

Answers to the questions of 2 October 2026

Data as of: US market data to 30 Sep / 1 Oct 2026; cross-country monthly data to Aug 2026

ml

2 October 2026

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Summary

This document answers ten questions raised while reading the essentials PDF. Questions 1–5 are about using the data room. Questions 6–10 are about the framework's arguments and are answered with data fetched on 2 October 2026 from the original publishers.

Every table below is generated by `dataroom/research/2026-10-02/analysis.py` from files saved in `dataroom/research/2026-10-02/data/`. The list of downloads, with the URL, time, size and sha256 of each, is in `data/sources.csv`. To rebuild everything: `make research-2026-10-02 answers-pdf` from `dataroom/` (the fetch step needs the internet).

Table 1: Short answers to the ten questions.

#	Question	Short answer
1	Audit PDF with a list of tables	Done: <code>dataroom/report/dataroom-audit.pdf</code> , 126 pages, with a list of all 88 tables and their pages. Rebuild with <code>make report-pdf</code> .
2	See Parquet data wide, and print it	<code>make show KEYS="ust10y tips10y acm_tp10" ARGS="--freq M --last 24"</code> . Add <code>--csv</code> or <code>--xlsx</code> to save a printable file.
3	Update the series	<code>make refresh (all)</code> , <code>make refresh-one KEYS="..."</code> (a few).
4	What changed between updates	<code>make changes</code> compares the current register with the last git commit. The revised column flags revised history.
5	Is it automatic?	It was meant to run daily at 07:00 but had never run , because <code>launchd</code> skips runs missed while the Mac is off. Fixed: it now also catches up at login, at most once a day. A wake schedule needs one <code>sudo</code> command.
6	UK 2022 and Japan's yield cap	Japan capped yields; the UK did not. The Bank of England's purchases were a 2-week emergency backstop for a market in a fire sale. In Japan the cap held, but the yen fell 31% against the dollar and prices rose 8%.
7	Why a nominal cap does not protect wealth	A cap fixes the bond's price in yen or pounds, not what that money buys. In three historical cases, holders lost 10–24% in real terms under a cap.
8	Basis for the 4–5.5% range	The source note gave no workings. Rebuilt from the yield's three parts, the range comes out at 3.9–5.4%. The past range of the 10-year in regime B is 3.75–5.4%. Both support the range.
9	3–4% (OpenAI) against 4–5.5%	A 3–4% yield is as common in regime B as in A, so it does not by itself justify A. The regime is identified from the parts of the yield. Today all three parts say B.
10	Each structural driver against each yield component	The matrix and seven-economy data are in section 10. Short rates explain most of the rise in yields since 2019. Saving minus investment explains real yields. Debt adds about 3bp per point of GDP.

1. An audit PDF of every series, with a list of tables

Done. The file is `dataroom/report/dataroom-audit.pdf`, built from `report/dataroom.html`.

- It has 126 A4 pages.
- After the contents page there is a **List of tables**. It itemises all 88 tables (the status summary, the cross-checks, the regime dashboard, and one audit table per series) with page numbers.
- It is rebuilt by `make report-pdf`, which runs `scripts/report_pdf.py`. The daily refresh rebuilds the HTML but **not** the PDF. Run `make report-pdf` after a refresh when you want a printable copy.

2. Seeing the Parquet data in wide format, and printing it

What the files look like. Each series is stored in its own **long** file, `data/series/<key>.parquet`. Long means one row per date, with the columns `date`, `value`, `chg_1m`, `chg_3m`, `chg_12m`, `zscore_5y` and `revised`. **Wide** means one column per series and one row per date, which is what you want for reading or printing.

There are three ways to see it wide.

a. The show command (new). Run it from `dataroom/`:

```
make show KEYS="ust10y tips10y acm_tp10" ARGS="--freq M --last 4"
```

	ust10y	tips10y	acm_tp10
date			
2026-06-30	4.44	2.20	0.511
2026-07-31	4.75	2.47	0.836
2026-08-31	4.75	2.44	0.763
2026-09-30	5.29	2.93	0.888

Useful options:

- `--freq W|M|Q|A` keeps the last value of each week, month, quarter or year.
- `--from 2022-01-01` and `--to 2024-12-31` set the date range.
- `--last N` shows the last N rows.
- `--field chg_12m` shows the 12-month change instead of the level. The other fields are `chg_1m`, `chg_3m`, `zscore_5y` and `yoy_pct`.
- `--panel monthly` shows a whole ready-made panel. The panels are daily, weekly, monthly, quarterly, annual, events and `dashboard_monthly`.
- `--max-rows 0` prints every row.

b. The ready-made wide panels. These are `data/panels/*.parquet`, rebuilt on every refresh. In Python:

```
import pandas as pd
df = pd.read_parquet("data/panels/monthly.parquet") # one column per series
df[["ust10y", "tips10y", "acm_tp10"]].tail(24)
```

c. CSV grids. `data/tables/*_month_end_*.csv` hold month-end grids with years or months as rows. They open directly in Numbers or Excel.

To print, write a file and print that:

```
make show KEYS="ust10y tips10y breakeven10y acm_tp10" \
  ARGS="--freq M --from 2020-01-01 --xlsx ~/Desktop/yields.xlsx"
make show KEYS="ust10y tips10y" ARGS="--freq M --csv ~/Desktop/yields.csv"
```

Open the file in Excel or Numbers and print it (choose landscape and “fit to page width”). For a print-ready copy of every series with its audit trail, use the PDF from question 1.

3. Updating the series

From dataroom/:

Table 2: Commands to update the data room.

What	Command
Every series	<code>make refresh</code> (about 2 minutes; exit code 0 means every check passed)
A few series	<code>make refresh-one KEYS="ust10y tips10y"</code>
Everything from one publisher	<code>make refresh-source SRC=fred</code>
Then the printable audit PDF	<code>make report-pdf</code>
Then this document's numbers	<code>make research-2026-10-02 answers-pdf</code>

A refresh fetches each series, saves the raw file with its sha256 hash and runs the checks. A series that fails a critical check **keeps its previous data**, and the failure shows in the “Needs attention” box of `report/dataroom.html`. Adding a new series is described in `00-overview/01-how-to-update.md`, section 7.

4. Knowing what changed between updates

There are four layers, from quickest to most detailed.

1. **make changes** (new) compares today's register (`register/audit_register.csv`) with the version in the last git commit. It lists each series whose latest date, value, status or verification changed. It also counts the series whose raw source file was byte-for-byte identical. Today's run:

Compared with git HEAD: 21 of 86 series changed.

key	last_date_was	last_date	latest_value_was	latest_value	...
acm_tp10	2026-09-29	2026-09-30	0.8467	0.8876	
jgb10y	2026-09-30	2026-10-01	3.057	3.092	
on_rrp	2026-09-30	2026-10-01	11.539	0.35	

...

Source file identical (same raw sha256) for 43 series.

To compare with an older state: `make changes ARGS="--vs HEAD~5"`, or with any commit or tag.

2. **Revisions to history.** When a publisher changes past values (GDP and payrolls do this often), each changed row is flagged `revised = True` in the series file. The count appears in the register's `revisions_last_run` column, and `make changes` lists those series separately.
3. **Git history.** The register is committed to git. `git log -p register/audit_register.csv` shows every past change. The suggested routine is to commit after each review (section 9 of the how-to guide). The next `make changes` then shows exactly what moved since you last looked.
4. **Raw files.** `data/raw/<source>/<date>/manifest.json` records the hash of each file downloaded that day. `logs/run_log.jsonl` records every run.

5. Is this updating automatically?

It is now. Until 2 October it had never run.

- The launchd job `com.ml.dataroom.refresh` runs `scripts/refresh.sh` every day at 07:00.
- On 2 October, `launchctl print` reported `runs = 0`. macOS runs a missed 07:00 job when the Mac wakes from **sleep**, but skips it if the Mac was **shut down**, which is how it had been missed.
- **The fix (applied 2 October):**
 - The job also starts at login.
 - The script refreshes at most once a day, and not before 07:00, so a login never adds a second run.
 - It waits up to 2 minutes for the network first.
- **Optional, needs your password:** wake the Mac from sleep for the 07:00 run with `sudo pmset repeat wakeorpoweron MTWRFSSU 06:55:00`. Check it with `pmset -g sched`.
- Check the job with `make schedule-status`. Each day's run is logged in `logs/refresh-YYYY-MM-DD.log`.

Two other things are never automatic: git commits, and the PDFs (the audit PDF, `essentials.pdf` and this document). Those are rebuilt with their make targets.

6. How the UK capped yields in 2022, how Japan's yield-curve control capped them, and why the price is inflation or a weaker currency

The framework says: *“Governments and central banks can cap nominal yields, as the UK did in 2022 and Japan did with yield-curve control. They do this by accepting higher inflation or a weaker currency.”* The data supports this for Japan. For the UK it needs correcting: the Bank of England put a temporary floor under a collapsing market but did not cap yields. The real fix there was political.

6.1 Bond basics in five sentences

- A government bond is an IOU. You pay, say, £100 today, and the government pays a fixed **coupon** each year, say £1.18, and returns the £100 at the end.
- The **yield** is the return a buyer gets at today's price. If new bonds pay 3.9%, nobody will pay £100 for one paying 1.18%. Its price falls until a buyer would earn about 3.9% on it.
- So **price and yield move in opposite directions**, and the longer the bond, the bigger the price move. A 20-year gilt bought at a 1.18% yield at the end of 2021 had lost **35%** of its value by the end of 2022, when the yield was 3.93%.
- To **cap** a yield, someone must stand ready to buy unlimited amounts at the matching price. That someone is the central bank, which pays with newly created money.
- That is the source of the trade-off. New money, or a promise to keep rates below what the market wants, has to show up somewhere: in prices (inflation), in the currency, or in both.

6.2 UK, September–October 2022: an emergency backstop, not a cap

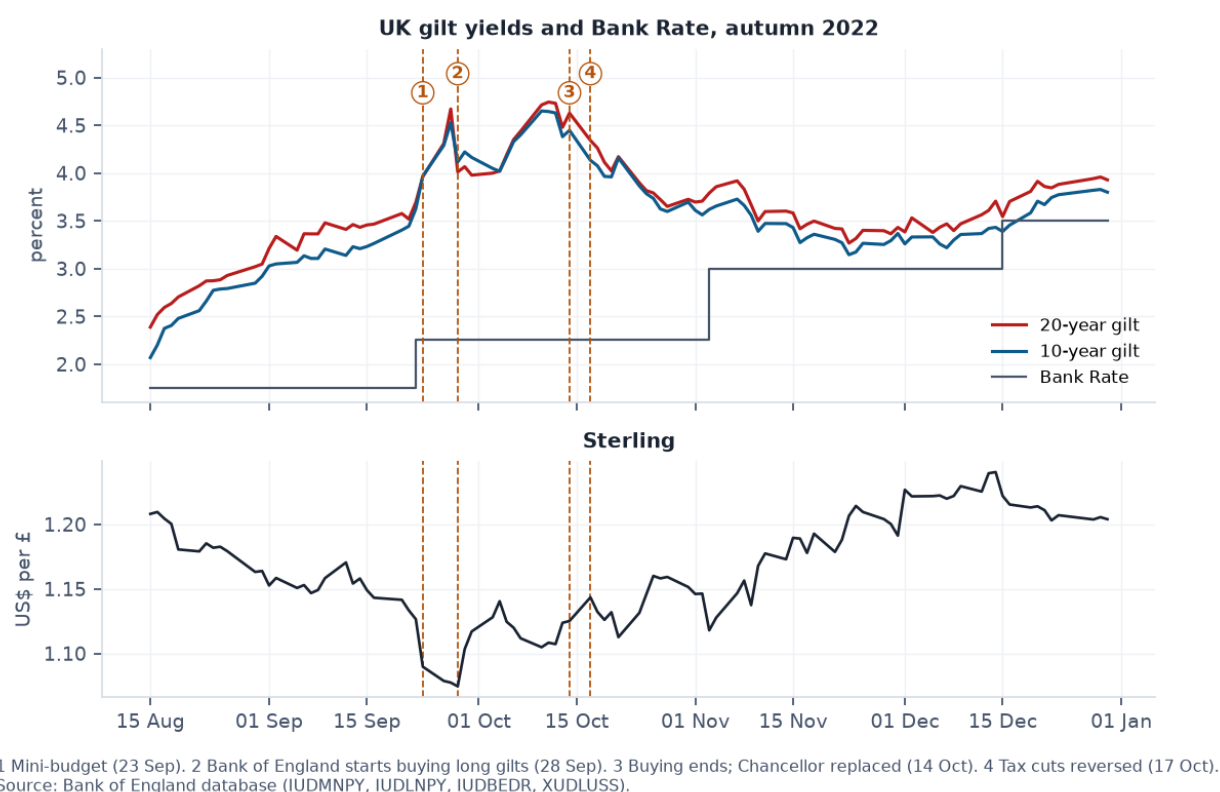


Figure 1: UK gilt yields, Bank Rate and sterling, Sep–Dec 2022

Table 3: UK 2022 timeline. Gilt yields: Bank of England nominal par yields (IUDMNPY, IUDLNPY); Bank Rate (IUIBEDR); GBP/USD (XUDLUSS).

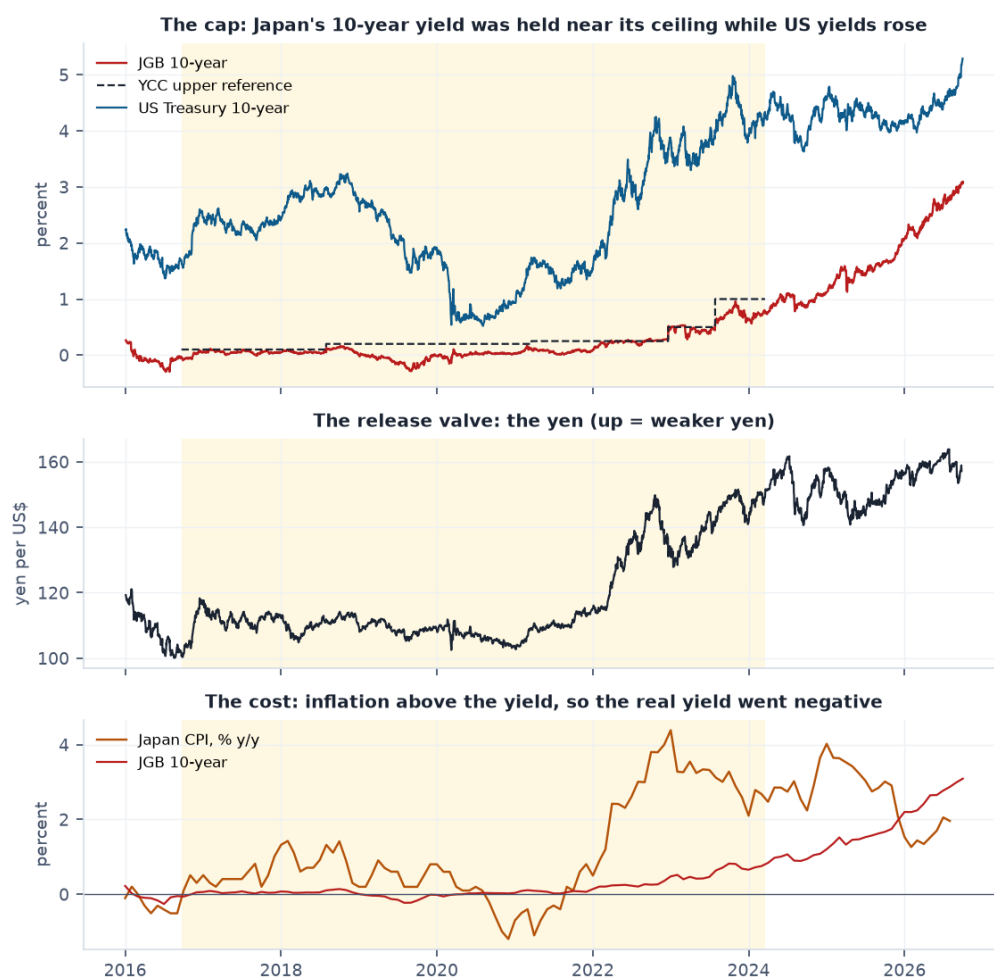
Date	Event	10-year %	20-year %	Bank Rate %	GBP/USD
21 Sep 2022	Day before the Bank's policy meeting	3.44	3.52	1.75	1.13
22 Sep 2022	Bank Rate raised 1.75% → 2.25%	3.63	3.69	2.25	1.13
23 Sep 2022	'Growth Plan' (mini-budget): about £45bn of unfunded tax cuts	3.97	3.96	2.25	1.09
26 Sep 2022	Sterling hits a record low in Asian trading	4.29	4.31	2.25	1.08
27 Sep 2022	LDI funds sell gilts to meet collateral calls	4.53	4.67	2.25	1.08
28 Sep 2022	Bank announces temporary long-gilt purchases	4.12	4.01	2.25	1.07
03 Oct 2022	45p top-rate cut abandoned	4.05	4.00	2.25	1.13
10 Oct 2022	Purchases extended; index-linked gilts added (11 Oct)	4.65	4.71	2.25	1.10
14 Oct 2022	Purchases end; Chancellor replaced; corporation tax rise restored	4.45	4.63	2.25	1.13
17 Oct 2022	New Chancellor reverses almost all the tax cuts	4.13	4.34	2.25	1.14
03 Nov 2022	Bank Rate raised to 3.00%	3.62	3.79	3.00	1.12
17 Nov 2022	Autumn Statement: tax rises and spending restraint	3.32	3.46	3.00	1.18
30 Dec 2022	Year end	3.80	3.93	3.50	1.20

What happened, step by step

1. **The trigger was fiscal.** The 23 September “Growth Plan” announced about £45bn of unfunded tax cuts, with no independent forecast from the Office for Budget Responsibility. Investors demanded a higher return to lend to the UK. The 20-year yield rose from 3.52% on 21 September to 4.67% on 27 September.
2. **Sterling fell at the same time.** GBP/USD fell from 1.133 to 1.0745 (the Bank’s daily rate on 28 September). In a normal sell-off, higher yields attract foreign money and lift the currency. When bonds *and* the currency fall together, investors are leaving the country’s assets altogether. That is the classic sign of a loss of confidence in fiscal policy.
3. **Leverage turned a repricing into a fire sale.** Many UK defined-benefit pension funds used liability-driven investment (LDI) funds, which hold gilts partly with borrowed money (repo) and interest-rate swaps. When yields jump, these funds must post more cash as collateral. To raise cash they sell gilts, which pushes yields higher, which triggers more collateral calls. Pinter (2023) shows the LDI, pension and insurance sector sold about £6bn of conventional gilts and £18bn of index-linked gilts net. The Bank says 30-year yields rose 130bp in three days, more than three times any previous move. The 30-year bid–ask spread widened from about 0.5bp to 2.5bp.
4. **The Bank of England stepped in as buyer of last resort.** On 28 September it announced temporary purchases of long gilts, with capacity of up to £65bn. It **bought only £19.3bn** (£12.1bn conventional and £7.2bn index-linked, the latter added on 11 October) and **stopped on 14 October as announced**. The 20-year yield fell 66bp on the day, from 4.67% to 4.01%.
5. **The Bank kept tightening.** Bank Rate went from 2.25% to 3.00% on 3 November, 3.50% in December, and peaked at 5.25% in August 2023. It postponed active gilt sales (QT) from early October to 1 November. It sold the emergency gilts back between 29 November 2022 and 12 January 2023, raising £23.1bn.
6. **The fix was fiscal.** The top-rate tax cut was dropped on 3 October and the corporation-tax rise restored on 14 October. On 17 October the new Chancellor reversed almost all the tax cuts. Yields came back down: the 10-year was 4.13% on 17 October and 3.32% after the 17 November Autumn Statement.

What it shows. The Bank did not hold yields below what investors wanted. It stopped a *self-reinforcing* collapse for two weeks and made clear the support was temporary. It did this because an open-ended cap would have meant printing money to fund the government while UK inflation was 10–11%. The 10-year yield was 4.1% in October 2022 and inflation peaked at **11.1%** that month, so the real yield was about **–7%**. The trade-off the framework describes was visible: the market sold the pound alongside the gilts. But the Bank chose not to make that trade. The lesson for the framework is that *a central bank fighting inflation will backstop a bond market but will not cap it*.

6.3 Japan, 2016–2024: a real cap



Shaded: yield curve control (21 Sep 2016 – 19 Mar 2024). Sources: Ministry of Finance Japan (JGB yields); Federal Reserve H.15 via FRED (DGS10, DEXJPUS); IMF CPI dataset.

Figure 2: Japan: JGB 10-year against the cap and the US 10-year; the yen; inflation against the JGB yield

How the cap worked. In September 2016 the Bank of Japan introduced yield-curve control (YCC): a target of “around 0%” for the 10-year JGB yield. From 2021 it said explicitly that the yield could move within $\pm 0.25\%$. Whenever the yield touched the top of the range, the Bank ran **fixed-rate purchase operations**: it offered to buy *any amount* of 10-year bonds at the price matching the cap. No one sells a bond in the market for less than the Bank will pay, so the yield cannot rise above the cap. This differs from the UK in two ways: it was meant to last, and the amount was unlimited.

Table 4: Phases of yield-curve control. Upper reference from Bank of Japan statements; JGB yields from the Ministry of Finance curve file; US 10-year (DGS10) and USD/JPY (DEXJPUS) from FRED.

From	Policy	Upper ref. %	JGB 10y max %	UST 10y avg %	Spread at end, pp	USD/JPY at end
21 Sep 2016	YCC begins: target ‘around 0%’ (range read as $\pm 0.1\%$)	0.10	0.11	2.45	2.87	110.98
31 Jul 2018	Range allowed to double (about $\pm 0.2\%$)	0.20	0.17	1.73	1.60	108.97
19 Mar 2021	Range clarified as $\pm 0.25\%$; fixed-rate operations to cap it	0.25	0.29	2.28	3.29	136.87
20 Dec 2022	Range widened to $\pm 0.5\%$	0.50	0.53	3.66	3.57	141.03
28 Jul 2023	$\pm 0.5\%$ now a reference; BoJ offers to buy at 1.0% daily	1.00	0.90	4.42	3.98	149.01

From	Policy	Upper ref. %	JGB 10y max %	UST 10y avg %	Spread at end, pp	USD/JPY at end
31 Oct 2023	1.0% becomes a reference, not a hard cap	1.00	0.96	4.20	3.57	149.13

The test, 2021–22. US inflation took off and the Fed raised rates. The US 10-year went from 0.93% (January 2021) to 4.21% (21 October 2022), while the JGB 10-year stayed between 0.03% and 0.29%. The gap between them widened by about 3pp. The cap held, so the pressure went somewhere else.

The currency channel. If dollar bonds pay 4% and yen bonds 0.25%, investors sell yen to buy dollars, and so do Japanese savers and insurers. USD/JPY rose from **103.2 to 149.8** (20 October 2022, Federal Reserve noon rate), meaning the yen lost 31% of its dollar value.

- From 2021 to the end of YCC in March 2024, the US–Japan yield gap and the (log) exchange rate had a correlation of **0.98**.
- Each extra percentage point of gap went with a yen about **13.5% weaker**.
- The Ministry of Finance sold dollars to slow the fall: ¥2.84tn on 22 September 2022 and ¥6.35tn on 21 and 24 October 2022, the first yen-buying interventions since 1998.

The inflation channel. Japan imports 87% of its energy (World Bank), priced in dollars, so a weaker yen raises import prices. Japanese CPI inflation went from –0.2% (2021 average) to a peak of **4.4% in January 2023**. With the 10-year capped near 0.5%, the **real** JGB yield averaged **–2.3% in 2022 and –2.7% in 2023**. A saver lent to the government and lost purchasing power each year.

The balance-sheet channel. To hold the cap the Bank had to buy what was offered. Its assets rose to **¥750tn** (December 2023, about 125% of GDP). By the end of 2023 it owned **53.8% of all JGBs** (Ministry of Finance, Debt Management Report 2024). Once the central bank holds half the market, private price-setting has largely gone.

Table 5: Japan, annual averages. JGB 10-year from the Ministry of Finance; CPI from the IMF CPI dataset; US 10-year and USD/JPY from FRED.

Year (average)	JGB 10y %	Japan CPI y/y %	Real JGB 10y %	UST 10y %	USD/JPY
2016	–0.05	–0.13	0.08	1.84	108.66
2017	0.05	0.48	–0.43	2.33	112.10
2018	0.08	0.99	–0.91	2.91	110.40
2019	–0.09	0.47	–0.56	2.14	109.02
2020	0.01	–0.02	0.03	0.89	106.78
2021	0.07	–0.23	0.30	1.45	109.84
2022	0.24	2.50	–2.26	2.95	131.46
2023	0.57	3.27	–2.70	3.96	140.50
2024	0.91	2.74	–1.83	4.21	151.46
2025	1.54	3.18	–1.63	4.29	149.57
2026 (to date)	2.56	1.60	0.96	4.46	158.54

The exit. The Bank loosened in steps: $\pm 0.5\%$ in December 2022, 1.0% as a reference in July and October 2023. It ended YCC and negative rates on 19 March 2024. The 10-year is now **3.09%** (1 October 2026) and USD/JPY 157. The Bank’s own research estimates that YCC held the 10-year about 1pp below where it would otherwise have been (Nakazawa & Osada, 2024).

6.4 The mechanism in general: why the price is inflation or the currency

A central bank can fix **one** price of money. If it fixes the long-bond yield, it gives up control of the two other ways an economy adjusts.

- **The quantity of money.** Investors who want more than the capped yield sell their bonds to the central bank, which pays with new money. With more money chasing the same goods, there is **inflation pressure at home**.
- **The exchange rate.** In an open economy, they take that money abroad, where yields are not capped. The currency falls. Imports cost more, which adds **imported inflation**.

Either way the bondholder's return is cut. The adjustment simply moves from the bond's price to the price level or the currency. Which channel dominates depends on the economy:

Table 6: Three yield caps and where the pressure went.

Case	Capital flows	Main release valve	Evidence
United States 1942–51 (2.5% long-bond ceiling)	Largely closed; dollar the anchor of the Bretton Woods system	Domestic inflation	CPI +60% from Apr 1942 to Mar 1951; inflation peaked at 19.7% y/y in Mar 1947. The Fed ended the peg with the Treasury–Fed Accord of March 1951 because it could not fight inflation while buying bonds
Japan 2016–24 (YCC)	Open, with a floating yen	Currency first, then imported inflation	Yen –31% against the dollar 2021–22; CPI peak 4.4%; ¥9.2tn spent on intervention in 2022
UK 2022 (temporary purchases)	Open; current-account deficit of 3% of GDP	The Bank refused the trade-off; fiscal policy reversed instead	Sterling and gilts fell together; purchases ended on schedule; Bank Rate kept rising

Debt-heavy governments can find this useful. Reinhart & Sbrancia (2015) document how the US, UK and other countries cut public debt after 1945 by keeping interest rates below inflation (“financial repression”). Negative real rates removed 3–4% of GDP of debt a year in the US and UK. That gain is the bondholders' loss, which is the subject of question 7.

7. A nominal cap does not protect wealth

A cap protects the **number** on the bond (its price in pounds, yen or dollars), not what that number **buys**. What matters to a saver is the **real return**:

$$\text{real return} = \frac{1 + \text{nominal return}}{1 + \text{inflation over the period}} - 1$$

There are three ways a capped bondholder loses.

1. **Inflation erodes the fixed payments.** The cap holds the coupon and price steady while prices rise. US long bonds under the 1942–51 peg returned +22% in dollars, but prices rose 60%, so the real return was –24%.
2. **The currency falls.** For anyone who spends or compares in another currency, the loss is larger. A 10-year JGB bought at the end of 2020 lost 2.7% in yen by the end of YCC, but 33% in US dollars. For an Australian investor, the AUD return would have been similar.
3. **The cap ends, usually when inflation is high.** Caps are removed because inflation forces it, and yields then jump. The same JGB held from March 2024 to today fell a further 6% in yen. That makes –8.9% **nominal**, –20.9% **real** and –40% **in US dollars** since 2020.

Table 7: Holder of a 10-year JGB bought on 30 December 2020 (priced from the Ministry of Finance curve; CPI from the IMF; USD/JPY from FRED).

Period	Yield bought %	Yield at end %	Nominal return %	Japan prices %	Real return %	Return in US\$ %
Under the cap: end-2020 to the end of YCC (19 Mar 2024)	0.04	0.45	–2.67	7.96	–9.85	–33.29
Same bond held to 01 Oct 2026	0.04	2.31	–8.89	15.11	–20.85	–40.12

Table 8: Real wealth of a bondholder, three cases.

Case	Nominal return %	Prices %	Real return %
United States 1942–51: 2.5% long-bond ceiling (Fed pegged prices)	22.3	60.2	–23.7
Japan 2020–24: 10-year JGB under yield curve control	–2.7	8.0	–9.8
UK 2022: 20-year gilt, no cap (for contrast)	–35.2	10.5	–41.4

The UK row is the **uncapped** comparison. Without a cap the price fell fast: –35% nominal and –41% real. With a cap, the loss comes slowly and in real terms rather than in price. **Neither protects wealth.** The cap changes *how* the loss arrives (gradually and hidden, through inflation and the currency) rather than *whether* it arrives.

What this means for the framework’s portfolio decision. In a capped or repressed regime, the risk in long nominal bonds is a real loss, not a fall in price. Assets that hedge it include inflation-linked bonds, short-maturity bonds that reprice quickly, real assets, and foreign-currency exposure. This is the framework’s “real-versus-nominal under a policy cap” point, now with numbers.

8. Where “base case 10-year around 4–5.5%” comes from

The honest answer. The range was taken from the Claude source note (01-source-notes/claude_treasury-yields-2002-vs-2026.md, line 58: “Higher for longer: the 10-year at 4-5.5%”). The Gemini note gives the same floor. Neither shows any workings, so the framework repeated a judgment. Below, the range is rebuilt four independent ways from data. They support it, with one caveat.

8.1 Method 1: build it from the three parts of the yield

The framework splits the 10-year yield into three parts:

$$\text{10-year yield} = \underbrace{\text{expected inflation}}_{\text{5y5y breakeven}} + \underbrace{\text{expected real short rate}}_{\text{neutral rate } r^*} + \underbrace{\text{term premium}}_{\text{ACM, Kim-Wright}}$$

Each part has market, model or official measures. Here they are today, against their history:

Table 9: The yield’s parts today and their history. FRED: DGS10, DFII10, T5YIFR, THREEFYTP10, EXPINF10YR, REIN-TRATREARAT10Y; NY Fed: ACM term premium, Holston-Laubach-Williams r^* . Latest values to 30 Sep / 1 Oct 2026.

Component (data from)	Now	P10 since 2010	P90 since 2010	P10 all	Median all	P90 all
Expected inflation: 5y5y breakeven (2003)	2.36	1.79	2.60	1.81	2.28	2.59
Expected inflation: Cleveland Fed 10-year (1982)	2.57	1.50	2.35	1.65	2.48	4.20
Real yield: 10-year TIPS (2003)	2.93	−0.71	1.95	−0.58	1.06	2.19
Real rate: Cleveland Fed 10-year (1982)	2.24	−0.03	1.78	0.35	2.06	4.72
Real rate: expected average real short rate (10y − ACM premium − 5y5y) (2003)	2.04	−1.40	1.93	−1.35	0.31	1.94
Real neutral rate: Holston-Laubach-Williams r^* (1961)	1.01	0.75	1.32	0.90	3.11	4.63
Term premium: ACM (NY Fed) (1961)	0.89	−0.79	1.57	−0.21	1.43	3.39
Term premium: Kim-Wright (Fed Board) (1990)	1.02	−0.24	0.61	−0.05	0.75	2.05
10-year Treasury yield (1962)	5.29	1.56	4.28	2.23	5.36	9.29

For each part, a low, central and high value is set from data (the last column gives the source):

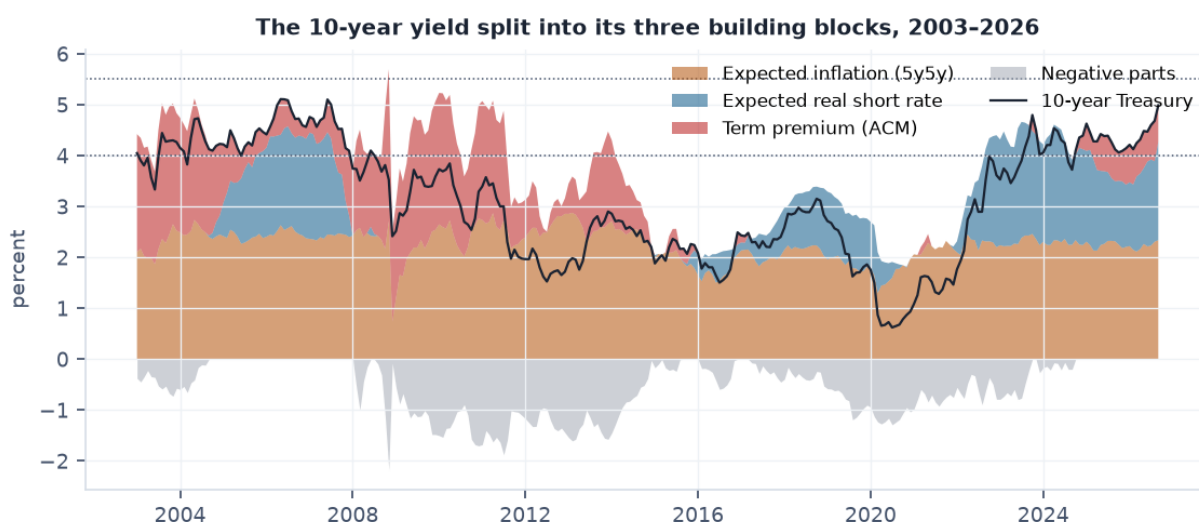
Table 10: Building blocks for the 10-year yield.

Block	Low %	Central %	High %	Where the numbers come from
Expected inflation	2.10	2.36	2.60	Low: Fed’s 2% PCE target $\approx$ 2.1–2.3% on the CPI basis breakevens use; 5y5y P25 since 2010. Central: 5y5y breakeven today. High: Top of the B band; 5y5y P90 since 2010 is 2.60.
Expected real short rate	1.01	1.20	2.04	Low: HLW r^* (latest NY Fed estimate). Central: FOMC long-run funds rate 3.20% minus 2% target. High: What the market prices now: 10y − ACM premium − 5y5y.

Block	Low %	Central %	High %	Where the numbers come from
Term premium	0.25	0.89	1.25	Low: Floor of the B band; post-2010 median is 0.03. Central: ACM today (Kim-Wright 1.02). High: C threshold; long-run median 1.43.
10-year yield (sum)	3.36	4.45	5.89	Sum of the three blocks

Workings.

- Simply adding the lows (3.36%) or the highs (5.89%) assumes all three parts sit at their extremes together. That is unlikely, so the result is too wide.
- If the three parts move independently, the uncertainties combine as the square root of the sum of squares. Treat each low-to-high span as a P10–P90 band; its half-width is then about 1.28 standard deviations:
 - inflation: $(2.60 - 2.10) / 2 = 0.25$
 - real rate: $(2.04 - 1.01) / 2 = 0.52$
 - term premium: $(1.25 - 0.25) / 2 = 0.50$
 - combined: $\sqrt{0.25^2 + 0.52^2 + 0.50^2} = 0.76$
- The midpoint is $2.35 + 1.53 + 0.75 = 4.63\%$.
- The P10–P90 range is $4.63 \pm 0.76 = 3.86\% \text{ to } 5.39\%$.



Expected real short rate = 10-year – ACM term premium – 5y5y breakeven. Sources: FRED (DGS10, T5Y1FR); NY Fed ACM.

Figure 3: Building blocks for the 10-year

8.2 Method 2: where history says the yield goes from here

Start at today's 5.29% and add every 12-month and 36-month change in the 10-year since 1962 (or since 1990). This assumes nothing about economics, only that future moves look like past ones.

Table 11: Statistical range from today's 10-year yield (FRED DGS10, monthly averages).

Horizon	P10 %	P25 %	Median %	P75 %	P90 %
12 months, changes since 1962	4.03	4.63	5.36	5.97	6.49
12 months, changes since 1990	4.06	4.52	5.09	5.81	6.27
36 months, changes since 1962	3.30	4.23	5.19	6.17	7.37
36 months, changes since 1990	3.42	4.11	4.87	5.73	6.45

Each row adds the historical distribution of 10-year yield changes to today's 5.29%.

The 12-month P10–P90 is about **4.0–6.5%**. Its lower end matches the base case, but it is centred on today's 5.29%, so its top is higher.

8.3 Method 3: what the 10-year has done when the parts said “regime B”

Each month since 1982 is classified as A, B or C from its three parts (method in section 9). The yields in the regime-B months are then collected.

Table 12: 10-year yield by regime (FRED DGS10; regime from Cleveland Fed expected inflation and real rate and the ACM term premium).

Sample and regime	Months	P10 %	P25 %	Median %	P75 %	P90 %
1982–2026: A	166	1.50	1.79	2.30	2.86	3.40
1982–2026: B	167	3.75	4.10	4.42	4.88	5.42
1982–2026: C	202	5.97	6.59	7.85	9.19	11.67
1998–2026: A	166	1.50	1.79	2.30	2.86	3.40
1998–2026: B	167	3.75	4.10	4.42	4.88	5.42
1998–2026: C	12	5.00	5.65	5.99	6.26	6.50

In 167 regime-B months the 10-year had a P10–P90 of **3.75–5.42%**, with a median of 4.42%.

8.4 Conclusion on the range

Table 13: The four methods compared with the framework's range.

Method	Lower	Upper
Building blocks, independent parts (P10–P90)	3.86	5.39
Building blocks, all extremes together	3.36	5.89
History of regime B (P10–P90)	3.75	5.42
History of 12-month changes from today (P10–P90, since 1990)	4.06	6.27
Base case in the framework	4.0	5.5

- **The lower end of 4%** needs inflation expectations near 2.1–2.2%, a real rate near r^* (about 1.0–1.2%) and a small term premium (about 0.25–0.5%). That is roughly where the parts were in 2023–24.
- **The upper end of 5.5%** needs expectations at the top of their post-2010 range (2.6%) plus either today's real rate (2.0%) and a 0.9% premium, or a 1.2% real rate and a 1.25% premium.
- **The caveat.** The 10-year is at 5.29% today, near the top of the range, because the real rate and premium are both high. The range describes the *regime*. It is not a forecast that yields will be inside it every month. A 12-month forecast centred on today would sit higher, at about 4–6.3%.

9. Two views, two ranges: a systematic way to set a range and assign a regime

The OpenAI note says a move back to 3–4% “would not be difficult to imagine under a sufficiently weak-growth or disinflationary scenario” (openaa_interest-rate-regimes-2002-vs-2026.md, line 125). That is a **conditional scenario**, not a base case. The two notes answer different questions, which is the first thing a systematic method must make explicit.

9.1 The method, in six steps

1. **Say exactly what the range is.** Give the horizon (12 months or 3 years), the measure (monthly average or a single day) and the coverage (for example 80%, P10–P90). Say whether it is **unconditional** (all things considered) or **conditional** (if growth weakens).
2. **Build the range from the parts, not the headline.** Bound each part with data: market prices (breakevens, TIPS), models (ACM, Kim-Wright, r^*), official projections (FOMC long-run rate) and history. Combine the parts as in 8.1.
3. **Check against history.** Compare with the distribution of past changes (8.2). If the two disagree, find which part explains the gap.
4. **Assign the regime from the parts.** Each part votes using the framework’s Layer 3 bands. The gaps between bands are closed so every value gets a vote:

Table 14: Regime vote bands for each part of the yield.

Part (measure)	A	B	C
Expected inflation (Cleveland Fed 10-year)	below 2.0%	2.0–2.75%	2.75% or more
Real rate (Cleveland Fed 10-year real)	below 1.5%	1.5% or more	below 1.5% <i>with</i> inflation of 2.75% or more
Term premium (ACM)	below 0.25%	0.25–1.25%	1.25% or more

The month’s regime is the majority (2 of 3). It is “held” only after 3 months running, as the framework requires.

5. **Turn the range into regime probabilities.** By Bayes’ rule:

$$P(\text{regime} \mid \text{range}) \propto P(\text{range} \mid \text{regime}) \times P(\text{regime})$$

Here $P(\text{range} \mid \text{regime})$ is the share of past months in each regime when the 10-year was inside the range. The prior $P(\text{regime})$ is the framework’s 25/50/25.

6. **Set triggers.** Name the readings that would move the call, such as inflation expectations below 2.0% or TIPS below 1.25% for 3 months, and review them monthly (the framework’s 3-of-5 rule).

9.2 Applying it

The classification gives these regime episodes since 1982:

Table 15: Regime episodes, 1982–2026 (episodes of 6 months or more).

Regime	From	To	Months	10y avg %	Exp. inflation avg %	Real avg %	Term prem. avg %
C	Mar 1982	Dec 1997	190	8.46	3.94	4.33	2.86
B	Jan 1998	Jun 1999	18	5.26	2.79	2.63	0.95
C	Jul 1999	Mar 2000	9	6.17	3.18	3.24	1.51
B	Apr 2000	Jun 2001	15	5.59	2.91	2.73	1.06
B	Oct 2001	Jan 2009	88	4.32	2.38	1.81	1.47
A	Feb 2009	Nov 2022	166	2.32	1.77	0.54	0.35
B	Dec 2022	Sep 2026	46	4.20	2.29	1.75	0.14

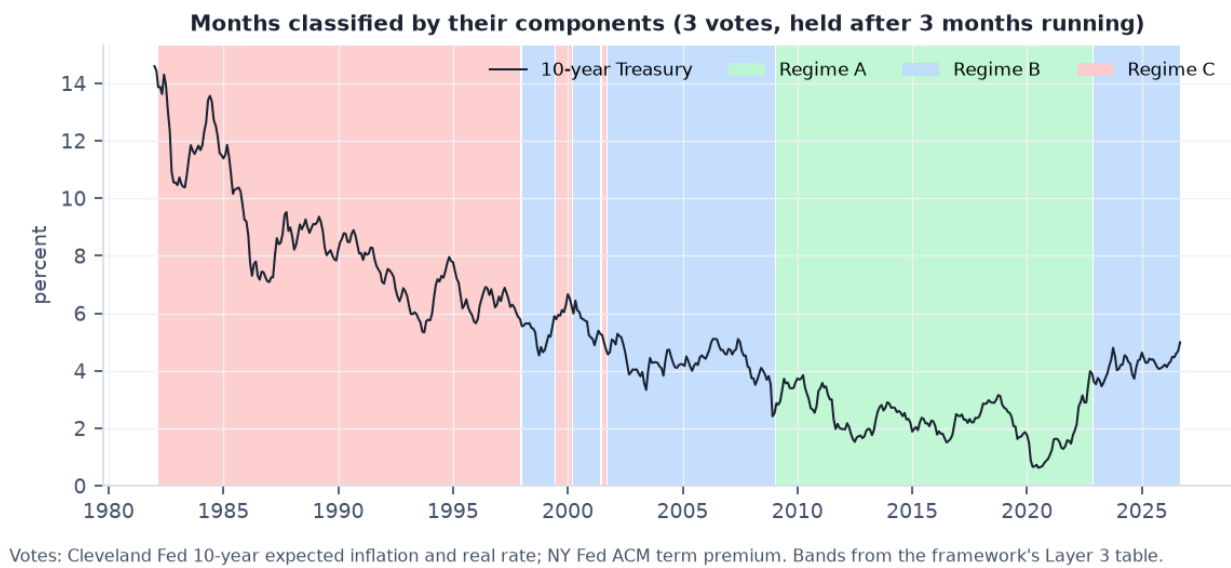


Figure 4: Regime history: 10-year yield shaded by regime

How likely is each range under each regime (1998–2026), and what does that imply?

Table 16: Share of months with the 10-year inside each range, by regime.

10-year range	P(range A)	P(range B)	P(range C)
OpenAI: 3–4%	0.18	0.17	0.00
Claude: 4–5.5%	0.00	0.72	0.25

Table 17: Regime probabilities given each range.

	OpenAI: 3–4%	Claude: 4–5.5%
P(A range), equal priors	0.51	0.00
P(B range), equal priors	0.49	0.74
P(C range), equal priors	0.00	0.26
P(A range), framework priors	0.34	0.00
P(B range), framework priors	0.66	0.85
P(C range), framework priors	0.00	0.15

What this shows

- **A 3–4% yield does not identify regime A.** It occurred in 18% of A months and 17% of B months, so it is equally consistent with both. With the framework's priors it points to **B (66%)** more than A (34%). Saying "3–4%, therefore regime A" mixes up the level with the regime.
- **A 4–5.5% yield points to B (85%).** It is almost never seen in A, and is seen sometimes in C (25% of C months since 1998, though there are only 12 such months).
- **The regime is identified by the parts.** Today (September 2026) expected inflation is 2.57% (B), the real rate 2.24% (B) and the term premium 0.72% as a monthly average (B). That is 3 of 3 for B, held since December 2022.
- **What would have to happen for OpenAI's regime A.** A 3–4% yield in regime A would look like 1.9% inflation expectations, a 1.0% real rate and a 0.0–0.3% premium. That means:
 - the real rate falling by more than 1pp, which needs Fed cuts toward r^* and rising unemployment;
 - expectations dropping below 2%;
 - the premium returning to its post-2010 median of 0.03%.

These are the triggers to watch. A 3–4% yield *with* B-type parts (for example 2.3% + 1.2% + 0.4% = 3.9%) would still be regime B.

Limits.

- The bands are the framework's choice; changing them moves the history.
 - Since 1998 there are only 12 regime-C months, so regime C is poorly measured.
 - The parts are themselves estimates. The ACM and Kim-Wright premia differ by 0.1–0.6pp.
-

10. How each structural driver acts on each part of the yield, across seven economies

10.1 The matrix

The framework names six structural drivers and three parts of the yield. Each cell gives the direction of the effect when the driver increases, the mechanism, the data that measures it and the main research behind it.

Table 18: Structural drivers and the parts of the yield they move.

Driver	Expected inflation	Expected real short rate	Term premium	Data point that measures it	Evidence
Saving minus investment	Small	Main channel. More saving than investment lowers the real rate that clears the market	Small; surplus countries' savers buy long bonds	National saving and investment, % of GDP (IMF WEO); current account	Rachel & Summers (2019); Del Negro et al. (2019); IMF WEO Apr 2023 ch. 2
Fiscal path (debt, deficits)	Up if the central bank is pushed to finance it	Up: government borrowing absorbs saving	Main channel. More bonds to absorb, more duration risk	Gross debt and deficit, % of GDP (IMF WEO); debt maturity; foreign official holdings (US TIC)	Laubach (2009); Plante, Richter & Zubairy (2025); ECB blog (2023); Greenwood & Vayanos (2014)
Demo-graphics	Ambiguous	Down while workers save for retirement; up later as retirees spend	Small	Old-age dependency ratio (World Bank)	Carvalho, Ferrero & Nechio (2016); Mian, Straub & Sufi (2021); IMF WEO 2023
Productivity and AI	Down (cheaper output)	Up: faster growth raises the return on capital, so r^* rises with trend growth	Small	Output per worker growth (World Bank); trend growth (IMF)	Holston, Laubach & Williams (2023); Acemoglu (2024)
Globalisation and energy	Main channel: open trade and cheap energy hold prices down; tariffs and energy shocks push them up	Small	Up via inflation risk	Trade % of GDP; energy imports % of use (World Bank); CPI	Auer, Borio & Filardo (2017); Wright (2011)
Central-bank credibility and buyers	Main channel: anchors long-run expectations	Through the policy rate path	Lower with credible targets and price-insensitive buyers (QE, reserve managers)	Long-run inflation forecasts against target; central-bank and foreign-official share of bonds	Gürkaynak, Levin & Swanson (2010); Krishnamurthy & Vissing-Jorgensen (2012); Warnock & Warnock (2009)

There is one more driver the framework treats as a reaction rather than a structural force: the **policy rate**. In the data below it is the single largest influence on today's 10-year yields.

10.2 The data

Table 19: 10-year yields, short rates and inflation. OECD monthly averages (DF_FINMARK) for 10-year and 3-month rates; IMF CPI index; IMF WEO (April 2026) inflation forecasts for 2029–31.

	United States	Germany	France	United Kingdom	Japan	China	Euro area
10y now %	4.68	3.18	4.00	4.99	2.94	1.71	3.66
10y 2015–19 avg %	2.27	0.21	0.61	1.37	0.06	3.31	1.04
Δ10y vs 2015–19, pp	2.41	2.97	3.39	3.62	2.88	–1.60	2.62
3-month rate now %	3.82	2.51	2.51	3.62	1.46	1.54	2.51
CPI y/y latest %	3.69	2.86	2.36	3.03	1.96	0.80	1.90
IMF inflation 2029–31 %	2.19	2.15	1.87	2.00	1.97	1.96	2.03
Real 10y (10y – IMF 2029–31 inflation) %	2.49	1.03	2.13	2.99	0.97	–0.25	1.63

10-year and 3-month rates: OECD monthly averages for Aug 2026 (China Jul 2026). CPI: IMF CPI index, Aug 2026 (euro area: OECD, Dec 2025).

The “real 10-year” is the 10-year yield minus the IMF’s inflation forecast for 2029–31, used as a proxy for long-run expected inflation. Only the US has a liquid inflation-linked market across the period. The euro-area and EU columns are aggregates; the EU has no single government bond, so it appears only in the fiscal and structural tables.

Table 20: Fiscal position and saving. IMF World Economic Outlook, April 2026 (GGXWDG_NGDP, GGXCNL_NGDP, NGSD_NGDP, NID_NGDP, BCA_NGDPD). Euro area = IMF group G163; EU = G998.

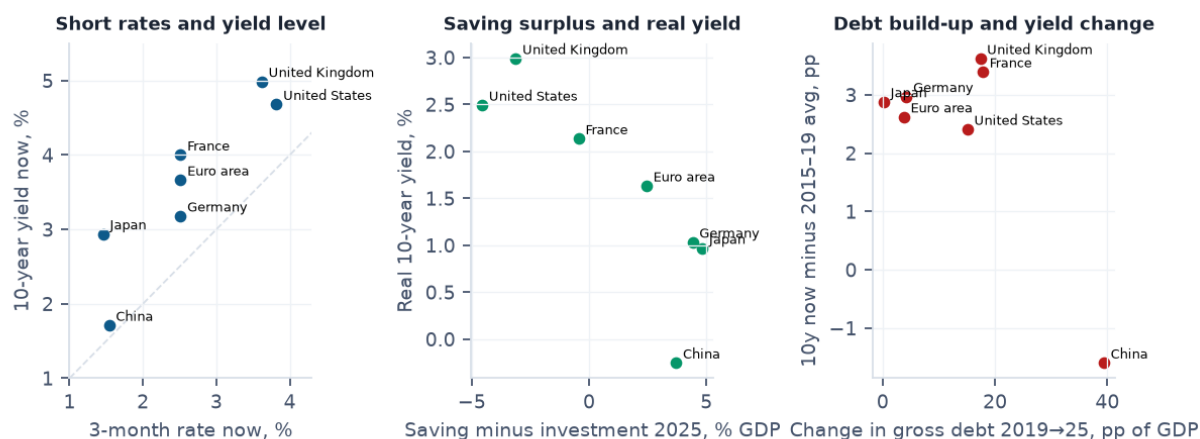
	United States	Germany	France	United Kingdom	Japan	China	Euro area	European Union
Gross debt 2019 % GDP	108.8	58.7	98.2	84.9	206.3	59.8	83.3	79.1
Gross debt 2025 % GDP	123.9	62.9	116.0	102.3	206.5	99.2	87.1	82.5
Δdebt 2019–25, pp	15.1	4.2	17.8	17.4	0.2	39.4	3.8	3.4
Gross debt 2031 % GDP (IMF)	142.1	73.7	120.7	102.6	192.8	126.8	89.7	85.9
Deficit 2025 % GDP	6.8	2.7	5.1	5.4	1.1	7.9	3.0	3.1
National saving 2025 % GDP	16.8	26.3	21.6	15.4	32.6	42.5	24.4	24.4
Investment 2025 % GDP	21.4	21.9	22.1	18.6	27.7	38.8	21.9	22.0
S – I 2025 % GDP	–4.6	4.4	–0.4	–3.1	4.8	3.7	2.5	2.4
Current account 2025 % GDP	–3.6	4.4	–0.4	–3.1	4.8	3.7	1.6	2.4

Table 21: Growth, demographics and openness. IMF WEO (growth); World Bank WDI (SL.GDP:PCAREM.KD, SPPODPND.OL, NE.TRD.GNFS.ZS, EG.IMPCONS.ZS).

	United States	Germany	France	United Kingdom	Japan	China	Euro area	European Union
Real growth 2010–19 avg %	2.4	2.0	1.4	2.0	1.3	7.7	1.4	1.7
Real growth 2026–31 avg % (IMF)	2.0	0.9	1.0	1.4	0.6	3.8	1.2	1.4
Productivity growth 2010–19 %	1.1	0.9	1.1	0.8	0.7	7.6	0.9	1.0
Productivity growth 2019–25 %	1.9	0.3	–0.0	0.5	0.2	5.1	0.5	0.7
Old-age dependency 2010	19.0	31.3	25.9	24.8	36.4	11.9	27.6	26.4
Old-age dependency latest	28.5	38.0	36.8	31.1	51.0	21.4	36.2	35.4
Trade % GDP latest	25.0	78.5	67.2	62.5	44.9	38.0	87.3	90.1

	United States	Germany	France	United Kingdom	Japan	China	Euro area	European Union
Energy imports % use latest	−9.0	70.5	47.1	44.0	87.3	24.0	67.5	62.5

10.3 Linking each driver to yields



Sources: OECD MEI long-term rates; IMF World Economic Outlook (published 2026-04-14).

Figure 5: Seven economies: short rate against 10-year; saving minus investment against the real 10-year; change in debt against change in yield

Correlations across the seven economies (US, Germany, France, UK, Japan, China, euro area):

Table 22: Cross-country correlations, seven economies.

Pair	Correlation	Reading
3-month rate vs 10-year yield	0.90	The policy rate sets most of the level
Change in 3-month rate vs change in 10-year, against 2015–19	0.95	It also explains most of the rise
Saving – investment vs real 10-year	−0.84	Surplus savers have lower real yields
Gross debt vs real 10-year	−0.03	No link in the level across countries
Change in debt vs change in 10-year	−0.76, or +0.46 without China	China’s yields fell as its debt rose; the rest show the expected sign
Old-age dependency vs real 10-year	0.05	No link across countries; the effect is global and slow
Trend growth vs real 10-year	−0.47	Driven by China; no clean link

Seven points are too few to prove anything. These correlations illustrate the mechanisms; the research below supplies the estimates.

Saving minus investment → real rate.

- Japan (+4.8% of GDP), Germany (+4.4%) and China (+3.7%) save more than they invest and have the lowest real yields (1.0%, 1.0% and −0.25%).
- The US (−4.6%) and UK (−3.1%) borrow from abroad and have the highest (2.5% and 3.0%).
- This is the “global saving glut” mechanism in reverse. Rachel & Summers (2019) estimate private-sector forces would have pushed the neutral rate down by about 7pp since the 1970s, but government borrowing offset part of that. Del Negro et al. (2019) attribute the fall in world real rates mainly to a higher convenience yield on safe bonds and slower growth.

Fiscal path → term premium and real rate.

- **The research consensus is about 3bp per point of debt-to-GDP:**
 - Laubach (2009): 3–4bp per point of debt, and about 25bp per point of the projected deficit.
 - Plante, Richter & Zubairy (2025): about 3bp, three-quarters of it through the term premium.
 - Kirpson & Staehr (2025): about 3bp for the euro area.
 - The ECB (2023) finds the effect larger at high debt: 10pp more debt adds about 20bp at low debt and 65bp at high debt.
- **Applied to 2019–25** (table below), the rise in debt explains about 0.5pp of the rise in US, UK and French yields. The rest, about 2–3pp, matches the rise in short rates.
- **France against Germany is the cleanest test.** Both have the same central bank, the same 3-month rate (2.51%) and the same currency.
 - The France–Germany 10-year spread widened from 0.40pp (2015–19 average) to 0.82pp (August 2026).
 - France’s debt ratio rose 13.6pp more than Germany’s (the gap went from 39.5pp to 53.1pp).
 - That is 0.42pp / 13.6pp ≈ **3.1bp per point of debt**, right on the research estimate. Political events also mattered; this is a two-country comparison, not a regression.
- **Who buys matters too.** Foreign official holders such as central-bank reserve managers rarely sell on price. Their share of marketable US Treasuries fell from **33.7% (2014) to 12.0% (July 2026)** (US Treasury TIC and Monthly Statement of the Public Debt). Warnock & Warnock (2009) estimate foreign flows held the US 10-year about 80bp lower in the mid-2000s. Krishnamurthy & Vissing-Jorgensen (2012) estimate Treasuries’ “convenience yield” at about 73bp. Losing price-insensitive buyers raises the term premium.

Table 23: Debt channel: what the research implies against what happened.

Country	Δdebt 2019–25, pp	Implied by 3bp per pp, pp	Implied by 2–6.5bp per pp (ECB), pp		Actual Δ10y vs 2015–19,
United States	15.10	0.45	0.30 to 0.98		2.
Germany	4.25	0.13	0.08 to 0.28		2.
France	17.83	0.54	0.36 to 1.16		3.
United Kingdom	17.38	0.52	0.35 to 1.13		3.
Japan	0.20	0.01	0.00 to 0.01		2.
China	39.40	1.18	0.79 to 2.56		–1.
Euro area	3.78	0.11	0.08 to 0.25		2.

China and Japan show the fiscal channel can be overwhelmed. China’s debt rose 39pp, yet its 10-year fell 1.6pp. It has very high saving (42.5% of GDP), capital controls, near-zero inflation (0.8%) and state banks that hold the bonds. Japan, at 206% of GDP, had near-zero yields for a decade because domestic savers and then the Bank of Japan absorbed the bonds. Debt raises yields when the marginal buyer has a choice.

Demographics → real rate.

- Old-age dependency rose everywhere: US 19→29, Germany 31→38, Japan 36→51, China 12→21 retirees per 100 people of working age.
- Across countries this has no link with today’s real yields ($r = 0.05$). This fits the research view that the effect works on the *global* rate over decades.
 - Carvalho, Ferrero & Nechio (2016) estimate demographics lowered the real rate by about 1.5pp from 1990 to 2014.
 - The IMF (WEO April 2023) expects ageing to keep rates low in advanced economies.
 - Mian, Straub & Sufi (2021) find rising saving by the rich matters more than ageing.
- So the framework’s 0/+1 score, which bets on retirees spending their savings, is not yet visible in the data.

Productivity and AI → real rate.

- The US is the only economy where output per worker *accelerated*: 1.9% a year in 2019–25 against 1.1% in 2010–19. It also has one of the two highest real yields.

- In Germany, France and Japan, productivity growth slowed to 0–0.3%.
- Holston, Laubach & Williams (2023) find no clear rise in r^* yet. Acemoglu (2024) puts AI's 10-year boost to total factor productivity at 0.66% *in total*, a small number.
- So the framework's 0 score is supported. A clear US acceleration, sustained, would be the signal to move to +1.

Globalisation and energy → expected inflation.

- Economies that import most of their energy were hit hardest by the 2022 price shock: Japan 87%, the euro area 68%, Germany 70%. The US is a net energy exporter (–9%).
- Auer, Borio & Filardo (2017) show that global value chains make domestic inflation more sensitive to global conditions.
- Wright (2011) shows that term premia rise with inflation uncertainty, so energy and trade shocks also act through the premium.

Central-bank credibility → expected inflation and term premium.

- The IMF's inflation forecasts for 2029–31 are 1.9–2.2% in every economy, so long-run expectations are still anchored near 2% everywhere. Gürkaynak, Levin & Swanson (2010) show that inflation targeting anchors long-dated expectations.
- In the US, the 5y5y breakeven is 2.36%, inside its post-2010 range (1.79–2.60%).
- So credibility is not yet pushing yields up. The rise has come through real rates and the premium. A move of the 5y5y above 2.6% would be the first sign of change.

10.4 Country summaries

Table 24: What drives each economy's 10-year yield.

Economy	10-year now	Main drivers of the level and the change since 2015–19
United States	4.68 (Aug avg; 5.29 on 30 Sep)	Highest short rate; deficit of 6.8% at full employment; borrows from abroad ($S - I - 4.6\%$); productivity up; foreign official share down to 12%. Real rate and term premium both high
Germany	3.18	Saver ($S - I + 4.4\%$), low debt (63%); rise driven by the ECB rate (+2.8pp). Higher Bund supply from defence and infrastructure spending is in the IMF's 2031 debt path (74%)
France	4.00	Same ECB rate as Germany; debt 116% and deficit 5.1% explain the 0.8pp spread over Germany
United Kingdom	4.99	Highest of the seven: deficit, borrowing from abroad (–3.1%), inflation 3.0%, Bank Rate 3.6%. The 2022 episode adds a premium for fiscal credibility
Japan	2.94	End of YCC; inflation positive since 2022; Bank of Japan shrinking its balance sheet (¥645tn from ¥750tn). Large saver, so the real yield is still low (1.0%)
China	1.71	Falling: near-zero inflation, high saving, capital controls, policy easing; debt up 39pp with no yield penalty
Euro area	3.66	Weighted mix of the above; ECB deposit rate the anchor

Sources

Data (all fetched 2 October 2026; hashes in dataroom/research/2026-10-02/data/sources.csv)

Table 25: Data sources.

Data	Publisher and series	Link
Gilt yields, Bank Rate, GBP/USD	Bank of England Statistical Interactive Database: IUDSNPY, IUDMNPY, IUDLNPY, IUDBEDR, XUDLUSS	bankofengland.co.uk/boeapps/database
UK CPI	Office for National Statistics, D7G7 (MM23)	ons.gov.uk D7G7
JGB yield curve 1974–2026	Ministry of Finance Japan, “Interest Rate” (jgbcme_all.csv, jgbcme.csv)	mof.go.jp JGB interest rates
US yields, TIPS, breakevens, USD/JPY, US CPI, BoJ assets, Kim-Wright premium, Cleveland Fed expectations	FRED: DGS10, DFII10, T10YIE, T5YIFR, DEXJPUS, DEXUSUK, CPIAUCNS, JPNASSETS, THREEFYTP10, EXPINF10YR, REAINTRATREARAT10Y	fred.stlouisfed.org
ACM term premium	Federal Reserve Bank of New York	newyorkfed.org ACM
Neutral rate r^*	Federal Reserve Bank of New York, Holston-Laubach-Williams	newyorkfed.org r-star
FOMC long-run funds rate	Federal Reserve, Summary of Economic Projections (16 Sep 2026)	federalreserve.gov SEP
Foreign holdings of Treasuries; marketable debt	US Treasury TIC; Monthly Statement of the Public Debt	treasury.gov TIC; fiscaldata.treasury.gov
10-year and 3-month rates, seven economies	OECD Data Explorer, DF_FINMARK (IRLT, IR3TIB)	sdmx.oecd.org
CPI, six countries	IMF CPI dataset (IMF.STA:CPI), index 2020 = 100	data.imf.org
Debt, deficit, saving, investment, current account, growth, inflation forecasts	IMF World Economic Outlook, April 2026 (IMF.RES:WEO)	imf.org WEO
Dependency, productivity, trade, energy imports	World Bank WDI: SPPODPND.OL, SL.GDPPCAPEM.KD, NE.TRD.GNFS.ZS, EG.IMPCONS.ZS	data.worldbank.org

Official documents on the episodes

- Bank of England (2023), Alexander, Fakhoury, Horn, Panjwani & Roberts-Sklar, “Financial stability buy/sell tools: a gilt market case study”, *Quarterly Bulletin* 2023. [Link](#). Source for the £65bn capacity, the £19.3bn purchased, the 130bp move in 3 days and the sales to 12 January 2023.
- Pinter, G. (2023), “An anatomy of the 2022 gilt market crisis”, Bank of England Staff Working Paper 1,019. [Link](#)
- HM Treasury (2022), “Chancellor statement, 17 October 2022”. [Link](#); House of Commons Library (2022), “The 17 October 2022 fiscal statement”, CBP-9643. [Link](#)
- Bank of Japan, statements on yield-curve control: 21 September 2016, 31 July 2018, 19 March 2021, 20 December 2022, 28 July 2023, 31 October 2023, 19 March 2024; all linked from the Bank’s reference page. [Link](#)
- Nakazawa, T. & Osada, M. (2024), “Effects of the Bank of Japan’s yield curve control”, Bank of Japan Working Paper 24-E-10. [Link](#)

- Ministry of Finance Japan (2024), *Debt Management Report 2024*, “Diversification of JGB investor base” (Bank of Japan 53.8% of JGBs at end-2023). [Link](#)
- Ministry of Finance Japan, “Foreign exchange intervention operations” (22 Sep 2022 and Oct 2022 totals). [Link](#)
- Federal Reserve History, “The Treasury-Fed Accord” (1942 peg of 3/8% bills and an implicit 2.5% cap on long bonds; Accord of 4 March 1951). [Link](#); Federal Reserve Board staff memo (2003), “Targeting the yield curve: the experience of the Federal Reserve, 1942-51”. [Link](#)

Research

- Acemoglu, D. (2024), “The simple macroeconomics of AI”, NBER WP 32487; *Economic Policy*. [Link](#)
- Auer, R., Borio, C. & Filardo, A. (2017), “The globalisation of inflation: the growing importance of global value chains”, BIS WP 602. [Link](#)
- Benigno, G., Hofmann, B., Nuño, G. & Sandri, D. (2024), “Quo vadis, r^* ? The natural rate of interest after the pandemic”, *BIS Quarterly Review*, March. [Link](#)
- Carvalho, C., Ferrero, A. & Nechio, F. (2016), “Demographics and real interest rates”, *European Economic Review* 88. [Link](#)
- Del Negro, M., Giannone, D., Giannoni, M. & Tambalotti, A. (2019), “Global trends in interest rates”, *Journal of International Economics* 118. [Link](#)
- ECB (2023), “Fiscal policy: from free to affordable lunch”, ECB Blog, 4 January. [Link](#)
- Greenwood, R. & Vayanos, D. (2014), “Bond supply and excess bond returns”, *Review of Financial Studies* 27(3). [Link](#)
- Gürkaynak, R., Levin, A. & Swanson, E. (2010), “Does inflation targeting anchor long-run inflation expectations?”, *Journal of the European Economic Association* 8(6). [Link](#)
- Holston, K., Laubach, T. & Williams, J. (2023), “Measuring the natural rate of interest after COVID-19”, NY Fed Staff Report 1063. [Link](#)
- IMF (2023), *World Economic Outlook*, April, chapter 2: “The natural rate of interest: drivers and implications for policy”. [Link](#)
- Kirpson, R. & Staehr, K. (2025), “Government debt and long-term interest rates in the euro area”, Bank of Estonia WP 6/2025. [Link](#)
- Krishnamurthy, A. & Vissing-Jorgensen, A. (2012), “The aggregate demand for Treasury debt”, *Journal of Political Economy* 120(2). [Link](#)
- Laubach, T. (2009), “New evidence on the interest rate effects of budget deficits and debt”, *Journal of the European Economic Association* 7(4). [Link](#)
- Mian, A., Straub, L. & Sufi, A. (2021), “What explains the decline in r^* ? Rising income inequality versus demographic shifts”, Jackson Hole symposium. [Link](#)
- Plante, M., Richter, A. & Zubairy, S. (2025), “Revisiting the interest rate effects of federal debt”, NBER WP 34018 / Dallas Fed WP 2513. [Link](#)
- Rachel, Ł. & Summers, L. (2019), “On secular stagnation in the industrialized world”, *Brookings Papers on Economic Activity*, Spring. [Link](#)
- Reinhart, C. & Sbrancia, M. B. (2015), “The liquidation of government debt”, *Economic Policy* 30(82); NBER WP 16893. [Link](#)
- Warnock, F. & Warnock, V. (2009), “International capital flows and U.S. interest rates”, *Journal of International Money and Finance* 28(6). [Link](#)
- Wright, J. (2011), “Term premia and inflation uncertainty: empirical evidence from an international panel dataset”, *American Economic Review* 101(4). [Link](#)