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Fixed Income Securities

**Bond Trading Strategies**

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# Overview

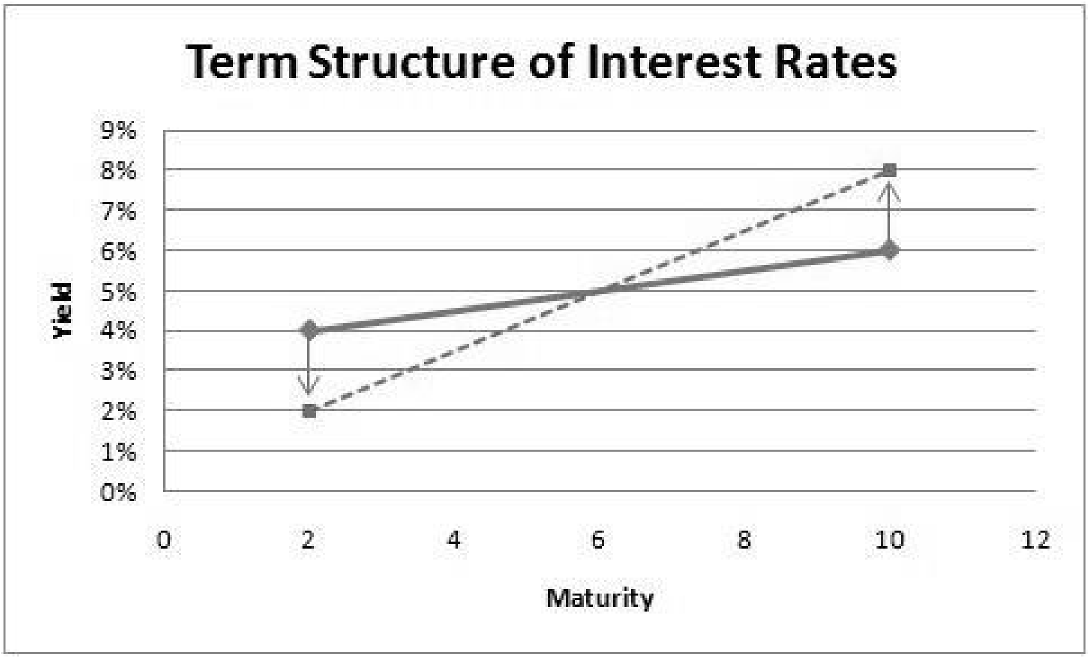
Outline



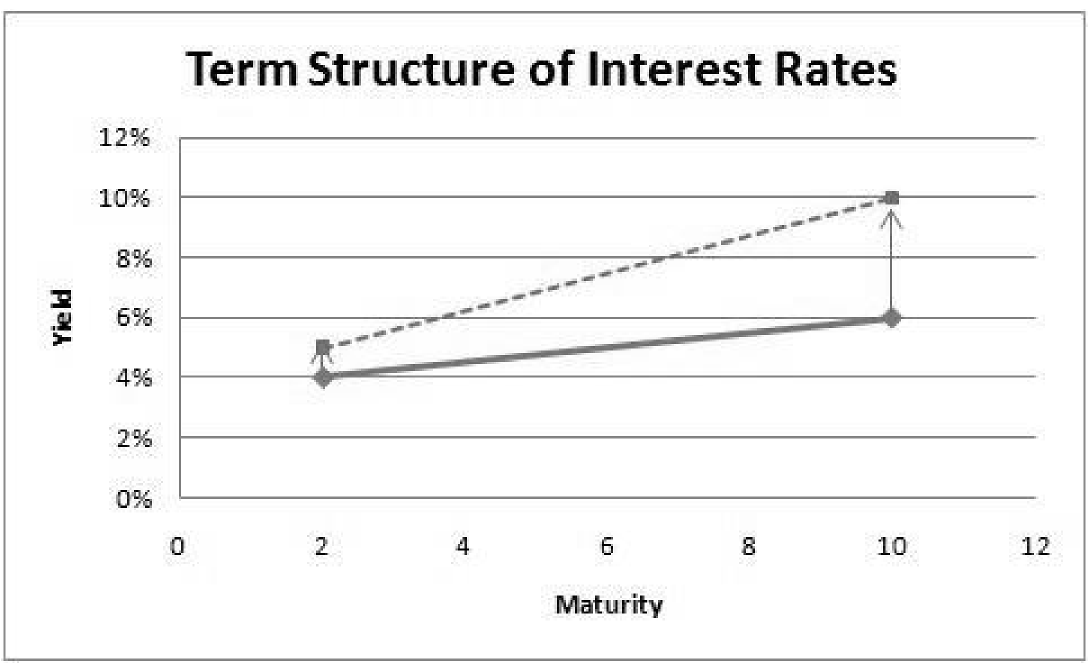
# Yield-Curve Steepener Trade

- Generally, trading on interest rates requires the following steps:
    1. Identify your views.
    2. Calculate measures of interest rate exposure (duration and/or convexity).
    3. Determine the correct portfolio to hedge against certain types of interest rate exposures.
    4. Test the trading strategy using scenario analyses.

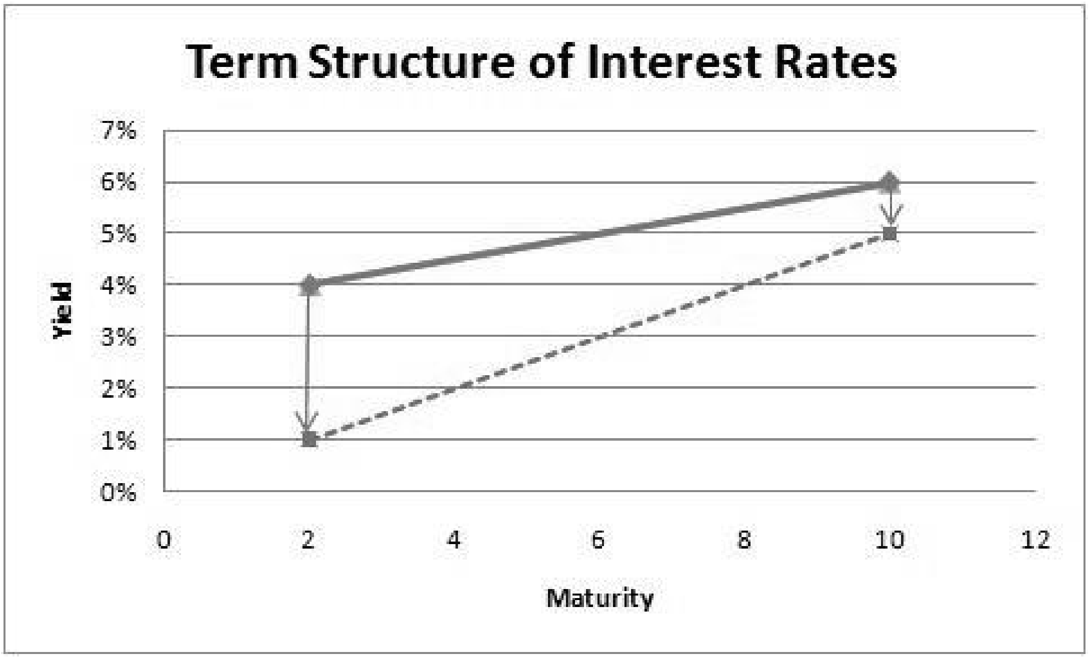
- In a **Steepener** trade, we take a view about future movements in relative interest rates.
- Let's consider an example:
    - Suppose that the yield on a 2-year bond is 4% and the yield on a 10-year bond is 6%. (both zero coupon bonds; annually compounded yields).
    - Suppose also that we believe that the yield on the 10-year bond will increase relative to the yield on the 2-year bond.
    - We are not sure whether the overall level of yields will go up or down



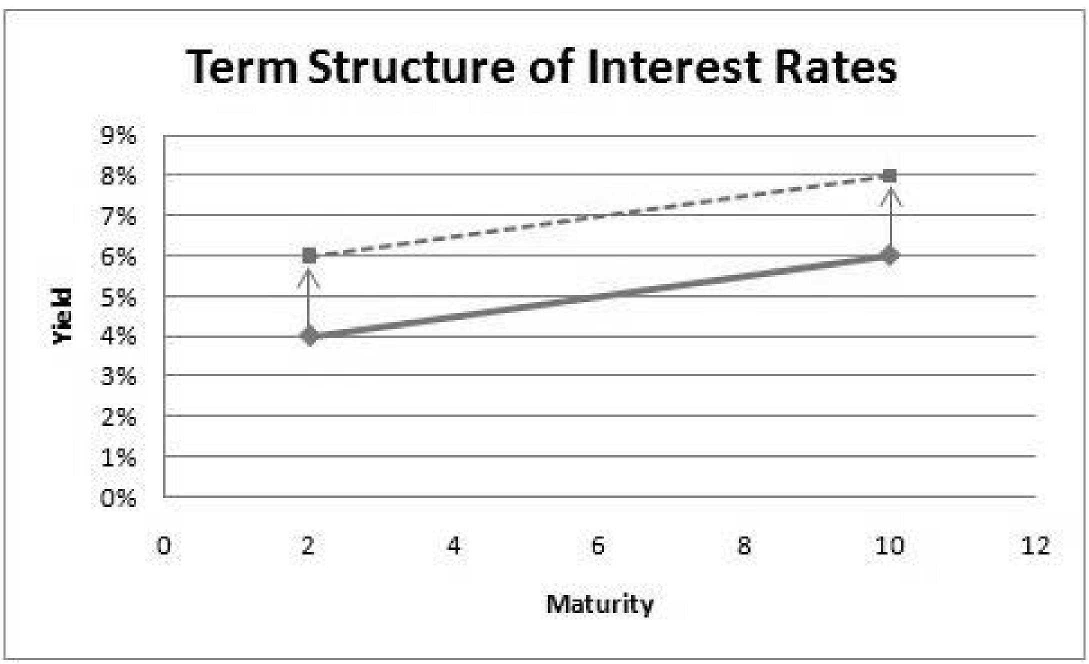

- Intuition:
    - 10-yr yield ↑ ⇒ Price ↓
    - 2-yr yield ↓⇒ Price ↑
    - Suggests that we want to long the 2-year and short the 10-yr bond.



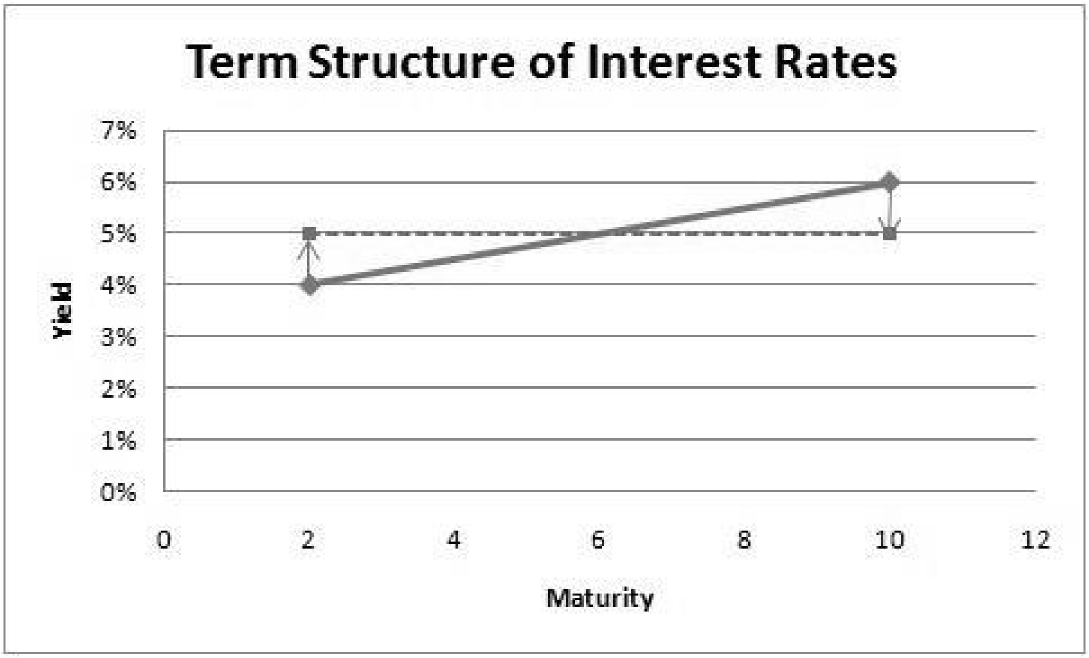
- In this scenario, both yields go up, but the 10-yr yield goes up by more.
- The yield curve becomes steeper.




- In this scenario, both yields go down, but the 2-yr goes down more.
- Yield curve becomes steeper.




- In this scenario, yields move in parallel.
- Same steepness.




- In this scenario, the yield curve becomes flatter.
- This is the opposite of the view we are taking in a steepener trade.
- If this were to happen, we should expect to lose money.

- We think the yield curve will get steeper.
  - Thus, we want to **buy** the 2-year bond and **short** the 10-year bond.
- Question: But in what proportion?
  - We want our exposure to the level of interest rates to roughly be zero.
  - If the 2-year rate and the 10-year rate change by the same amount, we want our portfolio value to remain close to constant.

- To illustrate the issue, consider the plots above.
- The 2-year spot rate is 4% and the 10-year spot rate is 10%.
- A $1000 par value of the 10-year bond is worth

$$P_{10} = \frac{1000}{1.06^{10}} = 558.39$$

- The Modified duration of a 10-year zero-coupon bond is

$$MD_{10} = \frac{10}{1.06} = 9.434$$

- The Modified duration of a 2-year zero-coupon bond is

$$MD_2 = \frac{2}{1.04} = 1.923$$

- To set up the trade, consider a long position in the 2-year zero-coupon bond of $**x** and a short position in the 10-year zero-coupon bond of $558.39 ($1000 face value):

| **Assets** | **Liabilities** |
|---|---|
| $x in 2-year | $558.39 in 10-year |
| $MD_2$ = 1.923 | $MD_{10}$ = 9.434 |
| If yield changes by Δy: | If yield changes by Δy: |
| $\Delta B_2/B_2$ ≈ -1.923 Δy | $\Delta B_{10}/B_{10}$ ≈ -9.434 Δy |
| $\Delta B_2$ = x(-1.923) | $\Delta B_{10}$ = (558.39)(-9.434) |

- Thus, $x = 2739.295$
  - Note, this corresponds to $2962.82$ in face value of the 2-year bond (since $2962.82 = 2739.295 \times 1.04^2$).

- Overall position value is: 2180.9
  - Assets minus Liabilities = 2739.295 - 558.39 = 2180.90

- Next, let's see how well we have done in hedging *level changes*:

- If $y_2 \to 6\%$ and $y_{10} \to 8\%$ (both yields increase by 2%), then the portfolio is worth $2173.71$.
  - Calculation: $2962.82/1.06^2 - 1000/1.08^{10} = 2173.71$

- If $y_2 \to 2\%$ and $y_{10} \to 4\%$ (both yields decrease by 2%), then the portfolio is worth $2172.21$.
  - Calculation: $2962.82/1.02^2 - 1000/1.04^{10} = 2172.21$

- What if the yield curve *steepens*?

- If $y_2 \to 4\%$ and $y_{10} \to 8\%$, then the portfolio is worth $2276.10$.
- Calculation: $2962.82/1.04^2 - 1000/1.08^{10} = 2276.10$

- This is roughly a gain of $95.20 (2276.10 - 2180.90)

- Take-away
  - We can use modified durations to make our portfolio (close to) insensitive to level changes.
  - This allows us to bet on relative yields.
  - In many ways, this is like a long-short equity strategy.
    - *Intuitively*: Buy what we think is (relatively) too cheap. Short what we think is (relatively) too expensive. Buy in the right proportion to be "market-neutral."

# On-the-run/off-the-run Treasury Trade

- One popular trade is based on on-the-run versus off-the-run US Treasury bonds.
- On-the-run Treasuries are the most recently issued US Treasuries.
- Off-the-run Treasuries are all of the other Treasuries and tend to have low prices (high yields) relative to on-the-run Treasuries.
- Buy off-the-run Treasuries and short on-the-run Treasuries.
- **Caution**: This trade is not an arbitrage in an academic (free money) sense.

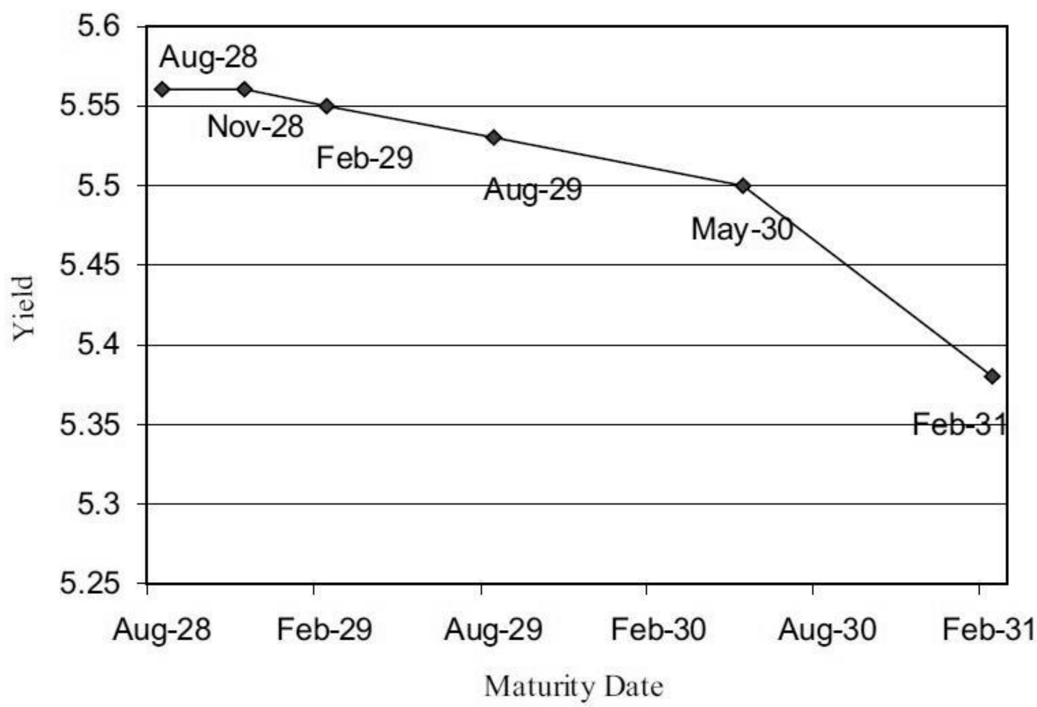



Fig. 1. The yield curve for the 30-year bond sector as of February 9, 2001.

- Note the difference in yields between the May-30 (29.25yr) and Feb-31 (30yr) bonds.
    - Source: Krishnamurthy (2001)

- The basic idea is that these long maturity bonds are not very different from each other, so their yields should not be very different.
- Note the difference in yields between the May-30 (29.25yr) and Feb-31 (30yr) bond.
- One might expect that the yield at the very right will go up a little

- Long-Term Capital Management (LTCM)
    - "One of the fund's main strategies was to exploit tiny differences between the price of a newly issued ("on the run") 30-year American Treasury bond, and a similar one issued previously ("off the run"). There is little economic reason for these bonds to have different yields. Yet off-the-run Treasuries often trade slightly cheaper than on-the-run ones. LTCM bet that their yields would converge by buying off-the-run Treasuries and selling their on-the-run counterparts short." (*Economist, October 17, 1998*)

- To illustrate the intuition behind the on-the-run/off-the-run trade, let's make the simplifying assumption that we have zero-coupon bonds.

| Long (off-the-run) | Short (on-the-run) |
|---|---|
| x of 29.25yr bond | 1000 of 30yr bond |
| MD = 29.25 1.055 = 27.7251 | MD = 30 1.0538 = 28.4684 |
| ΔB/B ≈ -27.7251Δy | ΔB/B ≈ -28.4684Δy |

- $$-27.7251 \times x = -28.4684 \times (1000)$$
- $$\rightarrow x = 1026.81.$$
- Face values:
    - Off-the-run: $1026.81 \times (1.055)^{29.25} = 4916.14$
    - On-the-run: $1000 \times (1.0538)^{30} = 4816.66$
- Portfolio value: $1026.81 - 1000 = 26.81$

| Long (Assets) | Short (Liabilities) |
|---|---|
| Off-the-run (29.25yr) bond | On-the-run (30yr) bond |
| 4916.14 in face value | 4816.66 in face value |
| 1026.81 in market value | 1000 in market value |

- Suppose that we wait nine months and the yield of the on-the-run bond goes up to 5.47% while the yield of the off-the-run bond stays at 5.5%.
- Then, the new portfolio value is:

$$\frac{4916.14}{1.055^{28.5}} - \frac{4816.66}{1.0547^{29.25}} = 54.45.$$

# Wrap-Up

Outline

- [x] Yield-Curve Steepender Trade
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