FIN 513 Case Study

"CDX skew notes"

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Question 1.

➢ Define the CDX "skew" and find how to make an arbitrage trade.

Question 2.

➢ Design a transaction to catch CDX "skew" in CDS market and to pay bond-like cash flows.

Question 3.

➢ What happens to my or investor's returns if CDX "skew" moves to more negative value?

Question 4.

➢ Financial engineering's overall roles and functions in financial market.

Question 1 : What is CDX skew?

CDX Skew note

- ✓ The structured notes which repackage "the difference" between the spread of a CDS index(CDX) and its constituent single-name CDS contracts. **<u>The difference is called the Skew.</u>**

  (nothing related to Skewness in Statistics)

- ✓ CDX buyer takes on the credit exposure to the loans or bonds, and exposed to defaults. It means buying index is equivalent to selling protection so that buying position receive a fixed coupon.

Question 1 : How exactly is it calculated?

Calculation

✓ **The (Negative or Positive) Skew = Composite Spread - Model Spread**

✓ **Composite Spread** = a CDS index

  ex) "commodity" listed on ICE named as MARKIT CDX.NA.IG.("IG")

✓ **Model Spread** = 125 of the most liquid North American entities with investment grade credit ratings.

  (21st Century Fox America, Inc. AT&T Inc., CBS Corporation, HP Inc.)

✓ The term "Spread" is price quotation and indicates basis point.

✓ AND, the model spread is a result of converted price to quotation unit "spread".

Question 1 : How exactly is it calculated?

Calculation

✓ **The (Negative or Positive) Skew = Composite Spread - Model Spread**

✓ There are two ways to calculate the theoretical value of an index based on the underlying instruments

1. Simple valuation

Model Value(Intrinsic value)

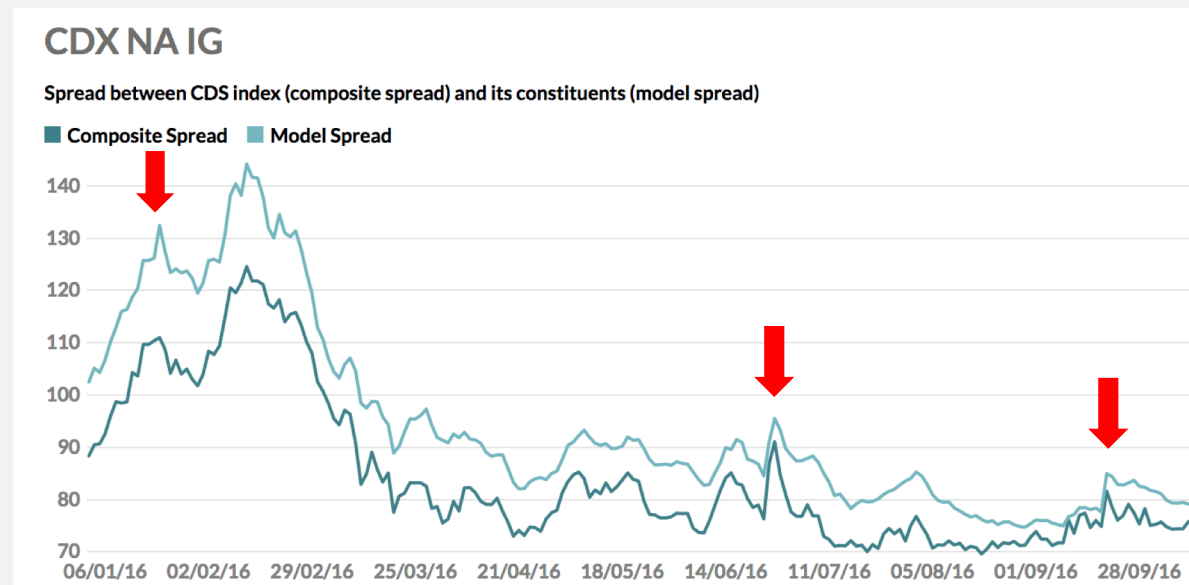$$= 100 - \sum_{n=1}^{125}\big((CDS\ spread_n - CDS\ index\ fixed\ coupon) * Risky\ Duration\big)$$

2. Complex valuation

The more accurate and complex way is to use the hazard rate model for each underlying components of the index.

Question 1 : What arbitrage trade is available to market participants in mid 2016?

Statistical Arbitrage (Assuming convergence)

- ✓ In the middle of 2016, there was negative skew. It means the composite spread is smaller than the model spread. Namely, Short the model spread(125 single-name CDS) and Long the composite spread(index) because it might generate the positive yields(model spread – composite spread >0).

CDX NA IG

Spread between CDS index (composite spread) and its constituents (model spread)

■ Composite Spread   ■ Model Spread

140	
130	
120	
110	
100	
90	
80	
70	

06/01/16 02/02/16 29/02/16 25/03/16 21/04/16 18/05/16 14/06/16 11/07/16 05/08/16 01/09/16 28/09/16

Buy Cheap and Sell High!

Question 1 : Who is taking the other side of this trade?

Arbitrage benefit from… Market inefficiency!

✓ Example) Negative Skew Case
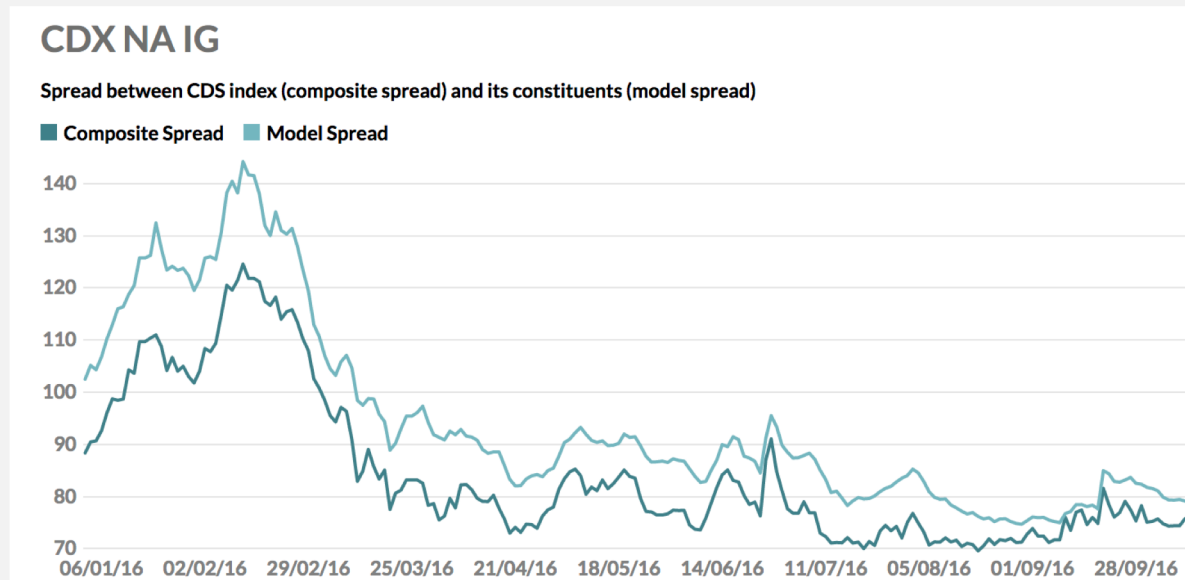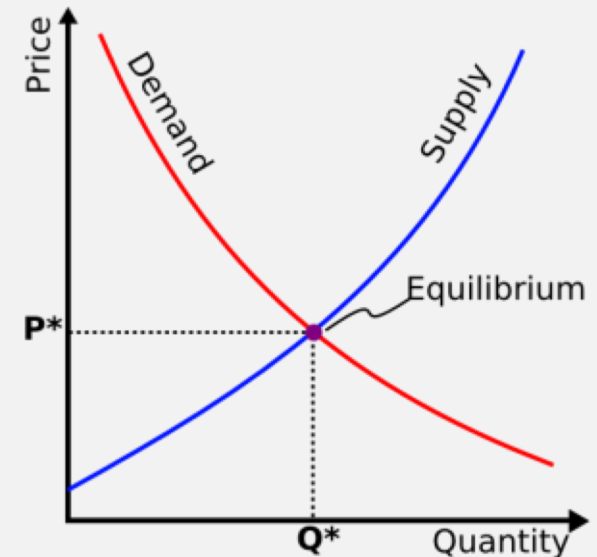
1) Model spread

Demand : A lot of Single name protection buyer

Supply : Small number of Single name protection seller

2) Composite spread

Demand : Small number of CDX long position

Supply : A lot of CDX short position

CDX NA IG

Spread between CDS index (composite spread) and its constituents (model spread)

■ Composite Spread   ■ Model Spread

Why did negative skew happened?
In 2016, illiquidity of corporate bond market was severe and needs for protection went to CDX market.
But!, it can be the opposite anytime depending on the economic circumstances

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Question 2

Suppose you work for a bank and want to take advantage of the opportunity **to issue a skew bond**. Assume the **"skew" is -15 bp** when the transaction is initiated. (1) How to design a transaction that can pay investors LIBOR + 2.00% with certainty? Design a transaction that can pay investors LIBOR + 200 bp with certainty. (2) Explain the terms of the deal and what trades your bank needs to undertake to set up the note, and to guarantee that investor's principal is protected. (3) Show a diagram of where all the cash-flows go in your structure.
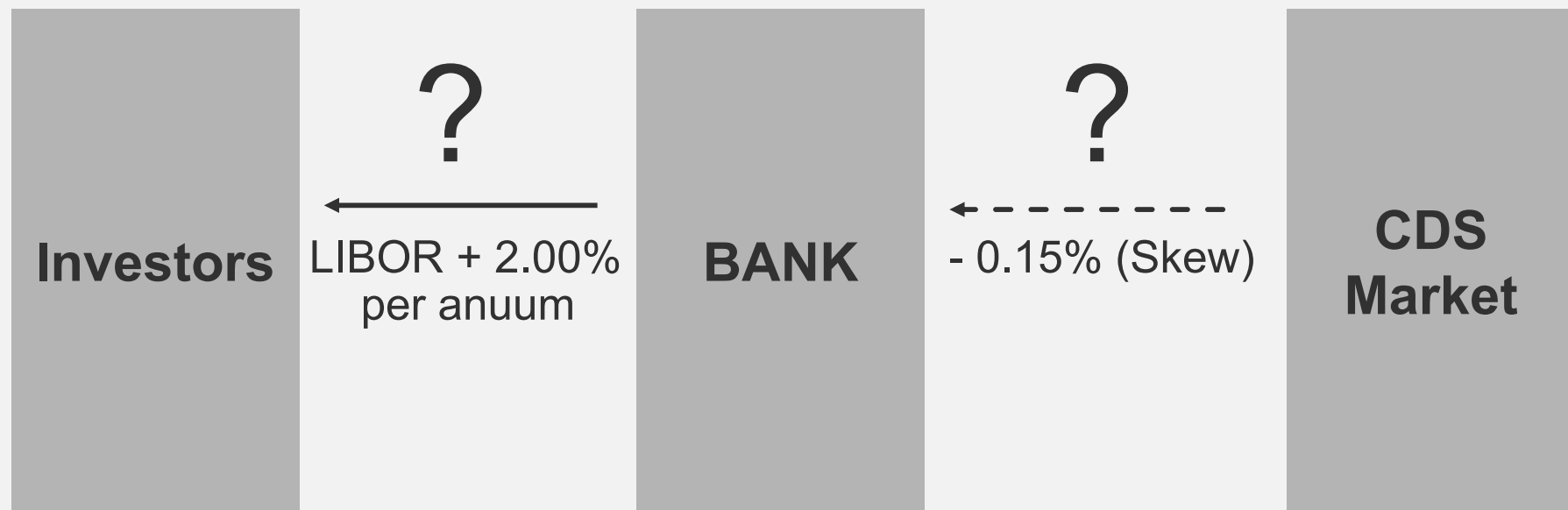
➤ We NEED six steps to do ! Let's look a example of Citibank's Skew note.

Question 2 : Big Picture
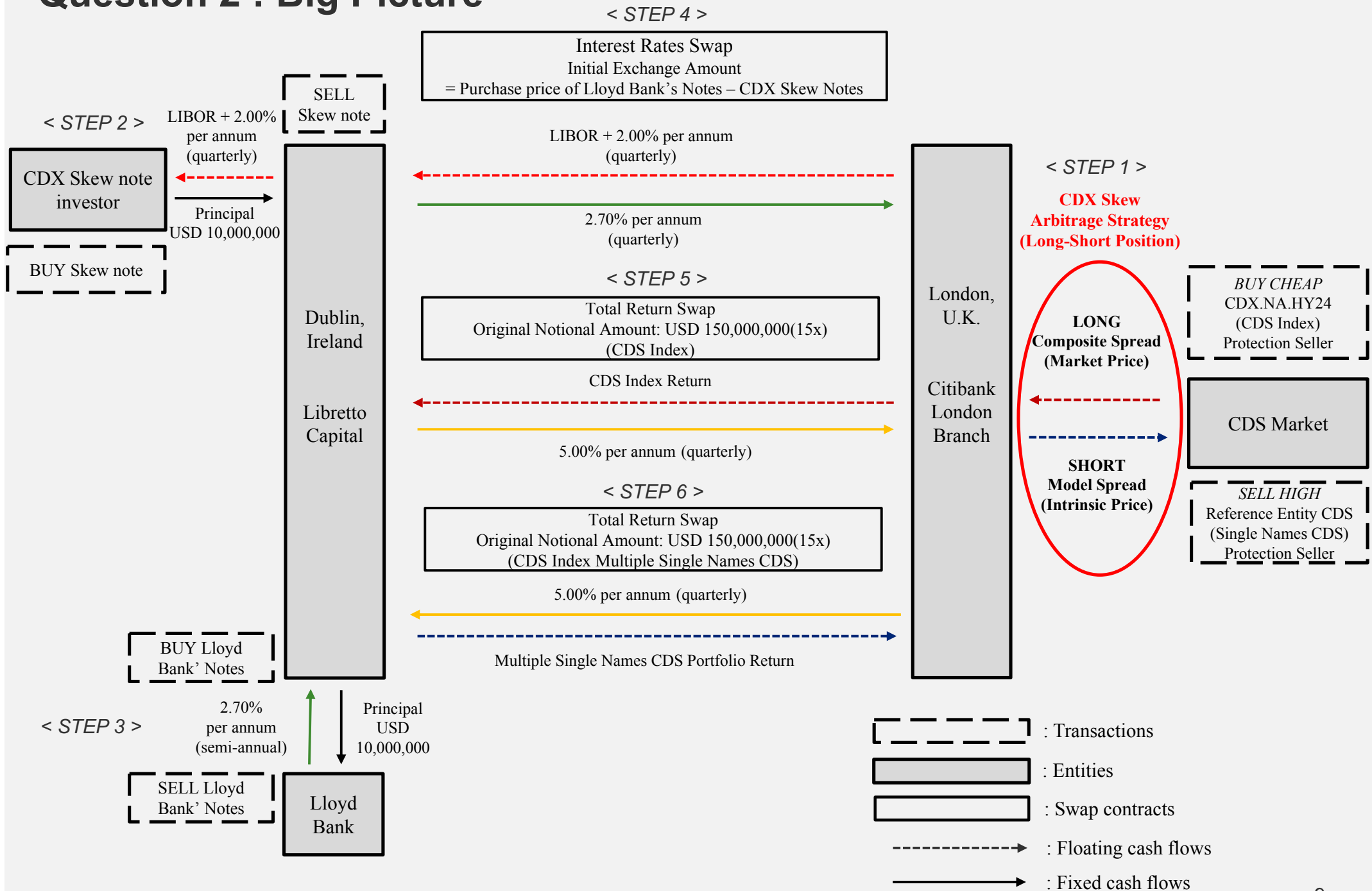
Question 2 : Back to 2016

1. Structural reform of the EU banking sector

European Commission

➢ The European Commission proposed a regulation to stop the largest and most complex banks from engaging in *the risky activity of proprietary trading.*
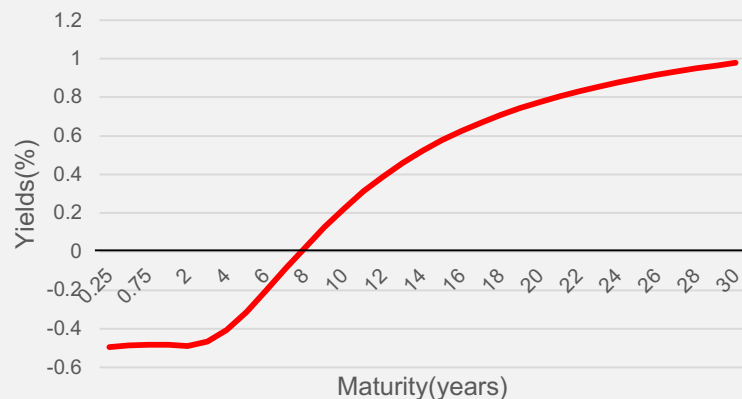
2. The Solvency II regime will become fully applicable on 1 January 2016

eiopa
EUROPEAN INSURANCE
AND OCCUPATIONAL PENSIONS AUTHORITY

➢ *Capital requirements* including the solvency capital requirements (SCR) and the minimum capital requirements (MCR) are strengthened.

3. Negative Interest rates
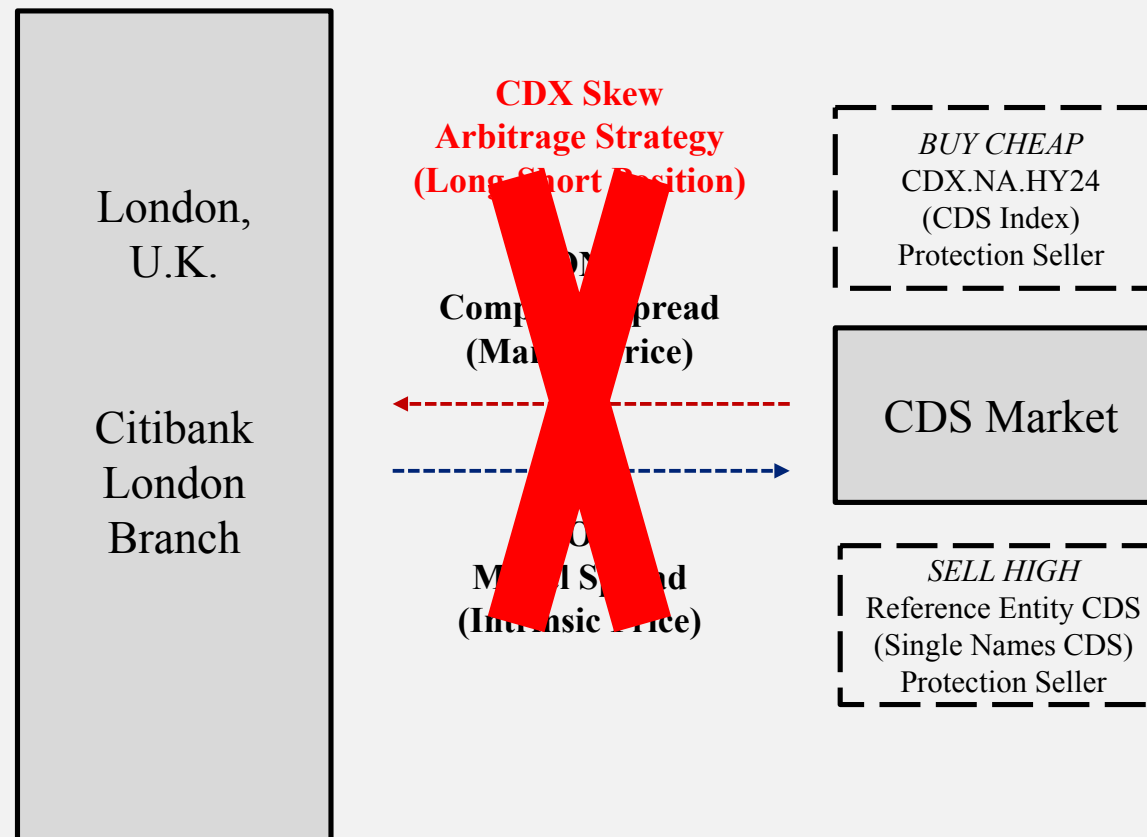
Euro area yield curves in mid of 2016

➢ *Negative* government bonds yields makes European insurance companies to choose other investable assets.

Source : ECB statics

Step 1. CDS market side

In 2016 CDS market, there were arbitrage opportunities.
➢ Index spread was lower than its components portfolio spread.
➢ If we expect two prices will converge ? Buy Cheap and Sell High!
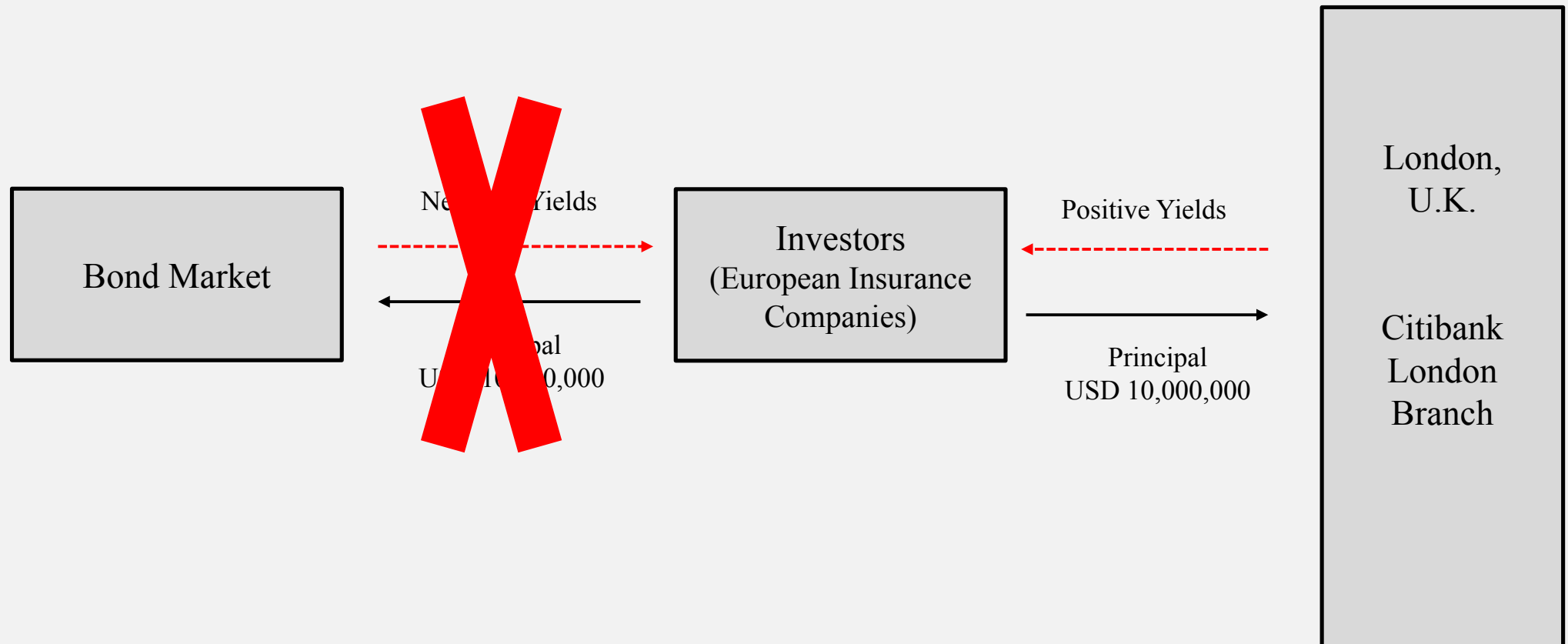

➢ *However, risky activity of proprietary trading was banned.*

Step 2. Investor side

In 2016 European government bonds market, it was not favorable for fixed-income security investors.
- ➢ As we seen before, government bonds yields were negative at least to eight years maturity.
- ➢ Long-term investors such as insurance companies pursued *positive yield products.*


- ➢ *Therefore, investors asked banks to construct a new product with positive yield and bond-like characteristics.*

Step 2. Both sides

What if the bank issue a fixed income product, named "Skew Note" with LIBOR + 2.00% coupon rates ?

➢ It solves one of investors' needs. (positive yields)
➢ It also gives a justification for the bank to trade CDX skew arbitrage transactions, which may not be classified as a *proprietary trading because this Long-Short position's purpose are connected to client activity*.
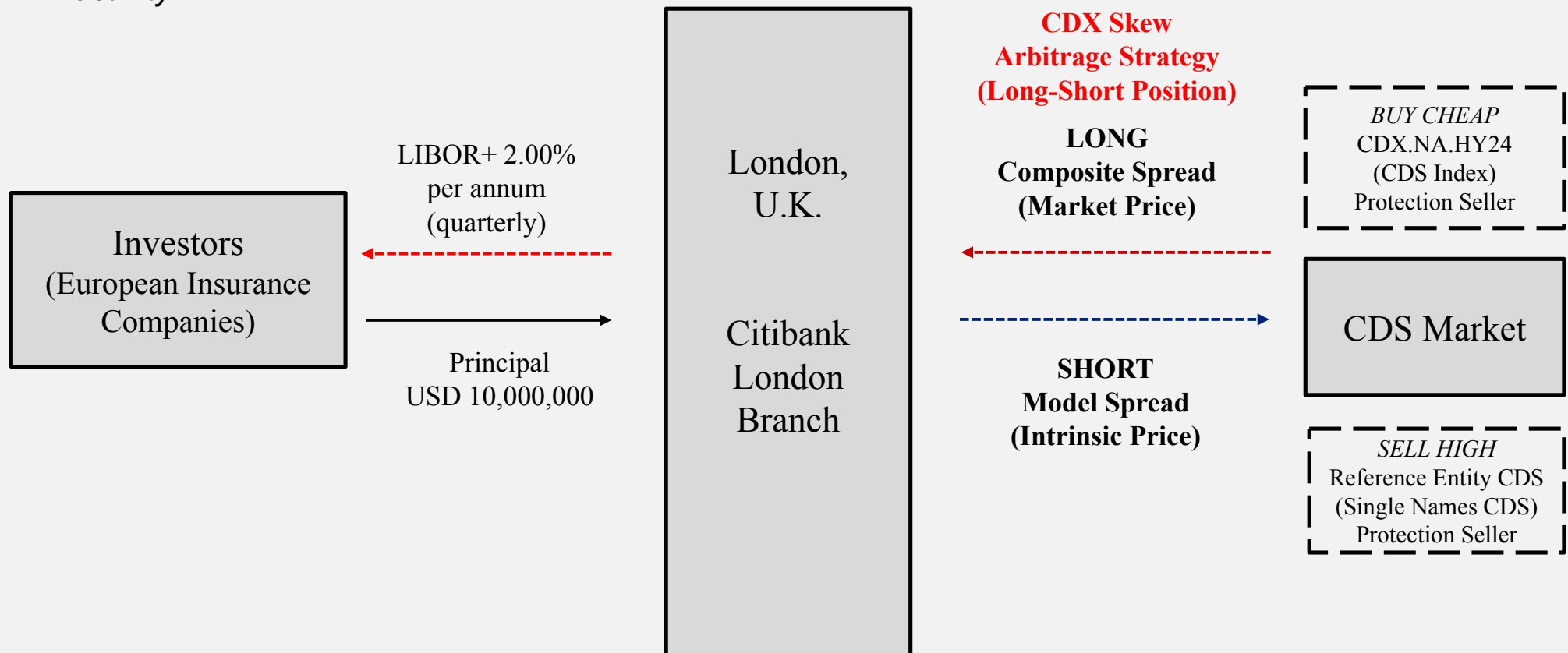
However, we have two questions.
➢ *Is it possible for the bank certainly to pay the coupon ?*
➢ *And to protect the investor's principal ?*

Step 3. Both sides + third party

In the mid of 2016, there was a bank to issue a mid-term notes with 2.70% coupon rates.

➤ Lloyd Bank's mid-term unsecured senior debt ratings of "A1" by Moody's, "A" by S&P and "A+" by Fitch in 2016.
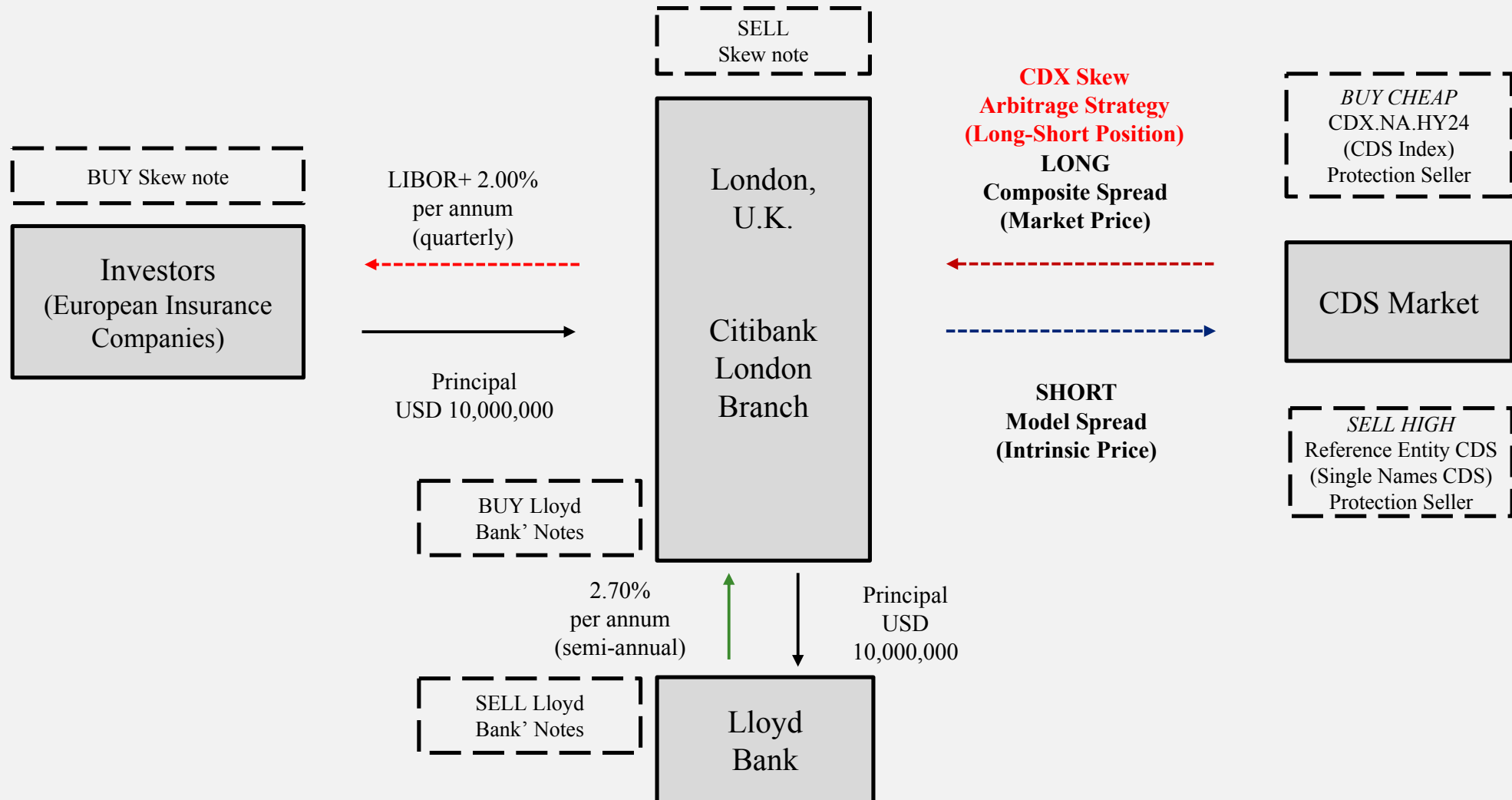
➤ *Now, it has high likelihood to guarantee the investor's principal.*
➤ *And plus fixed cash flows.*

Additional benefit (Tax and Risk)

In 2016, U.K. corporate tax rate was 19.00%, however, Ireland corporate tax rate was 12.50%.

2016 European Countries Corporate Tax Rates
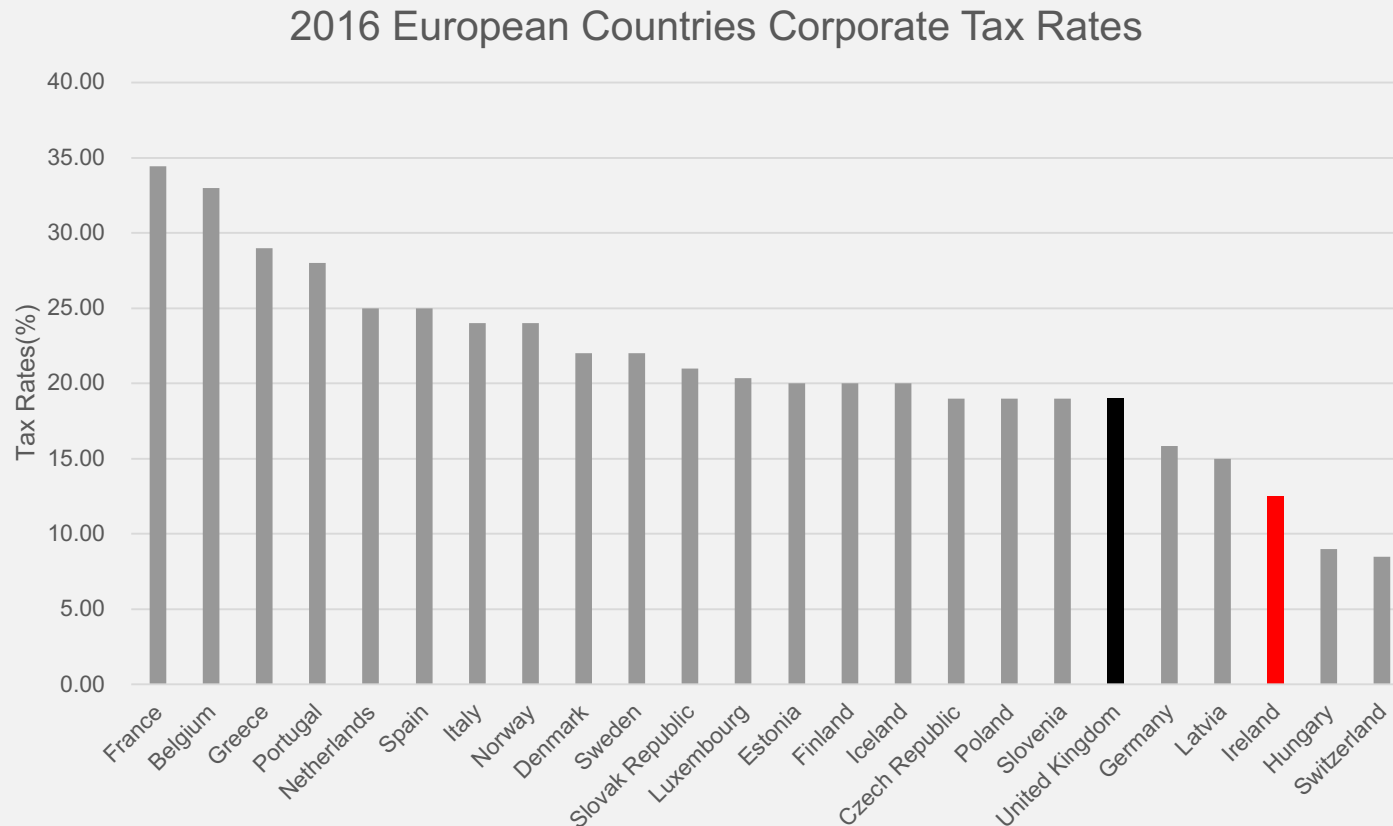
Furthermore, if the bank hopes to insulate CDX skew arbitrage trading's risks ?
- ➢ Found *a special purpose vehicle(SPV).*
- ➢ Where? not in London, *but in Ireland for tax benefits.*
- ➢ And *sign several swap contracts* to move earnings and risks from the bank to SPV.

Step 4, 5, 6. Found SPV and Sign several swap contracts
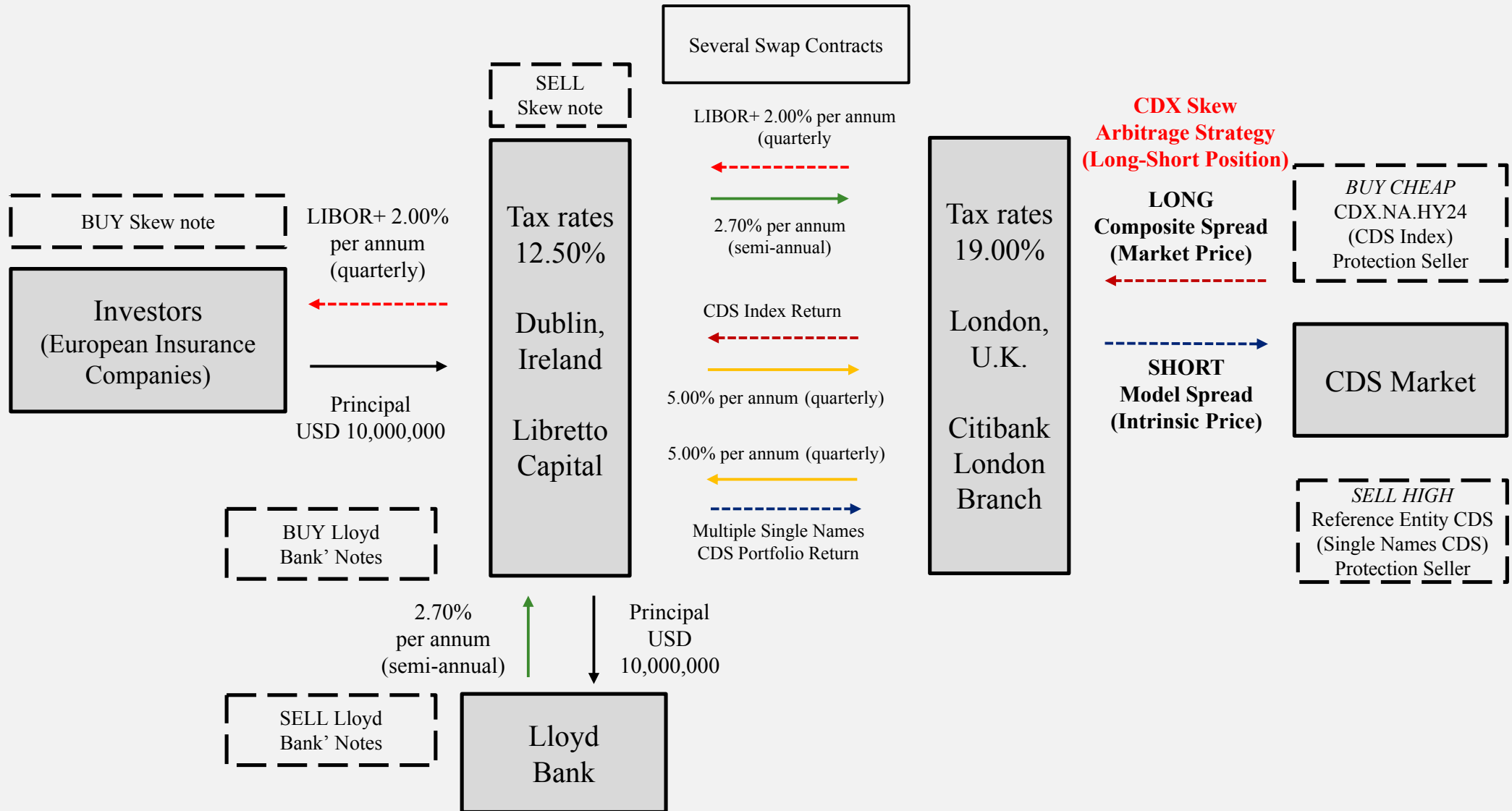
> *Now, a combination of transactions satisfy all participants except…*
> *The tax receiver, namely the government !*

Question 2 : Revisited Big Picture

< STEP 4 >

Interest Rates Swap
Initial Exchange Amount
= Purchase price of Lloyd Bank's Notes – CDX Skew Notes

< STEP 2 >

SELL Skew note

LIBOR + 2.00% per annum (quarterly)

CDX Skew note investor

BUY Skew note

Principal USD 10,000,000
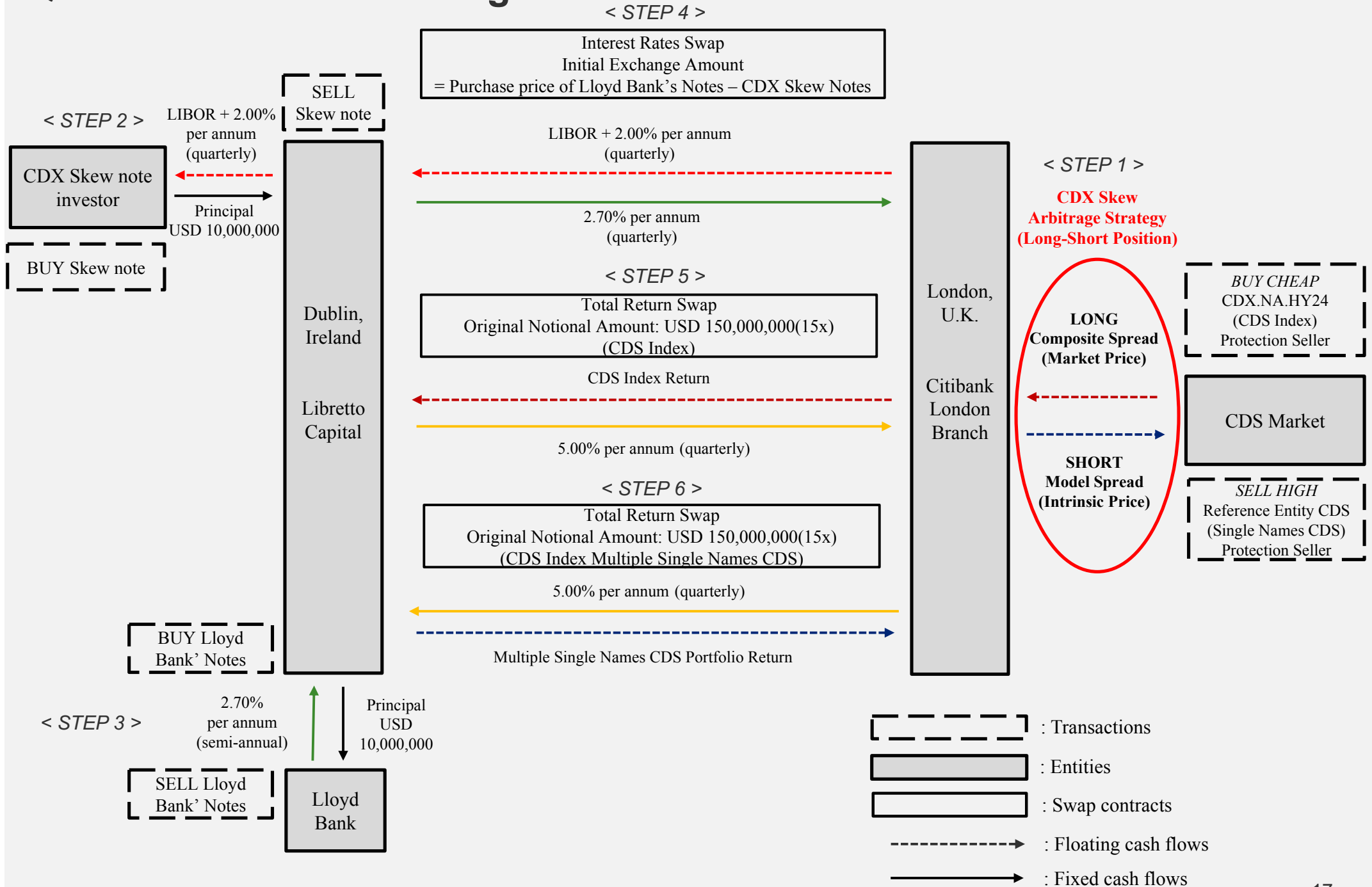
Dublin, Ireland

Libretto Capital

LIBOR + 2.00% per annum (quarterly)

2.70% per annum (quarterly)

London, U.K.

Citibank London Branch

< STEP 1 >

CDX Skew Arbitrage Strategy (Long-Short Position)

LONG Composite Spread (Market Price)

SHORT Model Spread (Intrinsic Price)

BUY CHEAP CDX.NA.HY24 (CDS Index) Protection Seller

CDS Market

SELL HIGH Reference Entity CDS (Single Names CDS) Protection Seller

< STEP 5 >

Total Return Swap
Original Notional Amount: USD 150,000,000(15x)
(CDS Index)

CDS Index Return

5.00% per annum (quarterly)

< STEP 6 >

Total Return Swap
Original Notional Amount: USD 150,000,000(15x)
(CDS Index Multiple Single Names CDS)

5.00% per annum (quarterly)

Multiple Single Names CDS Portfolio Return

BUY Lloyd Bank' Notes

< STEP 3 >

2.70% per annum (semi-annual)

Principal USD 10,000,000

SELL Lloyd Bank' Notes

Lloyd Bank

: Transactions

: Entities

: Swap contracts

: Floating cash flows

: Fixed cash flows

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Question 3: What happens the skew gets more negative?

SKEW = Composite Spread – Model Spread

More negative skew: Larger difference between composite spread and model spread

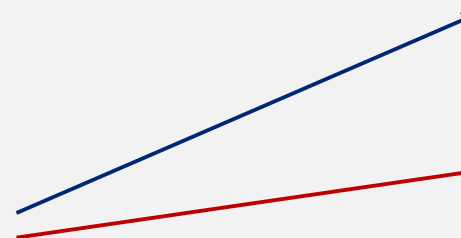|	
Composite Spread	**Marked to Market**
Model Spread	**NOT Marked to Market**

Question 3: Two Cases for Negative Skew

Skew gets more negative means change in model spread is larger than change in composite spread.
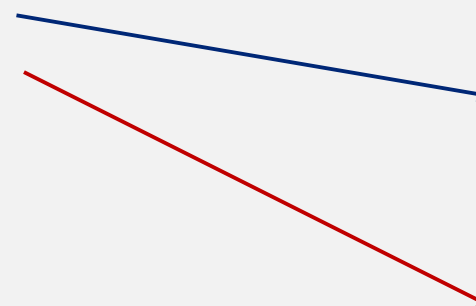
➢ We can separate it into two cases.

1. **ΔModel Spread > ΔComposite Spread > 0**

➢ Cash Flow from Model Spread(Short): 0

➢ Cash Flow from Composite Spread(Long): Positive

2. **0 > ΔModel Spread > ΔComposite Spread**

➢ Cash Flow from Model Spread(Short): 0

➢ Cash Flow from Composite Spread(Long): NEGATIVE

Model Spread

Composite Spread

➢ **Composite Spread ONLY affects intermediate cash flow.**

Question 3: Marking-to-Market Problem – Needs for additional cash

If the skew diverges, there will be negative return to the bank.

➢ The bank has to pay in additional cash because of negative return at terminal date of strategy.

However, sometimes, the bank should pay in additional cash in intermediate period even if the skew converges to zero…

➢ This is because value of long position is not offset by short position.

➢ Composite spread: marked-to-market / model spread: non-marked-to-market.

➢ Higher leverage would make it worse: higher initial margin, higher maintenance margin…

How can overcome this caveat?

➢ If the bank can make marking-to-market value of short position by dynamically trading their short position, marking-to-market value from long position might be offset.

Is it possible to make marking-to-market value manually?

➢ I don't know. Maybe not. It depends on market condition.

Question 3: How does this affect risk/reward characteristics?

Marking-to-market feature has considerable impacts on risk/reward characteristics of the transaction.

➢ It increases notes issuer's credit risk.

➢ The issuer must be ready to fulfill margin.

➢ Cash flow are not matched between long and short position.

Assume: Selling order for CDS index increases dramatically.

➢ Long position value will immediately and rapidly decrease.

➢ The bank should have sufficient funds to hold its long position.

➢ However, there is no offset cash flow from short position because model spread is not marked-to-market.

➢ Possibility of default due to lack of cash.

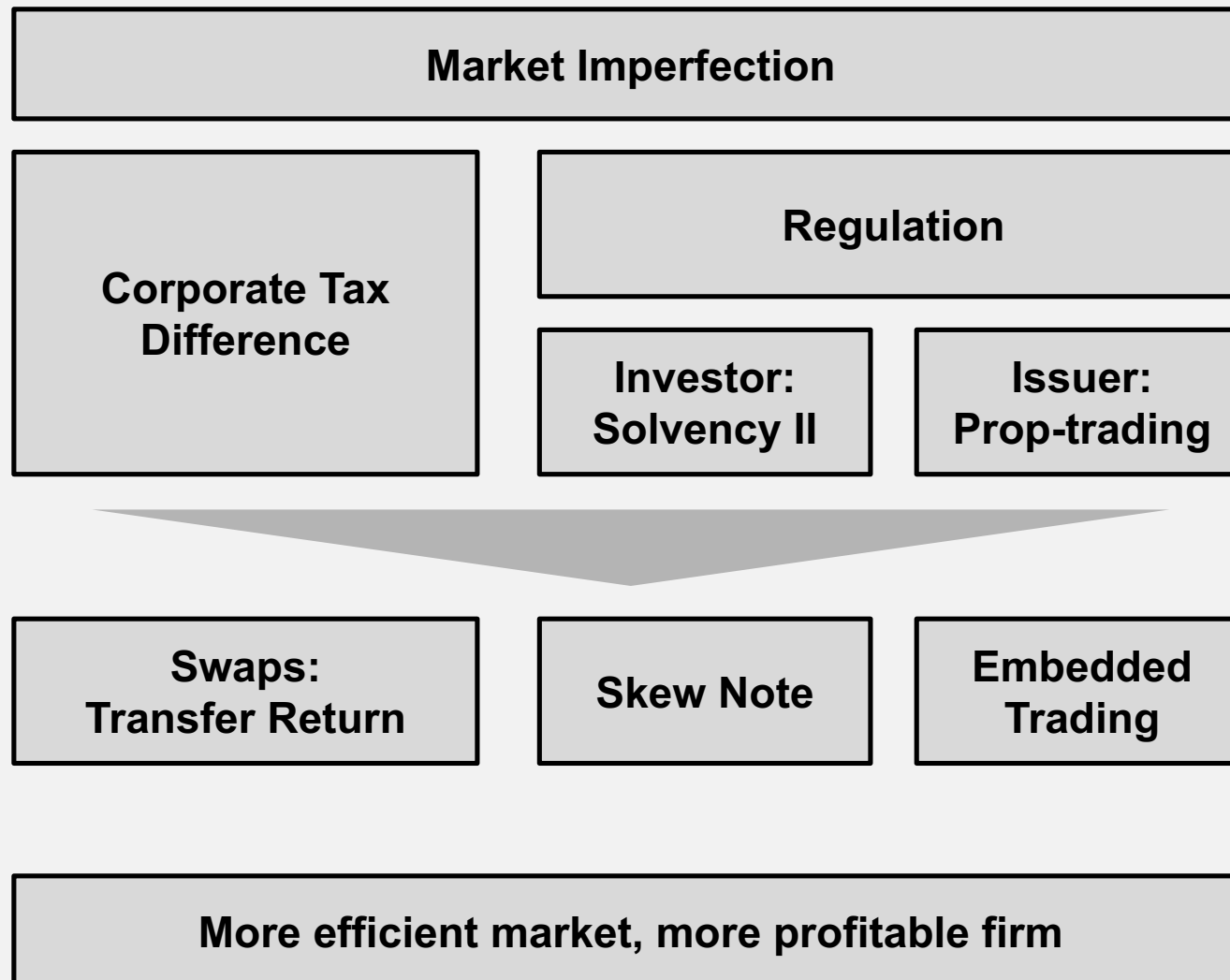# Question 4: What financial engineering problem skew bond solve?

First, what is the "financial engineering problem"?

➢ From the lecture note:

➢ Financial engineers create, analyze, and trade derivative products.

➢ Derivatives <u>get around market imperfections</u>.

➢ Financial engineering is kind of dealing with market imperfection.

Q. <u>How the skew note deals with market imperfections?</u>

Question 4: What financial engineering problem skew bond solve?

Market Imperfection

Corporate Tax Difference

Regulation

Investor: Solvency II

Issuer: Prop-trading

Swaps: Transfer Return

Skew Note

Embedded Trading

More efficient market, more profitable firm

THANK YOU!