, 391

Credit Suisse Financial Products, 483

Credit support annex (CSA), 403, 406, 411

Credit trades, 425–426

Credit transition matrices, 691–692

Credit value adjustment (CVA), 388, 459–475

Credit VaR, 479–492

CRM. See Comprehensive risk measure

Cross-selling, 608

Crowded exit, 555

Crowdfunding, 631–632, 633, 636, 641

Crude oil, 115

Cryptocurrency. See Digital currencies

CSA. See Credit support annex (CSA)

Cumulative normal distribution function, 147

Cumulative probability distribution, 253, 254–255

Cure periods, 463

Currency swaps, 472, 670–671

Current exposure method (CEM), 352, 365, 391

Curry, Thomas J., 516

Curvature risk charge, 419–420

CVA. See Credit value adjustment

Cyber risk, 515–516, 637

Daily percentage changes, 218

Daily volatility, 222–224

Damage to physical assets, 518

Danish Financial Supervisory Authority (DFSA), 508

Darling, Alistair, 547

Data consortia, 523

Data vendors, 523

Debit (debt) value adjustment (DVA), 460, 463, 469–470

Debt repudiation, 41

Debt rescheduling, 41

Dedicated short funds, 89

Deductible, 61, 531

Default, 404

Default correlation, 258–264, 480–492

Default intensity, 435

Default probabilities, 152, 258–263, 349–351, 354–355, 481, 586, 592
- estimating, 431–455
- estimating, from credit spreads, 444–446
- historical, 434–436
- real-world vs. risk-neutral, 152, 449–451, 455, 479

Default risk, 17, 18–19

Default risk charge, 421

Deferred annuities, 51, 52

Defined benefit plans, 67–70

Defined contribution plans, 67–68

De Fontmouvelle, P., 530
INDEX

Deleveraging, 558–559
Delta, 161–169, 174, 175, 185–186, 674, 678–679
interest rate, 200–204
principal component analysis for calculating, 207
Delta-gamma approximation, 306
Delta hedging, 162–169, 176–177, 178, 179, 181
Delta limit, 178
Delta-neutral portfolio, 162, 165, 169, 171, 174, 179, 181
Dependence, vs. correlation, 244–245
Deposit insurance, 30–31, 348, 392
Deposits and Loans Corporation (DLC), 28, 29, 30
credit, 19, 369–370
default, 404
electricity, 116–117
events of default and, 404
linear model of, 321
natural gas, 116
non-traditional, 114–117
oil, 115–116
over-the-counter, 349, 351, 393, 401–402, 404–405, 406, 408, 411, 440
plain vanilla, 102–114
regulation of, 408–412
weather, 114–115
Derivatives markets, 101–102
Derman, E., 572
Deutsche Bank, 597–598, 648
Deutsche Morgan Grenfell, 592
De Witt, J., 444
DFAST. See Dodd-Frank Act Stress Test
Digital cameras, 638, 639, 640
Digital currencies, 623, 626–629, 632, 636, 641
Digital reasoning, 637
Digital wallets, 625
Dimon, Jamie, 579
Directed brokerage, 83
Discount bonds. See Zero-coupon bonds
Discount brokers, 37
Disintermediation, 621, 629, 634
Distance to default, 454
Distressed securities, 89–90
Distributed ledger technologies (DLTs), 624–625
Diversification, 18, 75–76, 320–321, 561, 596, 597, 646, 653
Dodd-Frank Act, 28, 36, 66, 392–394
Dodd-Frank Act Stress Test (DFAST), 507
Dollar convexity, 198, 200, 208
Dollar duration, 196, 200
Dollar-neutral fund, 89
Domestic systemically important banks (D-SIBs), 389
Douglas Amendment, 27
Downgrade triggers, 465
Drexel, 349
D-SIBs. See Domestic systemically important banks
Duffie, D., 409
Duration, 193–196, 208–209
Dutch auctions, 33–34, 35
DV01, 203
DVA. See Debit (debt) value adjustment
Dynamic hedging, 165–169, 178, 556
Dynamic scenarios, 501
Eastman Kodak, 638–639, 640
Economic capital, 43, 479, 483, 585–600
aggregating, 592–596
allocation of, 596–597
business risk, 589–590
components of, 588–589
credit risk, 589
definition of, 586–590
Deutsche Bank’s, 597–598
market risk, 588
measurement of, 587
operational risk, 589
Efficient frontier, 6–8, 607
Eigenvalues, 685–687
Eigenvectors, 685–687
Electricity derivatives, 116–117
Electronic trading, 98
E-mails, 529–530
Emerging market hedge funds, 92
Employee compensation, 139–140, 393, 395–396, 612–614
Employment practices, 518
Endowment life insurance, 51
Energy Information Administration (EIA), 115
Engle, R. F., 225
Enron, 533, 644, 648–649
Enterprise risk management (ERM), 603–618
Eonia (Euro OverNight Index Average), 191
Equitable Life, 53
Equity capital, 29–30, 353, 372, 382–383
Equity crowdfunding, 631–632, 633, 636, 641
Equity funds, 77, 78
Index 787

Equity-market-neutral fund, 89
Equity prices, 452–455
Equity tranche, 132–133
ERM. See Enterprise risk management
ES. See Expected shortfall
ETFs. See Exchange-traded funds
Euler, Leonhard, 284
Euler’s theorem, 284–285
Eurobonds, 92
Eurodollar futures, 190, 204, 208
European Central Bank, 549, 550
European Growth Trust (EGT), 592
European options, 110, 112, 673–675
European Union, 396, 506
  insurance regulations in, 66, 371
  legislation in, 394–395
  sovereign debt crisis, 438
Events of default, 404
EWMA. See Exponentially weighted moving average
Exceptions, 286, 287–288
Excess cost layers, 62–63
Excess kurtosis, 10–11
Exchange clearing houses, 399, 401, 403
Exchange-traded contracts, 106, 115, 117
Exchange-traded funds (ETFs), 79–80, 94
Exchange-traded markets, 97–98, 101–102, 110, 113, 120, 399
Execution, delivery, and process management, 518
Executive compensation, 393, 395–396, 612–614
Exercise price, 110
Expected return, 2–5, 7–9, 11–13, 147–149, 155, 604–607
  historical simulation for, 299
  partial, 423
  stressed, 299
Expected tail loss, 274
Expected value of a variable, 2
Expedia, 621
Expense ratio, 59, 78
Expiration date, 110
Exponential spectral risk measure, 278
Exposure at default (EAD), 365, 391
External data, 523–524, 533
External fraud, 518
External risks, 517
Extreme value theory (EVT), 289, 307–313
  applications of, 310–313
  key result in, 307–308
Factor copula model, 258
Factor loadings, 205–206
Factor models, 251–252, 258, 264
Factor neutrality, 89
Factor score, 205, 206, 207
Failure resolution mechanisms, 404
Fair value accounting, 356, 580
Fama, E. F., 216
Fannie Mae, 41–42, 394, 549
FDIC. See Federal Deposit Insurance Corporation (FDIC)
  FDIC Improvement Act, 31
Federal Deposit Insurance Corporation (FDIC), 31, 65, 392, 395, 628
Federal Home Loan Mortgage Corporation (FHLMC; Freddie Mac), 41–42, 394, 549
Federal Insurance Office (FIO), 66, 371, 392
Federal National Mortgage Association (FNMA; Fannie Mae), 41–42, 394, 549
Federal Reserve Board, 27, 38, 156, 393, 506, 540, 549, 566
  SR 11–7, 566, 568, 570
  Fed funds rate, 191
  FICO score, 131–132, 630
  Fidelity, 76
  Financial Accounting Standards Board, 580
  Financial Conduct Authority (FCA), 635–636
  Financial crisis. See Credit crisis of 2007
  Financial institutions, 17. See also Banks and banking
diversity of, 561
  employee compensation in, 139–140, 393, 395–396, 612–614
  regulation of (see Regulation)
risk management by (see Risk management)
systemically important, 388–389, 393, 394
technological advances and, 638–640
  “too big to fail,” 326, 388, 412
  Financial Services (Banking Reform) Act, 394
  Financial Services Authority (FSA), 101, 547
  Financial Services Modernization Act, 39
  Financial Stability Board, 389
  Financial Stability Oversight Council (FSOC), 66, 392, 394
INDEX

FinTech innovation, 621–641
insurance, 633–635
lending, 629–632
payment systems, 625–629
regulation and compliance, 635–638
response to, 638–640
technological advances, 622–625
wealth management, 632–633

FIO. See Federal Insurance Office (FIO)

Firm commitment public offering, 32

Fitch, 19, 431

Fixed coupons, 441–442
Fixed income arbitrage, 91–92

Flexibility, 653–654
Flight to quality, 545, 557, 644, 649, 650, 651
Floors, 113

Foreign currency options, 219
Foreign currency risk, 103, 118
Foreign exchange, 626

Foreign exchange forward contracts, 103
risk-neutral valuation of, 149

Forward rates, 661–662

Foundation IRB approach, 360, 366
Fraud, 515, 516, 517, 518, 523, 623, 625, 641
Freddie Mac, 41–42, 394, 549
French, K. R., 216

Front-end load, 78
Front office, 161, 647
Front running, 83

FRTB. See Fundamental Review of the Trading Book

FSA. See Financial Services Authority (FSA)

FSOC. See Financial Stability Oversight Council (FSOC)

Full-service brokers, 37

Fundamental analysis, 89, 92

Fundamental Review of the Trading Book (FRTB), 318, 415–426

Funding Circle, 631
Funding risk, liquidity, 545–554
Funds of funds, 84

Futures contracts, 98, 104–107, 401, 667–698
Futures exchange, 401

G-30 policy recommendations, 353–354
Gamma-neutral portfolio, 170–171, 172, 176

GAO. See Guaranteed Annuity Option (GAO)

GAP management, 203

GARCH(1,1) model, 227–229, 247–248

General Data Protection Regulation, 637

Generalized autoregressive conditional heteroscedasticity (GARCH), 213

Gerstner, Lou, 640

Ginnie Mae, 41–42

Girsanov’s theorem, 153, 157

Glass-Steagall Act, 38, 39

Global macro, 92

Global systemically important banks (G-SIBs), 388–389

Gnedenko, D. V., 307

Gold lease rate, 164

Goldman Sachs, 39, 88, 164, 178, 611, 613, 633

Gold-mining companies, 164, 550

Gonçalves, S., 306

Google, 34, 35, 622, 625, 630, 638, 640

Gordy, M. B., 364, 482

Government National Mortgage Association (GNMA), 41–42

Graham, Benjamin, 89

Greek letters (Greeks), 161, 174–175, 270, 674

Greenspan, Alan, 138, 559

Gross income, 369–370

Group health insurance plans, 61

Group life insurance, 51

G-SIBs. See Global systemically important banks

Guaranteed Annuity Option (GAO), 53

Guarantees, 369

Haircut, 401

Hammes, 624

Hazard rates, 434–435, 445, 462
Health insurance, 60–61, 70

Hazard degree days (HDD), 114–115
Heavy-tailed distribution, 218–220

“Hedge and forget” property, 164

Hedge funds, 83–94, 392, 559, 561

fees, 85–86
incentives for managers, 87–88
performance, 93–94
prime brokers and, 87–88
strategies, 88–93

Hedging, 118, 119, 121, 577–578, 579, 581, 652–653
Initial public offerings (IPOs), 33, 35  
Insurance, 47–66  
  adverse selection and, 62, 70  
  annuity contracts, 51–52  
  auto, 60–61, 634  
  deposit, 30–31, 348  
  FinTech innovation in, 633–635  
  health, 60–61, 70  
  life, 47–51, 61, 63–64, 70  
  longevity and mortality risk, 56  
  moral hazard and, 61, 70  
  mortality tables, 52–56  
  nonlife, 47  
  operational risk, 531–533  
  property-casualty, 47, 57–59, 63–64, 70–71  
  reinsurance, 62–63  
  rogue trader, 531, 532  
Insurance companies, 17, 18, 47, 516  
  capital requirements for, 63–64, 371  
  guarantee system for, 65  
  regulation of, 64–66, 71, 348  
  risks facing, 61–62, 64, 70  
Insurance guarantee associations, 65  
Intercontinental Exchange (ICE), 115–116  
Interest, 186–188  
  interest rate deltas, 200–203  
  interest-rate-dependent assets, 198–199  
  interest rate options, 113–114  
  interest rate risk, 114, 185–209  
  convexity and, 196–198  
  duration and, 193–196  
  gamma and vega, 207–208  
  nonparallel yield curve shifts and, 202–204  
  principal component analysis and, 204–207  
Interest rates, 156  
  compounding frequencies for, 657–660  
  model-building approach and, 326, 328  
  term structure of, 185  
  types of, 188–193  
  zero-coupon, 661–662  
Interest rate swaps, 108–109, 349, 405, 472, 573, 574, 669–670  
  Internal controls, 643  
  Internal data, 521–522, 533  
  Internal fraud, 518  
  Internal loss multiplier, 527  
  Internal models approach, 372, 423, 424–425, 566  
  Internal-ratings-based (IRB) approach, 360, 363–365, 432, 482–483, 504, 589  
  Internal risks, 517  

delta, 162–169, 176–177, 178, 179, 181  
dynamic, 165–169, 178, 556  
exotic options, 178–180  
by gold mining companies, 164  
interest rate, 203–204  
liquidity and, 550  
model risk and, 577–578  
realities of, 177  
rebalancing, 166–167  
High-frequency low-severity losses (HFLSLs), 523, 534  
High-frequency traders (HFTs), 636  
High-water mark clause, 85  
Historical data, 155, 229  
Historical simulation, 293–307, 313, 357, 489, 497, 499, 509, 510–511  
  bootstrap method, 306  
  computational issues, 306–307  
  extensions, 301–306  
  methodology, 293–299  
  model-building approach vs., 339–340  
  volatility estimates and, 303–304  
  weighting of observations, 301–302  
Homogeneity, 275  
Homogenous expectations, 11  
Housing bubble, 128, 130–131, 142, 500, 501  
Housing market, U.S., 128–131, 141, 500  
Hull, J., 151, 156, 303, 581  
Hunter, Brian, 87  
Hurdle rate, 85  
Hurricane Katrina, 57  
Hybrid approach, 594–596  
Hybrid funds, 77  
IBM, 637, 640  
ICE Clear Credit, 402  
Idiosyncratic risk. See Nonsystematic risk  
IDRC. See Incremental default risk charge (IDRC)  
IFRS 9, 40  
Iksil, Bruno, 569–570  
Implied default probabilities, 449  
Inception profit, 648  
Income statement, 28–29  
Incremental default risk charge (IDRC), 379–380  
Incremental risk charge (IRC), 379–380, 417  
Incremental value at risk, 283, 289  
Index funds, 77–78, 81, 89, 632  
Initial coin offerings (ICOs), 632  
Initial margin, 401, 402–404, 406–408, 411  
Initial public offerings (IPOs), 33, 35  
Insurance, 47–66  
  adverse selection and, 62, 70  
  annuity contracts, 51–52  
  auto, 60–61, 634  
  deposit, 30–31, 348  
  FinTech innovation in, 633–635  
  health, 60–61, 70  
  life, 47–51, 61, 63–64, 70  
  longevity and mortality risk, 56  
  moral hazard and, 61, 70  
  mortality tables, 52–56  
  nonlife, 47  
  operational risk, 531–533  
  property-casualty, 47, 57–59, 63–64, 70–71  
  reinsurance, 62–63  
  rogue trader, 531, 532  
Insurance companies, 17, 18, 47, 516  
  capital requirements for, 63–64, 371  
  guarantee system for, 65  
  regulation of, 64–66, 71, 348  
  risks facing, 61–62, 64, 70  
Insurance guarantee associations, 65  
Intercontinental Exchange (ICE), 115–116  
Interest, 186–188  
  interest rate deltas, 200–203  
  interest-rate-dependent assets, 198–199  
  interest rate options, 113–114  
  interest rate risk, 114, 185–209  
  convexity and, 196–198  
  duration and, 193–196  
  gamma and vega, 207–208  
  nonparallel yield curve shifts and, 202–204  
  principal component analysis and, 204–207  
Interest rates, 156  
  compounding frequencies for, 657–660  
  model-building approach and, 326, 328  
  term structure of, 185  
  types of, 188–193  
  zero-coupon, 661–662  
Interest rate swaps, 108–109, 349, 405, 472, 573, 574, 669–670  
  Internal controls, 643  
  Internal data, 521–522, 533  
  Internal fraud, 518  
  Internal loss multiplier, 527  
  Internal models approach, 372, 423, 424–425, 566  
  Internal-ratings-based (IRB) approach, 360, 363–365, 432, 482–483, 504, 589  
  Internal risks, 517
INDEX

International Accounting Standards Board, 580
International Organization of Securities Commissions (IOSCO), 411
International Swaps and Derivatives Association (ISDA), 354, 403, 438
Interstate banking, 26, 27–28
In-the-money option, 111
Investment banking, 25, 31–36, 40, 549, 621
    advisory services, 34–36
IPOs, 33
    potential conflicts of interest for, 38–39
Investment grade bonds, 19
Investment opportunities, 3–5
IPOs. See Initial public offerings
IRC. See Incremental risk charge
Irrational exuberance, 559–560, 562
ISDA. See International Swaps and Derivatives Association
ISDA master agreement, 354, 403, 404, 406–407
Isserlis’ theorem, 338–339
ITraxx Europe, 441
Jensen, Michael, 13, 80–81
Jensen’s alpha, 13
Jett, Joseph, 573, 575, 643, 644, 647
Joint distributions, 252, 255–256
Jones, Alfred Winslow, 84, 88–89
JPMorgan Chase, 26, 28, 39, 76, 269, 270, 486, 515, 549, 569–570
Jumpstart Our Business Startups (JOBS) Act, 631, 636
Jump-to-default (JTD) risk, 421, 425, 489
Junk bonds, 19, 89
Kahneman, D., 614–615
Kendall, M. G., 299
Kerviel, Jérôme, 115, 121, 516, 592, 643, 644
Key risk indicators (KRIs), 529
Kickstarter, 631
Kidder Peabody, 572, 573, 575, 643, 644, 647
Knock-on effects, 501
Known risks, 653
Kodak, 638–639, 640
Kurtosis, 218, 591, 593
Late trading, 83
LCR. See Liquidity coverage ratio
Leeson, Nick, 121, 643, 644, 647
Legislation, 394–396. See also specific acts
Lehman Brothers, 15, 17, 39, 76, 88, 138, 188, 296, 349, 386, 395, 411, 438
Lenders of last resort, 549
Lending:
    FinTech innovation in, 629–632
    standards, 128–130, 138
Lending Club, 629, 630
Leptokurtic distribution, 218
Less developed countries (LDCs), loans to, 41
Leverage ratio, 384–385
Leveraging, 558–559
LGD. See Loss given default
Liability insurance, 57–58
Liar loans, 129
LIBOR. See London Interbank Offered Rate
LIBOR-in-arrears swaps, 573, 574, 575
LIBOR-OIS spread, 192
Life assurance, 48
Life insurance, 47–51, 61, 70
    capital requirements, 63–64
    endowment, 51
    group, 51
    longevity and mortality risk, 56
    mortality tables, 52–56
    term, 48
    universal, 50
    variable, 50
    variable-universal, 50
    whole, 48–50
Liikanen, Erkki, 394
Linear homogeneity, 284
Linear products, 162–164, 166, 572
Liquid assets, 545, 546
Liquidity, 188, 410, 537, 540–542, 638
Liquidity-adjusted VaR, 543
Liquidity black holes, 554–555, 561, 562, 649, 650
Liquidity coverage ratio (LCR), 386, 552
Liquidity horizon, 380, 416
Liquidity preference theory, 188
Liquidity requirements, 188
Liquidity risk, 64, 381, 385–388, 537–562, 649–651
    funding risk, 545–554
    trading risk, 538–545
Litterman, Robert, 633
Living wills, 394
Ljung-Box statistic, 235
Loan portfolios, 258–263
Loans:
    to less-developed countries, 41
    originate-to-distribute model, 41–42
Index

Loan-to-value ratio, 131–132
Local currency bonds, 92
London Interbank Offered Rate (LIBOR), 108, 109–110, 113, 114, 189–191, 192, 208, 401–402
London Whale, 593, 568, 569–570
Longevity bonds, 57
Longevity derivatives, 57
Longevity risk, 56, 69–70
Long positions, 100, 103, 105, 106, 112
Long/short equity strategy, 88–89, 95
Long-tail risk, 58
Long-Term Capital Management (LTCM), 87, 92, 93, 501, 502, 540, 556–557, 560, 592, 644, 649–650
Lookback options, 118
Loomis, Carol, 84
Loss component, 527
Loss frequency distribution, 520–521
Loss given default (LGD), 421, 436
Loss probability density function, 363, 590, 591
Loss probability distributions, 590–591
Loss ratio, 59
Loss severity distribution, 520–521
Low-frequency high-severity losses (LFHSLs), 523, 534
LTCM. See Long-Term Capital Management
Lucas, R., 582
Lucas Critique, 582
Macaulay, Frederick, 195
Macaulay’s duration, 195
Machine learning, 622–623, 629
Madoff, Bernard, 121, 592
Managed futures, 92–93
Marcos family, 41
Margin, 97, 99–100, 106–107, 400–404, 406–407, 556
Margin accounts, 99–100, 101
Marginal distributions, 252–253
Marginal VaR, 283–284, 289
Margin call, 410
Margin period of risk, 463
Marked to market, 40
Market discipline, 360, 370–371
“Market for lemons” problem, 631
Market liquidity, 540–545
Market makers, 37, 98, 538, 575
Market-neutral strategies, 89
Market portfolio, 8
Market price of risk, 156
Market risk, 18, 42, 356, 378–381, 415–417, 425, 591, 592
economic capital, 588
loss probability density function for, 590
Market timing, 13, 83
daily percentage changes in, 218, 226–227
volatilities of, 303–304
Marking to market, 356, 580
Marking to model, 40, 580, 648
Markowitz, Harry, 3, 317
Markowitz portfolio theory, 270, 317, 323
Matten, C., 599
Maturity date, 110
Maximum likelihood methods, 229–234, 239, 308–309
Maximum peak exposure, 464
McCarran-Ferguson Act, 64
McDonough, William, 361
McDonough ratios, 361
McFadden Act, 26–27
MCR. See Minimum capital requirement
Mean reversion, 155
Medicaid, 60
Mercury Asset Management, 591
Merger arbitrage, 90–91
Merrill Lynch, 2, 39, 135, 138, 591
Merton, R., 452, 455
Merton’s model, 452–455
Mesokurtic distribution, 218
Metalgesellschaft, 539, 551
Metro do Porto, 611, 612
Mezz ABS CDOs, 141
Mezzanine tranche, 132–133, 134
Mian, A., 129
Microsoft, 119
Middle office, 161, 647
Millennial Disruption Index, 639–640
Miners, 624
Minimum capital requirement (MCR), 371–372
Minimum transfer amount, 400
Model-building approach, 317–340
correlation and covariance matrices, 323–324
extension of basic procedure, 331–332
generalization of, 321–323
historical simulation vs., 339–340
methodology, 318–321
Monte Carlo simulations, 335–336
<table>
<thead>
<tr>
<th>Model-building approach (Continued)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>non-linearity and, 333–339</td>
<td></td>
</tr>
<tr>
<td>term structures, 326–330</td>
<td></td>
</tr>
<tr>
<td>Model development, 567–568</td>
<td></td>
</tr>
<tr>
<td>Model risk, 565–582</td>
<td></td>
</tr>
<tr>
<td>Models: actively traded products, 575–578</td>
<td></td>
</tr>
<tr>
<td>ARCH((\theta)), 225</td>
<td></td>
</tr>
<tr>
<td>back-testing, 424</td>
<td></td>
</tr>
<tr>
<td>correlation, 487–488</td>
<td></td>
</tr>
<tr>
<td>dangers of, 570–571</td>
<td></td>
</tr>
<tr>
<td>GARCH(1,1), 227–229, 247–248</td>
<td></td>
</tr>
<tr>
<td>less actively traded products, 578–580</td>
<td></td>
</tr>
<tr>
<td>linear products, 572</td>
<td></td>
</tr>
<tr>
<td>missteps in, 581–582</td>
<td></td>
</tr>
<tr>
<td>non-standard products, 579–580</td>
<td></td>
</tr>
<tr>
<td>for pricing standard products, 575</td>
<td></td>
</tr>
<tr>
<td>regulatory requirements, 566–572</td>
<td></td>
</tr>
<tr>
<td>trusting in, 647–648</td>
<td></td>
</tr>
<tr>
<td>validation of, 568–571</td>
<td></td>
</tr>
<tr>
<td>Modified duration, 195</td>
<td></td>
</tr>
<tr>
<td>Money center banks, 26</td>
<td></td>
</tr>
<tr>
<td>Money market mutual funds, 76</td>
<td></td>
</tr>
<tr>
<td>Monotonicity, 275</td>
<td></td>
</tr>
<tr>
<td>weighted, 579–580</td>
<td></td>
</tr>
<tr>
<td>Moody’s, 19, 431, 454</td>
<td></td>
</tr>
<tr>
<td>Moore, Gordon, 622</td>
<td></td>
</tr>
<tr>
<td>Moral hazard, 31, 61, 70, 348, 531, 532</td>
<td></td>
</tr>
<tr>
<td>Morgan Stanley, 39, 88</td>
<td></td>
</tr>
<tr>
<td>Mortality risk, 56</td>
<td></td>
</tr>
<tr>
<td>Mortality tables, 52–56</td>
<td></td>
</tr>
<tr>
<td>Mortgage market, 41–42</td>
<td></td>
</tr>
<tr>
<td>Mortgages adjustable rate (ARMs), 129</td>
<td></td>
</tr>
<tr>
<td>subprime, 128–130, 134–136, 141, 539, 560, 645, 649, 651</td>
<td></td>
</tr>
<tr>
<td>Mt. Gox bitcoin exchange, 628</td>
<td></td>
</tr>
<tr>
<td>Multibank holding company, 27</td>
<td></td>
</tr>
<tr>
<td>Multiple vertices approach, 328–331</td>
<td></td>
</tr>
<tr>
<td>Multivariate copulas, 258</td>
<td></td>
</tr>
<tr>
<td>Multivariate normal distributions, 250–252</td>
<td></td>
</tr>
<tr>
<td>Mutual funds, 75–79, 94</td>
<td></td>
</tr>
<tr>
<td>National Association of Insurance Commissioners (NAIC), 65, 371</td>
<td></td>
</tr>
<tr>
<td>National Westminster Bank, 644, 647</td>
<td></td>
</tr>
<tr>
<td>Natural disasters, 57–58</td>
<td></td>
</tr>
<tr>
<td>Natural gas derivatives, 116</td>
<td></td>
</tr>
<tr>
<td>NAV. See Net asset value (NAV)</td>
<td></td>
</tr>
<tr>
<td>Negative feedback traders, 555, 556</td>
<td></td>
</tr>
<tr>
<td>Net asset value (NAV), 77</td>
<td></td>
</tr>
<tr>
<td>Net interest income, 185–188, 369, 519</td>
<td></td>
</tr>
<tr>
<td>Net interest margin, 185–186, 188, 208</td>
<td></td>
</tr>
<tr>
<td>Net replacement ratio (NRR), 355–356</td>
<td></td>
</tr>
<tr>
<td>Net stable funding ratio (NSFR), 386–387, 552</td>
<td></td>
</tr>
<tr>
<td>Netting, 354–356, 403–404, 406, 409</td>
<td></td>
</tr>
<tr>
<td>Neural networks, 623</td>
<td></td>
</tr>
<tr>
<td>New York Stock Exchange (NYSE), 97–98, 636</td>
<td></td>
</tr>
<tr>
<td>NINJA, 129</td>
<td></td>
</tr>
<tr>
<td>Nonce, 624</td>
<td></td>
</tr>
<tr>
<td>Nonfinancial corporations, 652</td>
<td></td>
</tr>
<tr>
<td>Noninvestment grade bonds, 19</td>
<td></td>
</tr>
<tr>
<td>Nonlife insurance, 47</td>
<td></td>
</tr>
<tr>
<td>Non–linearity, 333–334</td>
<td></td>
</tr>
<tr>
<td>Nonlinear products, 165–169, 177</td>
<td></td>
</tr>
<tr>
<td>Non-normal distributions, 331–332</td>
<td></td>
</tr>
<tr>
<td>Non-standard products, 579–580</td>
<td></td>
</tr>
<tr>
<td>Nonsystematic risk, 9, 14–15, 450–451</td>
<td></td>
</tr>
<tr>
<td>Non–traditional derivatives, 114–117</td>
<td></td>
</tr>
<tr>
<td>Normal distributions, 217–218, 300–301</td>
<td></td>
</tr>
<tr>
<td>generating random samples from, 250–251 multivariate, 250–252</td>
<td></td>
</tr>
<tr>
<td>Northern Rock, 17, 188, 386, 537, 545, 547–548, 550</td>
<td></td>
</tr>
<tr>
<td>Notice of intention to deliver, 105</td>
<td></td>
</tr>
<tr>
<td>Notional principal, 437</td>
<td></td>
</tr>
<tr>
<td>NRR. See Net replacement ratio</td>
<td></td>
</tr>
<tr>
<td>Obama, Barack, 28, 60, 378</td>
<td></td>
</tr>
<tr>
<td>Objective probability, 510–511</td>
<td></td>
</tr>
<tr>
<td>Offer price, 98</td>
<td></td>
</tr>
<tr>
<td>Office of Credit Ratings, 393</td>
<td></td>
</tr>
<tr>
<td>Office of Financial Research (OFR), 392, 394</td>
<td></td>
</tr>
<tr>
<td>Office of Thrift Supervision, 392</td>
<td></td>
</tr>
<tr>
<td>Oil derivatives, 115–116</td>
<td></td>
</tr>
<tr>
<td>OIS rate. See Overnight indexed swap rate</td>
<td></td>
</tr>
<tr>
<td>One–factor models, 251–252, 258, 263</td>
<td></td>
</tr>
<tr>
<td>Open–end fund, 76</td>
<td></td>
</tr>
<tr>
<td>Open outcry system, 98</td>
<td></td>
</tr>
<tr>
<td>Operating ratio, 59</td>
<td></td>
</tr>
<tr>
<td>Operational risk, 29, 42, 369–370, 515–534, 566, 591, 592, 653</td>
<td></td>
</tr>
<tr>
<td>allocation of capital, 530</td>
<td></td>
</tr>
<tr>
<td>categorization of, 518–519</td>
<td></td>
</tr>
<tr>
<td>definition of, 517</td>
<td></td>
</tr>
<tr>
<td>Index</td>
<td>793</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>economic capital, 589</td>
<td></td>
</tr>
<tr>
<td>implementation of AMA, 520–525</td>
<td></td>
</tr>
<tr>
<td>insurance, 531–533, 534</td>
<td></td>
</tr>
<tr>
<td>loss probability density function for, 591</td>
<td></td>
</tr>
<tr>
<td>power law, 530–531</td>
<td></td>
</tr>
<tr>
<td>preventing losses, 527–530</td>
<td></td>
</tr>
<tr>
<td>proactive approaches to, 527–528</td>
<td></td>
</tr>
<tr>
<td>regulatory capital, 519–525</td>
<td></td>
</tr>
<tr>
<td>Sarbanes-Oxley Act and, 533</td>
<td></td>
</tr>
<tr>
<td>scenario analysis, 524–525</td>
<td></td>
</tr>
<tr>
<td>standardized measurement approach, 525–527</td>
<td></td>
</tr>
<tr>
<td>Option premium, 111</td>
<td></td>
</tr>
<tr>
<td>Options, 110–113, 122, 165–169, 178, 575</td>
<td></td>
</tr>
<tr>
<td>binary, 118, 150</td>
<td></td>
</tr>
<tr>
<td>delta of, 161–169, 674</td>
<td></td>
</tr>
<tr>
<td>exotic, 117–118, 122, 178–180</td>
<td></td>
</tr>
<tr>
<td>foreign currency, 219</td>
<td></td>
</tr>
<tr>
<td>gamma of, 169–171, 674</td>
<td></td>
</tr>
<tr>
<td>rho of, 174, 674</td>
<td></td>
</tr>
<tr>
<td>static options replication, 178, 180</td>
<td></td>
</tr>
<tr>
<td>synthetic creation of, 556</td>
<td></td>
</tr>
<tr>
<td>theta of, 173–174, 674</td>
<td></td>
</tr>
<tr>
<td>vega of, 171–173, 674</td>
<td></td>
</tr>
<tr>
<td>Orange County, California, 643, 644, 645, 652, 653</td>
<td></td>
</tr>
<tr>
<td>Organization of Economic Co-operation and Development (OECD), 350</td>
<td></td>
</tr>
<tr>
<td>Organized trading facilities (OTFs), 39, 395, 405</td>
<td></td>
</tr>
<tr>
<td>Originate-to-distribute model, 41–42, 549</td>
<td></td>
</tr>
<tr>
<td>OTC market. See Over-the-counter market</td>
<td></td>
</tr>
<tr>
<td>OTFs. See Organized trading facilities (OTFs)</td>
<td></td>
</tr>
<tr>
<td>Outcomes analysis, 571</td>
<td></td>
</tr>
<tr>
<td>Out-of-the-money option, 110–111</td>
<td></td>
</tr>
<tr>
<td>Outside-model hedging, 577–578</td>
<td></td>
</tr>
<tr>
<td>Overcollateralization, 135–136</td>
<td></td>
</tr>
<tr>
<td>Over-fitting, 581</td>
<td></td>
</tr>
<tr>
<td>Overnight indexed swap (OIS) rate, 191–192</td>
<td></td>
</tr>
<tr>
<td>Overnight repos, 193</td>
<td></td>
</tr>
<tr>
<td>Over-parameterization, 582</td>
<td></td>
</tr>
<tr>
<td>Over-the-counter (OTC) market, 38, 97, 98, 99, 116, 120, 399, 405, 406</td>
<td></td>
</tr>
<tr>
<td>central clearing and, 99, 401–402</td>
<td></td>
</tr>
<tr>
<td>derivatives, 349, 351, 393, 399–413, 440</td>
<td></td>
</tr>
<tr>
<td>pricing standard products, 575</td>
<td></td>
</tr>
<tr>
<td>Pareto distribution, 301, 308</td>
<td></td>
</tr>
<tr>
<td>Partial simulation approach, 335</td>
<td></td>
</tr>
<tr>
<td>Patient Protection and Affordable Care Act, 60, 61</td>
<td></td>
</tr>
<tr>
<td>Paulson, John, 613</td>
<td></td>
</tr>
<tr>
<td>Payment systems, 625–629</td>
<td></td>
</tr>
<tr>
<td>PayPal, 625, 626, 640</td>
<td></td>
</tr>
<tr>
<td>PCA. See Principal components analysis (PCA)</td>
<td></td>
</tr>
<tr>
<td>Peak exposure, 464–465</td>
<td></td>
</tr>
<tr>
<td>Peer-to-peer (P2P) lending, 629–631</td>
<td></td>
</tr>
<tr>
<td>Penalty-free withdrawals, from annuities, 51–52</td>
<td></td>
</tr>
<tr>
<td>Pension Benefit Guaranty Corporation (PBGC), 69</td>
<td></td>
</tr>
<tr>
<td>Pension plans, 47, 66–70, 93</td>
<td></td>
</tr>
<tr>
<td>PeopleSoft, Inc., 37</td>
<td></td>
</tr>
<tr>
<td>Peripheral variables, 500</td>
<td></td>
</tr>
<tr>
<td>Permanent life insurance, 48–50</td>
<td></td>
</tr>
<tr>
<td>Permissioned blockchains, 624</td>
<td></td>
</tr>
<tr>
<td>Permissionless blockchains, 624</td>
<td></td>
</tr>
<tr>
<td>Peston, Robert, 547</td>
<td></td>
</tr>
<tr>
<td>Phone calls, 529–530</td>
<td></td>
</tr>
<tr>
<td>Physics, 572</td>
<td></td>
</tr>
<tr>
<td>Pillar 1:</td>
<td></td>
</tr>
<tr>
<td>of Basel II, 359–360</td>
<td></td>
</tr>
<tr>
<td>of Solvency II, 371</td>
<td></td>
</tr>
<tr>
<td>Pillar 2, 506</td>
<td></td>
</tr>
<tr>
<td>of Basel II, 360, 370</td>
<td></td>
</tr>
<tr>
<td>of Solvency II, 371</td>
<td></td>
</tr>
<tr>
<td>Pillar 3:</td>
<td></td>
</tr>
<tr>
<td>of Basel II, 370–371</td>
<td></td>
</tr>
<tr>
<td>of Solvency II, 371</td>
<td></td>
</tr>
<tr>
<td>Plain vanilla derivatives, 102–114</td>
<td></td>
</tr>
<tr>
<td>Plain vanilla interest rate swaps, 108–109, 405, 669–670</td>
<td></td>
</tr>
<tr>
<td>Platykurtic distribution, 218</td>
<td></td>
</tr>
<tr>
<td>Poison pills, 36, 37</td>
<td></td>
</tr>
<tr>
<td>Poison distribution, 520–521, 524</td>
<td></td>
</tr>
<tr>
<td>Policyholder, 47</td>
<td></td>
</tr>
<tr>
<td>Policy limit, 61, 531</td>
<td></td>
</tr>
<tr>
<td>Porter, M., 617</td>
<td></td>
</tr>
<tr>
<td>Portfolio immunization, 200</td>
<td></td>
</tr>
<tr>
<td>Positive feedback traders, 555–556</td>
<td></td>
</tr>
<tr>
<td>Positive-semidefinite matrix, 249</td>
<td></td>
</tr>
<tr>
<td>Potential future exposure (PFE), 391–392</td>
<td></td>
</tr>
<tr>
<td>Power law, 220–222, 239, 289, 307, 309, 530–531, 534</td>
<td></td>
</tr>
<tr>
<td>Predatory lending, 129</td>
<td></td>
</tr>
<tr>
<td>Predatory trading, 539–540, 556</td>
<td></td>
</tr>
<tr>
<td>Preferred stock, 353</td>
<td></td>
</tr>
<tr>
<td>Premiums, 47</td>
<td></td>
</tr>
<tr>
<td>Prepayment risk, 41</td>
<td></td>
</tr>
<tr>
<td>Prime brokers, 87–88</td>
<td></td>
</tr>
<tr>
<td>Prince, Chuck, 559</td>
<td></td>
</tr>
<tr>
<td>Principal components analysis (PCA), 204–207, 326–328, 577, 689</td>
<td></td>
</tr>
</tbody>
</table>
### Index

<table>
<thead>
<tr>
<th>Term</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>long-tail</td>
<td>58</td>
</tr>
<tr>
<td>model</td>
<td>565–582</td>
</tr>
<tr>
<td>mortality</td>
<td>56</td>
</tr>
<tr>
<td>nonsystematic</td>
<td>9, 14–15, 450–451</td>
</tr>
<tr>
<td>operational (see Operational risk)</td>
<td></td>
</tr>
<tr>
<td>prepayment</td>
<td>41</td>
</tr>
<tr>
<td>quantifying</td>
<td>3, 604, 607, 609</td>
</tr>
<tr>
<td>relative importance of</td>
<td>591–592</td>
</tr>
<tr>
<td>return</td>
<td>2–5, 14–17, 604–607</td>
</tr>
<tr>
<td>systematic</td>
<td>3, 9, 13, 17–18, 450–451</td>
</tr>
<tr>
<td>systemic</td>
<td>349, 392, 394, 404, 405, 412</td>
</tr>
<tr>
<td>unsystematic</td>
<td>14</td>
</tr>
<tr>
<td>wrong-way</td>
<td>468–469, 592</td>
</tr>
<tr>
<td>Risk-adjusted performance measurement (RAPM)</td>
<td>598</td>
</tr>
<tr>
<td>Risk-adjusted return on capital (RAROC)</td>
<td>586, 598–600</td>
</tr>
<tr>
<td>Risk aggregation</td>
<td>18</td>
</tr>
<tr>
<td>Risk appetite</td>
<td>603, 604–610, 617</td>
</tr>
<tr>
<td>Risk-averse investors</td>
<td>5</td>
</tr>
<tr>
<td>Risk budgeting</td>
<td>285</td>
</tr>
<tr>
<td>Risk capital</td>
<td></td>
</tr>
<tr>
<td>Risk concentration</td>
<td>609</td>
</tr>
<tr>
<td>Risk control and self-assessment (RCSA)</td>
<td>529</td>
</tr>
<tr>
<td>Risk culture</td>
<td>610–614, 618</td>
</tr>
<tr>
<td>Risk decomposition</td>
<td>18</td>
</tr>
<tr>
<td>Risk factors</td>
<td>321, 407, 408, 416</td>
</tr>
<tr>
<td>Risk-free rate</td>
<td>147, 148, 208, 442–443, 446</td>
</tr>
<tr>
<td>Risk limits</td>
<td>643–645, 646</td>
</tr>
<tr>
<td>Risk management</td>
<td>1</td>
</tr>
<tr>
<td>bottom-up approaches to</td>
<td>603, 609</td>
</tr>
<tr>
<td>challenges in</td>
<td>118–120</td>
</tr>
<tr>
<td>definition of</td>
<td>603–604</td>
</tr>
<tr>
<td>enterprise risk management (ERM)</td>
<td>603–618</td>
</tr>
<tr>
<td>by financial institutions</td>
<td>18–19</td>
</tr>
<tr>
<td>mistakes to avoid in</td>
<td>643–654</td>
</tr>
<tr>
<td>strategic</td>
<td>616–617</td>
</tr>
<tr>
<td>top-down approaches to</td>
<td>603, 604, 609</td>
</tr>
<tr>
<td>by traders</td>
<td>161–181</td>
</tr>
<tr>
<td>Risk measures</td>
<td>274–277, 416</td>
</tr>
<tr>
<td>See also Value at risk and Expected shortfall</td>
<td></td>
</tr>
<tr>
<td>RiskMetrics database</td>
<td>226–227, 270</td>
</tr>
<tr>
<td>Risk-neutral probabilities</td>
<td>152</td>
</tr>
<tr>
<td>Risk-neutral valuation</td>
<td>147–152, 156–157, 449–451</td>
</tr>
<tr>
<td>binary options</td>
<td>150</td>
</tr>
<tr>
<td>Black-Scholes-Merton application</td>
<td>150–151</td>
</tr>
<tr>
<td>forward contracts</td>
<td>149</td>
</tr>
<tr>
<td>Risk-weighted amount</td>
<td>350</td>
</tr>
<tr>
<td>Risk-weighted assets (RWA)</td>
<td>350, 352, 356, 360, 363, 366, 373, 384, 638</td>
</tr>
<tr>
<td>Risk weights</td>
<td>350, 359, 407</td>
</tr>
<tr>
<td>RMFI software</td>
<td>174, 773–775</td>
</tr>
<tr>
<td>Robotics process automation (RPA)</td>
<td>622</td>
</tr>
<tr>
<td>Robo-advisers</td>
<td>632, 633, 635</td>
</tr>
<tr>
<td>ROE. See Return on equity</td>
<td></td>
</tr>
<tr>
<td>Rogue trader insurance</td>
<td>531, 532</td>
</tr>
<tr>
<td>Roll, R.</td>
<td>216</td>
</tr>
<tr>
<td>Rolling over of deposits</td>
<td>188</td>
</tr>
<tr>
<td>RORAC. See Return on risk-adjusted capital</td>
<td></td>
</tr>
<tr>
<td>Rosenberg, J. V.</td>
<td>590</td>
</tr>
<tr>
<td>Ross, S.</td>
<td>3, 79</td>
</tr>
<tr>
<td>RSF. See Required stable funding</td>
<td></td>
</tr>
<tr>
<td>Rusnak, John</td>
<td>643, 644</td>
</tr>
<tr>
<td>RWA. See Risk-weighted assets</td>
<td></td>
</tr>
<tr>
<td>S&amp;P 500</td>
<td>77, 79, 80, 84, 93, 231, 232–233, 605–606</td>
</tr>
<tr>
<td>S&amp;P/Case-Shiller composite-10 index</td>
<td>128</td>
</tr>
<tr>
<td>SA-CCR</td>
<td>365, 390–392</td>
</tr>
<tr>
<td>Santander</td>
<td>592, 611, 612</td>
</tr>
<tr>
<td>Sarbanes-Oxley Act</td>
<td>533</td>
</tr>
<tr>
<td>Sasson, Steve</td>
<td>639</td>
</tr>
<tr>
<td>Scaling factor</td>
<td>367</td>
</tr>
<tr>
<td>Scandals, mutual funds</td>
<td>83–84</td>
</tr>
<tr>
<td>estimating real-world processes</td>
<td>155–156</td>
</tr>
<tr>
<td>generating scenarios</td>
<td>497–504</td>
</tr>
<tr>
<td>individual variables</td>
<td>498</td>
</tr>
<tr>
<td>multiple variables</td>
<td>499</td>
</tr>
<tr>
<td>operational risk</td>
<td>524–525</td>
</tr>
<tr>
<td>in practice</td>
<td>154–155</td>
</tr>
<tr>
<td>probability estimates</td>
<td>508–509</td>
</tr>
<tr>
<td>regulation and</td>
<td>504–507</td>
</tr>
<tr>
<td>results from</td>
<td>507–511</td>
</tr>
<tr>
<td>Schloss, Walter J.</td>
<td>84</td>
</tr>
<tr>
<td>Schuermann, T.</td>
<td>590</td>
</tr>
<tr>
<td>SCR. See Solvency capital requirement</td>
<td></td>
</tr>
<tr>
<td>Sector neutrality</td>
<td>89</td>
</tr>
<tr>
<td>Securities:</td>
<td></td>
</tr>
<tr>
<td>distressed, 89–90</td>
<td></td>
</tr>
<tr>
<td>trading, 36–38</td>
<td></td>
</tr>
<tr>
<td>Securities and Exchange Commission (SEC)</td>
<td>83, 84, 533, 608, 636</td>
</tr>
<tr>
<td>Securitization</td>
<td>42, 131–137, 140, 381, 425, 540, 549</td>
</tr>
</tbody>
</table>
INDEX

SEFs. See Swap execution facilities (SEFs)
Seller's market, 539
Senior tranche, 132–133, 134, 135
Shadow banks, 614, 635
Share capital, 382
Share-for-share exchange, 90
Sharpe, W., 3
Shocks, 416, 501
Short positions, 100, 103, 112
Short sales, 100–101
Short-squeezed investor, 100
Short-term funding, 651
SIFIs. See Systemically important financial institutions (SIFIs)
SIMM See Standard Initial Margin Model
Simons, Jim, 85
Simple approach, 362–363
Simplified approach, 421
Skewness, 10–11, 591, 593
SMA, See Standardized measurement approach
Smart contracts, 627
Social Security, 67
Société Générale (SocGen), 1, 115, 121, 515, 516, 592, 643, 644, 645
Solvency, 537, 545
Solvency capital requirement (SCR), 371–372
Solvency I, 66, 371
Solvency II, 66, 347, 371–372
SONIA (Sterling OverNight Index Average), 191
Soros, George, 84, 92
Sovereign debt crisis, 438
Sovereign exposures, 365–367
Sovereign wealth funds, 43
Special purpose vehicles (SPVs), 132
Specific risk charge (SRC), 357, 358
Spectral risk measure, 277–278
Speculation, 118, 121
Speculative grade bonds, 19
Spider, 79
Spot interest rate, 661
Spot trades, 99
SPVs. See Special purpose vehicles
SR. 11–7, 566, 568, 570
SRC. See Specific risk charge
Stable value funds, 76
Standard and Poor's (S&P), 19, 431
Standard deviation of loss, 588, 593
Standard deviation of return, 605, 606
Standard Initial Margin Model (SIMM), 318, 339, 407–408
Standardized approach:
credit risk, 360–361
exposure at default, 391
Fundamental Review of the Trading Book, 318, 417–421
operational risk, 369–370, 391, 519, 525–527
solvency capital requirement, 371–372
total capital requirement, 390–391
Standardized measurement approach, 525–527
Standard products, 575–576
State Farm, 76
Static options replication, 178, 180
Statistical quality test, 372
Stock market crash of 1987, 556, 557, 650
Stock picking, 89
Stop-loss rules, 556
Strategic risk management, 616–617
Stressed ES, 299
Stressed VaR, 299, 378–379
Stress tests/testing, 354, 370, 497–511, 553, 646–647, 650
conditional, 500–501
regulation and, 504–507
results from, 507–511
reverse, 501–502
Strike price, 110
Strips, 573, 663–664
Structured products, 118
Stuart, A., 299
Student's t-copula, 256–257
Stumpf, John, 608
Subadditivity, 275
Subjective probability, 510–511
Subprime crisis (2007), 2, 17, 43, 560, 645, 651
Subprime mortgages, 128–130, 134–136, 141, 539, 560, 645, 649, 651
Suñi, A., 129
Sunk costs bias, 616
Suo, W., 581
Supervised learning, 622, 623
Supervisory review, 360, 370, 504, 506
Supplementary capital, 353
Surplus premium, 49
Survivor bonds, 57
SwapClear, 402
Swap execution facilities (SEFs), 38, 393, 394, 405
Swap options (swaptions), 113
Swap rates, 110, 189–191, 204–205
Swaps, 109–110, 120, 122, 443–444, 669–671. See also Credit default swaps (CDSs)
Index

Swing options, 117
Swiss Re, 62
Switzerland, 389, 390
SyndicateRoom, 631
Synthetic collateralized debt obligations (CDOs), 697–699
System failures, 518
Systemically important financial institutions (SIFIs), 388–389, 393, 394
Systematic risk, 3, 9, 13, 17–18, 450–451
Systemic risk, 349, 392, 394, 404, 405, 412
Tail dependence, 256–257, 263
Tail loss. See Expected shortfall
Take-and-pay options, 117
Taleb, N., 616, 653
TARP. See Troubled Asset Relief Program (TARP)
Tax:
  annuity contracts and, 51–52
  hedge funds and, 84
  life insurance and, 50
  mutual funds and, 77
  pension plans and, 67
Tax loss harvesting, 633
Taylor series expansions, 175–177, 333, 681–683
Technical analysis, 92–93
Technological advances, 622–625
Technological change, 621, 638, 639, 640
Temporary life insurance, 48
Term life insurance, 48
Term structure of interest rates, 185
Theta, 173–174, 674, 679
Threshold, 400
Tier 1 equity capital, 30, 353, 358, 366, 372, 382–383, 389
Tier 2 capital, 30, 353, 358, 372, 382–383
Tier 3 capital, 358, 372, 382
Time decay, 173
Time horizon, 278, 279–280, 285, 293–294, 479–480
TLAC. See Total loss-absorbing capacity
“Too big to fail,” 326, 388, 412
Total expense ratio, 78
Total loss-absorbing capacity (TLAC), 389
Tourre, Fabrice, 613
Tracking error, 78
Trading:
  liquidity risk, 537–562
  unwinding position optimally, 543–545, 561
  banking book vs., 425–426
  credit-sensitive products in, 488–490
  Fundamental Review of the Trading Book, 415–426
  liquidating positions, 548
  marking to market and, 580
  Trading patterns, 574–575
  Trading rooms, 647–649
  Trading rules, 93
  Trading volume per day, 545
  Tranche spread, 697
  Transaction costs, 168, 169
  Translation invariance, 275
  Transparency, 138, 140, 370, 393, 540, 651
  Travel business, 621
  Travelocity, 621
Treadway Commission, 603
Treasury bonds, 546
Treasury departments, 652–653
Treasury rates, 188–189, 191, 663
Treasury zero rates, 663–664
Triangular distributions, 253
Troubled Asset Relief Program (TARP), 296, 395–396
Trust services, 39
Tversky, A., 614–615
Type I errors, 433
Type II errors, 433
UBS, 1, 2, 138, 394, 643, 645
Uncertainty, 653
Uncleared trades, 406
Unconditional default probability, 434
Unconditional distributions, 252
Unexpected losses, 586, 589
Unilever, 591
United Kingdom, 396, 410, 411, 506, 635–636
  health care in, 60
  legislation in, 394, 395
United States, 506
  bank regulation in, 392–394
  banks in, 26–28
  credit crisis of 2007 in, 127–142
  health care in, 60–61
  housing market, 128–131, 141, 192, 500
  insurance regulations in, 64–66
  mortgage market, 41–42
Unit-linked endowment, 51
Unit trusts, 75. See also Mutual funds
Universal life insurance, 50
Unknown risks, 653–654
Unknownable risks, 653–654
Unsupervised learning, 622, 623
Unsystematic risk, 14
Upstart, 630
Uptick rule, 101
USD/GBP exchange rate, 103
U.S. dollar, 119, 188
Use test, 372

Validation, model, 568–571
Valuation, 145, 156
   credit default swaps, 693–695
   forward contracts, 667–698
   futures contracts, 667–698
   options, 673–679
   risk-neutral, 147–152, 156–157, 449–451
   swaps, 669–671
   synthetic CDOs, 697–699
Value at risk (VaR), 269–274, 357–358, 363–364, 604
   accuracy of, 299–301
   aggregating, 285
   back-testing, 285–288
   choice of parameters for, 278–283
   coherent risk measures and, 274–277
   component, 283–284, 289
   conditional, 274
   credit, 479–492
   definition of, 271
   drawback of, 273–274
   historical perspective on, 270
   historical simulation for, 293–313, 324, 332, 357
   incremental, 283, 289
   liquidity-adjusted, 543
   marginal, 283–284, 289
   model-building approach to, 317–340, 568, 570
   stressed, 299, 378–379
Vanguard, 632
Vanguard 500 Index Fund, 78
VaR. See Value at risk
Variable life insurance, 50
Variable-universal life insurance, 50
Variance-covariance approach, 317. See also
   Model-building approach
   Variance-covariance matrix, 205–206, 249–250, 264, 317, 322–324, 325
   Variance rate, 215, 222, 235–236, 239
   Variance targeting, 233
   Variation margin, 400–401, 402, 406, 412–413
   Vasicek’s model, 258–263, 482–483, 486
   Vega, 171–173, 178, 181, 207–208, 674
   Vega hedging, 577
   Vendor models, 571–572
   Vickers, John, 394
   VIX index, 215–217
   Volatility, 146–147, 155, 171–172, 213–239, 318
   causes of, 216
daily percentage changes, 218, 226–227
definition of, 213–215
   EWMA model, 225–227, 230–234, 239
   forecasting future, 235–237
   GARCH(1,1) model, 227–229
   impact of changes in, 238–239
   implied, 215–217, 575–576, 577, 581
   of market variables, 303–304
   maximum likelihood methods, 230–234, 239
   monitoring daily, 222–224
   power law, 220–222, 239
term structure, 237–238
   variance rate and, 215, 239
   Volatility scaling, 303–305
   Volatility surfaces, 575–577, 580
   Volcker rule, 97, 393, 395

Waterfall, 132–133
WCDR. See Worst case default rate
Wealthfront, 632
Wealth management, 632–633
Weather derivatives, 114–115
Weatherstone, Dennis, 270
Weighted Monte Carlo simulation, 579–580
Weighted sensitivities, 332
Weighting schemes, 224–225
Wells Fargo, 607–609, 639
West Texas Intermediate (WTI) crude oil, 115
White, A., 156, 303
Whitelaw, R., 301
Whole life insurance, 48–50
Wholesale banking, 25
Wholesale deposits, 548–549
Winkler, R., 500
Wishful thinking, 614
Within-model hedging, 577–578
With-profits endowment life insurance, 51
Workplace safety, 518
World Economic Forum, 624
<table>
<thead>
<tr>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worst-case default rate (WCDR), 364–365, 482</td>
</tr>
<tr>
<td>Worst-case scenarios, 604, 617</td>
</tr>
<tr>
<td>Writing an option, 112</td>
</tr>
<tr>
<td>Wrong-way risk, 468–469, 592</td>
</tr>
<tr>
<td>Yield curve, 185, 190, 193, 198, 199</td>
</tr>
<tr>
<td>nonparallel shifts, 200–204</td>
</tr>
<tr>
<td>rotation of, 202–203</td>
</tr>
<tr>
<td>Yield curve play, 662</td>
</tr>
<tr>
<td>Young, Peter, 592</td>
</tr>
<tr>
<td>Zero-coupon bonds, 194, 203, 326, 573,</td>
</tr>
<tr>
<td>663–664</td>
</tr>
<tr>
<td>Zero-coupon interest rates, 185, 208, 661–662</td>
</tr>
<tr>
<td>Zero-coupon yield curve, 190, 198–199, 200, 201, 208</td>
</tr>
<tr>
<td>Zero curve, 201, 203, 204, 207–208, 661–664</td>
</tr>
<tr>
<td>Zero rates, 661–662, 663–665</td>
</tr>
<tr>
<td>Zhu, Y., 409</td>
</tr>
<tr>
<td>Zimmerman, T., 129</td>
</tr>
<tr>
<td>Z-score, 432–433</td>
</tr>
</tbody>
</table>