Author Index

A
Ahmed, 160
Aiyagari, 246
Almgren, 216
Andersson, 160
Avellaneda, 118

B
Barrieu, 63
Basar, 167
Bellman, 67, 82
Benachour, 118
Bensoussan, 118, 160, 216, 251
Bertsekas, 160
Bertsimas, 216
Bismut, 160
Buckdahn, 63
Burdzy, 117
Burkholder, 54

C
Cadenillas, 160
Caines, 245, 251
Cardaliaguet, 118
Carlin, 216
Carmona, 26, 118, 161, 216, 217, 251
Carrillo, 118
Cathiaux, 118
Chau, 251
Chriss, 216
Crisan, 63
Cucker, 244
Cvitanic, 118

D
Davis, 54, 98, 118
Delarue, 26, 57, 118, 161, 251
Dellacherie, 121
Ding, 160
Djehiche, 63, 160
Dos Reis, 63

E
Eisele, 216
El Karouli, 63, 117, 160

F
Fenchel, 91
Fleming, 117, 118
Fouque, 216
Frehse, 118, 160
Friedman, 216

G
Girsanov, 119
Grongwall, 6
Guillin, 118
Gundy, 54

H
Hamadene, 63, 117, 160, 216
Hamilton, 82
Huang, 251

I
Imkeller, 63
Isaacs, 119, 138, 216

J
Jacobi, 82
Jourdain, 26

K
Kabanov, 118
Kang, 117
Kapoudjian, 63
Karatzas, 160
Kobyanskii, 34, 63
Kushner, 160

L
Lachapelle, 251
Lacker, 251
Lasry, 118, 250
Legendre, 91
Lepeletier, 34
Li, 63, 118, 161
Lions, 118, 143, 250
Lo, 216
Lobo, 216
Lukes, 216
Lyons, 118

M
Mélandé, 26
Ma, 63
Malhamé, 245, 251
Malliavin, 45
Malrieu, 118
Manolarakis, 63
Markowitz, 92, 118, 154
Matoussi, 63
McCann, 118
McKean, 26
Merton, 90
Meyer–Brandis, 161

N
Nagai, 160
Nash, 167, 169
Neveu, 121
Nisio, 160
Norman, 98, 118
Nourian, 245, 251

O
Øksendal, 160

P
Paras, 118
Pardoux, 29, 63
Pareto, 169
Peng, 29, 63, 160, 216
Pham, 63, 118
Pontryagin, 119, 125, 130, 187
<table>
<thead>
<tr>
<th>Author</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quenez</td>
<td>63, 160</td>
</tr>
<tr>
<td>Ramanan</td>
<td>117</td>
</tr>
<tr>
<td>Riccati</td>
<td>48</td>
</tr>
<tr>
<td>Roynette</td>
<td>118</td>
</tr>
<tr>
<td>Russel</td>
<td>216</td>
</tr>
<tr>
<td>Răşcanu</td>
<td>63</td>
</tr>
<tr>
<td>Safarian</td>
<td>118</td>
</tr>
<tr>
<td>San Martin</td>
<td>34</td>
</tr>
<tr>
<td>Schied</td>
<td>216, 217</td>
</tr>
<tr>
<td>Schweizer</td>
<td>63</td>
</tr>
<tr>
<td>Schöneborn</td>
<td>217</td>
</tr>
<tr>
<td>Shreve</td>
<td>100, 118</td>
</tr>
<tr>
<td>Skorohod</td>
<td>116</td>
</tr>
<tr>
<td>Smale</td>
<td>244</td>
</tr>
<tr>
<td>Soner</td>
<td>100, 117, 118</td>
</tr>
<tr>
<td>Sun</td>
<td>216</td>
</tr>
<tr>
<td>Sung</td>
<td>251</td>
</tr>
<tr>
<td>Sznitman</td>
<td>26</td>
</tr>
<tr>
<td>Talay</td>
<td>118</td>
</tr>
<tr>
<td>Touzi</td>
<td>26, 63, 117, 118</td>
</tr>
<tr>
<td>Vallois</td>
<td>118</td>
</tr>
<tr>
<td>Villani</td>
<td>118</td>
</tr>
<tr>
<td>Viswanathan</td>
<td>216</td>
</tr>
<tr>
<td>Vlasov</td>
<td>26</td>
</tr>
<tr>
<td>Woyczynski</td>
<td>26</td>
</tr>
<tr>
<td>Wu</td>
<td>216</td>
</tr>
<tr>
<td>Yam</td>
<td>251</td>
</tr>
<tr>
<td>Yang</td>
<td>217</td>
</tr>
<tr>
<td>Yong</td>
<td>63, 160</td>
</tr>
<tr>
<td>Yung</td>
<td>251</td>
</tr>
<tr>
<td>Zhou</td>
<td>63, 118, 160, 161</td>
</tr>
<tr>
<td>Zhu</td>
<td>26, 251</td>
</tr>
</tbody>
</table>
Subject Index

A
abatement, 76
action, 68, 167
adjoint
  equation, 113, 119, 128
  process, 128, 187, 190
admissible
  action, 68, 167
  control, 68
  strategy, 68, 167
affine BSDE, 28
Aiyagari’s growth model, 246
American
  contingent claim, 39
  option, 67
ask price, 134
autonomous diffusion, 112

B
backward
  Euler scheme, 45
  stochastic differential equation, 27
banking, 75
barrier, 37
basis function, 45
best response map, 172
bid price, 134
borrowing, 75
BSDE
  affine, 28
  mean-field, 35
  quadratic, 34
  reflected, 37
Burkholder–Davis–Gundy
  Inequality, 54
business as usual, 76

closed loop, 68
  control, 72
  equilibrium, 170
    in feedback form, 170
  perfect state, 167
  coefficient, 27
  comparison principle, 103
  complete market model, 33
condition
  Isaacs, 184
  min-max, 184
conditional
  cost, 123
  value function, 123
constant relative risk aversion, 89
contingent claim, 33
  American, 39
continuation
  method, 49
  region, 110
control, 68
convertible bond, 40
cvx convex envelope, 80
cost
  conditional, 123
  functional, 69, 74, 168
  switching, 111
coupling, 16
covariable, 70, 173, 184
CRRA power utility, 98
CRRA utility function, 132
cubature, 45, 63
Cucker–Smale model, 244

d
de Finetti’s law of large numbers, 248
decoupled FBSDE, 42
decoupling field, 42, 55
deterministic equilibrium, 170
Dirac measure, 220
discount factor, 34
distributed strategies, 168
Doléans exponential, 33, 74
drift, 8
driver, 27
dual variable, 70, 173, 184
duality approach, 133
dynamic programming
  equation, 110
  principle, 67, 81
dynamics
  McKean–Vlasov, 35
Dynkin game, 40

E
efficient
  frontier, 92
  portfolio, 92
electricity production, 75
eïale, 101
eïïicity, 101
eïirical
  distribution, 220
  measure, 16
envelope
  lower semicontinuous, 102
  upper semicontinuous, 102
equilibrium
  closed loop, 170
    in feedback form, 170
  deterministic, 170
  Nash, 167
  open loop, 170
equivalent martingale measure, 33
ergodic theory, 112
control, 112
control problem, 118
essential
  infimum, 121
  supremum, 121
Euler scheme, 45
  backward, 45
<table>
<thead>
<tr>
<th>Subject</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>forward</td>
<td>45</td>
</tr>
<tr>
<td>European option</td>
<td>32</td>
</tr>
<tr>
<td>externality</td>
<td>78</td>
</tr>
<tr>
<td>F</td>
<td>FBSDE value function, 42, 55, 80, 139 feature function, 45 feedback form, 174 perfect state, 167 Fenchel–Legendre transform, 91, 98 Feynman–Kac formula, 9 fixed point, 172 flow, 6 Fokker–Planck equation, 10 form strong, 72 weak, 72 forward backward stochastic differential equations, 42 Euler scheme, 45</td>
</tr>
<tr>
<td>G</td>
<td>game Dynkin, 40 lower value, 177 of timing, 40 upper value, 177 value function, 177 zero-sum, 177 Gâteaux derivative, 125 generator, 8 Girsanov theorem, 119 Gronwall’s inequality, 6 growth model Aiyagari, 246</td>
</tr>
<tr>
<td>H</td>
<td>Hamilton–Jacobi–Bellman equation, 67, 82 Hamiltonian, 70, 172 reduced, 71, 173 hedging, 39 high water mark, 106 historical measure, 77 HJB equation, 67, 82, 119 stationary, 86 value function, 79, 80 hypoellipticity, 83</td>
</tr>
<tr>
<td>I</td>
<td>impulse region, 110 Inada condition, 76 independent copy, 35 infinite horizon, 85 initial endowment, 33 instantaneous cost, 69 inventory, 134 Isaacs condition, 138, 172, 173, 184 Itô obstacle, 38</td>
</tr>
<tr>
<td>J</td>
<td>Kolmogorov equation, 10</td>
</tr>
<tr>
<td>K</td>
<td>Lagrange multiplier, 212, 213 Lagrangian, 212, 213 duality, 140 law of large numbers de Finetti’s, 248 Legendre transform, 91 linear growth condition, 51 linear-quadratic, 179 FBSDE, 63 model, 136 stochastic games, 179 Lipschitz condition, 51 local time, 96 log utility function, 132 lower semicontinuous envelope, 102 value function, 177</td>
</tr>
<tr>
<td>M</td>
<td>major particle, 19 player, 247, 248 Malliavin calculus, 45 marginal distribution, 12 market model, 32 Markov Nash equilibrium, 174 property, 6 Markovian, 68 equilibrium, 170 strategy profile, 174 martingale representation theorem, 27 master equation, 244 matrix Riccati equation, 226 maximum principle, 119, 130 McKean–Vlasov dynamics, 35 mean-field, 219 interaction, 11 BSDE, 35 game, 26, 35, 172, 216 interaction, 13 of order 1, 13 of scalar type, 13 SDE, 26 mean-variance Markowitz criterion, 92, 154 optimization, 73 portfolio selection, 92, 154 memoryless perfect state, 167 Merton problem, 88 midprice, 134, 205 min-max condition, 184 minor particle, 19 player, 247, 248 model Cucker–Smale, 244 monotonicity assumption, 46 Nash certainty equivalence, 251 equilibrium, 167, 169 nondegeneracy condition, 55 nonintervention region, 95 nonlocal operator, 109</td>
</tr>
<tr>
<td>P</td>
<td>parabolicity, 101 Pareto</td>
</tr>
</tbody>
</table>
optimality, 169
weakly efficient, 169
partial differential equation, 42
particle
  approximation, 15
  major, 19
  minor, 19
payoff
  running, 39
  terminal, 39
permanent price impact, 205
player
  major, 248
  minor, 248
pollution permit, 75
Pontryagin maximum principle, 119, 130
portfolio, 33
  efficient, 92
  self-financing, 33
price impact, 134
  permanent, 205
  temporary, 205
private state, 224
probabilistic approach
to LQ control problems, 138
progressive $\sigma$-field, 19, 68
progressively measurable, 68
propagation of chaos, 15
propagator, 61
push-forward image, 14
Q
quadratic BSDE, 34
quasi-variational inequality, 44, 87, 109
R
reduced Hamiltonian, 71, 173, 184
reflected BSDE, 37
regime, 111
regular conditional distribution, 19
replicate, 33
representative agent, 93
Riccati equation, 48, 139
  for the decoupling field, 139
  for the value function, 139
risk
  appetite, 72
averse, 73
aversion, 72, 90
neutral, 205
premium, 33
seeking, 73
rough paths, 45, 63
running
cost, 69, 168
payoff, 39
S
saddle point, 177
Schauder fixed-point theorem, 235
scrap value, 39, 215
self-financing, 33
portfolio, 33
semi-linear
game, 181, 216
parabolic equation, 42
setup, 23
singular
control, 87
control problem, 87
measure, 87
Skorohod’s lemma, 116
small investor, 32
smooth fit condition, 112
Snell envelope, 109
solvency region, 97
spike perturbation, 161
standard space, 19
state price density, 34
stationary HJB equation, 86
stochastic
differential equation, 42
HJB equation, 123
maximum approach
to LQ control problems, 138
maximum principle, 125, 187
partial differential equation, 222
stochastic game
  linear-quadratic, 179
strategy, 68, 167
  profile, 166
strong
  form, 72
  solution, 74
sub-game perfect, 174
switching cost, 111
systemic risk, 198
T
temporary
  impact, 134
  price impact, 205
terminal
  condition, 27
  cost, 69, 168
  payoff, 39
transaction
  costs, 205
  price, 134
transform
Fenchel–Legendre, 91
U
uniform
ellipticity, 83
ellipticity condition, 55
upper
  semicontinuous envelope, 102
value function, 177
utility function, 88, 89, 132
V
value function, 55
  conditional, 123
FBSDE, 42
verification
  argument, 42
  theorem, 56, 123
viscosity
  solution, 43, 44, 102, 117, 177
  subsolution, 102, 177
  supersolution, 102, 177
volatility, 8
W
Wasserstein distance, 12
weak
  form, 72
  formulation, 119
solution, 74
weakly Pareto efficient, 169
wealth maximization, 88
Z
zero-one law, 232
zero-sum game, 177