

FINANCIAL INSTITUTIONS AND MARKETS · MF50004.01

Assignment 1

Asset valuation and risk measurement

Prof. Jiajun Jiang · School of Economics, Fudan University · Semester 1, 2026–2027
 Set in Week 2 · due Friday 9 October 2026, 23:59 (China Standard Time) · individual work

WHAT TO HAND IN

Hand in one PDF or Word file on eLearning. Show the steps of every calculation, not only the answer.

THE DATA

Assignment1_data.xlsx has three tabs: **Market data** (real quotes, each with its date and source), **Instruments** (the bonds and the loan you are asked to price) and **Scenarios** (Question 4). Question 5 gives you no data: you look the two yields up yourself.

CONVENTIONS

- Every bond pays one coupon a year, has a face value of 100, and every rate is an annual rate with annual compounding.
- Give prices to two decimal places, and rates and returns to three.

Questions

Question 1 — Pricing the four credit-market instruments

The instruments are in the Instruments tab. Every yield here is a real quote from 18–20 August 2026.

- Price UST10: a US Treasury note with 10 years to maturity and a 4.00% annual coupon, priced to yield 4.735%. Give the price per 100 of face value.
- Price CGB10: a Chinese government bond, 10 years, a 2.00% coupon, priced to yield 1.67%.
- CGB1 pays 100 at maturity in one year and yields 1.20%. What does it cost today?
- A 20-year mortgage of ¥1,000,000 is repaid in 20 equal annual payments at the over-five-year LPR of 3.50%. (i) What is the annual payment? (ii) A second bank offers the same 20-year loan with an annual payment of ¥75,000. What interest rate is it charging? Use whatever method you like — a spreadsheet, a financial calculator, or a search by hand — and say which you used.
- One of the bonds in (a) and (b) sells above its face value and the other below it. Say which is which and explain why in two sentences, without any further calculation.

Question 2 — Return, yield and duration

- (a) For UST10, compute the Macaulay duration and the modified duration. Show the present value of each year's payment and the weight it carries in the price.
- (b) Yields rise by 100bp. Use modified duration to estimate the new price of UST10, then compute the exact price. Report both and the difference between them, and say which way the estimate errs.

CONVEXITY — WHAT YOU NEED FOR (c)

Modified duration treats the price–yield relation as a straight line through today's yield, so it always predicts a larger fall than actually happens. The true relation bends, and the bend is convexity, C . Adding the next term of the expansion gives a better estimate:

$$\% \Delta P \approx -D_{\text{mod}} \times \Delta y + \frac{1}{2} \times C \times (\Delta y)^2$$

Δy is the change in yield written as a decimal, so a 100bp rise enters as 0.01. C for UST30 is given in the Instruments tab; its definition is in the Week 2 appendix, and you are not asked to derive it.

- (c) Now UST30 (30 years, 5.00% coupon, yield 5.32%). Compute its price and its modified duration. For a 100bp rise in yields, give (i) the duration estimate of the new price, (ii) the estimate with the convexity term added, and (iii) the exact price. Why does the convexity term matter more here than in (b)?
- (d) You buy UST10 today, hold it for one year, collect the coupon and sell it. Over that year yields rise 100bp. What is your return for the year? Show the two parts of it separately.
- (e) Bank A holds 100 of face value of UST10 and bank B holds 100 of face value of UST30. Rates rise 100bp and neither issuer misses a payment. In two sentences: which bank has the larger loss, and what kind of risk is it?

Question 3 — Risk structure and term structure

- (a) US high-yield corporate bonds traded at an option-adjusted spread of 271bp over Treasuries on 12–13 August 2026. What yield does that imply for a 10-year high-yield bond? Mishkin gives three things a spread can compensate for: name them, and say which of them apply here. If investors expect to lose 2% a year to default, how much of the spread is left?
- (b) One-year Chinese AA notes traded 41bp over comparable government debt in May 2025 — the tightest since 2007. What yield is that? In three or four sentences, explain why the Chinese spread is so much smaller than the US one. Use what Week 3 says about ratings: the median gap of seven notches between a Chinese firm's domestic and global ratings, and the 24% of jointly rated firms that the two sets of agencies rank in the opposite order.
- (c) From the US curve (2-year 4.19%, 10-year 4.735%), compute the average annual interest rate the market implies for years 3 to 10. Under the pure expectations theory, what is the market saying about short-term rates, given that the policy rate is 3.50–3.75%? What changes in that reading once you allow for a term premium?
- (d) Do the same for China, using the 1-year yield (1.20%) and the 30-year yield (2.15%): the implied average annual rate for years 2 to 30. Then compare the two curves in two or three sentences: which theory of the term structure do you find more useful for China, and why?

Question 4 — Portfolio risk and the CAPM

The Scenarios tab gives five states of the economy for the year ahead, their probabilities, and the return of two assets in each state: an A-share bank stock and a Chinese government bond fund. That table is constructed for this exercise; everything else in the workbook is a real quote.

- (a) Compute the expected return and the standard deviation of each of the two assets.
- (b) Compute the covariance and the correlation between them. What does the sign tell you — and which state keeps the correlation from being closer to -1 ?
- (c) A portfolio holds half its money in each asset. Compute its expected return and its standard deviation. Compare that standard deviation with the simple average of the two individual ones, and explain the difference in one sentence.
- (d) Take the 3-month Treasury bill as the risk-free rate and assume a market risk premium of 5.0 percentage points. Use the CAPM to compute the required return on two shares whose published betas are 0.54 and 1.26. Newmont Mining, a gold miner, has a beta of 0.32 although its share price moves a great deal: explain in one or two sentences why beta and volatility are not the same thing. Then: about 90% of daily turnover in the A-share market comes from retail investors. Does that change what a beta estimated on A-share data means? Two or three sentences, marked on your reasoning.

Question 5 — Case: where should a bank put new deposits?

THE SITUATION

A mid-sized Chinese commercial bank has just taken in ¥10 billion of one-year time deposits, on which it pays the big-bank rate of 0.95%. The money has to be invested, and the treasury desk has narrowed it to two choices: one-year Chinese government bonds, or thirty-year ones. China's whole government curve spans less than a percentage point, so the extra income from going long is small. The price risk is not.

- (a) Find today's 1-year and 30-year Chinese government bond yields yourself. Give both numbers, the source, and the date you looked them up. (ChinaBond publishes the official curve; Trading Economics, Investing.com and the AkShare package carry it too.)
- (b) Assume the bank buys bonds issued at par, with a coupon equal to the yield you found. Compute the modified duration of each.
- (c) On ¥10 billion: how much more income a year does the thirty-year bond give than the one-year bond? And if yields rise by 50bp, how much value does each of the two portfolios lose?
- (d) How many years of that extra income does a 50bp rise wipe out?
- (e) Recommend one of the two, in no more than half a page. Then answer this: the deposits are one-year money. If the depositors do not renew and the bank has to sell, does your recommendation change, and who bears the loss?