Rates

STG SS25 Meeting 9

Agenda

- Announcements
- Market Update
- Open Discussion
- Rates
- Q&A

Follow us on social!

- Club Announcements!
- Economic news!
- Previous meeting slides!
- Club updates
- Don't miss out!

Trading Competition

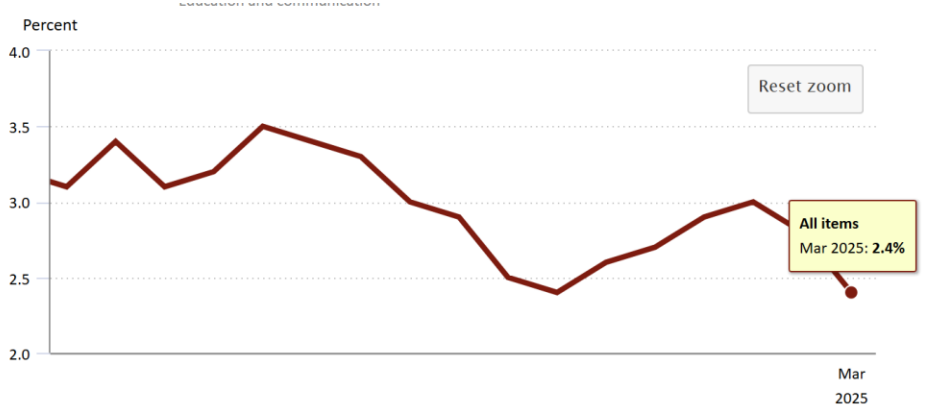
- Showcase your skills
- Compete against your peers
- Starts 01/30, ends 04/17
- **This will not require any capital on your end!**

MarketWatch

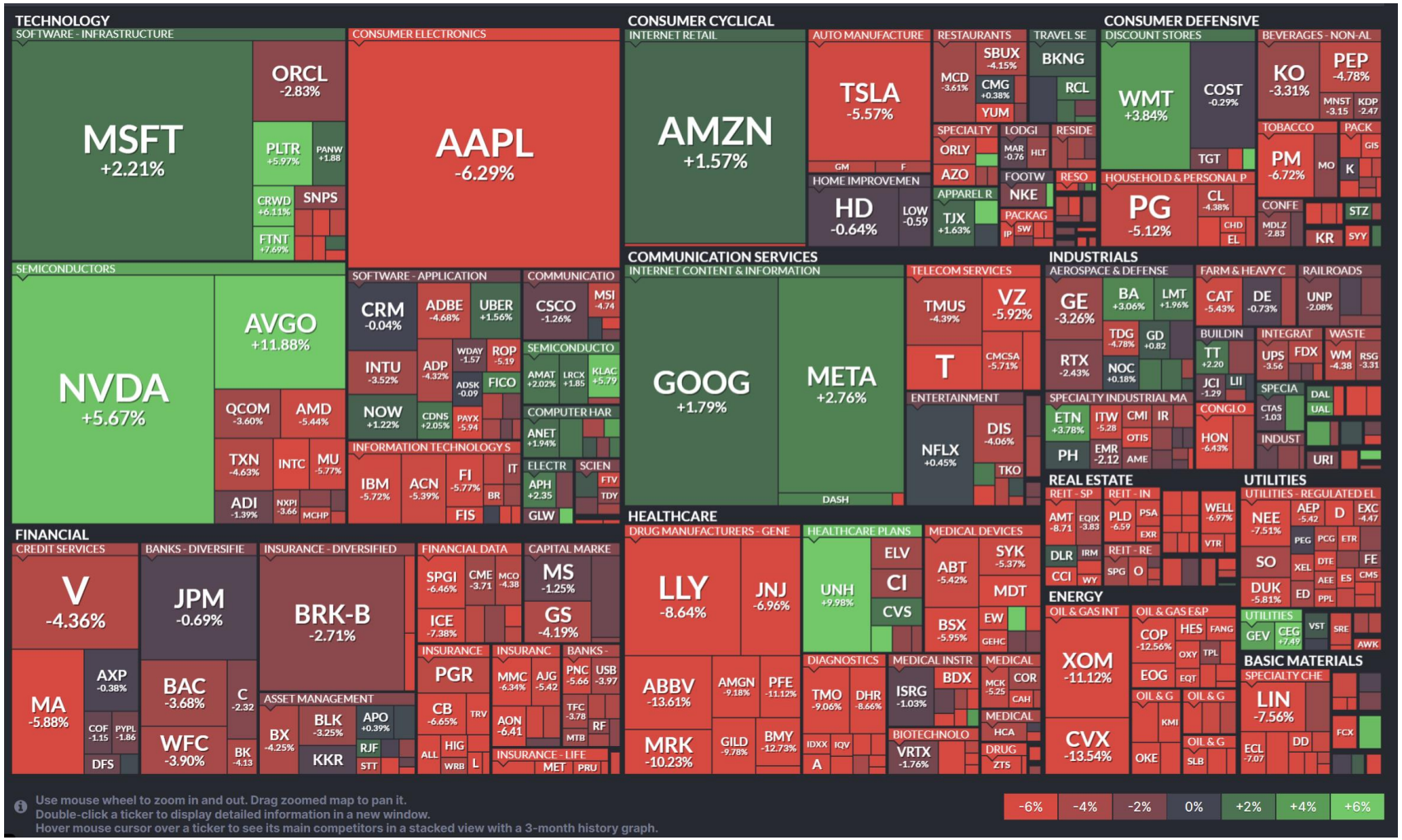
Market Update

- S&P 500: 5,268.05 (+3.82%)
- NASDAQ: 16,387.31 (+5.13%)
- DOW Jones: 395.68 (+3.25%)
- Crude Oil: $60.28 (-2.75%)
- Gold: $3173.98 (+4.50%)
- 10-Year Yield: 4.42%

- Additional data:
- Core CPI (YoY):
  - Previous: 2.8%
  - Forecast: 3.0% (+0.1%)
  - Actual: 2.4% (-0.2%)



Sector Update



Open Discussion

- Recent Trades
- Economic Talking Points
- Noticeable Assets/trends

US RATES

US Treasuries

- Current size of UST market; $28.6 trillion
- Biggest owner of US treasuries; The Federal Reserve (7 Trillion), Japan (1.1 Trillion), and China (800-900 Billion)
- What is a bond ? What is a callable bond ?
- For Treasuries, cash flows are fully defined by face value, coupon, and maturity date

Purchasing a Treasury Bond

- Pay cash upfront
- Borrow money from repo market (levered purchase)
- What is repo?

Measuring Risks in a Bond

- Duration

– Duration measures the bond's price sensitivity to changes in interest rates

– Mathematically: $dP/dY = - D * P$

- Convexity

– Convexity measures how the duration of a bond changes as interest rates change (rate of change)

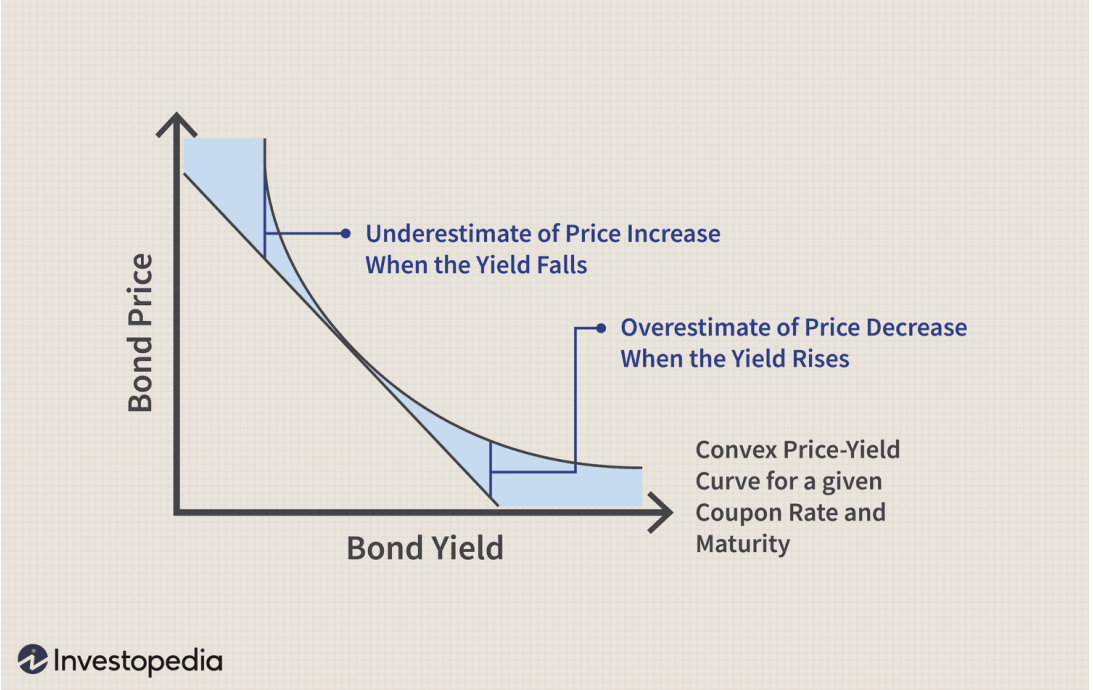
– Mathematically: $d^2P/dY^2 = C * P$

More about convexity

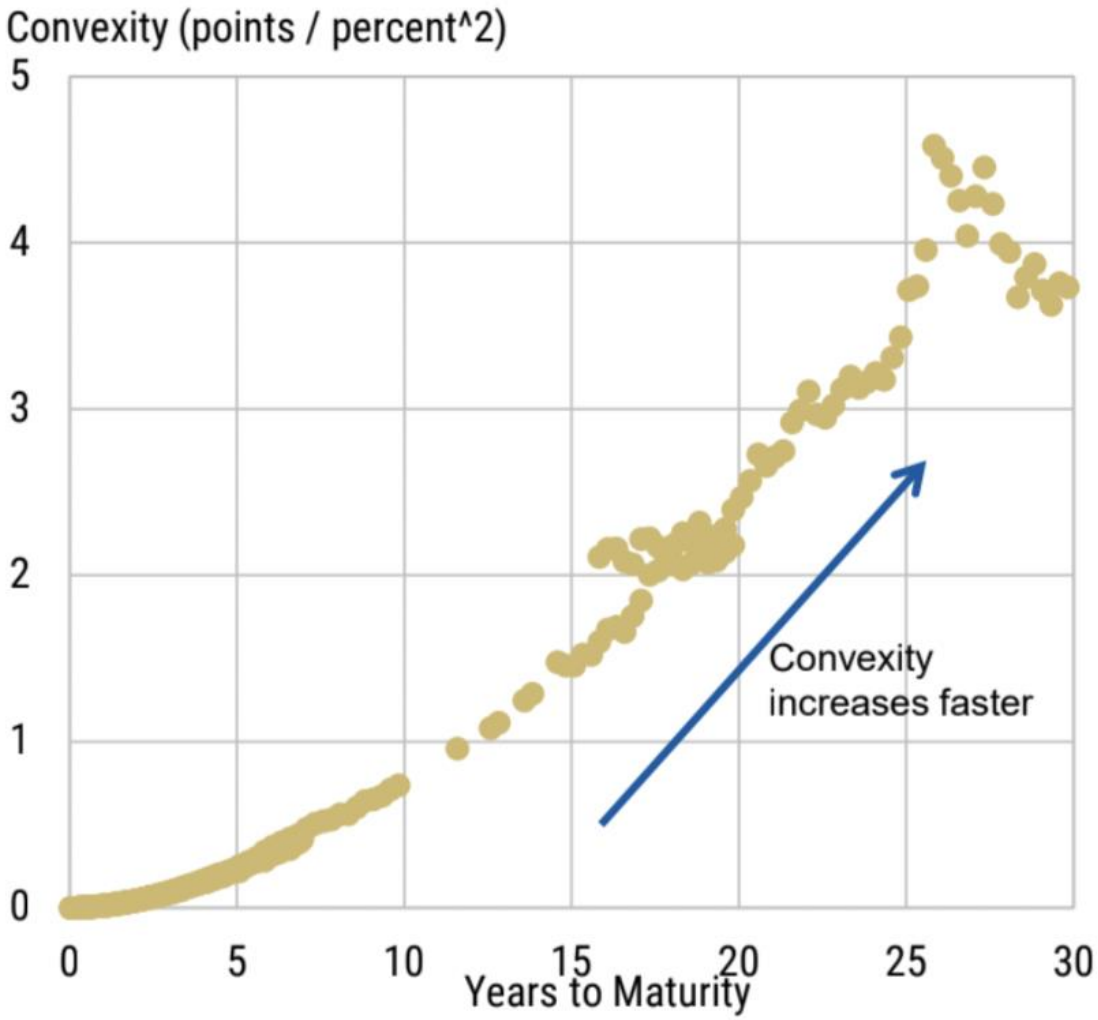
1. The relationship between bond prices and yields is not linear

2. Positive convexity in a bond is a desirable property

3. Higher duration bonds have a higher convexity



Convexity Values Across The Yield Curve



Forwards, Rolldown, Carry, and Convexity

Bond forwards

- *Simple fundamental idea:* To profit from a long-duration trade, the bond must outperform the forward

- *Forwards price: T*oday's price + the cost (or benefit) of holding the asset until the forward date

Price of the Forward

$$F = P + rtP - ct$$

Borrowing rate

Carry rate

P = today's price

F = forward price

r = financing rate

t = time till the forward contract

c = cost of carry

This formula is what you'll pay to acquire a bond in future. If you already hold bond, tells you what you'll receive later

The forward price is the market's price to buy the bond in the future.

Rolldown, Carry, and PNL

The PNL at the end of a trade is roughly:

PNL ≈ carry + mark-to-market

- Mark-to-market is the market price (PV) of the future cash flows
- Carry is the cost or benefit of holding the asset

Calculating PNL from Realized Forward Price

$$PNL = F_{realized} - F_{purchase}$$

$$PNL = F_{realized} - (P_{spot} + rtP - c)$$

$$PNL = \underbrace{(c - rtP)}_{\text{Carry}} - \underbrace{(P_{spot} - F_{realized})}_{\text{Mark to market}}$$

PNL in Yield Terms

$$PNL_{\$} = (\mathrm{c} - rtP) - (P_{spot} - F_{realized})$$

Carry

Mark to market

$$PNL_{bp} = (\mathrm{Y_{fwd}} - \mathrm{Y_{spot}}) - (Y_{fwd-rlzed} - Y_{spot})$$

When the forward realized yield in the equation is the same as the spot rolled down yield, the mark-to-market term equals rolldown

Rolldown: when a bond's price change as it moves closer to maturity date

Rolldown explanation

- At horizon (e.g., 3m into a 10y bond), the remaining instrument is a 9y9m bond

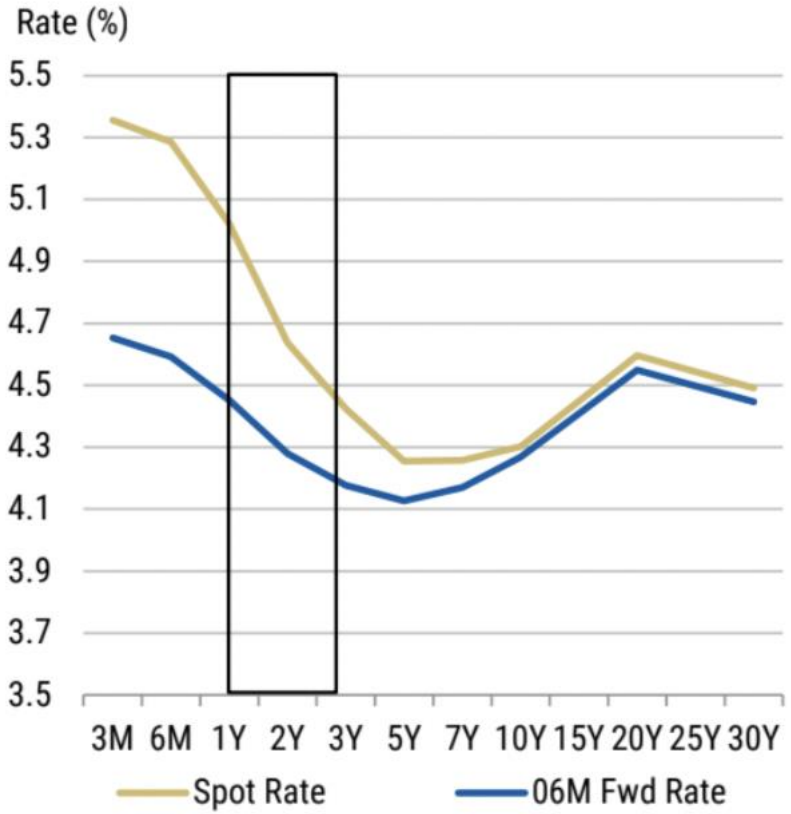
- In an unchanged yield curve, the mark-to-market will be represented by the rolled-down rate. We expect to make:

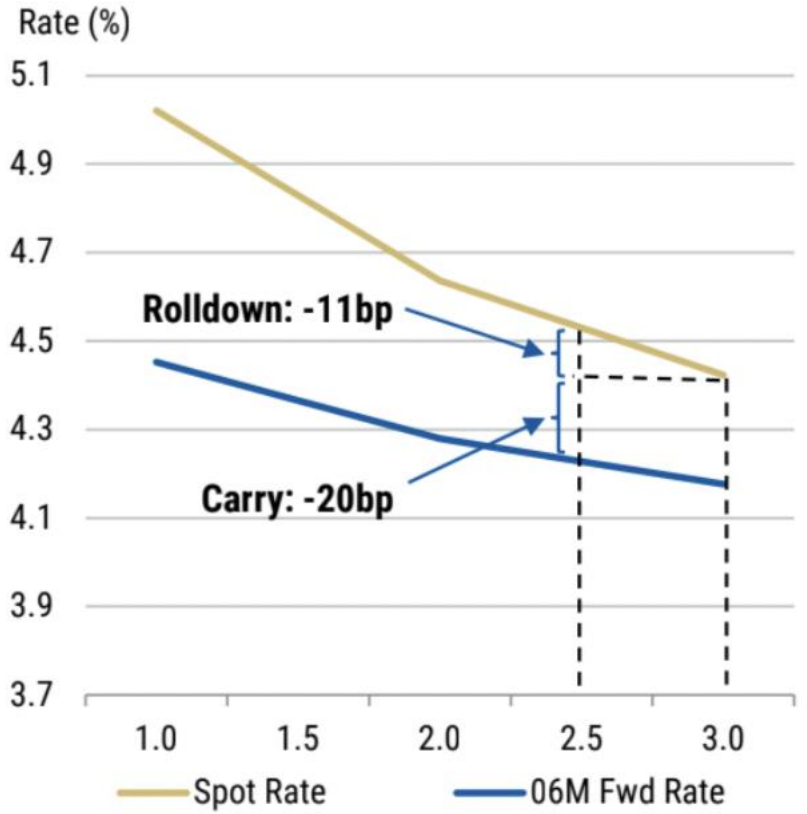
$$\text{Rolldown} = Y10 - Y9.75$$

- In a positively sloped yield curve, the rolled-down rate is lower than the spot rate

- A bond that exhibits higher convexity generally exhibits lower rolldown

Rolldown and Carry: Graphical Summary





Macro Trades: Curves, Butterflies, and PCA

Curve Trading

- You bet on the shape of the curve and erase the directionality of your trade
- You can win even if rates go up or down, as long as the spread moves your way
- Curve trades are usually DV01-neutral
- Play steepening or flattening

Curve Trades Example

If we think 2s10s curve will flatten, we want to make $50k for every bp it flattens

- 10y DV01 is 7.97 (dollars per bp) for every $10,000

Notional = 50,000/DV01 ≈ $62.7mn 10y bonds to buy

- 2y DV01 is 1.86 (dollars per bp) for every $10,000

Sell 7.97/1.86 = 4.28 more 2y bonds than 10s bought

4.28 * 62.7 mn = 268.7mn

Therefore, we need to sell $268.7mn 2y bonds, buy 62.7mn 10y

Butterfly

Just like a curve trade, we need to weight the legs by the DV01

DV01=Bond Price×Duration×0.0001

– *Butterfly:* For every $100m we short on 5s (=4.44), we buy $50m * 4.44 / 7.97 = $27.85m 10s and buy $50m * 4.44 / 1.86 = $119.35m 2s

Treasury Rate	DV01
2y	1.86
5y	4.44
10y	7.97

Principal Component Analysis

- Used to simplify complex data structures
- PC 1 = Level of interest rates, PC 2 = slope , PC 3 = curve
- If PCA analysis reveals that the slope (PC2) of the yield curve is likely to steepen, the investor might take a long position in short-term bonds and a short position in long-term bonds
- The butterfly trade may then be weighted more heavily on the positions that are sensitive to changes in the slope, based on the PCA results

Calculating PC factors

$$\begin{pmatrix} r_1 \\ r_2 \\ \dots \\ r_{15} \\ r_{20} \\ r_{30} \end{pmatrix} = \alpha_1 \begin{pmatrix} v_{1,1} \\ r_{1,2} \\ \dots \\ v_{1,5} \\ v_{1,20} \\ v_{1,30} \end{pmatrix} + \alpha_2 \begin{pmatrix} v_{2,1} \\ r_{2,2} \\ \dots \\ v_{2,5} \\ v_{2,20} \\ v_{2,30} \end{pmatrix} + \dots$$

Q/A and Thanks for coming!

MSU STG STUDENT TRADING GROUP