



LEVEL 1: PORTFOLIO MANAGEMENT

Reading 55 (8th out of 8): FINTECH

Difficulty:

easy

Benchmark Study Time:

2h

2022





THIS E-BOOK:

- ❖ is a selective summary of the corresponding Reading in your CFA® Program Curriculum,
- ❖ provides place for your own notes,
- ❖ helps you structure your study and revision time!

How to use this e-book to maximize your knowledge retention:

1. **Print** the e-book in duplex and bind it to keep all important info for this Reading **in one place**.
2. **Read** this e-book, best twice, to grasp the idea of what this Reading is about.
3. **Study** the Reading from your curriculum. **Here add** your notes, examples, formulas, definitions, etc.
4. **Review** the Reading using this e-book, e.g. write your summary of key concepts or revise the formulas at the end of this e-book (if applicable).
5. **Done?** Go to [your study plan](#) and change the Reading's status to **green** :
(it will make your Chance-to-Pass-Score™ grow ☺).
6. **Come back** to this e-book from time to time to **regularly review for knowledge retention!**

NOTE: While studying or reviewing this Reading, you can use the tables at the end of this e-book and mark your study/review sessions to hold yourself accountable.



FINTECH, BIG DATA, MACHINE LEARNING, AND ARTIFICIAL INTELLIGENCE

Fintech

Fintech is a **technological innovation** related to services and products provided by the financial industry. Fintech impacts both the design and delivery of financial products and services.

Fintech areas of interest:

- ▶ analysis of large data sets,
- ▶ developing new analytical tools,
- ▶ automated trading,
- ▶ robo-advisers,
- ▶ financial record keeping.

Big Data

Big Data includes datasets **characterized by:**

1. a very large volume,
2. real-time velocity, and
3. high variety.

Sources of Big Data:

- ▶ financial markets,
- ▶ businesses,
- ▶ governments,
- ▶ individuals,
- ▶ sensors,
- ▶ Internet of Things (aka. IoT).

2 types of data sources:

- ▶ traditional,
- ▶ alternative,



HERE KNOWLEDGE RETENTION HAPPENS | WRITE: notes, examples, formulas, definitions, relations, etc.



Examples of traditional sources of data:

- ▶ companies,
- ▶ stock exchanges,
- ▶ governments,
- ▶ central banks, etc.

Examples of alternative (non-traditional) sources of data:

- ▶ social media,
- ▶ sensors,
- ▶ IoT.

Data processing methods

Capture – how data are collected and transformed into a suitable format.

Curation – ensuring data quality and accuracy.

Storage – how data is recorded, archived, and accessed.

Search – how to query data.

Transfer – from data source or storage location to an analytical tool.

Artificial Intelligence & Machine Learning

Artificial Intelligence (AI) = machines, computers, or programs that mimic the cognitive functions of human minds, e.g. learning, problem solving, decision making, etc. (traditionally perceived as available only to humans)

Neural networks = computer programming based on how human brains learn and process information

Machine Learning (ML) = subdivision of AI; computer programs & algorithms that based on Big Data are able to learn to do tasks and improve their performance over time, e.g. a computer program that learns how to recognize faces using a very large set of data (images) from a social platform.



HERE KNOWLEDGE RETENTION HAPPENS | WRITE: notes, examples, formulas, definitions, relations, etc.



2 types of machine learning approaches:

- supervised learning,
- unsupervised learning.

supervised learning

If there are tags and goals included in machine learning, we are dealing with **supervised learning** – the algorithm has to learn specified similarities, differences, and relationships based on some data, e.g. there is a set of million images of city streets and the role of the algorithm is to learn to recognize the images with and without street signs.

unsupervised learning

If there are no tags and goals included in machine learning, we are dealing with **unsupervised learning** where the ML program has to find by itself the differences, similarities, and relationships inside data, e.g. there is a set of million images of city streets and the algorithm analyzes them on its own looking for the similarities and differences between data and tag images (using different tags).

There is a lot of things that such an algorithm may learn, e.g. the algorithm may learn:

- which images include street signs and which do not,
- which images were taken in the old town and which in the modern business center,
- which images show trees and which do not, etc.

Note 1: Of course, machine learning is not only about image analysis. Thanks to ML, neural networks, and deep learning (deep learning nets), things such as speech recognition, pattern recognition, face recognition, etc. are also possible.

Note 2: ML algorithms still need to be supervised by humans to work correctly. Humans are responsible for e.g. the choice of appropriate data analysis techniques, overall judgment, cleaning the data from biases or spurious data, making sure that there is no overfitting (overfitting is when the algorithm learns the data too precisely – it's over-trained and so the chances it can work correctly on a different set of data are slim).



HERE KNOWLEDGE RETENTION HAPPENS | WRITE: notes, examples, formulas, definitions, relations, etc.



APPLICATION OF FINTECH, MACHINE LEARNING, AND ARTIFICIAL INTELLIGENCE

Text analytics and Natural Language Processing (NLP)

Natural Language Processing (**NLP**) combines computer science, AI, and linguistics in order to develop computer programs that can analyze and interpret the human language. NLP covers things like translation, speech recognition, sentiment analysis, etc.

Robo-advisers

Robo-advisers provide investment services to a large number of retail investors at a cost lower than the cost offered by traditional investment services advisers. These investment services are provided through internet portals, so there is no need for an intermediary (like a financial adviser). It's true especially in the case of fully automated **digital wealth managers**. There is also a sector of robo-advisers supported by human financial advisors. This sector is called adviser-assisted digital wealth managers.

Robo-advisers mainly offer passive investments with a reasonable risk at a cost suitable even for less affluent clients.

Risk analysis

In relation to risk management, AI, ML, and Big Data are used for:

- ▶ monitoring & analyzing real-time risk, market data, and trading patterns thanks to Big Data,
- ▶ assessing data quality thanks to ML algorithms,
- ▶ backtesting of computation heavy simulations which can be accelerated thanks to AI-based techniques.

Algorithmic trading

algorithm trading = using algorithms to buy and sell assets on exchanges and other trading venues

Algorithm trading:

- ▶ is often used for the execution of a large order on different exchanges,
- ▶ is characterized by high-speed execution, lower costs, and anonymity,
- ▶ algorithms may update themselves on a regular basis in line with the current market situation.



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High-frequency trading:

- ▶ form of algorithmic trading,
- ▶ used to profit from intraday-market mispricing,
- ▶ execute trades in ultra-high-speed, low-latency networks.

Distributed ledger technology

distributed ledger = digital database shared among different participants of a network; the database is created in such a way that every participant stores the current version of the database → to achieve this, we need the so-called **consensus mechanism** that confirms new entries and participants.

blockchain = type of a digital ledger in which information is recorded sequentially within blocks that are chained together and secured by means of cryptographic techniques.

Steps related to adding a new transaction to a blockchain distributed ledger network:

1. A transaction takes place between parties.
2. The transaction is sent to different nodes (network computers).
3. Network computers validate transaction details.
4. After verification, the transaction is added to other transactions and a new block of data is created.
5. The block of data is added to (chained with) previous blocks containing data in the ledger.
6. The transaction is considered complete after updating the ledger.

smart contract = computer programs that self-execute based on predefined conditions and rules agreed by the parties of the contract.

Types of networks:

- ▶ permissionless networks,
- ▶ permissioned networks.

Permissionless networks (e.g. bitcoin) are open to any participant who wants to join them and all information regarding transactions is available to all participants. In a permissioned network, some activities in a network require additional permission.

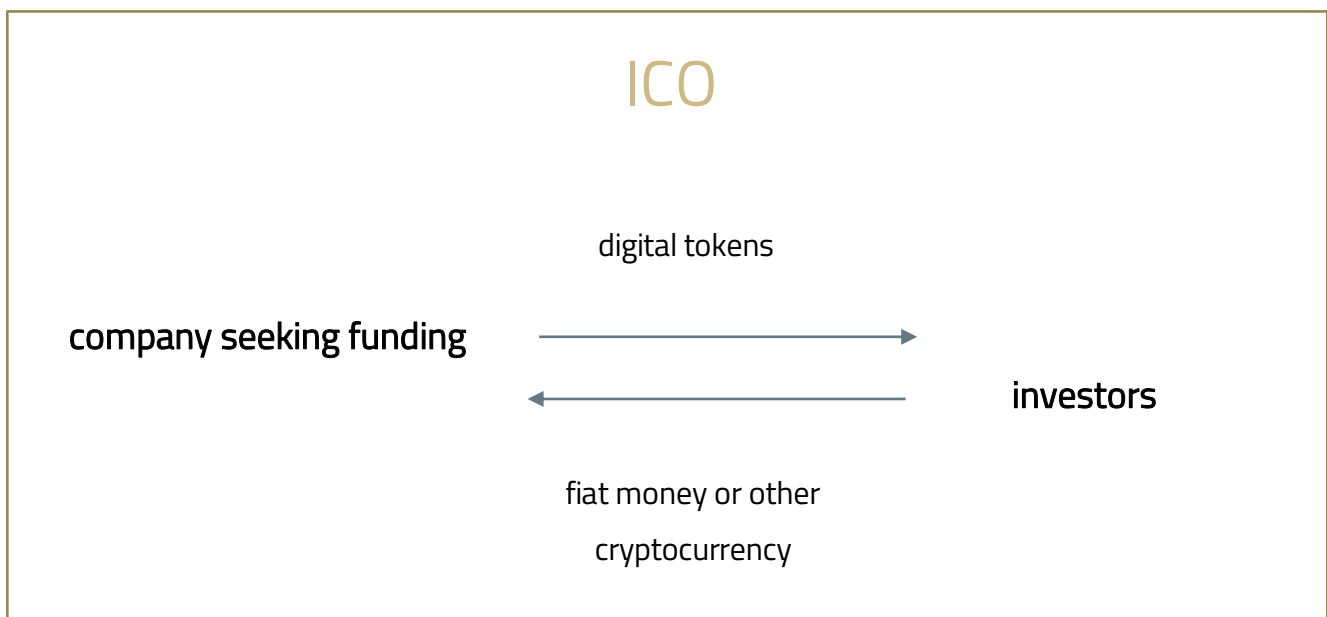


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cryptocurrency (aka. digital currency) = electronic currency that allows almost real-time transactions without any intermediary; cryptocurrencies use distributed ledger technology

Cryptocurrencies are not only used in buy-sell transactions (like e.g. bitcoin) but also to raise capital. A company that needs funding may create its own cryptocurrency and distribute it to potential investors via a process called **initial coin offering (ICO)**.



fiat money = “traditional currency” emitted by a government or central bank that is generally accepted and can be exchanged for other currencies, goods, services, etc.

digital tokens = created by a company and distributed to investors who can then use them to buy products or services that the company will develop thanks to the funds received from the investors.

Tokenization:

- ▶ is a process of representing ownership rights to an asset,
- ▶ is useful in the case of physical assets like luxury goods, real estate, commodities,
- ▶ is based on distributed ledger technology (DTL),
- ▶ is not related to digital tokens discussed above.



HERE KNOWLEDGE RETENTION HAPPENS | WRITE: notes, examples, formulas, definitions, relations, etc.



Summarizing key concepts:

- ☐ Fintech – description and application

My summary:

- ☐ Big Data – description, sources, and processing methods

My summary:

- ☐ Artificial Intelligence & Machine Learning

My summary:

- ☐ Supervise learning vs Unsupervised learning

My summary:



☐ Application of fintech, machine learning, and artificial intelligence

My summary:

☐ Distributed Ledger Technologies

My summary:

☐ Cryptocurrencies

My summary:



Keeping myself accountable:

TABLE 1 | STUDY

When you sit down to study, you may want to **try the Pomodoro Technique** to handle your study sessions: study for 25 minutes, then take a 5-minute break. Repeat this 25+5 study-break sequence all throughout your daily study session.



Tick off as you proceed.

POMODORO TIMETABLE: study-break sequences (25' + 5')													
date		date		date		date		date		date		date	
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TABLE 2 | REVIEW

Never ever neglect revision! Though it's not the most popular thing among CFA candidates, regular revision is what makes the difference. If you want to pass your exam, **schedule & do your review sessions**.

REVIEW TIMETABLE: When did I review this Reading?													
date		date		date		date		date		date		date	
date		date		date		date		date		date		date	