Module 11 : Yield Curve Strategies

11.1 : YC Dynamics, Trades for a static YC

Active mgt requires a view of how YC will change over time.

YC plots yield of a certain type of FI security as a function of maturity.

3 Sources of YC Changes:
1) Level (i.e. parallel shift)
2) Slope (i.e. steepening / flattening)
3) Curvature (a "butterfly movement")

butterfly spread = − short-term yield + 2 × med-term yield − long-term yield

Recall 5-step FI return decomposition:
1. Coupon Income = annual cpn amt / current bond price
2. Rolldown return = (projected bond price assuming no YC chg) ÷ begining BP − 1
3. Price chg. due to investor Yield chg. prediction :
   $(-MD \times \Delta Y) + \frac{1}{2} C \cdot \Delta Y^2$
4. Price chg. due to investor spread chg. prediction :
   $(-MD \times \Delta S) + \frac{1}{2} C \cdot \Delta S^2$
5. Currency G/L.

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Impact of chg in YC Curve (ΔY) in Step 3 & key facts regarding durations & convexity:

- bond w/ higher convexity will outperform bond w/ lower convexity during times of high int. rate volatility (leading to bonds w/ higher convexity @ a premium & subsequently lower YTM)

- higher dispersion of CF in time around the bond's modified duration <=> higher convexity

EXAMPLE: Barbell vs. bullet

Consider the following hypothetical U.K. government bonds:

Maturity	Coupon	Modified Duration	Convexity
2y	2.25%	1.86	5.2
10y	0.25%	9.52	104.8
20y	1.25%	16.23	292.8

Portfolio 1 is a bullet portfolio with 100% weight in the 10-year bond. Portfolio 2 is a barbell portfolio with 46.68% weight in the 2-year bond and 53.32% weight in the 20-year bond.

Calculate the change in values of Portfolios 1 and 2 if the yield curve undergoes a parallel shift up of 50 basis points.

2-yr $= -0.50\% \cdot 1.86 + \frac{1}{2} (-0.50\%)^2 \cdot 5.2 = -0.0092$

10-yr $= -0.50\% \cdot 9.52 + \frac{1}{2} (-0.50\%)^2 \cdot 104.8 = -0.0463$

20-yr $= -0.50\% \cdot 16.23 + \frac{1}{2} (-0.50\%)^2 \cdot 292.8 = -0.0775$

Portfolio 1 $= 100\% \cdot -0.0463 = -0.0463$

Portfolio 2 $=$ 46.68% 2-yr + 53.32% 20-yr

$= 0.4668 (-0.92\%) + .5322 (-.0775)$

$= -4.56\%$

Static YC.

Cash-based static YC strategies include:

1. Buy-and-hold

2. Rolling down the YC.

3. Repo Carry trade

Derivative-based static YC strategies include:

1. Long futures positions

2. Receive-fixed swaps.

EXAMPLE: Extending duration (bond vs. swap)

An active manager has the view that the yield curve will remain static over the next six months. They are considering two different trades to exploit this view by extending the duration of the portfolio.

Trade A: Purchase a 10-year 3% semiannual coupon U.K. Treasury bond currently yielding 2.5%, priced at 104.3998.

Trade B: Enter a 10-year semiannual receive-fixed swap at 3%. Current floating MRR is 0.5%.

For a six-month horizon, a £50 million par value position, and a 25 bps fall in both Treasury yields and swap rates, **calculate**:

1. The coupon income and price appreciation for Trade A. Break the price appreciation down into rolldown and the change in price due to the change in rates.
2. The swap carry and MTM gain/loss on the swap.

1. Cpn Income on Trade A = 3% ÷ 2 × 50 MM = 750,000

Price in 6 months: 19 N, 2.25 ÷ 2 = 1.125 I/Y,
3/2 = 1.5 PMT, 100 FV. = PV 106.3828

Price Appreciation = (106.3828 − 104.3998) × 50 MM / 100
= 991,500

Rolldown part of price appreciation =
19 N, 2.5 ÷ 2 = 1.25 I/Y, 3/2 = 1.5 PMT, PV 104.2048
⇒ (104.2048 − 104.3998) ÷ 100 × 50 MM = −97,500

Yield change part of price appreciation
= (106.3828 − 104.2048) ÷ 100 × 50 MM = 1,089,000

2. Swap Carry = fixed leg income - floating-leg outflow
= [(0.03 - 0.005) / 2] × 50MM
= 625,000

Swap carry in 6-month :
the fixed leg = 19 N, 2.75 ÷ 2 = 1.375 I/Y, 0.03 ÷ 2 = 0.015 PMT,
1 FV ⇒ PV 1.02077

the floating leg (can be viewed as FRN) = 50,000,000
total MTM gain/loss = 1.02077 × 50 MM - 50 MM
= 1,038,817

MODULE QUIZ 11.1

1. Portfolio A is a bullet portfolio, Portfolio B is a barbell portfolio, and both are invested in risk-free government securities with the same portfolio modified duration. Under which of the following yield curve changes will Portfolio B outperform Portfolio A?
   A. A downward shift in yields only.
   B. An upward shift in yields only.
   C. Both a downward and an upward shift in yields.
2. A manager that expects a stable yield curve environment is likely to consider which of the following trades to profit from this view?
   A. Receive-fixed swap.
   B. Pay-fixed swap.
   C. Reverse repo carry trade.
3. Which of the following yield curve scenarios is the major risk to a manager engaging in a buy-and-hold strategy?
   A. A parallel shift up in yields.
   B. An inversion from a normal upward-sloping yield curve to a downward-sloping yield curve due to falling long-term rates.
   C. Yield curve remains unchanged.

1. C
2. C
3. A

Trades for a dynamic YC

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Terminology: View that rates will fall $\Leftrightarrow$ bullish view

View that rates will rise $\Leftrightarrow$ bearish view

Strategy	Increase Duration	Decrease Duration
Cash Bond	Overweight Longer-dated bonds	Short shell bonds / Overweight shorter-dated bonds
Swap	Receive fixed	Pay - fixed
Futures	Long Contract	Short Contract

3 hypothetical bonds:

Maturity	Cpn	Mod. Duration	Convexity
2y	2.25%	1.86	5.2
10y	0.25%	9.52	104.8
20y	1.25%	16.23	292.8

a BM of equal weighted portfolio will have:

duration $= (1.86 + 9.52 + 16.23)/3 = 9.203$

Convexity $= (5.2 + 104.8 + 292.8)/3 = 134.3$

if expecting rate to rise,

shifting to 50% 2y, 25% 10y & 20y will have

duration $= 7.368$

convexity $= 102.0$

if the view is right & rate rises by 40bps,

price chg on BM $= 0.40\% \cdot (-9.203) + \frac{1}{2} \cdot .40\%^2 \cdot 134.3$

$= -3.57\%$

price chg on Port $= 0.40\% \cdot (-7.368) + \frac{1}{2} \cdot .40\%^2 \cdot 102$
$= -2.87\%$

Can also achieve the same outcome w/ swaps:
- combine BM port w/ a pay-fixed swap w/ modified duration of −8.354.

Assuming Manager has 100MM:
BPV of BM $= 100MM \cdot 0.01\% \cdot 9.203 = 92{,}030$

Target portfolio BPV $= 100MM \cdot 7.368 \cdot 0.01\%$
$= 73{,}680$

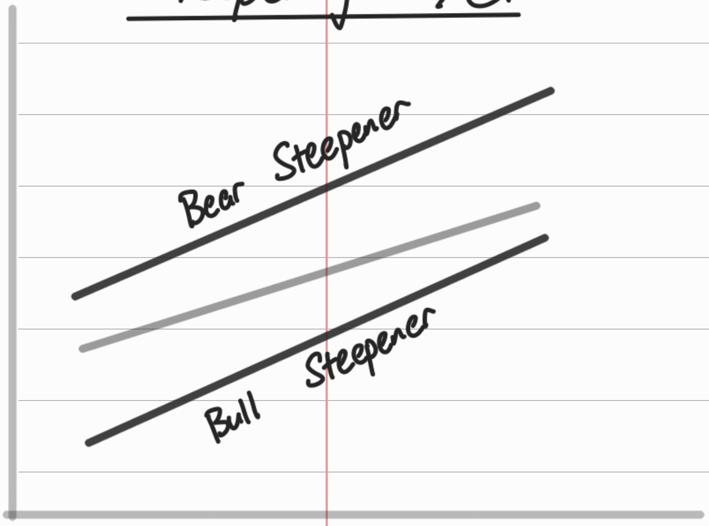
Pay swap must have the BPV $= 73{,}680 - 92{,}030$
$= -18{,}350$

$-8.354 \cdot NP \cdot 0.0001 = -18{,}350$
$NP = 21.98\ MM$

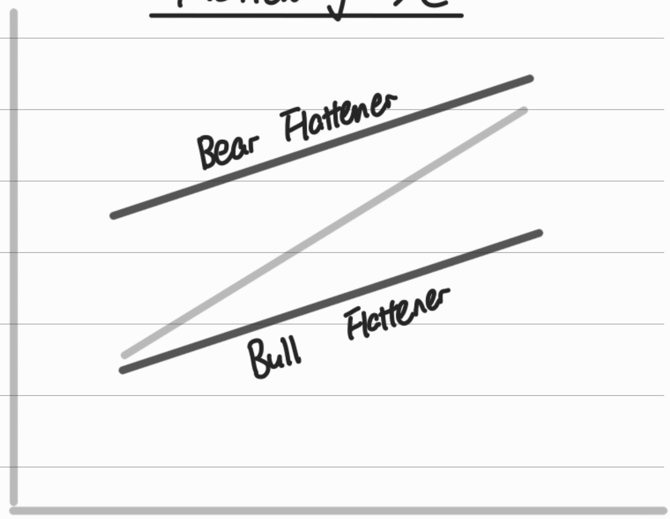
Divergent YC Slope View

if expecting a chg. in the shape of the YC, should buy bonds w/ rates that expect to fall relative to the rest of the curve & short bonds w/ rates that expect to rise relative to the rest of the curve

Steepening YC.



Flattening YC



EXAMPLE: Bull steepening

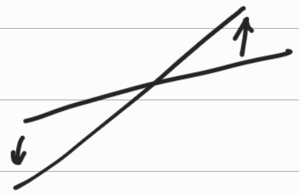
A portfolio manager expects the yield curve to steepen and has collated the following information on government bonds:

Maturity	Coupon	Modified Duration	Convexity
2y	2.25%	1.86	5.2
10y	0.25%	9.52	104.8

The manager wishes to take a long position with market value of £100 million and an appropriately sized short position in order to take advantage of their view. They currently do not expect a change in the general level of rates.

1. **Describe** the trades the manager should make to profit from their view.
2. **Calculate** the total profit or loss of the portfolio if there is an immediate 20 bps decline in 2-year yields and 20 bp rise in 10-year yields.
3. **Discuss** how the manager would adjust the portfolio positions should they subsequently decide the yield curve will undergo a bull steepener (no calculations required).

Steepens ⇒



ST rate drops,
LT rate rises.
short LT, long ST ?!

⇒ long 100MM 2y

$BPV(2y) = 100MM \cdot 1.86 \cdot 0.01\%$
$= 18,600$

Since there's no expected chg. in level of yield,
⇒ keep it duration - neutral & target $BPV(10y) = -18,600$

$-18,600 = 9.52 \cdot MV \cdot 0.01\%$
$MV = -19,537,815$

2. Price chg (2y) $= 0.20\% \cdot 1.86 + (0.20\%)^2 \cdot \frac{1}{2} \cdot 5.2$
$= 0.3704\%$

Price chg (10y) $= 0.20\% \cdot 9.52 + (0.20\%)^2 \cdot \frac{1}{2} \cdot 104.8$
$= -1.883\%$

Total P/L $= 0.3704\% \cdot 100MM + (-19{,}537{,}815) \cdot (-1.883\%)$
$= 740{,}937.$

3. Bull Steepener ⟺ Add duration
by either : adding more long on the 2y
or shorting less on the 10y.

Divergent YC Shape View – Chg. in Curvature.

butterfly spread = – short-term yield + 2 × med-term yield
– long-term yield

↑ in butterfly spread = med. yield are rising
(relative to short & long term yield)
⇒ curvature is increasing
(aka a NEGATIVE butterfly TWIST)

Negative butterfly view ⟺ increase in curvature.

Butterfly strategies are constructed to be DURATION (not convexity) neutral

EXAMPLE: Butterfly strategy

Recall the following three hypothetical U.K. bonds:

Maturity	Coupon	Modified Duration	Convexity
2y	2.25%	1.86	5.2
10y	0.25%	9.52	104.8
20y	1.25%	16.23	292.8

A manager wishes to construct a portfolio to profit from a positive butterfly view. They wish to set the total market value of any long position in the portfolio to £100 million, and they wish the wings of the trade to be of equal market value.

1. **Explain** how a manager should construct a duration neutral portfolio. **Show** your calculations.
2. **Calculate** the profit on the portfolio if 2- and 20-year yields rise by 10 bps and the 10-year yield falls by 25 bps.
3. **Discuss** the convexity exposure of the resulting portfolio and the impact on portfolio performance, should the manager's view be correct (note that no calculations are required for this part).

Positive butterfly view $\Leftrightarrow$ short & long term rates will rise

1. long 10y, short 2y & 20y.

$BPV(10y) = 100MM \cdot 9.52 \cdot 0.01\%$
$= 95{,}200$

$MV_w \cdot 0.01\% \cdot 1.86 + MV_w \cdot 0.01\% \cdot 16.23 = -95{,}200$
$MV_w = -52\,625{,}760$

2. use Step 3.

price chg $= (-1.86 \cdot 0.001) + (\frac{1}{2} \cdot 5.2 \cdot 0.001^2)$
$= -0.001857$

resulting p/L $= -0.001857 \times -52{,}625{,}760$
$= £97{,}747$

price chg. (10-yr bond)
$= (-9.52 \cdot -0.0025) + (\frac{1}{2} \cdot 104.8 \cdot -0.0025^2)$
$= 2.41275\%$

resulting P/L $= 2.41275\% \cdot 100{,}000{,}000$
$= £2{,}412{,}750$

price chg (20-yr bond)
$= (-16.23 \cdot 0.001) + (\frac{1}{2} \cdot 292.8 \cdot 0.001^2)$
$= -1.60836\%$

3. Short a high convexity port, long a low convexity portfolio. the long leg will lose performance when the yield move.

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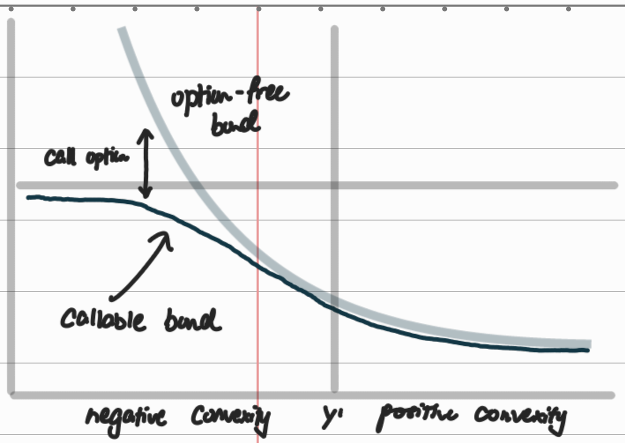
MODULE QUIZ 11.2

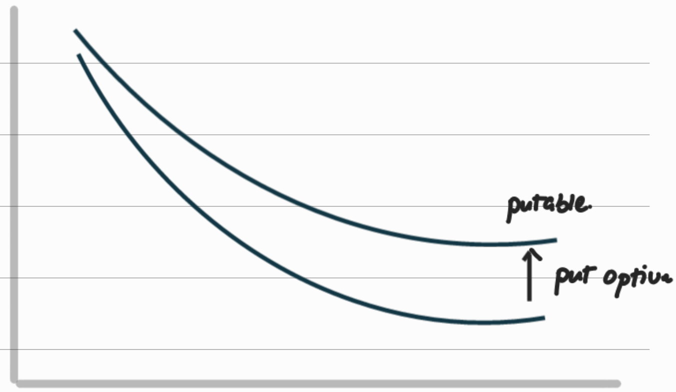
1. Which of the following trades is *most likely* to be executed by a manager that expects a downward shift in yields?
   A. Enter a pay-floating swap.
   B. Enter a receive-floating swap.
   C. A short futures position.
2. A manager positions their portfolio to have a negative overall duration with long positions in short-term bonds and short positions in long-term bonds. Which of the following yield curve changes is the manager *most likely* anticipating?
   A. Bear flattener.
   B. Bear steepener.
   C. Bull flattener.
3. A manager who buys the wings and sells the body in a butterfly trade is *most likely* expecting:
   A. a decrease in curvature.
   B. the butterfly spread to decrease.
   C. a negative butterfly twist.

1. A
2. B
3. A

YC Volatility Strategies, Key rate duration

Callable bond gives the issuer to buy back the bond from the investor.
(i.e. = an option-free bond & a SHORT-CALL)
more valuable as the yields fall & NEGATIVE CONVEXITY (price will rise @ slower pace b/c of the increase in value of the option)





putable bond grants investor the right to sell the bond back to the issuer

Bonds w/ embedded options should be analyzed using **EFFECTIVE DURATION**

$$\text{effective duration} = \frac{PV_- - PV_+}{2(\Delta \text{curve})\, PV_0}$$

$$\text{effective convexity} = \frac{PV_- + PV_+ - 2PV_0}{(\Delta \text{curve})^2\, PV_0}$$

Option will **ALWAYS LOWER THE DURATION** of otherwise option-free bond. the short call or long put option move **INVERSELY** to the underlying bond. (i.e. when the bond price falls, the option value rises).

Summary

	Duration
Long call on bond price / bond futures price	↑
Long put on bond price / bond futures price	↓
Long payer swaption	↓
Long receiver swaption	↑

Key Rate Duration

$$\text{Key Rate Dur} = -\frac{\text{chg in port val.}}{\text{port val} \times \text{chg. in key rate}}$$

when dealing w/ zero-cpn bonds,

Key Rate Dur = modified duration × weight

EXAMPLE: Key rate duration

An active fixed-income portfolio manager takes the following positions in the zero-coupon bonds displayed below:

Maturity	Annualized Yield	Position ($m)
2	2%	250
10	3%	–50
20	5%	100

The manager's benchmark is equally weighted across the three zero-coupon bonds.
1. **Calculate** the key rate durations and overall modified durations for both the manager and the benchmark.
2. **Determine** the most likely view of the manager on the next change in yield curve level, slope, and curvature.

1. modified duration = macaulay duration / (1 + YTM)

time to maturity for 0-cpn bond

mod. d (2Y) = 2 / 1+2% = 1.961.
mod. d (10Y) = 10 / 1+3% = 9.7087
mod. d (20y) = 20/ 1+5% = 19.0476
mod. d (port) = 2y Key-rate duration + 10y Key-rate duration + 20y Key-rate duration
= 1.961 × (250/300) + − 9.7087 × (50/300)
+ 19.0476 × (100/300)
= 6.365

mod. d (BM) = (1.961 + 9.7087 + 19.0476) ÷ 3
= 10.239

Maturity	Portfolio	BM	Active Diff.
2y	1.634	6.654	0.980
10y	-1.618	3.236	-4.854
20y	6.349	6.349	0
			- 3.874

2. View:

overall portfolio duration < 0 ⇒ the manager is bearish

slope perspective, ⊕ active exposure in short-term & 0 long-term exposure

⇒ expect ST to rise less than LT (i.e. curve is gonna STEEPEN)

med. rate rises, short rate & long rate drops.

increase in curvature, ⇒ NEG. BUTTERFLY VIEW

SUMMARY = Bearish Steepener, Neg. Butterfly view

MODULE QUIZ 11.3

1. Given otherwise similar bond characteristics, a manager who is expecting an upward shift in rates is *least likely* to invest in:
   A. a callable bond.
   B. a putable bond.
   C. an option-free bond.
2. Which of the following positions would *most likely* be established by a manager expecting a downward shift in yields?
   A. Short a receiver swaption.
   B. Long a payer swaption.
   C. Long a call option on bond futures contracts.
3. A manager has created active key rate durations of 3, −0.5, and −3 at the 10-year, 20-year, and 30-year maturities, respectively, using only derivatives to create the active exposures. Which of the following derivatives positions is the manager *most likely* using?
   A. Receive-fixed 10-year swap, short 20-year futures, and pay-fixed 30-year swap.
   B. Pay-fixed 10-year swap, short 20-year futures, and receive-fixed 30-year swap.
   C. Short 10-year futures, long 20-year futures, and receive-fixed 30-year swap.

1. A
2. C
3. -0.5 20-year ⇒ Short futures
   3 10-year ⇒ long pay-fixed
   B

Module 11.4: Active Management a/c. Currency, Evaluating YC Strategies

Unhedged Foreign Bond Position

$$R_{DC} = (1 + R_{FC})(1 + R_{FX}) - 1$$

EXAMPLE: Unhedged foreign bond investment

An Australian portfolio manager invests in a 2-year zero-coupon U.S. Treasury bond for one year. Details of the transaction are as follows:

- The U.S. bond is initially trading at a price of 96.374.
- The USD/AUD exchange rate was 0.90 at the start of the year and 0.80 at the end of the year.
- The U.S. bond ends the year at a price of 99.939.

Calculate the return of the investor in domestic currency terms.

$$R_{FC} = 99.939 / 96.374 - 1$$
$$= 3.70\%$$

0.90 USD / AUD → 0.80 USD / AUD

USD appreciates / ⊕ R_{FX}

$$R_{FX} = \frac{1}{0.80} \div \frac{1}{0.90} - 1$$
$$= 1.25 \div 1.11 - 1$$
$$= 12.5\%$$

$$R_{DC} = (1 + 12.5\%)(1 + 3.70\%) - 1 = 16.66\%$$

CIRP states that hedging a foreign curreny via. selling the foreign contract forward should not earn excess return:

$$\text{fwd rate} = \text{spot rate} \times \frac{(1 + r_{DC})^{T}}{(1 + r_{FC})^{T}}$$

Currency rate convention = DC / FC.

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EXAMPLE: The hedging decision

Following on from the previous example, assume the manager actually holds the U.S. bond for two years to its maturity when it redeems at par. Recall the following formation:

- The original price of the U.S. 2-year zero-coupon bond was 96.374.
- The original USD/AUD exchange rate was 0.90 at initiation of the trade.

An equivalent 2-year zero-coupon Australian government bond was yielding 5% at the initiation of the trade.

1. **Calculate** the fair 2-year forward rate.
2. **Demonstrate** that the manager would earn their domestic risk-free rate if they used this forward rate to hedge their USD foreign currency exposure. **Show** your work.

1. $0.90 \times \dfrac{(1+\text{yield})^2}{1.050^2}$

where $\text{yield} = (100 \div 96.374)^{1/2} - 1 = 1.864\%$

$= 0.90 \times \dfrac{(1+1.864\%)^2}{1.050^2}$

$= 1.1806$ AUD / USD.

2. ** MUST REMEMBER

BUY BOND @ 96.374 USD. / 107.0822 AUD.

RECEIVE BOND @ 100 USD

& sell USD @ 1.1806 AUD / USD = 118.06 AUD

return $= (118.06 / 107.08)^{1/2} - 1 = 5.0\%$

Note : AUD Yield > USD Yield

(By CIRP) => the higher-yielding AUD will be trading @ a FORWARD DISCOUNT & USD @ a FORWARD PREMIUM (think of higher value when USD is the quote/base currency)

UCIRP : high interest rate should depreciate over time & all unhedged investors earn the same return

UIRP tends not to hold & forward rate IS NOT AN UNBIASED predictor of future spot rate (aka. future rate bias)

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Hedging Foreign Coupon-Paying Bonds

- can achieve via a FIXED-FIXED cross-currency swap.

Assume USD/AUD is 0.80, hedge 100MM USD par of 10-year US T-bond

Position	@ Initiation	Periodic Payment (Semiannual)	@ the end
US T-bond	Pay out USD 100MM to purchase the bond	Receive-fixed USD bond	receive USD 100MM to purchase the bond
Fixed-Fixed Cross-Curr Swap.	Receive USD 100MM & pay 125 MM AUD in exchange	Pay-fixed USD, Receive-fixed AUD	Pay USD 100MM & receive 125 MM AUD in exchange
Net-flow	Pay AUD 125MM	Receive-fixed AUD	Pay AUD 125MM

Fixed-Fixed Cross-Curr Swap. is the combo of 3 SWAPS:

1. USD int rate swap. (USD paid fixed, USD receive floating)
2. AUD int. rate swap (AUD receive fixed, AUD paid floating)
3. Cross-currency basis swap.
   (Pay USD floating, receive AUD floating, exchange principal @ initiation & end)

How to get 3 right direction-wise:

Annualized %??

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EXAMPLE: INR carry trade

A manager is considering executing a carry trade with a 1-year horizon through borrowing U.S. dollars (USD) and investing in short-term Indian rupee (INR) securities. Details of the trade are as follows:

- The manager will borrow at the 1-year USD rate of 1%.
- The manager will roll 90-day INR securities, which currently offer a rate of 5% on an annualized basis.
- The current INR/USD spot rate is 70.

1. **Calculate** the approximate return from the carry trade if interest rates and exchange rates remain stable over the year.
2. **Calculate** the return from the carry trade based on if short-term 90-day INR rates evolve to be 5%, 6%, 4%, and 3% over the coming year, and the final INR exchange rate is 85.

Borrow USD, invest in INR

1.

Borrow 100 USD. & Get 7000 INR

earn $(1 + 5\%/4)^4 - 1 = 5.1\%$

cost of borrowing USD $= 1\%$

total P/L $= 5.1\% - 1\% = 4.1\%$

(w/ no chg. in FX rates)

2. Foreign return

$$= \left(1 + \frac{5\%}{4}\right) \times \left(1 + \frac{6\%}{4}\right) \times \left(1 + \frac{4\%}{4}\right) \times \left(1 + \frac{3\%}{4}\right)$$

$= 4.6\%$

cost of borrowing $= 1\%$

P/L on FX rate $= \left(\frac{1}{85} \div \frac{1}{70}\right) - 1 = -17.6\%$

Total P/L $= 4.1\% - 1\% - 17.6\% = -14.0\%$

Golden rule: extend duration?? → receive fixed swap.

A Framework for Evaluating YC Strategies

EXAMPLE: CAD bullet vs. barbell

A U.S.-based portfolio manager is considering investing in Canadian zero-coupon bonds. The manager collates the following information relating to the expected performance of a bullet portfolio relative to a barbell portfolio over the next year.

	Bullet	Barbell
Average bond price	96.75	97
Expected average price in 1 year assuming stable yield curve	98.75	98.95
Expected effective portfolio duration	4.89	4.92
Expected portfolio convexity	28.5	43
Expected change in CAD bond yields	0.25%	0.25%
Expected change in CAD versus USD	–0.50%	–0.50%

1. **Calculate** the expected return from the bullet and barbell portfolios over the next year.
2. **Discuss** reasons for the difference in performance of the bullet and barbell portfolios.

1. Step 1: Coupon income:

Bullet : 0
Barbell : 0

$\}$ both zero-cpn bnds.

Step 2: Rolldown yield:

Bullet : $(98.75 \div 96.75 - 1) = 2.067\%$
Barbell : $(98.95 \div 97 - 1) = 2.070\%$

Step. 3: Impact of chg. in yield

Bullet : $-0.25\% \cdot 4.89 + (-0.25)^2 \cdot \frac{1}{2} \cdot 28.5 = -1.214\%$
Barbell : $-0.25\% \cdot 4.92 + (-0.25)^2 \cdot \frac{1}{2} \cdot 43 = -1.217\%$

Step 4: Impact of chg in spread.

N/A (no info given)

Step 5: Impact of currency

Bullet : $(1 + 2.067\% - 1.214\%) \times (1 - 0.005) - 1 = 0.35\%$
Barbell : $(1 + 2.070\% - 1.217\%) \times (1 - 0.005) - 1 = 0.29\%$

Bullet outperforms barbell by 6 bps.

MODULE QUIZ 11.4

1. A U.S. investor buys a zero-coupon 1-year European bond denominated in EUR for EUR 99.01. At the same time, the 1-year U.S. interest rate is 3%. The manager chooses to hedge currency exposure through selling EUR forward against USD. If covered interest rate parity holds, the manager will least likely:
   A. sell EUR at a 2% premium against USD.
   B. sell USD at a 2% premium against EUR.
   C. buy USD at a 2% discount against EUR.
2. Excess returns from the unhedged carry trade imply that which of the following parity relationships is not holding?
   A. Covered interest rate parity only.
   B. Uncovered interest rate parity only.
   C. Both covered and uncovered interest rate parity.
3. A manager believes a foreign yield curve will undergo a bull steepening, while their higher-yielding domestic yield curve will remain stable and upward sloping. In order to maximize carry benefits according to their view, the manager should:
   A. pay-fixed in foreign currency, receive-fixed in domestic currency.
   B. pay-fixed in foreign market, receive-floating in domestic currency.
   C. pay-floating in foreign currency, receive-fixed in domestic currency.
4. A manager constructs a barbell portfolio using a 60% position in Bond A and a 40% position in Bond B, details of which are displayed here:

Bond	Maturity	Coupon	Modified Duration	Convexity
A	2y	2.25%	1.86	5.2
B	10y	0.25%	9.52	104.8

If a bear flattening occurs through a 50 bps rise in the 2-year rate and a 30 bps rise in the 10-year rate, the change in price of the portfolio will be *closest* to:
   A. −1.68%.
   B. −1.71%.
   C. −1.97%.

1. $100 \div 99.01 - 1 = 1\%$
   USD = 3% ⇒ sell USD @ 2% premium (B).
2. B.
3. C (bull → rates goes down → receive fixed) market? currency?
4.

$-1.86 \cdot 50bps + \frac{1}{2} \cdot 50bps^2 \cdot 5.2 = -9.2935 \cdot 10^{-4}$.

$-9.52 \cdot 30bps + \frac{1}{2} \cdot 50bps^2 \cdot 104.8 \cdot = -2.851 \cdot 10^{-3}$

C.