



HISTORY OF BANKING

*HSBC QUANT ACADEMY FOR FACULTY OF MATHEMATICS AND COMPUTER
SCIENCE OF UJ*

DR. PHILIPPE J.S. DE BROUWER

ALL RIGHTS RESERVED BY THE AUTHOR
prepared for: Jagiellonian University in krakow

OCTOBER 4, 2026

Contents

Contents	2
1 History of Banking: a subjective selection	2
1.1 Early Developments	2
1.1.0.1 Banking's Early Beginnings	3
1.2 Early Middle Ages in Europe	5
1.3 Late Medieval Europe	6
1.3.0.1 The Knights Templar as Pioneers of Medieval Finance	8
1.3.0.2 Military Prowess and Financial Power	8
1.3.0.3 The Downfall: Sovereign Debt and Confiscation	8
1.3.0.4 The Legacy and Successors in Banking	9
1.3.0.5 The Nature of Credit and Contractual Obligation in Venetian Society	10
1.3.0.6 Interest, Risk, and the "Pound of Flesh" as Collateral	10
1.3.0.7 The Legal Resolution and its Financial Consequences	11
1.3.0.8 Wealth Transfer and the Moral Economy	11
1.4 Modern Times	11
2 Cycles of Capitalism	15
2.1 The Steam Engine	15
2.2 The Train	16
2.3 The Internal Combustion Engine, Electricity and Magnetism	17
2.4 Automobiles and the Petro-Chemical Industry	18
2.5 The Electronic Computer and the Internet	19
2.6 Artificial Intelligence	20
3 Modern Banks	21
3.1 How banks operate	21
3.2 Overview of Banking Institutions	21
3.2.0.1 The Size of Banks	26
4 Conclusions	27
Nomenclature	28

1 History of Banking

1.1 Early Developments

Grain loans supported agriculture

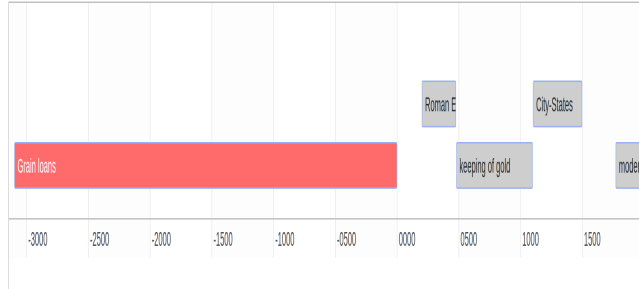


Figure 1: The timeline of banking shows a long and stable phase in agrarian societies.

Mesopotamia 2,000 BCE

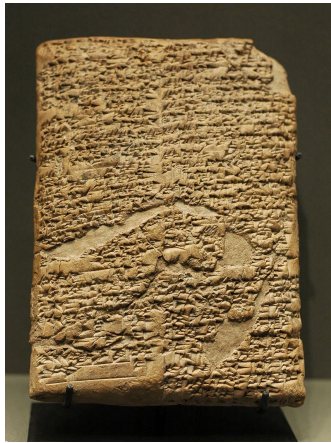


Figure 2: The Hammurabi Code (Law 100) describes interest-bearing loans. Commissioned by Hammurabi, the king of Babylon (ca. 1792–1750 BCE) – source: [wikipedia.org](https://www.wikipedia.org)

1.1.0.1 Banking's Early Beginnings The origins of banking can be traced back to ancient Mesopotamia, around 2000 BCE, where the first known form of lending took place. Temples, often considered the earliest banks, served as repositories for valuable items and grain, and priests would lend these resources to local farmers and merchants. The temples were also responsible for keeping

records of these transactions, giving birth to the concept of bookkeeping.

In ancient Greece, the concept of banking further evolved with the establishment of moneylenders and private depositories. Around 600 BCE, the Greek city-state of Athens introduced the first standardized coinage system, which facilitated trade and contributed to the growth of banking activities. The Romans, too, played a significant role in the development of banking. They established a network of banks throughout their empire and introduced financial innovations such as bills of exchange, which allowed for the transfer of funds between different locations.

Jesus of Nazareth flips over tables and whips money changers and merchants



Figure 3: Christ driving the money changers from the temple by Jan Sanders van Hemessen. – source [wikimedia.org](https://commons.wikimedia.org/wiki/File:Christ_driving_the_money_changers_from_the_temple.jpg)

The cleansing of the Temple narrative tells of Jesus expelling the merchants and the money changers from the Temple and is recounted in all four canonical gospels of the New Testament. The scene is a common motif in Christian art.

In this account, Jesus and his disciples travel to Jerusalem for Passover, where Jesus expels the merchants and consumers from the temple, accusing them of turning it into "a den of thieves" (in the Synoptic Gospels) and "a house of trade" (in the Gospel of John) through their commercial activities.

The narrative occurs near the end of the Synoptic Gospels (at Matthew 21:12–17, Mark 11:15–19, and Luke 19:45–48) and near the start of the Gospel of John (at John 2:13–16). Some scholars believe that these refer to two separate incidents, given that the Gospel of John also includes more than one Passover.

Bankers in Ancient Rome

- **Professional Bankers** distinct social group (*equites* class).
- **Public Bankers (*Mensarii*)**
 - State-appointed officials (economic stability).
 - Public loans from the treasury (*aerarium*) (from crisis in 352 BC).
- **Currency Controllers (*Nummularii*)**
 - Test coins and manage currency circulation (1st century BC – 4th century AD).
- **Private Bankers (*Argentarii*)**
 - Freeman in a professional guild (*collegium*).
 - Operated *tabernae argentariae* (banking shops) offering credit and financial services (mid-2nd century BC – mid-2nd century AD).

Social Status

Successful bankers gained wealth and influence.

money transfers - *Permutatio*

move large sums across distances by adjusting bank ledgers

1.2 Early Middle Ages in Europe

The Dark Ages

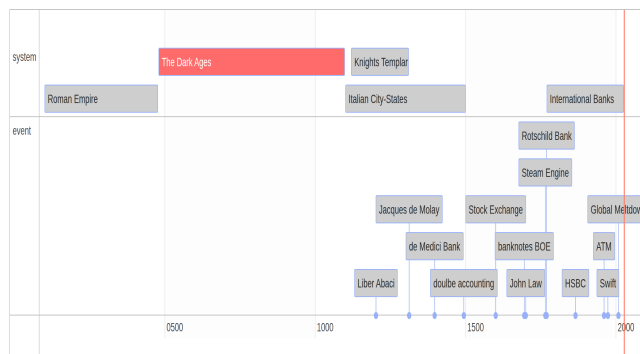


Figure 4: Balance Sheet more than 4,000 years old.

The period from 500 to 1000 CE in Europe is known as the Early Middle Ages, a transitional time following the collapse of the Western Roman Empire,

characterized by political fragmentation, the rise of Germanic kingdoms, and the growing influence of the Latin Church. This era, sometimes called the "Dark Ages," saw a blending of Germanic, Roman, and Christian traditions to form a new European civilization, despite the loss of some Roman infrastructure and learning.

1.3 Late Medieval Europe

The late medieval period

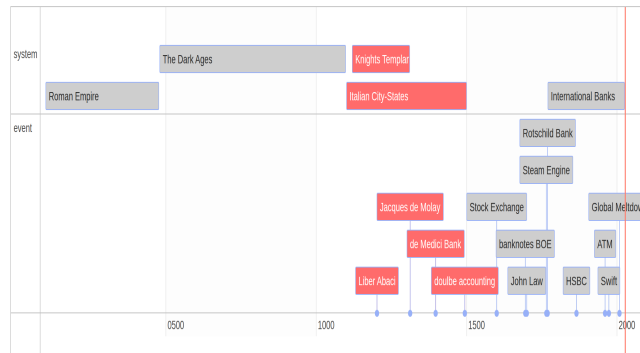


Figure 5: The late middle ages saw steady progress in science, trade, and economic development.

Liber Abaci: progress from mathematics



Figure 6: “Liber Abaci” (1202) by Leonardo di Pisa (posthumously Fibonacci) introduces the *Modus Indorum*, the Hindu–Arabic numeral system (base-10 notations) in section 1. In section 2 the advantages for business problems: currency conversions, profit and interest calculations - foto American Mathematical Society.

The real bankers: The Knights Templar



Figure 7: The Knights Templar: from poverty and devotion to military elite, richness and international banking (1120 – 1307)

1.3.0.1 The Knights Templar as Pioneers of Medieval Finance The re-emergence of banking in medieval Europe after the decline following the Roman Empire's fall is significantly attributed to the Knights Templar. Founded in 1119 as a military-religious order to protect pilgrims in the Holy Land, their financial innovations arose directly from this role. They established a vast international network of properties, from the Holy Land to Western Europe, granted sweeping tax breaks by the papacy in 1139. This physical infrastructure, combined with their reputation for discipline and trustworthiness, allowed them to create the first widespread, secure financial transport and storage system. Pilgrims could deposit valuables at one Templar preceptory and withdraw funds at another, using letters of credit, thus avoiding the peril of carrying wealth on long journeys. This system of secure storage and fund transfer laid the foundational groundwork for modern banking practices, effectively making the Templars the first multinational financial institution.

1.3.0.2 Military Prowess and Financial Power The Templars' financial credibility was inextricably linked to their military reputation as the "fiercest fighters of all the Franks." Their legendary discipline, encapsulated in a Rule that forbade retreat while their banner flew, made them the elite fighting force of the Crusader states. Key military successes underpinned their stability and growth. During the Second Crusade in 1148, they saved the French army of King Louis VII from annihilation in Asia Minor by imposing military discipline on the beleaguered crusaders and even providing an emergency loan, demonstrating an early intersection of their military and financial roles. They were crucial to the defense of key castles and territories, from Gaza to the Amanus Mountains. Despite a catastrophic defeat at the Battle of Hattin in 1187, where Saladin executed nearly 200 captured Templars, the order recovered under King Richard the Lionheart, serving as the vanguard and rearguard of his army. Their continued role in the Fifth Crusade in Egypt and the *Reconquista* in Spain ensured a constant flow of donations and consolidated their wealth for two centuries.

1.3.0.3 The Downfall: Sovereign Debt and Confiscation The ultimate demise of the Knights Templar provides a stark lesson in the perils of becoming a creditor to sovereign power. By the early 14th century, with the Crusader states lost, the order's purpose was questioned, but its vast wealth remained. King Philip IV of France was deeply in debt to the Templars. In 1307, he orchestrated the order's destruction to avoid his financial obligations and confiscate their assets. On Friday, October 13, 1307, he had Templars across France, including the last Grand Master Jacques de Molay, arrested on false charges. The subsequent suppression, backed by papal authority, led to the order's formal dissolution in 1312 and the seizure of its properties. Jacques de Molay was burned at the stake in 1314. This event highlights a critical dynamic in banking history: the vulnerability of financial institutions to political predation, especially when acting as lenders to the state.

1.3.0.4 The Legacy and Successors in Banking The Templars' fall created a vacuum in European finance that was quickly filled by secular institutions. The Italian city-states of Florence, Venice, and Genoa emerged as the new centers of banking. The most famous, the Medici Bank of Florence, built upon the financial concepts pioneered by the Templars and was instrumental in popularizing and perfecting the double-entry bookkeeping system, a cornerstone of modern accounting. The next major evolutionary step was the development of the central bank. The Bank of Amsterdam, founded in 1609, is often cited as the birth of modern central banking. It functioned to stabilize the local currency and provide a reliable place for deposit, serving as a direct model for later institutions such as the Sveriges Riksbank (1668) and the Bank of England (1694). Thus, while the Templars' military order was extinguished, their financial innovations provided a critical blueprint for the European banking system that followed.

The Medici

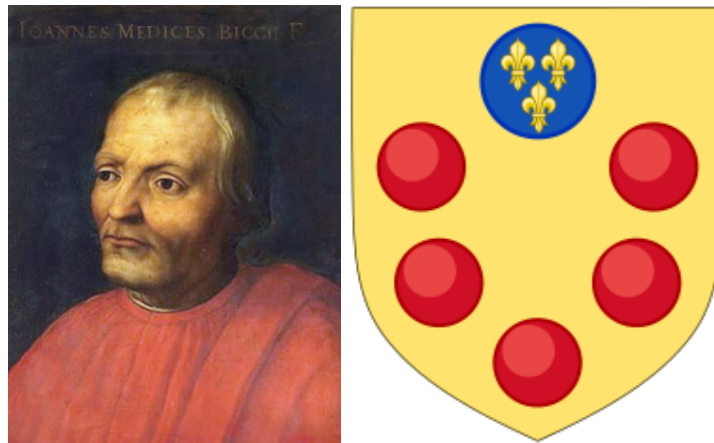


Figure 8: *The Medici Dynasty power and influence beyond comparison through local in Italy - bank created by Giovanni de Medici in the 15th century.*

Shakespeare's Merchant of Venice



Figure 9: Ernst von Posart as Shylock in Shakespeare's play "The Merchant of Venice" (ca. 1600). – image [wikimedia.org](https://commons.wikimedia.org/wiki/File:Ernst_von_Posart.jpg)

1.3.0.5 The Nature of Credit and Contractual Obligation in Venetian Society The plot of *The Merchant of Venice* is fundamentally driven by a financial instrument—a risky loan—that highlights the mechanics of credit in a pre-modern European mercantile economy. The central transaction involves Bassanio, a cash-poor nobleman, seeking a loan of 3,000 ducats from the Jewish moneylender Shylock, with the wealthy merchant Antonio acting as guarantor. Antonio's wealth is illiquid, tied up in speculative maritime ventures ("his ships and merchandise are busy at sea to Tripolis, the Indies, Mexico and England"), demonstrating that even the richest merchants of Venice operated on credit and faced significant cash-flow constraints. This scenario underscores the essential role of lenders like Shylock in providing the liquidity necessary for both commerce and personal expenditure.

1.3.0.6 Interest, Risk, and the "Pound of Flesh" as Collateral The terms of the bond are critically important for the history of finance. Shylock, who normally charges interest (usance), proposes a loan with zero interest, a superficially generous offer that masks its true nature. Instead of financial compensation, the collateral is a pound of Antonio's flesh. This "pound of flesh" clause represents an extreme form of a penalty clause, a concept with which modern financial history is familiar. The play explores the legal and ethical limits of contractual agreements. Shylock's insistence on the literal enforcement of the bond's terms ("I stand here for law") reflects a strict, albeit brutal, interpretation of financial contracts. However, the court's eventual ruling demonstrates that financial contracts, while binding, are not above broader legal and humanitarian principles, as the state reserves the right to intervene when a contract threatens public order or a citizen's life.

1.3.0.7 The Legal Resolution and its Financial Consequences The courtroom climax serves as a profound commentary on the enforcement of financial agreements. Portia, acting as a legal advocate, does not void the contract but instead enforces it with a literal precision that destroys its original intent. By stipulating that Shylock may take only flesh and not a single drop of blood, the law introduces an impossibility of performance that voids the dangerous clause. This legal quibble saves Antonio but also highlights the potential for legal systems to be manipulated in financial disputes. The subsequent judgment against Shylock has severe financial repercussions: he is stripped of his wealth, with half his estate forfeited to the state and half to Antonio, and is forced to convert to Christianity. This outcome illustrates the vulnerability of financiers to political and legal power, a recurring theme in banking history where sovereign authority often overrides private financial contracts, leading to the confiscation of assets.

1.3.0.8 Wealth Transfer and the Moral Economy The resolution of the play solidifies a transfer of wealth from Shylock to the Christian characters, reflecting the precarious position of moneylenders in a society that morally condemned usury. Antonio's condition that Shylock bequeath his estate to his daughter Jessica and her Christian husband Lorenzo ensures that Shylock's accumulated capital ultimately funds a Christian household. This mirrors historical instances where the assets of marginalized financial groups, such as Jews or the Knights Templar, were expropriated. The play concludes with the restoration of Antonio's commercial fortunes, as Portia reveals that his previously lost ships have "returned safely after all." This happy ending for the merchant, juxtaposed with the ruin of the moneylender, reinforces a contemporary moral hierarchy that valorized speculative mercantile trade (despite its risks) over the practice of moneylending, while simultaneously demonstrating the indispensable and interconnected roles both played in the economy of the Renaissance.

1.4 Modern Times

Modern Times

Shares and stock exchange

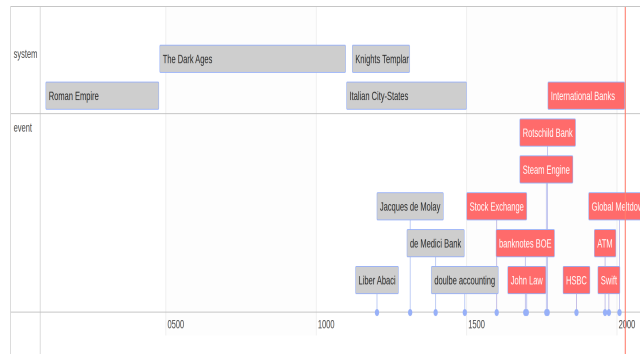


Figure 10: Rapid developments of banking during modern times.



Figure 11: The Amsterdam Stock Exchange: 1602.

Mayer Amschel Rotschild



Figure 12: *Mayer Amschel Rothschild re-invents international banking – The Internationalisation of the bank ca. 1770.*

The Expansion of Banking

The 17th and 18th centuries marked the growth of banking in Europe, with the establishment of banking dynasties such as the Rothschilds and Barings. Joint-stock banks, which allowed investors to buy shares and participate in profits, also began to emerge during this period.

Banking expanded to the New World with the founding of the Bank of New York in 1784 and the First Bank of the United States in 1791. American banking further developed in the 19th century with the creation of state-chartered banks and the establishment of the Federal Reserve System in 1913, which aimed to maintain financial stability and serve as the central banking authority in the United States.

Innovations and the Evolution of Banking

The 19th and 20th centuries saw rapid technological advancements that significantly impacted the banking industry. The introduction of the telegraph in the 1840s enabled faster communication between banks, while the invention of the telephone in the 1870s further revolutionized communication and allowed for the creation of the first wire transfers.

The advent of new technologies, such as ATMs, electronic payments, and online banking, revolutionized the banking industry in the latter half of the 20th century. These innovations made banking more convenient and accessible to consumers, while also improving efficiency and reducing costs for banks.

The globalization of the banking industry in the late 20th century also brought about significant changes, as banks expanded their reach beyond national borders and began to offer new services such as international payments and currency exchange. Today, we have digital currencies, something bankers of ancient times probably would not have been able to comprehend.

The last piece of the puzzle



Figure 13: *The last piece of the puzzle: energy rich food with the potato. From the end the 16th century (via Spain around 1570, and via the British Isles between 1588 and 1593) – widely used since the 1700s.*

The Motor: the Scientific Method

Aristotle (384–322 BCE, Greece) can be seen as the father of the scientific method, because of his rigorous logical method which was much more than natural logic. But it is fair to credit Ibn al-Haytham (aka Alhazen — 965–1039, Iraq) to prepare the scientific method for collaborative use. His emphasis on collecting empirical data and reproducibility of results laid the foundation for a scientific method that is much more successful. This method allows people to check each other and confirm or reject previous results.

However both the scientific method and the word “scientist” only came into common use in the 19th century and the scientific method only became the standard method in the 20th century. Therefore, it should not come as a surprise that this became also a period of inventions and development as never seen before.

Indeed, while previous inventions such as fire, agriculture, the wheel, bronze and steel might not have followed explicitly the scientific method they created a society ready to embrace the scientific method and fuel an era of accelerated innovation and expansion. The internal combustion engine, electricity and magnetism fuelled the economic growth as never seen before. The electronic computer brought us to the 21st century and now a new era of growth is being prepared by big data, machine learning, nanotechnology and –maybe– quantum computing.

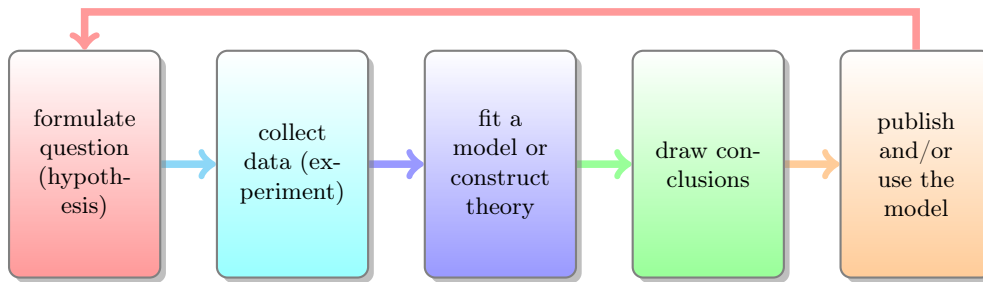


Figure 14: The steps in the scientific method for the data scientist as commonly in use from the 19th century, long after the work of Ibn al-Haytham (aka Alhazen — 965–1039, Iraq).

2 The Great Cycles of Capitalism

2.1 The Steam Engine

The steam engine provides power for factories and fuelled unprecedented economic growth

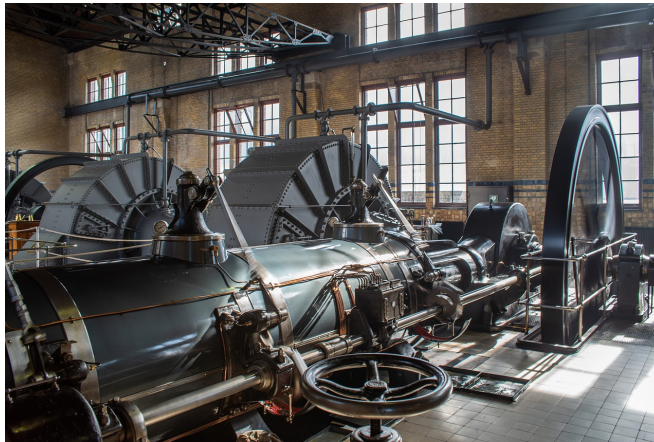
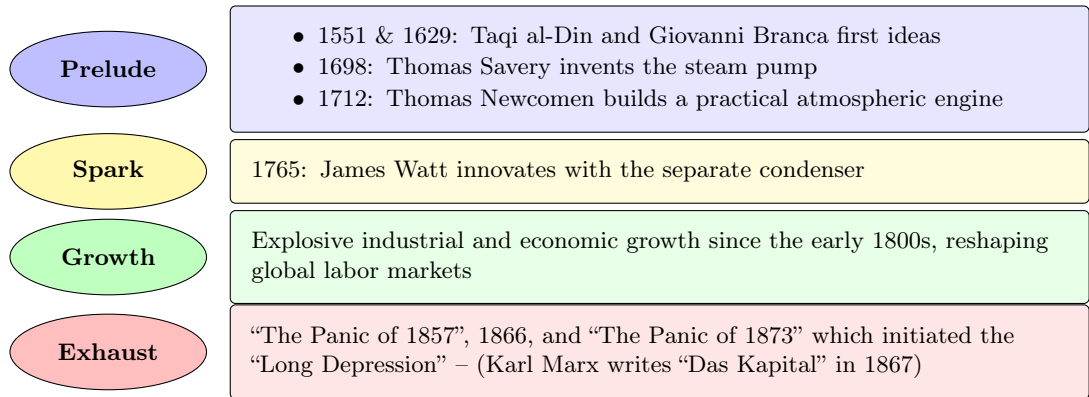


Figure 15: Steam Engine in factory — image by Kobus van Leer from [pixabay.com](https://www.pixabay.com)

The Steam Engine

Key dates



2.2 The Train

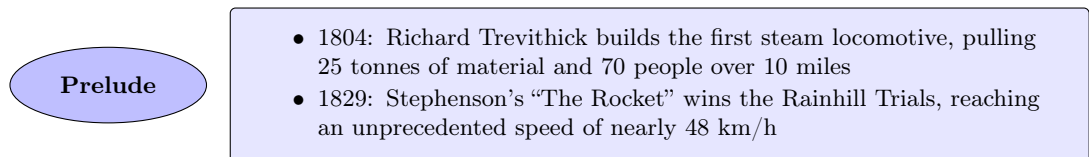
The Train



Figure 16: The Train provided reliable mass transport — image Image by Erich Westendarp from [pixabay.com](https://www.pixabay.com)

The Train

Key Dates



Spark	1830s–1840s: The era of “Railway Mania” drives rapid, explosive expansion of rail networks across Europe and North America. Speeds reach up to 96 km/h
Growth	Further global railroad expansion stabilizes logistics; approximately 40% of the world’s cargo still moves by train today due to its high efficiency.
Exhaust	Over-speculation leads to market crashes like “The Panic of 1901” and financial exhaustion leading up to WWI.

2.3 The Internal Combustion Engine, Electricity and Magnetism

The Internal Combustion Engine, Electricity and Magnetism

Fuelled exponential economic growth and provided individual transport



Figure 17: The internal combustion engine gave rise to reliable individual transport — image by S. Hermann & F. Richter from pixabay.com. Electricity and Magnetism provided lightbulbs, radio, and all kinds of powered appliances — image by PublicDomainPictures from pixabay.com

The Internal Combustion Engine, Electricity & Magnetism

Key Dates

Prelude	• 1805: Humphry Davy invents the “carbon arc” lamp • 1832: William Sturgeon the first DC electric motor • 1885: Karl Benz the first practical gasoline-powered automobile
Spark	1908: Henry Ford introduces the Model T, initiating the age of affordable mass motorization and assembly-line manufacturing.
Growth	Widespread electrification and mastery of electromagnetism drive rapid automation, transforming operations both at home and in the factory.

Exhaust

The “Wall Street Crash of 1929” triggers the global “Great Depression,” setting off socioeconomic instability that ultimately culminates in WWII.

2.4 Automobiles and the Petro-Chemical Industry

Automobiles and the Petro-Chemical Industry

Fuelled exponential economic growth



Figure 18: The petro-chemical industry — image by Frauke Feind from pixabay.com

Automobiles and the Petro-Chemical Industry

Key Dates

Prelude

- 1600 BCE: Mesoamericans use natural rubber for artifacts
- 1850s: First modern oil wells and refineries (Łukasiewicz)
- 1856 & 1872: Inventions of early man-made plastic (Parkesine) and PVC

Spark

- 1933: Polyethylene discovered by ICI (Gibson and Fawcett)
- 1930s: Industrial manufacturing of Polystyrene (PS) and PVC by BASF

Growth

1940s–1950s: Post-war boom driven by PET (1941), Polypropylene, (Giulio Natta, 1954) and Dow Chemical’s polystyrene — reshaping packaging, insulation, and automotive supply chains.

Exhaust

The 1973–1974 Oil Shocks (OPEC oil crisis, brings an end to the era of cheap, unchecked petrochemical expansion)

2.5 The Electronic Computer and the Internet

The Electronic Computer

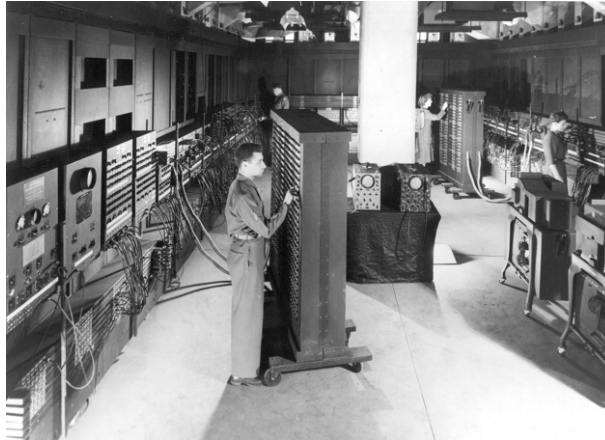


Figure 19: *The ENIAC (Electronic Numerical Integrator and Computer) — image by Unidentified U.S. Army photographer - Public Domain*

ENIAC (**E**lectronic **N**umerical **I**ntegrator and **C**omputer) was the first electronic, general-purpose computer. It was Turing-complete, digital, and could be reprogrammed to solve a wide range of numerical problems.

Although its primary design purpose was to calculate artillery firing tables for the U.S. Army, its first actual program was a study on the feasibility of the hydrogen bomb.

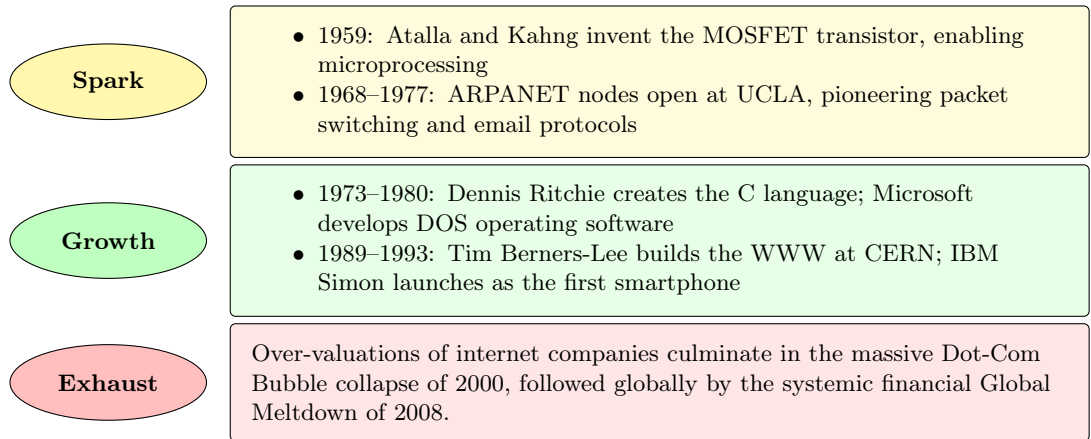
Completed in 1945, ENIAC was publicly dedicated in February 1946. It was phenomenally faster than previous electro-mechanical machines, capable of performing a calculation in 30 seconds that took a human 20 hours. The machine cost nearly \$500,000. After being upgraded and moved to Aberdeen Proving Ground in 1947, it remained in continuous operation until 1955.

The Computer

Key Dates

Prelude

- 1843: Ada Lovelace writes the first machine algorithm for Babbage's Analytical Engine (1830s)
- 1942–1946: Transition to digital computing via ABC, Colossus, and the programmable ENIAC
- 1952–1953: IBM's commercial mainframes; invention of the hard disk drive



2.6 Artificial Intelligence

Artificial Intelligence



Figure 20: Artificial Intelligence is the next industrial wave.

Artificial Intelligence

Key Milestones

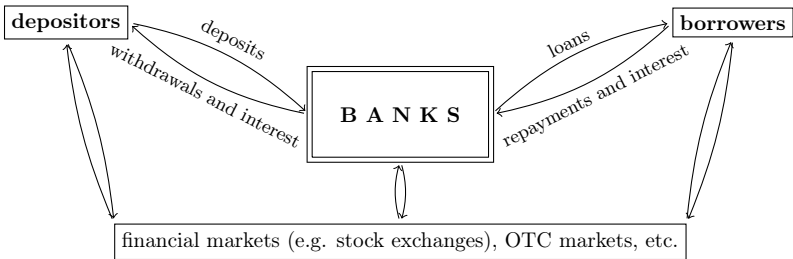


Figure 21: The role of banks

Prelude	• 1920: Karel Čapek introduces the word “robot” in his sci-fi play <i>R.U.R.</i> • 1950: Alan Turing proposes the “Turing Test” for machine intelligence • 1956: The Dartmouth Workshop establishes AI as a research field • 1966: Shakey becomes the first mobile reasoning robot; ELIZA simulates early NLP • 1974–1980: The First “AI Winter” emerges following the critical Lighthill Report • 1987–1993: The Second “AI Winter” hits as commercial Expert Systems collapse • 1997: IBM’s Deep Blue makes history by defeating chess champion Garry Kasparov
Spark	• 2012: AlexNet wins ImageNet, sparking the GPU-accelerated Deep Learning boom • 2017: Google invents the Transformer architecture • 2022: ChatGPT launches as the first mass-adopted LLM
Growth	• TODAY: exponential adoption • TOMORROW: AGI, ASI, and the singularity
Exhaust	?

3 Modern Banks

3.1 How banks operate

How banks operate

3.2 Overview of Banking Institutions

Global Universal Banks

- **What they do:**

- Offer a full range of services worldwide: retail, commercial, and investment banking.

- **Unique characteristics:**

- Massive scale and global reach.
- Integrated financial service models.
- Significant systemic importance.

- **Role in system:**

- Facilitate international trade and capital flows.
- Serve multinational corporations and global clients.

Examples:

- HSBC (Global)
- BNP Paribas (France/Global)
- Deutsche Bank (Germany/Global)
- Santander (Spain/Global)

Commercial Banks

- **What they do:**

- Serve businesses and corporations.
- Business loans, treasury services.

- **Unique characteristics:**

- Focus on business cash flow and needs.
- Larger transaction sizes.

- **Role:** Fund business operations and growth.

Examples:

- Bank Pekao (Poland)
- ING Bank Śląski (Poland/Netherlands)
- Commerzbank (Germany)

Retail Banks

- **What they do:**
 - Serve individual consumers.
 - Basic accounts, savings, personal loans, mortgages.
- **Unique characteristics:**
 - Extensive branch/ATM networks.
 - High-volume, low-value transactions.
- **Role:** Main banking access for the public.

Examples:

- PKO BP (Poland)
- mBank (Poland)
- Barclays (UK)
- Société Générale (France)

Investment Banks

- **What they do:**
 - Capital raising (IPOs, bonds).
 - Mergers & Acquisitions (M&A) advice.
 - Securities trading.
- **Unique characteristics:**
 - Fee-based revenue model.
 - Serve corporations, governments, institutions.
- **Role:** Facilitate complex financial transactions.

Examples:

- Goldman Sachs (USA/Global)
- Rothschild & Co (France/Global)
- Dom Maklerski PKO BP (Poland)

Central Banks

- **What they do:**
 - Set monetary policy (interest rates).
 - Supervise the banking system.
 - Ensure financial stability.
- **Unique characteristics:**
 - Sole authority to issue currency.
 - Lender of last resort.
 - Non-profit, public institution.
- **Role:** Macroeconomic management.

Examples:

- European Central Bank (Eurozone)
- Narodowy Bank Polski (Poland)
- Bundesbank (Germany)

Cooperative Banks

- **What they do:**
 - Provide banking services to members.
 - Often community or profession-focused.
- **Unique characteristics:**
 - Customer-owned (member-owned).
 - "One member, one vote" governance.
- **Role:** Support local communities and members.

Examples:

- Credit Agricole (France)
- DZ Bank (Germany)
- Spółdzielcza Kasa Oszczędnościowo-Kredytowa (SKOK) (Poland)

Credit Unions

- **What they do:**
 - Provide retail banking to a member group (e.g., employees, residents).
- **Unique characteristics:**
 - Not-for-profit, member-owned.
 - Common bond requirement for membership.
- **Role:** Financial cooperation for a specific group.

Examples:

- Less common in Poland.
- Popular in North America.

Savings and Loan Associations

- **What they do:**
 - Specialize in residential mortgages.
 - Accept consumer deposits.
- **Unique characteristics:**
 - Historical focus on home financing.
 - Mutual ownership structure.
- **Role:** Promote home ownership.

Examples:

- Less distinct in Europe today.
- Many evolved into universal banks.
- (Historically prominent in the USA)

Islamic Banks

- **What they do:**
 - Provide Sharia-compliant financial services.
 - Use profit-sharing instead of interest.
- **Unique characteristics:**
 - Prohibition of interest (riba).
 - Asset-backed financing.
- **Role:** Serve Muslim populations ethically.

Examples:

- Kuveyt Türk (Turkey)
- Al Rayan Bank (UK)
- (Niche presence in Europe)

Table 1: Comparison of Bank Balance Sheets (2023) vs. European Country GDP (2023)

Bank (Country)	Assets (\$bn)	Country
gray!10 Global Banks		European Countries
Industrial & Commercial Bank of China (China)	5,742	Germany
China Construction Bank (China)	4,942	United Kingdom
Agricultural Bank of China (China)	4,715	France
Bank of China (China)	4,192	Italy
Mitsubishi UFJ Financial Group (Japan)	3,078	Spain
HSBC Holdings (UK)	3,036	Poland
JPMorgan Chase (USA)	2,974	Netherlands
gray!10 Additional European Banks for Context		Other European Countries
BNP Paribas (France)	2,835	Belgium
Deutsche Bank (Germany)	1,448	Sweden
Santander (Spain)	1,367	Austria
Credit Agricole (France)	2,531	Switzerland

3.2.0.1 The Size of Banks

- **Data Sources:** Bank assets from annual reports (2023), GDP figures from IMF World Economic Outlook (2023)
- **Note:** All figures in USD billions for comparative purposes

- HSBC ranks as the 6th largest bank globally by assets
- Poland's GDP (\$688bn) is larger than the assets of major European banks like Deutsche Bank (\$1,448bn) but smaller than the global banking giants
- The four largest Chinese banks each have balance sheets larger than Germany's GDP

The size of banks is considerable

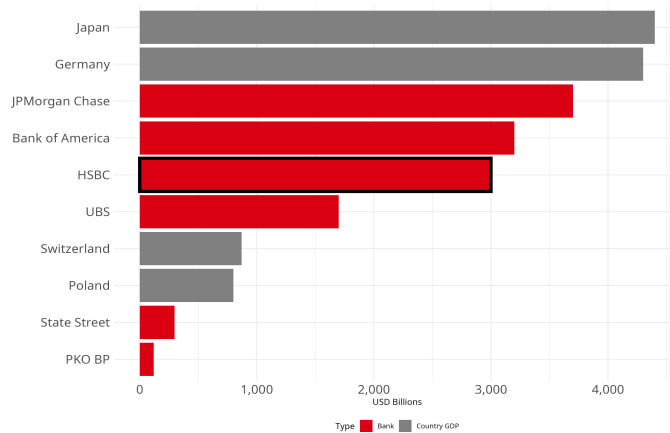


Figure 22: Balance Sheet of some banks compared to the GDP of some countries.

4 Conclusions

Conclusions

Historical Legacy Meets Digital Future

- Banking evolved from **temple repositories** to **global digital platforms**, yet core principles of trust and intermediation remain the same
- Banks were one of the enablers of each technological revolution (**steam, electricity, computing**) that gradually transformed banking's scale and scope
- Today's large banks operate at sizes similar to **national economies** - HSBC's balance sheet exceeds Poland's GDP
- **Banks are crucial to economies**

eginframeqrCodes ndframe

Nomenclature

AGI	Artificial General Intelligence, page 21
AI	Artificial Intelligence, page 20, 21
ASI	Artificial Super Intelligence, page 21
BASF	Badische Anilin und Soda Fabrik, page 18
BCE	before common era, page 18
ENIAC	Electronic Numerical Integrator and Computer, page 19
GDP	Gross Domestic Product, page 27
GPU	graphics processing unit, page 21
LLM	large language model, page 21
MOSFET	metal–oxide–semiconductor field-effect transistor, page 20
NLP	natural language processing, page 21
PS	polystyrene, page 18
PVC	polyvinyl chloride, page 18
WWI	World War I, page 17