

INDEX

Note: Page numbers followed by “*n*” indicate notes.

- Accounting, 28. (*see also* Financial auditing)
 - profession, 98
- Agreement, 46
- Alternative trading systems (ATS), 187
- Anti-money-laundering (AML), 109, 133
- Application programming interfaces (APIs), 199, 250
- Applications (APPS), 257
- Artificial intelligence (AI), 267
- Artisanal and Small-Scale Mining (ASM), 151
- Artisanal Miners (ASM), 169
- Asset-backed securities (ABS), 98, 184–185
- Asset-backed security tokens (ABSTs), 183
- Asset(s), 29
 - drawback, 100–102
 - improper valuation of, 94–95
 - securitization, 98–102
 - works, 99–100
- Asymmetric cryptography, 178
- Atari: Fistful of Quarters* (movie), 87
- Auditability, 3
- Auditing blockchains/distributed networks, 244
 - addressing BC/DLT ecosystem, 250–251
 - distributed audit for distributed ledger, 251–252
 - netting of transactions and control implications, 248–249
 - risks and limitations, 247
 - securing blockchain, 246–247
- Auditing fees, 230
- Australian Modern Slavery Act (2018), 156
- Automobile industry, application in, 218–220
- Autonomous machines, 114
- Availability, 269
- Bartering, 8–9
- Basel Committee on Banking Supervision, 96
- Bit Gold, 61
- Bitcoin (BTC), 1, 7, 15, 35, 37, 53, 141
 - activity statistics, 18
 - blockchain beyond, 21–22
 - transaction, 17–21
 - value compared to other economic metrics, 19
- Blackcoin, 57
- Block time, 31
- Blockchain, 1–3, 7, 14–17, 23–24, 43
 - adoption, 7
 - application in automobile industry, 218–220
 - beyond bitcoin, 21–22
 - bitcoin transaction, 17–21
 - collateralized lending in cryptoworld, 213–218
 - cryptocurrency, 13–15
 - cryptotax business model, 210–213
 - ecosystem, 260–261
 - facilitating smart contracts, 74–75
 - financial transformation sparked by, 178–179
 - fungible tokens, 161–163
 - greenwashing, 167–168
 - insurance to protect against flight delays and cancellation, 221–223
 - key characteristics, 3
 - key event dates in, 4
 - mass processing of minerals, 166
 - microrental of parking spaces, 220–221
 - for mineral supply chain, 89
 - non-fungible tokens, 163–164
 - operationalizing tokenization, 164–165
 - option contracts traded through, 85–86

- projected worldwide investment in, 2
 - provenance, 224–227
 - recording history of supply chain, 161
 - solution, 160
 - supported business innovations, 209
 - threats to development of, 281–282
 - trade–barter system to
 - cryptocurrency, 8–10
 - trust, 10–13
- Blockchain and distributed ledger
 - technology (BC/DLT), 229
- Blockmatrix, 284
- Blocks, 16, 30–33
- Bonus Newsletter Subscription, 136
- Bottom-up approach, 117–118.
 - (*see also* “Top-down” approach)
- Bribery attacks, 278
- Business(es)
 - ecosystem, 200
 - functions or processes, 3
- Byzantine Generals Problem, 44, 46–51

- California Transparency in Supply
 - Chains Act, 155–156
- Car Dossier, 218
- Cash flow method, 84
- Censorship attacks, 279
- Central counterparty clearing house
 - (CCP), 143
- Central securities depository (CSD), 144
- Certificates of origin, 271
- Chain forks, 54–55
- Chinese Due Diligence Guidelines for
 - Responsible Mineral Supply Chains (2015), 154
- Chinese GSRM (2014), 154
- Cognitive costs, 67
- Cold storage, 216–217
- Collateralized lending in cryptoworld,
 - 213–218
- Colored coins, 177
- Coming to America* (movie), 87
- Committee of Sponsoring Organizations
 - of the Treadway Commission (COSO), 236–237
 - COSO Cube, 236–237
- Conflict-Affected and High-Risk Areas
 - (CAHRAs), 154
- Consensus mechanism, 36, 43–44, 250,
 - 255
- Byzantine general’s problem, 46–51
- economics of validity and
 - verifiability, 51–52
 - importance, 44–46
 - proof of stake, 57–58
 - proof of work, 52–56
- Contracts, 75–76. (*see also* Smart contracts)
- Contractual capability, 76
- Corda open-source blockchain provider,
 - 38
- Cost per transaction, 114
- Credit(s), 10, 28–29
 - default swaps, 71
- Cross-border cooperation, 97
- Cross-border trades, 273
- Cross-border transactions, risks
 - associated with, 96–98
- Crowd funding of movies, 87–89
- Cryptoassets, 212
- Cryptocurrency, 1, 8
 - basic features and challenges, 13–15
 - trade–barter system to, 8–10
- Cryptography, 3, 178
 - hashing algorithms, 178
 - technical primer on, 112–113
- Cryptokitties, 121
- Cryptotax business model, 210–213
- Curzio Equity Owners (CEO), 127
 - tokens, 141–142, 144
- Curzio Research, 89, 127–128, 135
- CurzioEquityOwners.com, 138

- Danish Maritime Authority, 273–274
- Data
 - data-ledger, 28
 - provenance, 269
 - self-sovereignty, 170
 - transparency, 197–201
- Daywalker Movie Fund, 87
- Debits, 28–29
- Decentralized applications (dApp), 38
- Decentralized management, 269
- Decentralized network, 25
- Delegate proof of stake, 57
- Department of Homeland Security
 - (DHS), 110
- Desynchronization attack, 277
- Deterministic property of hash function,
 - 32
- Digital assets, 97, 180

- Digital securities (DS), 130–131, 181–183, 197
 - ecosystem, 187–188
 - services, 187
- Digital tokens, 80
- Digitized assets, 217
- Direct participation program market (DPP), 143
- Distributed audit for distributed ledger, 251–252
- Distributed control, 125
- Distributed ledger technology (DLT), 177–178
- “Divide and conquer” strategy, 33
- Dodd-Frank Act (2012), 154
- Double-spending, 13, 276–277
- Due diligence, reduction in, 95–96
- E-commerce, 7
- E-identity system, 121–122
- E-notary system, 121–122
- E-verification platforms, 121–122
- Eclipse Attacks, 278
- Economics
 - of microtransactions, 66–67
 - of validity and verifiability, 51–52
- Encryption
 - technical primer on, 112–113
- Energy sector, 270–272
- Enterprise Risk Management process (ERM process), 232–234
- Entity level controls, 240
- EOS software, 38
- Equity method, 84
- Ernst and Young (EY), 218
- Ether (ETH), 141
- Ethereum platform, 37–38
- Ethereum Request for Comments (ERC), 179
 - ERC20 tokens, 179–180
- EU Conflict Minerals Regulation (2017), 154–155
- EU Directive on Non-Financial Disclosures (2014), 156
- EU Non-binding Guidelines for identifying CAHRAs, 155
- “4-Eyes” based control environment, 231
- Fifty-one Percent Attacks, 278
- Filecoin, 139
- Financing corporate expansion through tokenization
 - Curzio Research, 127–128
 - financing in mineral industry, 145–146
 - private offering, 128–130
 - security token offerings *vs.* traditional private placements, 130–132
 - STO process, 133–144
- Finney attack, 277–278
- Fizzy business process, 222–223
- Flight delays and cancellation, insurance to protect against, 221–223
- Foreign investors, 193
- Fork, 45
- French Corporate Duty of Vigilance Law (2017), 156
- Fungible tokens, 161–163
- Game theory, 59n2
- Gas, 36, 53
 - cost, 36
- Genesis block, 30
- Genetic algorithms (GAs), 121
- Global Financial Crisis (GFC), 98
- Global Real Estate Transparency Index (GRETI), 199–200
- Global trade, 96
- Globalization, 186
- GodoKaisha-TokumeiKumiai (GK-TK), 194
- Gold supply chain, 150–152
- Governmental agencies, 274–276
- Greenwashing, 167–168
- Grinding attacks, 280
- Gross domestic product (GDP), 191
- Gross Risks, 232
- Hash function, 3, 30–33
- Health services, 268–270
- Herd mentality, 96
- Hollywood accounting, 87–88
- Hyperledger, 38
- Hyperledger-Fabric, 38
- Idiosyncrasies of blockchain, 111–112
- “If-then-else” rules, 283
- “If-then” rules, 62, 67, 71
- Illiquid-Liquid Spectrum, 189–190
- Illiquidity discount, 81–82

- Immutability, 3, 15
 - of data, 171
 - immutable audit trails, 269
- Incentivized machines, 114
- Incentivizing participation in
 - blockchain, 168
 - data self-sovereignty, 170
 - ensuring credible information, 171–172
 - immutability of data, 171
 - incentives for companies, 168–170
 - incentivizing incident reporting, 172–174
- Information technology controls (IT controls), 243–244
- Ingots, 165
- Initial Coin Offerings (ICO), 80, 180
- Institutional real estate firms, 201
- Insurance, 124–125
 - industry, 71–72
- Internal controls
 - auditing blockchains/distributed networks, 244–252
 - for entire ecosystem, 260–263
 - risk management and internal controls framework, 231–240
 - system audit for blockchain, 252–259
 - types and assessments of, 240–244
- Internal controls over financial reporting (ICFR), 234
- Internal Revenue Service (IRS), 35, 210–211
- Internet of Things (IoT), 38, 64, 72
- IOTA (open-source distributed ledger), 38
- IPFS (peer-to-peer hypermedia protocol), 38
- IPOs, 127
- J-Curve effect, 204–205
- Japanese real estate investment trusts (J-REITs), 191
- Japanese Real Estate Market, 89–90, 177, 190
 - digital securities, 181–183
 - digital securities ecosystem, 187–188
 - financial transformation sparked by blockchain, 178–179
 - harmonizing financial regulation across jurisdictions, 180–181
 - inefficiencies in real estate market, 188–190
 - market size and investment environment, 191–194
 - pain points in, 194–197
 - projected growth of security tokens, 183–186
 - smart contract standards expediting digital asset functions, 179
 - tokenization of, 197–205
- Jones Lang LaSalle (JLL), 191
- Know-your-customer regulations (KYC regulations), 109, 133
- Large-Scale Mining operations (LSM), 151, 169
- Ledger, 26–27
- Legal jurisdictions, 76
- Licensed STEs, 142
- Liquidity, 203–205
- Loan to value ratio, 215
- Lock-up period, 57, 148*n*1
- Long-range attacks, 279
- Lukka's approach, 250
- Management assertions, 239–240
- Maritime industry, 272–274
- Market optimization, 272
- Mass processing of minerals, 166
- Mass-balance traceability, 166–167
- Member, 27
- Merkle trees, 3, 30–33
- Metal streaming financing, 145
- Microrental of parking spaces, 220–221
- Microtransactions, economics of, 66–67
- Mineral industry, financing in, 145–146
- Mineral supply chain, 149
 - blockchain solution, 160–168
 - complexity of, 150–152
 - evolving regulation on traceability of minerals, 153–158
 - incentivizing participation in blockchain, 168–174
 - lack of transparency in, 153
 - money laundering through mineral sourcing, 158–159
 - traceability requirements, 159–160
- Mining, 145
 - royalty financing, 145
- Modern money, 9

- Money laundering through mineral sourcing, 158–159
- Mongo DB database, 38
- “Monopoly Classic”, 40
- Monopoly on blockchain, 39–40
- Mortgage securitization, 98–99
- Mortgage-backed securities (MBS), 99–100
- Mosi-oa-Tunya Declaration, 155
- Multiparty settlement, 272

- Napster (music sharing application), 14
- NEM (platform), 38
- NEO (blockchain project), 38
- Net Risks, 232
- Network, 27
- Non-fungible tokens, 163–164
- Nothing at stake attacks, 280
- Nxt, 57

- OECD Due Diligence Guidance for Responsible Supply Chains, 154
- Off-chain
 - transactions, 248, 250
 - volume, 248
- On-chain
 - transactions, 248
 - volume, 248
- On-Off Ratio, 248–249
- Open Chain distributed ledger system, 38
- OpenFinance Network (OFN), 142, 144, 187
- Operationalization, 83–85
- Option contracts traded through blockchain, 85–86
- Over the counter desks (OTC desks), 250

- Paper money, 9–10
- Participants, 25–27
- Past majority attacks, 281
- PayPal, 8
- Peer-to-peer
 - blockchain, 114
 - model, 14
 - network, 23, 25
- Perception of monitoring, 231
- Physical risks, 272
- Portfolio lenders, 99
- Pre-offering, 133–140
- Primer on blockchain terminology
 - blockchain platforms, 37–38
 - blocks, hashes and Merkle trees, 30–33
 - essential features of blockchain, 36–37
 - formation, 33
 - misconceptions, 28–30
 - monopoly on blockchain, 39–40
 - participants and transactions, 25–27
 - types of blockchain, 34–35
- Privacy, 269
- Private and non-permissioned networks, 34
- Private and permissioned network, 35
- Private keys, 20, 178
- Private offering, 128–130
- Private placement, 128
- Private placement memorandum (PPM), 135
- Process mining, 242
- Profits, improper valuation of, 94–95
- Programing languages, 119–120
- Proof of elapsed time, 57
- Proof of stake, 44, 57–58
- Proof-of-work (PoW), 3, 15–16, 44, 52–56
- Proprietary trading systems, 187
- Protocol
 - accreditation, 250
 - code, 254
 - protocol-based financial engineering, 188
- Provenance, 224–227
- Pseudocode analytic, 257
- Public and non-permissioned network, 34
- Public and permissioned networks, 34–35
- Public key, 20
 - systems, 112–113
- Public key cryptography (PKC), 178
- Public knowledge, 11
- Public ledger, 114
- “Pump-and-dump” schemes, 96

- Quorum open-source blockchain platform, 38

- Race conditions, 259
- Real estate investment trust (REIT), 190
- Red flags, 155
- Reentrancy, 259

- “RegTech”, 275
- Regulatory arbitrage, 97
- Regulatory Sandbox Model, 132
- Reinsurance, 125
- “Research Blast”, 248
- Responsible sourcing, 149
- Restricted securities, 143
- Return of the Jedi* (film), 87
- Risk(s)
 - management, 231–240
 - in smart contracts, 257–259
- Robustness, 269

- Secure Hashing Algorithm (SHA), 33
 - SHA-256 algorithm, 33
- Securities transaction lifecycle (STL), 143–144
- Securitization, 99, 102–103
- Security, 269. (*see also* Digital securities (DS))
- Security Token Exchanges (STE), 130, 187
- Security Token Offerings (STOs), 80, 91–93, 127, 130–133, 183
 - issuance phase, 140–141
 - lifecycle management, 141–144
 - pre-offering, 133–140
- Security tokens, 139–140
 - projected growth of, 183–186
- “Segregation of duties” principles of auditing, 231
- Selfish mining, 279–280
- Settling trades, 123
- Shor’s algorithm, 114
- Simple Agreement for Future Equity (SAFE), 135
- Smart contracts, 3, 36, 61–66, 110–111, 114, 118–120, 283
 - advantages, 73–74
 - applications, 71–73
 - blockchain facilitating, 74–75
 - economics of microtransactions, 66–67
 - features, 67–69
 - functioning, 70
 - legal complexities, 75–77
 - standards expediting digital asset functions, 179
 - supply chain transaction in traditional setting, 64
 - supply chain transaction with, 65
 - tokenization with, 120–121
 - works, 69–71
- Smelters, 152
- Spider-Man* (film), 87
- Stale blocks, 54
- Start-up financing, 93, 184
- STOC tokens, 85
- Stocchain, 85
- Stock trading back office, 123–124
- Sudoku puzzles, 55–56
- Sumitomo Mitsui Trust Research Institute (SMTRI), 191
- Supply chain responsibility. (*see* Responsible sourcing)
- Symmetric encryption
 - algorithms, 178
 - systems, 112
- Syndicated underwriting, 125
- System and Organization Controls (SOC), 243–244
- System audit for blockchain, 252
 - new risks, 253–257
 - risks in smart contracts, 257–259
 - traditional system audit controls applied to blockchain, 252–253
- “System of record” approach, 251, 261–262

- Termination, 46
- Test of design (TOD), 241–242
- Test of effectiveness (TOE), 241–242
- Third edition OECD Due Diligence Guidance (2016), 154
- Token. (*see also* Security tokens)
 - discounts, 135–136
 - format, 137
 - holder obligations, 137
 - holder rights, 136
 - proceeds, 137
 - transfer restrictions, 137
- Tokenization, 36–37, 79–80, 111, 114
 - of art, 86–87
 - asset securitization, 98–102
 - data transparency, 197–201
 - enhanced liquidity, 203–205
 - growth in tokenization market, 91–93
 - illustration of appeal of, 82–83
 - of Japanese Real Estate Market, 197
 - Open Access, 201–203
 - operationalization, 83–85, 164–165
 - prevailing risks, 93–98

- process, 89–91
 - and securitization, 102–103
 - with smart contracts, 120–121
 - untapped potential, 80–82
 - use-cases, 85–89
- TokuteiMokutekiKaisha (TMK), 194
- “Top-down” approach, 116–117
 - financial controls identification, 237–238
- Traceability, 224
 - conflict minerals regulations, 154–155
 - evolving regulation on, 153
 - of minerals, 153
 - modern slavery and human rights regulations, 155–157
 - ramifications of changing political dynamics, 157–158
 - requirements, 159–160
- Trade–barter system to cryptocurrency, 8–10
- Traditional private placements, 130–132
- Traditional security tokens, 183
- Traditional sourcing methods, 159
- Traditional system audit controls
 - applied to blockchain, 252–253
- Tranches,–100
- Transaction(s), 25–27, 219–220
 - fee, 51
 - or business process level controls, 240
 - and smart contracts, 250
- Triple-entry bookkeeping system, 29–30
- Trust, 10–13, 103
- Trust Service, 143
- Trusted broker, 80
- Trusted third parties, 7, 11, 13–14, 83
- Tylenol tablets, 268–269
- U. S. Securities and Exchange
 - Commission (SEC), 76, 91
- Ujo (online music sharing/purchase company), 72
- UK Modern Slavery Act (2015), 156
- United Nations Conference on Trade and Development (UNCTAD), 272
- United Nations Guiding Principles on Business and Human Rights (UNGPs), 156
- United Parcel Services, 273
- Unregistered offering, 128, 133
- US dollars (USD), 136
- Use-cases of blockchain, 107–108
 - applying framework, 116–118
 - caveats and risks, 125–126
 - framework to evaluating, 113–115
 - idiosyncrasies of blockchain, 111–112
 - key attributes of blockchain, 110–111, 114
 - sample use-cases, 120–125
 - score card, 115
 - smart contracts, 118–120
 - technical primer on cryptography and encryption, 112–113
- Utility
 - billing, 271
 - token, 139
- Validity, 46
 - economics of, 51–52
- Verifiability, 3
 - economics of, 51–52
- Vulnerabilities, 276
 - bribery attacks, 278
 - censorship attacks, 279
 - desynchronization attack, 277
 - double spending, 276–277
 - eclipse attacks, 278
 - fifty-one percent attacks, 278
 - Finney attack, 277–278
 - grinding attacks, 280
 - long-range attacks, 279
 - nothing at stake attacks, 280
 - past majority attacks, 281
 - selfish mining, 279–280
- Web 3.0, 181–183, 201
- Witnesses, 58
- Yap, 11–12