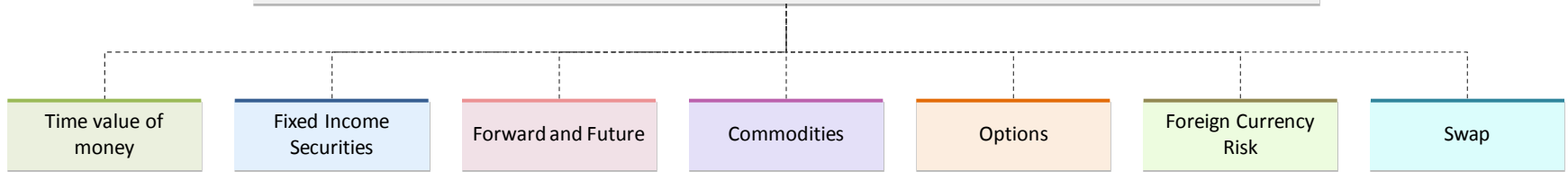


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## Financial Market and Products

## Financial Market and Products



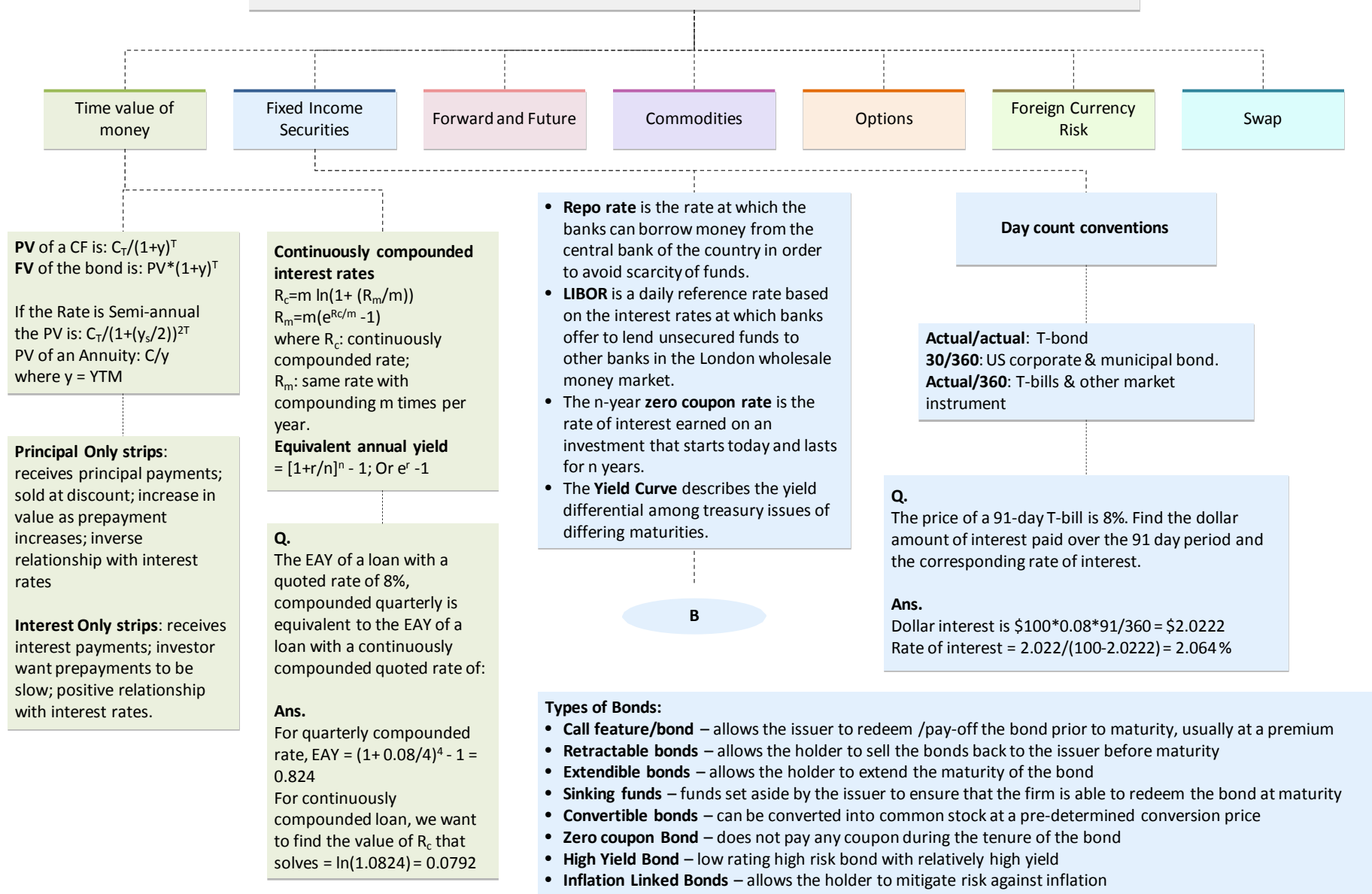
## Financial Market and Products

Mechanics of Option  
Pricing

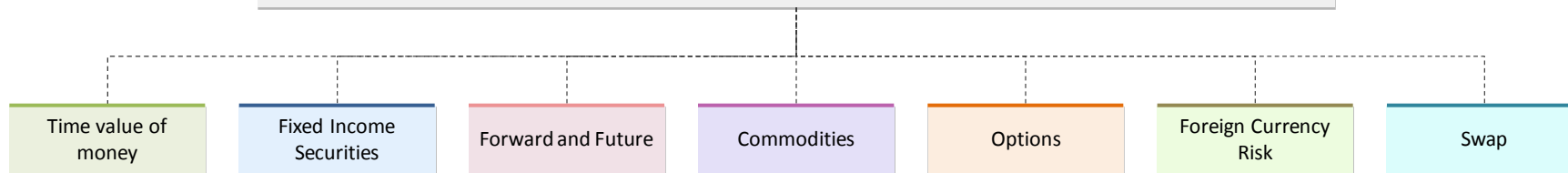
Exotic Options

Mortgage Backed  
Security

# Financial Market and Products



# Financial Market and Products



B

## Bond portfolio structure

**Barbell:** manager uses bonds with short and long maturity  
**Bullet:** manager buys bonds concentrated in the intermediate maturity range  
 If a bullet and a barbell have the same duration, the barbell portfolio have greater convexity and is related to the square of maturity

Q.

Which of the following is TRUE?

- i. A barbell portfolio will have a smaller convexity than a bullet portfolio with

will be greater than the duration of a coupon bond of the same maturity.

- iii. Duration and convexity are based, respectively, on the first and second derivatives of price with respect to yield.

- iv. Convexity increases with the square of a bond's duration.

- a) I and II. b) II and III. c) III only. d) I, III, and IV

Ans. B

## Bond Price

C = coupon payment  
 T = Time to maturity  
 r = interest rate/required yield  
 F = value at maturity,/par value

$$P_0 = \sum_{t=1}^T \frac{C}{(1+r)^t} + \frac{F}{(1+r)^T}$$

## Clean and dirty price

**Clean price:** Bond price without accrued interest

**Dirty price:** Includes accrued interest;  
 Flat price (Clean price) = Full price (Dirty price) - Accrued Interest

## Duration & convexity

BA

Q.

A US corporate bond (30/360 days convention with 10% coupon pays semiannually on Jan 1 and July 1. Assume that today is April, 1, 2005 and the bond matures on July, 1, 2015. Compute the Dirty price and Clean Price of the bond, if the required annual yield is 8%.

Ans.

Use Calculator, N=21, PMT = 50, 1/Y= 4, FV=1000, CPT = PV = 1,140.29; Then 90 days later, on April, 1, 2005, the DP =  $1,140.29 * (1.04)^{.5} = \$1,162.87$   
 CP = DP - AI  $(1000 * .1 * .25) = \$1,162.87 - \$25 = 1,137.87$

## Bond Yields:

**Coupon yield:** Coupon payment (C) divided by the face value =  $C / F$

**Current yield:** Coupon payment (C) divided by the bond price =  $C / P_0$ .

**Yield to maturity:** (YTM) is the discount rate which returns the market price of the bond, is also called IRR.

$$MP = \sum_{t=1}^T \frac{C}{(1+YTM)^t} + \frac{F}{(1+YTM)^T}$$

- When Bond sells at a discount: YTM > coupon yield.

- When Bond sells at a premium coupon yield > YTM.

- When bond sells at par: YTM = coupon yield.

**YTM:** Bond prices go down when the YTM goes up and vice-versa.

**Term to maturity** – long maturity bonds have greater price volatility than short maturity bonds

**Size of coupon** – low coupon bonds have greater price volatility than high coupon bonds

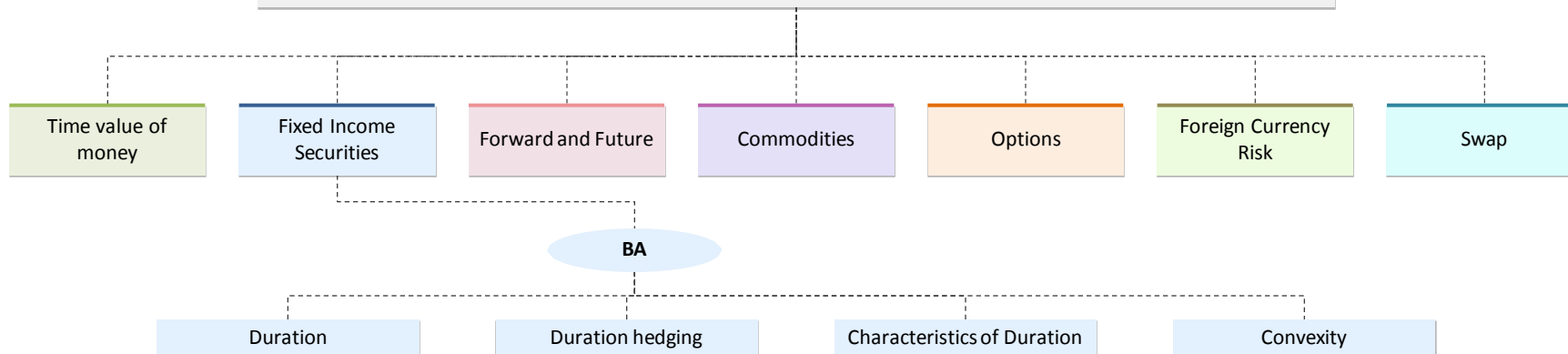
Q.

A Fixed income instrument offers annual payment of \$90 for 10 years. The current Value of the instrument is \$ 950. Calculate YTM on this security.

Ans.

Use Financial calculator, N=10, PMT = 90, PV = -950; CPT = 1/Y = 9.81%

# Financial Market and Products



**Duration** : First derivative of the price/yield relationship; the longer (shorter) the duration, more (less) sensitive the bond's price to change in interest rates; can be used for linear estimates of bond price changes

**Macaulay duration**: Weighted average term to maturity of a bond's cash flows  
**Modified duration (D\*)**: In case of n times compounded yield, the Macaulay Duration is not valid anymore & Modified duration is used

$$D^* = \frac{\text{Macaulay Duration}}{1 + (r / n)}$$

Where r is the yield to maturity of the bond, and n is the number of cash flows per year.

$$\text{Effective Duration} = \frac{(BV_{-\Delta y} - BV_{+\Delta y})}{2 * BV_0 * \Delta y}$$

**DV01**: Dollar value of basis point is the absolute change in the bond price from one basis change in yield  $DV01 = |\text{price at } YTM_0 - \text{price at } YTM_1|$

## Duration Hedging:

1. Hedge ratio:  $[DV01 \text{ (per \$100 of initial position)} * \text{beta}] / DV01 \text{ of hedging instrument}$
2. Hedge ratio:  $P * D_P / (F_C * D_F)$ ; where  
 P = portfolio value;  
 D<sub>P</sub> = Duration of Portfolio;  
 F<sub>C</sub> = Future position with a contract;  
 D<sub>F</sub> = Duration of future contract

## Q.

Using a semiannual compounding, compute DV01 for 10 yrs, 5% bond that is yielding 4.5%.

## Ans.

Price at 4.49%:  $N=10*2$ ,  $PMT = 5/2$ ,  $1/Y = 4.49/2$ ,  $FV=100$ ,  $CPT = PV$   
 Price at 4.5%:  $N=10*2$ ,  $PMT = 5/2$ ,  $1/Y = 4.5/2$ ,  $FV=100$ ,  $CPT = PV$ .  
 Please note: The PV is always negative value.

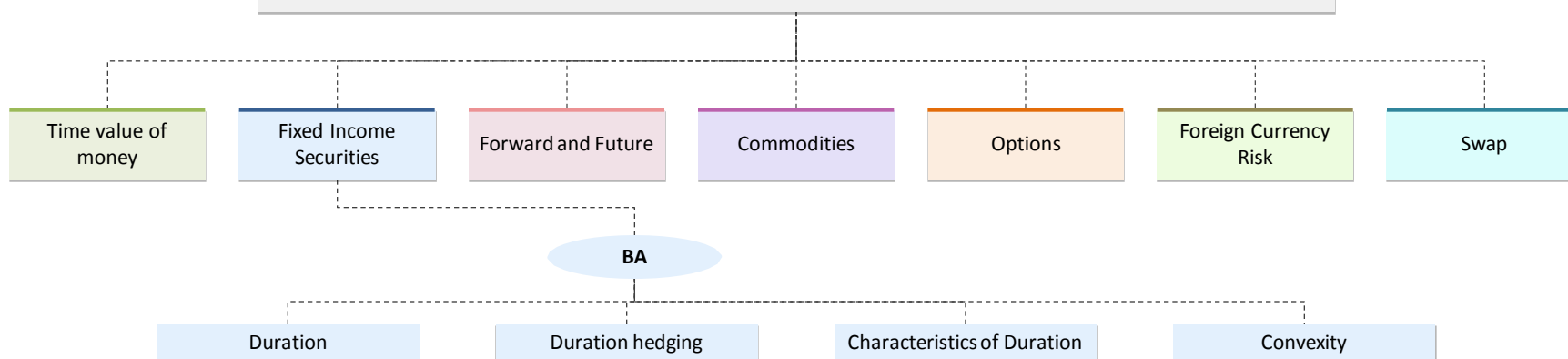
## Q.

Royal Bank has a \$25 million par position in a 5-year, zero-coupon bond that has a market value of \$19,059,948. The modified duration of the bond is closest to:

## Ans.

YTM of the bond is,  $PV = -19,059,948$ ,  $N = 10$ ,  $PMT = 0$ ,  $5.5\%$ .  
 Macaulay duration is equal to maturity for a zero-coupon bond, so modified duration =  $5 / (1 + 0.055/2) = 4.866$  years.  
 Please note: while inserting PV type it as a negative value.

# Financial Market and Products



**Q.** Ceteris paribus, the duration of a bond is positively correlated with the bond's

- A. time to maturity      B. coupon rate  
C. yield to maturity      D. all of the above

**Ans. A**

**Q.** Given the time to maturity, the duration of a zero coupon bond is higher when the discount rate is

- A. higher  
B. lower  
C. equal to the risk free rate  
D. independent of the discount rate

**Ans.**

Duration of the Zero Coupon Bond is its term to maturity.

**Q.** Holding other factors constant, which one of the following bonds has the smallest price volatility?

- a. 5-year, 20% coupon bond; b. 5-year, 12% coupon bond  
c. 5 year, 14% coupon bond; d. 5-year, 0% coupon bond

**Ans.**

A. Higher the sensitivity of the bond to its interest rate, higher the volatility

- Maturity increases, duration increases;
  - Coupon increases, duration decreases ;
  - Yield decreases, duration increases.
- Zero coupon bond :The duration is equal to the bond's term to maturity. Therefore, the longest durations are found in stripped bonds or zero coupon bonds. These bonds have the greatest interest rate elasticity.

**Convexity :** Second derivative of the price/yield relationship. Price change for larger interest rates estimated by duration and convexity are more precise since convexity can capture the curvature

$$\text{Convexity Approximation} = \frac{P_+ + P_- - 2P_0}{2 * P_0 * (\Delta y)^2}$$

$$\frac{\Delta P}{P} = -D_m * \Delta y + \frac{(\Delta y)^2}{2} * \text{Convexity}$$

The convexity relationships imply that a larger price increase occurs with a yield decrease than a price decrease associated with an identical yield increase

**Q.**

Evaluate, at the same yield, the investment that is expected to have the greatest convexity is

- a. 10 year zero- coupon bond  
b. Portfolio with a duration of 10 yrs that contains a 5 year and a 15 year zero- coupon bond  
c. 6% coupon bond of 10 year duration  
d. Callable 6% coupon bond of 10 year duration

**Ans. B**

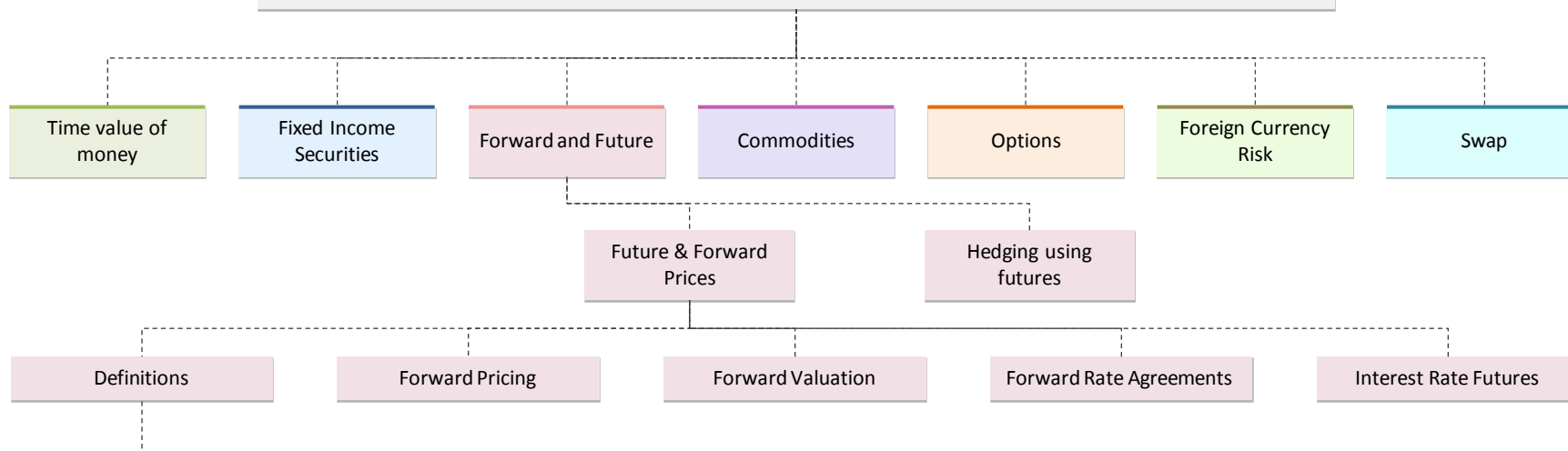
**Q.**

A bond has effective duration of 7.5 and a convexity of 104, if the yield rise by 82 bps, the price of the bond will:

**Ans.**

% price change = [-duration \* Δy \* 100 + (1/2) \* convexity \* Δy<sup>2</sup> \* 100] = Decrease by 5.8%

# Financial Market and Products



**Futures Contracts:** Agreement to buy or sell an asset for a certain price at a certain time. Its is traded on an exchange.

**Forward Contracts :** Forward contracts are similar to futures except that they are traded Over the Counter (OTC) **Spot**

**rate:** A t-period spot rate is the Yield to Maturity of on a Zero Coupon Bond that matures in t-years.

**Forward Rates:** Forward rates are interest rate between two dates in future as implied by the spot rates

$F_{21} = (S_2T_2 - S_1T_1) / (T_2 - T_1)$ , where

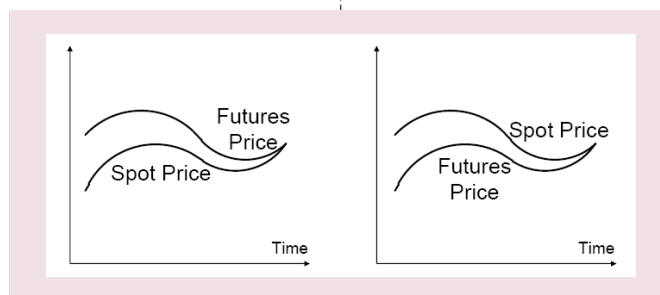
$F_{21}$  = Forward rate b/w time  $T_2$  and  $T_1$

$S_1$  and  $S_2$  = Spot rate for maturity  $T_1$  and  $T_2$  respectively

**Backwardation:** Spot price is higher than the future price (high convenience yield compared to the cost i.e. rate of interest) 2<sup>nd</sup> Graph.

**Contango** vice versa 1<sup>st</sup> Graph.

The cost of carry is the storage cost plus the interest costs less the income earned



**Q.**

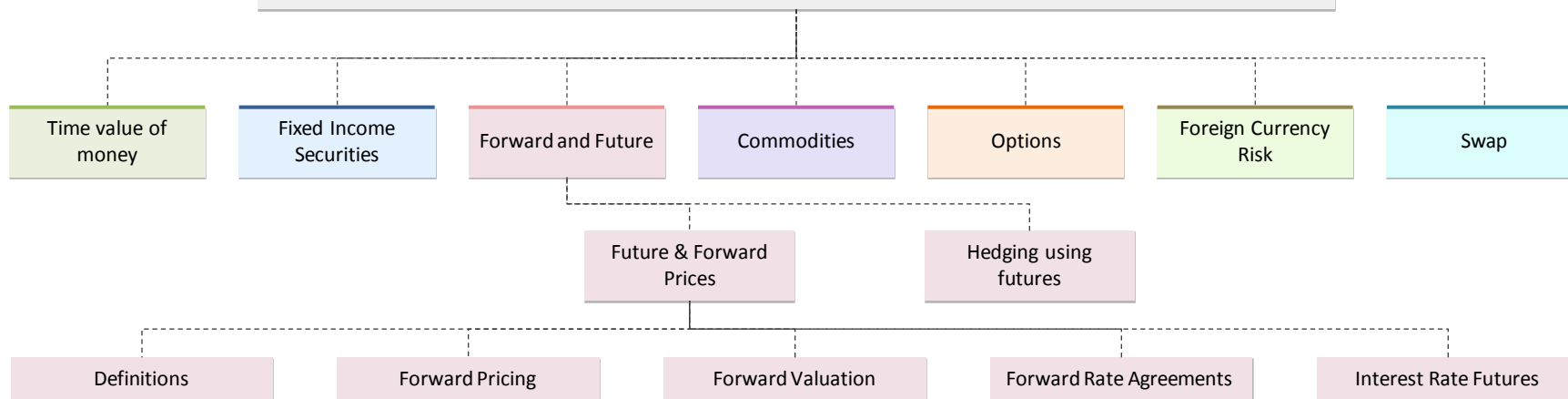
If 1 & 1.5 years' spot rates are 1.8% and 2.2%, the 6-month forward rate on an investment that matures in 1.5 years is :

**Ans.**

$(2.2\% \times 1.5 - 1.8\% \times 1) / 0.5 = 3\%$



# Financial Market and Products



## Investment Asset

$F_0 = S_0 e^{rt}$ , for non yielding asset

$F_0 = S_0 e^{(r-d)t}$ , continuous dividend paying stock

$F_0 = (S_0 - I) e^{rt}$ , discrete dividend paying stock,

## Foreign Exchange

$F_0 = S_0 e^{(r-rf)t}$ , Currency Forward Commodity

$F_0 = S_0 e^{(r-\delta)t}$ , for commodity with lease rentals

$F_0 = (S_0 + M) e^{rt}$ , commodity with storage costs

$F_0 = S_0 e^{(r+\lambda-c)t}$ , commodity with convenience yields

## Consumption Commodities

$F_0 \leq (S_0 + M) e^{rt}$

**Where**  $r$  = annual interest rate,

$t$  = Time period  $d$  = % of annual dividend

$I$  = the PV of dividend received.

$rf$  = foreign currency domestic risk free rate

$M$  is the PV of storage costs

$\delta$  = lease rate (cost of borrowing the commodity)

$c$  = % annual convenience yield (CY is the benefit of owing the consumable asset)

$\lambda$  = % annual storage cost

**Short selling** involves selling securities that is not owned.

## Q.

Current 1-year forward exchange rate is 1.200 USD /EUR. An American bank pays 2.4% annual interest rate on a 1-year deposit and a 4.0% annual interest rate on a 3-year USD deposit. A European bank pays a 1.5% annual interest rate for a 1-year deposit and a 2.0% annual interest rate for a 3-year EUR deposit. The forward exchange rate in USD per EUR for exchange 3 years from today is closest to:

## Ans.

The 2 year forward rate in US =  $\sqrt{[(1.04)^3 / 1.024]} - 1 = 4.81\%$

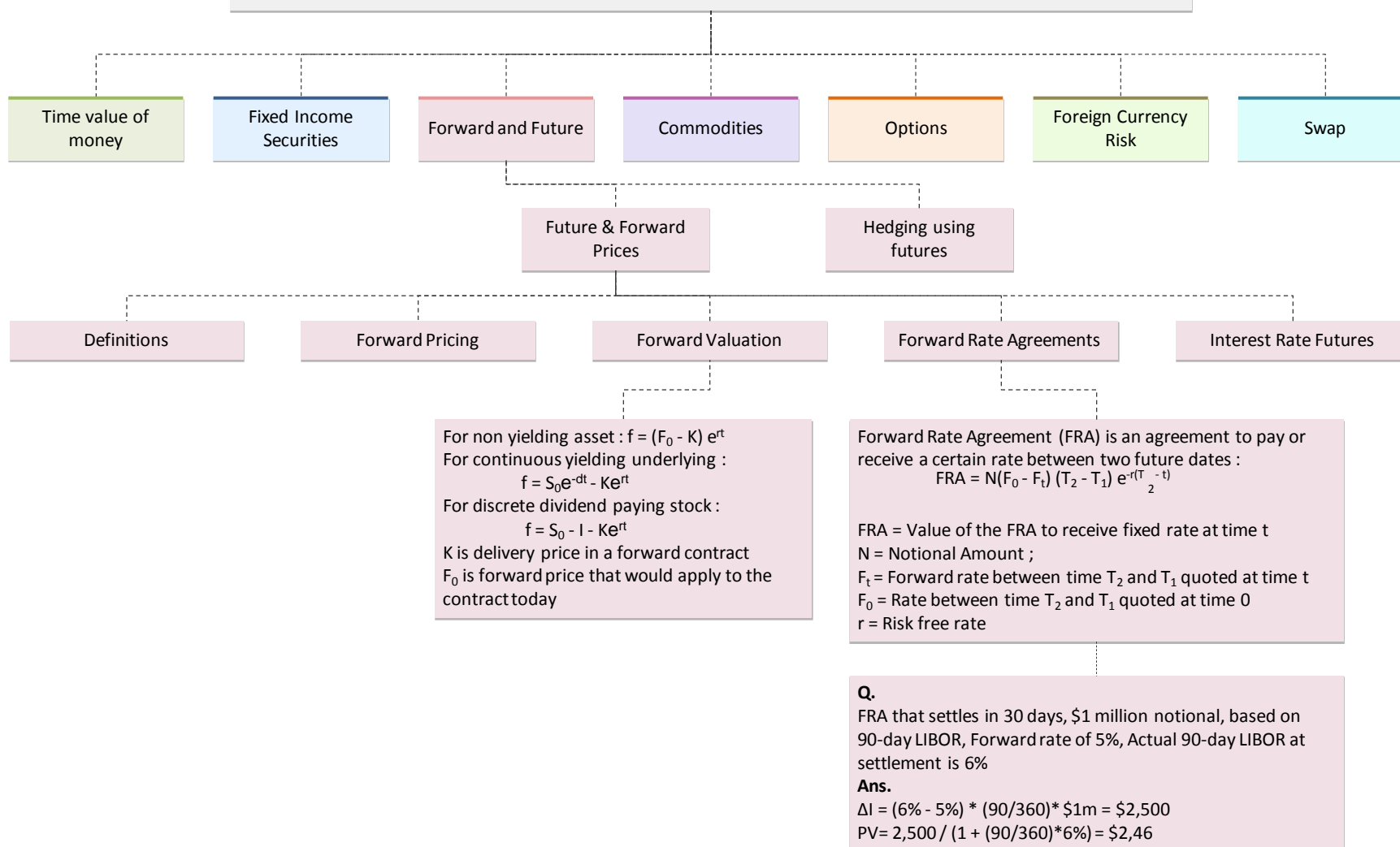
The 2 year forward rate in Europe =  $\sqrt{[(1.02)^3 / 1.015]} - 1 = 2.25\%$

The forward exchange rate in USD per EUR for exchange three years:  $1.2 * (1.0481^2) / (1.0225^2) = 1.261$

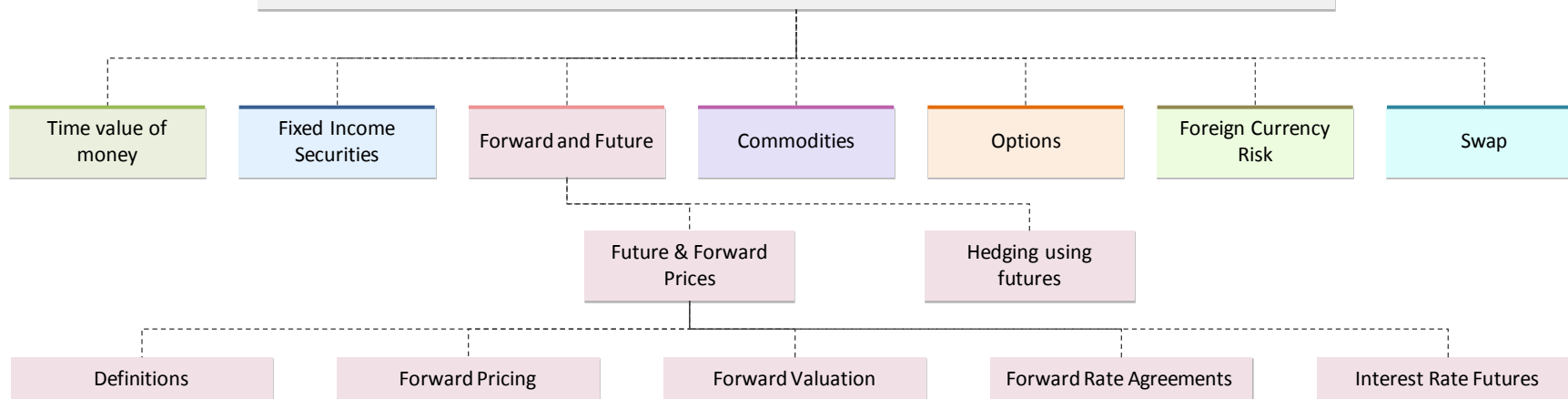
## Arbitrage

1. If  $F_0 > S_0 e^{rt}$ , borrow loan, buy spot, sell forward today, deliver asset, repay loan at the end
2. If  $F_0 < S_0 e^{rt}$ , Short sell the asset, invest the proceeds at risk-free rate, buy forward today, collect loan buy asset under forward contract, deliver to cover short sale

# Financial Market and Products



# Financial Market and Products



**Q.**  
Suppose the  $\sigma$  of short rate changes is 1.2%. Find the forward rate when the 8-year euro-dollar futures price quote is 94. The time to maturity is 8 yrs, whereas the maturity of the rate underlying the futures is 8.25 years. Find the convexity adjustment and hence the forward rate.

**Ans.**

Forward rate =  $[6\% \text{ pa}/360 (\text{qtrly})] / [365/90 * \log(1 + 0.06/4)] - \frac{1}{2} * 0.0122 * 8 * 8.25 = 5.563\%$

**Q.**

A fund manager has \$10 mn invested in a portfolio of government bonds with a duration of 6.80 years and wants to hedge against interest rate moves between Aug and Dec. How many Dec T-bond futures should manager use.

**Ans.**

The futures price is 93-02 or 93.0625 and the duration of the CTD bond is 9.2 years =  $(10,000,000 * 6.8) / (93,062.5 * 9.2) = 79$ .

**Q.**

If the quoted price for the June 2006 Eurodollar futures contract is 96.89, the value of one contract is closest to

**Ans.**

\$992,225

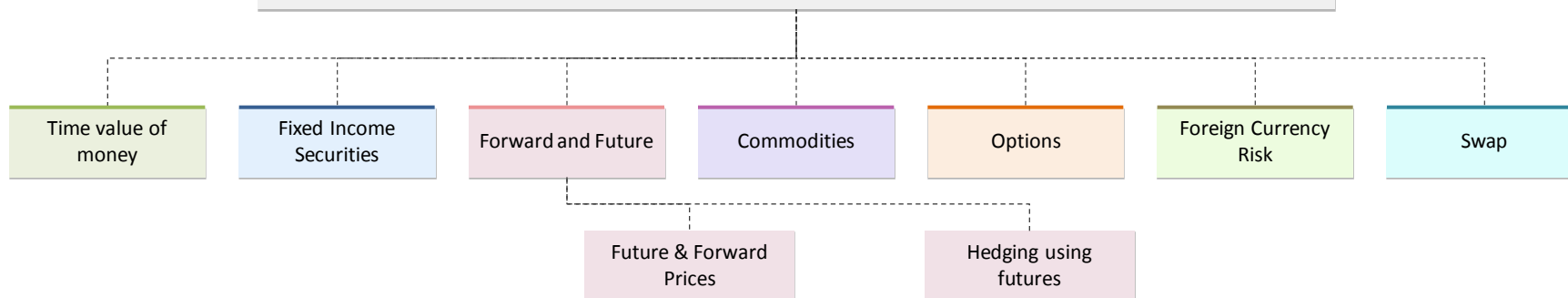


## Cheapest-to-deliver (CTD)

The party with the short position will have an option to deliver the CTD bond, a CTD bond is for which the following is the least:  
*Quoted spot price - (Quoted futures price x Conversion factor)*

- **T Bill:** The cash Price is:  $(100 - Y) * 360/n$  where Y is the Quoted Price(QP) in the market.
- **T-Bill Futures quoted price Z** =  $100 - (360/n) * (100 - Y)$
- **The T-Bill futures cash invoice price** =  $10,000[100 - (n/360) * (100 - Z)]$
- **T Bond Cash price** =  $QP + AI$
- **T Bond Futures price** =  $(\text{quoted futures price}) \times (\text{conversion factor}) + AI$
- **Eurodollar Future:** is a future based on Eurodollar deposits.
- **Contract Price** =  $10,000 * [100 - 0.25 * (100 - Q)]$

# Financial Market and Products



**Basis Risk:** Arises out of two reasons

- The properties of the underlying under the contract and the asset to be hedged are different
- The maturity date of the future contract is different than the date at which asset is to be sold or bought

**Basis** = Spot price to asset to be hedged - Futures price of the contract

**Strengthening of Basis** = Basis increase is good for short hedge and bad for long hedge

**Weakening of Basis** = Basis declines is good for long hedge and bad for short hedge

**Q.**

Under which scenario is basis risk likely to exist?

- A hedge (which was initially matched to the maturity of the underlying) is lifted before expiration.
- The correlation of the underlying and the hedge vehicle is less than one and their volatilities are unequal.
- The underlying instrument and the hedge vehicle are dissimilar.
- All of the above are correct.

**Ans.** d.

**Optimal hedge Ratio:**

$$h^* = \frac{\text{Cov}(S, F)}{\sigma_F^2} = \rho * \frac{\sigma_S}{\sigma_F}$$

Where  $\sigma_S$  is the  $\sigma$  of spot price changes;

$\sigma_F$  is the  $\sigma$  of futures price changes;

$\rho$  is the correlation btw Spot & future prices

Hedging with Futures:  $(\beta * P) / A$  where P is the value of the portfolio, A is the value of the assets underlying one futures contract

**Q.**

Current S & P 500 future is 1,167 and the manager wants to reduce the Beta from 1.20 to .85. Value of the portfolio is \$5 mn and the index multiplier is 250, the stock index futures position taken is :

**Ans.**

Short 6 contracts

**Q.**

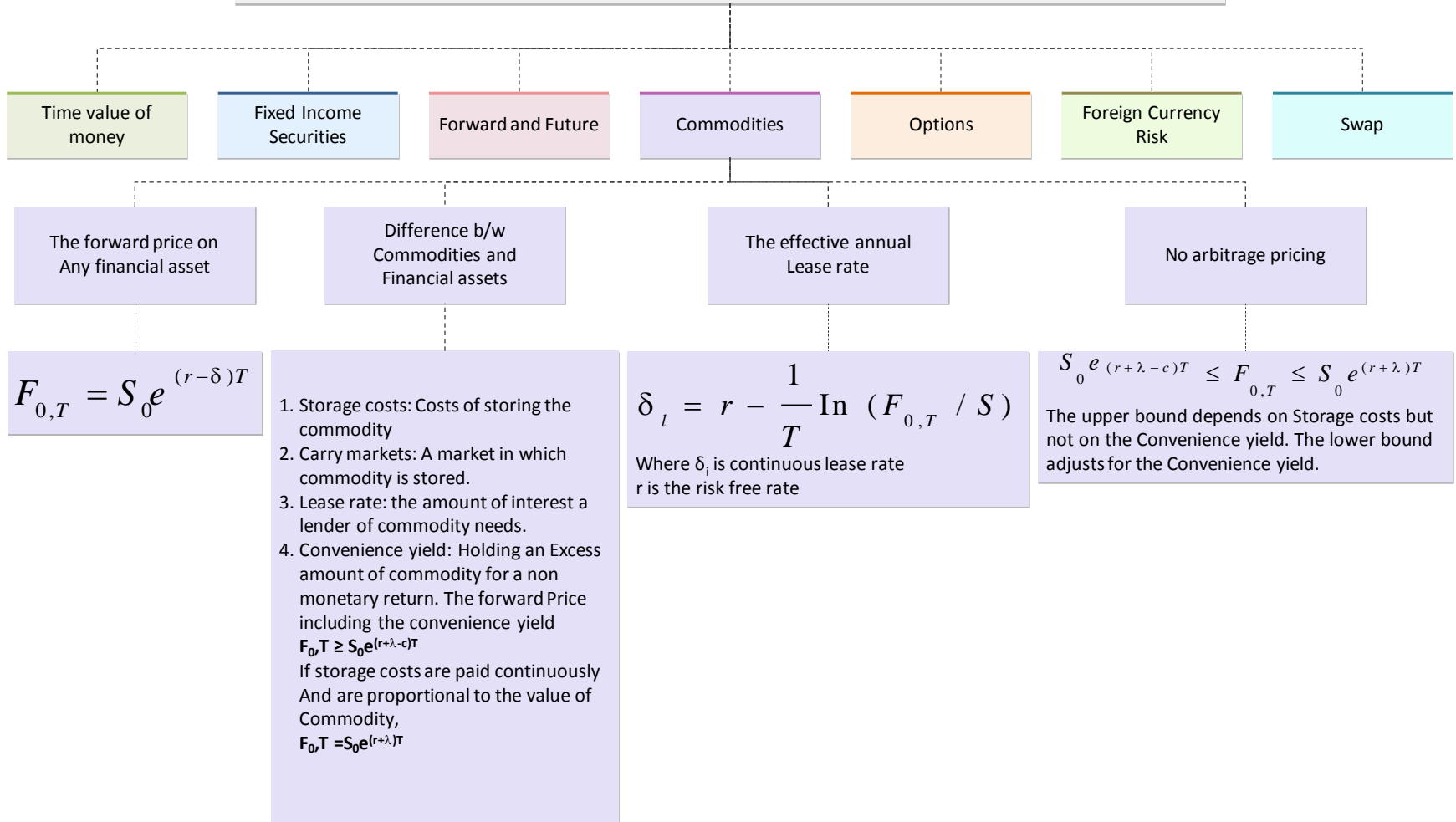
In August a fund manager has \$10 million invested in a portfolio of government bonds with a duration of 6.80 years and wants to hedge against interest rate moves between August and December. The manager decides to use Dec T-bond futures. The futures price is 93-02 or 93.0625 and the duration of the cheapest to deliver bond is 9.2 years. The number of contracts that should be shorted is:

**Ans.**

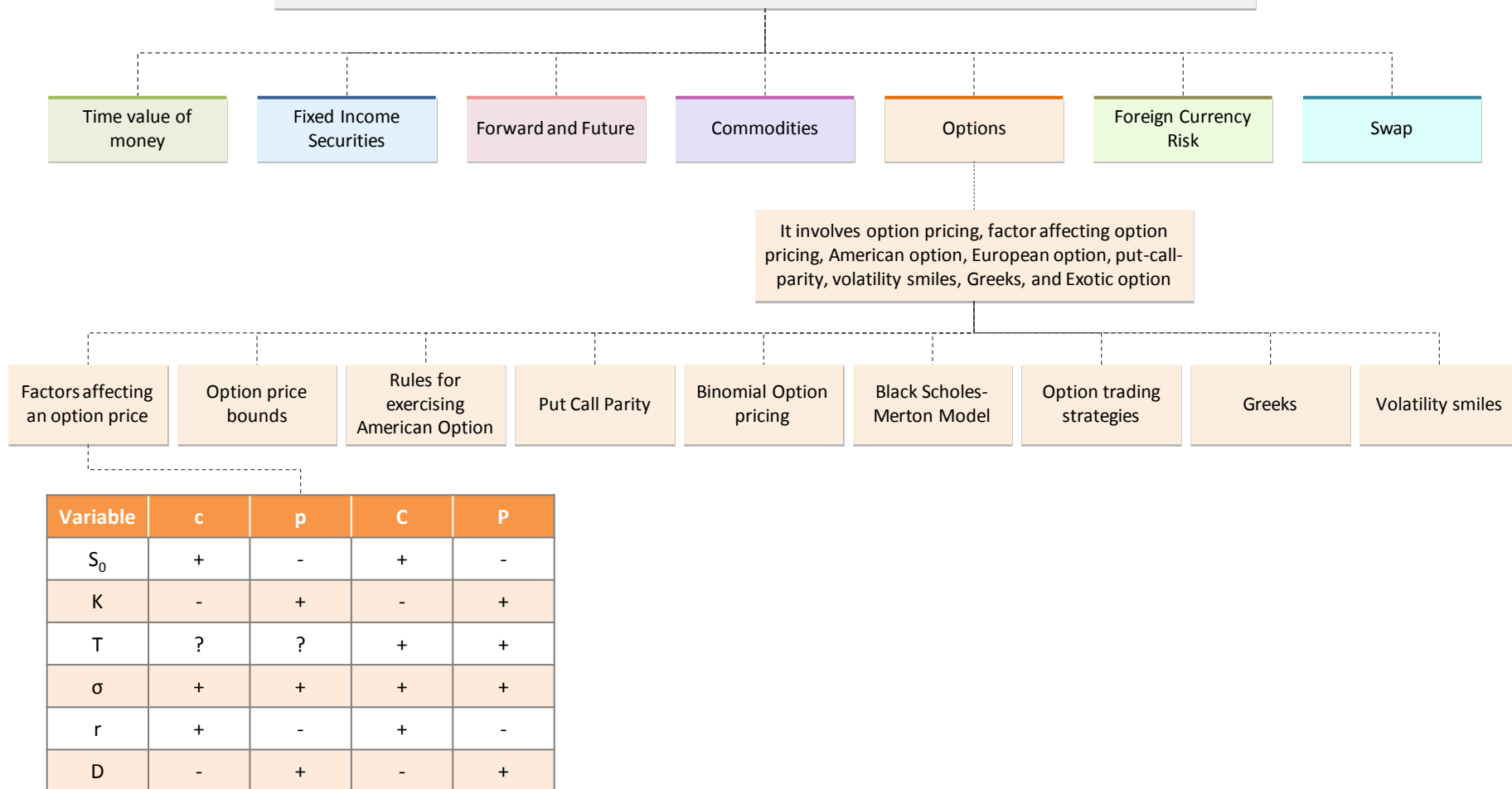
$$\frac{10,000,000}{93.0625 \times 100} \times \frac{6.80}{9.20} = 79$$



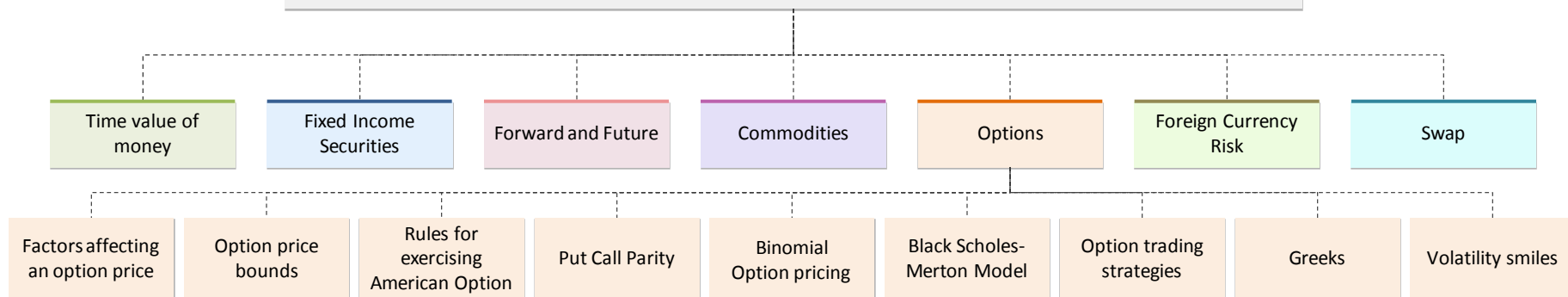
# Financial Market and Products



# Financial Market and Products



# Financial Market and Products



**Upper bound European/American call:**  $c \leq S_0$  ;  $C \leq S_0$   
**Upper bound European/American put:**  $p \leq Xe^{-rt}$  ;  $P \leq X$   
**Lower bound European call** on a non dividend paying stock  
 $c \geq \max(S_0 - Xe^{-rt}, 0)$   
**Lower bound European put** on a non dividend paying stock  
 $p \geq \max(Xe^{-rt} - S_0, 0)$

## Early Exercise:

- It is never optimal to exercise an American call on a non-dividend paying stock before its expiration date
- American Put can be optimally exercised early if they are sufficiently in-the money
- An American call on a dividend paying stock may be exercised early if the dividend exceeds the amount of forgone interest

## Q.

If the current USD/AUD rate is 0.6650 (1 AUD=0.6650 USD) and the risk-free rates for the USD and AUD are 1.0% and 4.5% respectively, what is the lower bound of a 5-month European put option on the AUD with a strike price of 0.6880?

## Ans.

Lower bound =  $0.6880 \times [\exp(-0.01 \times 5/12)] - 0.6650 \times [\exp(-0.045 \times 5/12)]$   
 $= 0.6880 \times (0.9958) - 0.6650 \times (0.9814) = 0.04$

## Q.

Early exercise of an option is more likely for:

- European calls options on stocks paying large dividends.
  - American call options on stocks paying small dividends.
  - American call options close to maturity.
  - American put options on stocks paying large dividends
- a. I and IV. b. II and IV. c. III only. d. III and IV.

## Ans. C

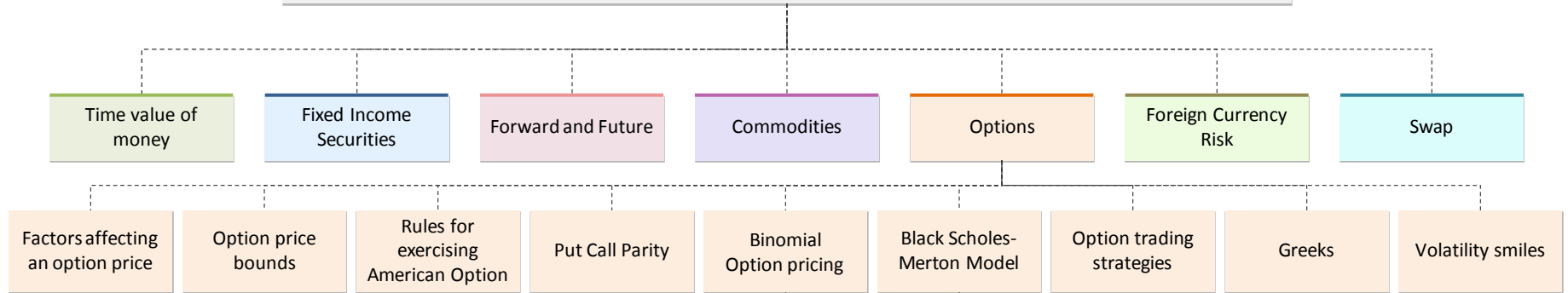
## Q.

According to Put Call parity for European options, purchasing a put option on ABC stock will be equivalent to

- Buying a call, buying ABC stock and buying a Zero Coupon bond.
- Buying a call, selling ABC stock and buying a Zero Coupon bond.
- Selling a call, selling ABC stock and buying a Zero Coupon bond.
- Buying a call, selling ABC stock and selling a Zero Coupon bond

## Ans. B

# Financial Market and Products



$$P + S_0 = C + Xe^{-rT}$$

**Q.**  
Consider a 1 year European call option with a Strike price of \$27.50 that is currently valued at \$4.1 on a \$25 stock. The 1 year risk free rate is 6%. Which of the following is the closest to the value of the corresponding put option  
**Ans.**  
 $p = c + D - S_0 + X_e$   
 $= 5$

- **Binomial Pricing:** At each step, it is assumed that the underlying instrument will move up or down by a specific factor (u or d) per step of the tree. So, if S is the current price, then in the next period the price will either be:  
 $S_{up} = S * u$  and  $S_{down} = S * d$ ;  
where  $U = e^{u\sigma}$  and  $D = 1/U$ .
- At each final node of the tree i.e. at expiration of the option the option value is simply its intrinsic, or exercise value. The following formula is applied at each node: European Option Payoff =  $[p \times \text{Option}_{up} + (1-p) \times \text{Option}_{down}] \times \exp^{-rT}$

**Q:**  
Assume that a binomial interest-rate tree indicates a 6-month period spot rate of 2.5%, and the price of the bond if rates decline is 98.45, and if rates increase is 96. The risk-neutral probabilities respectively associated with a decline and increase in rates if the market price of the bond is 97 correspond to:  
**Ans.**  
 $[p * 98.45 + (1-p) * 96] / [1 + (0.025/2)] = 97$

$$c = S_0 N(d_1) - Xe^{-rT} N(d_2)$$

$$p = Xe^{-rT} [1 - N(d_2)] - S_0 [1 - N(d_1)]$$

$$d_1 = \frac{\ln\left(\frac{S_0}{K}\right) + \left(\frac{r + \frac{\sigma^2}{2}}{1}\right)T}{\sigma \sqrt{T}}$$

$$d_2 = d_1 - \sigma \sqrt{T}$$

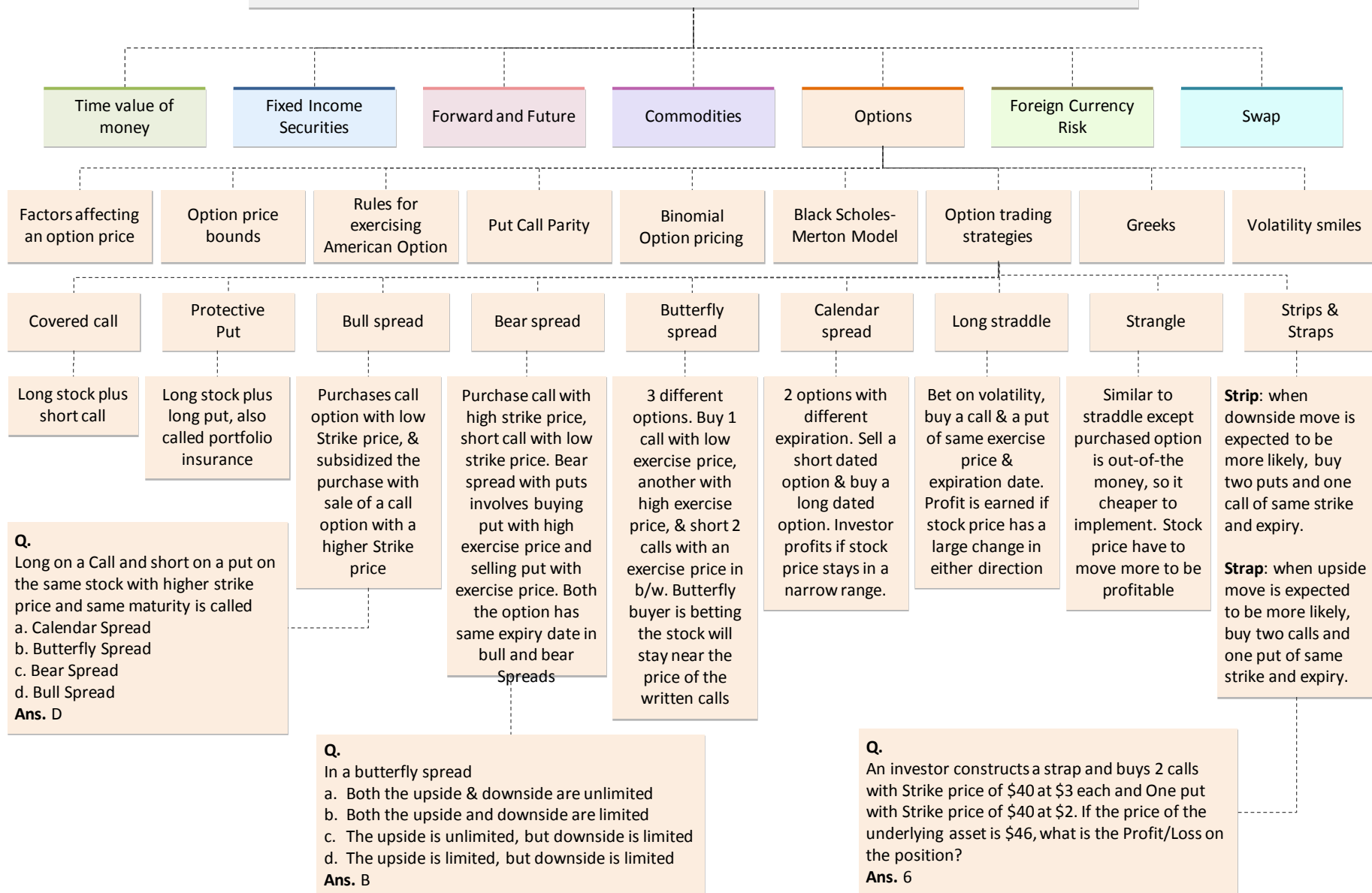


**Q.**  
The stock price is \$25. A put option with a \$20 strike price that expires in 6 months is available.  $N(-d_1) = 0.0263$  and  $N(-d_2) = 0.0349$ . If the underlying stock exhibits an annual  $\sigma$  of 25%, & the continuously compounded risk-free rate is 4.5%, the BSM value of the put is:  
**Ans.**  
 $p = Ke^{-rT} N(-d_2) - S_0 N(-d_1) = \$0.03$

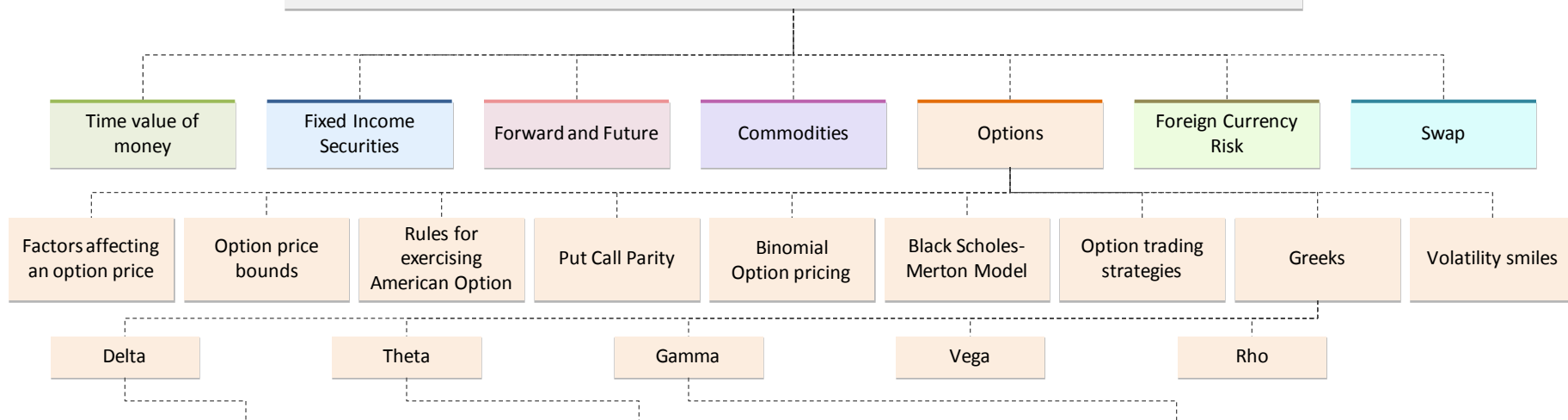
$N(d_1)$  is the delta of the option and therefore  $S_0 N(d_1)$  represents the current price of delta.  
 $N(d_2)$  is the probability that a call option will be exercised,  $1 - N(d_2)$  is the probability that a put option will be exercised,



# Financial Market and Products



# Financial Market and Products



**Delta:** estimates the change in value of an option for a unit change in stock price.

A delta of 0.5 means that price of a call option will change by \$0.5 for \$1 change in value of the stock.

**Call options delta:**

0 for deep out of money;  
0.5 for at the money;  
1 for deep in the money,

**Put option delta:**

- 1 deep in the money,
- 0.5 for at the money and
- 0 for deep out of money.

**Delta of a option** =  $\delta_o / \delta_s$

**Delta of a forward position** is equal to 1

**Delta of Future** =  $e^{-rt}$

**Theta:** Time decay, most negative when option is at the money & close to expiration Theta is negative because as time passes the value of both calls and puts decreases..

**Gamma:** rate of change in delta as underlying stock price change ( also Convexity); largest when option is ATM, which indicates that option price changes very fast as Stock price changes.

ITM options and OTM options have low gammas.

**As the maturity nears,** the option gamma increases.

**Fixed coupon bonds,** have positive convexity. Positive gamma is beneficial, it implies that value of the asset drops more slowly and increases more quickly.

**Long positions in options,** ( calls or puts), create positive gamma

**Delta Neutral Hedging:**

- To completely hedge a short call position, purchase no. of shares of stock=delta\*no. of options sold.
- Only appropriate for small changes in the value of underlying asset
- Gamma can correct hedging error by protecting against large movement in asset price
- Gamma neutral positions are created by matching portfolio gamma with an offsetting option position.

**Q.**

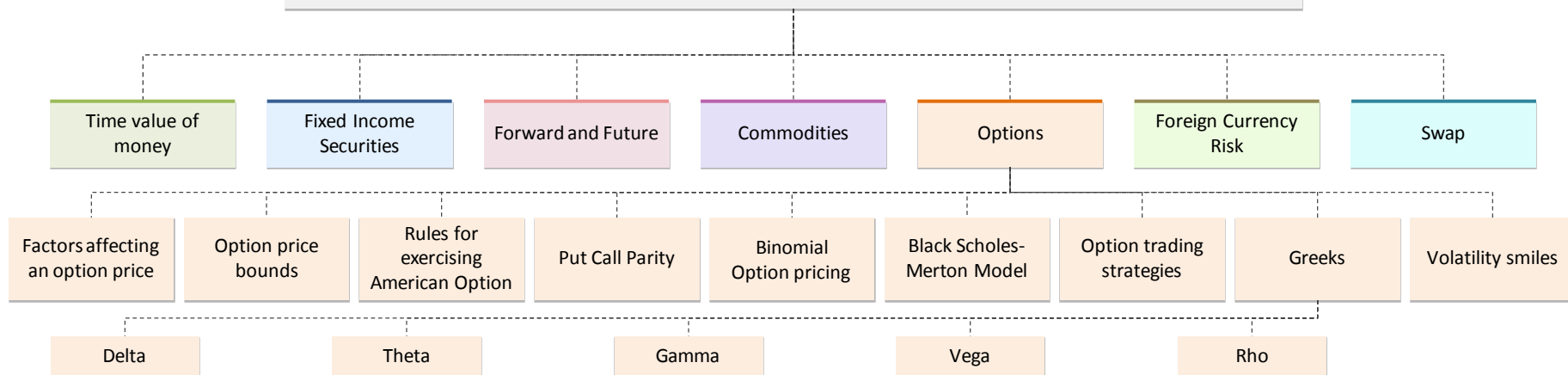
An existing option short position is delta neutral, but has a -5,000 gamma exposure. An option is available that has a gamma of 2 and a delta of 0.7. What actions should be taken to create a gamma neutral position that will remain delta neutral?

- Go long 2,500 options and sell 1,750 shares of the underlying stock.
- Go short 2,500 options and buy 1,750 shares of the underlying stock.
- Go long 10,000 options and sell 1,750 shares of the underlying stock.
- Go long 10,000 options and buy 1,750 shares of the underlying stock

**Ans.**

A, - Gamma means we are short on options, to create a gamma-neutral portfolio  $(5000/2) = 2,500$  long option. However this will change the position from delta-neutral portfolio to  $2,500 * .7 = 1,750$  long delta. So sell 1,750 shares to be gamma and delta neutrality.

# Financial Market and Products



**Q.**  
At the money options close to the maturity tend to have a high  
a. Rho b. Gamma c. NPV d. Vega  
**Ans. B**

**Q.**  
Which of the following have –Delta  
a. Strangle b. Straddle c. Bear Spread d. Bull Spread  
**Ans. C**

**Vega:** sensitivity of the option price to changes in the volatility of the underlying stock, highest for long-term ATM options. close to 0 when option is deep ITM or OTM; Vega decreases with maturity.

**Rho:** sensitivity of the option price to changes in the Risk free rate. Largest for ITM option "ITM" calls and Puts are most sensitive to changes in the rates than "OTM"

## Q. True or False

- Theta affects the value of a call and a put in similar way. **True**
- Theta is more pronounced when the option is "in the money". **False**
- Theta usually decreases in absolute terms as expiration approaches. **False**
- It is possible for a European put option that is "in the money" to have a positive theta value. **True**
- Rho for fixed income is small. **False**
- Call option delta range from 0 to 1. **True**
- A Vega of .1 suggests that for 1% increase in volatility, the option price will increase by \$.10. **True**
- Theta is the most negative for OTM options. **False**
- Options are most sensitive to changes to volatility, when they are "At the money". **True**

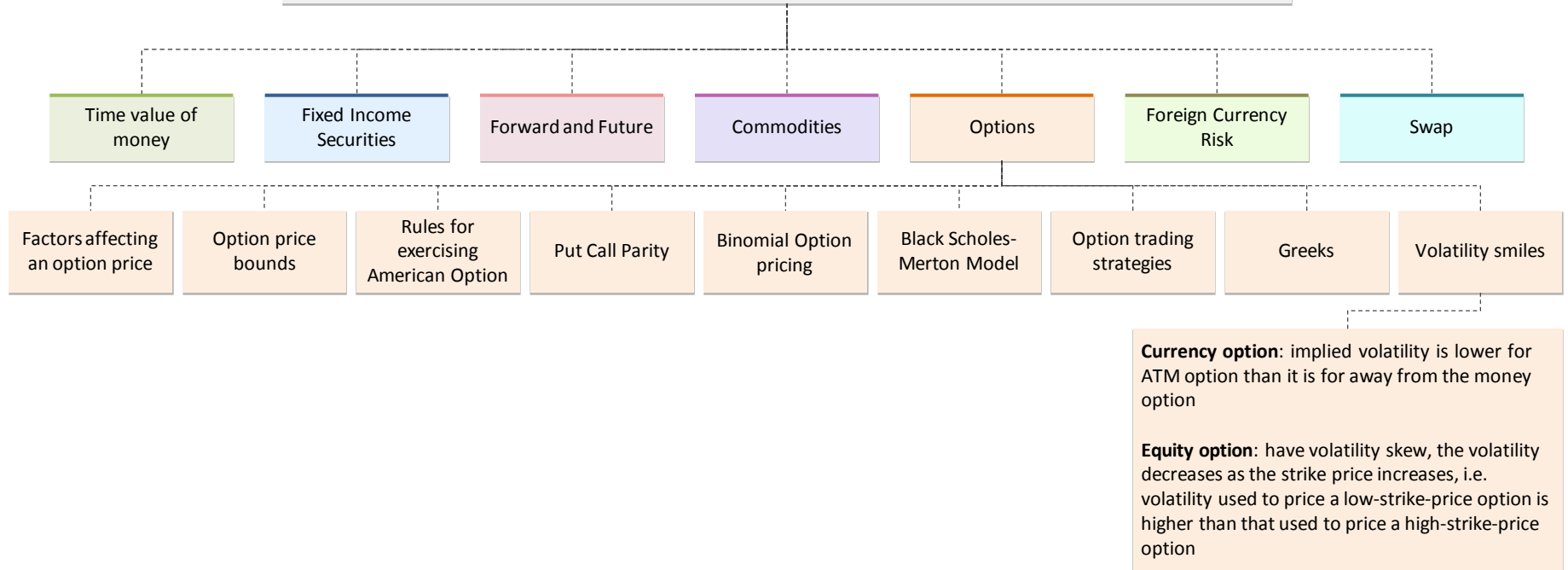
## Q.

An investor is looking to create an options' portfolio on XYZ stock that will have virtually zero Vega exposure while maximizing the ability to profit from increases in interest rates. If the current price of XYZ is \$50, which of the following would accomplish his goals?

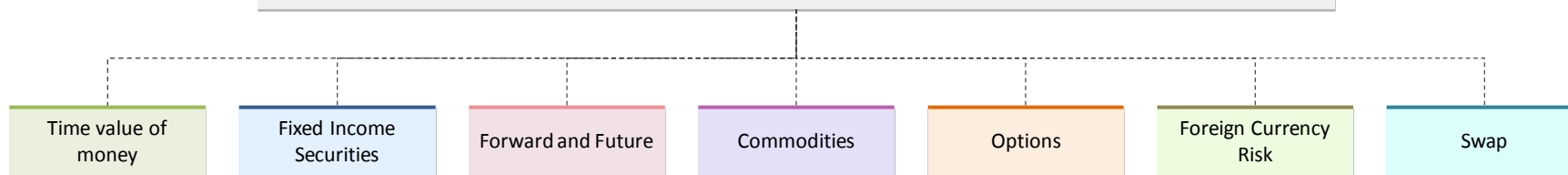
- Sell a call with Strike price (SP) 50
  - Buy a call with a SP of 25.
  - Sell a put with a SP of \$75.
  - Buy a put with a SP of \$25.
- I only
  - II and III
  - II and IV
  - III and IV

**Ans. B**

# Financial Market and Products



# Financial Market and Products



A net long (short) currency position means a bank faces the risk that the FX rate will fall(rise) versus the domestic currency.

- a) On-Balance Sheet hedging: matched maturity and currency foreign asset-liability book.
- b) Off-Balance Sheet hedging: enter into a position in a forward contract

## Q.

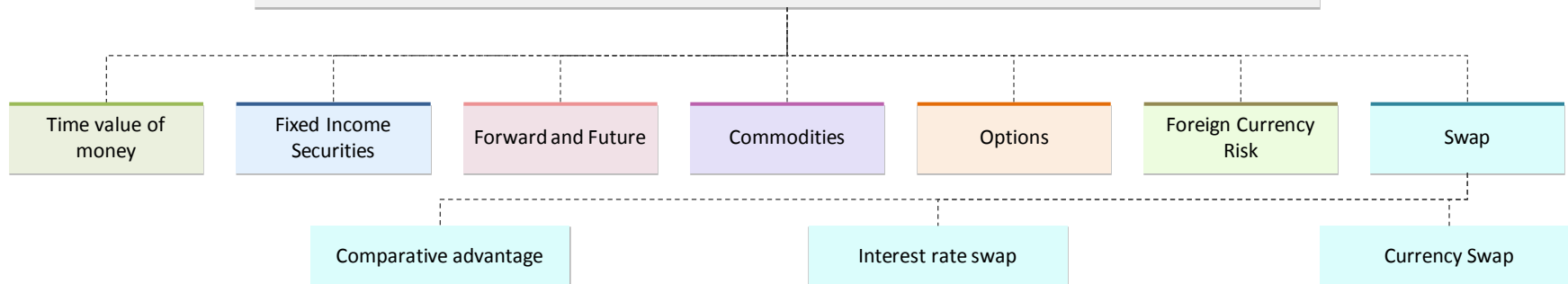
A bank has a USD50mn portfolio available for investing. Cost of funds for the USD50mn is 4.5%. The bank lends 50% of the assets to domestic customers at an loan rate of 6.25%. The rest of the portfolio is lent to UK clients at 7%. The current exchange rate is USD1.642/GBP. At the same time, the bank sells a forward contract equal to the expected receipts one year from now. The forward rate is USD1.58/GBP. What is the weighted average return to the bank.

## Ans.

The return from domestic customers is 6.25%,  
 The return from UK customers,  $\$25,000,000 / 1.642 = \text{GBP } 15,225,335$   
 $\text{GBP } 15,225,335 \times 1.07 = \text{GBP } 16,291,108$ .  
 The bank sells a forward contract:  $\text{GBP } 16,291,108 \times 1.58 = \text{USD } 25,739,951$

Earnings  $(\text{USD } 25,739,951 - 25,000,000) / 25,000,000 = 2.96\%$   
 Weighted average return  $= 6.25\% \times 0.5 + 2.96\% \times 0.5 = 4.61\%$

# Financial Market and Products



Co.	Fixed Rate	Floating Rate
A	4%	L + 20
B	5%	L + 60

In this example, Company A has absolute advantage in fixed and floating rate. Assume B & A wants to raise money in a fixed and floating rate respectively, However, comparatively B has to pay 1% higher than A on fixed rate but only 0.4% higher than A on floating rate. Therefore B has comparative advantage in raising loan on floating rate interest and A in fixed rate.

**Q.**

A bank entered into a 5-year \$150 million annual-pay LIBOR-based interest rate swap three years ago as the fixed rate payer at 5.5%. The relevant discount rates (continuously compounded) for 1 year and 2-year obligations are currently 5.75% and 6.25%, respectively. A payment was just made. The value of the swap is closest to:

**Ans.**

Fixed rate Coupon =  $\$150 \times 0.055 = \$8.25$  million;

$B_{\text{fixed}} = 8.25e^{-0.0575} + 158.25e^{-0.0625 \times 2} = \$147.44$

$B_{\text{floating}} = \$150$  million;

Value of Swap =  $\$150 - \$147.44$  million =  $\$2.56$  million

- One party pays fixed and other pays depending on the floating reference rate (LIBOR is the reference rate)
- At inception, the value of a swap is 0.
- After inception, the value for the swap is the difference b/w the PV of the remaining fixed & floating rate payments.  
 $V_{\text{swap to pay fixed}} = B_{\text{float}} - B_{\text{fixed}}$   
 $V_{\text{swap to receive fixed}} = B_{\text{fixed}} - B_{\text{float}}$

**Q.**

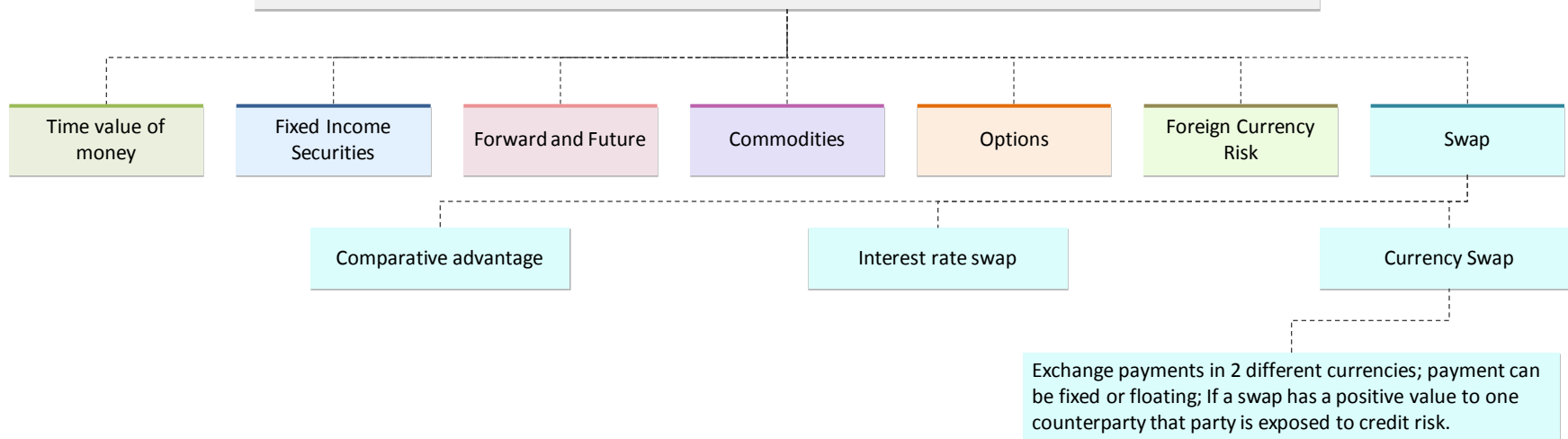
Which of the following regarding the payoff of a 1-period risky swap to a risk-free counterparty paying a fixed amount and receiving a variable is (are) TRUE?

- The payoff profile is the same as a short position on a put option and a long position on a call.
- The payoff profile is the same as a long position on a put option and a short position on a call.
- If the correlation between the risky counterparty and the variable payment declines, the potential payoff is unaffected.
- If the correlation between the risky counterparty and the variable payment declines, the potential payoff is affected.

a) I only   b) II only   c) II and III   d) I and IV

**Ans. D**

# Financial Market and Products



**Q.**

Bank One enters into a 5-year swap contract with Mervin Co. to pay LIBOR in return for a fixed 8% rate on a nominal principal of \$100 million. Two years from now, the market rate on 3-year swaps at LIBOR is 7%; at this time Mervin Co. declares bankruptcy and defaults on its swap obligation. Assume that the net payment is made only at the end of each year for the swap contract period. What is the market value of the loss incurred by Bank One as result of the default?

a.\$1.927 million b.\$2.245 million c.\$2.624 million d.\$3.011 million

**Ans.**

C; At the new swap rate, the replacement cost on the swap is \$1 million a year discounted at 7% for each of the 3 years, which is \$2.624 million.

**Q.**

Which of the following swap positions can be used to transform a floating-rate asset into a fixed-rate asset?

- Receive the floating-rate leg and receive the fixed-rate leg of a plain vanilla interest-rate swap.
- Pay the fixed-rate leg and receive the floating-rate leg of a plain vanilla interest-rate swap.
- Pay the floating-rate leg and pay the fixed-rate leg of a plain vanilla interest-rate swap.
- Pay the floating-rate leg and receive the fixed-rate leg of a plain vanilla interest-rate swap.

**Ans. D**

# Financial Market and Products

## Mechanics of Option Pricing

### Types of Options:

Call Option  
Put Option

### Underlying Assets:

Stock Option  
Currency Option  
Index Option  
Future Option

### Non Standard Products:

- FLEX Options
- ETF Options
- Weekly Options
- Binary Options
- CEBOs
- DOOM Options

## Exotic Options

### Non Standard Features:

- **Bermuda Option:** Early Exercise may be restricted to certain dates
- **Lock out period:** Early Exercise allowed during only a part of the life of the option

### Types of Exotic Options:

- GAP Options
- Forward Start Option
- Cliquet Options
- Chooser Options
- Barrier Options
- Binary Option
- Look-back Options
- Shout Options
- Asian Options
- Exchange Options
- Rainbow Options
- Volatility/ Variance swaps

### Static Option Replication

- Deals with hedging of exotic option position
- Involves searching for a portfolio of actively traded regular options whose value matches the value of the exotic option on some boundary
- Shorting this portfolio will hedge the exotic option position

## Mortgage Backed Security

### Types of MBS:

- **Agency fixed rate and pass through's**  
Excess Servicing = Loan rate – servicing fees – guarantee fees – pass through loan coupon rate
- **Agency Adjustable Rate Pools and Pass Through's**
- **Private Label Pools and Pass Through's**
- **Agency Mortgage Strips**
- **Private Label Mortgage Strips**

### Dollar roll transactions:

A dollar roll transaction occurs when an MBS market maker buys position for one settlement month and sells those same positions for another month at the same time.

### Dollar Roll to Trade Special:

When the price drop is large enough resulting in financing cost to be less than the implied cost of funds, then the dollar roll is trading special.



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# Thank you!

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