Technical report

AI Investments, Purchases and Debts Between the World's Companies and States

Does AI Money Go Round in Circles?

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Abstract

In the margin, a badge tells where each number comes from: measured computed by us from the ledger, estimated computed from published quantities, by a named analyst or by us, reported published as it stands by a company, a regulator or the press.

The seller who funds its customer. In September 2025, Nvidia, which makes most of the chips behind artificial intelligence, announced that it would invest in OpenAI, the company behind ChatGPT. At the same time OpenAI pledged to buy chips from Nvidia. Analysts at once spoke of "circular financing". The picture needs no training in finance. A baker buys a share of the school canteen and becomes one of its owners. The canteen spends that money on bread, from him. The baker's sales climb, even though part of the money paying for them came out of his own till. Economists call this practice, a seller funding its customer, *vendor finance*. If all of AI worked that way, its sales would rest in part on money going round in circles. We measured how much money really comes back to the seller, where the rest comes from and who takes the risk.

A ledger built pair by pair. The ledger records 472 documented flows, purchases or investments, among 69 companies that make AI: chip makers, renters of computing power, the labs that design the models and the companies that put those models into their products. 412 of these flows were current on 22 November 2026. Every pair of companies was searched in both directions, for purchases and for investments. On top come 135 flows between these companies and governments or their public funds, then a database of 100 debts that pay for the building. Every amount keeps its status: published, estimated or undisclosed. Undisclosed amounts stay in the calculation. We lend them a plausible size, then watch how far the results move.

The thesis.

> The AI money loop is open. Cross-investments are mostly vendor finance, yet they pay for only 1.7% to 7.6% of current purchases measured. The promises to buy made by the two big labs, OpenAI and Anthropic, therefore rest on revenue they have not yet earned. Size for size, that risk weighs 5.3 times more on CoreWeave, a compute renter, than on AMD, the most exposed of the large chip makers measured. The gap falls to 1.7 times against Cerebras, a smaller chip maker measured. The renters, who wait to be paid, borrow to build. In our middle reading, between the most cautious and the widest, $664.9 billion of debt pays for AI. CoreWeave alone owes 2.16 times its stock market value measured. Public money enters at both ends of the chain, the chip factories and the labs. It does not reach the renters.

The facts behind it.

- 57 of the 101 current investments link a customer and its supplier. They make up 97% of the dollars invested. Vendor finance does dominate investment. measured
- Yet these stakes cover $187 billion out of $2,464 billion of current purchases, a *round-trip share* of 7.6%. We redid the sum under four assumptions, drawing the uncertain amounts measured

at random 2,000 times under each: the share stays between 1.7% and 7.6%. Finn's cycling index follows the money along detours of any length (A pays B, who pays C, who pays A). It stays below 4.2%.

- Anthropic has promised to buy $900.9 billion of computing power, 11 years of its revenue at the current pace. Until 2030, each year's promise comes to 1.31 times that revenue. OpenAI promises each year 4.4 times what it takes in, going by its own announcements.
- The two labs' promises to Oracle come to 0.95 times its stock market value. That ratio is 14 times higher than Nvidia's (0.066).
- The 12 public subsidies with a known amount all go to makers of chips and memory ($49.4 billion). Sovereign wealth funds, the investment funds that belong to a country, buy into the labs (21 flows, 7 of them with an amount). The six compute renters receive 3 public flows, 0 of them with an amount.
- The middle of the chain borrows. CoreWeave owes 2.16 times its stock market value. Its debt also exceeds the promises it has received from the two labs. The two labs have drawn not one dollar of debt.

One number, two readings. Every index reads both ways. Anthropic's promises for the next twelve months come to 0.87 times its yearly revenue: today's revenue pays next year's bills. The sellers' money pays for a small share of their own sales, so it does not manufacture their revenue. Further out, the reading turns. Until 2030, Anthropic's yearly promise comes to 1.31 times its current revenue and OpenAI's to 4.4 times: their revenue will have to grow. Counting only money promised firmly, with no strings attached, CoreWeave expects from the two labs, size for size, 5.3 times more than AMD does. Chapter 7 weighs both readings, index by index.

Jeff Bezos and the industrial bubble. In October 2025, in Turin, Amazon's founder Jeff Bezos called AI an "industrial" bubble. Such a bubble ruins its investors but leaves the world useful inventions, as fibre-optic cable outlived the internet bubble of 2000. He set it against financial bubbles, such as the banking crisis of 2008, which harm the whole economy. Our indices prove him right about the loop: the money does not go round in circles. His reasoning leaves out how the building gets paid for. We measured it. In the middle reading, $664.9 billion of debt pays for AI. The bond market, where IOUs are sold to thousands of lenders, holds 72.2% of it, banks 20.0%. That debt brings AI closer to the telecom carriers of 2000, which laid their networks on credit, than to a bubble paid for with shares alone. Chapter 8 describes the mechanisms. It also puts a figure on what a burst would cost workers, savers and households, even in a "not nearly as bad" crisis.

The weak points, laid out. The two labs' share of all purchases depends on two choices the data do not settle: how many years a yearly purchase counts for and how big the undisclosed amounts are. It ranges from 17% to 68%. We do not keep it as a result. The ledger counts stakes. It leaves aside the guarantees and loans a supplier grants its customer, two other roads by which the loop could close. The debt database records them separately. 25 of its lines rest on the press alone. The maturity of $175 billion of debt is unknown. Finally, we checked our own data. An audit drew 85 lines at random and held each one up against its sources. It found serious errors, in the amount or in the direction of the flow, in 6% of them (from 3% to 13%, given the size of the sample). Those errors are corrected, as are the ones a search of the whole ledger turned up afterwards. With every correction made, the round-trip share moved from 7.5% to 7.6%.

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CHAPTER 1

Introduction

September 2025, a puzzling announcement. In September 2025, Nvidia announced that it would invest in OpenAI. Nvidia sells most of the chips that run AI, graphics processors first built for video games that became the calculating engines of large models. OpenAI makes ChatGPT. That same month, OpenAI pledged to buy chips from Nvidia. Money leaves Nvidia for OpenAI, then leaves OpenAI for Nvidia. Analysts at once spoke of "circular financing". A year later the Bank for International Settlements (BIS), the institution in Basel where the world's central banks meet to coordinate, devoted a whole bulletin to these crossed relationships (Frost et al. 2026). reported

The baker and the canteen. A familiar example shows the mechanism better. A baker buys a share of the school canteen: he takes a *stake* and becomes one of its owners. The canteen spends that money on bread, from him. The baker's sales go up. Yet part of the money paying for that bread came out of his own till. When a seller funds its customer this way, economists speak of *vendor finance*. The practice is legal and often sensible, since the baker secures a loyal customer. The trap is the illusion it creates. Seen from afar, the baker's sales seem to prove that the pupils are hungry, when in part they measure his own money finding its way home. The example stops at scale: in AI, the stakes run to billions of dollars and the orders stretch over years.

Three questions, in order. The picture calls for a measurement. If most of the money the sellers invest came back to them as orders, AI demand would feed on itself. A seller that slowed down would cut its investments, hence its customers' orders, hence its own sales, like a ring of dominoes. If the loop stays open, the money that keeps the industry turning comes from elsewhere: customers who pay to use AI, debt, financial markets, governments. The risk then shows up wherever those outside sources run short. We ask three questions.

1. What share of the money moving among AI companies comes back to where it started?
2. If that share is small, what do the promises to buy rest on? Who takes that risk?
3. Where does public money enter this chain?

The thesis.

> The AI money loop is open. Cross-investments are mostly vendor finance, yet they pay for only 1.7% to 7.6% of current purchases measured. The promises to buy made by the two big labs therefore rest on revenue still to come. Size for size, that risk weighs 5.3 times more on CoreWeave, a compute renter, than on AMD, the most exposed of the large chip makers measured. The gap falls to 1.7 times against Cerebras, a smaller chip maker measured. Public money enters at both ends of the chain. It does not reach these renters.

Two stories put to the test. The thesis contradicts two opposite stories. The first sees the crossed deals as a machine for manufacturing make-believe revenue. Our measurements show that the recycled money is far too small for that. The second treats the deals as harmless.

Our measurements show that they shift risk towards companies smaller than the promises they receive. The danger comes mostly from what takes the loop's place: a promise of future revenue.

The words of this report. A few words come back on every page. We fix them here, then always use them in this sense.

- A *flow* is a documented payment from one company to another. It is either a *purchase* (chips, rented computing power, a licence for a model) or an *investment* (a stake in the company, or a pledge to take one). Money goes from buyer to seller, from investor to the company invested in.
- A *promise to buy* is a purchase signed by contract, spread over several years and not yet paid, like a subscription you sign up to pay every month. Company filings call it a purchase commitment. The largest flows in the ledger are of this kind.
- A *lab* designs and trains AI models, programs that learn to write or to reason from vast amounts of text. OpenAI and Anthropic are the two largest.
- A *compute renter* fills data centres, huge warehouses of computers, with graphics processors (GPUs), then rents out their computing power to others: Oracle, CoreWeave, Nebius, Nscale, Fluidstack, Crusoe. Amazon, Microsoft and Google rent out computing power too, over the internet, which is what people call the *cloud*. They do it inside far larger groups: we call them the cloud giants.
- The *proof status* of a number says how it was established: **measured** computed by us from the ledger, **estimated** computed from published quantities, by a named analyst or by us, **reported** published as it stands by a company, a regulator or the press.

The road through the report. The report follows the order of the questions.

- Chapter 2 describes the ledger, the debt database that completes it and what they see. Chapter 3 defines the measures and how to read them.
- Chapter 4 measures the loop. Chapter 5 measures what takes its place, who takes that risk and on how much debt. Chapter 6 follows public money.
- Chapter 7 says, for each index, what is worrying about it and what is reassuring.
- Chapter 8 holds these indices up against the thesis of Jeff Bezos, for whom AI is an industrial bubble. It also puts a figure on what a burst would cost ordinary people.
- Chapter 9 says what the ledger cannot see and measures its errors.
- Appendix A gathers the key numbers and their proof. Appendix B tells the crises of 2000 and 2008 in numbers, in the United States, the euro area and China.

CHAPTER 2

The data

2.1 A ledger built pair by pair

Four questions for every pair. The ledger was compiled from 13 to 21 November 2026, with the help of AI agents, pair by pair and source by source. For every pair of companies A and B, taken one way and then the other, four questions were asked. Does A buy from B? Does B buy from A? Does A invest in B? Does B invest in A? A yes becomes a flow, with its source, its year, its status and its amount. A no leaves a dated trace too, in a separate list: the pair was searched and no source documents the flow. The ledger thus tells "found nothing" apart from "never looked". It holds 472 flows among 69 companies. An audit then went back to the sources of a sample drawn at random from this ledger, from the government flows and from the debt database, to measure their error rate. Proven errors are corrected in a list of sourced corrections, never in the original ledger (section 9.1).

measured

Four layers, from chips to apps. The 69 companies make AI or buy it in bulk. They come from eight zones: the United States, Canada, India, Europe, the Gulf, China, Taiwan and South Korea. We sort them into four layers, from the most physical to the closest to the user, according to what they sell in the ledger.

- *Hardware* (23 companies) makes the objects: chips, memory, the machines that etch chips, factories, servers, networking gear. Nvidia designs chips, TSMC manufactures them for others, SK hynix produces memory, ASML builds the etching machines.
- *Compute* (14) sells computing power: the cloud giants, the compute renters, the energy supply of data centres and two Gulf groups, G42 and Humain.
- *Models* (14) brings together the labs that train AI models: OpenAI, Anthropic, Elon Musk's group (xAI and SpaceX, counted together), Mistral, DeepSeek and others.
- *Uses* (18) buys AI to put it into software, platforms or devices: Meta, Apple, Palantir, SAP.

A company that sells several things goes into the layer of what it sells most in the ledger. Google sells cloud computing, chips of its own design (TPUs) and models: it goes into compute.

The flows that count today. A flow is *active*, *reduced*, *announced*, *mentioned*, *in talks* or *past*. We call *current* the active, reduced and announced flows, because they commit money today or through a signed contract. The ledger holds 412 of them. 172 of them cross a border between two zones.

measured

2.2 Amounts written with care

The amount as the source gives it. The ledger writes each amount as a careful journalist would, in billions of dollars: "13" (published), "≈ 41/yr" (estimated, every year), "up to 40"

(a ceiling), "8 + up to 25" (a firm part and a part that depends on conditions), "≈ 5 to 10" (a range), "at least 110" (a minimum), "n.d." (a documented flow whose amount is not disclosed). The calculation reads each of these forms. Of the 412 current flows, 53 have an measured amount published as it stands, 118 an estimated amount and 241 no published amount.

Three values for every amount. Every amount yields three values. The *low* value keeps firm money and nothing else: a ceiling counts as zero, a range as its bottom. The *central* value is the figure the source puts forward: the ceiling for "up to", the middle of a range. The *high* value takes every ceiling in full. A minimum stays at its minimum in all three, since nothing documents more. Every result in the report is given at the central value, then checked at the low value.

One year or five. Some flows are paid every year: "≈ 41/yr" is what Microsoft buys from Nvidia each year. Others are commitments over several years: "over 300" is what OpenAI promises Oracle over five years. Adding them up takes a convention, just as nobody adds a monthly rent to the price of a house without saying how many months of rent they count. We call H the number of years a yearly flow is counted for. The ledger takes $H = 1$. We give every sensitive result for $H = 1$ and for $H = 5$, the span of the largest commitments. The choice of H moves a single measure a great deal, the two labs' share of purchases. It barely moves the others (chapter 4).

The totals. At the central value, current purchases with a known amount add up to $2,464 billion with $H = 1$ and $3,458 billion with $H = 5$. Current investments with a known amount measured add up to $237 billion. Of the purchase dollars, 46% rest on published amounts and the rest on estimates. Of the investment dollars, 88% rest on published amounts.

2.3 Government money

Five ways for a government to pay. A second ledger, built the same way, records 135 flows between a company and a government or one of its public bodies: governments, ministries, measured public banks, sovereign wealth funds. 127 of them are current. We sort them by what the government gets in exchange for its money.

- A *subsidy* gives money or land for a factory or a project, with no share of the company in return.
- A *public purchase* makes the government a customer, through a contract, a purchase or a lease.
- A *stake or commitment* gives the government a share of the company, or the promise to take one.
- *Listed holdings* gather the shares a sovereign wealth fund owns on the stock market.
- *A country's purchases* add up what a country's companies buy from foreign sellers, going by what those sellers report selling in that country. This money comes from companies and not from the government. These flows, all Chinese, are kept apart in every count.

2.4 The debt that pays for AI

A third database, line by line. The two ledgers count what companies and governments pay one another. They do not say what money the buyers pay with. A third database, compiled on 22 November 2026, lists the debts that pay for building AI. It holds 100 lines, of several kinds.

- A *bond* is an IOU cut into small pieces and sold to many lenders. The borrower pays them interest every year at a rate set in advance, the *coupon*, then hands back the sum on a set date, the *maturity*.
- A *project loan* pays for a single building site, a data centre for instance. It is repaid out of what that site earns.
- A loan *secured on GPUs* works like a mortgage: if the borrower stops paying, the lender seizes the chips, as the bank seizes the house.
- A *credit line* is a reserve of money that a bank keeps on hand. The borrower *draws* on it when needed. Until the line is drawn, the borrower owes nothing.
- *Vendor credit* is the loan a seller grants its customer so that the customer buys its products.
- A *guarantee* is a promise to pay in someone else's place if they default. A *promised rent* is a lease signed for later.

Every line names the *final borrower*, the company whose payments repay the debt. Often it is a tenant. When a developer borrows to build a data centre leased to Oracle, the debt is booked to Oracle. The project company that signed the loan is named alongside. The line also gives the lender, the collateral, the maturity, the coupon and an exact quotation from the source.

Mostly first-hand sources. 75 lines rest on a primary document: a quarterly or annual report filed with the SEC (the American stock market regulator), the pricing sheet of a bond issue, a press release from the borrower or the lender. 25 rest on the press alone. The 158 bond tranches in the pricing sheets are copied out one at a time, with their coupon and their year of maturity. An amount in euros, pounds, yen or Canadian dollars is converted into dollars at the European Central Bank's reference rate on the line's date. The proof status follows the line: an amount published as it stands is reported, an amount we derive from a document is estimated, a total we compute is measured.

measured

reported

estimated

Three estimates, from the firmest to the widest. Not all of a large group's debt pays for AI. When Amazon borrows, the money also pays for its warehouses and its lorries. The database therefore tells apart three degrees of link with AI and draws three *readings* from them.

- The *low* reading keeps *direct* debt alone, at its firm value: loans secured on GPUs, the debt of data centre project companies, the debt of compute renters and labs, bonds that the issuer ties to its own AI capacity. An undrawn credit line counts as zero. It comes to $242.7 billion.
- The *middle* reading adds, at their announced amount, the general bonds and loans that the big AI spenders have issued since September 2025. It comes to $664.9 billion, of which $261.5 billion is direct debt and $403.4 billion this recent general debt.

measured

measured

- The *high* reading adds the older debt of the same groups and the undrawn credit lines. It reaches $1,000.5 billion. measured

Results are given at the middle reading, as the flows are given at their central value. 72% of its dollars rest on a primary document. measured

September 2025, a chosen date. The date that separates recent general debt from older debt is a choice. We set it in September 2025, the month of the deal between Nvidia and OpenAI and of Oracle's first large bond issue tied to its AI contracts. An Amazon bond issued in November 2025 enters the middle reading. A bond Amazon issued before September 2025 stays in the high reading. The convention dates the start of the wave of borrowing that the BIS and the International Monetary Fund (IMF) describe. It does not claim that every dollar borrowed since then pays for data centres.

Guarantees and leases, counted apart. Two commitments look like debt without being debt. A guarantee is owed only if something happens. Meta guarantees up to $41.5 billion of the residual value of the data centres of its joint ventures in Louisiana and Texas (companies it owns with a financial partner), that is, what the buildings will be worth when the contract ends. Nvidia guarantees up to $105 billion of OpenAI's rent, Google $4.9 billion of Fluidstack's. A lease that has not yet started promises future rent: $288 billion at Oracle, $356 billion at Meta, $165 billion at Amazon, $161 billion at Anthropic, according to their filings. The database records these commitments and keeps them out of the three readings. No debt total adds them in. reported

2.5 Numbers taken from outside the ledger

The anchors. A few numbers come from elsewhere, each with its date, its source and its exact wording. Anthropic's filing for its stock market listing, lodged with the SEC, gives its promises to buy, its revenue and its cash, the money it has to hand right now (Anthropic, PBC 2026). OpenAI publishes no accounts. Its promises come from a statement by its chief executive (TechCrunch 2025), its revenue from the press (Bloomberg 2026b). Oracle's order backlog, the sum of signed contracts it has yet to deliver, comes from its quarterly report to the SEC (Oracle Corporation 2026). The debt figures for the cloud giants come from the BIS (Drehmann and Eren 2026). reported

What the ledger sees of the two labs. These anchors also measure what the ledger catches. Anthropic declares $900.9 billion of promises to buy. The ledger sees $535 billion of them, 59%. OpenAI announces about $1,400 billion. The ledger sees $1,018 billion, 73%. The ledger thus catches most of the two labs' promises. The rest are contracts whose amount is not disclosed, or contracts the press has not yet spotted. reported measured

CHAPTER 3

The measures

Every measure answers a precise question. This chapter defines each one once and for all, first on an example, then with its formula when it has one. The chapters that follow use the measures without defining them again.

3.1 Counting the money that comes back

The round trip of a pair. The baker who bought a share of the canteen shows the calculation. Say he invested the equivalent of one month of bread and the canteen buys bread from him all year. His own money then pays for at most one month of sales. The rest of the year is paid for by something else, the pupils' lunches. The calculation is the same for two companies: an investor a and the company it invests in, b. Write I_{ab} for what a has invested in b and P_{ba} for what b buys from a. The most money a can recover from its investment, in the form of sales to b, is

$$R_{ab} = \min\left(I_{ab},\, P_{ba}\right),$$

the smaller of the two amounts. Amazon has invested $50 billion in OpenAI, which buys $138 billion from it. The round trip comes to $50 billion: at most $50 billion of the $138 billion of purchases comes from Amazon's money. The other $88 billion has to come from somewhere else.

The round-trip share. The *round-trip share* adds up these minimums over every pair, then divides by all purchases:

$$\rho = \frac{\sum_{a,b} \min\left(I_{ab}, P_{ba}\right)}{\sum_{a,b} P_{ab}}.$$

It deliberately overstates the money recycled in two steps, since it assumes that every dollar invested comes back whole as orders. It is an upper bound: the true share is smaller or equal.

Detours: Finn's cycling index. Money sometimes comes back by a detour. Nvidia invests in OpenAI, OpenAI buys computing power from Oracle, Oracle buys chips from Nvidia. Part of the dollar that left Nvidia comes home after three steps, even though no single pair shows a round trip. To count all these detours, we borrow a tool from ecology. In 1976, the ecologist John Finn wanted to know what share of the energy or the nitrogen in a forest or a lake is recycled, that is, passes again through the same living things instead of leaving (Finn 1976). His index answers that question for any network in which something circulates. Here, that something is money.

Following a dollar. Every company receives money and pays money out. At each step, part of the dollar stays in the network and goes on to another company in the ledger. The rest leaves: it pays wages, repays a debt, becomes profit. Money also comes in from outside: the revenue from end customers, borrowed money. The index follows every dollar along every possible path, however long. It counts the share that ends up passing again through its starting

point. It is 0 for a chain in which money never comes back, like a river running down to the sea. It is 1 for a closed circuit, like the water in central heating, which goes round and round the same pipes.

The formula. The *throughflow* T_j of a company j is the larger of what it receives and what it pays out in the network. The difference comes from outside the network, or leaves it. The share of j's throughflow sent to k is $Q_{jk} = F_{jk}/T_j$, where F adds purchases and investments together. The matrix $N = (I - Q)^{-1}$ adds up the paths of every length: one step, two steps, three steps and so on. Its diagonal term n_{jj} counts how many times, on average, a dollar leaving j passes through j, its departure included. If it passes through n_{jj} times, the share that comes back is $(n_{jj} - 1)/n_{jj}$. The index weights these shares by the throughflows:

$$\mathrm{FCI} = \frac{\sum_j T_j \, (n_{jj} - 1)/n_{jj}}{\sum_j T_j}.$$

3.2 Measuring the weight of the promises

A lab's coverage. For OpenAI and Anthropic, we divide the stakes they have received by the promises to buy they have made. Full coverage would mean that the investors' money pays for everything the lab promises. We compute it over all investors, then over the suppliers who are also investors.

Promises and revenue. For each lab, we compare what it promises to pay each year with what it takes in each year, as one would compare the rent of a flat with the salary of the person renting it. Anthropic publishes both amounts. For OpenAI, we divide the announced promise by eight, the number of years it gives itself.

A seller's exposure. A craftsman with one client who has ordered the equivalent of his whole workshop depends on that client far more than a department store with its crowd of shoppers. *Exposure* measures that dependence. For each seller, we add up the promises to buy that the two labs have made to it, then divide them by the seller's own value. For a listed company, that value is its *market capitalisation* on 20 November 2026: the price of all its shares at that day's price, in other words what the stock market thinks the whole company is worth. For an unlisted company, it is its latest published *valuation*, the price set in its most recent funding round. A ratio of 1 means that the seller has received promises from the two labs worth the entire company. The ratio does not measure a risk of bankruptcy, since a seller meets its contracts with other resources too. It measures how much a seller's health depends on two customers, set against its size.

Concentration. The concentration of purchases is measured with the Herfindahl-Hirschman index (Hirschman 1964): take each buyer's share of the total, square it, then add them up, $\mathrm{HHI} = \sum_i s_i^2$. A single buyer gives 1. Many small buyers give a number close to 0. The inverse, 1/HHI, gives the number of buyers of equal weight that would produce the same concentration.

3.3 Measuring the debt and who holds it

Debt against value and against promises. For a borrower, we divide its AI debt, at the middle reading, by two quantities. Debt against value divides by the market capitalisation on

20 November 2026, or by the latest published valuation. A ratio of 2 means that the borrower owes twice what the market thinks it is worth. Debt against promises divides by the promises to buy the borrower has received from the two labs. A ratio of 2 means that it owes twice what the two labs have promised to pay it: part of the repayment is waiting on other customers.

What secures the debt, what the balance sheet shows. A company's *balance sheet* is the snapshot of what it owns and what it owes, published in its accounts. Two shares are computed on direct debt alone, because the general bonds of the big groups are secured on no particular asset and all appear on their balance sheets: mixing them in would flatten the measure. The *secured share* divides the direct debt whose collateral is a GPU or a data centre by all direct debt. The lender then gets repaid from the object the debt paid for. The *off-balance-sheet share* divides the direct debt that does not appear on the final borrower's balance sheet, the debt of project companies, by all direct debt. That debt exists, but it is missing from the snapshot.

Who holds the debt. Every line sorts its lender into a family. The *bond market* gathers the buyers of bonds, whose names are not published. Next come the banks. *Private credit* brings together funds that lend without being banks. Finally, suppliers lend to their customers. We split the middle-reading debt among these families. A bond sold directly to a few fund managers, off the public market (a *private placement*), counts first with the bond market. A second reading puts it with private credit, whose logic it follows.

Maturities. The share due before 2031 divides the debt of known maturity that falls due in 2030 or earlier by all the debt of known maturity. A bond cut into tranches counts each tranche with its own year. For CoreWeave and Oracle, the repayment schedule in their filed reports gives the same share over all their debt. The date asks a simple question: does the debt fall due before the labs' promises, spread out until 2030 and beyond, are paid? Debt secured on GPUs is also set against the useful life of a GPU, the time it stays profitable, from 3 to 6 years according to disputed estimates. The three readings of the debt serve as a range: its amounts do not go through the random draws described below.

3.4 Measuring what we do not know

Two choices the data do not settle. Every measure depends on two choices. The first is the span H of a yearly flow: one year or five. The second is the size of the undisclosed amounts. The "zero" scenario gives them no value at all. The "imputed" scenario gives each one the value of a published flow picked at random among flows of the same kind between the same two layers, so that they resemble the flows we know. The two choices combine into four assumptions.

Thousands of random draws. Some amounts are blurred even when they are published: a ceiling, a range, an estimate. Instead of choosing a single value, we draw thousands of plausible versions of the ledger at random, then recompute every measure on each one. The method is called Monte Carlo, after the casino, because it lets chance play. Under each assumption, we draw all the amounts 2,000 times. An exact published amount and a minimum stay fixed. A ceiling and a range take a random value between their firm part and their high value. An estimate is multiplied by a factor drawn at random, which stays between half and double nine times out of ten (a so-called log-normal factor). Every measure thus receives a *median*, the middle value when the draws are lined up from smallest to largest. It also receives an *interval*

that holds 90% of the draws. The draws start from a fixed random seed (20261122), a starting number that lets anyone repeat the same draws exactly.

3.5 Reading the indices

Two more indices. The measures in this chapter give the study its indices: the round-trip share and Finn's index for the loop, coverage and the ratio of promises to revenue for the labs, exposure for the sellers, the debt measures (section 3.3). Two indices join them. The *exposure gap* divides a compute renter's exposure by AMD's, the most exposed of the large chip makers. It says how many times more, size for size, the middle of the chain expects from the labs than the bottom does. For CoreWeave, we keep firm money only. The count of public flows with a known amount going to a compute renter says whether public money enters the middle of the chain.

Danger and its absence. One value of an index reassures on one point and worries on another. A small round-trip share, for instance, reassures about the sellers' money and worries about the future revenue of customers. Chapter 7 therefore takes up every index again. It says what is dangerous about its value and what is reassuring.

CHAPTER 4

The loop is open

What share of the money moving among AI companies comes back to where it started? Of the three questions, this one is the simplest. To answer it, we first draw the chain, layer by layer, then measure the round trips between two companies and finally the detours of any length.

4.1 Money flows down, stakes flow back up

Purchases run down to the hardware. Figure 4.1 groups the 69 companies into four layers. Nearly all purchases run in the same direction, down the chain. The labs buy computing power ($1,094 billion) and hardware ($378 billion). The renters and the cloud giants buy hardware ($369 billion). The uses layer buys hardware ($116 billion) and computing power ($84 billion). No blue arrow climbs back up: hardware buys almost nothing from the layers above.

measured

The stakes, a trickle. Investments take the opposite road. Compute invests $149 billion in the labs, hardware $54 billion. These $202 billion climb towards the buyers, while $1,094 billion and $378 billion run down towards the sellers. In figure 4.1, the width of each arrow follows the amount: the orange of the stakes is a mere trickle beside the blue of the purchases.

measured

What is missing comes from elsewhere. Since the chain does not close, whatever keeps it turning comes in from the side. The grey boxes of figure 4.1 show three such inflows. The end customers of the two labs, people and businesses who pay to use their models, hand them $121 billion a year. The five largest cloud giants had issued $222 billion of bonds in 2026 by the end of September. Their capital spending will top $800 billion over the year (Drehmann and Eren 2026). Governments pay $49.4 billion of current subsidies. These three numbers do not share a unit: a yearly revenue, debt issued within the year, a total of subsidies. They show where the money comes from without adding up.

reported

4.2 The round trips of a pair

Investing in a customer, the rule at the top. A first fact backs the picture of the loop. Of the 101 current investments, 57 link two companies that also trade with each other, 56% by count. These 57 investments make up 97% of the dollars invested. The BIS, looking at 1,246 AI companies over five years, finds a lower proportion: 16.1% of deals and 46.4% of their value (Frost et al. 2026). The gap comes from the field observed. The BIS counts hundreds of young companies, while we keep the largest. At the top of AI, investing in a customer is the rule.

measured

reported

Money that rarely comes back as orders. Figure 4.2 goes through every pair in which a seller holds a stake in its customer. Amazon has invested $50 billion in OpenAI, which buys $138 billion from it: the stake covers at most 36% of those purchases. Microsoft has invested $13 billion in OpenAI, which buys $257 billion from it: the stake covers at most 5% of them.

measured

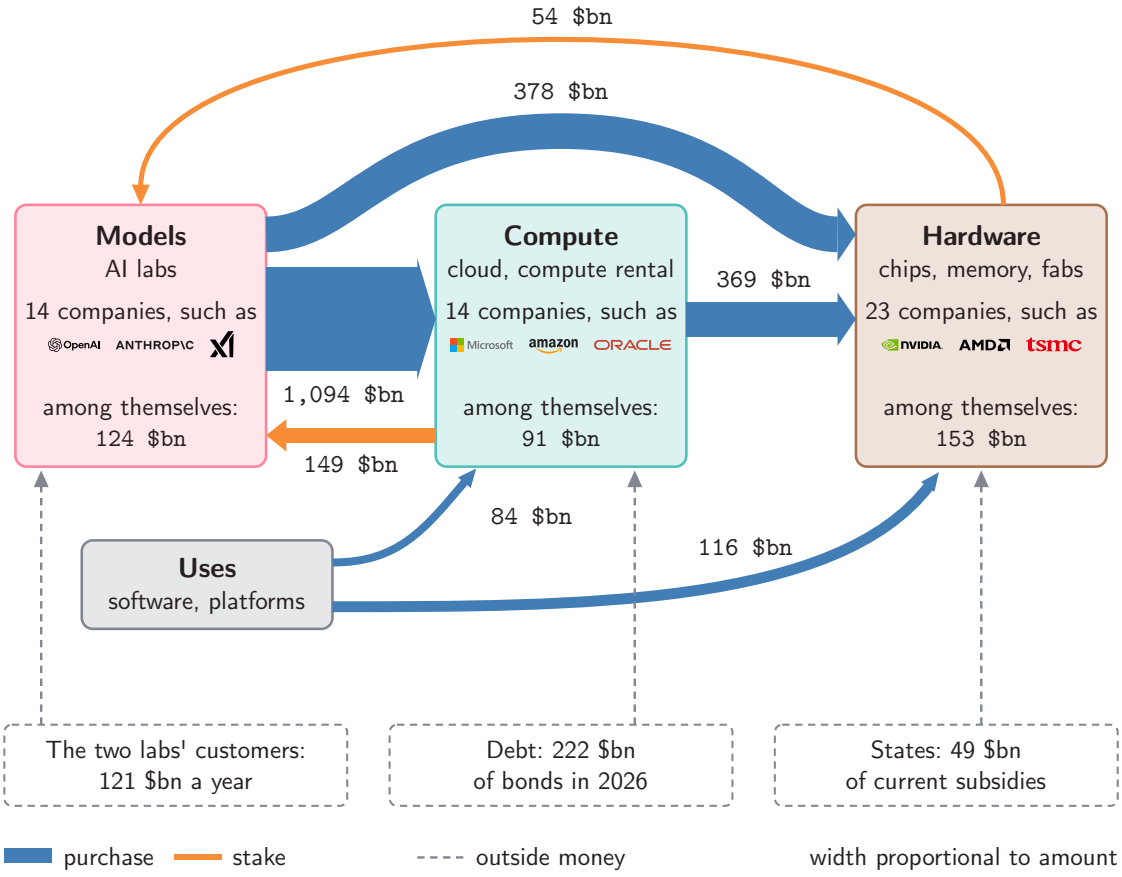


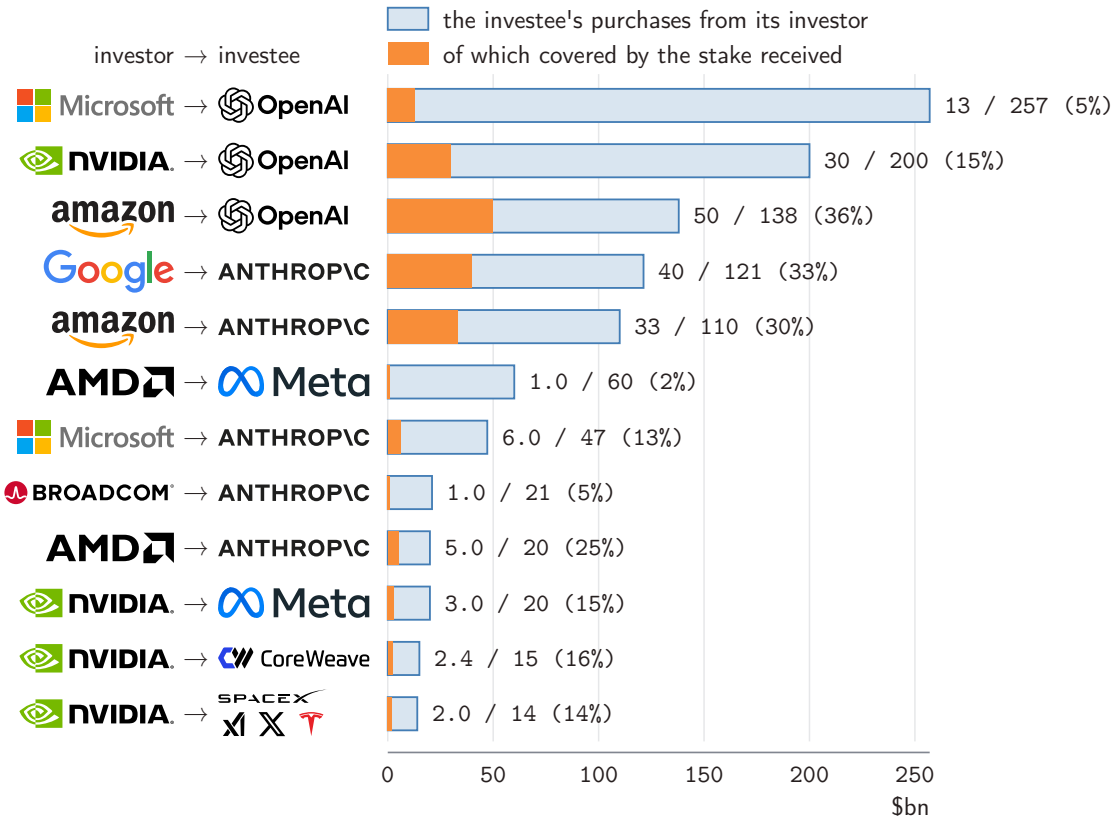
Figure 4.1. The AI money loop is open. Current purchases (blue) and stakes (orange) among 69 companies, grouped into four layers: hardware, compute, models, uses. Amounts in billions of dollars, at the central value, with a yearly flow counted for one year only. The width of an arrow is proportional to the amount. "Among themselves" adds up the flows inside a layer. The dashed grey boxes show three inflows of money from outside, each in its own unit: the yearly revenue of OpenAI and Anthropic, the bonds issued in 2026 by the five largest cloud giants (Drehmann and Eren 2026), the current public subsidies. The network values are measured [measured] from the ledger, the outside inflows are reported [reported].

Across the whole network, the sellers' stakes cover $187 billion out of $2,464 billion of current purchases. The round-trip share is 7.6%. At low values it falls to 5.2%. With $H = 5$ it is 5.4%.

A stake that opens the door. The mismatch comes from the nature of the two flows. A stake is paid once, out of money the investor already has. A promise to buy stretches over five to ten years and is paid out of the customer's revenue. The seller invests to win the order. Its money opens the door, then the rest of the contract waits on revenue that does not exist yet. This reading is an interpretation. The numbers that follow put it to the test.

4.3 Detours of any length

Finn's index, lower still. A round trip between two companies misses the three-way detour: Nvidia invests in OpenAI, which buys from Oracle, which buys from Nvidia. Finn's cycling index, defined in section 3.1, follows the money along all these detours. On the current network [measured] it is 4.0%. At low values it is 3.0%, with $H = 5$ 3.7%. On purchases alone, leaving out the



Across the whole network, sellers' stakes cover 187 $bn of the 2,464 $bn of current purchases: 7.6%.

Figure 4.2. What each round trip gives back to the seller. Each row is a pair in which a seller holds a stake of at least one billion dollars in its customer. The light blue bar gives what the customer buys from the seller. The orange part gives the largest share of those purchases the stake could cover, if every dollar invested came back whole as orders. On the right: the stake, the purchases and the share covered. Central values, a yearly flow counted for one year, in billions of dollars. The amounts are measured [measured] from the ledger: 88% of the dollars invested rest on published amounts, 46% of the purchase dollars.

stakes, it falls to 0.2%. A dollar of purchases almost never returns to the company that paid it. AI money looks more like the river than like the central heating: it crosses the chain almost in one run.

A tight network, an open loop. The loop stays open inside a network that is nonetheless very tight. The current flows link 377 distinct pairs of companies, each direction counted separately. 53 of the 69 companies belong to one block in which every company is reachable: from each, a path of flows leads to every other, like a road network on which you can drive from any town to any other. Mathematicians call such a block a strongly connected component. [measured] Nvidia touches 62 current flows, more than any other company. The roads home exist. The money that travels them is small.

4.4 Results that hold up under every assumption

measured

Four assumptions, little spread. Figure 4.3 redoes every measure under the four assumptions of chapter 3, with 2,000 random draws under each. The round-trip share stays between 1.7% and 7.6%. Finn's index stays between 0.9% and 4.2%. Both move little from one assumption to the next. Giving the undisclosed amounts the size of the known ones even lowers both measures, because most undisclosed flows are purchases. They swell the denominator, the total of purchases we divide by.

measured

The measure we set aside. The last row of figure 4.3 shows a fragile measure, the two labs' share of all purchases. With $H = 1$ and the undisclosed amounts at zero, OpenAI and Anthropic make 63% of the purchase dollars. With $H = 5$, the share falls to 46%. With the undisclosed amounts imputed, it falls further. Across the four assumptions it ranges from 17% to 68%. The explanation is arithmetic. The two labs' promises are commitments over several years, counted in one go. The cloud giants' purchases are often yearly: the more years we count, the more they weigh. The other buyers also have 174 purchases with no published amount. The median published purchase is $1.5 billion and one published purchase in ten tops $20.3 billion. Depending on the size we lend those hidden purchases, the two labs' share changes beyond recognition. We therefore do not keep it as a result.

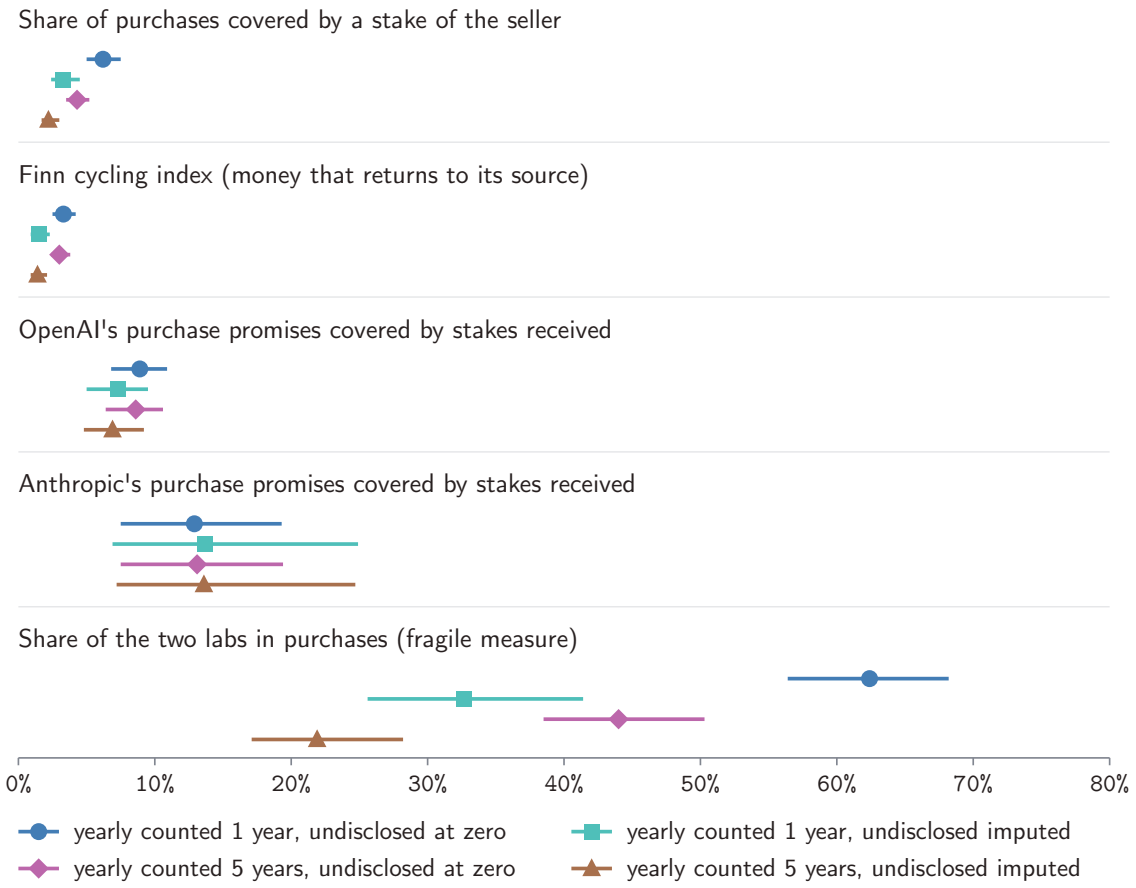


Figure 4.3. The loop measures move little from one assumption to the next, the two labs' share a great deal. For each measure and each assumption, the symbol marks the median of 2,000 random draws of the amounts and the line the interval that holds 90% of the draws. The assumptions cross two choices: a yearly flow counted for one year or for five, the undisclosed amounts set to zero or imputed from published flows of the same kind. The last measure is not part of the thesis. All values are measured measured.

CHAPTER 5

Promises on revenue still to come

The money the sellers invest pays for only a small share of what they sell. Whatever will pay for the promises to buy has to be found elsewhere. Who is waiting to be paid? With how much debt on their backs?

5.1 What the stakes cover

OpenAI and Anthropic, thinly covered. The two labs make the largest promises in the ledger. The ledger sees $1,018 billion of promises from OpenAI and $93 billion of stakes it has received from companies in the ledger, a coverage of 9%. For Anthropic, it sees $535 billion of promises and $98 billion of stakes, a coverage of 18%. At low values, which keep firm money only, Anthropic falls to 4%, because Google and Amazon promised most of their stakes on conditions. Under the four assumptions, OpenAI's coverage stays between 5% and 11%, Anthropic's between 7% and 25%.

measured

Even with the suppliers who invest. The calculation can be narrowed to the sellers who have also invested in the lab. OpenAI promises $595 billion to its investing suppliers, Microsoft, Amazon and Nvidia, which have invested $93 billion: the coverage is 16%. Anthropic promises $320 billion to its own, which have invested $85 billion: 27%. These suppliers thus win back several times their stake in orders. The rest of those orders will be paid for with something other than their money.

measured

5.2 What the labs take in

Anthropic, figures on file. To list its shares on the stock market, a company files with the SEC a document that sets out its accounts in detail. Anthropic filed its own on 10 November 2026 (Anthropic, PBC 2026). It declares $900.9 billion of promises to buy and to rent, "primarily" for computing power and infrastructure. $451.6 billion fall due before the end of 2030, $70.7 billion in the twelve months after 30 September 2026. The document declares revenue at an annual pace of $81 billion on 31 October 2026, meaning what the company would take in over a year if every month looked like the last one. It also declares $33.2 billion of revenue over the first nine months of the year. Anthropic holds $95.6 billion of cash, money available right away. It also holds $36.3 billion of short-term investments, which can be sold within a few days. According to a forecast in the same document, the listing should bring it about $84.6 billion net.

reported

Anthropic pays for the year ahead. Set against revenue, these promises amount to 11 years of revenue at the current pace. The calendar changes the picture, though. The next twelve months cost 0.87 times yearly revenue: today's revenue pays for them. Until the end of 2030, the average promise comes to $106 billion a year, or 1.31 times current revenue. Cash, short-term investments and the listing together ($216.5 billion) cover 24% of the total promised.

measured

Anthropic thus keeps its near promises. Its distant promises assume that its revenue goes on growing.

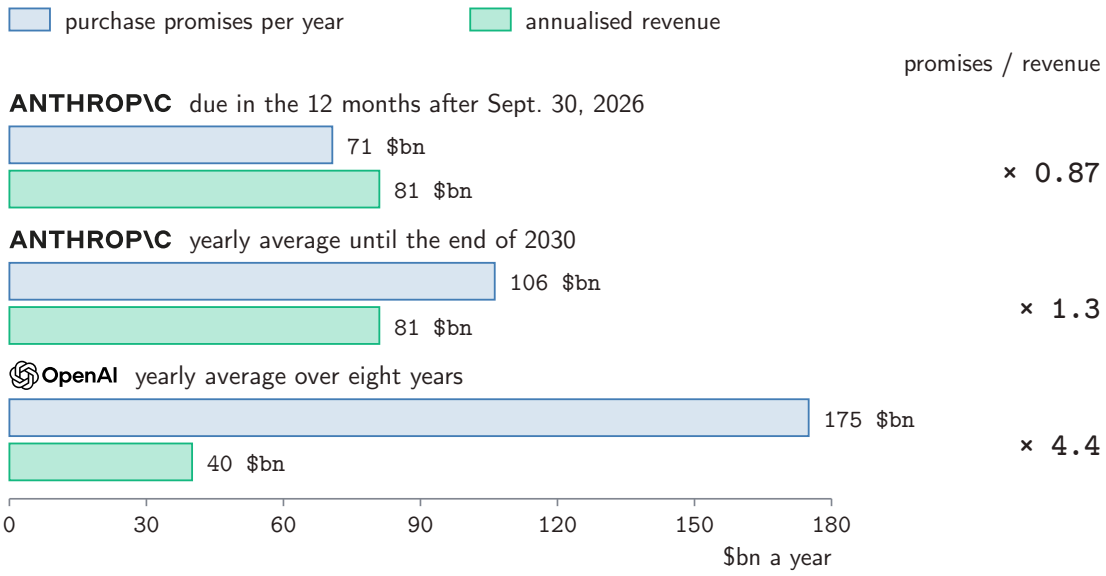
OpenAI, figures announced. OpenAI publishes no audited accounts, meaning accounts checked by an independent firm. In November 2025 its chief executive announced about $1,400 billion of commitments to computing power over eight years (TechCrunch 2025). In August 2026, Bloomberg reported revenue running at more than $40 billion a year (Bloomberg 2026b). More recent estimates, which count differently, give $50 billion (*Financial Times*) (Bloomberg 2026a) and $70 billion (Axios) (Axios 2026). The average promise then comes to $175 billion a year, 4.4 times revenue. Both numbers are statements, with no audited accounts behind them. Their ratio gives an order of magnitude.

reported measured

5.3 Who receives the promises

Oracle and CoreWeave in the front line. A promise to buy is an asset for the seller who receives it: it fills the order book. It turns into a risk if the customer does not pay. Figure 5.2 divides the two labs' promises received by each seller by that seller's value, what section 3.2 calls exposure. Oracle has received from OpenAI a promise of more than $300 billion over five years, for a stock market value of $315.5 billion. Oracle's exposure is 0.95. OpenAI's $300 billion make up 45% of Oracle's order backlog, $664 billion on 31 August 2026 (Oracle Corporation 2026). Paid over five years, they would each year equal 78% of its current revenue.

reported measured



Anthropic: filing with the US securities regulator (Form S-1/A, Nov. 10, 2026).
OpenAI: $1,400bn over eight years announced by its chief executive (Nov. 2025); annualised revenue of $40bn reported by Bloomberg (Aug. 2026). OpenAI publishes no audited accounts.

Figure 5.1. What the two labs promise to pay each year, against what they take in. In blue, the promises to buy computing power, brought down to one year. In green, revenue at an annual pace, what the lab would take in over a year at the pace of the last known month. Anthropic: listing document filed on 10 November 2026 (Anthropic, PBC 2026), reported amounts reported, with the average to the end of 2030 obtained by dividing $451.6 billion by 4.25 years. OpenAI: $1,400 billion over eight years announced by its chief executive (TechCrunch 2025), revenue reported by Bloomberg (Bloomberg 2026b). The ratios shown on the right are measured measured.

CoreWeave has received 0.93 times its value, 0.84 at low values. Fluidstack (6.7) and Nscale (3.1) have received promises several times their value. Both promises are ceilings, with no firm part published.

Chip makers far behind. Nvidia, by contrast, has received promises from the two labs worth 0.066 times its value, AMD 0.16, Broadcom 0.014. The cloud giants sit lower still: Amazon 0.093, Microsoft 0.084, Google 0.038. Oracle's ratio is 14 times Nvidia's. It is 6.1 times that of AMD, the most exposed of the large chip makers. At low values, CoreWeave's is still 5.3 times AMD's. Cerebras, a smaller chip maker, reaches 0.50. measured

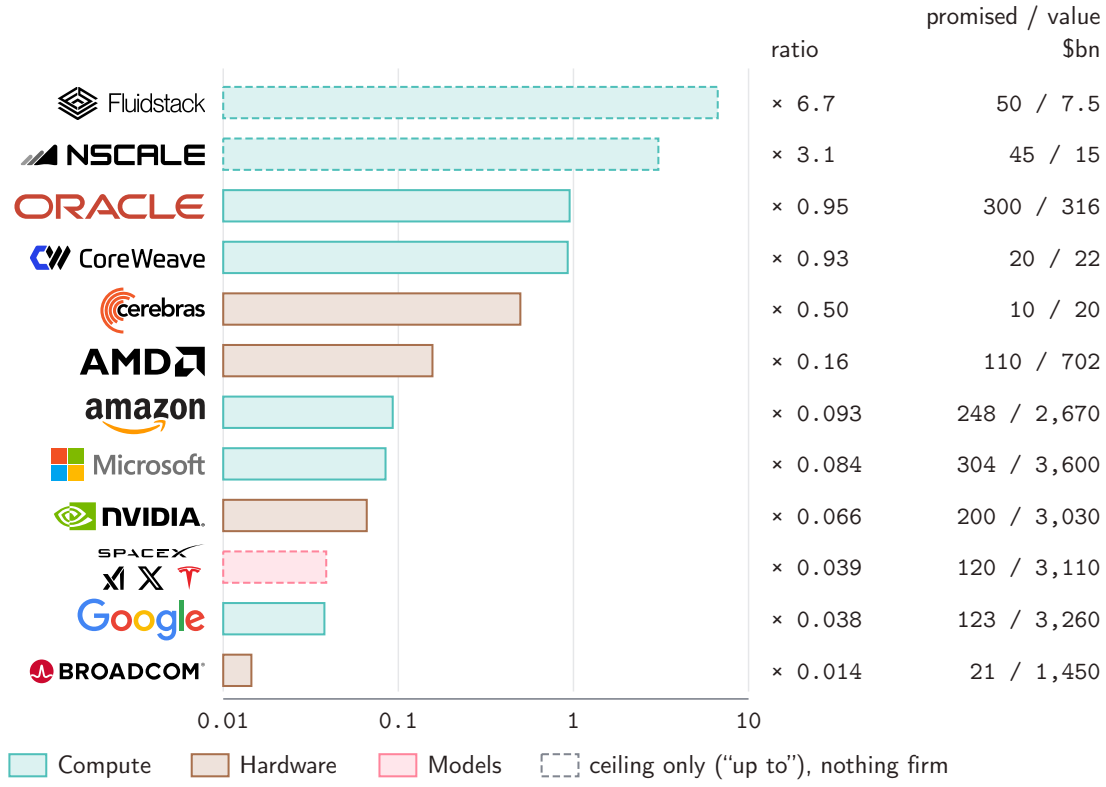
The car hire firm. The compute renters hold the most uncomfortable place in the chain. Their trade resembles that of a car hire firm. The firm buys its cars from the manufacturer, with cash or on credit, then rents them to a few large customers over several years. The manufacturer is paid on delivery. The hire firm is paid month by month, as long as its customers pay. Nvidia plays the manufacturer, CoreWeave the hire firm, OpenAI and Anthropic the customers. Those customers are few: at CoreWeave, two customers alone made up 54% of revenue in the third quarter of 2026, according to its quarterly report as recorded in the ledger. The chip makers sell to dozens of customers and have already been paid. The image stops at resale. A used car finds a buyer, while an AI chip stays profitable for 3 to 6 years according to disputed estimates. This reading of the mechanism is an interpretation. The exposure gap is measured. reported

5.4 The debt in the middle of the chain

Two renters, most of the debt. The compute renters wait for the money promised. To build what they will rent out, they borrow. The debt database (section 2.4) says how much, from whom, against what collateral and for how long. Two renters account for most of what it sees: CoreWeave and Oracle. Figure 5.3 places their debt among that of the other borrowers.

CoreWeave owes twice its value. CoreWeave owed $47.5 billion on 30 September 2026, spread over 19 lines of its quarterly report (CoreWeave, Inc. 2026). Its stock market value is $22 billion: the debt comes to 2.16 times the company. It also comes to 2.33 times the promises the two labs have made to it, $20.4 billion. Repayment therefore also waits on customers other than the two labs. $17.6 billion, 37% of the debt, are loans secured on its GPUs. Its dollar bonds, with no collateral, pay coupons of 9.00% to 9.75% a year. Its repayment schedule brings $27.9 billion, 58.6% of the debt, due before the end of 2030. Adding up all the new money CoreWeave has received, from shareholders and from lenders, debt makes up 95% of it. reported measured

Oracle, a debt booked with the developers. In the middle reading, Oracle owes $132.4 billion tied to AI. $53.0 billion are bonds Oracle itself has issued since September 2025, on its balance sheet. The other $79.4 billion are not on it. They are borrowed by the *developers*, the companies building the data centre campuses that Oracle will rent: Vantage in Texas and Wisconsin, Project Jupiter in New Mexico, Related Digital in Michigan, Crusoe's joint venture in Abilene, Texas. The press gives these amounts. No filed document confirms them. The lenders, mostly banks led by JPMorgan, MUFG and Goldman Sachs, have no recourse against Oracle: if they are not repaid, they cannot claim anything from it. They get their money back from Oracle's rent and from the value of the buildings. The rent Oracle will pay thus repays part of these loans. Its quarterly report of 31 August 2026 puts at $288 billion the signed leases that have not yet started (Oracle Corporation 2026). That rent stays out of the debt, measured reported



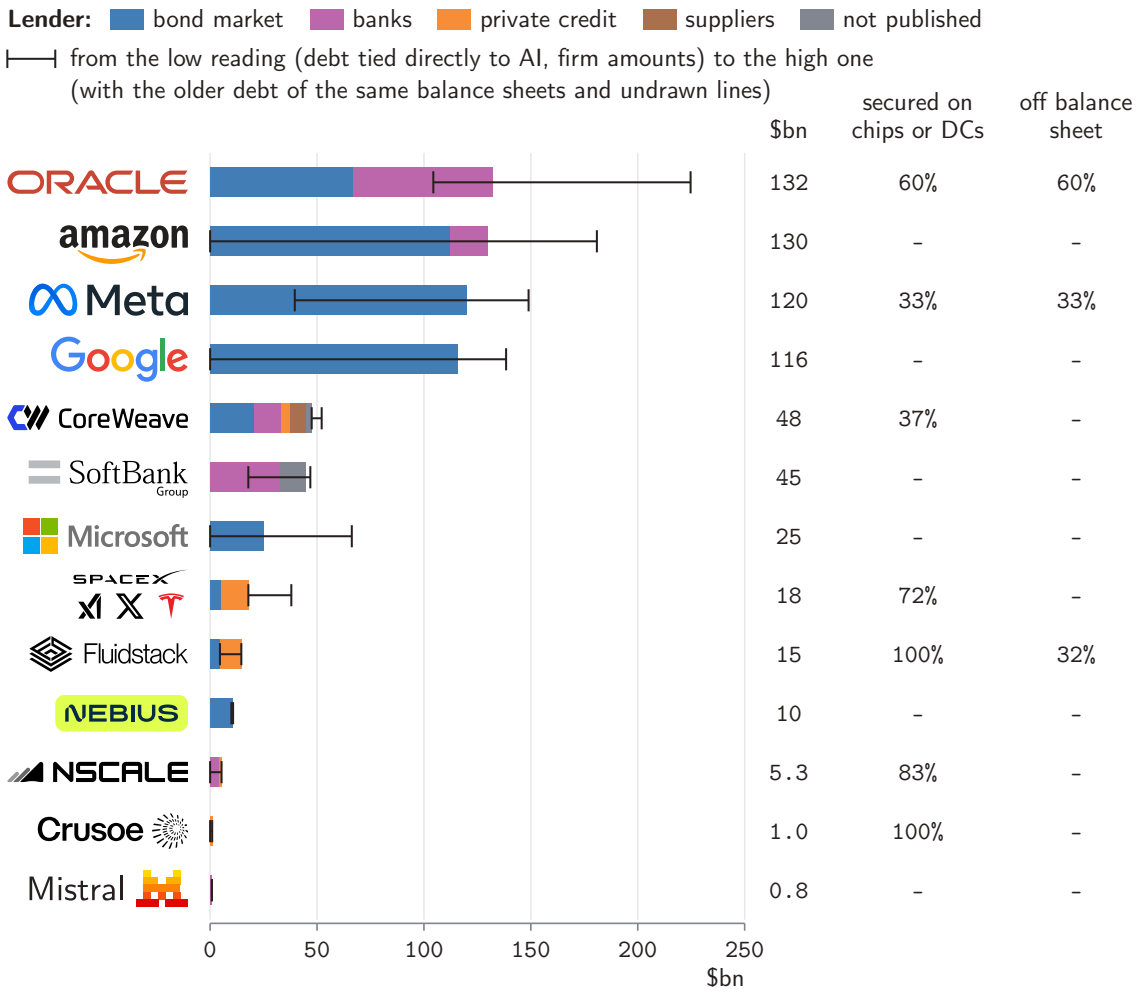
Amazon, Microsoft and Google sit in compute; the Musk group rents its chips to Anthropic.

Figure 5.2. Who receives the two labs' promises, set against its own value. For each seller, the promises to buy from OpenAI and Anthropic it has received, in billions of dollars, divided by its market capitalisation on 20 November 2026 (the price of all its shares) or by its latest published valuation. A ratio of 1 means that the promises are worth the entire company. The scale is logarithmic: each step multiplies by ten. Dashed outline: the amount is a ceiling ("up to"), with no firm part published. The colour gives the seller's layer. Amounts and values reported reported or estimated estimated depending on the flow, ratios measured measured.

counted apart. Set against its stock market value, Oracle's debt comes to 0.42. Set against the two labs' promises, it comes to 0.44.

The price of money climbs. Oracle's pricing sheets show what this debt costs. In September 2025, its bonds pay coupons of 4.45% to 6.10%. In November 2026, its latest issue pays 7.00% to 8.65%, for shorter maturities: the most distant moves from 2065 to 2046. Lenders charge more to lend for less time. The agency Standard & Poor's rates these latest bonds BBB-. On the rating agencies' ladder, that is the lowest rung of so-called "investment grade" securities, just above speculative ones, those judged risky. On the same day, Oracle also sells shares. Of all the new money Oracle has received, from shareholders and lenders together, debt makes up 79%. Its repayment schedule brings 23.1% of its bonds due before the end of 2030. measured

A fixed debt against promises. Debt and a promise get paid in two different ways. A lab's promise is paid as the contract runs, if the lab takes in enough to keep it. Debt is repaid on a fixed date, whether the customer pays or not. The renter is caught between the two. At CoreWeave, the debt exceeds the promises received and more than half of it falls due before the



In all: 665 $bn (from 243 $bn to 1,000 $bn). 72% comes from the bond market, 26% is secured on chips or data centres, 19% is off the balance sheet.

Anthropic and OpenAI have no debt drawn: their undrawn lines (67 $bn and 4.7 $bn) count only in the high reading. SoftBank borrows to fund its OpenAI stake; the Musk group gathers SpaceX, xAI, X and Tesla.

Lenders named by the sources, by amount lent:

JPMorganChase	PIMCO	Goldman Sachs	citi	VALOR
50 $bn	43 $bn	18 $bn	18 $bn	13 $bn
MACQUARIE	Morgan Stanley	MUFG	Blackstone	Brookfield
10 $bn	5.1 $bn	4.6 $bn	3.9 $bn	0.8 $bn

Figure 5.3. Who owes AI's debt, to whom, against what collateral. For each final borrower, the company whose payments repay the debt, the bar gives its AI debt at the middle reading, in billions of dollars. It is split by lender: bond market (the buyers of bonds), banks, private credit (funds that lend without being banks), suppliers, undisclosed lender. The horizontal line runs from the low reading (direct debt, firm amounts) to the high reading (adding the older debt of the same groups and the undrawn credit lines). On the right, for each borrower, the middle total, the share secured on chips or data centres and the share off the balance sheet, missing from its accounts. At the bottom, the lenders the sources name, ranked by amount lent. Anthropic and OpenAI have drawn no debt. Guarantees and leases not yet started are left out. Amounts reported reported or estimated estimated depending on the line, totals and shares measured measured.

end of 2030. At Oracle, most of the AI debt is booked with the developers. That arrangement protects Oracle's balance sheet and leaves the campus banks facing the tenant's risk.

CHAPTER 6

Public money

The compute renters gather the risk of the promises. If governments backed them, that risk would have a safety net, like the one stretched beneath a trapeze artist. Where does public money enter the chain? Where does it stay out?

6.1 What governments pay

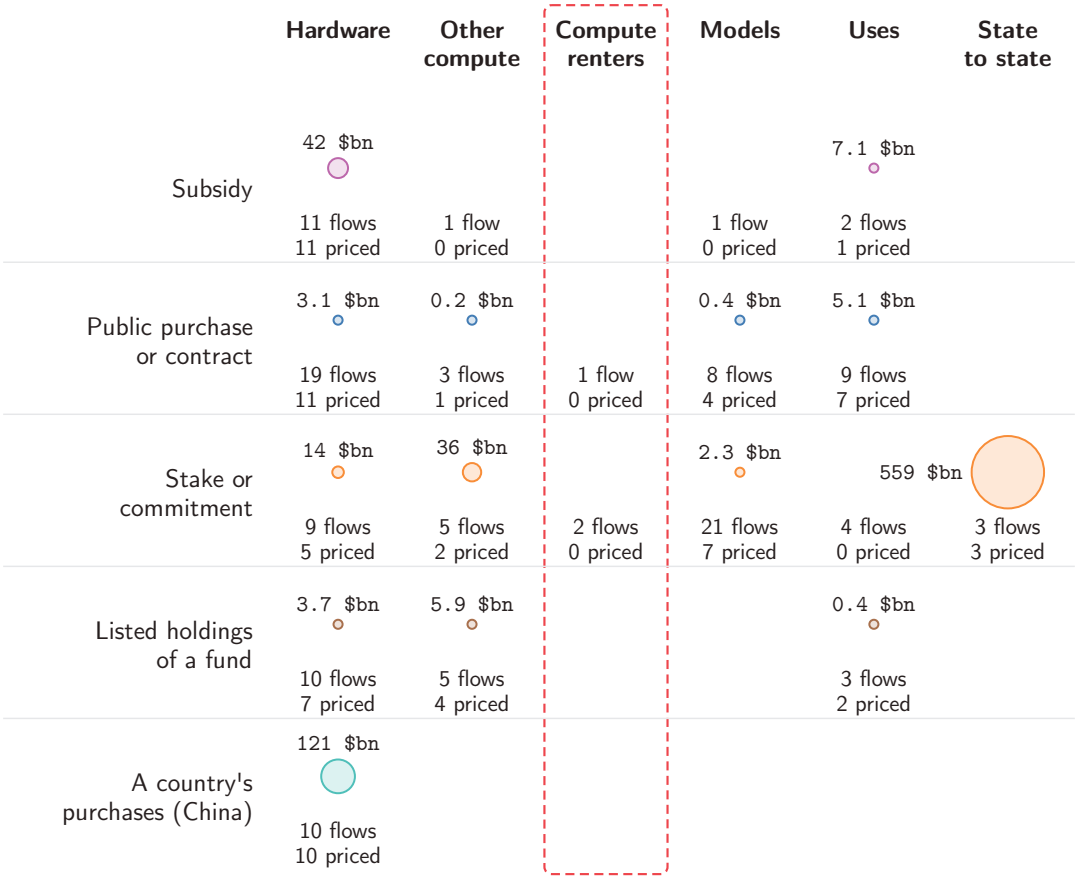
measured **Spending or investing.** The public ledger counts 127 current flows, out of 135. Figure 6.1 sorts them by kind of money and by layer. These kinds differ in size and in meaning. Subsidies (15 flows) and public purchases (40) are spending: the government pays and expects no money back. Stakes and commitments (44) and the listed holdings of sovereign wealth funds (18) are investments: the government buys a share of a company that it hopes will grow in value. China's purchases ($121 billion a year, from the sales that sellers report there) come from Chinese companies and not from the government: we keep them apart.

The largest figure stays outside the chain. The largest cell in the figure is a commitment from one government to another. In the trade agreement between Japan and the United States, Japan promises $550 billion of investment in projects that Washington will choose. The ledger reported singles out one slice of it, $33.3 billion for the gas power plants that SB Energy is building for data centres, without counting it twice. The rest has no recipient yet. Added to this are the shares of MGX (United Arab Emirates) and of Bpifrance, the French public investment bank, estimated in the AI campus planned near Paris: $9.1 billion between them, by our estimate. These $559 billion reach no company in the ledger. Without them, the current public stakes with a known amount come to $52.4 billion. measured

6.2 At both ends

At the bottom, the chip factories. Subsidies go to hardware. 11 of the 15 current subsidies reported go to makers of chips or memory, for $42.3 billion: TSMC in Japan, Germany and the United States, Micron, Samsung, SK hynix. The last subsidy with a known amount, $7.1 billion, pays for the chip factory that the Tata group is building in Dholera, India. The 12 subsidies with estimated a known amount thus all serve the making of semiconductors, the material chips are made of. The American federal government turned part of its own into a $8.9 billion stake in Intel. Governments pay for the physical base, the one they consider strategic.

At the top, the labs. At the other end, sovereign wealth funds buy into the labs. 21 current measured public flows go to the models layer, 7 of them with an amount, for $2.3 billion. MGX, the Abu Dhabi fund, holds stakes in OpenAI, in Anthropic and in Musk's group. The Qatari fund QIA and the Singapore funds GIC and Temasek come in too, as do Bpifrance at Mistral and the Canadian government at Cohere. Most of these amounts are not published. The funds join collective funding rounds, in which several investors put money in together. Only the total is



Disc area proportional to the published amount. A country's purchases are not public money: they are kept apart.

Compute renters: ORACLE CoreWeave NEBIUS NSCALE Fluidstack Crusoe

Other compute: amazon Microsoft Google Alibaba Tencent 腾讯 SB Energy G42 HUMAIN

Who pays: current public money, by country (China's purchases left out) $bn

Japan	595	France bpifrance	2.5
United States	33	China	2.3
Singapore GIC TEMASEK	10	Canada	1.3
India	9.0	United Kingdom	0.6
UAE ADIA MGX	6.8	France and UAE	0.5
Saudi Arabia Prosperity7	6.1	European Union	0.4
Germany	6.1	Qatar	-
South Korea	5.8	Taiwan	-

–: current flows, no amount published. Logos: each country's funds and public vehicles.

Figure 6.1. Public money for AI enters at both ends of the chain. Current flows from a government or a public body (government, ministry, public bank, sovereign wealth fund) to a company, sorted by kind of money (in rows) and by layer of the chain (in columns). The area of each disc is proportional to the published amount, in billions of dollars. Under each disc, the number of flows and the number of flows with an amount. The red frame surrounds the six compute renters. "State to state": commitments by one government to projects chosen by another, outside the companies of the ledger. Amounts reported reported or estimated estimated depending on the flow, counts measured measured.

announced. The ledger therefore measures their presence by the number of flows. Their stake mostly stays secret.

6.3 The middle, with no net

No public amount at the renters. Between the two ends, the six compute renters receive 3 public flows, 0 of them with an amount. The funds QIA and GIC bought into Crusoe, with no amount published. The American federal government gave Oracle a share of a defence cloud contract shared with Amazon, Google and Microsoft, under a joint ceiling of $9 billion and for general use, with no AI share published. Oracle, CoreWeave, Nebius, Nscale and Fluidstack receive no subsidy, no stake and no public purchase with a known amount.

measured

reported

The neighbour of the middle. One public flow with a known amount comes close to the middle. The $33.3 billion from Japan go to SB Energy, which is building the power supply and the data centres promised to OpenAI. We place SB Energy in the compute layer, outside the renters, because it builds data centres without renting graphics processors to others. It is the public flow with a known amount closest to the renters. Chapter 7 draws both readings from it.

reported

The middle left to the market. Public money follows a logic of sovereignty, each country's wish to master at home the technologies it considers vital, more than a logic of financial stability. It pays for chip factories, which governments want on their soil. It buys seats in the labs' capital, which the funds want to own. The middle, where the risk of the promises gathers, is left to the market and to debt. This reading is an interpretation. The column without a disc in figure 6.1 is measured.

CHAPTER 7

What worries, what reassures

A thermometer showing a low temperature reassures the patient who feared a fever and worries the one who feared the cold. The study's indices read the same way: one number reassures on one point and worries on another. This chapter takes them up one at a time. Each index was defined in chapter 3, then computed in chapters 4 to 6. Here we recall what it measures with an example from the ledger, then say what is dangerous about its value and what is reassuring. Table 7.1 gathers the values.

The round-trip share, small. Amazon has invested in OpenAI, which buys computing power from it. Part of those purchases may have been paid for with Amazon's own money. The round-trip share adds up that part over every pair, at most, then divides it by all purchases (section 3.1). It ranges from 1.7% to 7.6% depending on the assumptions. That value reassures about the most worrying story: the sellers' money does not manufacture their sales. Even counting Nvidia's guarantee on OpenAI's rent as money paid in, the share only rises to 11.9%.

measured

Yet the danger moves along with it. If the sellers' money pays for so little of the purchases, the rest comes from outside the network, mostly from revenue that the labs' end customers have not yet paid. A small share also shows that the loop exists in its form, if not in its volume: 97% of the dollars invested link a customer and its supplier. Finally, the ledger counts neither vendor credit nor off-balance-sheet vehicles, companies set up apart to keep a debt out of a firm's accounts. The BIS puts at $75 billion to $100 billion the securities tied to these vehicles placed in 2026. Money might come back through that channel without the round-trip share seeing it.

measured

reported

Finn's index, smaller still. Nvidia invests in OpenAI, OpenAI buys computing power from Oracle, Oracle buys chips from Nvidia. The dollar that left Nvidia comes home in three steps. Finn's index follows every dollar along every detour, of every length. It gives the share that returns to its starting point (section 3.1). It ranges from 0.9% to 4.2% depending on the assumptions, 0.2% on purchases alone. That value rules out the picture of a self-sustaining machine, in which a seller's slowdown would cut its own sales by a detour.

measured

The network is tight all the same. 53 of the 69 companies belong to one block, in which a path of flows leads from each to every other. Nvidia alone touches 62 current flows. A low index measures the money that comes back. It leaves aside the money that flows down. A lab that stopped paying its promises would cut off the revenue of the renter that sells it computing power, then of the chip maker that sells chips to that renter. Those paths all exist.

measured

Coverage of the promises, thin. Microsoft, Amazon and Nvidia have invested $93 billion in OpenAI, which promises them $595 billion of purchases. Their money covers 16% of what they will sell. Across all investors, coverage ranges from 5% to 11% for OpenAI, from 7% to 25% for Anthropic. For these suppliers, the figure describes a good deal: they win back in orders several times their stake. Their investment does not pay for their own sales.

measured

For the chain, the same figure signals a dependence. Most of the promises wait on money nobody has yet paid in, the labs' future revenue. Coverage also depends partly on conditions.

Table 7.1. The study's indices and their values. When a value is a range, it runs from the lowest to the highest of the intervals that hold 90% of the random draws, under the four assumptions of chapter 3. Exposure divides the promises to buy received from the two labs by the seller's value. The debt indices take the middle reading of the debt database (section 2.4). All values are measured measured.

Index	What it measures	Value
Round-trip share	The share of purchases that the seller's stake in its customer pays for, at most	1.7% to 7.6%
Finn's cycling index	The share of money that comes back to its starting point, by detours of any length	0.9% to 4.2%
OpenAI's coverage	The share of its promises to buy that the stakes it has received pay for	5% to 11%
Anthropic's coverage	The same share for Anthropic	7% to 25%
Anthropic's promises and revenue over twelve months	What Anthropic has to pay within the year, divided by its yearly revenue	0.87
Anthropic's promises and revenue until 2030	The average yearly promise until the end of 2030, divided by current revenue	1.31
OpenAI's promises and revenue	The announced yearly promise, divided by the reported yearly revenue	4.4
Oracle's exposure	The promises Oracle has received, divided by its stock market value	0.95
CoreWeave's exposure in firm money	The promises CoreWeave has received, leaving out amounts that depend on conditions, divided by its value	0.84
Gap between CoreWeave and AMD	CoreWeave's exposure in firm money, divided by AMD's	5.3
Public money to the renters	The public flows with an amount going to a compute renter, out of all the public flows that reach one	0 of 3
CoreWeave's debt and value	CoreWeave's AI debt, divided by its stock market value	2.16
CoreWeave's debt and promises	CoreWeave's debt, divided by the promises to buy it has received from the two labs	2.33
Secured direct debt	The share of direct debt secured on GPUs or data centres	64.9%
Off-balance-sheet direct debt	The share of direct debt missing from the final borrower's accounts	47.3%
Debt held by banks	The share of the debt, at the middle reading, lent by banks	20.0%
Debt due before 2031	The share of the debt of known maturity that falls due in 2030 or earlier	17.8%

Keeping firm money only, Anthropic's falls to 4%, because Google and Amazon promised most of their stakes on conditions. measured

Anthropic, the year ahead paid for. Anthropic owes $70.7 billion in the twelve months after 30 September 2026 and takes in $81 billion a year. The ratio of promises to revenue is 0.87. Today's revenue thus pays next year's bills, with no further growth needed. Cash, short-term investments and the listing together also cover 24% of the total promised. measured reported

Beyond that, the reading turns. Until the end of 2030, the average yearly promise comes to 1.31 times current revenue. All the promises together come to 11 years of revenue. And revenue also pays for wages, research and every other expense. Anthropic's distant promises thus assume that its revenue keeps growing, year after year. measured

OpenAI, the heaviest promise. OpenAI has announced $1,400 billion of commitments to computing power over eight years, or $175 billion a year on average. Bloomberg reports yearly revenue of more than $40 billion. The ratio is 4.4: each year, OpenAI promises several times what it takes in. It is the most worrying index in the study, because revenue has to multiply before the bills arrive. Two facts soften the reading. Both numbers are statements, with no audited accounts. More recent revenue estimates are higher: with Axios's, $70 billion, the ratio falls to 2.5. In every version, the promise still outweighs the revenue.

reported measured

The middle of the chain, the most exposed. Oracle's exposure is 0.95: the promises received from the two labs are worth almost the whole company. Keeping firm money only, CoreWeave's exposure is 0.84, or 5.3 times that of AMD, the most exposed of the large chip makers. Size for size, CoreWeave thus expects 5.3 times more firm money from the two labs than AMD does. The danger gathers there, with the car hire firm of section 5.3, which buys its chips with cash or on credit and gets paid as the contract runs. At CoreWeave, two customers make up more than half of revenue in the third quarter of 2026. OpenAI's promise makes up 45% of Oracle's order backlog.

measured reported

Other facts partly reassure. A promise to buy fills an order book: it stays an asset as long as the customer pays. The highest exposures, those of Fluidstack (6.7) and Nscale (3.1), are ceilings with no firm part published. Finally, the ratio measures a dependence. A seller meets its contracts with other resources too, so a high exposure does not by itself foretell a bankruptcy. The chip makers have already been paid: Nvidia has received promises worth 0.066 times its value.

measured

Public money, missing from the middle. The last index counts the public flows with an amount that go to the six compute renters. It finds 0 out of 3. The value reassures on one point: if a renter gave way, no public money with a known amount would be lost with it. Governments pay for chip factories and buy shares in labs, two choices that follow a logic of sovereignty.

measured

The same zero worries on another point. The middle, where the risk of the promises gathers, has no public safety net: it depends on the market and on debt. The closest case is SB Energy, which receives $33.3 billion from Japan to build the power supply for OpenAI's data centres. We place SB Energy outside the renters, because it rents out no computing power. A reader who would rather count it among them finds the flow and its note among the government flows of the ledger. Finally, the zero rests on an absence: a loan from a public bank to a renter, if it went unannounced, would escape the ledger.

reported

CoreWeave owes more than it is worth. Debt against value compares what a borrower owes with what the stock market thinks it is worth. CoreWeave owes $47.5 billion for a stock market value of $22 billion, a ratio of 2.16. Oracle's is 0.42. CoreWeave's figure worries its shareholders first. If the rent for computing power falls, the share price melts faster than the debt, which stays due in full. The creditors, those who lent, are repaid before the shareholders, but the cushion protecting them is thin.

measured

The same figure partly reassures. A stock market value measures the profits the market expects. It ignores part of what the company owns: CoreWeave has pledged $22.2 billion of assets as collateral, mostly servers, according to its quarterly report. At Oracle, the AI debt stays below half the stock market value.

reported measured

More debt than promises. Debt against promises compares what a renter owes with what the two labs have promised it. CoreWeave owes 2.33 times the promises received, Oracle 0.44

measured times. For CoreWeave, the reading worries. Even if OpenAI and Anthropic paid every dollar promised, that money would not cover the debt. The rest of the repayment rests on other customers, while two customers already make up more than half of its revenue. For Oracle, the reading reassures: once paid, the two labs' promises would repay its AI debt more than twice over. reported

measured **A debt secured on what it pays for.** The secured share of direct debt is 64.9%. CoreWeave's loans on its GPUs and the bonds of Meta's campuses in Louisiana and Texas are part of it. The share worries because it goes round in a circle. The collateral is worth what renting out computing power earns, hence what the bubble is worth. If rents fall, the collateral and the income that repays the loan fall together, as if a house lost its value on the day its owner lost his job. The $45.2 billion secured on GPUs run on average 5.6 years, where the maturity is known, for a chip whose useful life is estimated at 3 to 6 years.

The same share reassures on another point. A secured lender gets something back. GPUs make up only 17.3% of direct debt. The rest is secured on buildings and grid connections, which keep their value far longer than a chip. measured

measured **Nearly half of direct debt off the balance sheet.** The off-balance-sheet share of direct debt, the share that no final borrower's balance sheet shows, is 47.3%. The $79.4 billion borrowed by the developers of Oracle's campuses and the $39.7 billion of Meta's joint ventures are part of it. The share worries, because a reader of Oracle's balance sheet sees $53.0 billion of AI debt there, out of $132.4 billion. The BIS describes these arrangements as obligations "economically akin to debt" (Bank for International Settlements 2026).

The share also reassures. The lenders to Oracle's campuses have no recourse against it. Meta's have only its residual value guarantee. If a campus fails, the loss falls first on lenders who lent knowing the building. Oracle's creditors lose nothing from it. Finally, the leases that repay these loans appear in the filed reports: $288 billion at Oracle. reported

measured **Banks hold a fifth.** Knowing who holds the debt means knowing who would lose if it went unpaid. At the middle reading, the bond market holds 72.2% of it, banks 20.0%, private credit 4.4%, or 16.4% counting private placements with it. The banks' share worries, because the crisis of 2008 ran through them. It rises to 34.6% in direct debt, the debt of the campuses and the renters. JPMorgan alone lends $49.9 billion. Private credit itself borrows from banks (Bank for International Settlements 2026).

The split reassures all the same. Nearly three quarters of the debt are bonds, held by insurers, pension funds and investment funds. These lenders do not live on the deposits of ordinary savers, as banks do. A loss on these securities makes savers poorer without cutting off credit to the whole economy.

CoreWeave repays before it knows. The share of the debt of known maturity that falls due in 2030 or earlier is 17.8%. That overall value reassures: the cloud giants' debt runs for decades, until 2065 for Oracle. AI revenue has time to arrive. The detail worries. CoreWeave has to repay or *refinance*, which means borrowing again to repay, 58.6% of its debt before the end of 2030. It will do so before it has seen the labs pay most of their promises. A refinancing is paid at the going rate. That rate is climbing: Oracle's latest issue pays up to 8.65%. Finally, the maturity of $175 billion of the middle reading remains unknown. measured reported

The indices taken together. Read together, the indices move the worry elsewhere. The recycled money is too small to manufacture the sector's revenue. The danger comes first from

the revenue the labs have yet to earn beyond the coming year. It gathers next at the compute renters, who wait for that revenue with no public safety net and with debt to repay. That debt is concentrated in the middle, at CoreWeave and with Oracle's developers. Bondholders hold most of it, with a larger share of banks where the risk is closest.

CHAPTER 8

Jeff Bezos's industrial bubble

On 3 October 2025, in Turin, Jeff Bezos, the founder of Amazon, said that AI is in a bubble. He added at once that this bubble has its good side, because there are two kinds of bubble. Financial bubbles, like the one of 2008, harm the whole economy. Industrial bubbles, like the internet bubble of 2000, ruin their investors and leave society with useful inventions. The idea is strong and reassuring. We set out his reasoning in full, then the mechanisms beneath it. We then hold it up against the study's indices: what supports it and what weakens it. The chapter ends on what the thesis leaves out, the cost that even an industrial bubble lays on the people with the least room to absorb it.

8.1 What Bezos says

Turin, 3 October 2025. The conversation takes place on stage at Italian Tech Week, a yearly gathering devoted to new technology. The Italian industrialist John Elkann interviews Bezos. Elkann recalls that he was a student in Turin twenty-five years earlier, when the internet bubble burst. He sees resemblances between AI and that time. His instinct, he admits, urges caution. Bezos answers at length (Reuters 2025). The quotations below come from the full recording by the Reuters news agency, with its timestamps. The Associated Press recording gives the same text (Associated Press 2025).[1]

The share price drifts away from the company. Bezos starts from his own case. In 2000, when the internet bubble burst, "Amazon's stock in a very short period of time went from $113 a share to $6 a share". Shareholders were upset, employees nervous. Meanwhile, month after month, the number of customers rose, gross profit rose and losses shrank as a share of sales: "every single business metric [...] kept getting better".[2] He draws from it a first sign of bubbles: "The fundamentals can be disconnected" from the share price. The real health of the company and the price of its shares each go their own way. He quotes the investor Benjamin Graham, for whom the stock market is a voting machine in the short run and a weighing machine in the long run. In the short run, the price follows the mood of the buyers. In the long run, it ends up reflecting what the company is really worth. A founder's job, according to Bezos, is therefore "to build a heavy company".[3]

reported

Everything gets funded. "The second thing that happens when people get very excited as they are today about artificial intelligence for example is every experiment gets funded. Every company gets funded. The good ideas and the bad ideas. And investors have a hard time in the middle of this excitement distinguishing between the good ideas and the bad ideas. And so that's also probably happening today."[4] Bezos gives an example: billions of dollars put into

[1] The text comes from YouTube's automatic captions, checked against both videos. Several articles misquoted the central sentence. Fortune has society benefiting from "those investors" (Paoli 2025). Bezos says "inventions", at 00:38:48. The slip changes the meaning: what remains after the bubble is the inventions.

[2] 00:33:27 to 00:34:41. The prices of the time take no account of the share splits that followed.

[3] 00:34:46 to 00:35:16.

[4] 00:35:36 to 00:36:04.

"these six people at a $20 billion valuation even though they just started yesterday", with no product. He names no company.[5]

AI is real. The word bubble takes nothing away from the technology. For Bezos, AI is "a horizontal enabling layer", a tool shared by every trade, which "is going to affect every company in the world". Every factory, every hotel, every maker of consumer goods will see its quality and its productivity go up. He does not know the pace: "We don't know how long it will take exactly."[6]

Two kinds of bubble. Then comes the distinction the press picked up everywhere.

> "But the great thing about industrial bubbles, this is a kind of industrial bubble as opposed to financial bubbles. And I'll tell you what I mean by that. If you go back like the '90s had a biotech bubble and there were a bunch of uh pharma startup companies that were designing drugs and using new techniques […] As a group, they all lost money. But we did get a couple of life-saving drugs. A bubble like a […] banking bubble, a crisis in the banking system, that's just bad. That's like 2008. […] Those bubbles society wants to avoid. The ones that are industrial are not nearly as bad. It could even be good because when the dust settles and you see who are the winners, society benefits from those inventions. They still get those life-saving drugs. And that's what's going to happen here, too. This is real. The benefits to society from AI are going to be gigantic."[7]

The exchange then turns to fibre optics, the glass cables that carry the internet as light. Elkann recalls the enormous sums invested around 2000 to lay them. The answer comes at once: "all of that fiber optic cable that got laid and by the way the companies who laid all that cable went out of business. Literally went bankrupt. But the fiber optic cable was still there and we got to use it."[8]

May 2026: the good ideas pay for the losers. On 20 May 2026, on the American channel CNBC, Bezos came back to the argument (CNBC 2026). "We're in a phase where every experiment is getting funded," he said, because investors "haven't learned yet how to discriminate between good ideas and bad ideas". He is not worried by it, "because the good ideas will pay for all of the losers". "Even if it does turn out to be a bubble, you shouldn't worry about it": the bubble drives investment. "A lot of the investment is going to turn out to be very healthy". He returns to the biotech of the 1990s: many investors lost money, "but we've still got to keep all the life-saving drugs that they had invented".

The reasoning in five steps. Bezos does not lay out his argument in one go. Gathered together, it runs like this.

1. This is a bubble. Share prices drift away from the real business. Money pays for everything, without sorting.
2. The technology is real. It will raise the productivity of every company, at an unknown pace.

[5] "investors don't usually give a team of six people a couple of billion dollars with no product" (00:37:33 to 00:37:47).

[6] 00:36:18 to 00:37:16.

[7] 00:37:50 to 00:39:02; in the Associated Press recording, 00:27:38 to 00:28:50. Filler words repeated by the speaker are cut.

[8] 00:39:22 to 00:39:34. The automatic captions mark changes of voice without naming the speakers. The Singju Post transcript attributes the answer to Bezos.

3. There are two kinds of bubble. The banking bubble of 2008 is "just bad". The industrial bubble is "not nearly as bad", perhaps even good.
4. What separates them is what remains after the burst. An industrial bubble leaves behind the drugs and the fibre. Investors lose, society keeps.
5. The winners pay for the losers: taken as a whole, the wave earns more than it costs.

Silence on financing. In the Turin conversation, Bezos never mentions debt, loans or credit. The word "bank" only comes up for the banking crisis of 2008, or inside "bankrupt", for the fibre layers that went under. His distinction rests on the nature of what is being built and on what remains of it. It leaves aside another question: who pays for the building and with what money. Yet that is where the danger of a bubble is decided.

8.2 Two bubbles, two mechanisms

Bezos sets 2008 against 2000 without going into detail. The two chains of cause and effect still come down to a few steps. A few words help to follow them, here and in the rest of the chapter.

- A company's *equity* is its shareholders' money. It takes the losses first, before the lenders.
- *Leverage* measures how much of what a company holds is paid for with borrowed money. A family that buys a house with a tiny deposit and a big loan is highly leveraged: if the house loses a little value, the deposit vanishes. A bank with little equity and a lot of debt is in the same position: a small loss on what it holds wipes out its equity.
- *Securitisation* pools loans, thousands of mortgages for instance, then sells investors securities paid out of the repayments on those loans.
- An *off-balance-sheet* commitment is placed in a separate company. It does not show up as debt in the accounts of the company that benefits from it.
- *Private credit* means loans made by investment funds and insurers, outside the banks and the stock market.
- The *spread* is the gap between the interest rate a borrower pays and the rate the government pays, which counts as the safest. It widens when lenders fear a default, meaning that they will not be repaid.

2008, a financial bubble. Frederic Mishkin, then a governor of the Federal Reserve, the central bank of the United States, described in May 2008 the loop that makes bubbles dangerous (Mishkin 2008). Banks lend households money to buy a house, which serves as collateral. The house gains value, so the collateral does too, so the bank lends more: "The rise in asset values, in turn, encourages further lending against these assets." The securitised loans end up with heavily indebted banks, which themselves borrow for short periods. When prices turn, the loss wipes out their equity. They sell in a hurry, then stop lending to everyone, healthy firms included, which lay off workers. The state bails out the banks: part of the loss passes to taxpayers.

2000, an industrial bubble. The internet bubble was paid for with shares: stock market listings, venture capital (funds that bet on young companies), wages paid in stock options. When the stock market collapsed, the Nasdaq, the index of American technology shares,

estimated lost 78% from March 2000 to October 2002 (Federal Reserve Bank of St. Louis 2026). The shareholder lost the stake but had nothing to repay: the loss stopped there. The companies that laid the fibre went bankrupt. Others bought their networks cheaply. That is Bezos's picture. One segment escaped it, though. The telecom carriers that laid the fibre borrowed, about $1,000 billion worldwide according to the American communications regulator (United States Senate, Committee on Commerce, Science, and Transportation 2002). Equipment reported makers lent them the money to buy their gear: that is vendor credit. When the promised traffic failed to arrive, the carriers defaulted and their bankruptcy passed on to their suppliers. The 2000 bubble thus had two segments: one paid for with shares, true to Bezos's picture, the other paid for on credit, which went bankrupt along with its suppliers.

Credit makes the difference. Bezos separates industry from banking. Economic research separates shares from credit. Mishkin wrote it in 2008: "not all asset price bubbles are alike". "Asset price bubbles that are associated with credit booms present particular challenges" (Mishkin 2008). The economists Òscar Jordà, Moritz Schularick and Alan Taylor followed the bubbles of rich countries over more than a century. Their conclusion: "what makes some bubbles more dangerous than others is credit". "When fueled by credit booms, asset price bubbles increase financial crisis risks; upon collapse they tend to be followed by deeper recessions and slower recoveries" (Jordà et al. 2015).

reported The two American crises show it. Households lost sums of the same order in both: $4,900 billion of shares from 1999 to 2002, $5,600 billion of property from 2006 to 2009 (Taylor 2011). Yet real GDP, the country's output once rising prices are taken out, fell 0.4% in 2001 against 4.0% in 2008 and 2009. The economy lost 2.6 million jobs after 2001, 8.7 million after 2007 (Federal Reserve Bank of St. Louis 2026). Losses of the same size, harm on another scale estimated altogether! The economist Timothy Taylor sums up the gap in one line: "The key difference here is between equity and debt" (Taylor 2011). Bezos therefore has the right distinction, under another name. An industrial bubble financed on credit changes sides. Appendix B sets out the steps of both crises and their toll, compared across the United States, the euro area and China.

8.3 What the study's indices say about the thesis

What supports it. The study's indices prove Bezos right on several points.

measured
- The money does not go round in circles. The sellers' stakes cover 1.7% to 7.6% of current purchases. Finn's index stays below 4.2%. The sector does not have the shape of a closed financial loop in which the sellers' money manufactures their sales, the way the mortgages of 2008 swelled their own collateral.

- Public money builds lasting things. 11 of the 15 current subsidies go to makers of chips or memory, for $42.3 billion. These are factories, what Bezos calls what remains. reported

measured
- Revenue keeps up in the short run. Anthropic's promises for the next twelve months come to 0.87 times its yearly revenue.

- The stock market is less expensive than in 2000. In January 2026, the International Monetary Fund (IMF) judged that the possible overvaluation of American shares "is only about half that of the dot-com episode" (Adrian and Gourinchas 2026).

- The largest borrowers remain sound. The IMF noted in October 2026 that the hyperscalers, its name for the cloud giants, "continue to maintain strong balance sheets and ample liquidity buffers" (International Monetary Fund 2026).

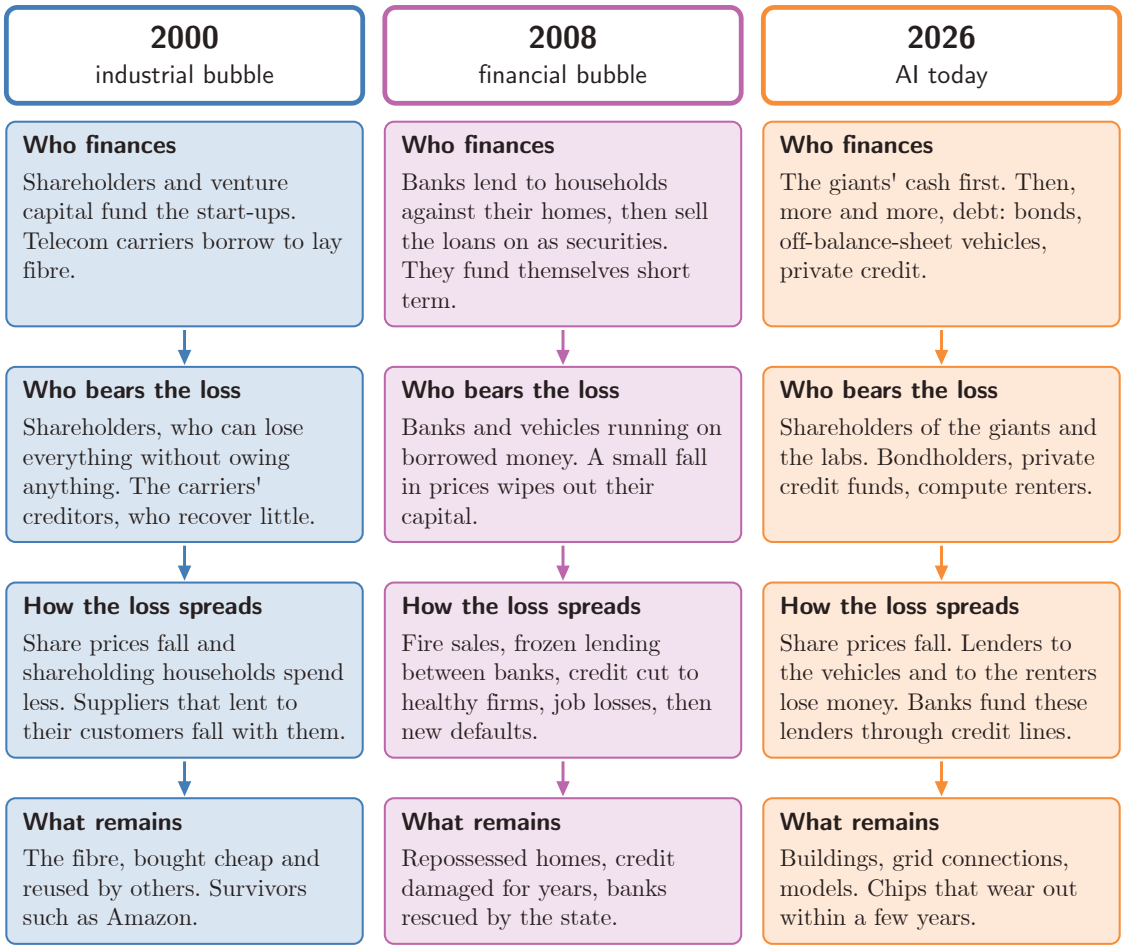


Figure 8.1. Two bubbles, two paths for the loss: where AI stands. Three columns: the internet bubble of 2000, the crisis of 2008 and the AI of 2026. Each column follows the money from top to bottom: who provides it, who takes the loss if the bubble bursts, through which channel the loss reaches the rest of the economy, what is left afterwards. In 2000 the loss stops mostly with shareholders, except in the telecom segment, paid for on credit. In 2008 it runs through the banks and cuts off credit to everyone. In 2026 the financing of AI is sliding from shares towards debt. Diagram drawn from Mishkin (2008), Jordà et al. (2015), Bank for International Settlements (2026) and International Monetary Fund (2026).

Financing tips towards debt. Bezos says nothing about financing. Our debt database measures it, line by line, from filed documents and pricing sheets (section 2.4). In the middle reading, $664.9 billion of debt pays for building AI. $403.4 billion of it are general bonds and loans the big spenders have issued since September 2025. The low reading, which keeps firm direct debt alone, gives $242.7 billion, the high reading $1,000.5 billion. The shift shows most clearly in each company's new money, from shareholders and lenders together.

measured

- In the middle of the chain, debt dominates. It makes up 95% of CoreWeave's new money and 79% of Oracle's.

measured

- At the top, the two big labs do not borrow. Anthropic and OpenAI have drawn no debt. They live on stakes: $182.5 billion for Anthropic, its listing included, $93 billion for OpenAI in the ledger. Anthropic keeps $67 billion of undrawn credit lines.

reported

measured

- The debt behind the labs is borrowed by their shareholders. SoftBank, the Japanese group that has invested in OpenAI, owes about $44.9 billion of loans, including loans secured on its Arm and OpenAI shares, according to the press. measured
- Money is getting dearer. Oracle's coupons go from 4.45% to 6.10% in September 2025 to 7.00% to 8.65% in November 2026, for shorter maturities. reported

Who lends, who would lose, through which channel. Bezos's distinction leaves three questions open. The debt database answers them with amounts.

- Who lends. The bond market holds 72.2% of the middle-reading debt, banks 20.0%, private credit 4.4%, 16.4% with private placements. The buyers of the bonds are not published. The IMF notes that the cloud giants' bonds now weigh in the indices that bond funds track (International Monetary Fund 2026). measured
- Who would lose. The answer depends on the level of the chain. An Amazon or Google bond is repaid by the whole group, over decades. A burst would reach it through its price more than through a default. Direct debt, $261.5 billion, is closer to the risk. 64.9% of it is secured on GPUs or data centres, 47.3% is off the balance sheet, with no recourse against the tenant or only limited recourse. At a renter, the shareholders lose first. The lenders of direct debt come next: banks for 34.6%, private credit for 11.2%. measured
- Through which channel. Three channels can be measured. The collateral follows the bubble: $45.2 billion is secured on GPUs, whose value depends on the rent for computing power. Refinancing comes early: CoreWeave has to repay 58.6% of its debt before the end of 2030, at rising rates. Banks lend to the campuses and to private credit: JPMorgan alone lends $49.9 billion in the debt database. measured

The guardians of stability see the same shift. Our measurements match those of the institutions in charge of financial stability. Our pricing sheets count $227.0 billion of bonds issued by the five largest cloud giants from January to September 2026. The BIS bulletin of October 2026 counts $222 billion (Drehmann and Eren 2026). The two counts were made separately and land almost in the same place. The institutions add what our database does not see. measured reported

- The IMF, in January 2026: "Debt financing is becoming more prevalent as expansion accelerates"; "Higher leverage could amplify shocks if returns fail to materialize" (Adrian and Gourinchas 2026).
- The Bank of England, in December 2025: AI infrastructure spending over the next five years could exceed $5,000 billion, of which "approximately half is expected to be financed externally, mostly through debt". "Should an asset price correction occur, losses on lending could increase financial stability risks" (Bank of England 2025). reported
- The Bank for International Settlements (BIS), in March 2026, describes "obligations that are economically akin to debt but largely reside outside corporate balance sheets". These arrangements tie the cloud giants to private credit funds and insurers. "Banks support the vehicles with funding lines" (Bank for International Settlements 2026). The bond issues of these giants topped $100 billion in 2025 (Bank for International Settlements 2026). From $75 billion to $100 billion of securities tied to off-balance-sheet vehicles were placed in 2026. reported
- The IMF, in October 2026: "Dwindling free cash flow has pushed hyperscalers to rely increasingly on debt financing." Their share of investment-grade bond issues, the bonds

of borrowers that rating agencies judge the safest, went from 0.5% in 2024 to almost 10% in 2026. Adjusted for the length of the bonds, it tops 6%, "approaching that of banks". Their interest bill more than doubled in a year, to nearly $6 billion in the second quarter of 2026 (International Monetary Fund 2026). The IMF concludes that "a disappointment in AI monetization and a slowdown in AI investments could be amplified into a market correction through deleveraging and lead to a broader tightening of financial conditions".

reported

Vendor credit is back. Set beside the debt, the figures of chapter 5 take on another meaning. Nvidia guarantees up to $105 billion of OpenAI's rent: that is vendor credit, the mechanism that brought down the telecom equipment makers in 2001. OpenAI promises each year 4.4 times what it takes in. OpenAI's promise to Oracle makes up 45% of Oracle's order backlog. In firm money, CoreWeave expects from the two labs, size for size, 5.3 times more than AMD does. Its debt comes to 2.16 times its stock market value and 2.33 times the promises received from the two labs (section 5.4). The ceiling of some of its loans depends on the value its accounts give its graphics processor servers, a value that falls every year as they age (CoreWeave, Inc. 2026). The largest cloud giants have also signed $1,200 billion of data centre lease commitments, $820 billion of them for leases not yet started (Drehmann and Eren 2026). A renter that borrows to build for a customer keeps its debt if the customer defaults. That was the position of the fibre layers.

reported

measured

What remains wears out faster. Bezos's second pillar is what remains. The fibre laid around 2000 outlived the companies that laid it. AI chips age faster. A company spreads the cost of a machine over its working life: that is depreciation. Meta has depreciated its servers over 5.5 years since January 2025. The investor Michael Burry finds that span too long for chips that Nvidia replaces with every generation. He puts at $176 billion the depreciation that the tech giants would understate from 2026 to 2028. Nvidia and CoreWeave dispute it (Roytburg 2025). After a burst, the buildings, the grid connections, the models and the know-how would remain. The chips, the largest expense, would quickly lose their value. This wear does not bring AI closer to 2008. It shrinks the share of the investment that society keeps, the share on which the thesis rests.

reported

Closer to the telecoms of 2000 than to 2008. Taken together, these facts place the AI of 2026 between the first two columns of figure 8.1, those of 2000 and 2008. The fairest parallel seems to be the telecom segment of 2000: infrastructure built on credit, vendor credit, builders exposed to a few customers who have yet to find their revenue. Three facts keep it away from 2008.

- The debt runs mostly for the long term: 17.8% of the debt of known maturity falls due before 2031.
- The bond market holds 72.2% of it, banks funded by deposits 20.0%.
- The IMF and the Bank of England describe shocks amplified and credit tightened, with no mention of a risk to ordinary savers' deposits.

measured

measured

Four mechanisms could still tip a crisis towards the 2008 column.

- The bank credit lines granted to off-balance-sheet vehicles and to private credit funds bring their losses back to the banks (Bank for International Settlements 2026).
- Investors buy AI shares on credit, through leveraged funds or on margin, meaning with money borrowed from their broker. A fall forces them to sell. The selling speeds up the fall (International Monetary Fund 2026).

- Chips serve as collateral for the renters' loans. Their value depends on the rent for computing power, hence on the bubble itself: if rents fall, the collateral and the income that repays the loan fall together.
- The giants' debt now weighs almost as much as the banks' in bond indices. A widening of their *spreads* would hit every fund that tracks those indices (International Monetary Fund 2026).

8.4 What ordinary people pay

Bezos speaks of "society" and of "the winners". As he uses it, the industrial bubble describes a long-run balance: what society keeps once the dust has settled. The immediate cost falls on those with the least room to absorb it. They are other people. Those who enjoyed the fibre in 2010 were not the ones who had lost their jobs or their savings in 2002.

2000, a mild crisis seen from afar. The recession of 2001 was short. It still cost many people dearly.

- Jobs. American unemployment rose from 3.8% in April 2000 to 6.3% in June 2003. 2.6 million payroll jobs vanished from February 2001 to August 2003 (Federal Reserve Bank of St. Louis 2026). Employment only touched bottom in August 2003, well after the recession had ended. estimated
- Families. Bezos tells it himself: as the share price fell, "shareholders were upset, employees were nervous". "We had all of our employee base, their parents were all calling our employees and saying are you okay?"[9] Families took fright just as the company was doing better.
- Retirement savings. The employees of Enron, an American energy giant, lost more than $1 billion in their company retirement plans (the American 401(k) plans), more than 60% of which was invested in Enron shares (United States Senate, Committee on Health, Education, Labor, and Pensions 2002). The company paid its own contribution in shares, which employees could not sell before the age of 50 (Knowledge at Wharton 2002). At WorldCom, a large telecom carrier, the share that filled these plans fell from 16 dollars to 12 cents (Earle 2002). In both cases, the employees' wages and their savings depended on the same company. They went down together. reported
- Telecom jobs. The economist Robert Litan counts 500,000 jobs lost in the industry and about $2,000 billion lost by its shareholders (Litan 2002). reported
- Small shareholders. The shares held by American households fell from $9,000 billion to $4,100 billion from 1999 to September 2002 (Taylor 2011). reported

Today, everyone's savings. The seven largest American technology stocks (Apple, Microsoft, Nvidia, Alphabet, Amazon, Meta and Tesla) made up 33.7% of the S&P 500 index in November 2026 (Daly 2026), about a third. The S&P 500 gathers the largest listed companies in the United States. Millions of savers follow it without giving it a thought. Every saver who holds an index fund, a default retirement plan or a share in a pension fund thus holds, without having chosen it, a large stake in AI. Borrowing by private investors is rising too. In Korea, according to press reports quoted by the IMF, private individuals held 92% of the leveraged reported

[9] 00:33:56 to 00:34:06.

funds on chip stocks when those funds collapsed in July 2026 (International Monetary Fund 2026).

The electricity bill. PJM runs the power grid of thirteen eastern American states. Its independent market monitor estimates that the growth in demand from data centres added $29.4 billion to capacity costs, the price paid to make sure enough power stations will be ready, over the last four auctions. Wholesale costs rose 46% over the first seven months of 2026 (Howland 2026). These costs pass into household bills, whether or not the bubble bursts. reported If the planned data centres never get built, the capacity paid for on their behalf stays paid for.

Public revenue. To attract data centres, American states exempt them from sales tax. reported Virginia thus gave up $1.6 billion of revenue in fiscal year 2025 (Robinson 2026). Ten states together give up about $3.1 billion a year (Bologna 2025). Schools and local services go without that money, whether or not the bubble bursts.

Spending by the well-off. American growth leans more and more on well-off households. According to the firm Moody's Analytics, the tenth of households with the highest incomes accounted for 49.2% of consumer spending in the second quarter of 2025, a record since 1989 (Marte 2025). Mark Zandi, its chief economist, ties that weight to AI: "The AI boom has reported sent the stock prices of AI companies skyward"; "those companies are owned by households in the top 10% in the income and wealth distribution" (Visé 2025). A fall in AI shares would first cut the spending of well-off households. The service jobs that live on it, often held by people on modest incomes, would absorb the adjustment. The IMF also warns that low-income countries, indebted and little exposed to AI, would suffer weaker demand from abroad and higher interest rates (Adrian and Gourinchas 2026).

The balance and the bill. "Industrial bubble" describes what society keeps after ten or twenty years: drugs, fibre, perhaps models and data centres. The phrase says nothing about who pays for the transition. The immediate cost of a burst falls on laid-off workers, on savers whose retirement tracks the index, on households paying for electricity, on local governments that gave up revenue. The long-run winners, the users of the inventions and the surviving companies, are not the short-run losers. Even a "not nearly as bad" crisis has its victims. They rarely chose the bet.

CHAPTER 9

What the ledger cannot see

A ledger built from public sources sees what the press, regulators and companies publish. The rest escapes it. Here we list every blind spot and the direction in which it could move the results, then we measure the errors of the ledger itself.

measured **The undisclosed amounts.** 241 of the 412 current flows have no published amount. The imputed scenario gives them the size of known flows of the same kind (section 3.4). It cannot tell whether the contracts kept quiet are larger or smaller than the ones announced. The loop measures move little from one scenario to the other. The two labs' share of purchases changes a great deal: we do not keep it.

The promises the ledger misses. The ledger sees 59% of the promises declared by Anthropic and 73% of those announced by OpenAI. The missing promises would almost all go to sellers. measured They would raise the measured exposure without changing the loop, since a promise with no stake on the other side adds nothing to the round trip.

Other roads home. The ledger counts purchases and stakes. It leaves aside rent guarantees, loans a supplier grants its customer, buybacks of unused capacity and off-balance-sheet vehicles. The loop could close along those roads. The Bank for International Settlements (BIS) reports that $75 billion to $100 billion of bonds and asset-backed securities, tied to the off-balance-sheet vehicles of data centres, were placed in 2026 up to the end of October. It puts at $1,200 billion the data centre lease commitments of the largest cloud giants in mid-2026, $820 billion of reported them for leases not yet started (Drehmann and Eren 2026). Our only test of this channel, Nvidia's guarantee on OpenAI's rent, lifts the round-trip share to 11.9%. The debt database measured (section 2.4) records part of this channel: guarantees, vendor credit, the debt of project companies. It keeps them out of the loop calculation. Its record is incomplete: Google also guarantees rent at Hut 8, with no amount published.

The blind spots of the debt. The debt database has its own limits.

- 25 lines rest on the press alone, among them the $79.4 billion borrowed by the developers of Oracle's campuses. For some of them, the quotation comes from a search result, without the page itself having been opened. These lines are flagged one by one.
- The amount drawn is not published for the credit lines of Nscale, of Crusoe or of Macquarie for Fluidstack. Their low value is zero.
- The maturity of $175 billion of the middle reading is unknown: Valor's equipment debt in Musk's group, the loans for the campuses of Vantage, Project Jupiter and Abilene, SoftBank's loans. The share due before 2031 is computed without them.
- The September 2025 convention sorts a general bond by its date. It does not know what the bond really pays for.
- The holders of the cloud giants' bonds are not published. The groups of banks that lend together, the banking syndicates, are often known only by their lead banks.

- The leases not yet started at Alphabet, Microsoft and CoreWeave were not read. Securities backed by data centres are not itemised line by line, although the BIS counts $75 billion to $100 billion of them placed in 2026. reported
- Lambda, a compute renter missing from the 69 companies of the ledger, is left out. SoftBank's loan secured on its OpenAI shares may overlap with another of its loans. Both are counted, the first with low confidence.
- Debt against promises makes sense for a renter that receives promises. For a company that receives almost none, such as Meta, the ratio swells without saying anything about risk: we do not quote it.

Government amounts. Sovereign wealth funds join funding rounds of which only the total is published. The public ledger knows that they are present at the labs, rarely for how much. The conclusion about the middle of the chain rests on an absence: no public flow with an amount going to a renter. Absence of evidence is not evidence of absence. A loan from a public bank to a renter, if it went unannounced, would escape the ledger.

A photograph taken on one day. Exposure divides promises spread over several years by a stock market value on a single day, 20 November 2026. If a renter's share price falls, its exposure rises without anything changing in its contracts. The valuations of unlisted companies date from their latest funding round, sometimes several months back. OpenAI's revenue comes from a statement reported by the press, with no audited accounts published.

Choices of classification. Putting a company in a layer is a choice: Google in compute, Musk's group in models, SB Energy outside the renters. Each choice is written down once and holds for every calculation.

Time. The ledger stops on 22 November 2026. AI flows change every week. The measures are valid for that date.

9.1 How reliable the ledger is

The lines of the ledger and of the debt database were collected with the help of AI agents, which read the sources and then copy out the facts. Such a survey sometimes goes wrong: it misreads a unit, mixes up two funding rounds, copies a neighbouring date. We measured how often, like an inspector who opens a few parcels picked at random to judge a whole warehouse.

Back to the sources, line by line. A random draw picked 50 company flows, 15 government flows and 20 lines of debt, starting from a fixed random seed (20261122) that lets anyone repeat the same draw. Half the company flows come from those with an amount, half from those without one, purchases and investments in almost equal parts. For every line, we reopened the cited source. We checked the direction of the flow, its kind, the company on the other side, the published amount, the calculation behind an estimated amount, the status and the date. When the page refused our reading program, failed to answer or had vanished, an equivalent source took its place. That happened 14 times. Each time, a replacement source turned up. Every line receives one of these grades: correct, minor error (rounding, date, label, assumed quantity presented as published), error of amount, error of direction or kind, source not found. Every line checked keeps its quotation from the source.

Table 9.1. The ledger's error rate, measured on a sample drawn at random and checked against the cited sources. A serious error affects the amount, the direction of the flow or its kind. The rate is read among the lines checked. In brackets, the 95% confidence interval computed with Wilson's method: the range that very probably holds the true rate of the whole ledger measured.

Layer	Lines	Correct	Minor	Serious	Error rate	Serious errors
Company flows	50	40	6	4	20% (11% to 33%)	8% (3% to 19%)
Government flows	15	14	0	1	7% (1% to 30%)	7% (1% to 30%)
Debt	20	18	2	0	10% (3% to 30%)	0% (0% to 16%)
All	85	72	8	5	15% (9% to 24%)	6% (3% to 13%)

Mostly minor errors among the companies. Of the 50 company flows, 40 are correct (table 9.1). The error rate is 20%, within a confidence interval of 11% to 33%. That interval, measured computed with Wilson's method, brackets the true rate of the ledger with 95% confidence. It is wide because the sample is small: a few lines more or fewer in a sample of this size shift the rate by several points. Most of these errors are minor. Serious errors, of amount or of direction, affect 8% of the flows (from 3% to 19%). If each group in the draw (with or without an amount, purchase or investment) is given the weight it has in the ledger, the error rate is 22%. The government flows hold a single error, an error of kind. The debt database holds no serious error in 20 lines, which puts the true rate below 16%. It mostly copies tables from filed reports, which can be found again to the last digit.

Four typical errors. Every serious error follows a mechanism one learns to recognise.

- A misread unit. AMD's purchase of memory from Samsung multiplied a market share by a capacity in billions of gigabytes, mistaken for an amount in dollars.
- An estimate set at the top of its own range. The purchases of Nvidia chips by Musk's group took the top of their range as the central value, without stating the unit price used. The chip cost data quoted on the same line gave markedly less.
- A resale of shares read as an investment. When Arm listed on the stock market, AMD bought shares sold by SoftBank. Cisco bought into CoreWeave through a sale of the same kind. In both cases the money went to the shareholders who were selling and the company received nothing, just as a car dealer gets nothing when one driver sells a used car to another.
- An option taken for a stake. Temasek's line on SAP copied out a call option, the right to buy shares later at a set price, declared in its quarterly report to the SEC.

The minor errors are assumed quantities presented as facts (a number of servers, a lease added "at a few billion"), a date or a status lagging behind the source, a lead role wrongly attributed. A single cited source had vanished. The official press release replaced it.

Corrections, written apart. The errors the audit proved are corrected. The raw ledger does not change: every correction is entered in a separate list, with the old value, the new one, the reason, the source that proves it and the date. Before replacing a value, we check that the old one is indeed the value in the ledger. The purchases of existing shares and Temasek's option on SAP leave the calculation. They are recorded apart, with their reason. AMD's purchase of memory from Samsung starts again from a size of the HBM market (the fast memory of AI chips) in dollars, published by Bank of America. The purchases of Nvidia chips by Musk's group take as their central value the chip costs estimated by Epoch AI for xAI and

Musk's own estimate for Tesla. The old value becomes the high value. Assumed quantities are written as assumptions.

The same search across the whole ledger. We then looked for the same errors across the whole ledger, beyond the sample. That search corrects 16 more lines, 7 of which leave the calculation. The other cornerstone investors in Arm's listing (Nvidia, Intel, Google, Apple, Samsung, TSMC) all bought shares from SoftBank. G42's fund bought its ByteDance shares from existing shareholders. Tencent bought its Tesla shares partly in a share issue by Tesla and partly on the stock market: only the issue paid Tesla. The line keeps only its ceiling. The other estimates that multiplied a share of the HBM market used the same capacity in gigabytes. They start again from the amount in dollars. Temasek's line on ASML added call and put options to the shares. The doubtful cases that the sources do not settle stay as they are, recorded as doubtful.

What the audit changes in the results. Table 9.1 gives the error rate of the initial survey, before any correction. It measures the reliability of the survey method, which also applies to the lines that neither the audit nor the search reread. With every correction made, the round-trip share moves from 7.5% to 7.6%, the top of Finn's index from 4.1% to 4.2% and the total of current purchases from $2,491 billion to $2,464 billion. The gap between CoreWeave and AMD stays at 5.3 times. Most of the flows removed had no published amount. The corrected amounts affect purchases that weigh little in the totals. The audit checks what the lines present in the ledger say. It does not measure the flows the ledger missed: those are the subject of the blind spots that open this chapter.

measured

CHAPTER 10

Conclusion

The shape of the loop, without its volume. The picture of circular financing describes the shape of the deals well and their size badly. At the top of AI, the baker does invest in his canteen: 97% of the dollars invested link a customer and its supplier. Yet those dollars pay for only 1.7% to 7.6% of current purchases. Finn's index, which follows the money along detours of any length, stays below 4.2%. AI money runs down the chain like a river to the sea. The loop is open. measured

A chain held together by promises. A promise keeps the chain turning. The two big labs have promised to buy computing power on a scale their investors barely cover: at most 11% of the promises for OpenAI, 25% for Anthropic. Anthropic pays for its next twelve months out of its current revenue. Beyond that, its promises assume that revenue keeps growing fast. OpenAI's assume it even more. measured

The most watched is not the most exposed. Among the sellers waiting to be paid, Nvidia has received promises from the two labs worth 0.066 times its value. Oracle has received 0.95 times its value. Size for size, the compute renters in the middle run a risk 5.3 times heavier than the large chip makers. Against little Cerebras, the gap falls to 1.7 times. Governments pay for chip factories at the bottom and buy shares in labs at the top. They put no money with a known amount in the middle. measured

Those who wait borrow. The middle of the chain builds on credit. In the middle reading, $664.9 billion of debt pays for AI. CoreWeave owes 2.16 times its stock market value. Oracle has booked $79.4 billion with the developers of its campuses, off its balance sheet. The two big labs have drawn no debt. If the bubble burst, the loss would run through bondholders and the banks that lend to the campuses, more than through shareholders alone. measured

An industrial bubble, financed on credit. Jeff Bezos sees AI as an industrial bubble, which ruins its investors and leaves inventions behind. Our indices prove him right about the loop. Debt, though, brings AI closer to the telecom carriers of 2000, which went bankrupt along with their suppliers. Even a "not nearly as bad" crisis would cost first of all workers, savers whose retirement tracks the index and households paying for the electricity of data centres.

What the ledger is worth. An audit of 85 lines drawn at random, checked against their sources, finds serious errors (of amount or of direction) in 6% of them (from 3% to 13%). Those errors are corrected, as are the ones a search of the whole ledger turned up afterwards. Together, these corrections moved the round-trip share from 7.5% to 7.6%. Chapter 9 sets out these errors in detail. measured

The numbers to watch. Three numbers will show, in the months ahead, how this risk evolves.

- The yearly revenue of the two labs, against their promises for the following year.

- The firm share of the promises received by the compute renters.
- The share of the renters' debt that falls due before 2031, with the coupon at which they refinance it.

Every number in this report is computed from the ledger and the cited sources. None is copied out by hand. Do you know of a flow that is missing? Write to the author (warithmetics@deraison.ai): the ledger is only too glad to grow.

APPENDIX A

Key numbers and their proof

Table A.1 gathers the numbers on which the thesis rests, each with its proof status. Like every number in the text, they are computed from the measures, the debt database and the external sources cited: none is typed by hand. A measured number can be recomputed from the ledger. A reported number points to a dated source, quoted word for word. For a flow, the source and the calculation appear in the ledger's notes. For a line of debt, they appear in the debt database, which quotes its source and gives its proof line by line.

Table A.1. Key numbers and their proof status

Number	Value	Status
Flows between companies in the ledger	472	measured
of which current	412	measured
Current priced purchases, $bn, $H = 1$	2,464	measured
Current priced investments, $bn	237	measured
Invested dollars linked to a purchase	97%	measured
Round-trip share, central value	7.6%	measured
Round-trip share, low value	5.2%	measured
Draws per assumption	2,000	measured
Round-trip share, highest of the four hypotheses	7.6%	measured
Round-trip share with Nvidia's guarantee	11.9%	measured
Finn cycling index, central value	4.0%	measured
Finn cycling index, highest of the four hypotheses	4.2%	measured
OpenAI's coverage by stakes	9%	measured
Anthropic's coverage by stakes	18%	measured
Anthropic's purchase commitments, $bn	900.9	reported
Anthropic's annual run-rate revenue, $bn	81	reported
Anthropic, twelve months of commitments / revenue	0.87	measured
Anthropic, yearly commitment to 2030 / revenue	1.31	measured
OpenAI's commitments, $bn	1,400	reported
OpenAI's annual run-rate revenue, $bn	40	reported
OpenAI's annualised revenue per the FT, $bn	50	reported
OpenAI's annualised revenue per Axios, $bn	70	reported
OpenAI, yearly commitment / revenue	4.4	measured
OpenAI, yearly commitment / revenue per Axios	2.5	measured
Oracle's exposure	0.95	measured
CoreWeave's exposure, low value	0.84	measured
AMD's exposure	0.16	measured
Nvidia's exposure	0.066	measured

Number	Value	Status
CoreWeave low / AMD	5.3	measured
CoreWeave low / Cerebras	1.7	measured
Current public subsidies, $bn	49.4	reported
Priced public flows to a compute renter	0	measured
US real GDP, peak-to-trough fall, 2001	0.4%	estimated
US real GDP, peak-to-trough fall, 2008 to 2009	4.0%	estimated
Payroll jobs lost from 2001 to 2003, millions	2.6	estimated
Payroll jobs lost from 2007 to 2010, millions	8.7	estimated
Nasdaq fall, March 2000 to October 2002	78%	estimated
Hyperscalers' share of investment-grade bond issuance, 2026	10%	reported
Capacity cost added by data centres (PJM), $bn	29.4	reported
AI-related debt, middle reading, $bn	664.9	measured
AI-related debt, low reading (firm direct debt), $bn	242.7	measured
AI-related debt, high reading, $bn	1,000.5	measured
CoreWeave's debt at Sept. 30, 2026, $bn	47.5	reported
CoreWeave, debt / market value	2.16	measured
CoreWeave, debt / the two labs' commitments	2.33	measured
CoreWeave, share of debt due before 2031	58.6%	measured
Oracle's AI-related debt, middle reading, $bn	132.4	measured
of which off balance sheet, at developers (press), $bn	79.4	measured
Oracle, highest coupon of November 2026, in %	8.65	reported
Oracle, leases not yet commenced, $bn	288	reported
Share of middle-reading debt held through bonds	72.2%	measured
Share held by banks	20.0%	measured
Private credit share, private placements included	16.4%	measured
Direct debt secured on GPUs or data centres	64.9%	measured
Direct debt off balance sheet	47.3%	measured
GPU-secured debt, middle reading, $bn	45.2	measured
Known average tenor of GPU-secured debt, years	5.6	measured
Debt of known maturity due before 2031	17.8%	measured
Hyperscaler bonds, January to September 2026, $bn	227.0	measured
The same quantity per the BIS, $bn	222	reported
Share of the two labs, lowest (not retained)	17%	measured
Share of the two labs, highest (not retained)	68%	measured
Audit, company flows: error rate (all classes)	20%	measured
Audit, company flows: amount or direction errors	8%	measured
Audit, state flows: error rate (all classes)	7%	measured
Audit, state flows: amount or direction errors	7%	measured
Audit, debt layer: error rate (all classes)	10%	measured
Audit, debt layer: amount or nature errors	0%	measured

APPENDIX B

The crises of 2000 and 2008 in numbers

Jeff Bezos sets two crises against each other when he separates industrial bubbles from financial ones: the internet bubble of 2000, paid for mostly with shares, then the crisis of 2008, paid for with bank credit. Chapter 8 gives the essentials. This appendix follows each crisis step by step, then measures what they cost in the United States, the euro area and China. Two words from chapter 8 help to read it. A bank's *equity* is its shareholders' money, which takes the losses first. Its *leverage* measures how much of what it holds is paid for with borrowed money: the higher it is, the faster a small loss wipes out the equity.

B.1 2008, step by step

Frederic Mishkin, then a governor of the Federal Reserve, described in May 2008 the loop that makes bubbles dangerous (Mishkin 2008). The crisis followed its steps.

1. Credit swells the price of assets. Banks lend households money to buy a house. The house serves as collateral. In Mishkin's words, "a credit boom begins, increasing the demand for some assets and thereby raising their prices".
2. The loop closes. The house gains value, so the collateral does too, so the bank lends more and loosens its standards: "The rise in asset values, in turn, encourages further lending against these assets."
3. The loans are securitised: pooled by the thousand, then sold on as securities paid out of their repayments. The securities end up with banks and in off-balance-sheet vehicles, separate companies whose debt does not show in the banks' accounts. Both are heavily indebted and themselves borrow for short periods.
4. Prices turn. Households stop repaying, the securities lose their value. With high leverage, the loss wipes out the equity. Mishkin describes a loop running backwards, "a reversal of the feedback loop in which loans go sour".
5. Sales become forced. Those who lent for short periods want their money back. The banks sell in a hurry, prices fall further, the loss spreads to everyone holding the same securities.
6. Credit freezes. Nobody knows who holds the losses, so the banks stop lending to one another.
7. The loss reaches healthy firms. The banks cut off credit to everyone. Firms lay off workers, then the laid-off households stop repaying in their turn.
8. The state pays. It guarantees deposits and bails out the banks. Part of the loss passes to taxpayers.

B.2 2000, step by step

The internet bubble took another road.

1. Shares paid for it: stock market listings, venture capital, wages paid in stock options.
2. Capacity outran demand. Fibre, routers and warehouses were built for traffic that came too late.
3. The stock market collapsed. The Nasdaq, the index of American technology shares, lost 78% from March 2000 to October 2002 (Federal Reserve Bank of St. Louis 2026). A share can fall to zero without anyone having anything to repay: the loss stops with the shareholder. Mishkin notes that "the bubble in technology stocks in the late 1990s was not fueled by a feedback loop" between credit and prices. estimated
4. Bankruptcies free up the equipment. The companies that laid the fibre disappeared. Others bought their networks cheaply and put them to use. That is the fibre Bezos brings up in Turin.
5. The recession stayed short. American real GDP fell 0.4% from peak to trough (Federal Reserve Bank of St. Louis 2026). The financial historian Edward Chancellor points out that the Federal Reserve cushioned it by cutting its interest rate as low as 1%, followed by the government's budget stimulus. In his view, that easy money went on to feed the housing bubble of 2008 (Chancellor 2025). estimated

Where the 2000 bubble still hurt. The internet start-ups lived on shares. The telecom carriers that laid the fibre borrowed. Robert Litan, of the Brookings Institution, a research centre in Washington, counts more than $500 billion invested in five years in fibre, switches and mobile networks (Litan 2002). In July 2002, Michael Powell, chairman of the American communications regulator, told the Senate that carriers around the world owed about $1,000 billion, "much of which will never be repaid and will have to be written off by investors" (United States Senate, Committee on Commerce, Science, and Transportation 2002). When the promised traffic failed to arrive, the carriers defaulted. In 2002, defaulted telecom bonds were worth on average only 16% of the sum the borrower had promised to pay back (Altman and Bana 2003). The equipment makers, for their part, had lent to their customers so that those customers could buy their gear: that is vendor credit. The customers' bankruptcy passed on to the suppliers. Nortel, the Canadian equipment maker, had about 94,500 employees at the end of 2000 (Light Reading 2001). It had 45,000 left at the end of 2001 (Gregson 2001). These losses fell on scattered bondholders, funds and insurers, more than on banks that borrow for short periods. No bank panic followed. The 2000 bubble thus had two segments: one paid for with shares, true to Bezos's picture, the other paid for on credit, which went bankrupt along with its suppliers. reported

B.3 Three economies through the two crises

Two crises in numbers, in the United States. American households lost sums of the same order in both crises: $4,900 billion of shares from 1999 to 2002, $5,600 billion of property from 2006 to 2009 (Taylor 2011). The harm is on another scale altogether (tables B.1 and B.2). Real GDP, the country's output once rising prices are taken out, fell 0.4% in 2001 and 4.0% in 2008 and 2009 (Federal Reserve Bank of St. Louis 2026). The economy lost 2.6 million jobs after 2001, 8.7 million after 2007. The loss that landed on shares was absorbed. The loss that landed on bank debt spread. reported estimated

In Europe, the banking crisis becomes a crisis of governments. The euro area came through 2001 without a recession. Its GDP never fell two quarters in a row. Its sharpest quarterly fall, early in 2003, was 0.28% (Eurostat 2026). Employment rose every quarter. Yet the stock markets fell almost as far as in New York: Germany's DAX lost 72.7%, France's CAC 40 65.3% (Yahoo Finance 2026). The 2000 bubble thus hit European shareholders without touching jobs. In 2008 the loss ran through the banks. GDP fell 5.7% and the economy lost 4.3 million jobs (Eurostat 2026). Then the crisis changed its nature. From 2008 to 2014, the governments of the European Union committed large public resources to rescuing their banks, which added heavily to their debt. Weakened governments in turn weighed on their banks, which had to pay higher risk premia, in other words borrow at a higher price (Buch 2026). That loop between banks and governments fed the public debt crisis of 2010 to 2012, when lenders doubted that some governments could repay. Unemployment peaked at 12.3% in 2013, well after the American peak. The economy lost another 1.7 million jobs from 2011 to 2013 (Eurostat 2026). Credit made the crisis worse, then made it last.

estimated

In China, public credit cushions the blow. China's GDP fell neither in 2001 nor in 2009. Its growth only slowed: from 8.6% in 2000 to 8.3% in 2001, then from 14.2% in 2007 to 9.4% in 2009 (World Bank 2026). In the first quarter of 2009, it fell to 6.1% year on year (Voice of America 2009a). The 2008 shock came from the global crisis. In early 2009, Chen Xiwen, who advises the leaders of the Communist Party on rural questions, estimated that about 20 million migrant workers, who had left the countryside to work in the cities, had lost their jobs, out of 130 million (Voice of America 2009b). Official unemployment showed almost none of it: it went from 4.0% to 4.3% (National Bureau of Statistics of China 2010). That rate counts only registered urban unemployed. Much of the population has no right to register where it lives, for lack of local registration (the *hukou*, China's residence permit). Benefits are too low to make the others bother. Finally, the figures travel up through the administration, which can distort them (Feng et al. 2015). A household survey puts unemployment at 10.9% on average from 2002 to 2009, against 4.2% for the official figure (National Bureau of Economic Research 2015). In November 2008, the government announced a stimulus plan of 4,000 billion yuan (Wheatley 2008). About 67% of the plan was paid for by borrowing, largely through local government financing vehicles, companies set up by cities and provinces to borrow from banks with land as collateral. New bank lending went from 4.7 trillion yuan in 2008 to 9.6 trillion in 2009 (Australian Treasury 2012). China cushioned the crisis with a wave of credit, which moved the debt onto local governments and banks.

reported

Table B.1. The internet bubble in three economies, from peak to trough. Changes computed by us estimated from the series of the Federal Reserve Bank of St. Louis (Federal Reserve Bank of St. Louis 2026), of Eurostat (euro area: GDP and employment for twenty countries, unemployment within the scope of the monthly series) (Eurostat 2026) and of Yahoo Finance for the European and Chinese stock indices (Yahoo Finance 2026). China: growth from the World Bank (World Bank 2026), registered urban unemployment from the National Bureau of Statistics (National Bureau of Statistics of China 2004), reported reported.

2000 to 2003	United States	Euro area	China
Stock market	Nasdaq: down 78%, from 10 March 2000 to 9 October 2002	DAX: down 72.7%, from 7 March 2000 to 12 March 2003; CAC 40: 65.3%	Shanghai: down 54.9%, from 13 June 2001 to 11 July 2005
Real GDP	Down 0.4% from peak to trough, in 2001	No fall over two quarters in a row; sharpest fall in one quarter: 0.28% early in 2003	No fall; growth of 8.6% in 2000, 8.3% in 2001
Unemployment	From 3.8% in April 2000 to 6.3% in June 2003	From 8.7% in 2001 to 9.5% in 2004	Registered urban rate: from 3.1% in 2000 to 4.3% in 2003
Jobs lost	2.6 million (2.0%), from February 2001 to August 2003	None: employment rose every quarter	No reliable series

Table B.2. The financial crisis in three economies, from peak to trough. Same sources as table B.1, plus the Nasdaq from the Federal Reserve Bank of St. Louis (Federal Reserve Bank of St. Louis 2026). China: quarterly growth from Voice of America (2009a), registered urban unemployment (National Bureau of Statistics of China 2010), migrant workers from Voice of America (2009b), reported reported.

2007 to 2010	United States	Euro area	China
Stock market	Nasdaq: down 55.6%, from 31 October 2007 to 9 March 2009	Euro Stoxx 50: down 60.3%, from 16 July 2007 to 9 March 2009	Shanghai: down 72.0%, from 16 October 2007 to 4 November 2008
Real GDP	Down 4.0%, from the second quarter of 2008 to the second quarter of 2009	Down 5.7%, from the first quarter of 2008 to the second quarter of 2009	No fall; growth of 14.2% in 2007, 9.4% in 2009, 6.1% year on year in the first quarter of 2009
Unemployment	From 4.4% in March 2007 to 10.0% in October 2009	From 7.3% in 2008 to 10.4% in 2010, then 12.3% in 2013	Registered urban rate: from 4.0% in 2007 to 4.3% in 2009
Jobs lost	8.7 million (6.3%), from December 2007 to February 2010	4.3 million (2.7%), from early 2008 to mid-2010	About 20 million migrant workers out of work in early 2009

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