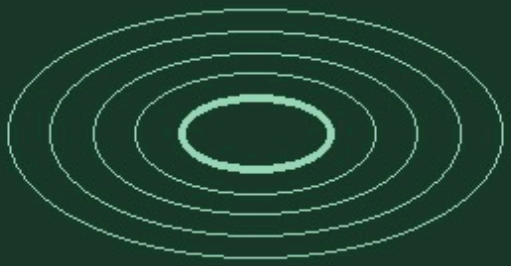
INDUSTRIES OF INDIA

THE BANKNOTE

Paper, Promise, Power



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T H E
B A N K N O T E

Paper, Promise, Power

Ketineni Ramarao

Reference numbers in square brackets resolve in the companion volume, The Banknote: Source Companion.

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I - THE IDEA

Chapter 1 - What a banknote is

Open a wallet almost anywhere in the world and you will find it: a small rectangle of printed paper, or in a growing number of countries a rectangle of printed plastic, that a stranger will accept in exchange for almost anything. It buys bread and pays debts, crosses borders in coat linings and money belts, sits in registers and vaults and under mattresses. It is called a banknote, and it is one of the most successful inventions in the history of commerce - a valueless object, made valuable.

The object itself is unimpressive, and deliberately so. A banknote is a few grams of cotton paper or polymer film, covered on both sides with printed images, numbers, text and patterns. It carries no precious metal. The ink and the substrate cost little; a modern note typically costs its issuer a small fraction of its face value to produce. What the note embodies is not material worth but a promise, and the nature of that promise has changed profoundly over the thousand years since paper money was invented.

The oldest banknotes were receipts. When London goldsmiths took a customer’s coin for safekeeping in the seventeenth century, they handed back a written acknowledgment, and the Bank of England, founded in 1694, did the same for its depositors [C3]. Those receipts began to circulate: rather than withdraw coin to make a payment, a merchant could simply endorse over the goldsmith’s note, and the next holder could present it for coin when he wished. The Bank of England’s notes still carry the fossil of that arrangement in the words “I promise to pay the bearer on demand” - a promise that once meant gold or silver on presentation and that today means, in effect, that the central bank will exchange the note for another note [C3]. One of the oldest surviving Bank of England notes, dated 18 June 1697, is a handwritten fragment promising to pay the bearer twenty-two pounds, an odd sum that records a deposit withdrawn in two instalments [C3]. The modern banknote descends directly from that scrap of handwriting.

A banknote is a bearer instrument, and that quality matters more than any other. The note belongs to whoever holds it. It requires no account, no password, no network, no approval from any intermediary. A coin has the same property, which is why coins and notes together make up what economists call cash: money in its final, settled form, payment complete the moment the object changes hands. Every other way of paying - cheque, card, transfer, mobile wallet - is at bottom an instruction to someone else to move a balance, and depends on that someone being able and willing to obey. Cash settles by itself.

Because a banknote is a bearer promise, everything about its manufacture is aimed at two problems that have defined it from the beginning: making the promise trustworthy, and making the paper impossible to fake. The very first paper money in history, the jiaozi issued by merchants in the Chinese city of Chengdu around the turn of the eleventh century, was already stamped with multiple seals against counterfeiting [C4]. Every banknote since has been a small war between printer and forger, fought in engraved lines and watermarked shadows, in security threads and colour-shifting inks. A modern note is the most technically dense object most people ever handle: a stack of defences against imitation that also, not incidentally, makes it beautiful. The portrait, the guilloche patterns, the latent images are security features that double as a national portrait gallery and a pocket art exhibition.

What gives the promise its value? For most of the banknote's history, the answer was convertibility: the note was worth something because it could be exchanged, on demand, for something else - coin at the goldsmith's counter, silver at the Bank of England, gold at the United States Treasury as late as 1933 for domestic holders and 1971 for foreign governments. Today almost every note in the world is fiat money, convertible into nothing but itself. A twenty-dollar bill is twenty dollars because everyone agrees it is, and that agreement rests on institutions: the central bank that issues the note and guards its scarcity, the law that declares it legal tender, and the state's willingness to accept it in payment of taxes. The last of these is older than most people realise. The Song dynasty in China, the first government to issue paper money on a large scale, collected its money taxes half in coin and half in paper, and intervened to buy back its own notes with silver when their market value faltered - a policy its officials described as maintaining equilibrium between the forms of money [C1]. The machinery has grown more elaborate, but the principle a thousand years later is recognisably the same: a paper currency stands because the issuer makes it useful and keeps it scarce.

The banknote is also, and not incidentally, a business. Issuing money is profitable: a banknote is an interest-free liability of the issuer, and the income earned on the assets it backs, net of the costs of printing and handling the currency - the revenue called seigniorage - is one reason governments have always guarded the privilege jealously and punished counterfeiters as enemies of the state. Printing notes is a specialised industry dominated by a handful of firms and state works, in which a missed delivery or a botched security feature can become a diplomatic incident. Moving notes around - filling cash machines, supplying bank branches, collecting shop takings - employs fleets of armoured vehicles and a workforce most account holders never think about. And destroying them is an industry too: every year central banks shred and

granulate worn notes by the tonne. The banknote is at once a public utility, a manufactured product, and an instrument of state power.

A banknote is also a piece of state theatre. Nations put their founding fathers, poets, scientists and monuments on their money; they argue, sometimes furiously, about whose face belongs there. Denominations are chosen with care, portraits redesigned at intervals, new series unveiled with press conferences. The European Central Bank, unable to choose real bridges without offending someone, printed imaginary ones. Few manufactured objects are looked at so often and examined so closely, and few carry so deliberate a load of symbolism. Later chapters return to the design of notes and to the strange politics of the pocket portrait gallery; here it is enough to note that no government treats its banknotes as mere paper, whatever the theory of fiat money says.

Two facts about the modern banknote frame everything that follows. The first is scale: banknotes circulate by the hundreds of billions, and the value of the world’s currency in circulation is measured in trillions of dollars, pounds, euros, yen and yuan. The second is paradox: in the countries where electronic payments have grown fastest, the value of cash in circulation has mostly kept rising even as its use in shops has fallen - people hold notes even as they spend them less. Why that happens, and what it means, is one of the questions this book sets out to answer.

This book follows the object itself through all of those lives. It begins where paper money began, in the iron-cash districts of eleventh-century Sichuan, and watches the idea fail and be reinvented: abandoned by Ming China, stumbled upon in Stockholm, systematised in London, nearly destroyed in Paris, and made ordinary in the young United States. It then takes the note apart - the paper, the engraving, the security thread, the polymer film - and looks at the people who make it, forge it, print it and count it. It follows cash into its crises, the inflations and demonetisations in which paper promises turn back into paper, and it ends with the question the digital age has made urgent: whether an invention a millennium old still has work to do, and what would be lost if it disappeared.

The story runs through every inhabited continent and through every kind of human institution, but it stays with the note. The banknote is not the whole of money, and this is not a history of money or of banking; it is the biography of a single artifact, told closely enough to reveal the systems around it - which is how a few grams of printed paper came to hold up so much of the world.

Chapter 2 - Money before paper

The banknote solved problems that were thousands of years old, and it could only appear once a particular set of materials, habits and institutions had accumulated. To see why paper money happened when and where it did, it helps to start with what came before: metal in the hand, and paper between merchants.

For most of recorded history, money was coin. The earliest coins appear in Iron Age Anatolia in the late seventh century BC, associated above all with the kingdom of Lydia: small lumps of electrum, a natural alloy of gold and silver, stamped with an image and sometimes an inscription. Among the earliest inscribed examples are coins from Ephesus bearing a stag and the name of Phanes, dated to around 625-600 BC [C8]. Herodotus credited the Lydians with two inventions that still define a market economy: the use of gold and silver coin, and selling goods by retail [C8]. Early electrum was awkward money - the alloy's proportion of gold varied wildly, so the value of each piece was unpredictable - but the idea proved irresistible. Within a century, Greek cities were striking small silver fractions suited to everyday purchases, and coinage had begun its long career as the default money of the Mediterranean world [C8].

China invented coinage at roughly the same time, and differently. Where Mediterranean money was gold and silver, Chinese money was bronze: low-value cast coins, round with a square hole so they could be strung together in strings of a thousand. From the outset, then, Chinese money was fiduciary - its nominal value often diverged from its metal content, so that accepting it already required a measure of trust in the issuer and the custom of the market [C1]. Chinese monetary thought diverged in the same direction. Where Western theory worried about money as a means of exchange and the setting of just prices, Chinese thinkers treated money chiefly as an instrument by which the ruler regulated markets and provided for his subjects [C1]. Both of these peculiarities - cheap token coins, and money conceived as a tool of state - would matter enormously when the time came to print money on paper.

Metal money had virtues that explain its long reign. Gold and silver were scarce, durable, divisible and universally desired; a coin carried its value in itself and needed no one's promise. But metal also had costs, and the costs grew with the economy. Coins were heavy. A string of a thousand Chinese cash was a serious weight, and where iron rather than bronze was used, as in Sichuan, the burden was worse - substantial payments meant cartloads. Coins wore down, were clipped and sweated, and were debased by the very rulers who issued them; the Roman silver denarius lost nearly all of its silver over

the empire's first three centuries. Above all, coin supply was hostage to mining and minting. When China's Song dynasty presided over what historians call a medieval economic revolution, its mints reached the highest output in imperial history and still could not keep pace with the market's demand for money [C1]. The constraint was physical: there were only so many coins.

Long before anyone made paper currency, merchants had learned to move money without moving metal. The instruments they used are the banknote's true ancestors. In Mauryan India in the third century BC, an instrument called the adesha ordered a banker to pay a sum to a third person - recognisably a bill of exchange [C9]. The Romans used written orders for payment. In Tang dynasty China in the eighth century, merchants deposited coin with offices in one city and carried a certificate, poetically called flying money, to redeem in another [C9]. Around 1150 the Knights Templar took pilgrims' valuables in Paris or London and issued notes redeemable at their preceptories in the Holy Land [C9]. Arab merchants used the suftadja from the eighth century onward, and the instrument reached Italian trading cities by the twelfth and thirteenth centuries, where the bill of exchange took its mature form [C9]. England recorded debts on split tally sticks - notched hazel rods split lengthwise so that debtor and creditor each held half of an unforgeable record - and the Exchequer went on using tallies into the nineteenth century; the bonfire of the old sticks in 1834 famously burned down the Palace of Westminster [C10].

Notice what all these instruments were not. A bill of exchange named its parties: this merchant, that banker, a specific sum and date. A tally recorded a particular debt. A Templar's note was a deposit certificate for a particular pilgrim. They moved value between known people inside networks of trust, but they were not currency - you could not hand a stranger a bill of exchange in a market and expect him to accept it as final payment. Currency requires something further: a promise addressed to the bearer, payable to anyone, in standard denominations, issued by an authority whose credit reaches further than any merchant's. The step from the bill of exchange to the banknote is the step from credit between persons to credit between everyone and no one.

Three preconditions had to coincide for that step. The first was paper itself, cheap and printable - and paper, like printing, was invented in China long before it reached Europe [C1]. The second was a money culture already comfortable with fiduciary value: a society that had spent a millennium using token bronze coins was far better prepared to accept valueless paper than one wedded to the intrinsic worth of gold and silver [C1]. The third was a state strong and interested enough to stand behind the promise - to make the notes acceptable for taxes, to defend them against counterfeiters, and ideally to restrain its own temptation to print too many. All three met first in China, and

specifically in the one province where the inconvenience of metal money had become unbearable.

It is worth underlining how often sheer weight pushed money toward paper. Sweden, where Europe's first true banknotes would appear, used copper dalers whose metal content had to match that of the silver dalers circulating alongside them, which made the copper pieces enormous - large payments moved by horse and cart [C5]. Sichuan's iron cash imposed the same logic a thousand years earlier. The banknote is often told as a story about trust, and it is; but it is just as much a story about hernias and pack animals, about the plain physical nuisance of metal. Paper money began, in both China and Europe, where coins were heaviest.

That province was Sichuan, ringed by mountains, rich in tea and silk, and cursed with iron cash. There, around the end of the tenth century, merchants and deposit houses began issuing paper certificates against coin left with them for safekeeping - private promises that soon circulated as money in their own right. The invention did not arrive as a state policy or a stroke of theory. It arrived as a workaround, a merchant's solution to a merchant's problem, exactly as bills of exchange had been. What happened next - the bankruptcies, the government takeover of 1023, and the slow discovery of what a state must do to keep paper promises good - is where the story of the banknote properly begins.

II - THE CHINESE INVENTION

Chapter 3 - The merchants of Sichuan

Paper money was born in a tea shop economy, in a province the rest of China treated as a world apart. Sichuan, in the far west of the Song empire, was a fertile basin ringed by mountains, dense with cities, rich in tea, silk and salt, and connected to the imperial heartland by roads so difficult that its merchants thought twice about what they carried over them. What the Song government gave them to carry was the worst money in the empire: iron cash.

The Song dynasty, which reunified China in 960, presided over an economic expansion so vigorous that historians call it China's medieval economic revolution [C1]. Cities swelled, markets multiplied, and the state increasingly collected its taxes in money rather than grain and labour. The mints ran at record levels - the highest coin output in imperial Chinese history - and still fell short of demand [C1]. Sichuan, however, did not use the empire's standard bronze coin. The region had been relegated to iron cash - the iron coins (tieqian) that circulated there in place of bronze [C4]. Iron was cheap and heavy, and the coins were worth so little that everyday commerce required absurd quantities of them. A merchant buying tea or silk in bulk faced a logistical problem before he faced a financial one: the money to pay for a load of goods might weigh more than the goods.

The merchants' answer was the jiaozi - the word means something like "exchange certificate". Around the end of the tenth century, deposit houses in Chengdu, the provincial capital, began accepting merchants' iron cash for safekeeping and issuing paper receipts for the deposits. The receipts passed from hand to hand: a merchant could pay for tea with the certificate rather than with the coins themselves, and the tea seller could redeem the paper at the issuing house or spend it onward. Early jiaozi had no standard denominations; each was written for the needs of the transaction, ranging from a few hundred wen to five guan, and their face values were adjusted annually by the issuing company [C4]. They were private promises, backed by private vaults, and for a while they worked beautifully. Paper was light, safe and convenient; iron stayed in the vault while commerce sped up.

The notes themselves were handsome objects. Jiaozi were printed from carved blocks in several inks - accounts describe as many as six - and impressed with multiple official seals, in red and black, precisely because forgery was a danger from the first day [C4]. A customer presenting iron cash at a deposit house paid a fee for the service: thirty wen per guan, about three per cent, for the convenience of carrying paper instead of metal [C4]. The houses profited from the float, and the public, on the whole, profited from the convenience. It

was an elegant arrangement, resting on one fragile assumption: that the house's vault actually held the coin its paper promised.

The convenience came with the oldest hazard of banking. A deposit house that held merchants' coin was tempted to put it to work - to lend it, invest it, or simply spend it on the assumption that not everyone would redeem at once. Some houses speculated and failed. When a house could not redeem its certificates, the paper in everyone's hands depreciated or died, and confidence in the whole arrangement frayed [C1]. The local government tried regulation: it licensed sixteen of the largest merchant houses as a privileged association, the Jiaozi hu, which standardised the notes and stood collectively behind them, charging a standard exchange fee of thirty wen per string of cash [C4]. Even this was not enough. The licensed houses still failed, and the losses still fell on the public.

The geography mattered as much as the metallurgy. Sichuan's wealth was real but landlocked: its tea, silk and salt travelled out over mountain passes or down the Yangzi gorges, and its merchants were exactly the people who felt most keenly the nuisance of heavy money. A certificate that could be folded into a sleeve was worth its fee many times over on the road to the tea markets. Paper money did not begin where money was most abstract but where it was most physical. The same pattern would repeat itself five hundred years later in Sweden, where copper dalers so heavy they moved by cart pushed Europe's first bank into printing its way out [C5].

The licensed consortium, the Jiaozi hu, tightened the system further. Its sixteen houses agreed on standard paper, standard designs and mutual oversight, and for a time the notes circulated as readily as coin across the province [C4]. But the consortium's discipline was only as strong as its weakest member's vault. When failures continued, the provincial authorities faced a choice between abolishing paper money altogether - throwing away a convenience the public had plainly come to depend on - and taking the business of promise-keeping into the hands of the only institution whose promises reached further than any merchant's. They chose the state.

In 1023 the Song state made its decision. It shut down the private issuers and took over paper money itself, establishing a government note-issuing office, the Jiaozi wu [C4]. The following year it issued the first series of official state jiaozi, printed to standard designs in standard denominations from one guan to ten [C4]. This was a genuine invention, not merely a nationalisation. For the first time anywhere, a state had declared that paper - its paper - was money, and had taken responsibility for making good on the claim. The jiaozi of the merchants of Sichuan had shown that paper could circulate; the Song government now set out to discover what it took to make paper endure.

The state inherited the merchants' problem in a new form. A private house could fail; a dynasty could not, at least not openly. Everything in the next century of Song paper money - the reserve rules, the redemption cycles, the tax policies - was an improvised answer to the question the Chengdu deposit houses had raised and failed to settle: what must the issuer of paper promises actually do, year in and year out, to keep those promises believed? The Song answer, worked out in practice rather than theory, was sophisticated enough that modern central bankers would recognise it. And its eventual breakdown, under the pressure of war, taught the first great lesson of paper money: the enemy of a paper currency is not counterfeiting or convenience but the fiscal appetite of its own issuer.

Chapter 4 - The empire takes over

What the Song government built around its paper money, between 1023 and the dynasty's fall two and a half centuries later, amounts to the first art of central banking. It was assembled piecemeal, in response to crises, and it worked - until the dynasty's fiscal emergencies became more urgent than its currency's credibility. The pattern it established, of a state managing paper promises against reserves, against taxes and against its own appetite, has never stopped being the pattern.

The official jiaozi of 1024 were already a managed currency. They were issued in fixed denominations - initially from one guan to ten, narrowed in 1039 to the five- and ten-guan notes, then broadened again in 1068 when a one-guan note returned and quickly grew to some 40 per cent of the notes in circulation [C4]. They were printed to standard designs on special paper, in multiple colours, with seals and serial marks against counterfeiting; by the early twelfth century the state printing offices were turning out tens of millions of notes a year [C12]. And they were issued in limited editions. A series circulated for a fixed term - originally about two years, later three - after which holders were required to bring their notes in and exchange them for the new issue, paying a small fee [C4]. Old notes died on schedule; the total in circulation was capped by decree, at one point fixed at 1,255,340 min, with cash reserves covering a fifth of the outstanding paper [C4].

The system's intelligence lay in the policies Song officials summed up as maintaining equilibrium between the different forms of money [C1]. The notes were not convertible on demand into coin in the modern sense, but they were not left to float either. If the market value of paper sagged, the state stepped in and bought back its own notes, paying out silver bullion from its reserves until confidence returned - silver functioned, in effect, as the system's reserve currency [C1]. And the state guaranteed demand for its own paper the simplest way there is: it accepted the notes for taxes. Most money taxes were collected half in coin and half in paper, which meant every taxpayer in the empire needed the government's notes and could not easily refuse them [C1]. Issue control, redemption cycles, a bullion reserve, and tax acceptance: the Song had discovered, by trial and error, nearly the whole toolkit by which states have ever since kept paper money sound.

The redemption cycle deserves a closer look, because it was the system's most distinctive device. Each series of notes, or jie, had a legal life of two to three years; at its expiry, holders exchanged old notes for new at the issuing office, paying a fee of thirty wen per guan - a few per cent - for the privilege [C4]. The arrangement did three kinds of work at once. It kept the physical stock of

notes fresh and legible in an age of fragile paper. It gave the state a regular audit of how much paper was actually outstanding. And it imposed a small, recurring tax on holding the currency, which encouraged people to spend or invest their notes rather than hoard them. The Song understood, long before the phrase existed, that a currency's velocity matters as much as its quantity.

The state also learned to manage the border between paper and metal rather than pretend it away. Because the early notes were issued in large denominations, they served wholesale trade while coin continued to serve the market stall; when the one-guan note returned in 1068 and paper began to reach everyday transactions, it was deliberately made the largest single part of the note stock [C4]. Redemption was not always in cash - notes could be exchanged for silver, for gold, or for tax-exemption certificates - which conserved the coin reserve while still honouring the state's promise in some valuable form [C4]. It was flexible, pragmatic, and dependent throughout on one thing the court could not print: credibility.

For a long time the system succeeded. Jiaozi became the dominant money of Sichuan, largely displacing coin, and in the twelfth century the court extended paper currency to other regions of the empire, with considerable success [C1]. Not every experiment took: the huaijiao, introduced in the Liang-Huai region in 1136, failed to catch on and faded quickly [C4]. But paper proved its worth precisely where the state needed it most, which was war. The Song spent their dynasty under military pressure from the northern steppe, and money taxes and paper currency were the sinews of that defence. It was war, in the end, that broke the currency - not because paper failed, but because the state's need overwhelmed its own rules.

The unravelling came in stages. In 1105, with inflation already biting, the emperor Huizong replaced the jiaozi with a new note, the qianyin; the new name did not repair the old problem, which was that the court had not backed its paper with sufficient coin [C4]. Through the thirteenth century, as first the Jurchen and then, from 1234, the Mongols pressed on the northern frontiers, the court printed to pay its armies. The numbers tell the story with unusual precision. At one point some 3.78 million min of paper circulated against perhaps seven hundred thousand iron cash; the total rose past four million; in 1204 alone another 5.3 million min were issued, and a note with a face value of a thousand cash changed hands for between one and four hundred [C4]. Local governments sold tax exemptions, silver, gold and even offices to meet the gap [C4]. And yet - this is the remarkable part - the paper did not die. Severely depreciated, it remained in use, and became if anything more deeply woven into the private economy. By the time the Mongols completed their conquest of the Song in 1279, paper money was the monetary standard of China [C1].

That is the first great lesson of the banknote, learned in its first homeland: a paper currency is not destroyed by depreciation alone. It is destroyed when people stop believing the issuer will ever stop printing. The Song, for most of two centuries, managed the equilibrium; the conquest dynasties that followed would show both how far the idea could be pushed and how completely it could collapse.

Chapter 5 - The Mongol experiment

In 1276 the Mongols took the Song capital at Hangzhou, and with it the oldest paper currency system in the world. Conquerors usually melt down the money of the conquered. The Mongols did the opposite: they kept the paper, extended it, and pushed it further than the Song had ever dared. Under Kublai Khan's Yuan dynasty, paper money ceased to be one form of money among several. It became, by decree, the money of China - the court banned the use of bronze coins and even of silver in trade, and relied on paper alone [C1]. For the first time in history, an empire of a hundred million people ran on printed promises.

The notes were the chao, printed from bronze plates on paper made from the bark of the mulberry tree - the same tree whose leaves fed the silkworms of China's other great export [C11][C12]. They were handsome, elaborate productions, issued in several denominations, in multiple colours, in quantities that had become routine under the Song: tens of millions of notes a year [C12]. A surviving Yuan note and its bronze printing plate, preserved in the British Museum, show how industrial the business had become: this was printing on a scale nothing in Europe would approach for centuries [C12].

The world heard about it from a prisoner. Marco Polo, the Venetian merchant who served at Kublai's court in the 1270s and 1280s and dictated his travels to a cellmate in a Genoese gaol, gave Europe its first detailed account of paper money, and his wonder is still fresh [C7]. The emperor's mint at Cambaluc, he wrote, was run in such a way that "you might say he hath the secret of alchemy in perfection". The Khan caused the bark of the mulberry tree, "made into something like paper, to pass for money over all his country". All the emperor's payments were made in these pieces of paper, and they circulated universally through his kingdoms and provinces; merchants arriving with gold, silver or gems were required to sell them to the emperor alone, receiving his paper in exchange [C11]. Polo's contemporaries found much of his book hard to believe, and nothing harder to believe than this: that tree bark, stamped by a distant ruler, could buy anything. His account was the most detailed of eight medieval European descriptions of Chinese printing, and paper money was apparently the only form of that printing Europeans wrote about before Gutenberg [C12]. The banknote reached European imagination long before it reached European pockets.

His description of the notes themselves is precise enough to check against the surviving objects. They were cut to different sizes for different denominations, from a half tornesel up to ten gold bezants; officials wrote their names on each note and stamped it with seals, and the chief officer of the mint impressed the

great vermilion seal that made the money authentic. Anyone forging it, Polo noted, was punished with death. The lightness of the thing astonished him most: ten bezants' worth of paper weighed less than a single gold bezant, and merchants several times a year brought goods worth four hundred thousand bezants to court and accepted payment in paper, because the paper could buy anything anywhere in the empire [C11]. Polo was a storyteller with a reputation for tall numbers, and his claim that the Khan issued each year a quantity of money "which costs him nothing, that it must equal in amount all the treasure in the world" should be read as wonder, not statistics [C11]. But the surviving Yuan notes and their bronze printing plates bear out the essentials: this was standardised, state-certified, mass-produced money [C12].

The Mongol experiment also showed how the idea travelled - and how it failed to. In the mid-thirteenth century, the Ilkhanid rulers of Persia, heirs of the same Mongol world-empire, tried to introduce paper money on the Chinese model: notes called cha, after the Chinese chao, printed for use between the court and the merchants [C9]. The experiment collapsed within about three years, destroyed from above: the court itself would only accept its own notes back at a discount, and a currency the issuer will not honour at face value is a currency no one else will honour either [C9]. It was the Song lesson repeated in miniature. Paper money does not fail because paper is worthless; it fails when the issuer's conduct says so.

The Yuan system outlasted Kublai by the better part of a century - longer than any paper currency had yet lasted - but not by grace of better management. Military campaigns, court expenditure and disaster relief were met increasingly at the printing plate, and the chao suffered severe depreciation in the dynasty's later decades [C1]. The Mongols had demonstrated that a state could run an entire empire on paper; they had not discovered how to stop themselves spending it.

When the Yuan fell to the Ming in 1368, paper money had been continuously current in China for more than three centuries. It had survived private bankruptcy, dynastic collapse and foreign conquest. What it would not survive was the fiscal indiscipline of its next and last imperial sponsor - after which China, the country that invented the banknote, abandoned it entirely and did not return to it for more than four hundred years.

Chapter 6 - The retreat from paper

The Ming dynasty came to power in 1368 in a country whose money had been ruined by its predecessors, and its founder, the Hongwu emperor, set out to rebuild it. Among his restoration projects was paper money. He founded an Imperial Board of Revenue and, in 1374, a treasure note control bureau to issue a new state currency: the Great Ming Circulating Treasure Certificate [C14].

The surviving notes are extraordinary objects, and the British Museum's example - printed in 1375, one guan, the value of a full string of a thousand cash - shows exactly how the Ming wanted their money understood [C13]. It is a large sheet of soft, velvety grey paper made from mulberry bark, the legally approved material, bigger than a modern sheet of A4, printed on one side from a woodblock in black ink [C14]. Bold characters across the top announce the certificate's name; a border of dragons runs round the design; and in the centre, wonderfully, is a picture of the money itself - ten stacks of a hundred coins, the thousand cash the note represents [C13][C14]. The note is a picture of a promise: paper that points at metal and says, I stand for this. And along the border runs the state's other argument, in plain characters: "To counterfeit is death. The informant will receive 250 taels of silver, and in addition the entire property of the criminal" [C14]. Terror and reward, printed on every note - the Ming understood as well as the Song had that a paper currency rests on enforced belief.

What the Ming did not do was manage the currency. The Song had spent two centuries learning to equilibrate paper and metal: capping issues, redeeming old notes, buying back paper with silver, and above all accepting their own notes for taxes, which gave everyone a reason to want them. The Ming court issued its certificates in quantity but failed at the most basic discipline of the system it had inherited - it did not collect its taxes in paper [C1]. A government that spends its notes but will not take them back is telling the market what its own paper is worth, and the market listens. The certificates depreciated severely, and although the court propped and decreed, by the early fifteenth century Ming paper money was largely defunct [C1]. Around 1425 the government suspended its use altogether; by then the paper had lost more than 99 per cent of its value against gold [C12][C14].

China then did something with few precedents in monetary history: having invented paper money and used it for four centuries, it gave it up. The populace shifted to a bullion standard of uncoined silver, weighed out in transactions, and the Ming state itself adopted silver as the basis of its fiscal accounts and taxation [C1][C14]. For roughly the next four hundred years, the

country that had shown the world how to print money did without it. When banknotes circulated in China again, in the nineteenth century, they came from private Chinese banks and foreign institutions, not from the imperial state.

There is a sharp historical irony in the timing. For five hundred years, roughly from 1000 to 1500, China ran the world's most advanced monetary system on paper while Europe clung to gold and silver coin; historians debating why the Industrial Revolution happened in Europe rather than China have had to reckon with the fact that China's precocity included fiat currency eight hundred years before Europe's first viable paper money [C1]. And then, in the fifteenth century, the paths crossed: China abandoned paper for bullion just as European banking was beginning to generate the private paper instruments - deposit receipts, bills of exchange, goldsmiths' notes - from which Europe's own paper currency would grow. The invention did not die; it emigrated. But it arrived in Europe without the Chinese memory of how paper money fails, which is why the European story, told in the next part of this book, reads so often like the Song story being learned again at full cost.

The silver standard China adopted had its own quiet costs, and they are worth pausing on, because they show what paper had been doing. Silver circulated not as coin but as bullion - ingots and fragments weighed out at every transaction and assayed for purity. Every payment became a small act of metallurgy: scales, shears and the touchstone replaced the simple reading of a printed denomination. Merchants once again needed specialists between themselves and their money, and long-distance trade once again had to move weight or find trusted intermediaries to move promises instead. Private paper did not vanish - shop scrip and remittance drafts continued to grease Chinese commerce, as they always had - but the state's grand experiment in public paper was over. The country that had invented the lightest money in the world returned to the heaviest kind, and stayed there until a very different China, in a very different world, tried again.

The retreat was not a technological failure - the Ming could print as well as the Song - and it was not proof that paper money cannot work; the Song had made it work for two hundred years. It was a fiscal and institutional failure, and the lesson China wrote across five centuries is the one every later issuer of paper money has had to learn again. Paper currency succeeds when the issuer treats its own promises as sacred: accepting them for taxes, defending their scarcity, taking them back on the terms it issued them. It fails when the issuer treats the printing press as a substitute for revenue. The Song maintained the equilibrium through discipline; the Yuan and Ming lost it through appetite. Europe, when it stumbled into paper money in the seventeenth century, would repeat the whole education - the convenience, the overissue, the collapse -

almost note for note, beginning in a country whose coins were, like Sichuan’s, simply too heavy to carry.

III - EUROPE LEARNS

Chapter 7 - The goldsmiths’ receipts

Europe reinvented paper money without knowing it had been invented before. When banknotes appeared in seventeenth-century Europe, no one involved was imitating China; the few Europeans who had read Marco Polo’s account of mulberry-bark money had filed it among his marvels. Paper money in Europe emerged the way it had in Sichuan - out of the bookkeeping of deposit banking, in a trading city where metal was inconvenient - and it followed the same logic from private promise to public institution. The English version of the story begins, as English finance so often does, with goldsmiths.

By the middle of the seventeenth century, the goldsmiths of Lombard Street had become London’s bankers. They were a natural fit for the role: men with strongrooms, scales and a reputation to protect, in a city of merchants who needed somewhere safer than a counting-house floor to keep their coin. A merchant who deposited gold with a goldsmith received a receipt, and these receipts - “running cash notes” - began to take on a life of their own [C3] [C15]. They were made out in the name of the depositor and promised to pay him on demand; crucially, many carried the words “or bearer” after the name, which meant the note itself could change hands and the goldsmith would pay whoever presented it [C15]. In those two words, European paper money was born. A receipt that pays the bearer is no longer just a record of a deposit; it is a transferable promise, and a transferable promise from a trusted house can circulate as money.

The goldsmiths, meanwhile, had discovered what the Chengdu deposit houses discovered five hundred years earlier: not everyone comes for their coin at once. They paid depositors interest on running cash and put the money to work, lending at interest to merchants - and, increasingly, to the Crown [C3] [C16]. This was fractional-reserve banking in embryo, and it worked exactly as long as confidence held. The goldsmiths’ notes circulated because everyone believed the coin was there; the coin was mostly not there, because it was out earning interest; and the whole arrangement rested on the assumption that belief and reality would never be tested at the same moment.

In practice the notes never circulated as freely as a modern banknote does. Each was written for a particular depositor and often for an odd sum; as it passed from hand to hand it accumulated endorsements, and its value depended on how well the market knew the house behind it. A Backwell note was nearly as good as coin; a note from a shakier shop changed hands at a discount. This was credit with a face and an address - paper money in the sense that paper did the work of coin, but not yet currency in the Chinese sense of a standardised promise issued by a single authority for use by

everyone. England in 1660 was roughly where Sichuan had been under the sixteen licensed houses: private paper, privately managed, waiting for someone to decide whether the state should step in.

The goldsmiths' arrangement with their depositors also contained the seed of everything profitable and everything dangerous in the banknote's future. A goldsmith who noticed that only a fraction of deposits was ever withdrawn at once could lend the rest; a banker who could issue promises beyond his coin could, in effect, create money. The margin between the interest he paid and the interest he charged was the reward for keeping the public's confidence; the risk was that confidence, once questioned, evaporates in an afternoon. Every bank run in history is that afternoon. Europe was about to learn the lesson at national scale, twice in fifty years - first in Stockholm, then in Paris - before England built the institution that made the lesson stick.

The test came from the direction no one could refuse. Through the 1660s the Crown's spending ran ahead of the revenue Parliament would grant, and Charles II's government bridged the gap by borrowing heavily from the goldsmith bankers, secured on future tax receipts. Then, on 2 January 1672, the Crown simply stopped paying. The Great Stop of the Exchequer suspended repayment of some £1.2 million owed to the goldsmiths - a sum roughly equal to the king's entire ordinary annual revenue - so that the money could fit out a fleet for the war against the Dutch [C16]. The stop was declared for one year; it stretched on for decades in the courts, and was finally settled by Parliament in 1701 at 3 per cent interest [C16]. The contemporary verdict was Bishop Burnet's: "the bankers were broken, and multitudes who had put their money in their hands were ruined by this dishonourable and perfidious action" [C16]. Some of the greatest names in Lombard Street, men like Edward Backwell, never recovered.

The Stop taught English finance two lessons that between them explain the next two centuries of paper money. The first was that a private banker who lends to the state is hostage to the state: the goldsmiths' vaults had been full of royal promises, and royal promises, it turned out, could be suspended by royal decree. The second was subtler and more consequential. England's government had destroyed its own credit with the people best placed to lend to it, at precisely the moment when its wars were growing too expensive for any other arrangement. If the state was to borrow reliably, it needed a new kind of institution - one that stood between Crown and creditors, holding the state's debt in a form lenders could trust. That institution would be the Bank of England, founded in 1694 as a direct consequence of the wreck the Stop had made [C16]. And the notes it issued - descendants of the goldsmiths' running cash notes, still bearing their promise to pay the bearer - would become the most influential banknotes in the world.

But the first true banknotes in Europe had already been printed, a generation before the Bank of England was chartered and a decade before the Stop, in a country whose problem with metal money was the most extreme in Europe. Sweden’s coins were copper, and Swedish copper coins were enormous. The man who printed Sweden’s way out of them, Johan Palmstruch, is the forgotten father of the European banknote - and his bank’s collapse, seven years after it issued Europe’s first notes, taught the same lesson the Song court had learned six hundred years before.

Chapter 8 - Stockholm Banco

The first true banknotes in Europe were printed in Stockholm in 1661, and the circumstances would have been immediately familiar to the tea merchants of Chengdu six hundred years earlier. Sweden, like Sichuan, was stuck with the heaviest money in its world. The Swedish monetary system ran on two parallel currencies, the copper daler and the silver daler, and since the copper in a copper daler had to be worth as much as the silver in a silver one, the copper pieces were prodigious - great plates of metal so heavy that serious payments moved by horse and cart [C5]. A country whose money is a cartload is a country waiting for paper.

The man who supplied it was Johan Palmstruch, a Riga-born merchant of more ambition than capital. He had twice proposed a bank to the Swedish crown in the 1650s and twice been refused; the third proposal succeeded, sweetened by an offer to pay the crown half the bank's profits. King Charles X Gustav signed two charters on 30 November 1656, creating an exchange bank and a loan bank under one roof, and Stockholms Banco opened its doors in July 1657 [C5]. The bank itself was unremarkable - a self-conscious imitation of the famous banks of Amsterdam and Hamburg - but Palmstruch had combined its two halves in a way that was new and dangerous: the deposits taken in by the exchange bank funded the loans made by the loan bank. Depositors' money, not the owners' capital, financed the lending [C5]. It was the goldsmiths' model, institutionalised, with the same built-in fragility: the deposits were short-term and the loans were long, and if depositors came for their money together, it would not be there.

The crisis that produced the banknote arrived in 1660, when the government reduced the copper content of the coinage by 17 per cent. Holders of the old, heavier coins suddenly owned metal worth more than its face value, and depositors descended on the bank to withdraw their old coins before they disappeared [C2][C5]. Palmstruch could not pay - the deposits were out on loan - and so, in 1661, he reached for paper. The bank began issuing credit notes, Kreditivsedlar, in round denominations of 5, 25, 100 and 1,000 copper daler, each one signed by Palmstruch himself and his clerks [C5].

Here is why these notes, and not the goldsmiths' receipts, count as Europe's first true banknotes. A running cash note was a receipt for a specific deposit; the note's value ended where the deposit ended. Palmstruch's credit notes were tied to no deposit at all. They were handed out as loans, backed not by coin in the vault but by the bank's general promise to pay - by nothing more, in the end, than public confidence that the bank would honour them in metal on demand [C2]. Freely transferable, in standard denominations, resting on the

issuer’s credit alone: the Sichuan formula, reinvented. The public loved them. A thousand daler in copper was a cart; a thousand daler in Kreditivsedlar went in an envelope [C5]. The notes circulated, the bank’s lending grew, and for a few years Sweden had the most modern money in Europe.

The popularity of the notes was helped by a shortage they themselves had been invented to ease. When the copper content of the coinage was cut, the old full-weight coins were snapped up and hoarded or melted faster than new ones could be minted, and for a while the country was genuinely short of money [C5]. Palmstruch’s paper filled the gap so well that the bank issued a second series in 1666 - the Palmstruchare, as they came to be called - this time in denominations of 10, 25, 50 and 100 silver daler [C5]. The bank that could not honour copper was now issuing promises denominated in silver. It is the oldest confidence trick in the paper-money book, and it has not changed in the three and a half centuries since: the issuer who cannot pay expands the promise instead.

The failure followed the Song script almost line for line. The bank discovered that it could print loans, and by 1663 lending and note issue had swollen past any plausible redemption fund; the notes began to fall in value - the phenomenon, as the Riksbank’s own history dryly notes, that we now call inflation [C2]. When holders came to redeem their notes, the bank could not pay, and from the autumn of 1663 it increasingly refused; operations ceased entirely in 1664 [C5]. The government and the Riksdag were forced to step in, winding down the loans and exchanging the notes for coin, and the liquidation of Stockholms Banco was completed in 1667 [C5]. Palmstruch was sentenced to death for mismanagement in 1668, reprieved, and died in 1671, a year after his release from prison [C2].

The epilogue is the interesting part. Sweden did not respond to the collapse by abandoning banking; it responded by nationalising it. In September 1668 the bank’s privilege passed to a new institution owned by the estates of the realm, Riksens Ständers Bank - renamed Sveriges Riksbank in 1866, and today the oldest central bank in the world in continuous operation [C5]. Europe’s first banknote issuer had lasted seven years and ended in a death sentence; its successor, owned by parliament rather than a speculator, has lasted more than three and a half centuries. The pairing is the whole lesson of the early history of paper money in one Swedish vignette. The banknote was a magnificent invention and a dangerous one, and the difference between the two was never the paper. It was always the institution behind it - who issued the notes, who stood behind the promise, and who could stop the printing.

Chapter 9 - The Bank of England and the funded note

The Bank of England was not founded to invent money. It was founded to pay for a war - William III's war against Louis XIV's France - and the money it invented was almost an afterthought, a by-product of a loan. Yet the arrangement struck in 1694 between a cash-strapped king and a syndicate of London merchants turned out to be the most durable monetary invention since the jiaozi: the national bank note, backed not by a vault of coin but by the funded debt of the state.

The deal was this. In 1694, a group of subscribers lent the government £1.2 million at 8 per cent interest, plus a £4,000 annual management fee - terms that measure exactly how ruined royal credit still was after the Stop of the Exchequer [C16]. In return, the subscribers were incorporated as the Governor and Company of the Bank of England, with the right to take deposits, discount bills, and issue notes [C16]. The arrangement solved, at a stroke, the problem the Stop had exposed. Lenders no longer had to trust the king's personal word; they trusted an institution chartered by Parliament, whose own capital stood behind its promises and whose interests were bound up with the state's. The arrangement held: the British government would not again repudiate its creditors as Charles II had in 1672 [C16].

The Bank's notes grew directly out of the goldsmiths' practice. A customer who deposited coin or bullion received a note as a receipt; the notes were handwritten on Bank paper and signed by one of the cashiers - a lineage that survives on every Bank of England note today in the facsimile signature of the Chief Cashier and the words "I promise to pay the bearer on demand" [C15] [C3]. In the early years the notes were as irregular as the goldsmiths' had been. One of the oldest survivors, dated 18 June 1697, is a handwritten fragment promising to pay the bearer twenty-two pounds - an odd sum, reflecting a deposit drawn down in two instalments of five and seventeen pounds, in a period when coin was so scarce that notes were made out for whatever amount the customer needed [C3]. For decades they remained wholesale instruments: after 1696 the Bank issued no note below £50, at a time when £50 was more than a working family's annual income [C15]. The banknote of the eighteenth century was money for merchants, not for market stalls.

Standardisation came slowly, and it is worth watching it happen, because each step marks the note becoming more like the object we know. From 1725 the notes were part-printed - the pound sign and the first digit printed, the rest filled in by hand - and by 1745 they were part-printed in fixed denominations

from £20 to £1,000 [C15]. War drove the denominations downward: the gold shortage of the Seven Years' War forced the first £10 note in 1759, and the war with Revolutionary France brought the first £5 in 1793 [C15]. Then, in 1797, came the system's greatest test. The strains of the war set off a series of runs that drained the Bank's bullion reserve, and the government authorised it to stop paying gold for its notes - the beginning of the Restriction period, more than two decades in which Britain ran on an inconvertible paper currency, with £1 and £2 notes issued for the first time to fill the gap left by hoarded gold [C15]. The promise to pay the bearer on demand was suspended, and commerce carried on regardless. It was not planned as an experiment in fiat money, but that is what it was, and its success - the notes held their value tolerably well through a generation of war - taught the nineteenth century that convertibility was a discipline, not a necessity.

The word "funded" in the funded note deserves a moment, because it names the quiet revolution. The king's old debts had been personal promises, secured on whatever revenue he chose to divert and repudiated when diversion proved inconvenient. The new national debt was funded: Parliament assigned specific tax revenues to service it, in perpetuity, and the creditors could see the money coming. The Bank of England's notes were thus doubly anchored - the Bank's capital stood behind them, and behind the Bank stood a debt secured on the taxing power of the state. A banknote had become a circulating share in the national debt itself. It is no coincidence that the country which perfected this arrangement also built the eighteenth century's most formidable machinery of war and trade; cheap borrowing and trusted paper were two faces of the same institutional fact.

One neighbouring kingdom took the model in a characteristically different direction. The Bank of Scotland, chartered in 1695 - a year after the Bank of England - became the first bank in Europe to issue its own notes successfully, and Scotland developed a tradition of competitive note issue in which ordinary retail banks, not a single national institution, put their own paper into circulation [C18]. The system was durable enough that when Westminster threatened it in the 1820s, Sir Walter Scott took up his pen under the name Malachi Malagrowther to defend the Scottish note - and won; his portrait still gazes out from Bank of Scotland notes today [C18]. Three Scottish banks issue their own notes to this day, technically not legal tender anywhere, including Scotland, and accepted everywhere in practice [C18]. It remains the most visible survival of the era when a banknote was not the state's paper but a bank's promise - which is what every banknote originally was.

The last steps toward the modern note were mechanical and aesthetic. Until 1853 every Bank of England note was signed individually by a cashier; only then did fully printed notes, signature and all, appear [C15]. The visible

accretion of security - watermarked paper, complex engraved designs, the steady enlargement of the printer’s art - belongs to a later chapter. What matters here is the model the Bank of England fixed. Sweden had shown that a private bank could print money and destroy itself; England showed that a bank bound to the state’s debt, disciplined by Parliament and by its own shareholders, could print money for centuries. The note and the national debt were twins from birth, each backing the other: the state got its loans, the public got its paper, and the banker’s promise to pay the bearer became, quietly, one of the foundations of the fiscal-military state. Every central bank since has been built on some version of that bargain. France, meanwhile, was about to demonstrate what the bargain looks like when one man is allowed to rewrite it all at once.

Chapter 10 - John Law and the first great paper collapse

If the banknote has a cautionary tale to rank with the Song dynasty's, it is the story of John Law - the Scottish gambler who, in the space of five years, persuaded France to hand him its entire monetary system, proved that paper money could move an economy like a drug, and presided over the most spectacular paper collapse Europe had yet seen. Between 1716 and 1720, Law's System built the modern idea of fiat money, inflated it into a bubble, and wrecked it so thoroughly that France distrusted banknotes for generations.

Law was an unlikely monetary revolutionary. Born in Edinburgh in 1671 into a family of goldsmith-bankers, he joined the family business at fourteen, became a celebrated gambler with a genuine talent for the mathematics of probability, and in 1694 killed a man in a duel, was sentenced to death, and escaped to the Continent [C17]. For two decades he drifted through the gambling salons and counting-houses of Europe, writing pamphlets and pitching schemes. His idea, set out in works like Money and Trade Considered, was coherent and in its way profound: money exists to move trade, a growing economy needs a growing money supply, and paper - issued by a national bank and backed by the state's assets - could supply money in a way metal never could [C17]. He was, in outline, simply right. The problem was never the idea. It was the scale, the speed, and the man.

France after the death of Louis XIV in 1715 was the perfect laboratory: rich, financially desperate, and ruled by a regent, Philippe d'Orleans, who was Law's friend. In May 1716 the Regent approved Law's private Banque Generale, which took deposits and issued banknotes [C17]. The notes were a success - they were convenient, they held their value, and they began to revive French commerce. In 1717 Law added the second half of the machine: the Compagnie d'Occident, soon famous as the Mississippi Company, which received the whole vast Louisiana territory as a fief with a twenty-five-year trade monopoly [C6]. Its shares, offered at 500 livres, could be bought entirely in depreciated government debt at face value - a device that soaked up the state's discredited paper and replaced it with shares in Law's venture [C6]. Then the acquisitions began: the tobacco monopoly, the tax farms, the mints, the East India and China companies, until by 1719 Law's Company had absorbed the entire revenue-raising capacity of the French state [C6]. In January 1720 Law became Controller-General of Finances; in February his Bank, France's first central bank, was merged into the Company [C17][C6]. One man now controlled France's money, its debt, its taxes and its colonial trade.

For a few astonishing months it looked like genius. The shares, traded in the open-air market of the rue Quincampoix, climbed from 500 livres to twenty times that and more; Paris went mad for paper; the word millionaire entered the language [C6]. But the machine had a fatal circularity at its heart: the Bank printed notes to support the Company's share price, and the Company's prospects justified the notes. When price inflation began to surge in 1720, Law tried to hold the share price at 9,000 livres by decree, and then, on 21 May, to engineer a controlled reduction in the value of both the shares and the banknotes themselves - a measure so destructive of public trust that it was reversed within six days, too late [C17]. The public rushed to convert their paper into coin, and there was not nearly enough coin. The System collapsed through 1720; the Company went into government receivership in 1721, and Law fled France, dying in Venice in 1729 with little left but his reputation [C6][C17].

The mechanics of the collapse repay a moment's attention, because they recur in every later paper-money disaster. Law's Bank issued notes to lend to the state and to support the Company; the Company's rising shares were accepted as security for more borrowing; the borrowing bought more shares. While confidence held, the circle was virtuous: France's crippling debt was consolidated, commerce revived, the currency was abundant and trusted. The moment confidence broke, every link reversed at once. Falling shares undermined the notes that had bought them; falling notes drove holders to demand coin; the demand for coin exposed how little of it there was. Law's decree of 21 May 1720 - announcing that the paper would be progressively devalued - was an attempt to manage the reversal by law, and it detonated the one asset the System could not print: belief. Reversed within a week, it served only to prove that the Regent's government itself no longer believed its own paper.

The lessons were the Song lessons, relearned at continental scale and engraved on European memory. A paper currency is only as sound as the issuer's restraint; tying the currency to the price of a speculative asset is ruin; and decree cannot prop up a price the public has stopped believing. What was newer was the demonstration of fiat money's power even in failure. Law had shown that paper could energise an economy - French trade genuinely quickened under his notes - and that its collapse need not be the collapse of the state: historians still debate whether the unwinding of his System even counted as a sovereign default [C17]. Europe drew a simpler conclusion. Banknotes, said the French experience, were a swindle; banknotes, said the English experience twenty-five years earlier, were the foundation of the national credit. For the next century, the two models - Law's catastrophe and the Bank of England's discipline - framed every argument about paper money,

and the argument itself crossed the Atlantic to the colonies where the banknote’s next chapter was already being written.

IV - AMERICA AND THE MODERN NOTE

Chapter 11 - Colonial currency and the Continental

Paper money crossed the Atlantic not as a theory but as an emergency measure, and it kept that character for a century and a half. The American colonies were chronically short of coin: Britain kept its colonists on a tight monetary leash, expecting specie to flow home to settle trade balances, and the coins that actually circulated were a polyglot jumble of Spanish dollars and Portuguese pieces, supplemented - when even those ran out - by commodity money: tobacco in Virginia, beaver pelts in the north, wampum in New England [C19]. A colonial government that needed to pay soldiers and could not tax coin it did not have reached, inevitably, for paper.

The first issue came from Massachusetts. On 10 December 1690, the Province of Massachusetts Bay emitted bills of credit to pay for a military expedition in King William's War - the first authorised paper money issued by any government in the Western world [C19]. The oldest surviving bill is dated 3 February 1690, for twenty shillings [C19]. The device was elegant and became the colonial standard. The bills were not convertible into coin on demand; they were promises payable at a future date, issued to pay the government's debts, and retired by being accepted back for taxes [C19]. The Song formula - issue paper, accept it for taxes, withdraw it on schedule - had been reinvented again, in a place that had never heard of the Song.

It worked, within limits, and the limits were instructive. Each colony issued its own pounds, worth different amounts and all worth less than sterling; a Massachusetts pound was not a Pennsylvania pound [C19]. Colonies that printed responsibly, retiring their bills through taxation, kept their paper near par; colonies that printed freely watched it sink. The losers were often British creditors, repaid in depreciated colonial paper, and their complaints reached Parliament, which passed Currency Acts in 1751 and 1764 to restrict colonial paper - first in New England, then throughout the colonies, forbidding the bills from being made legal tender for private debts [C19]. The quarrel over paper money became one of the standing grievances of imperial politics: the colonists needed a medium of exchange, the mother country feared a medium of evasion.

Then came the Revolution, and paper money on a scale the colonies had never attempted. The Continental Congress, fighting the world's greatest military power with no taxing authority worth the name, paid for the war with printing presses. Between 1775 and the war's end, Congress issued some $199,990,000 in Continental currency, in denominations running from a sixth of a dollar to eighty [C19]. The states went on issuing their own bills of credit

alongside, uncoordinated, which meant the continental competed with a dozen state currencies for the public's shrinking confidence [C19]. The result was the classic fiscal collapse. By the end of 1778 the continental retained between a fifth and a seventh of its face value; by 1780 it was worth a fortieth; by May 1781 it had ceased to circulate as money at all [C19]. "Not worth a continental" entered the language, where it remained for two centuries.

The collapse had a vicious accelerant that foreshadows a later chapter of this book: enemy counterfeiting. The British waged economic warfare by forging Continentals on a large scale and circulating them from occupied New York. Benjamin Franklin, who had himself printed colonial currency years before, wrote that "the artists they employed performed so well that immense quantities of these counterfeits which issued from the British government in New York, were circulated among the inhabitants of all the states, before the fraud was detected" [C19]. Counterfeiting as an act of war - invented long before, practised here with industrial thoroughness - would reach its terrible perfection in a Nazi concentration camp a century and a half later.

The financial lesson the founders drew was written straight into the Constitution. The individual states were forbidden to issue bills of credit or to make anything but gold and silver coin a tender in payment of debts [C19]. The memory of the continental was so raw that the new republic built its monetary house on metal - and then discovered, within a generation, that it could not live there. The Constitution restrained the states, but as the Supreme Court would eventually confirm in Juilliard v. Greenman, it said nothing to deny Congress itself the power to issue paper and make it legal tender [C19]. That reservation, unnoticed at ratification, would become the legal foundation of the modern dollar when civil war forced the federal government to print again.

Chapter 12 - Greenbacks and the national bank notes

The United States went into the Civil War with no national paper currency at all. Since the Constitution had barred the states from issuing bills of credit, American paper money was bank money: notes issued by hundreds of state-chartered and private banks, nominally redeemable in specie, overseen so loosely that “wildcat banking” - fraudulent houses issuing worthless notes from places where no one would come to redeem them - had become a byword [C21]. A merchant accepting an unfamiliar bank’s note needed a subscription to a bank-note reporter and a strong stomach. It was a system made for commerce among strangers, and it broke down exactly when the country needed to mobilise for war.

The Union’s financial position in 1861 was desperate. The government was borrowing from private banks at rates of up to 12 per cent, with some banks demanding 36 [C20]. In July 1861 Congress authorised $50 million in Demand Notes - Treasury paper bearing no interest, redeemable in coin on demand, and printed, for the first time in American practice, on both sides, the reverse in green ink [C20]. The “greenback” was born, though the name would soon migrate to a bolder descendant. Demand notes were still tied to the promise of coin, and there was not remotely enough coin to redeem them. The man who said the quiet part out loud was Colonel Edmund Dick Taylor, an Illinois businessman serving as a volunteer officer, who met Lincoln in January 1862 and proposed issuing paper money backed by nothing at all [C20].

On 25 February 1862, Congress passed the first Legal Tender Act, and the United States Note - the true greenback - came into being: government paper, not redeemable in specie, declared by law to be legal tender for all debts public and private, with two revealing exceptions. Greenbacks could not be used to pay customs duties, the government’s main revenue, or interest on the national debt; those still required gold [C20]. Even at the moment of creating fiat money, the government exempted itself from having to eat its own cooking where it mattered most. The far west simply refused the experiment: California and Oregon, flush with gold from the mines, blacklisted merchants who accepted greenbacks at face value, and California banks would not take them for deposit [C20].

The greenback’s value against gold became the war’s ticker tape. It sank through 1862 until gold stood at a 29 per cent premium, fell further in the spring of 1863 to $152 against $100 in gold, rallied after Gettysburg to $131, and slid again as Grant ground bloodily forward in 1864 [C20]. A note’s

exchange rate was the public's judgment on the Union's chances, repriced with every bulletin. Yet the essential fact is that the paper never collapsed the way the continental had. Congress issued hundreds of millions of greenbacks, the currency depreciated but functioned, and the war was paid for [C20]. The difference from 1776 was institutions: a real Treasury, real taxes, and a government whose survival - this time - the creditors expected.

The war produced a second monetary invention alongside the greenback, quieter and just as consequential. The National Bank Acts of 1863 and 1864 created a system of federally chartered banks whose notes, the National Bank Notes, were backed by United States bonds deposited with the Treasury: a bank could issue notes up to 90 per cent of the value of its deposited bonds, maintaining a 5 per cent redemption fund [C21]. The design was deliberate financial engineering - it created a guaranteed market for government bonds at the moment the government most needed to sell them, a monetisation of the federal debt with the bond interest flowing to the banks as their reward [C21]. Each note carried the issuing bank's charter number and its officers' signatures, keeping the old bank-note tradition alive inside a federal frame. And in March 1865, Congress drove the point home with a prohibitive 10 per cent tax on the notes of state banks, deliberately sweeping the old wildcat paper out of circulation [C23]. For the first time, the United States had something like a uniform national currency.

The legal foundations took another twenty years to settle. The Supreme Court's answer came finally in Juilliard v. Greenman in 1884: the Constitution's ban on state bills of credit implied no restriction on Congress, which could issue paper and make it legal tender in peace as in war [C19]. The greenback, born as an emergency, had become a permanent feature of American money - United States Notes would remain in issue until 1971. And the National Bank Notes lasted until the 1930s, when a final consolidation retired them and left the field to the note Americans carry today: the Federal Reserve Note, child of the next great banking crisis and of the long American argument about who should be trusted to print the country's money.

Chapter 13 - The Federal Reserve note

The note in an American wallet today descends from the panic of 1907. That crisis - a cascade of bank runs stopped only when J.P. Morgan locked the country's leading bankers in his library until they agreed to a rescue - convinced even a nation allergic to central banking that it could not keep improvising its way through financial panics. The answer, after years of argument, was the Federal Reserve Act of 1913, and with it a new national paper money: the Federal Reserve Note [C22].

The design of the note expresses the compromises of the institution that issues it. Federal Reserve Notes are not issued by the Treasury; they are liabilities of the twelve regional Federal Reserve Banks and, simultaneously, obligations of the United States government - a deliberate blurring of public and private that is very American [C22]. They carry the engraved signatures of the Treasurer of the United States and the Secretary of the Treasury, as if the government itself had signed each bill, which in a formal sense it has [C22]. They were born convertible: the 1913 Act provided for redemption in gold or "lawful money", a category left conveniently vague [C22]. The Emergency Banking Act of 1933, in the depths of the Depression, cut the gold link for domestic holders, and since then the note's promise to pay has meant, as on the Bank of England's notes, a promise to pay in more of the same notes [C22]. The words each bill actually bears are the fiat formula: "This note is legal tender for all debts, public and private" [C22]. The promise to pay has become the declaration that payment, in paper, is final.

The physical currency took its modern form in 1928, when the notes shrank from the large "horse blanket" format to the size used ever since - a size borrowed, improbably, from the Philippine peso silver certificates issued under the American colonial administration, which had proved handy in circulation [C22]. In the same years the currency consolidated: National Bank Notes were retired in the 1930s, and the field was left to Federal Reserve Notes, with United States Notes and silver certificates trailing behind until they too were discontinued [C21][C22]. One design decision made then has proved remarkably durable: the familiar gallery of portraits - Washington on the one, Lincoln on the five, Hamilton on the ten, Jackson on the twenty, Grant on the fifty, Franklin on the hundred - has been essentially fixed since 1928, an anchor of stability in a currency that changes its security features constantly.

The making of the modern note is an industrial system of impressive scale. The Bureau of Engraving and Printing, a Treasury bureau, prints the notes; the Federal Reserve Banks order new notes as circulation requires, pay the BEP

the production cost, and post collateral - mostly Treasury and mortgage securities - for the notes they issue [C22]. The paper is itself a product: a blend of 75 per cent cotton and 25 per cent linen made exclusively for the purpose by Crane Currency of Dalton, Massachusetts, the descendant of the firm that has supplied American currency paper since the nineteenth century [C22]. At the other end of the life cycle, unfit notes are shredded by the Reserve Banks in astonishing quantity - some seven thousand tons of worn currency destroyed each year [C22]. Notes live different lives by denomination: as of 2018 a dollar bill survived in circulation an average of 6.6 years and a hundred-dollar bill 22.9, because hundreds are hoarded rather than spent [C22]. The banknote, remember, is a bearer instrument that settles by itself; the $100 bill has become the world's favourite way of holding value outside any banking system, which is a story of its own, told later in this book.

With the Federal Reserve Note, the banknote's long invention was complete. Every element had been assembled: the Song discovery that paper can be money if the issuer accepts and defends it; the European discovery that the issuer must be an institution, not an adventurer; the American discovery that a whole continent can run on a single trusted paper. What remained was the war the note has fought ever since - against the counterfeiter, against the printing press in the hands of desperate governments, and lately against the possibility that money might leave paper behind altogether. The next part of this book takes the note apart and looks at how it is actually made.

V - THE MAKING OF A BANKNOTE

Chapter 14 - The paper

Pick up a banknote and the first security feature is the one between your fingers. Banknote paper is not paper in any ordinary sense. It contains no wood at all: it is made from cotton - usually about three-quarters cotton and one-quarter linen, the exact recipe for United States currency paper, which is made by a single company, Crane Currency of Dalton, Massachusetts [C22]. The difference is instantly physical. Banknote paper is stiff and crisp, with a characteristic snap when flexed; it survives being folded, crumpled, laundered and carried in a wallet for years; and it holds a watermark and embedded threads that ordinary paper cannot. A dollar bill lasts in circulation only about six and a half years even so, and a hundred-dollar bill nearly twenty-three [C22] - longevity bought by engineering the sheet itself.

The cotton paper tradition is American in its modern form, but it descends from the oldest security technology in the business: the watermark. Papermakers in Bologna were marking their sheets as early as 1282, fixing a bent wire in the shape of a letter or symbol to the mould so that the fibres lay thinner there and the design showed when the sheet was held to the light [C29]. The watermark was born as a maker’s trademark; on a banknote it became a proof of authenticity - an image inside the paper itself, formed at the moment of manufacture, that no printer’s ink can imitate. The elaborate modern version, in which raised and recessed areas of the mould create a portrait in graduated light and shade, is still made on exactly the Bologna principle [C29].

The American story begins with a papermaking family in western Massachusetts. Stephen Crane supplied paper for the first United States securities during the Revolutionary War - the plates for them were engraved by Paul Revere, moonlighting from the midnight ride [C24]. His son Zenas built a mill catering to banks and printers, and Zenas’s son in turn devised a method of embedding silk threads vertically in the paper to mark the denomination [C24] - the ancestor of the security thread in nearly every modern note. In 1879, at the age of twenty-six, W. Murray Crane won the contract to supply paper for United States banknotes [C24]. Crane-made paper has carried the dollar ever since, through the greenback era, the National Bank Notes, and every series of Federal Reserve Notes [C22][C24].

A modern banknote substrate is a security system before a drop of ink touches it. The cotton-linen sheet takes the watermark; security threads - ribbons of metal or plastic, sometimes microprinted, sometimes colour-shifting - are woven into the paper as it forms; invisible fluorescent fibres are scattered through the pulp to glow under ultraviolet light. Crane’s own innovations

include the first demetallised security thread and the MOTION thread that debuted on the Swedish thousand-kronor note, with images that seem to move as the note tilts [C24]. When Sweden’s central bank outsourced its banknote production in 2002, it was Crane that took over Tumba Bruk, the mill outside Stockholm that had been making Swedish banknote paper since 1755 - so the company that began with Paul Revere’s plates ended up owning the paper mill of the country where Europe’s first banknotes were printed [C24]. The history of the banknote keeps folding back on itself like that.

The substrate matters so much because counterfeiting begins with imitation paper, and imitation paper is where most forgeries fail. A casual passer of fake notes is detected by feel - the crispness, the raised ink that comes later - before anything else. Even the polymer alternative, which Australia pioneered and which has since spread across the world, is best understood as another answer to the same question the Bologna papermakers answered with wire and water: how to build the proof of authenticity into the material of the money itself. That revolution in the substrate - plastic instead of rag - gets its own chapter. First, the ink.

Chapter 15 - The engraver’s art

The line that defends a banknote is a line you can feel. Run a thumb across a new note - across the portrait, the denomination, the decorative borders - and you feel ridges of ink standing on the paper. That is intaglio printing, the heart of banknote security for two centuries and the reason a genuine note is so hard to imitate: the printing process itself shapes the paper, leaving ink in raised relief that no commercial press, photocopier or desktop printer can reproduce [C25].

Intaglio - from the Italian for engraving - inverts the logic of ordinary printing. A normal printing plate carries ink on its raised surfaces; an intaglio plate carries ink in grooves cut into the metal. The plate is inked and then wiped, so that ink remains only in the engraved lines; the paper is then forced against the plate under enormous pressure, squeezing into the grooves and pulling the ink out onto its surface. The result is the characteristic banknote line: sharp, slightly raised, rich in colour, with a tactile quality that users learn to trust without thinking about it [C25]. The process is an old artistic one - intaglio engraving has been a medium of fine art since the Middle Ages - and on a banknote it does double duty, supplying at once the note’s beauty and its first line of defence [C25].

The craft begins with the engraver. Traditionally, the portrait on a banknote was cut by hand into a steel die, line by line, by one of a small guild of specialists - the most exacting branch of commercial art, since a slip of the burin across months of work could not be erased. The engraved die was then hardened and used to make the printing plates. Modern banknote production has added machines without abolishing the craft: computerised engraving systems, like the FIT technology developed by the German printer Giesecke+Devrient, combine laser engraving with digital control to cut lines of a fineness and complexity beyond any human hand - including translucent, multi-tonal structures that are themselves security features [C25]. But the design of a banknote still begins with artists, and the portrait still has to be engraved, by hand or by machine, into something that will hold ink in a groove.

Around the intaglio core, a modern note is printed by several presses in succession, each laying down a different layer. Offset lithography prints the background colours and fine rainbow patterns - the smoothly blended colour fields whose exact registration is hard to copy. Intaglio adds the portrait, vignettes and raised elements. Letterpress prints the serial numbers, each note unique. Special silk-screen processes apply the optically variable inks - the colour-shifting patches that change from green to blue or bronze to green as

the note is tilted, effects produced by inks containing microscopic interference flakes that are simply not available commercially [C25]. And through or over it all go the machine-readable features: magnetic inks, infrared-absorbing patterns, and ultraviolet-fluorescent elements like the two-colour images in De La Rue's GEMINI feature, invisible in normal light and glowing under UV [C26].

The whole elaborate edifice answers a single question, posed perfectly by a Kodak representative at the Australian think tank in 1968 that eventually produced the polymer note: if the new banknotes could be photographed, they could be printed, and if they could be printed they could be forged [C27]. Every security feature on a modern note is a way of making the note defeat the camera and the scanner - things that change with viewing angle, things that live inside the paper, things visible only under other light, things a machine can read that no eye can see. The engravers and printers cannot make forgery impossible; they can only keep the cost of a good fake above what a forger can profitably pay. It is an arms race, and like all arms races it never ends. The counterfeiter is always the second-best printer in the world, and the distance between first and second is the entire security of the currency.

Chapter 16 - The security arsenal

A modern banknote carries its defences in layers, engineered for different examiners. The first layer is for the public - features a shopkeeper can check in a second without equipment. The second is for machines - the counting and sorting devices in banks and cash centres. The third is for the issuing authority itself: covert features, read only by special sensors, that let a central bank measure the quality of its own currency and detect sophisticated fakes. The architecture is deliberate: the public layer must be easy to use and impossible to photograph, the machine layer must be fast and reliable, and the covert layer must stay secret [C25][C26].

The public features are the ones everyone half-knows. The watermark, in the paper since Bologna in the thirteenth century [C29]. The security thread, embedded in the sheet - once plain metal, then microprinted, now demetallised and colour-shifting, with moving micro-optical images like Crane’s MOTION thread or De La Rue’s KINETIC effects [C24][C26]. The intaglio relief you can feel. The see-through register - an incomplete design printed on each side that aligns perfectly only when held to the light. Microlettering: lines of text so small they reproduce as smudges in a copy. And the optically variable inks that change colour as the note tilts [C25]. Every one of these is a way of telling the holder: you can check me yourself, right now.

The most quietly effective public defence is one nobody is meant to notice. Modern colour photocopiers and image-editing programs refuse to copy many recent banknotes at all, and they decide what counts as a banknote partly by hunting for a small geometric pattern - five tiny circles in a specific arrangement, called the EURion constellation - that has been printed, in various disguises, into the designs of a large number of the world’s currencies [C30]. The pattern was kept secret for years and was only publicly described after researchers at Cambridge reverse-engineered it in 2002 [C30]. It is the banknote defending itself at the moment of attempted reproduction, in the copier’s software, before any human judgment is involved.

The machine layer works invisibly. Banknote sorting machines read magnetic inks, infrared patterns and ultraviolet fluorescence at speed, authenticating and counting simultaneously; central banks embed features readable only by their own sensors - De La Rue’s ASSURE is an example of this third level of security built into a note’s substrate [C26]. These covert layers serve a strategic purpose beyond catching fakes: they let the issuer monitor the quality of the currency in circulation, decide when notes are too worn to reissue, and keep a reserve of undisclosed tests that counterfeiters cannot know they are failing.

All of this is the state of a war, not a settled peace. The security printer’s problem is that every defence is published the moment it is issued, in the sense that the genuine article is in every pocket for study. The counterfeiter needs to fool only the next shopkeeper, or only the next counting machine; the issuer must fool-proof a billion transactions. The escalation runs through the whole history of the note - from the multiple seals of the jiaozi, through the engraved lathe-work of the nineteenth century, to threads, windows, holograms and colour-shifting inks - and its most radical recent move has been to change the battlefield itself: to abandon paper for a substrate that cannot be photographed, cannot be printed at home, and carries a window you can see through. That is the polymer story, and it begins, appropriately, with a counterfeiting crisis.

How well does the arsenal work? Better than most people guess. The European Central Bank counted 554,000 counterfeit euro banknotes withdrawn from circulation in 2024 - about 18 fakes per million genuine notes, with the fifty-euro note the most imitated [C51]. The Bank of England reported that in 2025 typically less than one banknote in 24,390 was counterfeit, and it credits the fall since 2019 to the very defences in this chapter - polymer notes, retired paper designs - alongside police work and the spread of electronic payments [C52]. For the dollar, the most recent official ratio is older: the Secret Service estimated in 2013 that less than 0.01 percent of the currency in circulation was fake [C53]. These are the fruits of a quiet victory. Counterfeiting has not been abolished - it never can be - but in the rich world’s currencies it has been pushed from a mortal threat to a rounding error, one redesign at a time.

Chapter 17 - Polymer: the reinvention of the banknote

The most radical change in the banknote since the Bank of England's part-printed notes of 1725 came from a counterfeiting embarrassment in the Antipodes. In 1966 Australia converted to decimal currency with a handsome new series of paper notes carrying what was then the state of the art - watermarks, metal threads, intaglio printing. Within about a year, good forgeries of the ten-dollar note were in circulation [C27]. The Governor of the Reserve Bank of Australia, H.C. "Nugget" Coombs, responded not by adding another feature to paper but by asking whether paper could be beaten altogether. In 1968 he convened a small think tank of CSIRO and university scientists at the alpine resort of Thredbo - the invitations, with fine scientific humour, were dated 1 April, and described the topic only as "some aspects of banknote printing" [C27][C28].

The decisive insight came at that meeting, from a Kodak representative: if the new banknotes could be photographed, they could be printed and forged [C27]. Two scientists, Dave Solomon and Sefton Hamann, drew the conclusion that changed banknote history. To beat the camera, a note needed something a camera cannot capture - a feature that changes its appearance when the viewing angle changes, what became known as an optically variable device, or OVD: a diffraction grating, a hologram, an element whose image shifts or moves as the note tilts [C27]. And Solomon then made the leap from feature to substrate. Paper could not hold such devices properly; the note would have to be made of plastic. No suitable commercial film existed, so CSIRO's team developed its own laminate, which could be opacified, printed by conventional methods, and given a clear see-through window - a feature no paper could ever offer [C27].

Proving it could be made was almost as hard as inventing it. Banknotes cannot be field-tested; a failed note in circulation is a scandal. Solomon's team, eventually thirty-one strong, built a secret pilot production line in Port Melbourne and printed the equivalent of fifty million banknotes and over a million OVDs simply to demonstrate that the concept was manufacturable at scale [C27][C28]. To simulate the punishment of circulation, they invented the Turbula test: notes weighted at the corners and tumbled in a kerosene drum with synthetic dirt, abrasive beads and artificial sweat, a rough-and-ready torture that proved remarkably accurate at predicting real-world life [C27]. The test notes themselves carried a joke with a security purpose: they were printed in denominations of three and seven dollars, values no Australian currency had, so that any lost sample would announce itself as a test piece

[C27]. The banking industry, conservative by profession, took years to convince; the breakthrough came in 1982, when the new RBA Governor, Bob Johnston, took part in a blind feel test of polymer against paper - and chose the plastic [C28].

The world saw the result in 1988: a commemorative ten-dollar note for Australia's bicentenary - the first circulating banknote on modern polymer substrate, after earlier experiments with plastic-based Tyvek notes in Haiti, Costa Rica and the Isle of Man had failed to catch on - "the next best thing to a field trial" [C27][C59]. The public accepted it; the note outlasted paper several times over; and by 1998 Australia had converted its entire currency to polymer, the first country in the world to do so, with savings estimated at more than twenty million dollars a year from the notes' longer life [C27]. In 1996 the technology went commercial as Securency, a joint venture between the Reserve Bank and the film-maker Innovia; by 2009 it was supplying more than twenty-five countries, with over three billion polymer notes in circulation [C27]. Today polymer banknotes are used in more than fifty countries on more than 150 denominations - Australia, Canada, New Zealand, Vietnam, much of the Pacific and the Caribbean, and, since 2016, the United Kingdom, where the Bank of England's five-pound note went plastic [C28][C52].

Polymer did not abolish the forger, but it changed what forgery costs. A polymer note's clear window, optically variable devices and printed features form a combination that defeats photography, home printing and most professional imitation; the notes stay cleaner, survive longer, and carry their security where everyone can see it - literally, through the note. The substrate wars are the banknote's oldest story retold: the Song sealed their paper, the Ming printed death threats on theirs, the Bolognese wired watermarks into the mould. Australia answered the same question with chemistry, and the note that began as tree bark in Chengdu is now, in a growing share of the world's wallets, a film of engineered plastic.

VI - THE ART OF THE NOTE

Chapter 18 - Design and symbolism

A banknote is the most widely distributed artwork a nation produces. No painting, anthem or postage stamp is handled as often, examined as closely, or carried as far. The choice of what goes on the note - whose face, which building, what scene - is therefore never merely decorative. It is a state deciding, in public, what it wants to be told about itself, several billion times over. That is why banknote design is a curiously serious business, why redesigns make front pages, and why people fight about portraits.

The classic banknote iconography is the portrait, and the classic subject is the national pantheon. The United States fixed its gallery in 1928 and has barely touched it since: Washington on the one, Lincoln on the five, Hamilton on the ten, Jackson on the twenty, Grant on the fifty, Franklin on the hundred - founders and presidents, stability itself, engraved in steel [C22]. Britain came to historical portraits only in 1970, but then with the governor’s personal approval of each “great Briton” - Newton, Elgar, Nightingale among them [C15]. The politics of the choice are real: when the Bank of England announced in 2013 that Winston Churchill would replace the prison reformer Elizabeth Fry on the five-pound note, leaving no woman but the Queen on any Bank of England note, the public outcry was instant, and the incoming governor Mark Carney responded by putting Jane Austen on the ten and launching a review of the whole selection process [C15]. Nations argue about their money because money is where the nation depicts itself.

The euro is the great exception that proves the rule. A currency for a union of nations could put no real person, place or monument on its notes without offending the others - so the European Central Bank’s design competition, won in 1996 by the Austrian Robert Kalina, produced architecture that exists nowhere: stylised windows and gateways on the front, imaginary bridges on the back, each denomination in a different historical style from classical to modern [C34]. The bridges were pure invention - symbols of connection between peoples, deliberately unbuildable. (Reality later intruded charmingly: a Dutch town subsequently built the fictional bridges as a housing development, so the euro’s imaginary monuments now exist after all.) The first series, issued when the notes entered circulation in 2002, was replaced from 2013 by the Europa series, which added a hologram of the mythological Europa to the watermark - a face, at last, but a safely mythical one [C34]. The euro’s design is a masterpiece of diplomatic geometry: seven denominations, identical across the eurozone, signed by the ECB’s president, naming the bank in five linguistic variants, showing a map of a continent whose membership kept growing around the printed borders.

Scotland offers the counterpoint: money as assertion of difference. The Bank of Scotland has printed its own notes since 1695, and three Scottish banks issue notes today that are not, technically, legal tender anywhere - yet circulate everywhere in Scotland on trust and habit [C18]. When London threatened the Scottish note issue in the 1820s, Sir Walter Scott defended it in print as Malachi Malagrowther, and the Bank of Scotland still puts his face on every note it issues - a portrait that is itself a political statement two centuries old [C18].

Beneath the politics lies the craft, and the craft has its own logic. A banknote design must work at arm’s length and under a loupe; must carry the security features - watermark, thread, hologram, colour-shifting ink - as integral elements of the art rather than afterthoughts; must distinguish denominations by size and colour so that the blind and the hurried can tell them apart; and must survive being crumpled in a million pockets while still looking like the full faith and credit of the issuer. The printers speak of design, substrate, features and printing as a single integrated system [C26], and the great series achieve exactly that unity: the euro’s imaginary bridges carry its holograms, the dollar’s familiar portraits sit in frames of microprint and colour-shift. The note is a poster, a passport and a puzzle in one rectangle of cotton or polymer - and every square millimetre of it is doing work.

VII - THE COUNTERFEITERS

Chapter 19 - The classic forgers

Counterfeiting is the banknote’s shadow - as old as the note itself, and defined by the same property that makes the note work. A coin could be weighed and bitten; a banknote’s whole value rests on the printed promise, so the note was born needing defences. The jiaozi were stamped with multiple seals against forgery [C4]; the Ming certificates threatened counterfeiters with death and offered informants the criminal’s entire estate [C14]; Marco Polo reported that forging the Khan’s paper was punished with death [C11]. Where the state’s promise is its money, attacking the promise is attacking the state, and the law has always treated counterfeiting accordingly: as treason, not mere fraud.

England’s greatest counterfeiter made his career in the chaotic decades when hammered coin was giving way to milled money and paper. William Chaloner, born a weaver’s son in Warwickshire in 1650, was apprenticed in Birmingham - then notorious for coining - where forged “Birmingham groats” circulated in quantity [C32]. He worked his way up through guineas and French pistoles to banknotes and lottery tickets, recruited engravers and moulders, and grew rich enough to keep a house in Knightsbridge and ride about in a carriage. Isaac Newton, who pursued him for years, described the transformation with controlled fury: “A Jappaner in clothes threadbare, ragged and daubed with colours, turned coiner and in a short time put on the habit of a gentleman” [C32].

The pursuer matters as much as the pursued. Newton, the greatest scientist alive, served as Warden and then Master of the Royal Mint, and he took the defence of the currency as seriously as he took gravitation. He interviewed informers in taverns and prisons, built cases methodically, and sent coiners to the gallows. Chaloner was his most formidable opponent - a forger so accomplished, wrote the Mint’s historian Sir John Craig, that “it galled him to spoil their perfection by use” of his dies [C32]. Chaloner even tried to play both sides, offering Parliament and the Mint his expert advice on defeating counterfeiters - men exactly like himself. Newton was not amused, and in March 1699 Chaloner went to Tyburn to be hanged for high treason [C32]. The case fixed the pattern for three centuries of currency defence: the forger’s art against the state’s science, fought through paper, plates and informers.

What the classic forgers established was the economics that still govern counterfeiting. A forged note must be good enough to pass, cheap enough to profit, and distributed without leading back to the press. The hand-engraved banknote raised the cost of entry exactly as intended: forging a guinea needed a mould; forging a fine intaglio note needed an engraver of genius. The great counterfeiters were therefore always craftsmen first - engravers, printers,

metallurgists - and the history of the crime is a backhanded history of the technology. Every new security feature selected for a new class of forger: the gifted amateur gave way to the professional print shop, and the print shop, in the twentieth century, to the state. The most dangerous counterfeiter was never the criminal in a Birmingham attic. It was the enemy government with a printing works at its disposal - and it was the twentieth century that proved it.

Chapter 20 - Operation Bernhard

The largest counterfeiting operation in history was run not by criminals but by a government, from inside a concentration camp. In 1942, Nazi Germany revived a dormant plan - first sketched in 1940 as Operation Andreas - to forge British banknotes on an industrial scale: partly to pay spies and buy supplies including gold, and partly in the hope that flooding Britain with fake money would destabilise its economy [C31]. The operation took its name from the SS officer in charge, Major Bernhard Krueger, and the men he assembled to do the work were prisoners, chosen for skills the Reich needed and meant to dispose of.

Krueger's team of 142 Jewish prisoners at Sachsenhausen, north of Berlin, included engravers, printers, graphic artists and bankers [C31]. Their task began with analysis. The British notes of the day were elegant and austere - black printing on one side of white cotton-rag paper, a small Britannia vignette in the corner, a design little changed since 1855 [C31]. Their security lay in subtleties: deliberate, minor defects, different for each denomination, introduced as secret marks. The prisoners studied quantities of genuine notes until they had identified about 150 of these marks, engraved the Britannia vignette to perfection, mastered the printing process and forged the signatures [C31]. Paper was the hardest problem: banknote paper has a watermark and an unmistakable feel, and the Germans experimented until they produced a sheet that matched both. The finished notes then had to be aged - rubbed and folded by dirty hands until they carried convincing wear [C31].

The forgeries they produced - £5, £10, £20 and £50 notes - were superb, among the finest counterfeits ever made. What defeated them was not the printing but the bookkeeping. The Nazis never cracked the Bank of England's serial-number system, and were reduced to reusing numbers from genuine notes; the Bank recorded the serials of withdrawn notes, and in 1943 a counterfeit surfaced through a British bank in Morocco and was caught [C31]. The paper, the plates, the ageing - everything the craftsman's eye could master, they had mastered. The forgeries failed on a clerical procedure, which is exactly how currency defence is supposed to work: the layers are designed so that beating one reveals another.

As the war turned, the operation's purpose curdled from economic warfare into finance: the forged notes bought gold, paid agents, and kept intelligence operations funded. When defeat became inevitable, the prisoners were moved from Germany to Austria to continue production - and, no doubt, to be silenced at the end. American forces liberated them on 6 May 1945 [C31]. The counterfeiters of Sachsenhausen survived, many of them, precisely because

they had been too useful to kill; several later testified to what they had been forced to do.

Operation Bernhard changed the banknote's strategic position forever. It proved that a determined state, with enslaved expertise and no scruples, could duplicate another country's currency well enough to fool banks - and it taught every issuing authority the lesson that still drives banknote design: security cannot rest on any single feature, however clever, because a state-level adversary can replicate any single feature. The modern banknote's layered defence - public features, machine features, covert features, numbering systems - descends directly from what the Bank of England learned in 1943. After the war the problem did not disappear; it globalised. The dollar replaced the pound as the world's reserve currency, and the superdollar replaced the Bernhard pound as the forger's supreme target.

Chapter 21 - The superdollar and the state forger

The hundred-dollar bill is the most counterfeited banknote on earth, and the reason is arithmetic: it is the highest-value note in the world’s most widely held currency, circulating by the billion far beyond America’s borders, accepted everywhere and examined nowhere as carefully as at home. Sometime in the late 1980s, a new class of fake began to appear - counterfeits so good they earned their own name. The superdollar, or supernote, was a forged hundred printed by the intaglio process on cotton-linen paper, recreating the genuine note’s security fibres, security thread and watermark - made, that is, with the same industrial equipment as the real thing [C33].

What made the supernotes sinister was precisely their quality. Conventional checks caught many of them, but only because the forgeries contained minute flaws - and the flaws documented the forger’s relentless refinement. On the genuine hundred, the left base line of the lamppost on the reverse is weak; early supernotes printed it too distinctly, making the fake crisper than the original, and later versions over-corrected by removing the line altogether. A spurious slash appeared beside the N of UNITED STATES; the clock hands on Independence Hall differed [C33]. By 2006, investigators had catalogued nineteen distinct families of supernotes, each marking another production source or another correction [C33]. These were not the work of gifted amateurs. Intaglio presses, engraved plates and genuine-specification paper pointed, as at Sachsenhausen, to a state.

Whose state was never quite established. The United States government accused North Korea, citing defectors who described a printing plant at Pyongsong linked to the regime’s clandestine money operations, and distribution through diplomatic channels - though some of the defector testimony later proved unreliable, and international opinion on the notes’ origin has never been unanimous [C33]. What is documented is the distribution network’s scale: in Operations Smoking Dragon and Royal Charm, between 2002 and 2005, American agents arrested at least 87 people and seized some $4.5 million in counterfeit currency, much of it in hundreds, without ever establishing a definitive origin [C33]. And the supernote was never the only game: in Manchester, a gang led by Anastasios Arnaouti was convicted in 2005 after printing some 350,000 hundred-dollar bills over eighteen months, on equipment capable of a million pounds’ worth of notes a day [C33].

The American answer was the same arms-race escalation the note has always relied on. The redesigned hundred-dollar bill that entered circulation in 2013 carries a blue three-dimensional security ribbon woven into the paper, with

images that move as the note tilts, colour-shifting numerals and microprinting - features chosen to be easy for the public to check and brutally hard to print [C53][C24]. The superdollar episode confirmed the lesson Operation Bernhard had taught and that every generation relearns. When the target is the world’s reserve currency, the counterfeiter may be another state, the technology is whatever the target uses, and the defence can never stand still. The banknote survives not because forgery is impossible but because issuing authorities have learned to keep the cost of a convincing fake just above the profit in making one - a margin that has to be defended, note by note, redesign by redesign, forever.

VIII - THE BUSINESS

Chapter 22 - The printers

The printing of money is itself an industry - a small, secretive, highly concentrated one, because almost nobody is qualified to do it. A commercial printer can reproduce the look of a banknote; what it cannot supply is the integrated chain of papermaking, security features, intaglio presses, numbering systems and sovereign-grade trust that a currency requires. Most central banks therefore face a choice between two models: print their own notes in a state works, or buy them from one of a handful of specialist firms. The economics and politics of that choice shape a global business most people never see.

Many of the great issuers print their own. The United States Bureau of Engraving and Printing produces every Federal Reserve Note [C22]; the Reserve Bank of Australia owns Note Printing Australia [C28]; the Bank of England's notes are printed at the Debden works in Essex - though in a sign of the times, the Bank contracted out the operation of its own printing plant to De La Rue in 2003 [C35]. Around the state works clusters the private industry, and its dominant names have been the same for a century. Giesecke+Devrient of Munich, founded in 1852, grew from printing German state banknotes into a family-owned currency-technology group with record revenues of EUR 3.1 billion in 2024 [C50]. Crane Currency of Massachusetts, the dollar's papermaker since 1879, now prints banknotes for more than fifty central banks, sits inside the listed Crane NXT - which in May 2025 also absorbed De La Rue's authentication business, reporting a record currency order backlog [C24][C49]. And then there is De La Rue of London, whose rise and recent fall tell the whole story of the industry's transformation.

Thomas de la Rue arrived in London from Guernsey in 1821 and set up as a straw-hat maker turned stationer; a Royal Warrant for playing cards came in 1831, postage stamps in 1855, and in 1860 the firm printed its first banknotes, for Mauritius [C35]. It grew into what it describes as the world's largest commercial printer of banknotes, a supplier of notes, polymer substrate and security features for more than 69 national currencies, acquiring along the way Portals - papermaker to the Bank of England since 1724 - and the Bank's own Debden works [C35]. The business was exactly the kind of quiet champion industrialists admire: technically deep, globally dominant, invisible to the public.

Its troubles in the 2010s show how hard the industry's ground has shifted. Cash usage began falling in De La Rue's richest markets; central banks consolidated their printing; with banknote demand at its lowest in more than twenty years, the firm sold its paper business in 2018, its identity business in

2019, and agreed in 2024 to sell its authentication division to Crane NXT, its American rival, for £300 million - a deal completed in May 2025 [C35][C48]. In April 2025 the board accepted a £263 million takeover by the American private-equity firm Atlas Holdings; the scheme took effect in July and De La Rue left the London Stock Exchange after some eighty years [C48]. The firm that once printed the world's money as a matter of empire had become, in a generation, an acquisition target. Meanwhile the balance of the industry tilted with technology: polymer notes, pioneered in Australia, are made on Guardian substrate - a company born of the Reserve Bank's own research, now owned by CCL Industries and claiming, by its own account, more than 80 billion notes across 175 denominations for over 40 central banks - competing with the very printers central banks once bought from [C27][C28][C47].

Beneath the corporate story runs a strategic one. A banknote is sovereignty made tangible, and governments treat its manufacture accordingly: printing works are among the most secure industrial sites in any country, supply chains are vetted, and the decision to let a foreign firm print your money is an act of trust. When a newly independent state or a country emerging from crisis needs a currency fast - Iraq after 2003 among them - it is the commercial printers who deliver it [C35]. The banknote industry, in the end, is a business built on the oldest fact in this book: anyone can print paper, but money is printed trust. The firms that survive are the ones states continue to trust with both.

Chapter 23 - The issuer

Every banknote is a promise, and the promise has a keeper. Behind the paper stands an institution - in almost every country today, a central bank - whose signature, seal and statute turn print into money. Understanding the banknote means understanding what that institution actually does, because issuing cash is one of the oldest and most concrete things central banks do, older than interest-rate policy and more tangible than any other part of their work.

The core of the job is a monopoly. States long ago concluded that competing private note issues were a recipe for confusion and fraud - the wildcat era taught that lesson the hard way [C21] - and gave the note issue to a single public institution. The Bank of England's effective monopoly in England and Wales was completed by the Bank Charter Act of 1844 [C15]; the Federal Reserve's notes replaced the patchwork of national bank notes and Treasury currencies in the twentieth century [C21]. The monopoly comes with obligations that are easy to forget because they usually work silently: notes must be available wherever and whenever people want them, in the right denominations, in good condition, and always convertible back into the deposit money of the banking system.

Meeting demand is a forecasting problem with physical consequences. A central bank estimates how many notes the economy will need next year - growth, seasonal peaks like holidays and harvests, the slow replacement of worn notes - and orders printing accordingly. The Federal Reserve projects annual demand and places an order with the Bureau of Engraving and Printing, which charges it the cost of production. For calendar year 2026 the order ran to 3.8-5.1 billion notes worth $109-140 billion - the humble $1 the largest run by pieces, the $100 the largest by value, and no $2 bills at all - against a 2025 currency operating budget of just over one billion dollars, with a single $100 note costing 11.3 cents to print [C46][C36]. The euro area runs the same logic at continental scale: national central banks forecast demand, the ECB allocates production among eleven high-security printing works - the French, German and Italian central banks between them printed 1.7 billion fifty-euro notes in 2017 - and stocks are redistributed so no country runs short while another piles up surpluses [C37]. The Eurosystem even maintains a Strategic Stock, a reserve for crises: sudden surges in demand or interruptions in supply, the paper equivalent of a strategic petroleum reserve [C37].

Then there is the quiet profit at the heart of paper money. A $100 note costs 11.3 cents to make and spends like $100 [C36]. The note circulates as an interest-free liability of the central bank, which holds income-earning assets against it; the income those assets yield, net of the costs of printing and

handling the currency, is seigniorage - the revenue of issue. It is one of the oldest forms of public finance: the Song court discovered it when it printed more jiaozi than its coin reserves could redeem [C1][C4], and every paper-issuing state since has lived on it to some degree. In normal times, seigniorage flows from the central bank to the treasury as a steady, unglamorous transfer. In desperate times, the temptation to enlarge it by printing faster is the original sin of paper money - the subject of a later chapter.

The issuer also tends the note across its whole life. New notes enter circulation through the banking system; worn, torn and soiled ones return, are machine-sorted for fitness, and the failures are shredded or granulated and replaced [C37]. Fitness standards, quality tests at the printing works, authentication at the counter and in the machine - all of it is one continuous act of maintenance, because a currency is only as good as the average note in the average wallet. The banknote is printed trust, and trust, like paper, wears out. Keeping it crisp is the issuer’s daily work.

Chapter 24 - The logistics of cash

A banknote is born at a printing works, but it lives on the road. Between the central bank's vaults and the wallet, cash travels one of the most expensive and heavily guarded supply chains in the world: an endless loop of armored trucks, cash centers, counting machines, vaults, branches and ATMs that moves money in circles - out to the public, back from shops and banks, sorted, re-issued or destroyed. This physical circulation is the hidden cost of cash, and the industry built to carry it is as old as the railroads.

The business began, fittingly, with the American West. Perry and Fidelia Brink founded their Chicago cartage company in 1859; it grew into the armored-transport industry, carrying everything from payrolls to the Hope Diamond [C39]. The model it established still runs today: secure vehicles, hardened cash centers, trained and vetted crews, and liability that passes from institution to institution with every handover. Around Brink's and its rivals - Loomis, G4S's cash businesses, and national operators everywhere - grew an infrastructure most cash users never think about until a truck is robbed. And robbed they are: the 1981 Brink's robbery in Nanuet, New York, became one of the most notorious crimes in American history, and armored vans remain targets from motorway ambushes to helicopter heists [C39]. The violence around cash is part of its cost too, priced into every note in circulation.

The second great machine of cash is the one on the wall outside the bank. On 27 June 1967, Barclays Bank unveiled the first automated teller machine at its Enfield branch in North London - a device built by De La Rue, the banknote printer, beating a rival Swedish machine to market by nine days [C38]. John Shepherd-Barron, the De La Rue engineer credited with the idea, imagined a chocolate-vending machine for cash; his first version dispensed money against cheques impregnated with mildly radioactive carbon-14, soon replaced by cards matched with a four-digit PIN - a security concept patented by James Goodfellow in 1966 that still guards the world's cash today [C38]. From that single machine in Enfield grew a global estate of roughly three million ATMs, about one for every three thousand people on earth [C38].

The ATM changed the geography of cash. Before it, getting paper money meant a bank branch, a queue, and banking hours; after it, cash became a twenty-four-hour utility, and the ATM became the public face of the entire supply chain - the point where the armored truck's loop meets the citizen. That loop is not cheap. Notes must be forecast, printed, shipped, stored, guarded, counted, dispensed, collected, sorted for fitness, and destroyed - the ECB runs hundreds of quality checks at the printing works and maintains strategic stocks for crises, and every one of those steps costs money that electronic payments

do not require in the same form [C37]. When countries debate the future of cash, this is the ledger they are really arguing about: the cash cycle costs billions to run, but it also serves everyone, works without power or networks, and settles instantly with finality. The armored truck is slow, heavy and armed. It is also, after six decades of digital alternatives, still on the road.

IX - POWER AND ITS LIMITS

Chapter 25 - When money dies

A banknote is a promise, and promises can be printed faster than they can be kept. The limit of paper money was discovered within a generation of its invention - the Song court, short of coin for its armies, issued jiaozi beyond its reserves and watched the notes sink [C1][C4] - and it has been rediscovered ever since, in the most catastrophic monetary events in history: the hyperinflations, when a currency does not merely weaken but dies on its feet, and the paper in the wallet becomes worth less than the paper it is printed on.

The anatomy is always the same, and it begins with the state. A government that cannot tax or borrow enough to cover its spending - usually because of war, defeat or collapse - turns to the printing press, the one creditor that cannot refuse. Money supply races ahead of real output; prices chase it; and once people expect prices to keep rising, the dynamic feeds itself. Everyone spends notes the instant they receive them, money circulates faster and faster, and the velocity of spending itself becomes a second printing press. The banknote’s entire edifice - the trust that lets paper pass as value - burns away, sometimes in months.

Weimar Germany remains the archetype. Crushed by war debt and reparations, the Reichsbank printed to fill the gap; by November 1923 the mark, once roughly four to the dollar, stood in the trillions to one. Workers were paid twice a day and rushed to spend wages before they evaporated; housewives burned banknotes for fuel because they bought less than firewood. The mark was saved only by a trick of confidence - the Rentenmark, a new currency whose real backing was a collective decision to believe in it. Zimbabwe repeated the pattern eighty-five years later: a collapsing economy, a government financing itself by printing, inflation running at rates statisticians gave up measuring, and a one-hundred-trillion-dollar banknote - the most zeros ever printed on a circulating note, though Hungary’s hundred-quintillion-pengő note of 1946 remains the largest denomination ever officially issued [C58] - that would not buy a bus ticket. Venezuela followed in the 2010s with the same script: falling oil revenue, printed deficits, and a bolivar that lost virtually all its value, forcing ordinary commerce into dollars and barter. In each case the technology of money worked perfectly. The notes were printed superbly. What failed was the restraint behind them.

Hyperinflation is the extreme proof of this book’s central claim: a banknote’s value has never lived in its paper, its ink or its art, but in the credibility of the institution that issues it. Engravers, watermarks and holograms can defend a note against the counterfeiter. Nothing can defend it against its own issuer. The million-mark note and the hundred-trillion-dollar note are, in the end, the

most instructive banknotes ever printed: perfectly genuine money, honestly issued, utterly worthless.

Chapter 26 - The recalled note

There is a quieter way for a banknote to die: by decree. Demonetisation - the state declaring its own notes void - is the sharpest expression of what paper money really is. A coin keeps its metal whatever the state says; a banknote is a creature of the issuer’s word, and the word can be withdrawn. Governments have reached for that power to fight hoarders, criminals and black markets, and the results form one of the great natural experiments in what cash means to ordinary life.

The Soviet Union did it by ambush. On 22 January 1991, President Gorbachev’s decree - the brainchild of Prime Minister Valentin Pavlov - withdrew all 50- and 100-ruble notes at midnight, giving citizens three days to exchange them and capping exchanges at 1,000 rubles, with anything above that requiring proof of legal origin before commissions of tax officials, police and KGB men [C56]. The two denominations made up more than a third of the cash in circulation, in a country where the average monthly wage was about 285 rubles [C56]. The stated target was the black market; the actual hit landed on savers, peasants and pensioners who kept their money in mattresses precisely because they did not trust the state - and were now proved right. The reform failed economically, and its political lesson echoed: a state that confiscates its own currency teaches its people to hold anything else.

India did it at digital speed. On the evening of 8 November 2016, Prime Minister Narendra Modi announced on television that the 500- and 1,000-rupee notes - the vast bulk of India’s cash by value - would cease to be legal tender within hours, in a strike against undeclared “black money,” counterfeits and terror finance. What followed was weeks of queues at banks and ATMs as the world’s most cash-dependent large economy tried to exchange its savings. And then the data arrived: the Reserve Bank of India eventually reported that Rs 15,310.73 billion of the Rs 15,417.93 billion in demonetised notes came back - 99.3 percent [C43]. The hoards of black money the exercise was meant to flush out were largely deposited, not destroyed. The central bank spent Rs 7,965 crore printing replacement notes in 2016-17 alone, more than double the prior year [C43]. Whether the shock accelerated India’s digital payments is still debated; what is not debated is that the black money stayed white.

The contrast case is the euro changeover - demonetisation designed to hurt no one. When twelve national currencies gave way to the euro in 2002, the old notes circulated alongside the new for up to two months, and after the final deadline the national central banks kept redeeming legacy banknotes - in Germany, Austria, Ireland and Luxembourg, without any time limit at all [C57]. Two decades on, a pre-euro Deutsche Mark note is still worth its euros.

That was deliberate: the new currency needed the public's trust, and nothing builds trust like a promise that the old money will never be worthless. The Soviet and Indian episodes took value hostage to force behavior; the euro bought legitimacy by refusing to. Between the ambush and the guarantee lies the whole politics of the recalled note.

X - THE RECKONING

Chapter 27 - The uses of cash

Here is a puzzle. In the rich world, people pay with cash less and less - and hold more of it than ever. At the end of 2025 there were $2.39 trillion of American banknotes in circulation, up from $854 billion on the eve of the 2008 financial crisis - nearly tripled in seventeen years, faster than the economy, faster than prices [C40]. By the ECB's count in August 2025, the euro area carried some 30.4 billion banknotes worth €1.6 trillion, about €5,000 for every citizen, and the pile was growing again [C41]. Yet in Sweden, where cash use has fallen sharply, only one person in ten paid cash for their last in-store purchase in the Riksbank's 2023 survey [C42]. If cash is dying as a way to pay, why is there more of it around than ever?

The answer is that a banknote does two jobs, and they have been drifting apart. The first is payment: handing over paper to settle a purchase. That job is shrinking almost everywhere that cards, phones and account-to-account apps work well. The second job is storage: holding value outside the banking system, in a form that needs no bank's promise, no network and no power. That job is booming. Economists at the Bank for International Settlements put numbers to the puzzle in 2018: across two dozen economies, cash in circulation rose from 7 to 9 percent of GDP between 2000 and 2016 even as card payments spread - and the growth was concentrated in the largest denominations, the signature of hoarding rather than spending [C54]. Later BIS data softened the picture but did not reverse it: by 2024, cash withdrawals were declining while the stock of cash in circulation had largely stabilised [C55]. Look at the denominations: of the $2.39 trillion in US currency, $1.99 trillion - 83 percent of all the value - sits in hundred-dollar bills [C40]. Nobody buys groceries with bricks of hundreds. The $100 note is a store of value: compact, anonymous, universally accepted, and good anywhere the dollar is trusted - which, given that as much as half the value of US currency is estimated to circulate abroad, is most of the world [C60].

Who holds it all? Some of the answer is unglamorous: the world's unbanked and underbanked, hundreds of millions of people for whom cash is not a preference but the only option; migrant workers paid in it; small traders who live by it. Some is precautionary: households and businesses that withdrew cash in panics - after the invasion of Ukraine in 2022, Swedish cash withdrawals jumped enough to bend the statistics [C42]. Some is frankly illicit: the same features that make cash a lifeline - finality, anonymity, no intermediary - make it the medium of the shadow economy, a theme the counterfeiters and the superdollar have already shown from the other side. And some is simply trust: in a crisis, a banknote is a claim on the central bank itself, the safest asset an ordinary person can hold.

The bankers who issue the notes draw a careful lesson from this. Falling use in shops does not mean falling demand. The ECB, planning cash’s future, treats both facts at once: transaction use declining, total circulation growing [C41]. A currency can be dying at the till and thriving in the mattress, the vault and the foreign suitcase at the same time - because payment is a service that can be replaced, while trust is harder to substitute. The next chapter asks what happens when societies actually try to replace it.

Chapter 28 - The cashless turn

Every few decades, someone announces the end of cash. The credit card was going to kill it in the 1960s, the debit card in the 1980s, the internet in the 1990s, the smartphone in the 2010s. Each wave genuinely did change how people pay - and yet the notes kept circulating. The interesting question is not whether cash will die but what the long, unfinished retreat actually looks like, and Sweden is where to watch it.

Sweden went far, and fast. Swedish banks cooperated to cut cash handling, bank branches went cashless in large numbers, and Swish - the mobile payment app the banks launched jointly in 2012 - became a verb. By 2023, only 10 percent of Swedes had paid cash for their most recent purchase in a shop [C42]. A country of ten million people had come within sight of a daily economy without paper money. And then the picture complicated. The 2023 figure was actually up from 8 percent the year before, and the Riksbank itself warned against reading even that as a reversal: other data pointed to continued decline, and the uptick may have reflected something darker - households withdrawing cash as a buffer after Russia’s full-scale invasion of Ukraine in 2022 [C42]. War, not convenience, put notes back in Swedish wallets. Sweden’s parliament and central bank have since pushed to protect access to cash [C61] precisely because a cashless society proved brittle: payments that depend on electricity, networks and a handful of private systems are a vulnerability in a crisis, and they leave out the elderly, the poor and anyone the digital system excludes.

The global pattern is the Swedish lesson, diluted. Cards conquered the rich world’s shops; mobile payments conquered China’s street markets with a speed that startled even China; the COVID-19 pandemic pushed contactless habits through whole populations in months. And still, at the end of 2025, the value of US currency in circulation stood nearly three times higher than before the 2008 crisis [C40], and euro cash was growing again [C41]. Payment and hoarding have decoupled: the till abandons paper faster than the safe does.

So the cashless turn is real but lopsided, and its endgame keeps receding. What has actually happened is a layering: each new payment technology takes a slice of cash’s old territory - first the shop, then the restaurant, then the market stall, then the friend’s share of the bill - while the note retreats to its oldest functions: backup, reserve, refuge. The question that remains, and that closes this book, is whether the state itself will follow the public into the digital realm - whether the central bank will issue not just paper money but digital cash. That experiment has a name: the central bank digital currency.

Chapter 29 - Digital cash

The banknote’s newest rival is not the card or the phone app - those are claims on banks, moving bank money. It is a stranger idea: a digital banknote, a direct claim on the central bank that lives in a phone instead of a wallet. This is the central bank digital currency, and by the middle of the 2020s it had moved from thought experiment to worldwide project. As of May 2026, the Atlantic Council’s tracker counted 146 countries and currency unions - representing over 98 percent of global GDP - exploring a CBDC, with 77 in an advanced phase of development, pilot or launch [C44].

The pioneers are small and their lessons sobering. The Bahamas launched the Sand Dollar in 2020, Nigeria the eNaira in 2021, Jamaica JAM-DEX in 2022 - three fully launched retail CBDCs, all struggling to give citizens a reason to prefer central-bank digital money over the cash and bank apps they already had [C44]. Nigeria’s is the cautionary tale: by August 2025 the eNaira’s wallet app had been quietly withdrawn and new sign-ups were failing; the central bank conceded it had failed on low acceptance and awareness and said it was working on a revival, and trackers still count the project among the launched [C62][C44]. The giant is China’s e-CNY, the largest pilot in the world, which had processed more than 3.4 billion retail transactions worth some RMB 16.7 trillion by the end of 2025 - real scale, though still modest beside China’s entrenched mobile-payment duopoly, and its final design continues to evolve [C44]. The biggest economies are the most hesitant: the United States has no retail CBDC and has confined itself to wholesale research, while Canada, Australia and Norway have all deprioritized retail projects [C44].

Europe is the case to watch. The ECB’s digital euro is the most consequential CBDC effort in the rich world, and its status shows how slow the marriage of money and law is: after a preparation phase that began in November 2023, the Governing Council moved to the next phase in October 2025, and if - only if - EU legislation is adopted during 2026, a pilot could start in mid-2027 with a possible first issuance during 2029, at an estimated development cost of €1.3 billion [C45]. A decision to issue has not been taken. The contrast with the banknote’s history is the point: the Song dynasty could decree paper money into existence in a decade; a modern currency union needs a legislative process measured in years.

Whether digital cash succeeds, the effort has already vindicated the banknote’s deepest idea. Central banks are not building CBDCs because paper failed; they are building them because paper worked - because a direct, public, universally accepted claim on the central bank turned out to be infrastructure worth having, and the digital economy was in danger of having no equivalent.

The banknote, a thousand years after Sichuan’s merchants tired of hauling iron, is still the standard its successors are trying to match.

XI - LEGACY

Chapter 30 - The enduring note

A merchant in eleventh-century Sichuan, tired of hauling iron coins, leaves his metal with a shop and pockets a receipt. A thousand years later, a shopper in Stockholm taps a phone, a truck driver in Texas keeps a folded hundred behind his license, and in Lagos cash still does the daily work, a point underlined in August 2025 when FIJ reported that the eNaira's wallet app had been withdrawn from app stores and new sign-ups were failing [C62]. Between the receipt and the hundred runs the whole story of this book: paper turned into money, money turned into power, and power forced to earn, again and again, the trust that makes paper work.

The banknote's career has been a series of unlikely survivals. It outlived the dynasty that invented it and the empire that spread it; it outlived wildcat banks and assignats, gold standards and world wars; it outlived the check, the credit card and the prediction - renewed every decade for sixty years - of its own death. Each technology that was supposed to replace it instead joined it: the press gave us printed notes, chemistry gave us polymer, networks gave us digital claims on banks, and now central banks themselves are building digital banknotes because the paper original turned out to be infrastructure worth imitating [C44][C45]. The thing designed as a convenience for merchants who hated heavy coins became the most successful form of money ever made.

Its lessons are stubborn ones. Trust is the technology: every security feature from mulberry bark to holograms defends not the paper but the promise, and the promise is only as good as the institution behind it - as Weimar's trillion-mark notes and Zimbabwe's hundred-trillion-dollar bills attest, and as every recalled note from Moscow to Mumbai reconfirms [C58][C56][C43]. Craft matters, because money people cannot believe in stops being money. And cash endures not from nostalgia but from what it uniquely does: it settles instantly, asks nothing of networks or batteries, excludes no one, and leaves no ledger behind. Those are not defects to be engineered away. They are features, paid for in armored trucks and central-bank balance sheets, that societies rediscover the value of whenever the lights flicker - as Sweden, where cash use has fallen sharply, learned when war returned to its borders and its citizens quietly queued for paper [C42].

Whatever comes next - digital euro, e-CNY, systems not yet named - will be judged against the banknote's ancient standard: can anyone use it, anywhere, and trust it completely? A millennium after the jiaozi, that remains the hardest problem in money. The paper answer is still in your pocket.

Glossary

Assignat - Paper money of revolutionary France, issued from 1790 against confiscated church lands; printed far beyond the value of its backing and nearly worthless by 1796. The classic early lesson that land, like coin, cannot keep pace with a printing press.

Banknote - A promissory note issued by a bank (today almost always a central bank), payable to the bearer on demand and intended to circulate as money.

Bill of exchange - A written order to pay a fixed sum at a future date, used by medieval merchants to move value without moving coin; the paper ancestor of the banknote.

Central bank digital currency (CBDC) - A digital form of central-bank money, a direct claim on the central bank like a banknote but held and transferred electronically.

Cotton paper - Banknote paper made from cotton and linen fibres rather than wood pulp, giving notes their distinctive crispness and durability.

Counterfeit - An imitation banknote made to deceive; the perpetual adversary of every security feature in this book.

Demonetisation - The state’s withdrawal of legal-tender status from its own notes, as in the Soviet Union in 1991 and India in 2016.

EURion constellation - A pattern of five small circles built into most modern banknotes that causes copiers, scanners and image software to refuse reproduction.

Fiat money - Money with no commodity backing, valuable because the state declares it legal tender and the public trusts the issuer. All modern banknotes are fiat money.

Flying cash (feiqian) - Tang-dynasty paper certificates that let merchants deposit coin in one city and redeem it in another; the distant ancestor of paper money.

Guilloche - The fine, interlaced engraved patterns on banknotes, difficult to reproduce exactly and among the oldest security features.

Hologram / diffractive OVD - An optically variable device using diffraction: a patch whose image shifts with viewing angle, the anti-copying concept from which Australia’s polymer programme began [C27].

Hyperinflation - Inflation so rapid that money loses value by the day or hour; the death of a currency by over-issue.

Intaglio printing - Printing from ink held in incised lines, leaving a raised, tactile relief; the heart of banknote security since the nineteenth century.

Jiaozi - The world's first true paper money, issued by merchants in eleventh-century Sichuan and nationalised by the Song dynasty in 1024 [C4].

Legal tender - Money that, within the issuer's jurisdiction, a creditor must accept by law in settlement of an existing debt.

Microprinting - Text printed so small it reads as a line to the naked eye and blurs when copied.

Optically variable ink - Ink that changes colour with viewing angle; the 2013 US $100 note's shifting numeral is the best-known example [C53].

Polymer substrate - Plastic film (biaxially oriented polypropylene) used instead of paper, developed by the Reserve Bank of Australia and first issued in circulating form on Australia's 1988 note, after earlier Tyvek experiments elsewhere [C27][C59].

Seigniorage - The issuer's revenue from creating money: the income earned on the assets held against the notes in circulation - an interest-free liability for the central bank - net of the costs of printing and handling the currency.

Security thread - A ribbon embedded or windowed in the paper, often magnetic, fluorescent or microprinted.

Superdollar - A very high-quality counterfeit US $100 note, widely attributed to North Korea [C33].

Watermark - An image formed in the paper itself by varying its thickness, visible against the light; in use since medieval Italy [C29].

Wildcat banking - Loosely regulated US banks of the 1830s-1860s that issued their own, often dubious, notes before national currency reforms [C21].