

**FINM 37400 Final Exam**

Fixed Income

February 5, 2025

**Name:** \_\_\_\_\_**UChicago ID:** \_\_\_\_\_

- This exam is **closed book** and **closed notes**.
- You are **not** allowed any electronics or calculator.

Section	Questions	Points per Question	Points Awarded	Points Possible
1	15	2		30
2	5	2		10
3	15	3		45
4	5	3		15
<b>Total</b>	40	-		<b>100</b>

## 1 True or False

1. The duration of a portfolio of bonds is the average of the durations of each bond in the portfolio.  
☐ True  
☐ False
2. For any outstanding U.S. treasury bond, the dirty price is greater than or equal to the clean price.  
☐ True  
☐ False
3. We found the swap rate empirically has a small spread to account for the counterparty risk of lending (or borrowing) the notional amount.  
☐ True  
☐ False
4. We found the swap rate empirically has a small spread to account for the counterparty risk of lending (or borrowing) the notional amount.  
☐ True  
☐ False
5. We found that the first principal component, driving most variation in yields, is approximately a long level factor and short slope factor.  
☐ True  
☐ False
6. Hedging a high-duration portfolio requires more frequent hedging adjustments.  
☐ True  
☐ False
7. In Homework 3, we found that a regression did NOT give a good approximation of the average duration over a time series of two treasury bonds .  
☐ True  
☐ False
8. If the spot discount rate curve is monotonically upward sloping (as a function of maturity) then we know the forward rates are higher than the spot rates at every maturity.  
☐ True  
☐ False
9. A downward-sloping yield curve with zero term premium indicates that 1-year yields are expected to decrease over time.

- ☐ True  
☐ False
10. Duration is  $D$  in the following approximation,  $dP \approx -Ddr$  where  $dr$  is a parallel change in spot discount rates.
- ☐ True  
☐ False
11. Before the 2008, the swap rate was typically higher than the maturity-matched treasury yield, but after 2008, the swap rate has been lower.
- ☐ True  
☐ False
12. A forward rate quoted at  $t$  and in effect between  $T_1$  and  $T_2$  is determined by the time- $t$  yield curve and time  $T_1$  yield curve.
- ☐ True  
☐ False
13. A Floating-Rate-Note has positive convexity which decreases toward zero as the reset date approaches.
- ☐ True  
☐ False
14. The yield curve can be used to price any one-time cash-flow from the Treasury, whereas the spot discount rate can be used to price any one-time cash-flow from any source.
- ☐ True  
☐ False
15. If the yield curve is downward sloping, then the rate on a 2-year forward loan to the Treasury (locked in today) must be lower than the rate on an immediate two-year loan to the Treasury.
- ☐ True  
☐ False

## 2 Multiple Choice

Circle the bullet point of exactly ONE answer.

1. What causes Floating Rate Notes (FRNs) to be priced at par on reset dates?
  - It has no accrued interest.
  - The floating rate index represents the discount rate.
  - The current floating rate value equals the current discount rate.
  - The spot curve is completely flat.
2. A parallel change in the coupon bond yield curve always implies:
  - A parallel change in the spot curve.
  - A parallel change in the forward curve.
  - A non-parallel change in the spot curve.
  - None of the above.
3. The standard convexity measure is defined to be...
  - change in duration for a change in rates.
  - second derivative of price to rates.
  - sensitivity of prices to a second-order change in rates, relative to the current price.
  - curvature of the price-yield relationship.
4. Using OLS to estimate spot rates often leads to forward rates which are inconsistent with...
  - the shape of the spot curve.
  - the shape of the yield curve.
  - other forward rates at small changes in maturity.
  - the pricing data of the reference bonds.
5. In the homework, we compared forward rates at a given time to the evolution of the one-year spot rates. We found that the forward rates...
  - overestimated the future spot rates.
  - underestimated the future spot rates.
  - were identical to the future spot rates.

### 3 Check All That Apply (if any)

Check the tick box for every true answer (and leave false answers unchecked.)

1. The return on a fixed coupon bond is guaranteed to equal the YTM (at purchase) on the bond if the following conditions all hold:
  - ☐ The bond is held to maturity.
  - ☐ The coupons are reinvested at the original YTM.
  - ☐ The coupon rate equals the YTM.
  - ☐ The YTM remains the same until expiry.
2. A flat **spot** curve implies:
  - ☐ A flat yield curve.
  - ☐ An increasing yield curve
  - ☐ A flat forward curve.
  - ☐ A flat discount factor curve.
3. A flat **yield** curve implies...
  - ☐ a flat spot curve.
  - ☐ an increasing spot curve.
  - ☐ a flat forward curve.
  - ☐ a flat discount factor curve.
4. Zero coupon bonds can be used to replicate:
  - ☐ Fixed coupon bonds
  - ☐ Forward Rate Agreements (FRAs)
  - ☐ Swaps
  - ☐ Floating Rate Notes (FRNs)
5. Two coupon bonds with the same maturity:
  - ☐ can have the same YTM
  - ☐ can have different YTM's
  - ☐ must have the same convexity
  - ☐ must have the same duration
6. The "swap rate" ...
  - ☐ is what the fixed leg of the swap pays (or receives.)
  - ☐ equals the YTM of a treasury with the same maturity.

- ☐ sets the value of a new swap to 100.
  - ☐ sets the value to par for a fixed coupon bond with coupon equal to the swap rate.
  - ☐ equals the floating rate of the swap on swap (reset) dates.
7. An **overestimation** of the entire spot discount curve (every point of the curve) will necessarily lead to **overestimation** of the...
- ☐ spot discount factors.
  - ☐ forward rates.
  - ☐ yields-to-maturity.
  - ☐ price of a fixed-coupon bond.
  - ☐ value of a paying-fixed swap.
8. A 30-year, 5% fixed-coupon, treasury bond's duration will necessarily **decrease** if, holding everything else constant,
- ☐ a (non-coupon-paying) day goes by.
  - ☐ a coupon-paying day goes by.
  - ☐ there is a parallel upward shift in the spot discount rate curve.
  - ☐ only the 1-year spot discount rate increases.
  - ☐ just before issuing the bond, the treasury decides to set the coupon higher, at a fixed 6%.
9. At any time,  $t$ , the fixed leg of a swap can be valued by discounting payments with the swap rate from...
- ☐ the date the swap was initialized.
  - ☐ the current date.
10. Which of the following have positive duration:
- ☐ Receiving fixed in a swap.
  - ☐ Selling a Floating Rate Note.
  - ☐ Paying fixed in a Forward Rate Agreement.
  - ☐ Selling a zero coupon bond.
11. A floating rate note necessarily has a value equal to par if the following statements are true.
- ☐ Floating rate equals the discount rate.
  - ☐ Valuation is immediately following a coupon payment
  - ☐ Valuation is immediately following a reset.
  - ☐ The floating coupon includes a fixed positive spread.
12. The following are advantages of using curve-fitting to model the spot discount rates relative to OLS. Curve-fitting...

- ☐ improves statistical power relative to OLS.
  - ☐ works with non-square cashflow matrices, unlike OLS.
  - ☐ works for cases where there are multiple gaps in maturity schedule, unlike OLS.
  - ☐ is more flexible in possible yield-curve shapes than OLS.
13. The long-short treasury convergence trade as seen in the case study had the following advantages.
- ☐ Convergence was guaranteed.
  - ☐ Duration was minimal.
  - ☐ Expected returns were high.
  - ☐ Historical context indicated the spread was typically small and converged quickly.
  - ☐ Short-term losses were limited by the trade construction.
14. Suppose we are long a treasury bond via repo. If the haircut goes from 2% to 5%,
- ☐ leverage goes down.
  - ☐ the repo rate increases.
  - ☐ expected return goes down.
15. Suppose you download data for all outstanding U.S. treasury issues as of today. In selecting a subset of data to use for a pure bootstrapping of the yield curve, you must...
- ☐ keep only one treasury corresponding to any particular maturity date.
  - ☐ eliminate any treasury which is not precisely at an ex-coupon date.
  - ☐ eliminate any dates where multiple treasuries pay a coupon, yet none mature.
  - ☐ eliminate any dates where no treasury is maturing, and keep the securities with missing date columns.
  - ☐ eliminate any dates where no treasury is maturing, and eliminate the securities with missing date columns.

## 4 Swap-Spread Trade

**Check the tick box for every true answer (and leave false answers unchecked.)**

In the homework, we analyzed a swap-spread trade with the following market data.

	coupon rate	price	YTM	swap rate	spread
Nov 2008	4.50%	105.21	4.19%	4.26%	0.06%
May 2009		102.31	4.36%	4.08%	-0.28%

Table 1: Scenario: Market according to the case.

1. Select the true statements regarding the Nov 2008 situation.
  - ☐ Coupon rates suggest positive cashflows for going long the treasury and paying-fixed in the swap at equal notionals.
  - ☐ The swap spread in Nov 2008 suggests going long the treasury and paying-fixed in the swap.
  - ☐ The hedging of dollar-duration meant that the notional was smaller in magnitude for the treasury position than the swap position.
2. Select the true statements regarding the evolution of the trade from Nov 2008 to May 2009.
  - ☐ Over these six months, both the treasury and receiving-fixed leg of the swap decreased in value.
  - ☐ The modified duration estimates were poor approximations for PnL, which is why the realized PnL was substantially different from zero, notwithstanding the hedge..
  - ☐ The revaluation of the positions was a larger impact on PnL than was the six-month cashflow.
  - ☐ The cashflow was a constant amount every six months, throughout the 30 years.
3. Which of the following were substantial risks to the implementation of the trade we analyzed?
  - ☐ Monetary policy changing the market-wide level of interest rates.
  - ☐ Convexity.
  - ☐ Cashflow uncertainty.
  - ☐ Changes in the swap spread .
  - ☐ Changes in the repo rate.
4. Suppose now that the swap-spread trade was implemented on a bond that was at par in Nov 2008, as shown in the following table.

	coupon rate	price	YTM	swap rate	spread
Nov 2008	4.50%	100.00	4.50%	4.26%	-0.24%
May 2009		102.31	4.36%	4.08%	-0.28%

Table 2: Scenario: Market has the bond at par in Nov 2008.

Which of the following statements are necessarily true? In this version of the trade...

- ☐ We go long the treasury and receiving-fixed on the swap.
  - ☐ We go short the treasury and paying-fixed on the swap.
  - ☐ The positioning is more unequal (in notional magnitude), if we once again size to be neutral in dollar duration.
5. Which of the following statements are true about the expected return of the swap-spread trade?
    - ☐ Speaking as of Nov 2008, the conditions in Table 2 indicate a higher expected return than the conditions in Table 1.
    - ☐ Focusing just on Table 2, the expected return on a swap-spread trade is higher in May 2009 than in Nov 2008.