

Index

Symbols

- $A_K(t)$, 11, 12
 \tilde{A}_T^j , 285
 A_T^{prac} , 285
 $a(t)$, 11, 12
 $a_{\overline{n}|}$, 115, 161
 $a_{\overline{n}|}$, 115
 $a_{\overline{n}| \& j}$, 232
 $a_{\overline{n}|}^{(m)}$, 192
 $a_{\infty|}$, 132
 $\ddot{a}_{\overline{n}|}$, 128, 164
 $\ddot{a}_{\overline{n}|}^{(m)}$, 194
 $\ddot{a}_{\infty|}$, 132
 $\bar{a}_{\overline{n}|}$, 208
 $\bar{a}_{\overline{n}|}$, 206
 B_t , 236, 266, 322
 C , 257
 $C(i, m)$, 432
 $C(i, \infty)$, 432
 \mathcal{C}_T , 279
 $\tilde{\mathcal{C}}_T^j$, 286
 $\mathcal{C}_T^{\text{prac}}$, 278
 $\tilde{\mathcal{C}}_T^j$, semiprac, 286
 c_t , 374
 $D(i, m)$, 421
 $D(i, \infty)$, 422
 $(Da)_{\overline{n}|}$, 151
 $(D\ddot{a})_{\overline{n}|}$, 153
 $(D\dot{s})_{\overline{n}|}$, 153
 $(Ds)_{\overline{n}|}$, 151
 \mathcal{D}_T , 276
 $\tilde{\mathcal{D}}_T^j$, 283
 $\mathcal{D}_T^{\text{prac}}$, 278
 d , 42, 43
 $d^{(m)}$, 48, 49
 d , 43
 d_n , 27, 29
 $d_{[t_1, t_2]}$, 26–28
 $E_h(i_0, 1)$, 447
 E_t , 322
 F , 257
 $f_{[t, s]}$, 349
 G , 257
 g , 257
 I , 257
 I_t , 266
 $(Ia)_{\overline{n}|}$, 151
 $(Ia)_{\overline{n}|}^{(m)}$, 204
 $(Ia)_{\infty|}^{(m)}$, 204
 $(I^{(m)}a)_{\overline{n}|}^{(m)}$, 201
 $(I^{(m)}a)_{\infty|}^{(m)}$, 202
 $(I\ddot{a})_{\infty|}$, 153
 $(\bar{I}\bar{a})_{\overline{n}|}$, 210
 $(\bar{I}\bar{a})_{\overline{n}|}$, 207
 $(IP, Qa)_{\overline{n}|}$, 149, 153
 $(IP, Qa)_{\infty|}$, 153
 $(IP, Q\ddot{a})_{\overline{n}|}$, 152
 $(IP, Q\ddot{a})_{\infty|}$, 154
 $(Is)_{\overline{n}|}$, 150
 $(Is)_{\overline{n}|}^{(m)}$, 204
 $(I^{(m)}s)_{\overline{n}|}^{(m)}$, 201
 $(I\dot{s})_{\overline{n}|}$, 153
 $(\bar{I}\bar{s})_{\overline{n}|}$, 207
 $(IP, Q\dot{s})_{\overline{n}|}$, 149
 $(IP, Q\dot{s})_{\overline{n}|}$, 152
 \mathcal{I}_T , 289
 i , 20, 41
 $i^{(m)}$, 46
 i_n , 14, 15, 29
 $i_{[t_1, t_2]}$, 14, 28
 j , 257
 \tilde{j} , 283
 K , 258, 374
 m , 257

488 Index

- $m_h(i_0)$, 446
- m_t , 322
- N , 257
- n , 257
- P , 258
- p^* , 388
- $P(i)$, 414, 417
- $PV_{a(t)}$, 31
- P_t , 267, 322
- \mathcal{P}_T , 290
- p_t , 374
- $p(t)$, 61
- $PV_{a(t)}$, 31
- r , 257
- r_t , 344
- $r_{[t_1, t_2]}$, 61
- S_t , 373
- $s_{\overline{n}|}$, 116, 164
- $s_{\overline{n}|i}$, 116
- $s_{\overline{n}|}^{(m)}$, 192
- $\ddot{s}_{\overline{n}|}$, 128, 164
- $\ddot{s}_{\overline{n}|}^{(m)}$, 194
- $\overline{s}_{\overline{n}|}$, 209
- $\overline{s}_{\overline{n}|i}$, 206
- V_d , 375
- V_u , 375
- v , 31, 43
- $v(t)$, 29
- α , 257
- δ , 54, 55, 60
- δ_t , 58
- \in , 59
- $|t|$, 23
- $(x)_+$, 378

- A**
- accumulation function, 11–12, 14
 - compound discount, 44
 - compound interest, 13, 21
 - from force of interest, 59–60
 - linear, *see* simple interest
 - simple discount, 40
- actual/actual, 17, 286
- actual/360, 18, 396
- algorithm
 - finding loan payment amounts, 118
 - BA II Plus instruction, 124
- amortization
 - bond, 256, 266–275
 - compared with sinking fund method, 231–235
- amortization schedule, 221–224, 227–228, 235
 - bond, 270
 - writing down, 274–275
 - writing up, 275
- Amortization worksheet**, 142–144, 224–225, 227, 271, 273
- amortized loan, 220–229
 - level payments, 222–229
 - payments in arithmetic progression, 236–237
 - payments in geometric progression, 239
- amount function, 11–13
 - simple discount, 40
 - simple interest, 12–13
- annual effective discount rate, 42
- annual effective interest, 13, 17
- annual effective yield, 47
- annual percentage yield, 47
- annuity, 112–212
 - arithmetic progression
 - BA II Plus instruction, 155
 - frequent payments, 201–205
 - infrequent payments, 198–200
 - arithmetic progression, 149–155
 - certain, 113
 - contingent, 113
 - continuously paying, 187, 205–210
 - constant rate, 206–207, 209–210
 - level payments, 279–280
 - rate $f(t)$, 209–210
 - rate t , 207–208, 210
 - deferred, 134–136
 - definition, 112–113
 - general accumulation function, 114–115, 164–168
 - geometric progression, 146–149
 - level

- frequent payments, 191–198
 - infrequent payments, 187–191
 - life, 113
 - nonlevel, 113, 144–146
 - value on any date, 133–138
- annuity symbols, 113
 - comparing, 129, 196–197, 207
 - nonintegral term, 161–164
- annuity-due, 113, 128–131
 - basic, 128
 - accumulated value, 128–130
 - present value, 128–130
- annuity-immediate, 113–127
 - basic, 114
 - accumulated value, 116
 - present value, 115
- AOS**, 2
- approximate dollar-weighted yield rate, 95–100
- APR, 46
- APY, 47
- arbitrage, 338–342, 444
- Arbitrage Theorem, 392
- arbitrageur, 340
- asset management, 444
- asset matching, 413
- asset-liability management, 415
- asset-liability matching, 415–416
- assets, 415
- average date for contributions, 100
- B**
- BA II Plus calculator, 1–7
 - worksheets**, *see by name*: **Amortization, Bond, Cash Flow, Date, Interest Conversion, Memory, TVM**
 - calculation methods, 2
 - algebraic operating method, 2
 - chain method, 2
 - convention for secondary functions, 3
 - default setting, 2–3
 - formatting, 3–5
 - inverse function, 4
 - rounding, 4–5
 - storing results, 5–6
 - worksheets, 6–7
- BA II Plus Professional, 1, 123, 303
- BA-35 calculator, 1
- balloon payment, 162–164
- Banker’s rule, 18–19
- base amount formula, 265–266
- basic price formula, 258
- basis, 365
- basis point, 420
- bear, 326
- biannually, 48
- biennially, 48
- binomial option pricing model
 - by weighted averages, 387–394
 - Method (8.10.6), 389
 - one period, 390
 - two periods of equal length, 392–394
 - two periods of unequal length, 390–391
 - with replicating portfolios, 375–383
 - Important Fact (8.9.3), 377
- bond, 255–308, 316
 - discount, *see* bond, zero-coupon
 - accrued adjustment to principal, 290
 - accrued coupon, 289–292
 - alphabet soup, 256
 - table, 259
 - base amount, 257–258, 265
 - book value, 266, 273, 276
 - recursion formula, 270
 - callable, 255, 296–300, 417, 446
 - American option, 297
 - Bermuda option, 297
 - European option, 297
 - convexity, 435–437
 - corporate, 286
 - coupon, 256
 - coupon period, 256
 - coupon rate, 257
 - varying, 261
 - discount, 263–264, 267, 268, 288–289, 297–299, 426–427
 - accumulation of, 272–273
 - amount for accumulation of,

490 Index

- 269
- duration, 424–427
- face value, 257
- floating-rate, 301–302
- government, 286
- indenture, 256
- issue date, 255
- laddered portfolio, 293–295
- maturity date, 255
- modified coupon rate, 257
- municipal, 286
- noncallable, 255
- par, 257
- par-value, 257
 - duration, 425–426
- premium, 263–264, 268, 279, 288–289, 299–300, 427
 - amortization of, 271–272
 - amount for amortization of, 268–269
- price after issue, 283–292
 - accrued interest by the practical method, 285–288
 - accrued interest by the theoretical method, 284–285, 287–288
 - cum dividend, 283
 - ex dividend, 283
 - flat price, 284
 - full price, 284
 - invoice price, 284
 - semipractical clean, 286
 - table of prices and adjustments to price, 287
 - theoretical clean, 286
 - theoretical dirty, 284, 287–288
 - transaction costs, 284
- principal
 - amount for adjustment to, 267–269
- pure discount, *see* bond, zero-coupon
- putable, 300, 417
- redemption amount, 257, 260
 - call premium, 296–297
- redemption date, 255
- resale, 256
- term, 255
- value
 - practical clean, 278–279
 - practical dirty, 278–279
 - table of clean and dirty, 282
 - theoretical clean, 279–281
 - theoretical dirty, 276–277
- valuing, 276–283
- writing down, 268
- writing up, 269
- yield
 - floating-rate, 301–302
 - yield rate, 257, 259–260
 - resale, 284
 - zero-coupon, 255
 - convexity, 431–433
 - duration, 424
- Bond worksheet**, 286, 302–307
- bootstrapping, 346–349
- broker, 320
- brokerage account
 - cash, 320
 - futures trader, 359
 - margin, 320–322, 327–328
 - restricted, 323
 - short position, 329–330
 - undermargined, 323, 329
 - margin account
 - broker call rate, 328
- brokerage statement, 319
- bullish, 326
- C**
- calculators, 1
- call date, 296
- capital gain, 290, 316, 317
- Cash Flow worksheet**, 34–39, 123, 126–127, 137–138, 145–146, 157–158, 161, 212, 291, 294, 307
 - deleting a cashflow, 39
 - inserting a cashflow, 39
- IRR subworksheet**, 81, 82, 85, 90, 94, 99, 100, 108, 123, 127, 138, 157, 158, 161, 212, 243, 291, 294, 301, 307
- NPV subworksheet**, 34, 36–38, 123, 126, 419
- cash price, *see* spot price

- cash settled future contract, 367–368
- CD, *see* certificate of deposit
- certificate of deposit, 25
- Chicago Board of Trade (CBOT), 356
- Chicago Board Option Exchange (CBOE), 370, 371
- Chicago Mercantile Exchange (CME), 367
- Chn**, 2
- clearing association, *see* clearinghouse
- clearing organization, *see* clearinghouse
- clearinghouse, 356–357, 363
- closed-end fund, 319
- closing a position, 363
- commissions, 320, 328, 333, 372, 380
- Commodity Futures Trading Commission (CFTC), 358
- common stock, 316
- competitive advantage (interest rates), 395
- compound discount, 41–46
- compound interest, 25
 - comparison with simple interest, 22
 - introduction to, 20–25
 - varying rates, 24–25
- compound interest accumulation function, 21
- compounded, 46
- concavity and convex sets, 430
- Consumer Price Index, 61
- continuous compounding, 56, 60
- convertible, 46
- convertible continuously, 55
- convexity, 415, 430–437
 - effective, 448, 453
 - Macaulay, 432–437
 - portfolio, 436–437
 - weighted average, 433
 - modified, 430–433
- counting days, 17
 - Date worksheet**, 19–20
- covering a position, *see* closing a position
- D**
- Date worksheet**, 19–20, 303
- dealer, 320
- debit balance, 321
- dedicated portfolio, 413
- dedication, 415–416
- default, 11, *see* risk, credit
- delta portfolio allocation, 387
- derivative, 338–339, 353
- designated contract market, 356
- discount, 25–29
 - amount of, 26
 - forward, 354
- discount curve, 353
- discount factor, 31
- discount function, 29
 - linear, *see* simple discount
- discount rate, 26
 - compound interest, 29
 - effective, 26–29, 42
 - nominal, 48–56
- dispersion, 434–435
- dividend, 316–317
 - reinvestment options, 327
 - short sale, 329–332
- dividend discount model, 318
- dollar-weighted yield rate, 87
- Dow Jones Industrial Average
 - Dow divisor, 318
- Dow Jones Industrial Average (DJIA), 318–319
- drop payment, 162
- duration, 414, 416–430, 433–435, 447–448
 - effective, 447–448
 - keyrate, 449
 - Macaulay, 414–415, 422–430, 433–435
 - portfolio, 428–430
 - weighted average, 423
 - modified, 414, 421–422, 424, 426
 - partial, 449
- dynamic portfolio allocation, 384–387
- E**
- effective discount rate, 26–29, 42
- effective interest rate, 14–15
- equation of value
 - multiple deposits, 79–87
 - single deposit, 77–79
- equity, 316, 322

492 Index

- equivalent rates, 27–28, 42–44, 46–54
- eurodollar, 367–368
- eurodollar future, 368
- exact simple interest, 17–18
- exchange
 - futures, 355–356
 - options, 369, 370
 - stock, 318
 - American Exchange (AMEX), 318
 - New York Stock Exchange (NYSE), 318
- exchange rate, 398–399
- exchange rates, 341, 367
- exercise price, *see* strike price
- expectations theory
 - biased, 343
 - pure, 342–343
- F**
- Federal Deposit Insurance Corporation (FDIC), 11, 319
- Federal Funds Rate, 24
- Federal Reserve Board (FRB), 320
- fiscal policy, 24
- Fischer, Irving, 342
- floor function, 23
- font convention, 2
- force of interest, 10, 57–61
 - compound interest, 57–58
 - constant, 54–56, 60–61
 - from accumulation function, 57–59
 - inflation-adjusted, 74
 - simple discount, 58
 - simple interest, 58
- foreign exchange rate (FX rate), *see* exchange rate
- forward contract, 339, 353–355
 - history, 355
- forward curve, 349–351
- forward price, 354–355
- forward rate, 349–353
 - basis swap, 395
 - market, 349, 351
 - speculating, 352–353
- fractional price change, *see* relative price change
- fund performance, 100–101
- future rate, 349
- futures, 339, 355–369
 - cashflows, 359
 - event, 369
 - gold, 357
 - hard red wheat, 356–357
 - interest rate, 368
 - liquidity, 365
 - physical delivery, 365
 - stock, 368
 - weather, 368
- futures contract
 - buy, *see* long position, future
 - sell, *see* short position, future
- futures price, 358
- G**
- geometric series
 - sum, 115, 132, 146–147, 261, 262
- GIC, *see* guaranteed investment contract
- greatest integer function, 23
- guaranteed investment contract, 292
- guess and check, 82–84, 90, 127, 137, 156–158, 160, 293
- H**
- hedging, 334, 336, 356, 369–371
 - cross, 366
 - dynamic, 384–387
 - using forward contract, 355
 - using futures contract, 365–366
 - using swap, 395–398
- Hicks, J.R., 343
- Hunter, Catfish, 176–177
- I**
- imaginary payments, 81, 135–137, 188, 189, 279
- immunization, 413–414, 437–445
 - full, 415, 442–443
 - Fact (9.4.6), 442
 - Redington, 415, 438–442
- implied forward rate, *see* forward rate
- in street name, 319
- index fund, 319

inflation, 61–64
 indexed bond, 261
 inflation rate, 61
 interest, 10
 amount of, 14, 26
 definition, 10
 justification for, 10–11
 interest component, 221
Interest Conversion worksheet, 6,
 50–54
 interest in advance, 25
 see discount, 1
 interest rate
 effective, 14–15
 inflation adjusted, 62
 nominal, 46–56
 real, 62
 interest-sensitive cashflows, 446
 internal rate of return, *see* yield rate
 investment opportunities theory, 10
 investment year method, 114, 168–171

K

Kansas City Board of Trade (KCBT),
 356–357
 KCBT Clearing Corporation, 357

L

law of one price, 338–340, 374–375
 leap years, 17
 leverage, 328, 356, 366, 372
 liabilities, 415
 limited order, 364
 liquidity preference theory, 343
 lockout provision, 296
 London interbank offer rate (LIBOR),
 396
 long position
 forward contract, 353
 option, 370
 stocks, 326–329

M

Macaulay, Frederick, 414
 Makeham’s formula, 265–266
 Makeham, William Matthew, 265
 margin, 322–323

 futures trader, 359
 margin call, 322
 avoiding, 323–324
 future contract, 360
 responding to, 324–325
 margin requirement
 initial, 320–322
 maintenance, 321–322
 market segmentation theory, 343
 market-weighted index, 319
 marking-to-market, 359–362
 with offsetting positions, 364–365
 mathematical induction, 20
Memory worksheet, 6
 method of equated time, 85–87, 423
 Modigliani, Franco, 343
 monetary policy, 24
 mortgage, 113, 140, 172, 221, 225–227,
 296, 446
 duration, 427–428
 Mortimer, Thomas, 326
 mutual fund, 319–320

N

n-th time period, 14
 NASDAQ, 318
 bid rule on short sale, 333
 Nasdaq, 318–319
 National Association of Security Deal-
 ers (NASD), 318
 National Futures Association (NFA),
 358
 net balance on sinking fund loan, 231
 net contributions, 96
 net interest payment, 235
 net present value, 32–34, 418–419
 netted payments (for swap), 394, 397
 new money rate, 168
 Newton’s method, 83–84, 91, 156, 158,
 160–161
 no-arbitrage model, 340, 345–346, 372,
 374–375
 forward price, 354–355
 nominal, 46, 64
 nominal discount rate, *see* discount
 rate, nominal

494 Index

nominal interest rate, *see* interest rate,
 nominal
 nonnegative part function, 378
 notional principal
 currency swap, 399
 interest-rate swap, 395, 398
 NPV, *see* net present value

O

offsetting position, 362–363, 365–366,
 369, 370, 372
 option, 339, 369–394
 American, 369, 373
 assignment of writer to holder,
 370
 Bermuda, 369
 call, 339, 369–370, 377–379
 speculating, 371–372
 capped style, 370
 commodity, 371
 European, 369, 373–394
 exercise, 370
 intrinsic value, 372–373
 listed, 370
 price, 339
 pricing, 374–383, 387–394
 American vs European, 373
 put, 339, 369–370
 hedging, 370–371
 replicating portfolio, 374–387
 stock, 371–372
 time premium, 372–373
 option buyer, *see* option holder
 Option Clearing Corporation (OCC),
 370
 option holder, 369–370
 option price, 369
 option seller, *see* option writer
 option writer, 370, 372
 ordinary simple interest, 18
 outstanding loan balance, 138–144, 221,
 224
 Amortization worksheet, 225,
 227
 bond balance of debt, 266
 following missed payments, 141

 prospective method, 138–139, 141–142,
 222
 retrospective method, 138–140,
 142, 164
 over the counter (OTC), 318

P

payable, 46
 payment period, 112–113
 perpetuity, 113, 131–133
 arithmetic progression, 153–154
 definition, 131
 geometric progression, 148–149
 level
 frequent payments, 197–198
 infrequent payments, 191
 portfolio rate, 168
 portfolio yield method, 171
 preferred habitat theory, 343
 preferred stock, 316–318
 adjustable, 317
 callable, 317
 cumulative, 317
 participating, 317
 premium
 call, 296–297
 forward, 354
 liquidity, 343
 option, *see* option price
 risk, 343
 term, 343
 premium-discount formula, 256, 262–264
 present value, 31–32
 price curve, 414, 417
 price discovery, 368–369
 price function, 417–418
 nondifferentiable, 446
 second-Taylor-polynomial approx-
 imation, 418–420
 tangent-line approximation, 418–419
 prime rate, 24
 principal, 11, 140, 220, 221
 level payments of, 236–237
 probability, 388–389
 probability theory, 374
 put-call party, 374

R

reinvestment
 replacement of capital, 239–247
 yield rate by intuitive method,
 240–241, 243–247
 yield rates, 239–243, 245–247
 yield rate, 94–95, 157–159, 296
relative price change, 420–421
replacement of capital, 239–247
replicate, 375
replicating portfolio
 in lieu of option purchase, *see* dy-
 namic portfolio allocation
risk
 credit, 353, 357–358, 360, 363, 394
 currency swap, 400
 interest-rate swap, 398
 option writer, 372
 reinvestment, 412–413, 423
 stock market, 326
 Trowbridge classification, 449
 C3, 438
risk-neutral probability, 388–389
rule of seventy-two, 78

S

sans serif, 2
securities, 318
Securities and Exchange Commission
 (SEC), 318, 320, 358, 370
Securities Investor Protection Corpo-
 ration (SDIC), 319
select rate, 168–171
self-financing, 387
semiannually, 48
settlement price, 359–360
short position
 forward contract, 353
 option, 370
 stocks, 329–334
short sale, *see* short position, stock
short squeeze, 333
simple discount, 39–41, 58, 60
simple interest, 15–19, 23, 58, 167–168
 accumulated value of an annuity,
 167–168

 approximation to compound in-
 terest, 96
 comparison with compound inter-
 est, 22
 exact, 17–18
 for fractional periods, 22–23, 282,
 304
 ordinary, 18
sinking fund account, 220, 229, 245–247,
 292–293
sinking fund method, 229–236
 compared with amortization, 231–235
sinking fund schedule, 230–233
slippage, 364
SOA/CAS examinations, x, xiii, 1
special memorandum account (SMA),
 325–326
speculating, 356, 369, 371–372
 forward contract, 355
 futures, 356
spot price, 354, 358
spot rate, 338, 344–349
Standard and Poor’s 500 (S&P500),
 318–319
static position, 387
stock certificate, 319
strike price, 369
surplus, 437–438
Sutch, Richard, 343
swap, 339, 394–401
 commodity, 400
 currency, 398–400
 equity
 total return, 400–401
 interest-rate, 395–398
 basis, 395
 pure vanilla, 395
swap dealer, 395

T

tax considerations, 221, 235, 267, 284,
 292, 398
term structure of interest rates, 338,
 342–353, 416
theoretical clean price, 286
theoretical forward rate
 implied, *see* forward rate

496 Index

- 30/360, 18, 282, 286
- tick, 357
- tiered investment account, 12, 23–24
- time preference theory, 10
- time value of money, 29
- time-weighted yield rate, 100–103
- timeline
 - simple example, 82, 86
 - with values of annuity symbols, 116, 128, 134, 149, 152, 193, 195, 201, 203
- Treasury securities, 11, 24, 255, 276, 301, 317, 327, 330, 333, 343–345, 361, 449
 - as underliers, 367
 - STRIPS, 345
 - yield curve, 344
- tree (for binomial pricing model), 376
 - one period, 376
 - two period, 379
 - with subtrees, 380–383
- TVM worksheet**, 6, 120–127, 130–131, 157–158, 194, 196, 260, 271, 273
 - Begin mode, 130
 - conversions per year C/Y , 121–122
 - END mode, 121
 - future value **FV**, 121
 - interest rate **I/Y**, 121–122
 - number of payments **N**, 122–123
 - payment **PMT**, 121
 - payments per year period P/Y , 121–122
 - present value **PV**, 121
- U**
 - ultimate rate, 168–171
 - underlier, 339, 353, 356, 358, 375
 - unit investment trust, 319
 - units of time, 11, 95
 - uptick rule, 333
- V**
 - variation margin, 360
- varying interest rates, 25, 47, 141–142, 244–245
- volatility, 423
- W**
 - working with stored values, 34
- Y**
 - yield curve, 343–344, 413
 - flat, 344, 416
 - humped, 344
 - inverted, 344, 349
 - normal, 344, 349
 - parallel shift, 417
 - yield rate, 87–95
 - bottom line approach, 92
 - examples with annuities, 156–161, 210–212
 - examples with bonds, 292–296
 - futures contract, 362
 - multiple, 89–91
 - no yield rate, 88
 - short sale, 331–332
 - time-weighted, 100–103
 - undefined yield rate, 89
 - unique, 88, 92–93
 - with reinvestment, 94–95