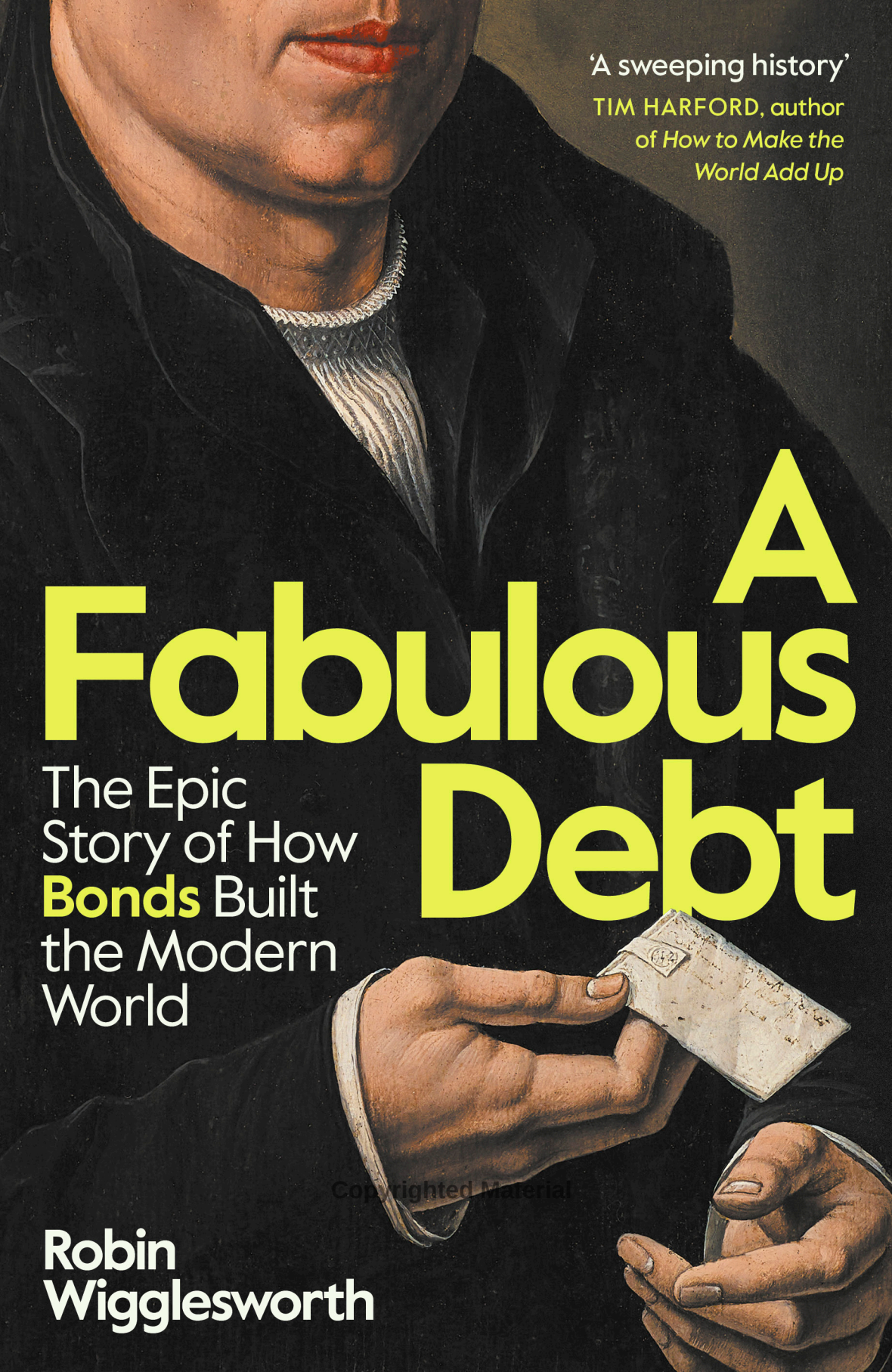

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The Epic Story of How Bonds Built the Modern World

Robin Wigglesworth

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For Ada.

Someday I'll learn how to say "no" to you.
But not today.

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INTRODUCTION

On the morning of April 9, 2025, the aggressive global tariff regime unveiled by American President Donald Trump a week earlier came into effect. Just a few hours later, The Donald hurriedly tapped out a message on his social media platform announcing an immediate ninety-day pause on the punitive levies.

The abrupt shift reportedly came after the president had been cornered in the newly gilded Oval Office by two of his top economic advisers—Treasury Secretary Scott Bessent and Commerce Secretary Howard Lutnick—who together helped Trump type out the message on his phone while they anxiously looked on.

They made an unlikely duo. Bessent, a silver-haired, polished, and patrician former hedge fund manager, and Lutnick, a bald, bearded, and infamously scrappy former brokerage executive, had even been rivals for the job that eventually went to Bessent. But they knew they had to work together to prevent a calamity from unfolding, and that morning they had a narrow window of opportunity to do so.

A third informal ally—Kevin Hassett, the director of Trump's National Economic Council—had a meeting scheduled with the president's hard-line trade adviser Peter Navarro that morning. Navarro had

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been a thorn in their side ever since Trump regained the White House, repeatedly urging Trump to be more aggressive on tariffs and insisting that he shouldn't back down, whatever happened. Navarro had been in and around the Oval Office ever since the new tariff regime was revealed on April 2, but his meeting with Hassett allowed Bessent and Lutnick to arrange a hasty unscheduled meeting with Trump to explain why he needed to back down.[1]

The stock market had thrown a tantrum and was lurching into a bear market. Some financiers were morosely joking that an event that Trump had touted as "Liberation Day" was quickly morphing into "Liquidation Day." America's preeminent banker, Jamie Dimon, had gone on Fox News that morning to say that an economic recession was now "likely."[2] However, what had truly spooked Trump's top economic advisers was the carnage unfolding in the bond market.

The bond market is where countries and companies go to finance themselves. While stocks represent tiny slivers of ownerships in the likes of Boeing, General Electric, or Apple, bonds are essentially tradable loans. They usually pay a fixed interest rate to the holder for a few years, and then the principal amount back on its maturity, which is why they are also often dubbed "fixed income."

At their best they are dependable and safe. Bonds have therefore long been considered the most boring bit of finance, the dour, dependable sibling to the racier, more glamorous stock market. Fixed income has occasionally cropped up incidentally in literature—*The Great Gatsby*'s narrator, Nick Carraway, and Sherman McCoy in Tom Wolfe's *The Bonfire of the Vanities* were both bond salesmen—but never in popular culture in the same way as stocks. When fixed income does appear, it has often been to signify dreariness. Ian Fleming chose the name Bond for his spy because he thought it was "the dullest name I've ever heard."

Nonetheless, bonds have played an integral if underappreciated part in humankind's evolution from subsistence farming to the modern era. The original "decentralized finance" has funded everything from wars, ports, highways, and coal mines to electric cars, Netflix TV series, and the data centers that now power artificial intelligence.

At the apex of the global bond market are Treasuries—debt issued

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by the US government to finance itself. Because of America's creditworthiness, the size and dynamism of its economy, the might of its military, and the global dominance of the dollar, the price of US government bonds influences virtually everything in the world. And in early April 2025, the Treasury market suddenly and mysteriously started to slide precipitously.

Because bonds pay a fixed interest rate known as a coupon, when their price falls it means that their effective "yield"—the interest rate a buyer in practice receives for their money—begins to spike higher. That month, the yield of the US Treasury bond that came due in 2035 jumped from a low of 3.8 percent—when investors first feared a recession—to a high of 4.5 percent on the morning of April 9.

This might seem undramatic to many people, but for the global financial system it was an alarming development, akin to a nuclear plant's warning lights suddenly starting to flash crimson because of a catastrophic breakdown in its coolant system. The unnerving jump in Treasury yields wasn't just a problem for the US government, which would have to pay more to finance its budget deficits. The financing costs of everyone from the German government to an American seeking a mortgage rose in tandem, thanks to how Treasury yields serve as a global benchmark for borrowers.

The stock market had begun to slide in February, when President Trump first slapped new punitive levies on Mexican and Canadian imports, and had been in free fall since the broader "Liberation Day" tariffs unveiled on April 2. But it took just a few days of carnage in the bond market for the president to back down to prevent the rout from escalating into a financial crisis.

Later that day, Trump hosted some auto racing champions and their brightly painted cars for a photo op outside the White House, and he admitted to the gathered journalists that it had been the adverse bond market reaction that had spurred the pause. "I thought that people were jumping a little bit out of line. They were getting yippy. You know, they were getting a little bit yippy, a little bit afraid," he said.

Although Trump had as recently as the night before told a Republican fund-raising dinner that "I know what the hell I'm doing" and

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insisted he would stay the course,[3] his supporters rushed to spin the volte-face as a textbook example of the president's artistry with deals. Trump had deliberately unveiled an unprecedented tariff regime to spook other countries, and now that they were suitably cowed and willing to make a deal, he was magnanimously willing to put it on hold, they argued.

"The successful negotiating strategy that President Trump implemented a week ago today has brought more than seventy-five countries forward to negotiate. It took great courage for him to stay the course until this moment," Bessent told reporters outside the West Wing later that day. Hard-line senior Trump adviser Stephen Miller went even further on social media: "You have been watching the greatest economic master strategy from an American President in history," he said.



IN HIS DEFENSE, Trump is not the first president, prime minister, or chief executive forced to grudgingly bow down to the awesome power of the amorphous bond market.

Back in the early 1980s, the financial analyst Edward Yardeni first dubbed the investors who bullied countries out of foolhardy policies by sending their borrowing costs spiraling as "bond vigilantes"—evoking a vivid mental image of ad hoc financial posses roaming through the global economy and enforcing discipline on spendthrift governments.

The targets were usually poorer, developing countries, but in the 1990s, Bill Clinton's adviser James Carville marveled at how the bond market had even forced the US government to reduce its budget deficit. At the time he famously quipped, "I used to think that if there was reincarnation, I wanted to come back as the president or the pope or as a .400 baseball hitter. But now I would like to come back as the bond market. You can intimidate everybody." In 2022 the bond market even managed to oust UK Prime Minister Liz Truss after just forty-five days in office, making hers the shortest premiership in British history.

Like all compelling narratives, the "bond vigilantes" concept is more nuanced in reality. Every example of its influence features a swirl of

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idiosyncratic factors that can be tricky to disentangle. The bond market's power is also indirect and ceded to it by borrowers. Its only real ability is to raise the cost of your debt, or to refuse to lend altogether. Yet in a world that increasingly depends on debt as the dominant fuel of economic growth, this is an awesome power. As a result, the sentiment that Carville's quote encapsulates is truer today than ever before—as Liz Truss and Donald Trump's brushes with the bond market demonstrated. It truly can intimidate everyone.

The bond market is today by far the biggest, broadest, and most important part of the global financial system. By the middle of 2025, there were at least $188 trillion worth of bonds outstanding according to the Bank for International Settlements, issued by everyone from the Japanese government, ExxonMobil, and the World Bank to American high schools, Sri Lankan banks, and the Church of England. In contrast, the entire pool of stocks around the world was, at the time of writing, valued at roughly $130 trillion.

More importantly, bonds are almost certainly bigger than the traditional banking system—and probably crossed that mark sometime in the past decade, for the first time since both were invented a millennium ago. If you count the assets of all banks around the world, the tally totals roughly $190 trillion, but much of this is actually in the form of bonds and bond derivatives, rather than mortgages and other classic types of loans. The distinction matters in myriad ways.

Bonds are often thought of as interchangeable with loans and are treated generically as debt. That is a mistake. Yes, bonds are debt too. But their form is fundamentally different. They behave differently at crucial times. The opportunities and challenges that the bond market's growth entails are therefore also fundamentally different. In fact, how we grapple with the ascendance of fixed income markets is one of the defining conundrums facing finance today.

To take just one example, America's biggest lender is no longer a bank, it is actually BlackRock, an investment group. At the end of 2025, BlackRock holds roughly $3.2 trillion worth of bonds on behalf of its customers, which range from central banks, sovereign wealth funds, and huge insurers to humble pension plans and ordinary people saving

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for a rainy day. That outstrips the $3.1 trillion of debts that JPMorgan holds on its balance sheet. In fact, over half of those debts are in the form of bonds.

This is no accident. In fact, it is a consequence of a century of political choices. While JPMorgan faces a vast and onerous regulatory burden—a legacy of all the financial crises caused by bank failures—BlackRock is still relatively lightly regulated. There are good reasons for this. Banks are truly very different beasts from investment managers. Yet the diverging political and regulatory attention paid to the two industries makes increasingly little sense, given the bond market's growing primacy in the financial system, and its ability to also cause mayhem.

There are enormous economic consequences as well. Modern capitalism has largely been ordered around the view of banks as the focal intermediaries of money. Central banks were mostly set up initially to backstop banks and eventually began trying to regulate the temperature of economies by tweaking the cost of their funding by moving their overnight interest rates up and down. Yet with the rise of bond markets, entirely new challenges have emerged and experimental tools to deal with them have become necessary—most notably enormous bond-buying programs dubbed "quantitative easing."

After all, if the ultimate goal of a central bank is to regulate the temperature of an economy by changing the cost of credit, then the fact that credit is increasingly extended by the bond market rather than banks inevitably has consequences. In fact, it is no understatement to say that the growing ascendance of the bond market, and the legion implications that flow from this phenomenon, is *the* defining issue for finance and economics today.



BUT HOW DID we get here? Toni Morrison said that "if there's a book that you want to read, but it hasn't been written yet, then you must write it." For some people that is the Great American Novel, a vast fantasy world of your own creation, or a taut thriller. For me, it was a book on the bond market and its vivid history.

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When I first learned about the bond market, it was similar to the awe young surgeons must feel the first time they gaze upon the beating heart or exposed brain of a patient laid out on the operating table. Stocks may get the attention, but this was the real deal. Once you learn about the bond market, you can see its impact virtually everywhere.

Bonds can synthesize the complexity of the world into a string of breathtakingly simple numbers, where every tick higher or lower is immediately and immensely important to entire countries. Show me a time series of a government bond market and I can tell you about the country's economic health, the strength of its institutions, the vibrancy of its society, and how all these have ebbed and flowed over history. What else can do that? By combining the judgment of millions of people, the bond market is the world's cleverest economist, its best political analyst, its most prescient corporate strategist, and its finest scientist.

It isn't always right. Crowds can screw up. In fact, this book will discuss at length how often the greed of humankind has swamped our senses and warped the bond market from engine of growth to machine of madness. But the reason one of the world's oldest financial technologies not only endures but continues to evolve and thrive today is that it works better than anything else we have come up with over the centuries.

Sadly, there is little knowledge or appreciation of the grand, sweeping history of the bond market in the finance industry. Even fixed income specialists can be oblivious to its origin story. As the economist John Kenneth Galbraith once joked, "There can be few fields of human endeavour in which history counts for so little as in the world of finance." This is my attempt at redressing the deficiency.

It is not a complete history of the bond market, even if it hopefully feels comprehensive. Occasionally I have skipped over entire centuries. It also focuses on the people who wittingly or unwittingly helped shape it over the centuries, to make the subject more palatable to those who might wrongly dismiss it as dull.

Some may still find it overly complex, while others may bemoan the unforgivably facile treatment given to convexity, Macaulay duration, or reverse repo operations. Some might miss chapters on inflation-linkers or sovereign bond restructuring shenanigans. I have also tried to avoid

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many potentially fascinating diversions along the way—such as exploring the interlinked evolution of banking, monetary policy, or even money—except when I felt it was essential to tell the central tale of bonds.

In my defense, I will invoke Lytton Strachey, a famous British biographer and friend of one of the book's characters, the economist John Maynard Keynes. Strachey argued that "ignorance is the first requisite of the historian—ignorance, which simplifies and clarifies, which selects and omits, with a placid perfection unattainable by the highest art." That may be a high bar to clear, but I have at least tried to do justice to the majesty of the bond market.

But where to start? After all, the concept of debt predates even that of currency by several millennia. The Sumerians noted down loans on clay tablets as early as 3500 BCE. The Romans invented annuities, which make small annual payments in return for a lump sum. Europeans recorded and traded debts on notched "tally" sticks throughout the Middle Ages.

What, then, is the bond market's true genesis moment? The Greek philosopher Heraclitus once noted that "war is the father of all," and in the bond market's case he was certainly right.

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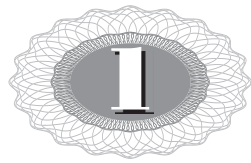

THE MERCHANTS OF VENICE

The birth of the bond market started with a ruthless multinational raid that sent shock waves through the Mediterranean. On the morning of March 12, 1171, the Byzantine emperor's soldiers suddenly rounded up every Venetian man, woman, and child they could find throughout their lands, seized their shops, wares, and ships, and threw the owners in jail.

Over ten thousand people in Constantinople alone were rounded up, and more than twenty thousand overall—so many that monasteries were requisitioned to handle the overflow.[1] Although the arrests were stunning for both their audacity and their success—planning and executing such a sweeping and coordinated operation without word getting out was a herculean task in the twelfth century—tensions between the imperial capital of Constantinople and its nominal vassal in northern Italy had been steadily rising for over a century.

The Byzantines saw Venice as an increasingly uppity bunch of nouveau riche merchants who would trade with anyone if there was money to be made. In the ninth century they even had the temerity to sell war materiel to Egypt, in violation of a ban on trading with Muslim countries.[2] That some Venetian traders in 828 used this to get their hands

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on the supposed body of Saint Mark from Alexandria—smuggling it out in a barrel of pork—did nothing to soothe relationships. Venice's willingness to trade with anyone, anywhere, at any time did not foster goodwill among many of its neighbors, and certainly not the city's distant liege.

The Venetians, spat one Byzantine official, were "a race characterised by a lack of breeding, which is totally at variance with our noble sense of order."[3] As Venice kept growing richer, more powerful, and stubbornly independent, a rupture was inevitable.

For Constantinople's energetic Emperor Manuel I Komnenos, the turning point was Venice's refusal to help with his plan to invade southern Italy, dashing his dream of restoring the Roman Empire. The ambitious emperor subsequently began nurturing closer relationships with Pisa and Genoa, Venice's main rivals in trade at the time.[4] Unsubtly, he granted these competing Italian city-states their own quarters in Constantinople, right next to the long-established Venetian quarter that had since 1082 functioned as an independent, tax-exempt quasi-colony in the heart of the Byzantine capital. It was a recipe for disaster. And soon enough, Emperor Manuel had a pretext for more drastic action.

In early 1171 the Genoese neighborhood was razed and many of its inhabitants murdered, an attack that the Byzantine emperor blamed on the arrogant local Venetians. "Buffeted by a series of villainies, one worse than the other, the emperor . . . turned the scales against them, spewing forth his anger like the tempestuous and stormy spray blown up by . . . a north wind," one contemporary Byzantine historian wrote.[5] Even while reassuring an anxious delegation of emissaries sent by Venice's leader—Doge Vitale II Michiel—Manuel sent out secret orders to officials across the empire to arrest any Venetian they could find and seize their property on March 12. It would have far-reaching consequences.



CONTEMPORARY DEPICTIONS OF Doge Vitale II show him as a weary man, with large eyes and a small, pursed mouth. Under the prominent nose there was a mustache or a full goatee. Any weariness would have been

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understandable, for managing the multitude of competing interests of one of the world's fastest-growing, most complex cities must have been taxing. Eventually, it would cost him his life.

Venice was the oddity of the Middle Ages. It was founded by refugees fleeing the Vandals, not some noble looking to expand his turf. With little dry land to speak of it produced hardly anything of value aside from salt. It became a serfless republic at a time of absolute monarchs and feudalism, and was constantly torn between east and west. It owed fealty to the Byzantine emperor in Constantinople and to the Catholic pope in Rome but showed a stubborn independent streak with both supposed masters (the papacy excommunicated the entire city several times). Even its physical foundations were precarious: millions of stakes made out of alder, oak, and pine that were hammered into the underlying marshland over the centuries.

The city's shifting, seemingly fickle loyalties infuriated many. "They are a quintessence and will belong neither to the Church nor to the emperor, nor to the sea nor to the land," a churchman once angrily lamented after Venice abrogated yet another treaty.[6] But the citizens of Venice did have one abiding loyalty from which they never wavered: commerce.

The lack of any natural resources to speak of forced its inhabitants to turn to their own ingenuity for livelihood. Its nobles were not barons with serfs, but merchants with ships. The primary enemy of Venice's fleet of crossbow-armed galleys were pirates, not foreign potentates. Its overseas territories were acquired for trading depots, not the glorification of its ruler.

As the eminent Venetian historian Thomas Madden has written, "Nobility in the sense of a group of families with a hereditary claim to political authority did not exist at all. In Venice, wealth, not land, defined nobility; commercial skill, not military prowess."[7] This nurtured entrepreneurial drive the likes of which Europe had not seen before. It is no coincidence that the famed merchant-explorer Marco Polo was from Venice.

By the twelfth century, Venice was the beating heart of Mediterranean trade. It became Europe's emporium, with eighty thousand citizens

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almost all dedicated to commerce in some fashion. Partnership contracts between investors and merchants known as *colleganza* allowed even poorer citizens to pool their money, invest in long-distance trade, and share in both the risks and the spoils. These became known as *commenda* elsewhere in Italy and were an early precursor to joint-stock companies that sprang up in northern Europe centuries later. These ensured a stunning level of social mobility in Venice. One surviving *colleganza* from the period reveals how Zaccaria Stagnario, the grandson of a freed Croatian slave and the son of a humble helmsman, managed to turn his skill as an entrepreneurial trader into a fortune, and eventually his family's entry into the Venetian governing elite.[8]

As a result, anyone visiting the city's Rialto market would have been astonished at the exotic products available at its multitude of shops and stalls, ranging from strong Bohemian iron and solid French oak to intricate jewelry from Antwerp, subtle Portuguese wines, pungent Levantine spices, Russian ermine, and religious relics brought back by returning Crusaders. Even centuries later, the Rialto was so famous that it was name-checked in Shakespeare's *The Merchant of Venice*. A zeal for trade had transformed Venice into one of the world's wealthiest cities—something that Doge Vitale II had to take advantage of in the hostilities with his suzerain in Constantinople.

When news arrived of Emperor Manuel's sweeping raids, the shocked doge summoned his counselors from Venice's most prominent families to advise on a course of action. Together they agreed on caution, skeptical that the excitable reports they had received could be true and wary of how outright war would damage their main objective, commerce. Rather than act rashly, they resolved to send envoys to find out what had actually happened, ask for the release of Venetian prisoners, and ensure that their property was returned.[9] After all, the Republic of Venice was known as *La Serenissima*—The Most Serene—for a reason.

Unfortunately, this circumspect, diplomatic approach was almost immediately scuttled when a convoy of Venetian ships that had managed to flee the Byzantine crackdown sailed into town, carrying distressing tales of injustices that infuriated the Venetian citizenry. Faced

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by an outpouring of popular anger, Doge Vitale II reluctantly decided to lead a fleet of warships to exact revenge on Constantinople and free the city's imprisoned citizens. And this is where the bond finally enters our story.

Venice's famous Arsenale shipyard had not yet reached the peak of its powers—at one point it was said to be Europe's largest industrial cluster—but it was still able to churn out the war galleys needed. However, the armada they planned to launch against Constantinople would cost dearly, and the city itself had little money, despite the wealth of its citizens.

The Italian statelets typically taxed modestly and covered larger expenditures with ad hoc loans. These were often backed by security in a specified state asset or revenue stream, such as toll receipts. For example, in 1164, Venice had borrowed about 270 kilograms of silver from a dozen of its wealthiest families, and in return granted them eleven years' worth of its income from the Rialto market.[10] But the scale of the navy needed to take its own sovereign down a peg meant that heading down to the Rialto market to hit up its moneylenders wouldn't suffice.

The doge had a drastic solution. He divided the city into six districts, systematically assessed the wealth of its citizens, and forced them to hand over the money Venice needed for its fleet.[11] But rather than a straightforward one-off war tax, it would be a loan, albeit an involuntary one. Venice promised to pay its citizens 5 percent a year until the debt could be repaid. Crucially, the receipts of the *prestiti*—the plural of *prestito*, or loan—were made tradable, so a citizen who needed to raise money could sell their claim to someone else at a discount if necessary.

Exactly how much was raised is unknown, but it must have been a considerable sum. Within months, it allowed Venice to dispatch 120 warships with the doge himself at the helm of the fleet. This would be sufficient to unleash havoc on Constantinople's territories, forcing Emperor Manuel to free Venice's citizens, restore their property, make good the damages, and think twice about challenging the Serene Republic again. Unfortunately, the expedition ended up a debacle.

The Venetian fleet started strongly, landing on the Greek island of Negroponte and laying siege to Chalcis, its Constantinople-controlled

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capital. But the doge's cautious, diplomatic instincts came back to the fore. In return for the desperate governor of Chalcis sending an emissary to Constantinople to urge Emperor Manuel to release his Venetian prisoners, Vitale withdrew his fleet to the island of Chios. There he spent the winter waiting for word from Constantinople, optimistic that outright war could still be averted.[12]

Manuel had no desire for negotiations, but cannily realized that time was on his side. The longer he could delay a Venetian attack, the longer he had to assemble his own forces. The emperor sent his own envoy to Chios to nurture Vitale's hopes, asking for yet another delegation of ambassadors for further talks.

Then disaster struck. The moored Venetian fleet at Chios was hit by the plague, with more than a thousand men dying in just the first few days. It desperately started moving from one Greek island to the next, but remained just as blighted by disease.[13] Then the Venetian ambassadors returned from Constantinople with bad news: The emperor had refused to even see them.

With his armada slowly dying and no longer a credible threat to Constantinople, Doge Vitale returned to Venice with what remained of the fleet in May 1172. The triumphant Manuel could not resist sending his cautious foe a mocking letter:[14]

> *Your nation has for a long time behaved with great stupidity. Once you were vagabonds sunk in abject poverty. Then you slinked into the Roman Empire. You have treated it with the utmost disdain and have done your best to deliver it to its worst enemies, as you yourselves are well aware. Now, legitimately condemned and justly expelled from the empire, you have in your insolence declared war on it—you who were once a people not even worthy to be named, you who owe what prestige you have to the Romans; and for having supposed that you could match their strength you have made yourselves a general laughingstock. For no one, not even the greatest powers on earth, makes war on the Romans with impunity.*

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Imperial crowing was the least of the doge's concerns. On May 27, 1172, a meeting was held at the Ducal Palace for Doge Vitale, his counselors, and the Venetian citizenry to discuss the debacle. Bereaved Venetians became increasingly irate, accusing the doge of cowardice, gullibility, and failure.[15] They had given him the means of revenge, and he had blown it. Compounding their ire, the returning ships had brought the plague to Venice.

The anger gradually deepened, as each furious speaker whipped up the next. Eventually, the mood became so vitriolic that the doge's advisers quietly started slipping away. Eventually Vitale himself attempted to flee for the nearby convent of San Zaccaria. But he was caught by the angry mob and stabbed to death on the streets of Venice.



THIS BELATEDLY CAUSED a bout of soul-searching by Venetians, who decided that they had wronged their peace-loving doge. Marco Casolo, the man who had dealt the fatal blows, was executed and his house razed. After Michiel's funeral, the regretful Venetians decided not to elect a new doge themselves. Instead, they chose an eleven-person commission that would select Venice's new ruler, apparently as a guard against the recently demonstrated rashness of the mob.[16] Although engineered by the city's wealthiest merchant families, this represented a quiet democratic revolution. The new Great Council became a proto-parliament that helped solidify Venice's remarkable success.

Another oddity that persisted for a long time afterward was the loan that Venice had imposed on its citizens. Shut out from Byzantine ports—it would take almost two decades to reach a truce with Constantinople and get the prisoners released[17]—and financially stricken by the failed venture, Venice did not have the wherewithal to repay the *prestiti* as planned. What was initially an involuntary emergency loan in practice became a permanent mountain of state debt.

Venice did maintain the 5 percent interest payments, setting aside tax revenue from the Rialto stalls to cover them. To reassure its anxious creditor-citizens, transparent records of all revenues and payments were

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maintained by Venice's Procurator of Saint Mark—a kind of deputy-doge-cum-finance-minister. Eventually this job went to the city's Great Council, reinforcing its importance.[18] This body was dominated by the city's wealthiest families, who as both creditors and citizens had an interest in ensuring that Venice did not simply abrogate its debts as many absolute monarchs around Europe often did, ruining many banking houses in the process. Whenever a new war or financial emergency broke out, the Great Council would mandate the issuance of new *prestiti*.

The credibility of the regular and fixed interest payment, coupled with the tradeability of the debt, transformed what was initially an annoying reminder of Venice's humiliation into a monument to its commercial genius.

Now, anyone in Venice could take money they had saved up and convert it into a future cash flow—perhaps to secure some income for when they retired, endow a charity, or give away as a dowry. They could use the *prestiti* as collateral for other loans, or as surety for goods. And if they needed to get back their money—or were worried about the solvency of Venice—they could head down to the Rialto market and sell their claims to the bankers, speculators, and merchants who had started to actively trade the *prestiti* there.

The Campo San Giacomo di Rialto—a colonnaded courtyard that is today a fresh vegetable market—thus became the world's first bond market. Around it moneymen and their *banci* wooden tables would buy and sell *prestiti*, in addition to their usual business of exchanging currencies, pawning goods, taking deposits, and making loans. Overlooking the square is Venice's oldest church and its oddly oversized and infamously inaccurate clock, with an inscription urging the merchants who gathered under its portico to treat people fairly. A short walk away Venice set up its Camera degli Imprestiti, the loan office that saw to the management of the city's debts (since these were not bearer bonds, each trade had to be officially registered with the Camera so that the correct owner could collect the interest).

Not only did the burden of the *prestiti* this way actually become a public good—in fact, a crucial component in the rise of the Italian city-

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states, many of which adopted the Venetian innovation—but it helped solidify the links between citizens and the state.

The level of wealth required to be hit by an involuntary loan was always quite high. In Venice, only 12 percent of the population were forced to lend money to the government in 1379.[19] But less well-heeled Venetians could always pick up a slice of state debt on the Rialto, often at a discount, helping disperse the *prestiti* throughout the population. There is sparse data on how widespread ownership was in Venice, but in 1380, one in six Florentines was a government creditor, and by 1427 almost a quarter of Florence's households held at least some of their city's debts.[20]

By thus turning most of its affluent citizens into creditors, Venice gave them a vested interest in the city's good governance. It is extraordinary how Venice managed to remain an island of relative democracy in a European sea of autocracy, and its doge constrained by a vast array of ordinances.

For example, Venice's ruler was modestly paid and banned from accepting gifts or owning land outside Venice. He was even forbidden from opening letters from foreign dignitaries without other officials present. Family members were prohibited from public office to avoid corruption and nepotism. When a doge passed away, a commission of inquisitors could be established to pass judgment on the job he had done, and his estate fined for any malfeasance uncovered.[21]

Doge Vitale II Michiel, the bond market's unwitting and unfortunate forefather, was also eventually avenged. Venice quickly recovered from the setback while the Byzantine Empire continued to shrivel in territory and power. Emperor Manuel's Komnenos dynasty only held on to the throne for five years after his death in 1180, and Venice played a pivotal role in the Fourth Crusade's brutal sacking of Constantinople in 1204.

The four majestic bronze horses that once decorated the hippodrome of Constantinople can still today be seen in St. Mark's Cathedral in Venice, a permanent monument to the zenith of the city's power and wealth.

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EVENTUALLY, THE DE facto permanence of the *prestiti* had to be acknowledged, however. In 1262, Venice was embroiled in yet another war with the latest Byzantine emperor and his troublesome Genoese allies. After some early setbacks the republic needed to shore up its finances, and the result was another great leap in the development of bond markets.

On March 12, 1262, Venice's Great Council passed the *Ligato Pecuniae*, an irrevocable edict that consolidated all its different debts into one uniform series—a *Monte*, or mountain in Latin—that would pay 5 percent a year, which would be made in two semiannual payments. The edict stipulated that the Venetian government could spend up to 3,000 lire a month on its expenses, but beyond that any resources had to be first used to cover interest payments, and after that finance the current or future wars. Only after all those had been satisfied could any money be used to actually pay off its loans or other expenses.[22]

In other words, creditors would be satisfied even before Venice's soldiers and sailors. It is fair to conclude that this eye-catching commitment was linked to the fact that the Great Council mostly consisted of Venice's grandest and wealthiest citizens—the city's biggest creditors. If they were to be subject to repeated involuntary loans, they wanted to safeguard their interests.

But the edict ensured that Venice continued to be able to easily finance its wars with debt and gradually repay it in times of peace. Moreover, one consolidated, homogeneous mountain of debt made each claim much easier to trade. This tradeability was central to the success of the *prestiti* and the *Monte*—and the subsequent emergence and growth of bond markets elsewhere.

The transferability of financial claims allows creditors to shift the risk to someone else when the need arises. Therefore, it often costs less to borrow than through banks, which are often unable to shift big loans and are therefore always vulnerable to one or several large creditors reneging on their debts.

For many people, the tradeability of bonds leads to one of their most confusing facets: how their "yield" can differ from their interest rate.

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This came up in the introduction, but here is a more fulsome explanation. Typically, a bond is issued at face value; in other words, a borrower sells a $1,000 bond for $1,000. If it pays a 4 percent fixed interest rate, then creditors will receive $40 a year—or perhaps two semiannual $20 payments.

But if some investors start to fret about the borrower's solvency, they might start selling the bond, driving its price down to $900. As long as there is no actual default, the bond will then have a running or "current" yield of 4.4 percent, because investors would be buying a $40 annual coupon payment for $900.

Conversely, if the borrower's financial health improves or if a central bank lowers interest rates—cutting the cost of newer-issued bonds and increasing the value of that $40-a-year fixed income stream—then the price of a bond can actually go above its face "par" value. If the $1,000 bond becomes worth $1,100, then the current yield falls to 3.6 percent, well below the actual, contractual interest rate of 4 percent.

Note that the calculation of the yield changes depending on whether the bond is a "perpetual" one that in theory never matures, as was the case in Venice, or whether it has a firm date when the principal comes due, as is the norm today. That is because the return will obviously be affected by when you get your initial money back. For example, a $1,000 bond that trades at its face value, pays a 4 percent interest rate, and matures in ten years has a "yield to maturity" of 4 percent. But if it trades at 90 or 110 cents on the dollar, the yield to maturity becomes 5.31 percent or 2.84 percent, respectively.

This is why—as newspapers habitually mention whenever writing about the subject—bond prices and yields move inversely. If the price of a bond goes up, yield goes down. And the lower the yield, the better for the borrower. In practice, bond yields synthesize a plethora of economic and financial data—from creditworthiness to the inflation outlook—into one interest rate continuously determined by markets. It is therefore one of the best one-stop indicators of a country's overall financial, economic, and even political vibrancy.

This was apparent in Venice as well. The interest payments were always fixed at 5 percent of the face value of the loan, but the Rialto's

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traders would usually buy and sell the *prestiti* or the *Monte* at a discount to their value. This price could vary greatly according to the ebb and flow of Venice's success in trade and war, and therefore its ability to keep making timely interest payments.

Helpfully, the Catholic Church, which took a dim view of interest payments because of its edicts against usury, grudgingly approved of the bonds issued by Venice and similar efforts in Genoa, Florence, and other city-states.

At the time theologians considered them more like an annuity contract, where one party bought an income stream from someone else, rather than an usurious loan. The permanence of the *prestiti* therefore helped their adoption.[23] Other priests argued that the forced nature meant that they could not be considered usurious, and that purchases of discounted slices at the Rialto were simply helping out someone who needed money.[24] Finally, the fixed 5 percent interest rate was not considered high enough to constitute usury. Venice would therefore issue more when it needed to raise money in a hurry, occasionally even at a discount—and therefore in practice at a higher effective interest rate than the clergy-approved 5 percent they carried.

The early history of the *prestiti* is hazy, but financial historians have records on the prices that the consolidated *Monte* would trade at from 1262 onward. Until about the 1370s, they would typically change hands at about 80–100 percent of their face value[25]—in other words, at a yield of between the stipulated 5 percent and a high of 6.25 percent. That would have been among the lowest long-term borrowing costs in the world at the time, and both a source and a reflection of Venice's economic health. The Venetian bond market was overwhelmingly a local affair, as permission from the city's Great Council was required for foreigners to buy the *prestiti*. But the right to do so was much sought after by European princes and merchants, underscoring the attraction of a relatively safe stream of fixed income.[26]

When an interest payment was somehow delayed, a fairly sophisticated market in overdue payments would crop up on the Rialto, with speculators betting on when they might get their money. The expenses of trading were also surprisingly low; by the early fifteenth century the

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transaction costs on trading *Monte* were below 0.5 percent. As a result, turnover was also robust. In 1434, about 300,000 ducats worth of Venetian bonds traded, roughly 3 percent of the entire market at the time.[27] In other words, this was a vibrant, relatively complex financial market where fortunes could be made and lost long before the invention of stock markets. Soon enough, even the Vatican was copying Venice's approach.[28]

However, wars were never far away. These were expensive—sometimes ruinously so. Standing armies were rare in Renaissance Italy, and conflicts were largely fought by full-time corps of mercenaries led by captains known as *condottieri*. Yet another conflict with Genoa wrecked Venice's finances in the 1380s, and it had to suspend interest payments even as it hit its citizens up for more and more loans. The price of Venetian bonds collapsed to as low as 20 percent of face value, or an effective interest rate of 25 percent.[29]

By 1463 the city had to introduce a direct semiannual tax that in some way mimicked the involuntary loans, except that with a tax the money raised naturally never had to be repaid. This proved too little too late to restore the health of its finances. In 1482, Venice took a more drastic approach, by introducing an entirely new series of bonds that became known as the *Monte Nuovo*, and the old bonds became the *Monte Vecchio* (the new and old mountains, respectively). While the *Monte Nuovo* bonds initially did well, trading at close to their face value, they too eventually collapsed in price as continual wars—most notably the brutal and chaotic Italian Wars of 1494–1559—kept sabotaging the city's finances.[30]

This strife once again forced the supposedly Serene Republic to be innovative. Rather than simply continually imposing involuntary loans on its citizens with a fixed 5 percent interest rate—well below what they could expect from other investments—it began to issue voluntary bonds in the 1520s. Because these *Depositi in Zecca* had to be sold rather than imposed, their interest payments had to be high enough to generate demand.

To contain its borrowing costs, Venice made them exempt from taxation and began to sell them to outsiders—including merchants from

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the old enemy, Genoa.[31] Now we could begin to see the very rough contours of today's bond market: market-set interest rates, tradable, widely distributed, and often tax free, rather than a form of de facto taxation in all but name.

Yet it was Venice's successor as Europe's powerhouse of commerce that truly started to demonstrate the power of the bond market, and ushered in its next big leap.

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THE BOG OF EUROPE

Joseph penso de la Vega was typical of the many Jewish refugees who settled in seventeenth-century Amsterdam. A Sephardi whose father had fled Spain after being forcibly converted to Catholicism in an Andalusian dungeon run by the Inquisition,[1] he made a good if unremarkable living as a diamond merchant in the more tolerant Netherlands, newly freed from the shackles of the Spanish crown.

De la Vega was a man of letters, having written a celebrated play in Hebrew when he was just seventeen years old, and for a time contemplated becoming a rabbi. He later published many poems, plays, treatises, and even a collection of novels, and was active in Amsterdam's literary debating society.[2] But de la Vega's main claim to fame is his groundbreaking chronicle of a new "enigmatic" phenomenon that had become the Dutch obsession of his day.

The 1688 book *Confusion of Confusions* is the first known detailed treatise on the stock market that had been established in Amsterdam several decades earlier. By de la Vega's time it had become a wonder of the world. The Amsterdam bourse of the seventeenth century echoed the physical appearance of Venice's Rialto market—housed in an open inner court surrounded by graceful columns—but had far outstripped

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it in vibrancy, innovation, and sheer financial shenanigans. Short selling, stock derivatives, margin loans, bear raids, and pump-and-dumps were all endemic.

Confusion of Confusions is a curious book, written in Spanish and published in Antwerp by a Sephardic Jew in Amsterdam, and styled as a fanciful dialogue between a philosopher, a merchant, and a stock trader. But many of de la Vega's descriptions and adages are as vivid and accurate today as they were over three centuries ago:

> . . . This enigmatic business which is at once the fairest and most deceitful in Europe, the noblest and the most infamous in the world, the finest and the most vulgar on earth. It is a quintessence of academic learning and a paragon of fraudulence; it is a touchstone for the intelligent and a tombstone for the audacious, a treasury of usefulness and a source of disaster, and finally a counterpart of Sisyphus who never rests as also of Ixion who is chained to a wheel that turns perpetually.

It was no coincidence that Amsterdam was home to the world's first stock market. De la Vega was writing at the tail end of what is now known as the Dutch Golden Age, when the seven United Provinces of the Netherlands were transformed from war-torn, waterlogged marshland—some called it the Great Bog of Europe—into one of the world's richest and most powerful countries.

Dutch influence extended into culture and philosophy, and the country became home—or temporary refuge—to some of Europe's greatest thinkers, such as Baruch Spinoza, René Descartes, and John Locke. As Bertrand Russell wrote in his *History of Western Philosophy*, "It is impossible to exaggerate the importance of Holland in the seventeenth century, as the one country where there was freedom of speculation."[3]

How could the Netherlands have managed this astonishing feat, in less than a century since a debilitating war of independence from the Spanish Habsburg crown that continued through much of its golden age? As de la Vega's book highlighted, by mastering the world of money.

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And although they go almost unmentioned in *Confusion of Confusions*, it was arguably through the canny development and use of bonds that the Netherlands truly excelled. As Prussia's Frederick the Great would later observe, "A financial system, handed over by father to son and constantly improved, can change a government's position. From being originally poor it can make a government so rich that it can throw its grain into the scales of the balance between the European great powers."[4]

Bonds bought Dutch independence, bankrolled its unending battles against the elements, and buoyed its rise as a global commercial empire. And in return, the Netherlands helped transform the bond from a haphazardly designed, balkanized instrument of city-states into something a little more akin to today's vast fixed income market. Europe would not be the same after the Dutch demonstrated what a healthy bond market could do.

ON NEW YEAR'S DAY 1624, drifting ice on the River Lek smashed a vital dike next to the hamlet of Tull en't Waal. For a country with over a quarter of its land below sea level, this was a disaster. Soon the entire region was under water, parts of Amsterdam were flooded, and Rotterdam, Delft, and Leiden were under threat.

The locals scrambled into action, digging ditches and building dikes in the freezing stormy weather to stanch the flood. Bridges were demolished to allow boats to bring materials more quickly, soldiers were sent to help out, and boats were filled with stone and sand and sunk to plug the holes.[5] The determination of the locals was captured by the fourteen-year-old Jan Both in a remarkable painting that still hangs at the local water authority. Eventually the flood was halted, but money needed to be raised for a full, durable rebuild as soon as possible. But the Dutch knew what to do.

For centuries, Dutch merchants, farmers, shopkeepers, clergy, and tradesmen alike had gathered in a series of so-called water boards that were responsible for building and maintaining the intricate system of

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dikes, levees, and canals that kept most of the Netherlands dry. At their nineteenth-century peak there were over three thousand across the country, a web of communities that banded together for mutual aid in a never-ending war against the elements that transcended the mutable borders of Europe. These boards were in turn overseen by a series of coordinating *Hoogheemraadschap*—high water authorities.

The boards were taken very seriously, given how slackness in one could cause disaster elsewhere. In 1323, Count William of Holland sent his army to burn down the town of Mijdrecht after repeatedly ignored requests for repairs to its dikes caused flooding in Utrecht.[6] Up until 1841 the *Hoogheemraadschap* had the legal authority to mete out punishment to slackers, including flogging, branding, banishment, and execution. The Rijnland water board even had its own gallows and a whipping post.[7]

The problem was always how to respond quickly to bigger disasters that necessitated immediate and expensive repairs. Although local landowners financed the upkeep and occasional repairs through taxation, rebuilds required far more capital, and often quickly—such as in the case of the 1624 flooding. Fortunately, the Italian city-states were not the only ones to develop bonds or bond-like instruments.

Something similar had sprung up in northern France around the same time. But rather than forced loans, they were voluntary financial contracts issued by local municipalities that paid either a fixed interest rate in perpetuity or more commonly over the buyer's lifetime, like an annuity. These were called *rentes* in French, or *renten* in Dutch and German. They were typically bought by local financiers, who then over time sold them off at a profit to ordinary farmers and merchants in neighboring towns and villages—an arrangement strikingly similar to the modern mechanism through which many bonds are sold today, with banks acting as "underwriters" of the loan and then distributing slices of it to investors.

The first documented *rentes* were sold in 1228 by Troyes—one of the six hosts of the Champagne fairs that became grandiose carnivals of commerce around the twelfth and thirteenth centuries—and over the centuries they spread across Europe.[8] But no one embraced them

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with as much aplomb as the Dutch. The water boards were particularly heavy users, routinely selling bonds to finance the building and rebuilding of dikes that kept the water at bay.

Once the immediate risk of flooding in 1624 had receded, the local water board—the Hoogheemraadschap Lekdijk Bovendams—therefore quickly sold over fifty bonds written on carefully cured goatskin to local potentates and merchants. These raised about 23,000 Carolus guilders to pay for a permanent rebuild of the busted levee.

The episode vividly highlights how adeptly the Netherlands used this financial technology to transform their country. Indeed, if one were to stretch the metaphor of bonds as a technology, one could say that the Venetians were the first to invent the wheel, but it was the Dutch who realized that four of them together made a more useful wagon.

As early as the 1300s, the local bond market had become fairly vibrant. Thanks to strong property rights, thrifty Dutch men and women became increasingly willing to invest their savings in bonds that financed ships, farmland, waterworks, and other projects. As a result, interest rates had fallen from about 12 percent to 5–6 percent by the time of the Black Death in the mid-1350s.[9] Simultaneously, these debts evolved from a hodgepodge of life annuities and other forms of idiosyncratic *renten* to more generic bond-like securities that anyone could use to raise money or invest their savings.

Like in Italy, the bond market became a boon for the political economy as well, helping strengthen community ties. But unlike in Italy—where cities were constantly bickering, frequently at war with each other, and each bond market often ended at the city walls—the Dutch bond market improved ties across communities, with many Dutch farmers, shopkeepers, sailors, and burghers investing in a neighboring town's bonds. The result was that the Netherlands eventually boasted the world's largest and most sophisticated bond market, long before the birth of the first stock market in Amsterdam.

The financial accounts of Dutch towns and cities indicate that by the start of the sixteenth century a decent chunk of their annual budget went toward servicing various *renten*.[10] Although worries about the burden of excessive debts existed then too, the Dutch recognized that

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these bonds also represented a societal benefit. One person's liability was another person's asset, and on the whole the system was a powerful economic engine.

Bonds allowed merchants to raise money for all sorts of ventures from a diverse group of investors, rather than just relying on the local moneylenders. Dutch burghers could easily secure a steady income for pensions, orphans, widows, or heirs. Underscoring how this was seen as a valuable service that should be available to everyone, Amsterdam sold bonds in 50-guilder increments to the city's working classes between 1578 and 1605.[11] This was, in effect, a rudimentary form of social security, where Dutch towns raised money from citizens and in return promised them a certain income.

The first known mathematical work on how to value bonds was also written in Dutch, by Jan de Witt, a polymath patrician who served as Holland's Grand Pensionary—a de facto prime minister at the time. Shortly before being murdered (and allegedly partly eaten) by a monarchist mob in The Hague in 1672, he published *Value of Life Annuities in Proportion to Redeemable Securities*. This dry tome on how to balance the revenues from selling *renten* against the cost of servicing them spurred Amsterdam to overhaul its bond-selling program, and became a white whale to both Gottfried Leibniz and Jacob Bernoulli, two of Europe's leading mathematicians, who unsuccessfully strived to get their hands on a scarce copy.[12]

The power of this regional bond market was demonstrated when the mostly Protestant provinces of the then Spanish Netherlands began to rebel against Spanish rule and the militant Catholicism of King Philip II—at the time Europe's most powerful man. What ultimately became the on-off Eighty Years' War of divorce for the northern provinces of the Spanish Netherlands required money, and lots of it.

The first stages of the revolt were financed by the grain trade. The prices of Baltic wheat, rye, and other crops had soared in the late 1500s thanks to rising demand from the Mediterranean, and Dutch merchants were well placed to dominate what became termed the "mother of all trades." But it was the ability of the Republic of the Seven United

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Netherlands to raise vast sums of money from their own citizens through sales of *renten* that kept them in the fight for so long, and eventually helped them secure independence from the Spanish crown.[13]

The fluctuating borrowing costs of Holland—the most powerful of the Dutch provinces—are instructive. Rising demand for funds had pushed interest rates up after the Black Death, and in 1550–60 the average *renten* cost just over 8 percent. This fell to almost 6 percent by 1570. The cost climbed back to over 8 percent in 1572 after the conflict with Spain erupted, but by 1590 interest rates began to fall again. By 1606 the cost of perpetual debt was almost 7 percent,[14] and by the end of the seventeenth century interest rates were just 3–4 percent.[15]

In other words, even as the United Provinces were fighting for their political survival—and their debts were ballooning because of it—their borrowing costs actually mostly fell. This was a powerful endorsement of Dutch creditworthiness, and the bond market's ability to marshal a multitude of savers and turn them into a collective financial superpower.

In contrast, King Philip II of Spain became as famous for his serial financial ruin as for his military exploits. Despite Spain's vast European and New World empire—and King Philip's reputation as an able, careful, and detail-oriented administrator—Spain defaulted on its loans four times through his reign, in 1557, 1560, 1575, and 1596.[16] Spain issued some longer-term bonds called *juros*, but the rates on these were prohibitive for a financially troubled country, so most of King Philip's borrowing was done through short-term loans known as *asientos* (with *juros* occasionally acting as collateral).

Spain's repeated bankruptcies led Europe's most prominent banking dynasties—such as the Spinolas of Genoa and Germany's Fugger family—to demand higher and higher interest rates in order to do business with them. Over King Philip's reign these loans cost an average of almost 10 percent a year,[17] despite their short-term nature and often being explicitly backed by various collateral and promised revenue streams.[18] Indeed, the rates that the Spanish crown sometimes had to pay for its loans were similar to those charged by Dutch pawn shops.[19]

No wonder, given how King Philip's creditworthiness frequently

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failed. The 1575 default on 12.3 million ducats of debt—almost twice Spain's annual revenues at the time[20]—was particularly painful. It ruined a series of banks and caused a regional financial crisis that led even the anxious papacy to intervene to urge a resolution.[21]

Perhaps most significantly, it led to a brief but consequential bankers' boycott of King Philip. This made it hard to get money to Spain's Army of Flanders, which was combating the nascent Dutch Revolt at the time. In November 1576 the unpaid soldiers mutinied and brutally sacked the prosperous Antwerp.[22] This was a huge setback in Spain's attempts to bring the unruly Netherlands to heel. It shocked even many loyal Catholics in the southern provinces, reinforced the independence movement across the region, and ensured Amsterdam's ascent as the most important city of the Low Countries.

Some historians have pointed out that Europe's great banking families were not as mad as it might seem, and they argue that the importance of the post-1575 money stop to the mutiny of the Army of Flanders is overplayed.[23] Thanks to the exorbitant interest rates the bankers charged, many still made money lending to King Philip, even after periodic "haircuts" to their claims.[24]

Yet the picture of Spain's near-constant money trouble stands in sharp contrast to the probity of the Dutch, and the benefits they reaped from being able to borrow relatively freely and cheaply throughout their struggle for independence. Cicero had noted already two millennia ago that "the sinews of war are infinite money." While not quite infinite, it was the well-developed Dutch bond market that provided the Netherlands with the ability to successfully fend off a far larger foe for several generations.

This struggle took time, however. It wasn't until the Peace of Westphalia in 1648—which finally ended the wider Thirty Years' War that had torn Europe apart—that the independence of the United Provinces of the Netherlands would be formally recognized by the Spanish crown. In the meantime the Dutch would gain another potent financial weapon to aid their economic rise and wield against their enemies—one that represented another quantum leap in the development of financial markets.

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