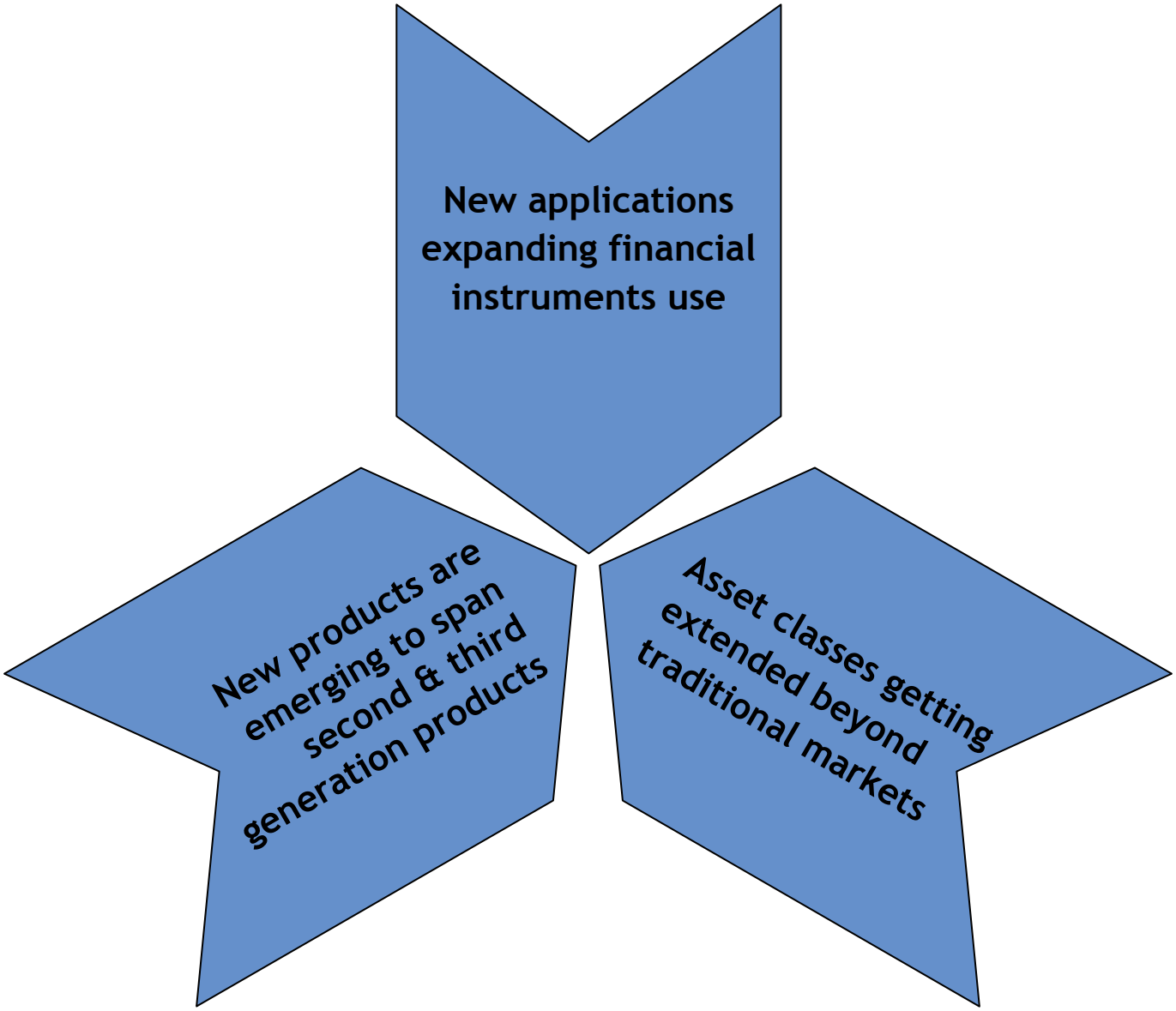
JULY 2006

CREDIT DERIVATIVES

Vaidya Nathan

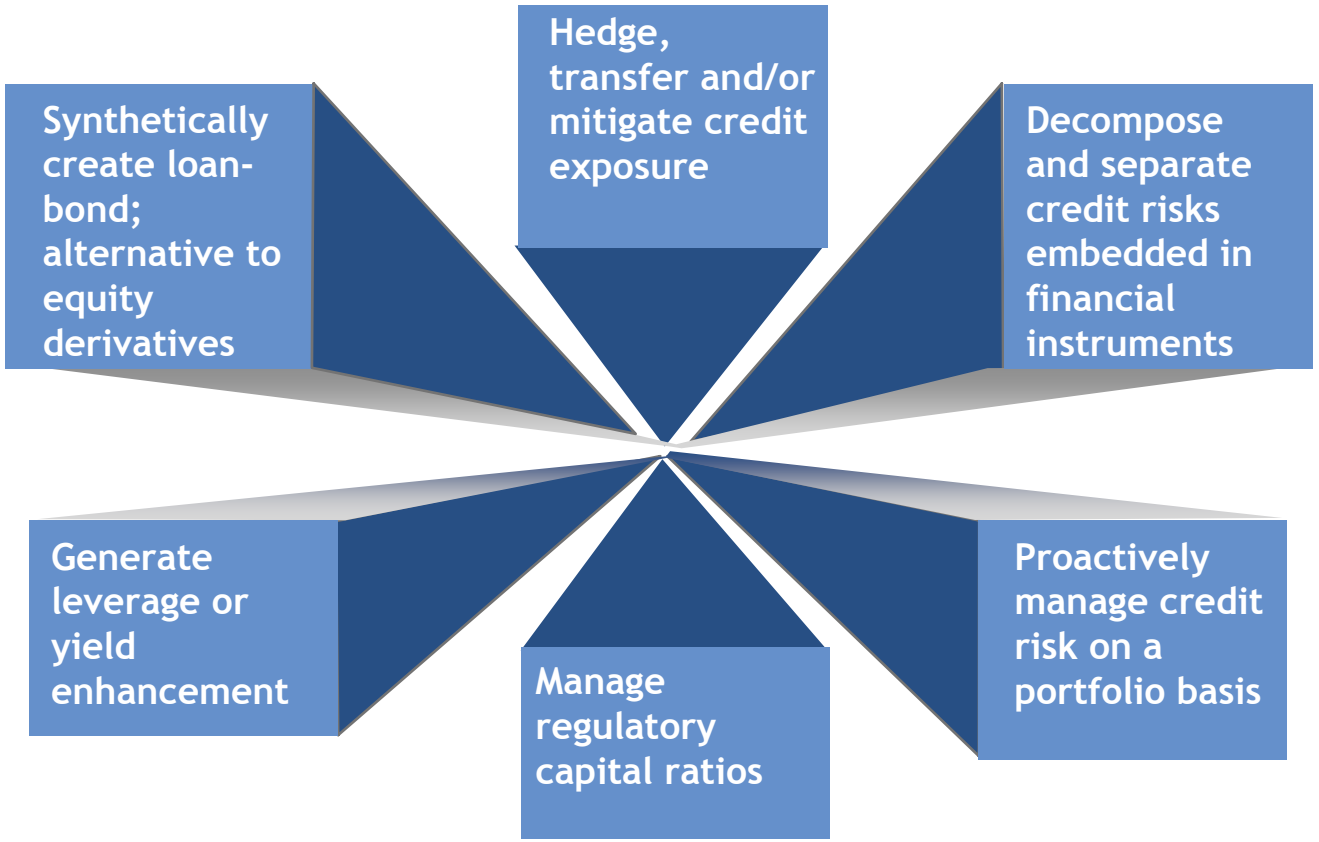
Outline

Credit derivatives in the context of financial markets growth



Role of Credit Derivatives

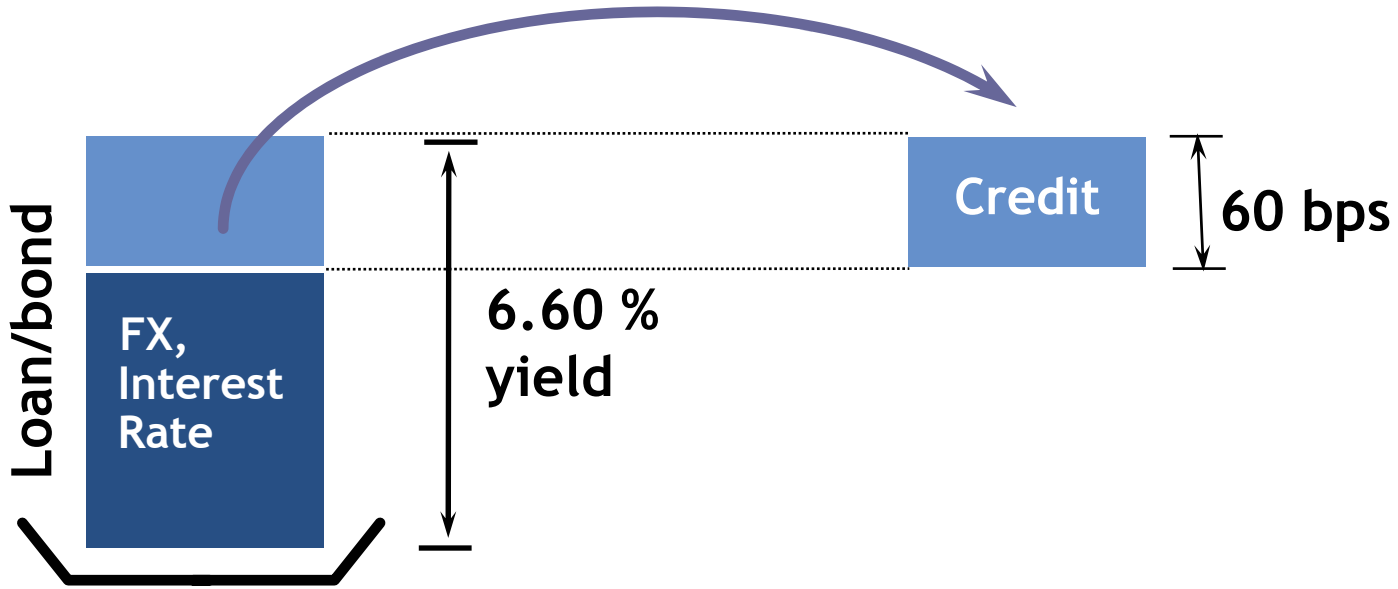
Motivations for use of Credit Derivatives



Credit derivatives isolate and transfer credit risk

Broad definition

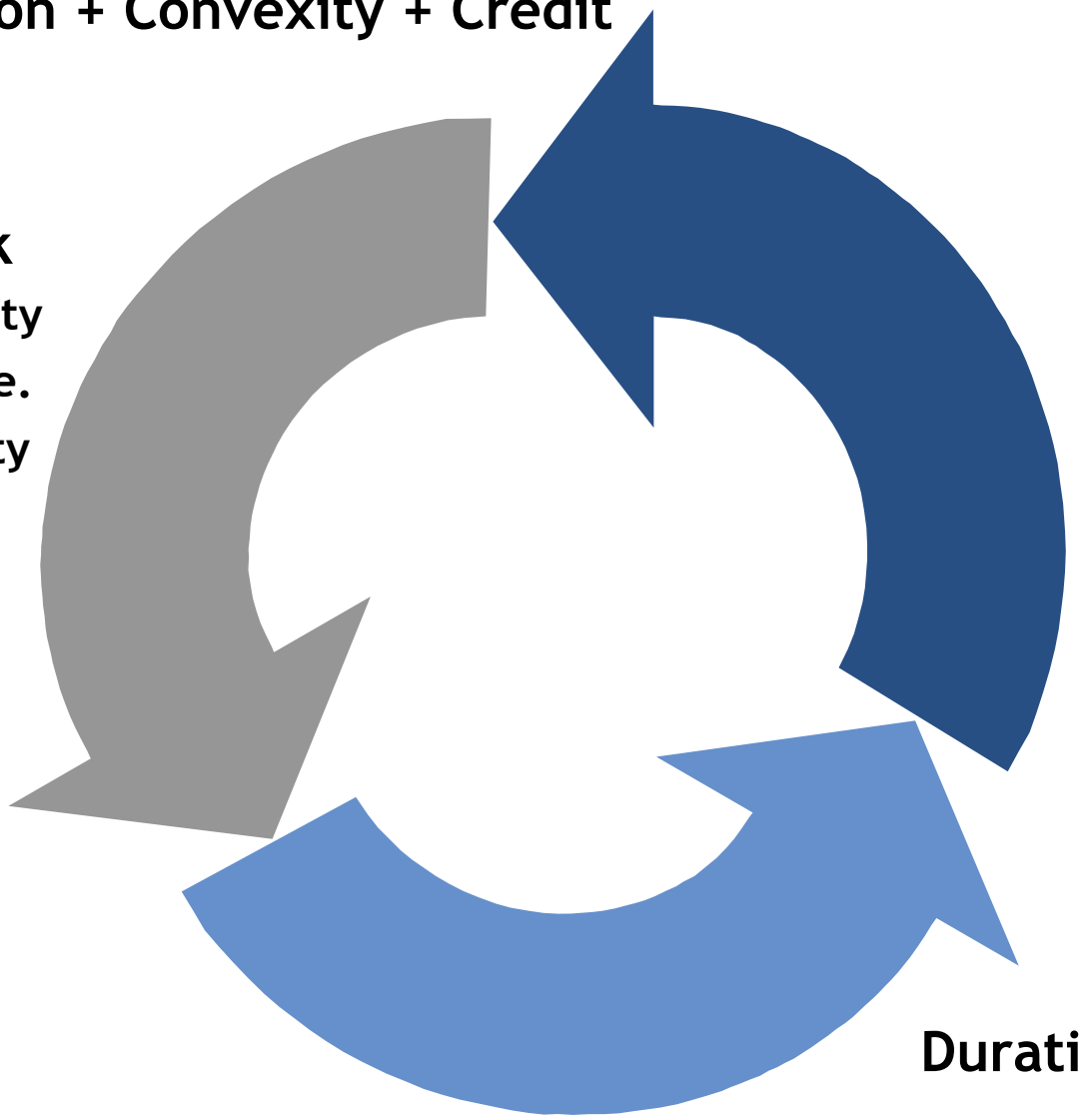
- *bilateral financial contract which allows specific aspects of credit risk to be isolated from the other risks of an instrument, and passed from one counterparty to another*



Credit derivatives perform a market completion role

Bond = Duration + Convexity + Credit

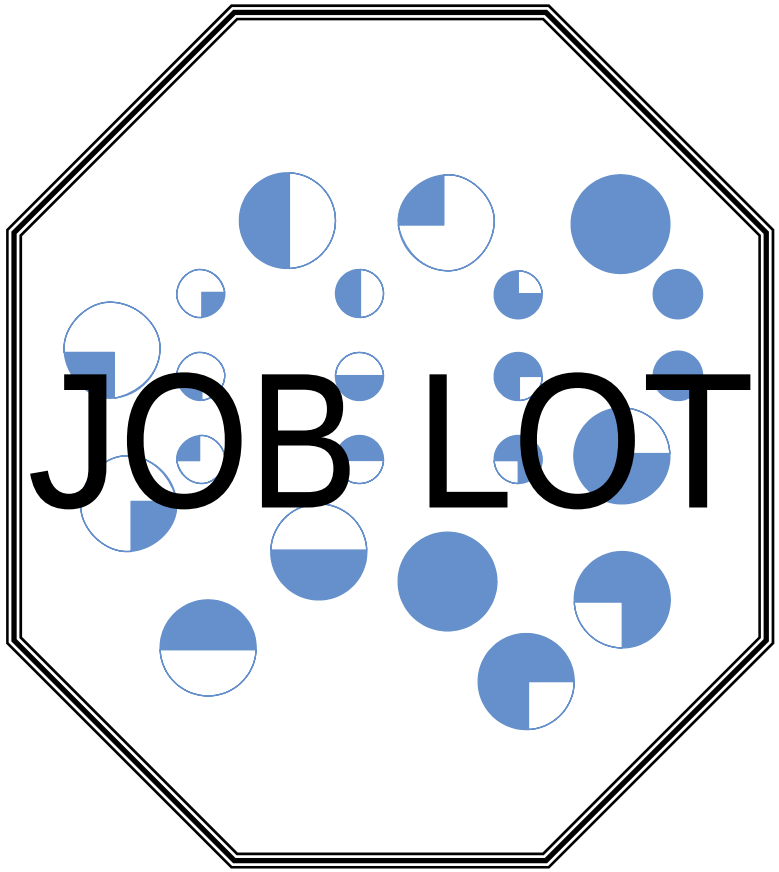
Convexity Risk
including callability risk sometimes i.e. negative convexity



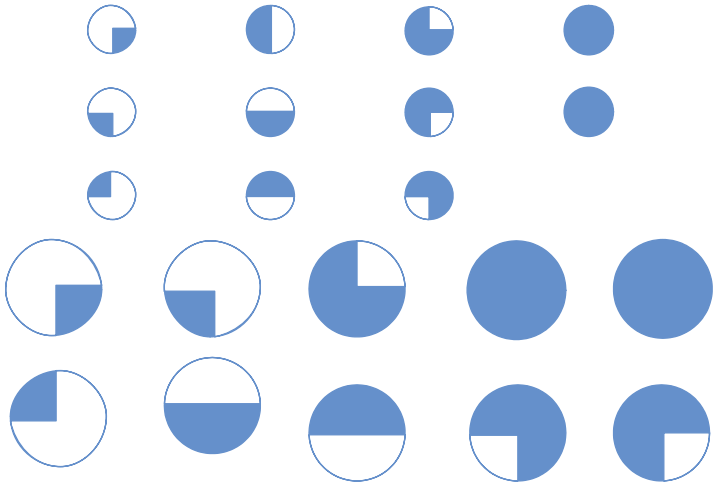
Credit risk

Duration Risk

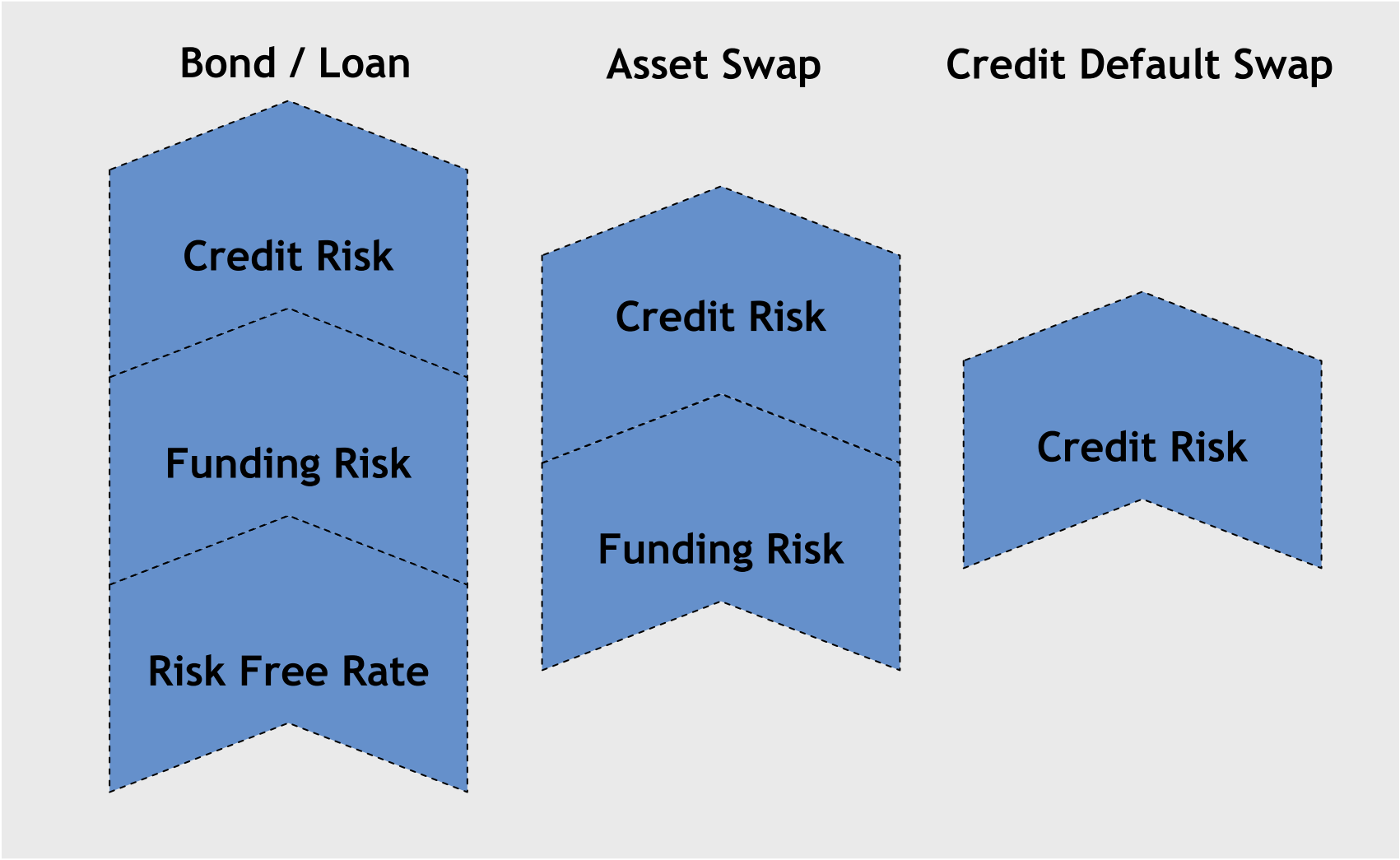
Efficiency gains arising from disaggregating risk



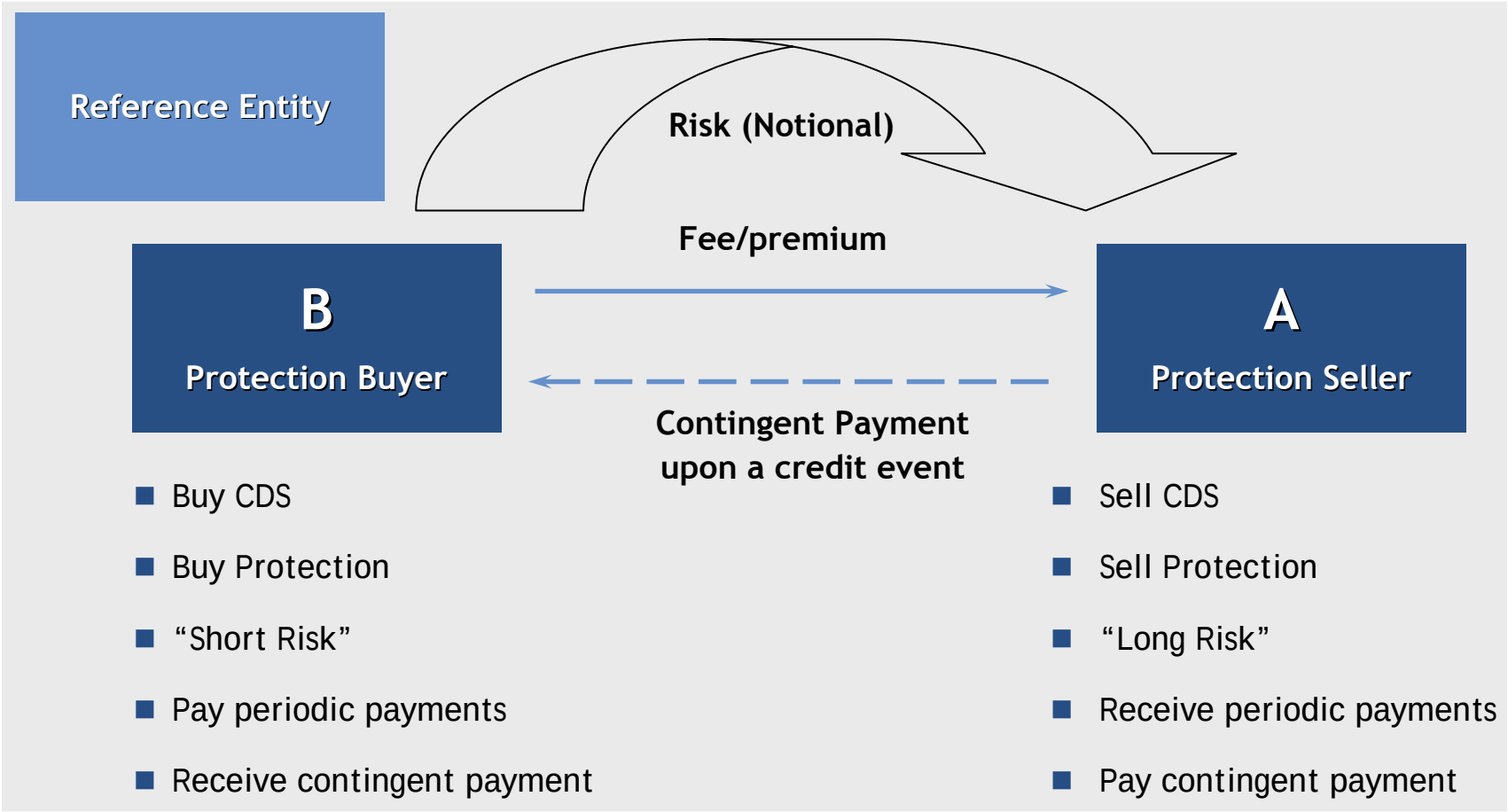
Auctioneer sells a number of risks, each to the highest bidder



Spreads of Credit Default Swaps can be compared to bond yields



The simplest instrument: single name credit default swaps



Indicative Summary Terms of CDS

General Terms

- Effective Date: 23 Nov 2006
- Scheduled Termination Date: 23 Nov 2008
- Floating Rate Payer: X (the "Seller")
- Fixed Rate Payer: Y (the "Buyer")
- Business Day: London & New York
- Business Day Convention: Modified Following
- Reference Entity: ABC
- Reference Obligation(s) - The obligation(s) identified as follows:
  - Primary Obligor: ABC Corporation
  - Maturity: 15 September 2011
  - Coupon: 6.5%
  - CUSIP/ISIN: USXXX
  - Original Issue Amount: USD 1,000,000,000

Fixed Payments

- Fixed Rate Payer Notional: USD 25,000,000
- Fixed Rate Payer Payment Dates: The 23rd of February, May, August and November, commencing on February 23, 2007
- Fixed Rate: X% per annum
- Fixed Rate Day Count Fraction: Actual/360

Floating Payment

- Floating Rate Payer Notional: USD 25,000,000
- Conditions to Payment:
  1. Credit Event Notice
     - Notifying Party: Buyer or Seller
  2. Notice of Publicly Available Information Applicable
     - Public Source(s): Standard Public Sources
     - Specified Number: Two
  3. Notice of Physical Settlement

Indicative Summary Terms of CDS

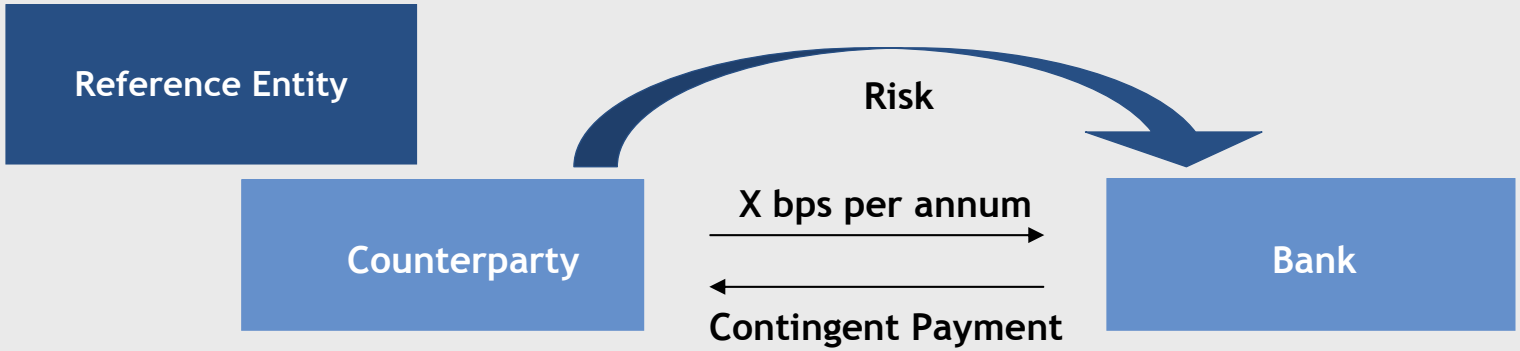
Credit Events

- Credit Events: The following Credit Event(s) shall apply to this Transaction:
  - Bankruptcy
  - Failure to Pay
  - Restructuring
- Grace Period Extension: Not Applicable
- Payment Requirement: USD 1,000,000 or its equivalent in the relevant Obligation Currency
- Default Requirement: USD 10,000,000 or its equivalent in the relevant Obligation Currency
- Obligations:
  - Obligation Category: Borrowed Money
  - Obligation Characteristics: None

Settlement Terms

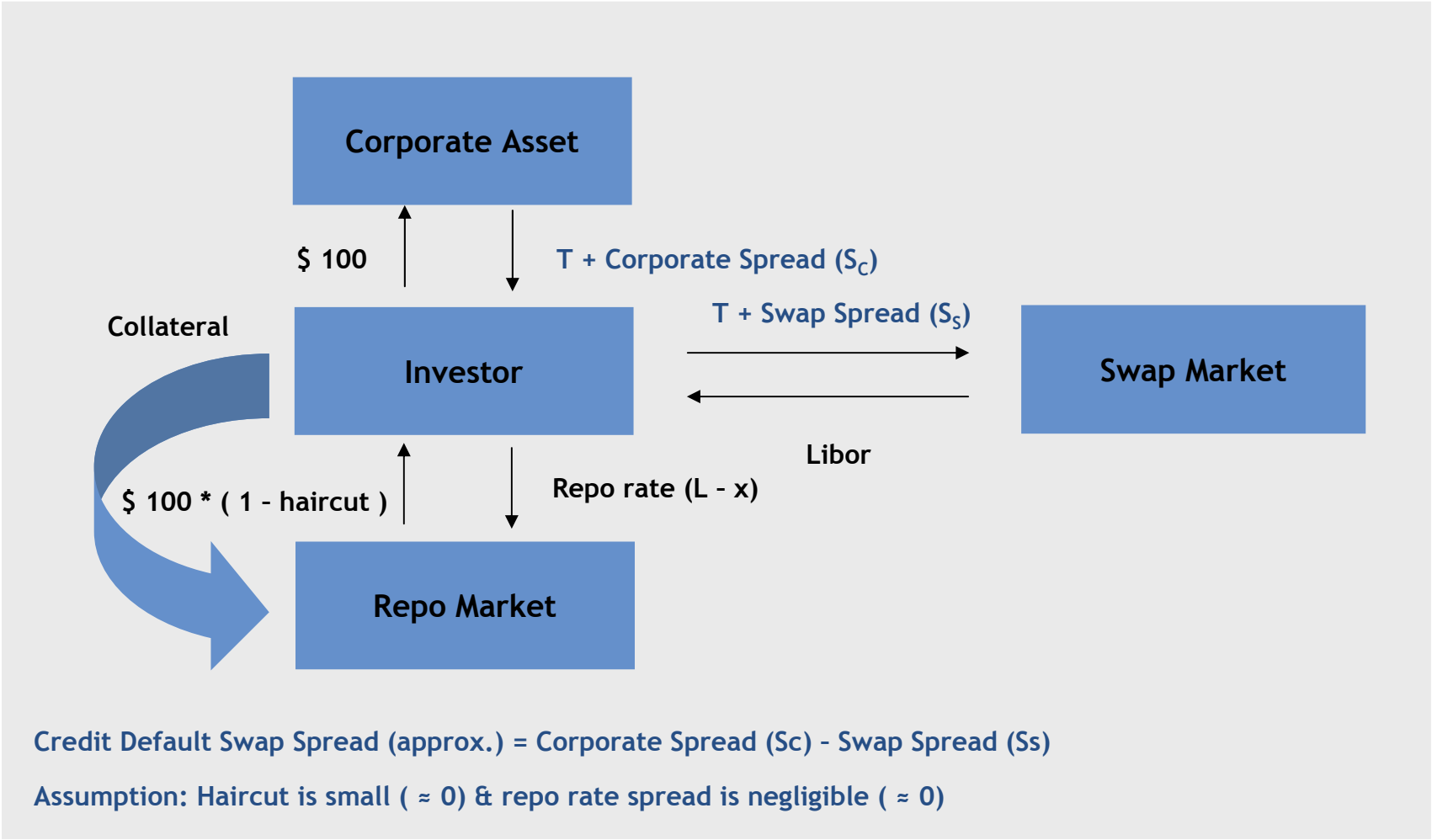
- Settlement Method: Physical Settlement
- Physical Settlement Period: Section 8.5 of the ISDA Credit Derivatives Definitions, subject to a maximum of 30 Business Days
- Portfolio: Exclude Accrued Interest
- Deliverable Obligation Category: Bond or Loan
- Deliverable Obligation Characteristics:
  - Pari Passu Ranking
  - Specified Currencies: Standard Specified Currencies
  - Assignable Loan
  - Consent Required Loan
  - Transferable
  - Not Contingent
  - Maximum Maturity: 30 years
  - Not Bearer
  - Restructuring Maturity Limitation Applicable

In reality assumes two names risk



- Buyer decreases exposure to Reference Credit(s), but assumes contingent ("two-name") exposure to Seller
- Seller receives a fee in return for making a Contingent Payment if there is a Credit Event of the Reference Credit which in turn depends on the financial health of the bank

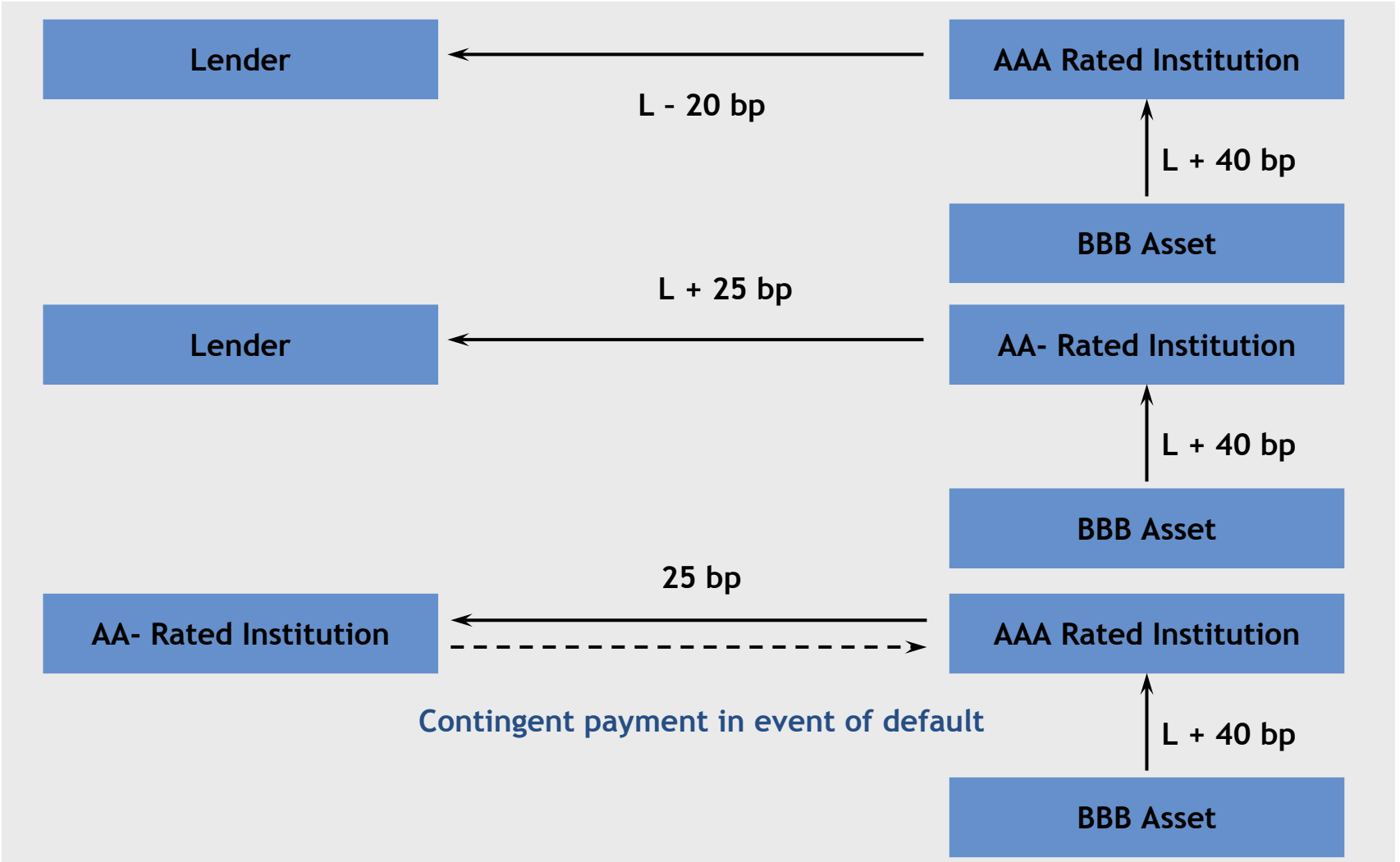
Replicating a Credit Default Swap



Credit Default Swap Spread (approx.) = Corporate Spread (Sc) - Swap Spread (Ss)

Assumption: Haircut is small (≈ 0) & repo rate spread is negligible (≈ 0)

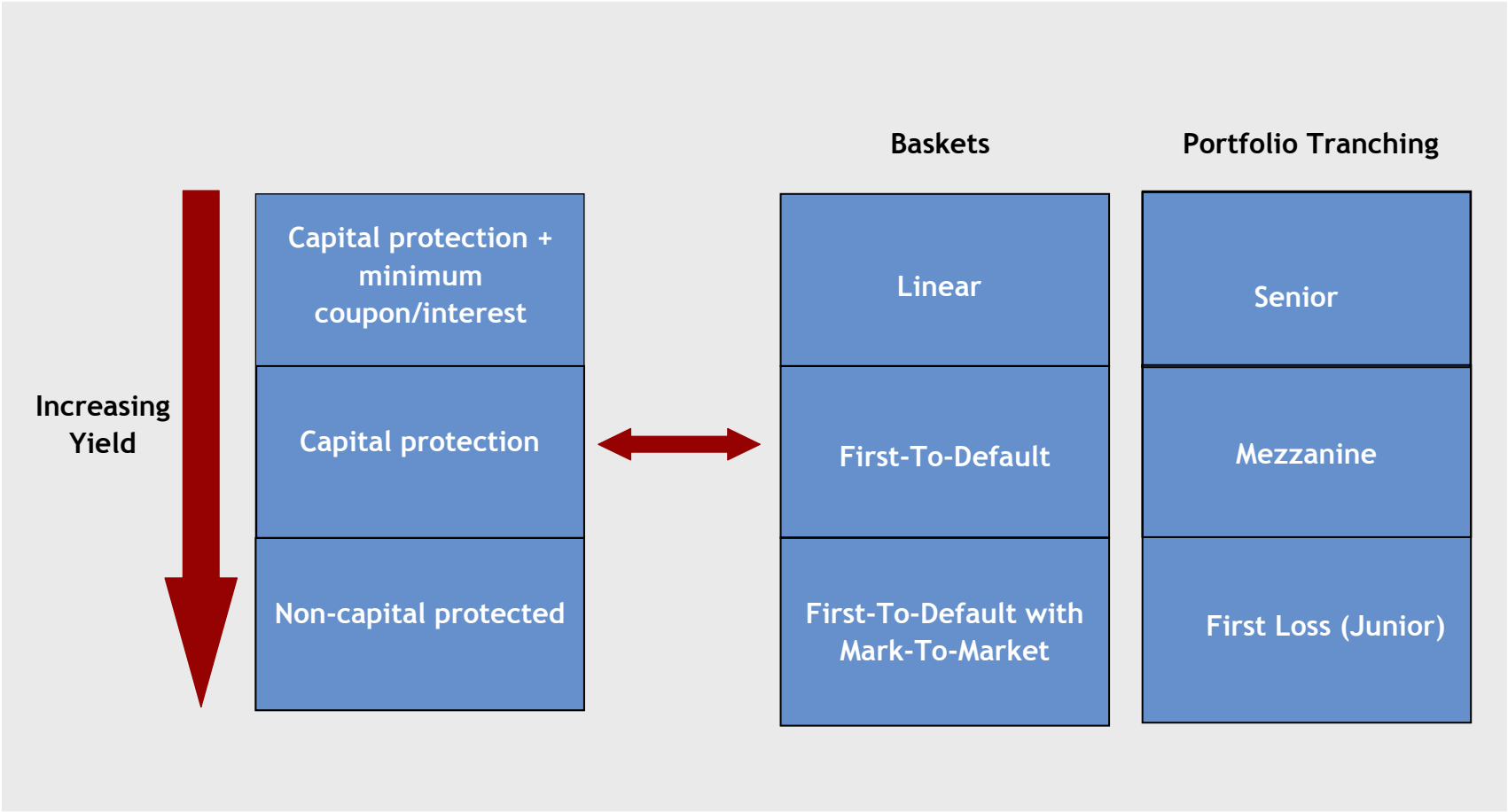
Funding Cost Arbitrage



Credit Assessment	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to B-	Below B-	Unrated
Risk Weight	20%	50%	100%	100%	150%	100%

Outline

Degrees of leverage in various Credit Derivative structures

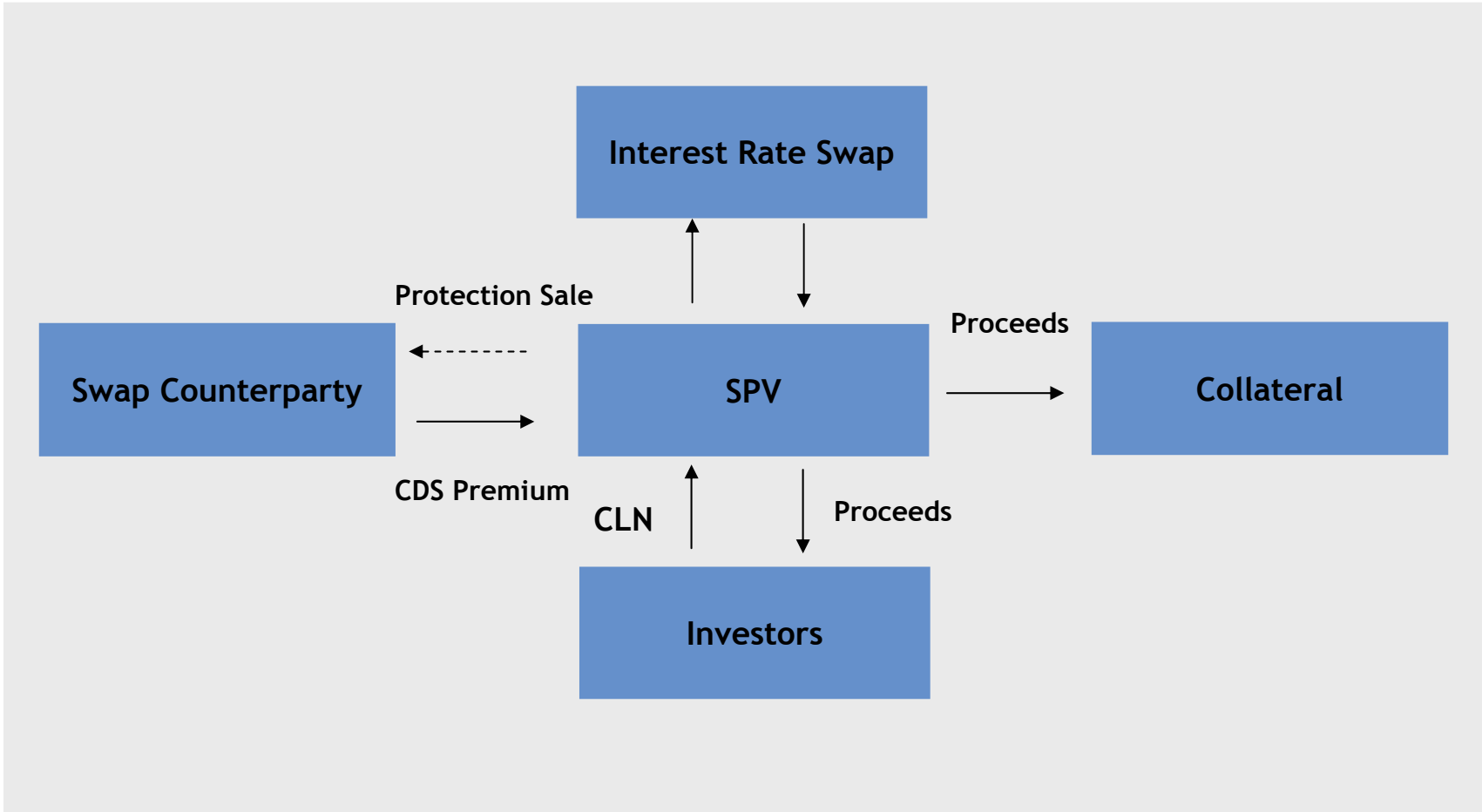


Ab Initio - Credit-linked notes

Tailored notes

- Structured for investor's required currency, maturity, and coupon needs
- CLNs can be rated and / or listed if required
- Both physical and cash delivery are available to the investor
- Provide solutions for many investors restricted from entering into OTC transactions
- Provide investors with yield and minimum ratings requirements through leveraged high grade structures

Structure of a Typical CLN

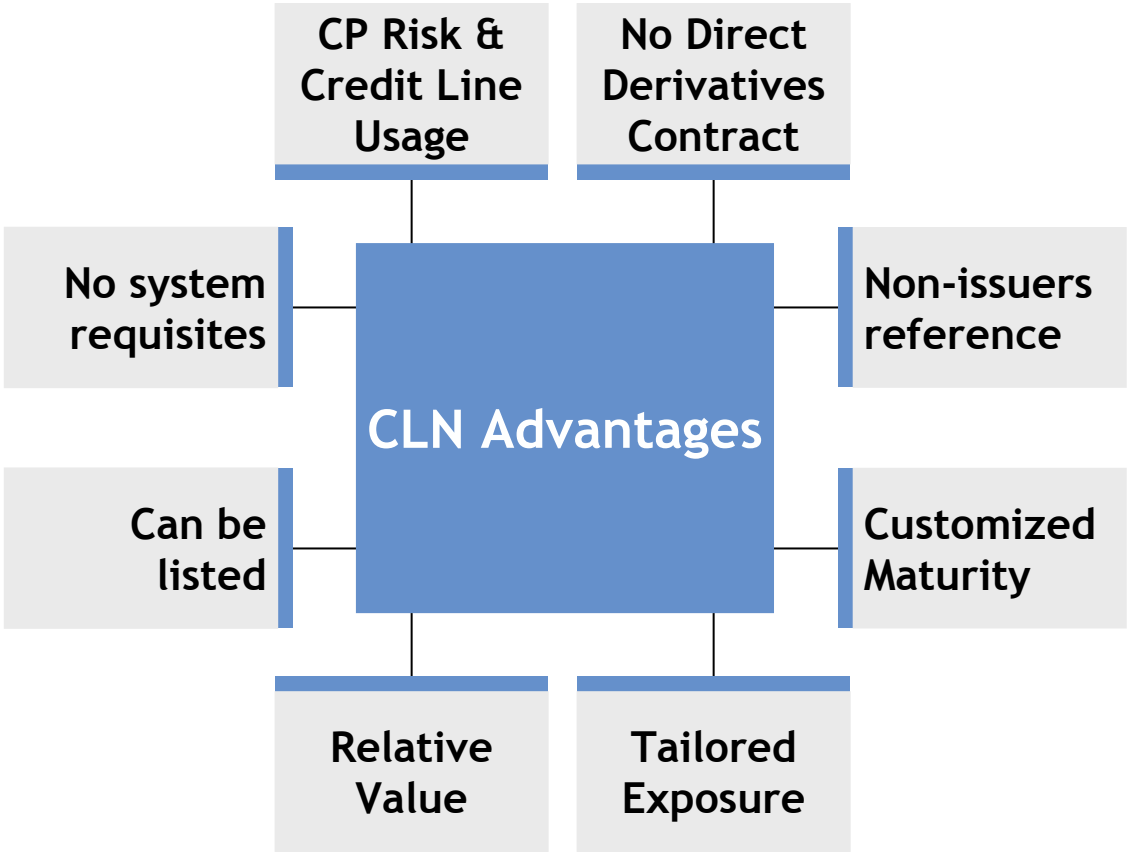


Linear Baskets

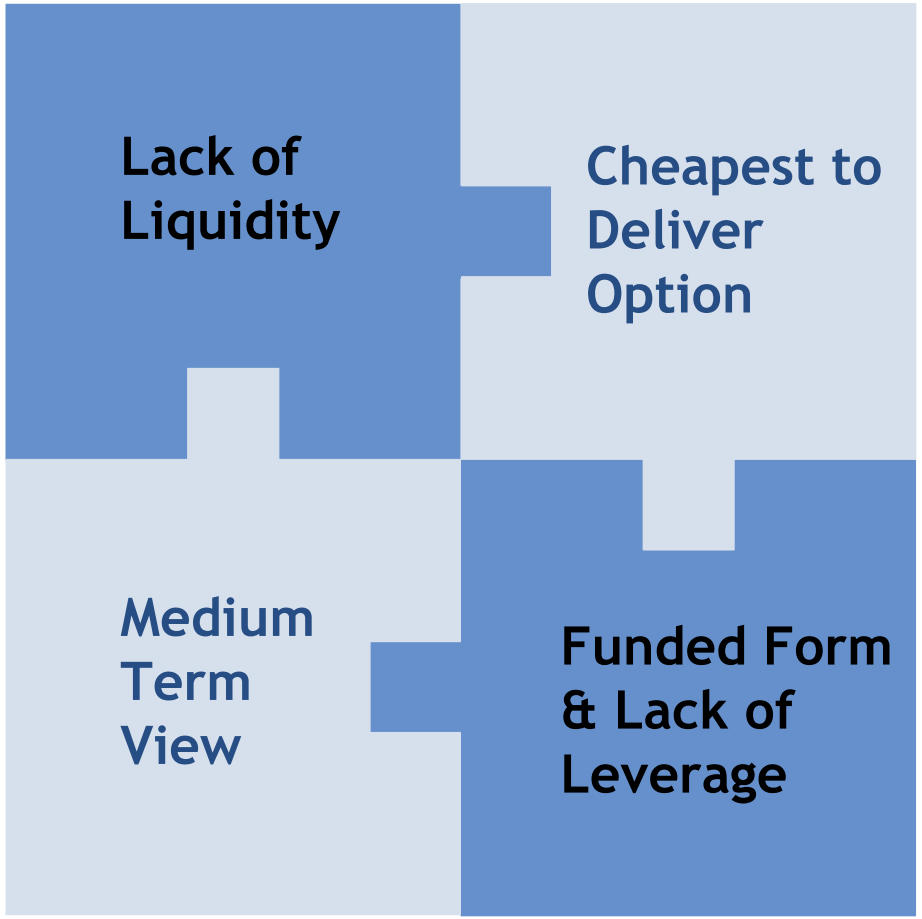
Linear basket swaps allow investors to gain exposure to multiple credits in one trade

- Risk buyer takes on exposure to each credit equal to the 1/N of the notional of the basket, where N is the number of credits in the basket (assuming equal weighting)
- After the first credit event:
  - swap on the defaulted credit terminates,
  - notional of the trade is reduced by the notional of the defaulted credit,
  - the investor bears exposure to the non-defaulted credits
- Yield on these structures is additive, since each credit is independent of the other (the same as yield on first-to-default basket with zero correlation)
- Advantage of less documentation by taking exposure to many credits in one single trade

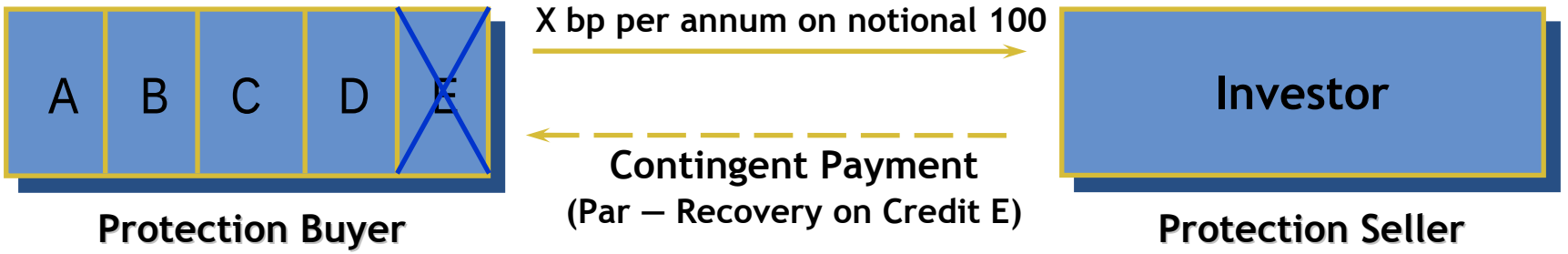
Advantages of Credit Linked Notes



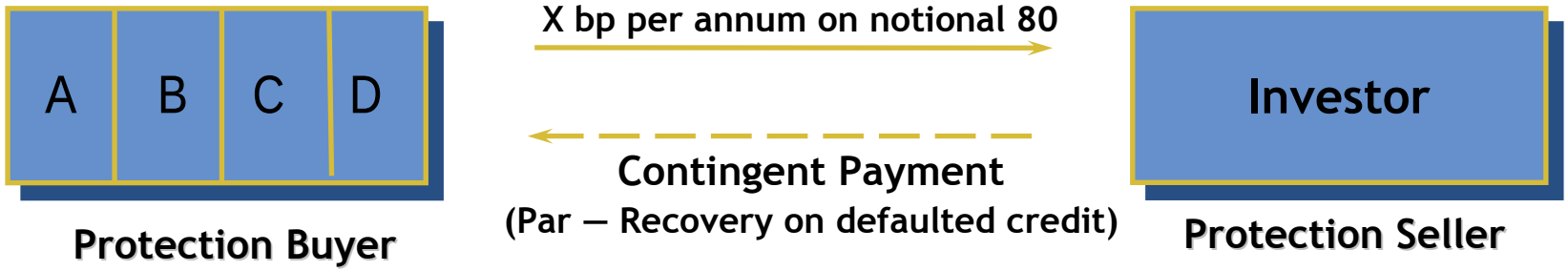
Disadvantages of CLNs



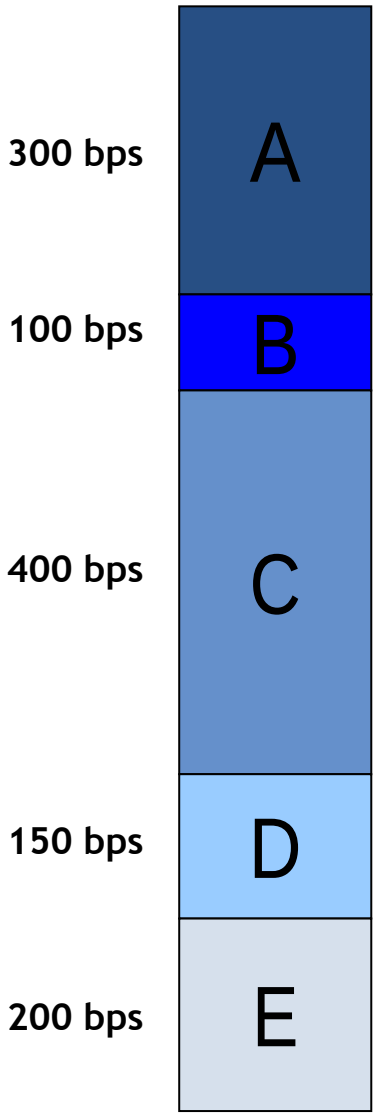
Linear Baskets - an illustration



Example: Green Bottle Swap on 5 equally weighted names on a notional of 100
If Credit E defaults, Protection Seller pays Par and receives the Recovery Value on Credit E
The rest of the swap remains, with the notional falling to 80



Linear Basket - Example



Equal weighted Linear Basket Spread

= (300 + 100 +400 + 150 +200)/5

=230 bps

Benefits of CDX

Liquidity

Use Credit Default Swaps to maximize liquidity - portfolios are composed of the most liquid credit default swap names

Diversification

Cost efficient and timely access to the Credit Markets via index swaps and credit-linked securities

Transparency

Daily reports on actual versus theoretical pricing

CDS indices: CDX and iTraxx

Two major CDS indices trade actively at tight bid-ask spreads

- DJ CDX in North America has 125 names
- DJ iTraxx Europe has 125 names

Weekly fixings on three CDS indices: DJ iTraxx Europe, HiVol index and Crossover index

Can also trade loss tranches on index

- Tranches are like synthetic CDO tranches
- Just as options are way to trade *volatility,* tranches are way to trade default *correlations*
- One-factor Gaussian copula is standard for *quoting* correlations

CDS indices for Asia and Australia

Nonlinearity of risky duration for half and double credit spreads

- iTraxx CJ has 50 Japanese names, with sub-indices for capital goods, tech and HiVol
- iTraxx Asia has 30 names from outside Japan with sub-indices for Korea, Greater China and rest of Asia
- iTraxx Australia has 25 names
- CDX.EM has 14 emerging market sovereigns, including Korea, Malaysia and the Philippines

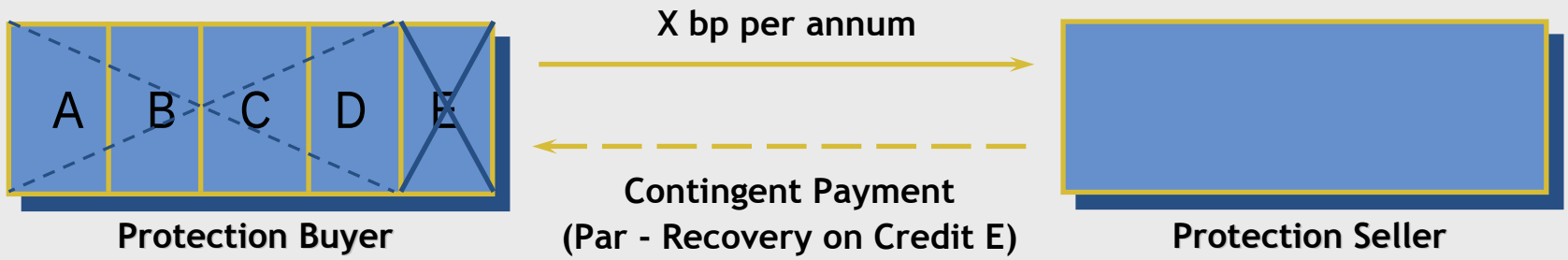
Outline

First To Default (FTD) Baskets

First-to-default basket swaps allow investors to leverage their exposure to a basket of credits

- After the first credit event, the first-to-default swap terminates and the investor no longer bears exposure to the non-defaulted credits
- Yield enhancement in these structures basically depends on the correlation of the names in the basket
- Risk buyer takes on exposure to each credit equal to the notional of the basket, thus achieving leverage of the number of names in the basket

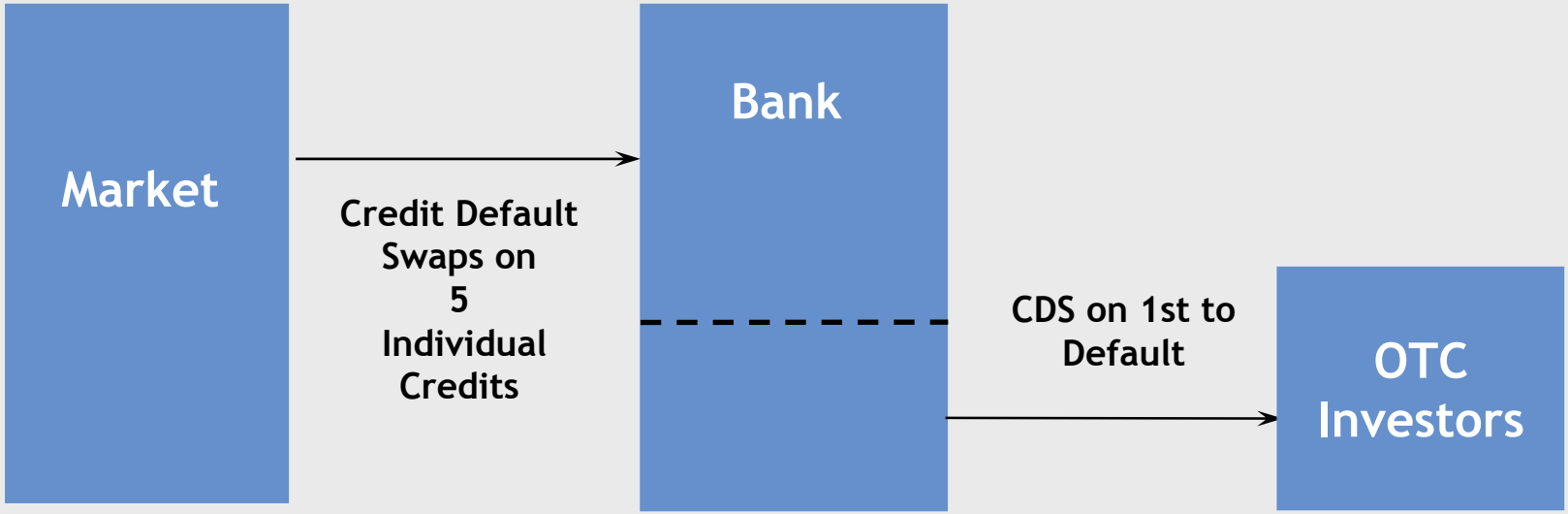
First To Default (FTD) Baskets — an illustration



- If Credit E defaults, Protection Seller pays Par and receives the Recovery Value on Credit E
- The first-to-default swap is terminated and Protection Seller has no further exposures
- The greater the correlation, the greater the probability of multiple defaults in the basket

Mechanics of a First To Default Basket Structure

- Risk is sourced from the market
- First to Default Tranche is sold either in bond or swap form
- Bank retains "Senior" Tranche



From individual default probability to basket default probability

Individual default probability → Basket default probability

Correlation of assets → Taking a leveraged exposure to a basket is equivalent to trading the correlation between those names

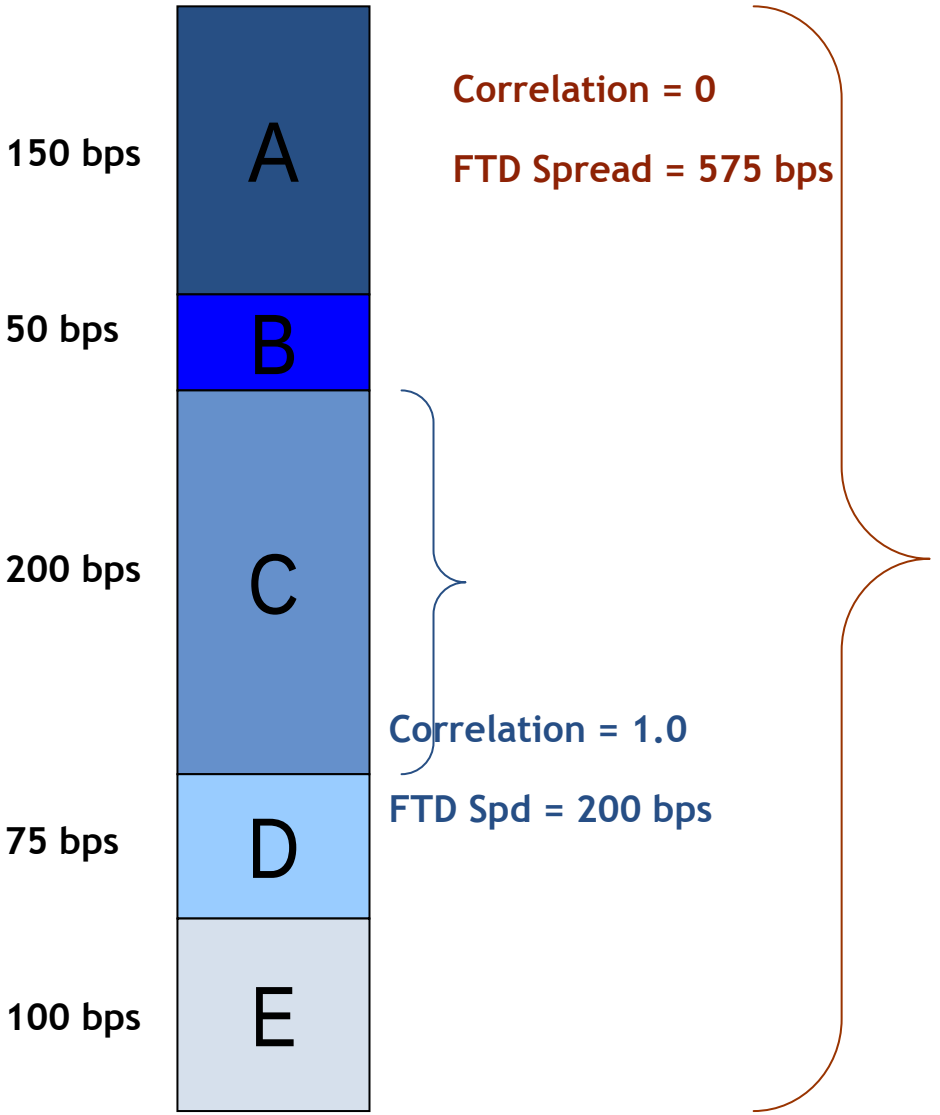
Intuition: The higher the correlation, the lower the spread on the leveraged piece

100% correlation

- The basket behaves like 1 single credit Protection Seller will expect to receive the widest of individual spreads

0% correlation

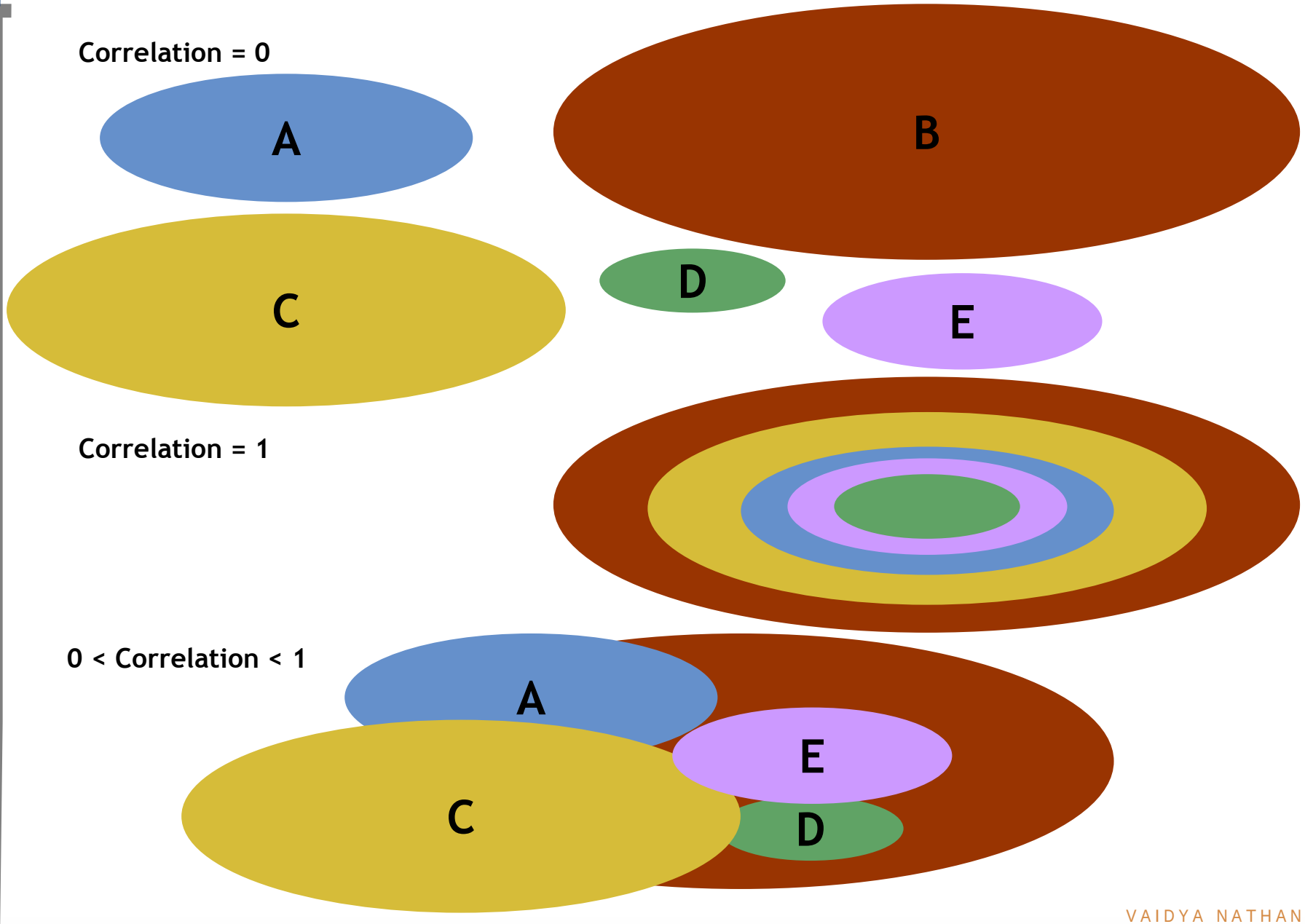
- Each name in the basket behaves independently. Protection Seller should receive the sum of the individual spreads



High and Low Correlation - the Tom & Jerry way

High & Low Correlation

Risk illustrated



Actual FTD trades - Example 1

Background

- Korean client buys FTD loan on six investment grade credits
- 50% of names chosen were local credits
- 50% of names were foreign credits
- Inclusion of foreign credits helps reduce correlation of the basket which inturn helps increase spread
- Non callable

Trade Summary

- Aggregate bid spread: 537 bps
- FTD Basket coupon: 6.75%
- FTD spread over Libor: 335 bps
- FTD spread over Libor as a % of aggregate spread: 62%
- FTD spread over Libor as a % of highest bid spread: 163%

Credit	5-year (bids)
Kookmin Bank	62
KEPCO	54
POSCO	53
Hutchison Whampoa	98
Ford	206
Standard Life Assurance	74

Actual FTD trades - Example 2

Background

- Client buys FTD note on five high yield credits
- Names chosen were high rated (BB) high yield credits
- Clustered spreads
- Spreads have low correlation to maximize spread
- Non callable

Trade Summary

- Aggregate bid spread: 950 bps
- FTD Basket coupon: 10.60%
- FTD spread over Libor: 720 bps
- FTD spread over Libor as a % of aggregate spread: 75%
- FTD spread over Libor as a % of highest bid spread: 335%

Credit	5-year (bids)	Rating
Amerisource Corporation	160	Ba3/BB
Chesapeake Energy Corporation	215	Ba3/BB-
Mandalay Resort Group	210	Ba2/BB+
Flextronics International Ltd	167	Ba2/BB-
Georgia Pacific Corporation	208	Ba2/BB+

Actual FTD trades - Example 3

Background

- Client buys FTD protection on five high yield credits
- Reduced costs relative to hedging each of the individual credits
- Sheds substantial portion of the risk
- Credits have high correlation to minimize cost

Trade Summary

- Aggregate offer spread: 795 bps
- FTD Basket premium: 5.0%
- FTD spread over Libor as a % of aggregate spread: 63%
- FTD spread over Libor as a % of highest bid spread: 222%

Credit	5-year (bids)
Delphi Corporation	113
Ford Motor Company	213
General Motors Acceptance Corporation	157
Lear Corporation	87
Visteorn Corporation	225

Default Correlation

Default correlations are key determinants of hedge ratios which determine basket premiums that dealers are willing to pay. The boundary conditions for the basket premium can be restated in terms of the default correlation as follows:

- Basket premiums should decline with an increase in correlation. A basket of uncorrelated credits trading at similar spreads produces the largest relative increase in premium compared to the average single-name default swap premium
- Default correlations impact the likelihood of multiple defaults up to a given time horizon. In practice, there is a lack of historical data that could be used to extract default correlations. Instead, market players use the asset correlation to calculate default correlation
- Asset correlations can be extracted from the ability-to-pay process of a portfolio of firms. Such a process is modeled for an individual firm as its market value of assets minus liabilities. Market inputs are equity and debt data. The asset correlation derived in this manner is deterministically related to the default correlation, i.e. one can be transformed into the other
- The most difficult factor to incorporate in the model for pricing basket products is the estimation of the underlying correlations. Estimating the correlation between two default events cannot be achieved by standard statistical methods. Instead some proxy for default or credit behaviour must be used

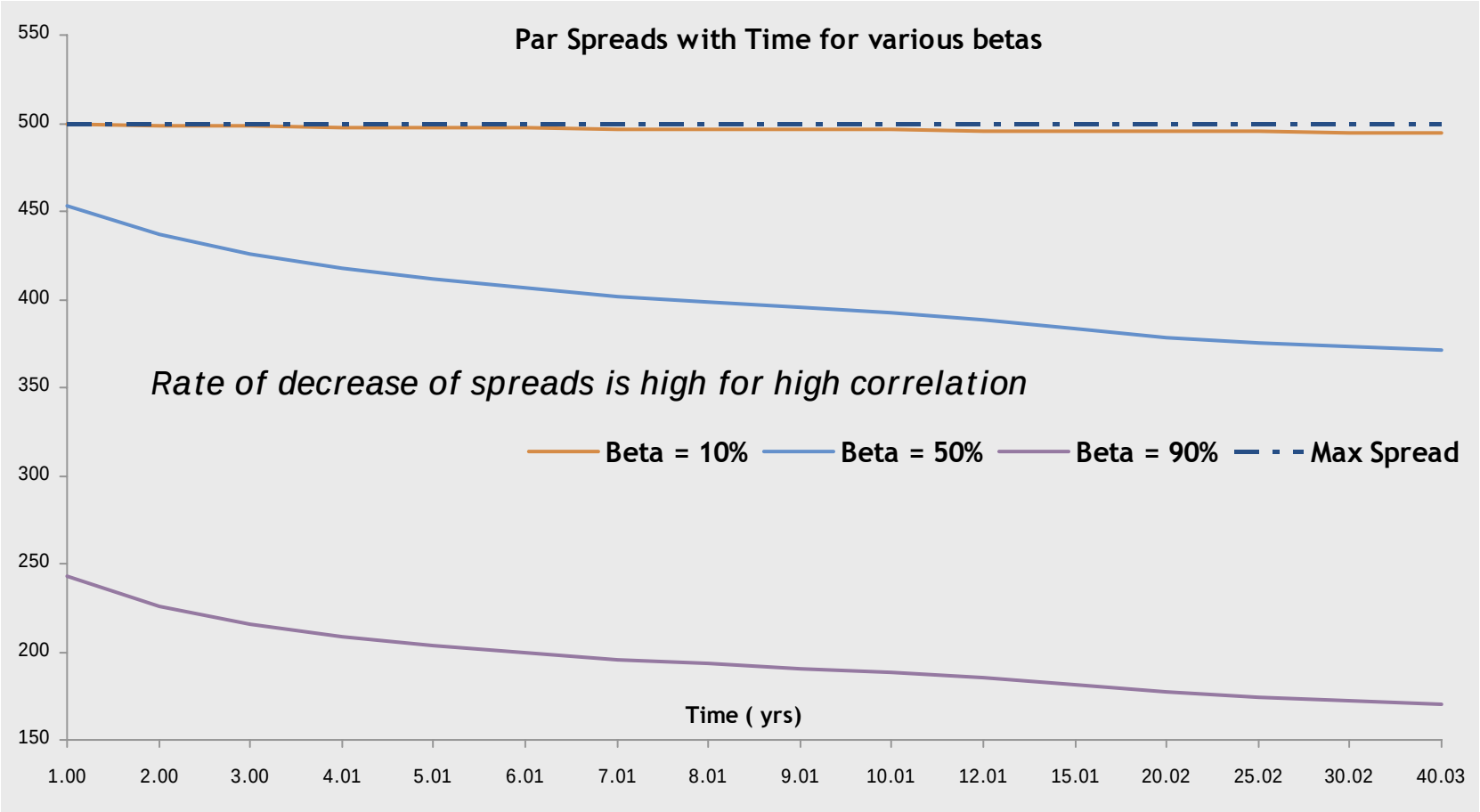
How to deal with correlation?

Model the correlation between names as a result of the correlation of each name with a systemic "market" variable (CAPM)

- given a market environment, the names default independently
- the probability of default of any given name depends on the market environment
- As correlation approaches zero: FTD Basket Premium = Sum of Basket Component's CDS Spreads
- As correlation approaches one: FTD Basket Premium = Highest Individual CDS Spread in Basket
- Investors wishing to maximize premium generated by selling FTD Basket protection should consider selecting a basket that is relatively uncorrelated

Par spreads for FTD with different betas

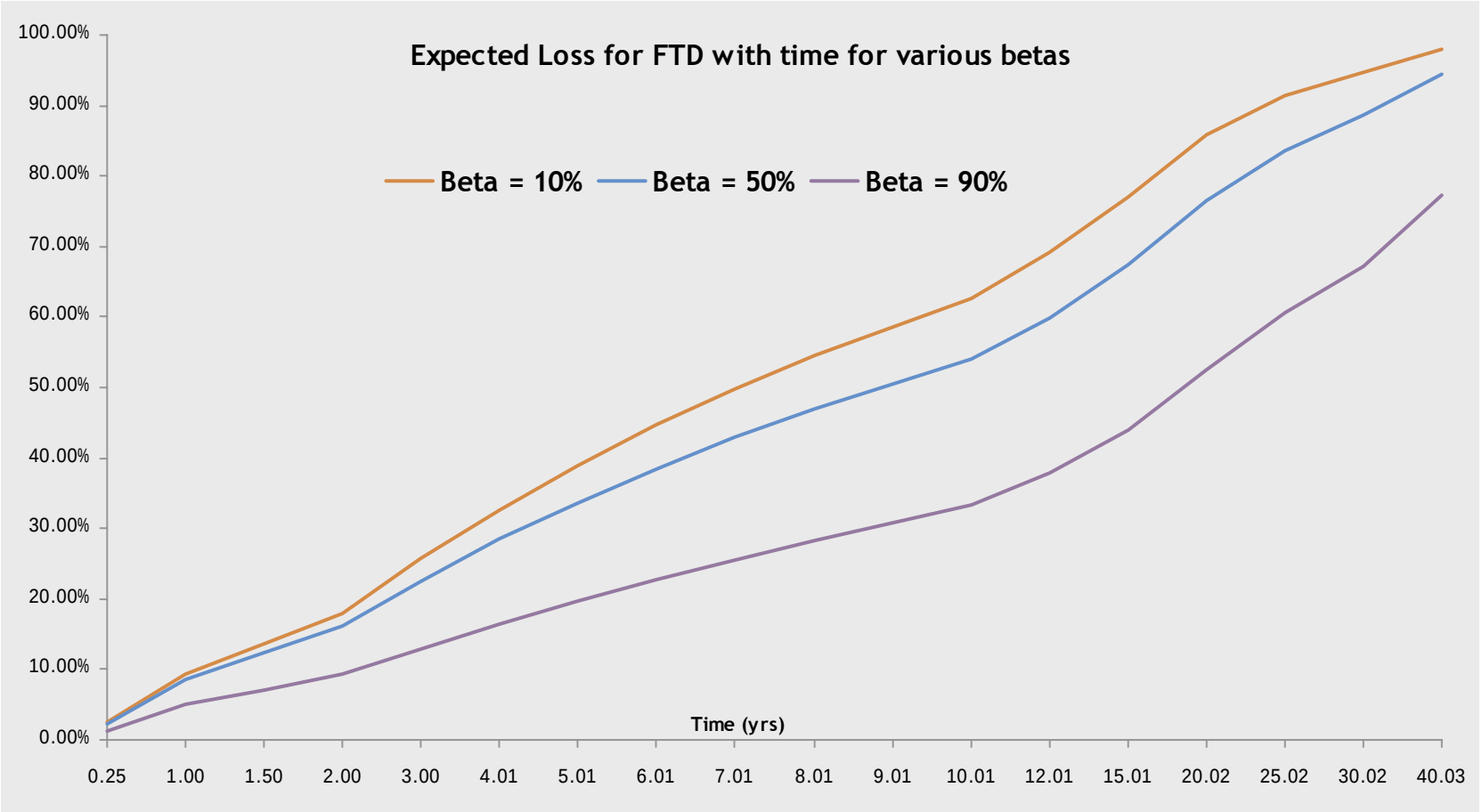
Par spreads for FTD with different betas



Basket of five names each trading at 100 bps. Rate of decrease of spreads is high for high correlation

Expected loss for FTD with different betas

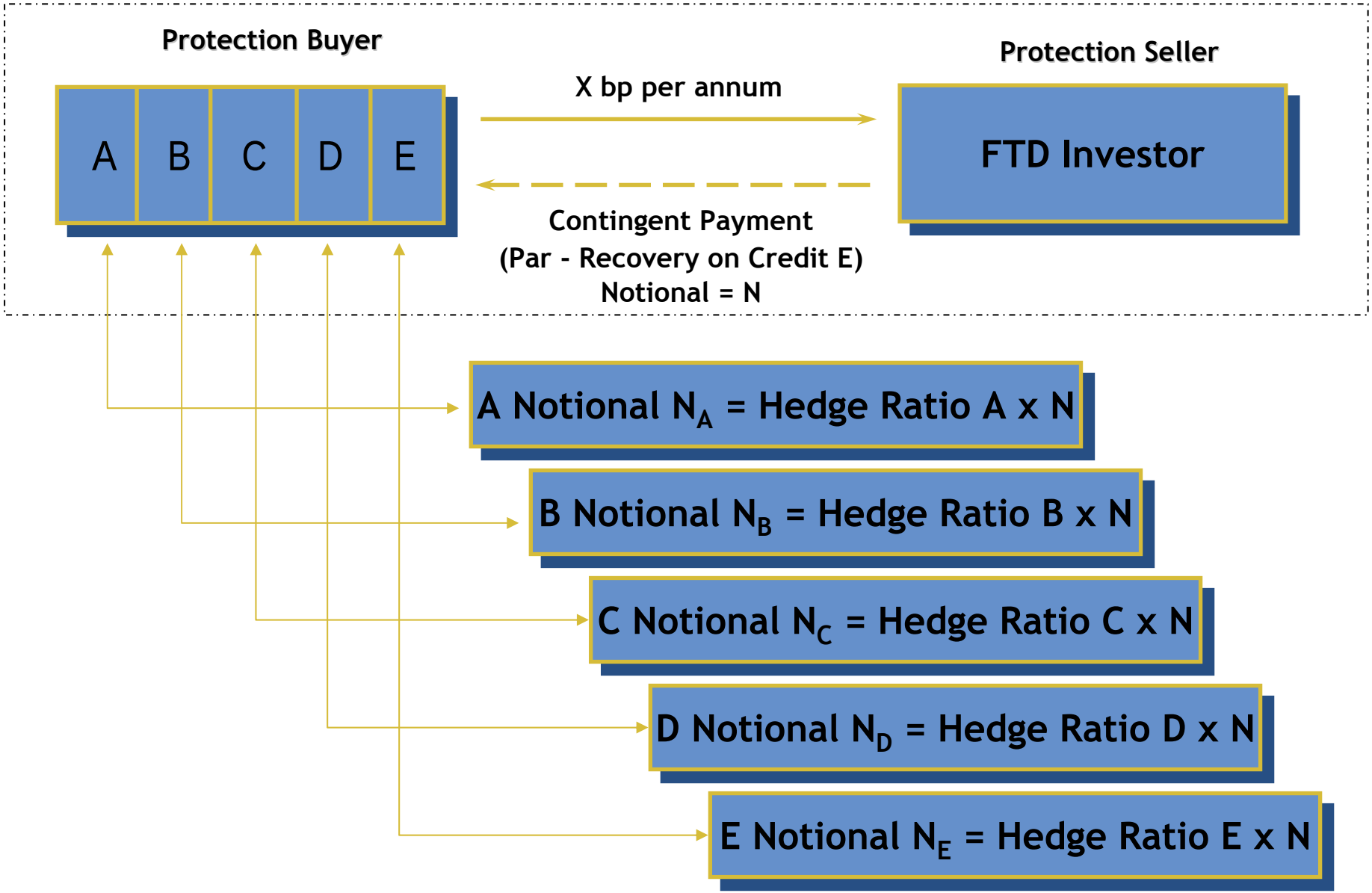
Expected loss for FTD with different betas



Dynamic Hedging Of The FTD Basket

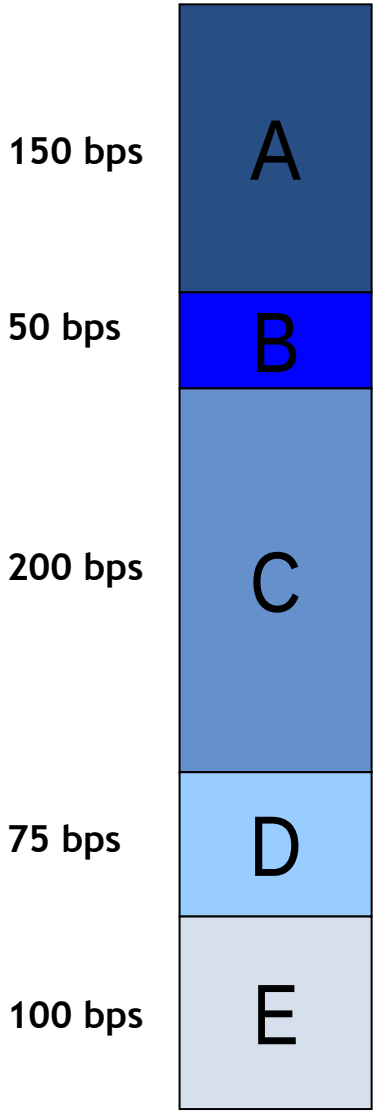
- The hedging behaviour of a dealer provides some intuition behind the actual basket premium
- A dealer that buys protection on a basket from an investor would normally hedge this transaction by selling default protection on each individual name in the basket
- As the underlying default premiums shift, the deltas will change and the hedges will need to be rebalanced dynamically
- The efficiency with which the hedge can be managed is a key factor that determines the basket premium
- For small movements in the hedge ratio, the dealer may not be able to sell or buy protection and may instead buy or sell bonds to hedge, thus taking on basis risk

Dynamic Hedging Of The FTD Basket



Dynamic Hedging of FTD Basket

- Following a credit event, the dealer will be forced to unwind the hedges on the other credits (assuming non-zero deltas for these credits)
- The cost of unwinding the hedge would depend on the spread movement for each of the non-defaulted credits. This, in turn, would depend on the correlation between the defaulted and the non-defaulted credits
- The greater this correlation, the greater the expected spread widening for a non-defaulted single-name default swap. This would imply a greater cost of unwinding the hedge. The dealer would therefore maintain a lower delta i.e. sell a lower amount of protection, to minimise losses from the unwind. This would, in turn, provide a lower premium to pay for the basket protection
- On the other hand, a low correlation would imply a lower expected spread change in a non-defaulted credit in the event of default and consequently a lower cost of unwinding that hedge. The hedger could therefore maintain a higher delta to manage the hedge i.e., sell a higher amount of protection. This provides a higher premium to pay for the basket protection



Investment rationale for a FTD Basket Swap

- Efficient leverage and limited downside : Investors are able to efficiently leverage credit risk with a defined downside potential by executing a FTD Basket Swap, since the swap's notional amount references a basket that is 5x to 10x its size
- Limited maximum loss: a $10mm FTD Basket Swap that references a basket of ten names (aggregate credit exposure of $100mm) still limits the investor's maximum loss to the first loss in the basket — or $10mm
- Basket component correlation premium : FTD baskets that are relatively uncorrelated pay investors a premium that approaches the sum of the basket's component default premiums rather the spread of the basket's riskiest component
- Efficient usage of regulatory capital: The notional amount of the swap, rather than the notional amount of the reference basket, would be used in a risk-based capital requirement calculation for a US bank. This allows banks to take credit risk to a reference portfolio that is 5x-10x as large as the notional amount of the swap for which it must set aside capital

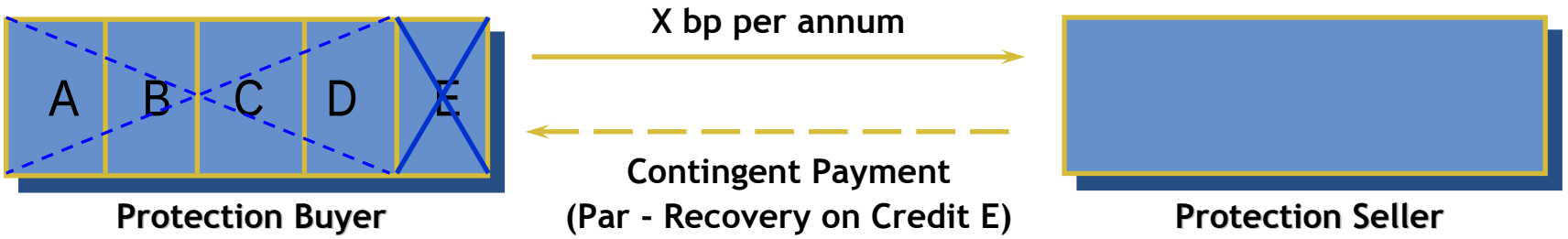
Investment rationale for a FTD Basket Swap

- Investment grade ratings available: Rating agencies have been willing to provide investment grade ratings to FTD Basket Swaps that meet rating agency requirements regarding credit risk and diversification
- Fund managers with limits on scope of assets to invest: This has allowed investors that are limited to specific ratings-based investment guidelines to earn premiums well in excess of those typically found in the single-name investment grade bonds or credit default swaps
- Executable via swap or funded note/deposit: Investors may elect sell FTD Basket protection via a swap or funded credit linked note (CLN)
- The settlement mechanics of a FTD Basket Swap are identical to a single name credit default swap (physical settlement of defaulted securities)

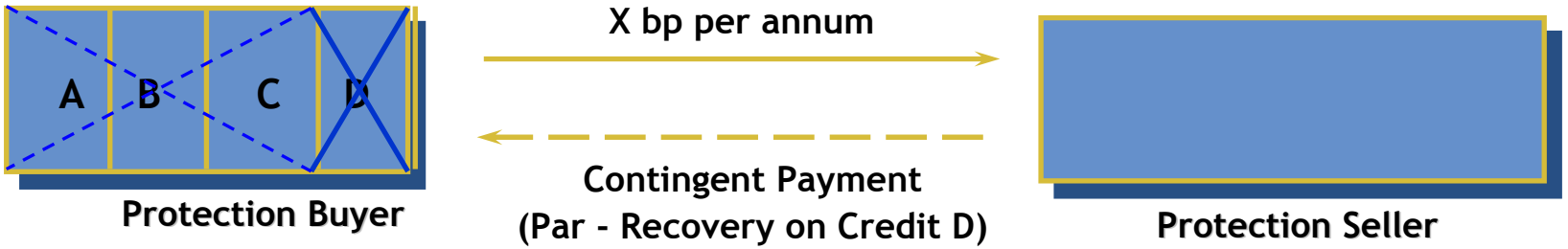
First 2 To Default (F2TD) Baskets

- First-2-to-default basket swaps allow investors to leverage their exposure to a basket of credits to a lesser extent
- The protection buyer is protected against the first two defaults
- Total premium for a F2TD basket should be lesser than for a first to default
- After the first credit event, contract settles partially and notional of the trade is reduced by half
- After the second credit event, contract settles fully and the trade terminates

First 2 To Default (F2TD) Baskets

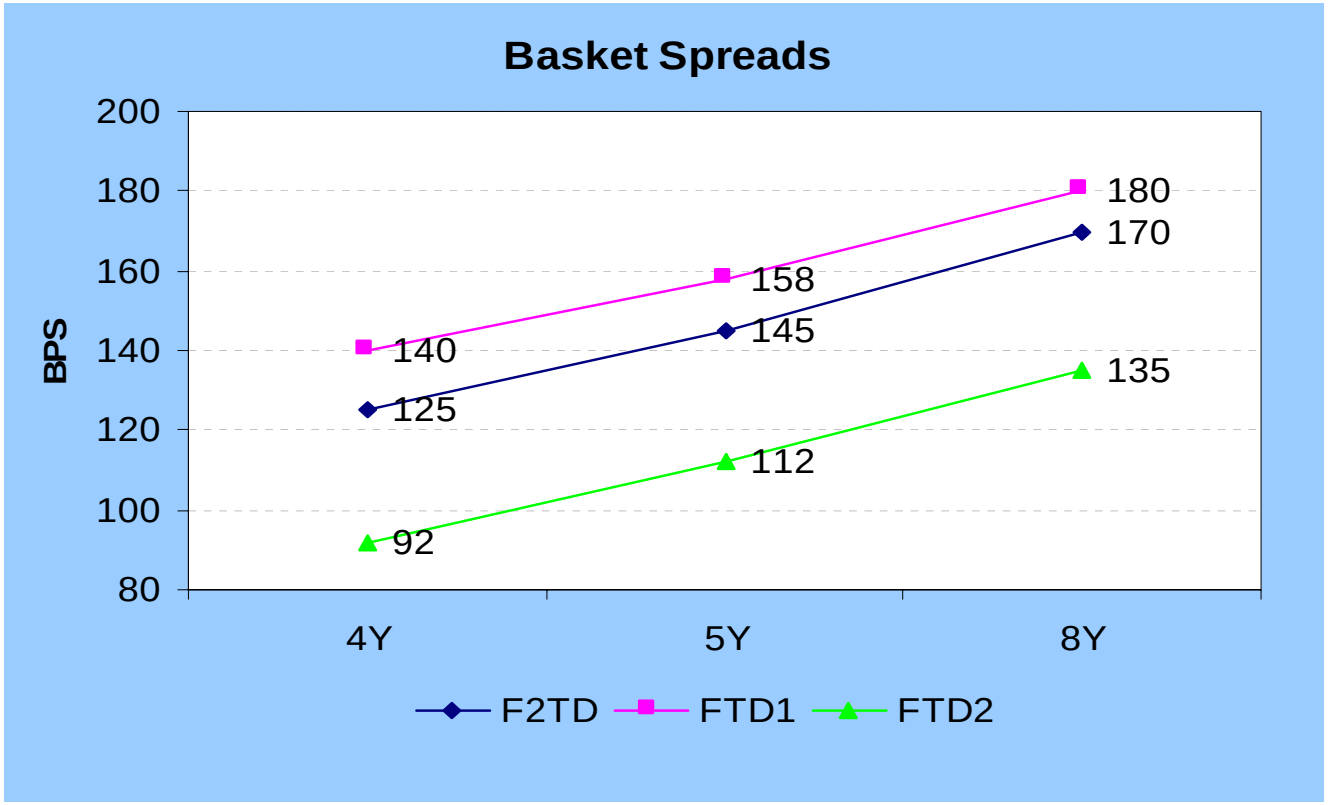


- If Credit E defaults, Protection Seller pays Par and receives the Recovery Value on Credit E



- If Credit D defaults, Protection Seller pays Par and receives the Recovery Value on Credit D
  Trade terminates

First-to-default vs First-2-to-default



FTD1 : Pacific Dunlop, Pasminco, MIM, Mayne Nickless, Qantas

FTD2 : CWOptus, Boral, United Energy, Woodside, Western Mining

F2TD : FTD1 + FTD2

Other Basket default products

- **Second to default :** The protection buyer is protected only against the second default, and pays a premium until the occurrence of this event. The premium will be less than for a FTD, since two defaults are always less likely than one (assuming that the credits are not perfectly correlated)
- **Second, third, fourth or fifth to default :** The premium for an nth to default decreases as n increases, since the probability of n defaults becomes more unlikely. The effect of correlation is to increase the premium, since this increases the probability of multiple defaults. Relatively speaking, this effect is more dramatic for larger n
- **Sum of first, second, third, fourth and fifth to default :** The total premium for these five contracts is always greater than the sum of the individual default swap premiums
- **Quanto basket default swap :** Similar to other quanto products. Assume that the FTD basket is cash-settled. Upon a credit event, observe the reference obligation (presumably denominated in USD), then protection buyer receives 1-R x Quanto FX i.e. an FX rate agreed
- **Actual Quanto Trade: a Taiwanese investor buys protection and pays a running TWD fee**. The basket consists of 5 names with reference obligations denominated in USD. There is a credit event, recovery on the deliverable is 40. The Taiwanese investor gets (100-40) x whatever FX rate that was agreed at the beginning of the trade. For trades in general, the fee and the payout don't have to be the same currency

Outline

A synthetic tranche is a specific allocation of risk of a synthetic CDO

A synthetic CDO pools the risk of various synthetic assets — corporates, sovereigns, financials — in the form of a portfolio of CDS

Credit risk is re-allocated from individual credits to tranches

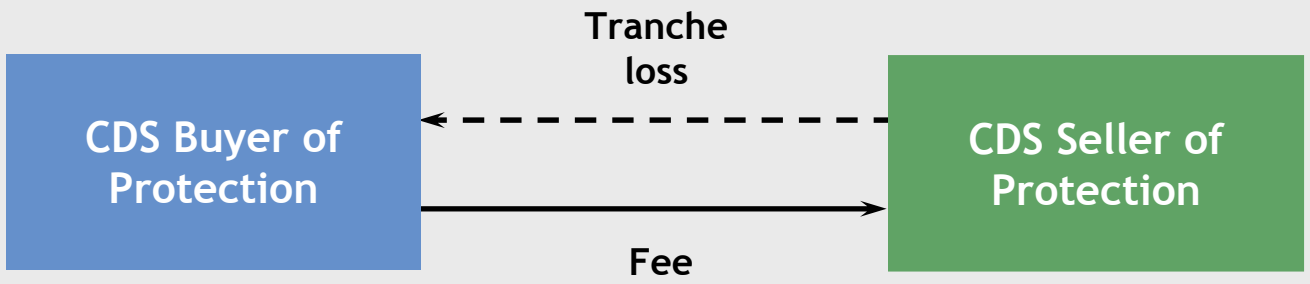
- Equity owner is in the first loss position
- Subordinated tranches (including Equity) are leveraged exposures
- Senior tranches (AAA, AAAA) are de-leveraged exposures

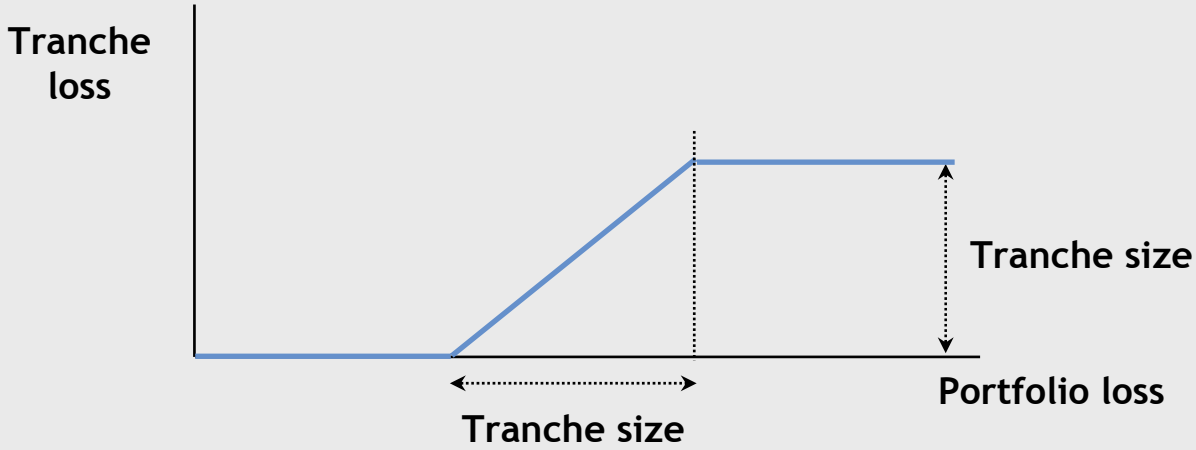
Each tranche exhibits different risk characteristics which reflect its expected share of portfolio losses as well as its sensitivity to changes in the expected distribution of losses within the portfolio

An active risk management strategy allows banks to create and offer tranche protection or exposure on a standalone basis

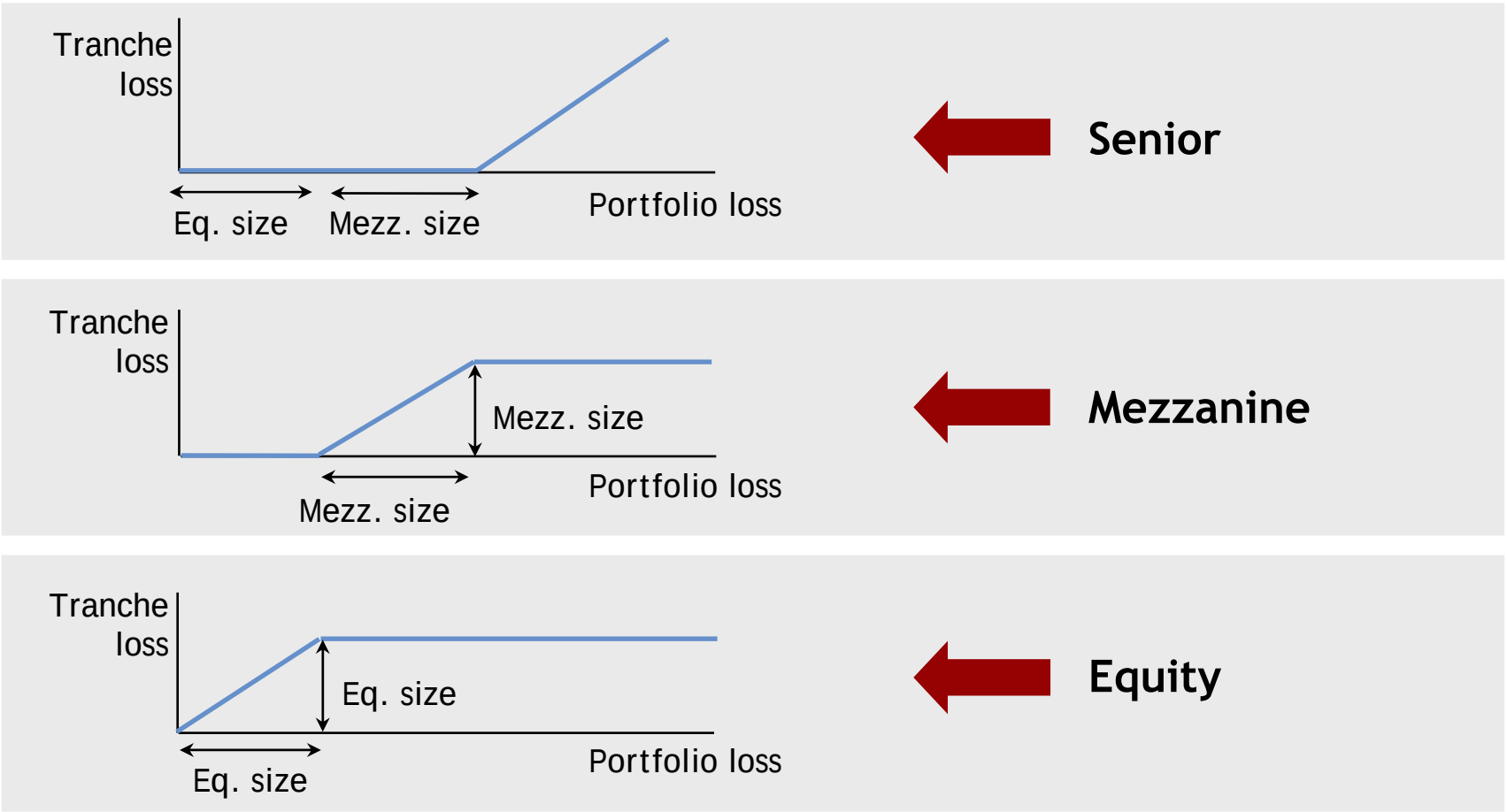
Each tranche is defined in terms of pay-off

Example of a mezzanine tranche

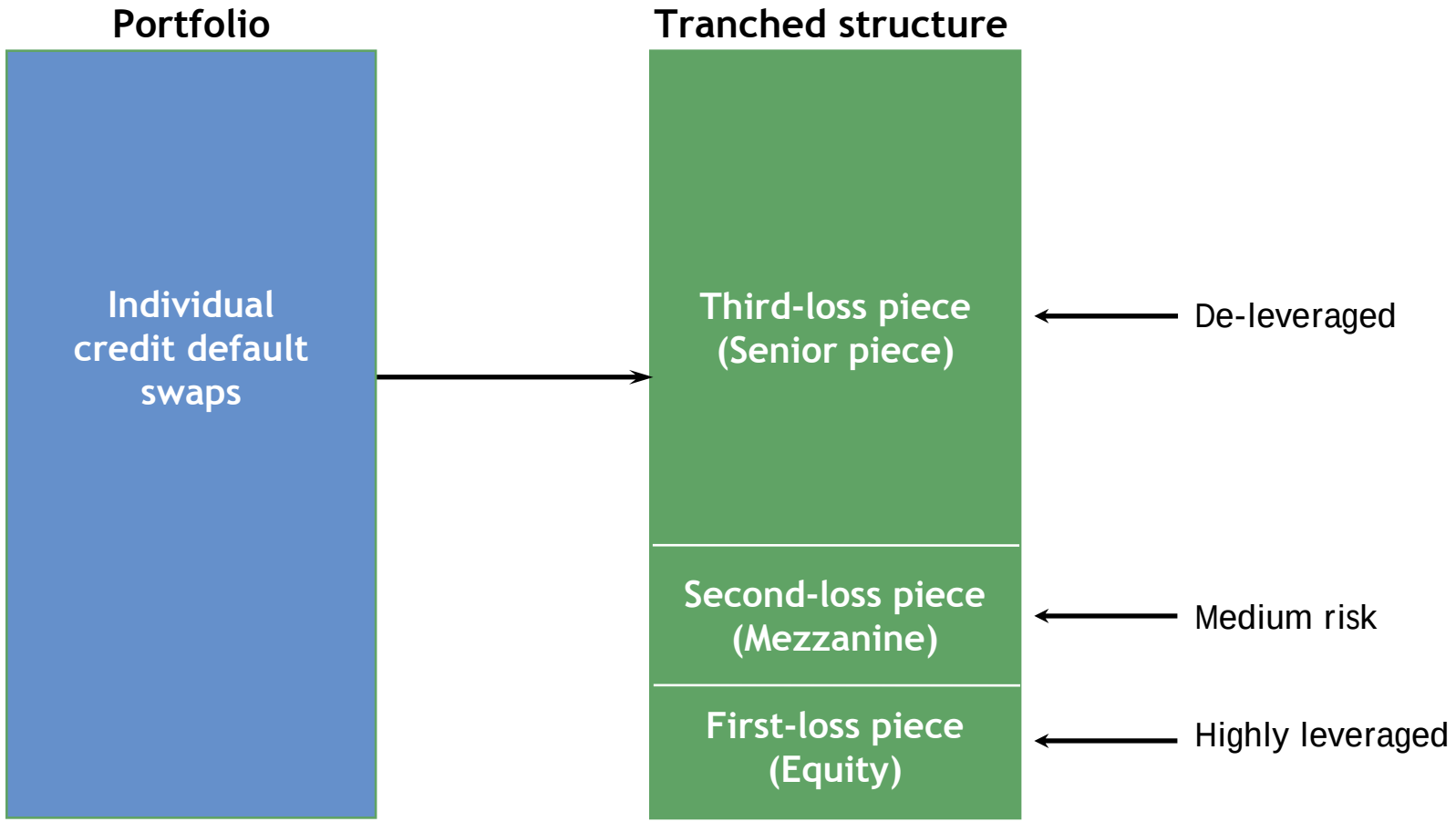




Sum of risks (losses) is equal to portfolio risk (loss)

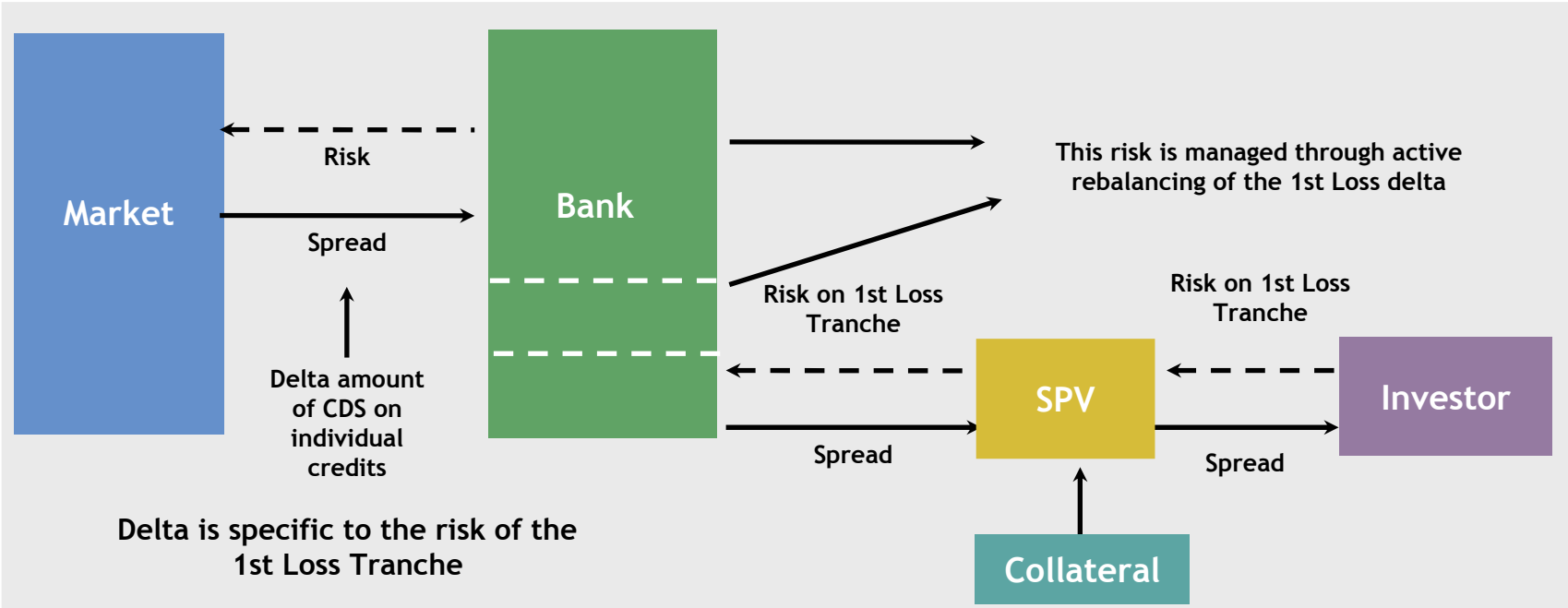


Risk of a tranche is defined by its position in the capital structure



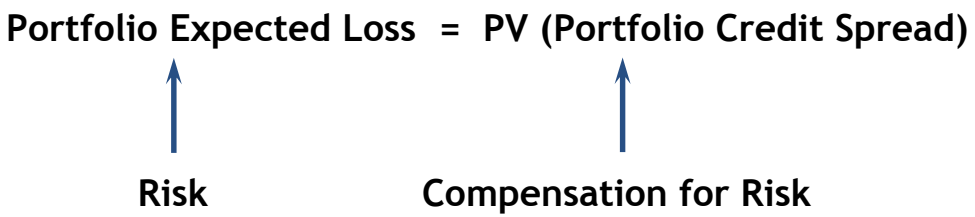
Synthetic first loss tranche is created by sourcing delta amount of CDS

- As in a CDO, risk is sourced from the CDS market; however, the amount of risk sourced reflects only the risk of the first loss tranche
- By synthetically reproducing its specific risk profile, any tranche can be created without the need to place the remainder of the capital structure



Pricing framework for a synthetic tranche is based on expected loss

- At the portfolio level, spread compensates for expected loss:



- Tranching reallocates losses within the portfolio
- The spread on an individual tranche must compensate for the tranche expected loss

Tranche Expected Loss = PV (Tranche Credit Spread)

To compute expected loss, obtain portfolio loss distribution

Ingredients for the calculation of the loss distribution:

- Recovery rate for each name — use CDS market estimates
- Probability of default for each individual name — derived from the credit spread and recovery rate estimate:
- P^D = S/(1-Recovery Rate)
- Default correlation between names — derived from historical asset correlations

Estimating loss distribution requires tranching, spreads & recoveries

A simplified example of a portfolio containing only one name

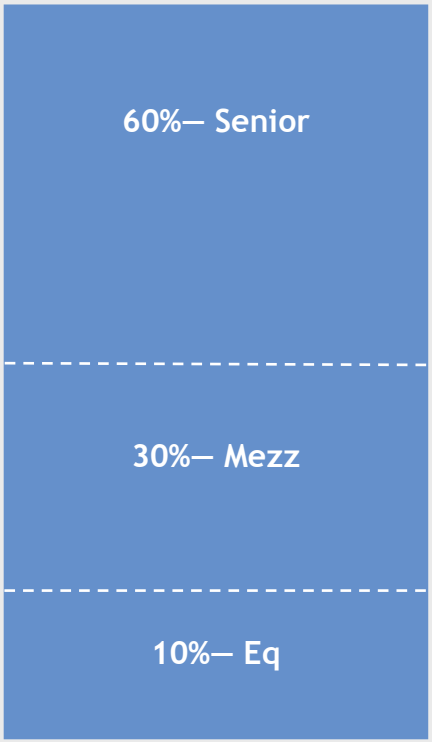
Portfolio:

Spread (bps)	Notional
150	100

Maturity = 1 year

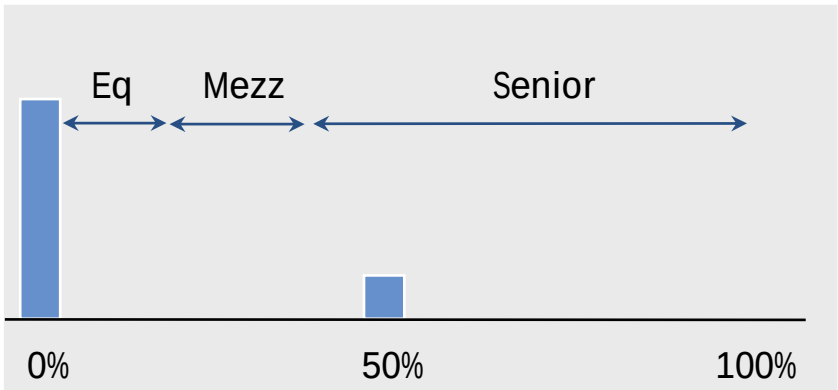
Recovery Rate Assumption = 50%

Tranched structure



Probability-weighting loss scenarios gives expected loss of tranches

Portfolio loss distribution

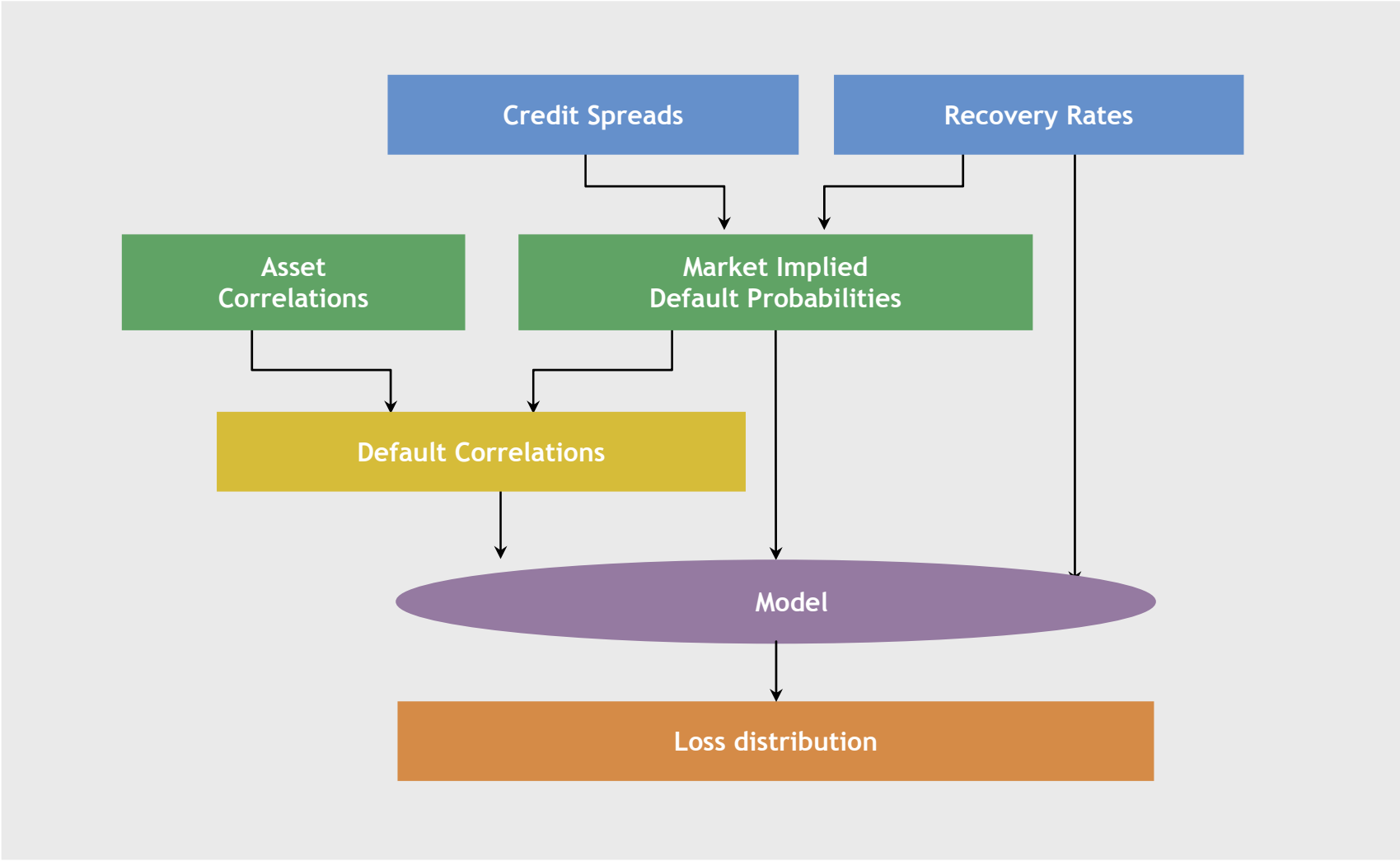


Tranche pricing

Scenarios	Probability	Notional defaulted	Portfolio loss	Portfolio loss (%)	Equity loss	Mezz loss	Sr loss
1	97.00%	0	0	0%	0%	0%	0%
2	3.00%	100	50	50%	10%	30%	10%

	Whole portfolio	Equity	Mezz	Senior
Expected loss (%of Not)	1.5%	0.3%	0.9%	0.3%
Tranche Notional	100%	10%	30%	60%
Tranche Spread (bps)	150	300	300	50

To model loss distribution, we take into account default correlation



Address default correlation in estimating the loss distribution?

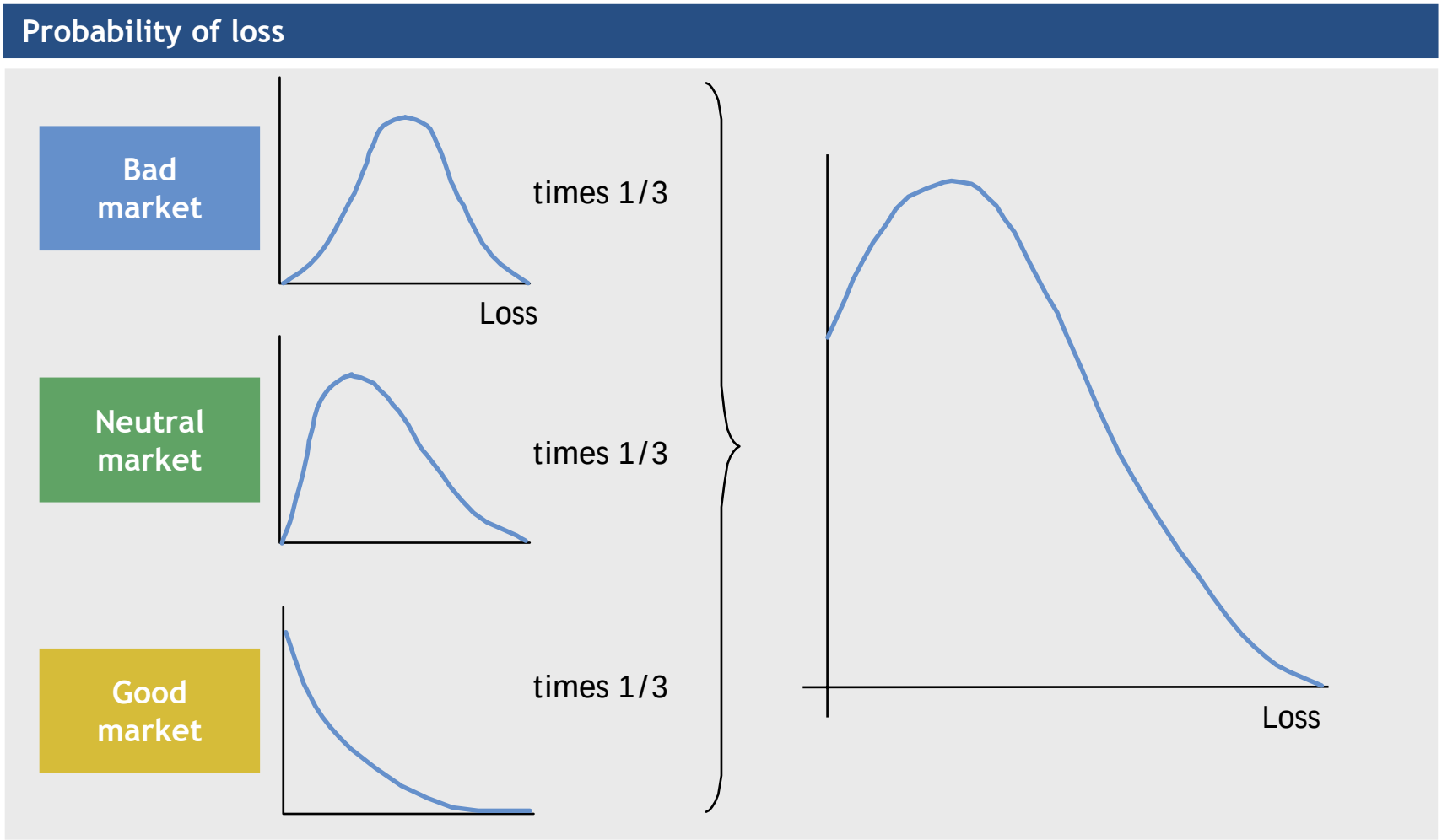
- We model the correlation between names as a result of the correlation of each name with a systemic market variable (similar to CAPM)
  - Given a market environment, the names default independently
- However, the probability of default of any given name depends on the market environment
- Integrating across all possible market environments yields a loss distribution which then incorporates the correlation between names

Probability of default depends on the market environment

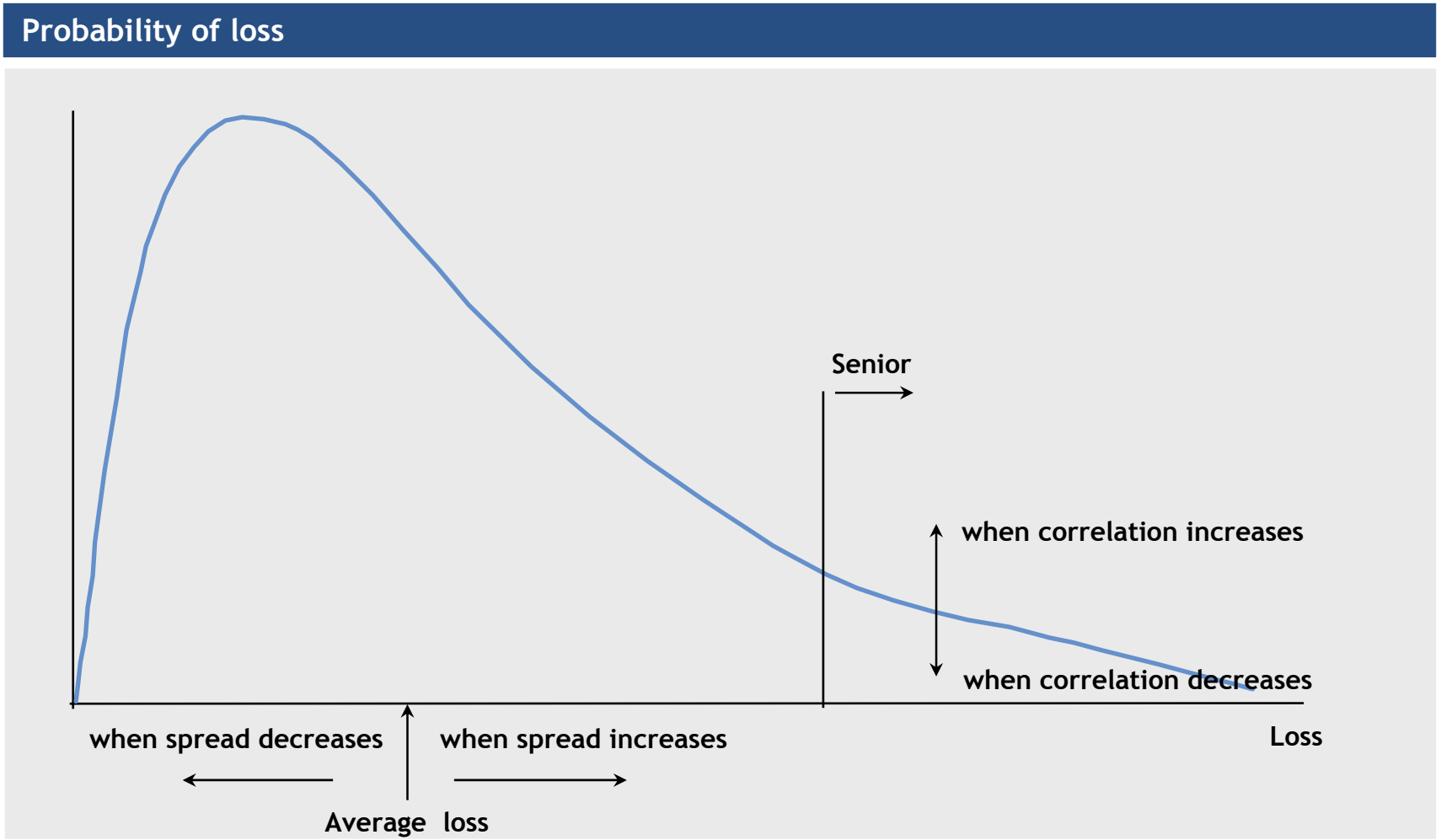
1-year default probability		Specific market scenarios			
		Market environment →	**Bad**	**Neutral**	**Good**
		Probability of market →	1/3	1/3	1/3
	(Average over markets)		1 year def. Prob for "Bad"	1 year def. prob for "Neutral"	1 year def prob for "Good"
Name 1	1.0%	Name 1	1.90%	1.00%	0.10%
Name 2	2.0%	Name 2	3.80%	2.00%	0.20%
Name 3	0.5%	Name 3	0.50%	0.50%	0.50%

Name 3 is uncorrelated with the market

Final loss distribution is calculated by averaging over all scenarios

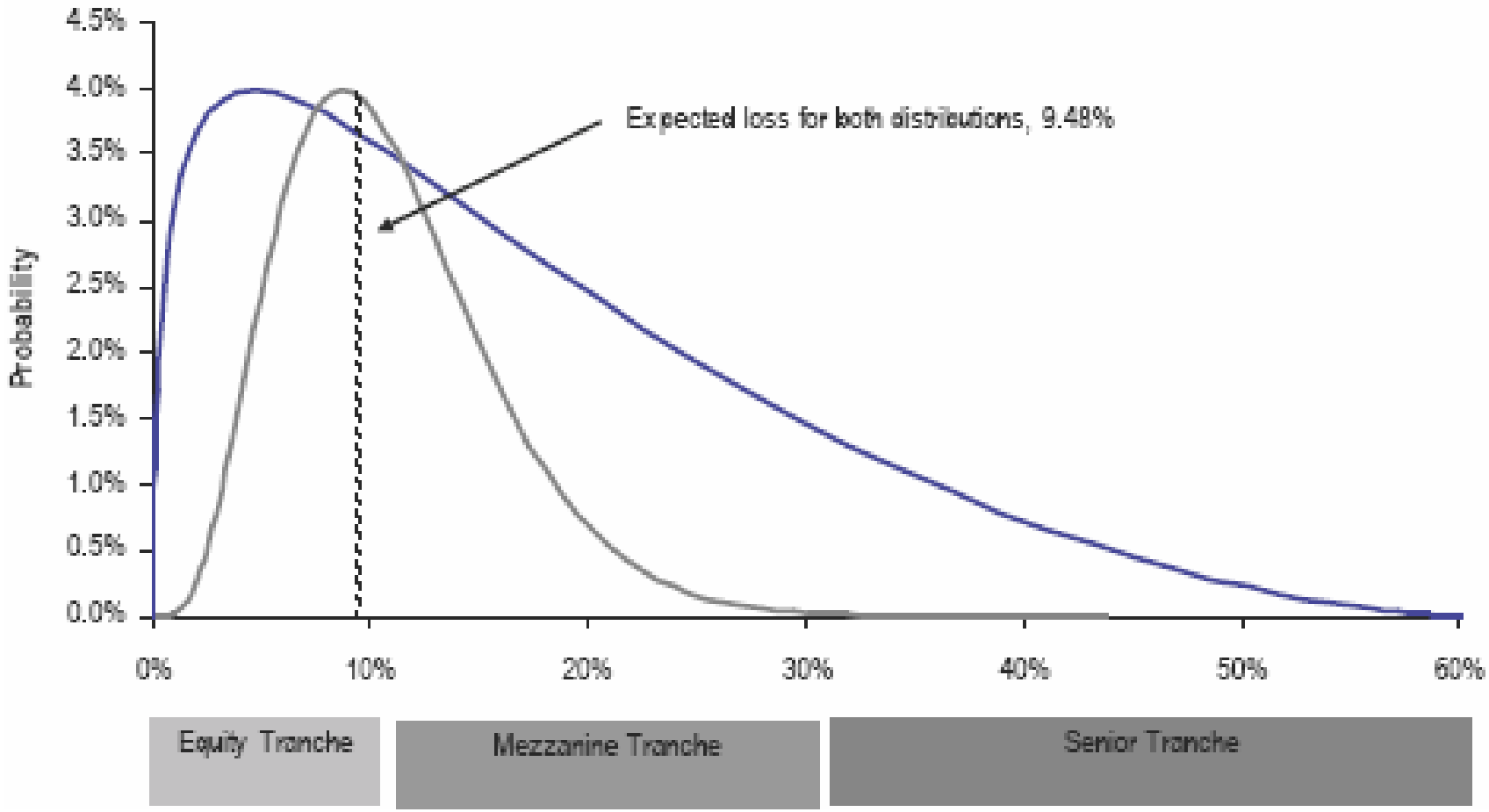


Loss distribution changes with spreads, recoveries, and correlation



Portfolio loss distributions for two portfolios

Tranche loss different for same tranche size for two different portfolios



As loss distribution changes, delta of any specific tranche changes

- In a fully-sold synthetic CDO, the risk of changes in the loss distribution is passed completely to investors
  - The distribution of losses within the portfolio will fluctuate, but the portfolio hedge is static
- In a synthetic tranche, bank's hedge must offset the risk position of the specific tranche
  - Initial delta reflects the relative proportion of the portfolio loss distribution which falls within the tranche
- Therefore, as the tranche expected loss changes, the delta hedge for that tranche must also be rebalanced

Risk management for synthetic tranches is rapidly evolving

- New technology allows for the creation of synthetic tranches with a range of attractive characteristics beyond the original static
- Tranche exposure can be offered in local currency whereas risk is sourced in a foreign currency
- Term of tranche credit exposure can differ from the term of the note or swap
- Credit exposure of coupons can differ from the exposure of the principal
- Investor or asset manager can be offered limited portfolio management flexibility

Credit derivatives offer some unique characteristics

Credit derivatives:

- unbundle credit risk from other aspects of ownership (tax, accounting, liquidity, relationship)
- are similar in substance to many traditional credit instruments
- are not triggered by underlying price movements but only by default
- provide the only efficient short positioning vehicle
- frequently require explicit consideration of correlation risk
- are available on- or off-balance sheet and can provide leverage efficiently

Outline

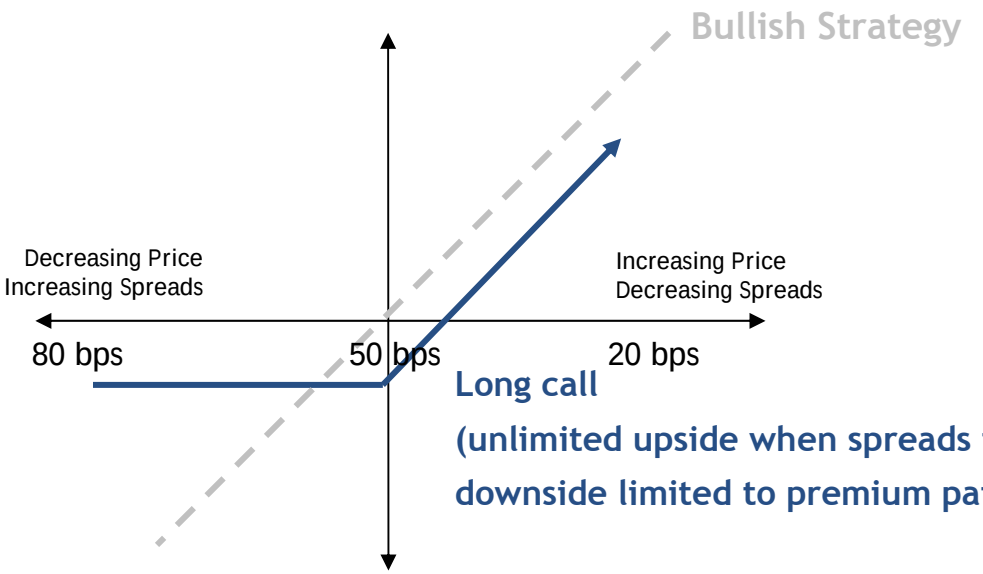
Options on Credit Default Swaps

- Options on credit default swaps can be structured into trades that work for various parties with different objectives
  - Fund managers can sell options to earn premium while waiting for spreads to widen to their target investment levels
  - Hedge funds can sell volatility through options to earn premium
  - Investors can buy callable CLNs/CDS to earn higher returns than on plain-vanilla CLNs/CDS
  - Investors can buy principal protected notes that are linked to spread tightening or spread widening options or their combinations
  - Investors can combine CDS options with interest rate or equity products to earn higher returns or reduce their risk profile on their investment

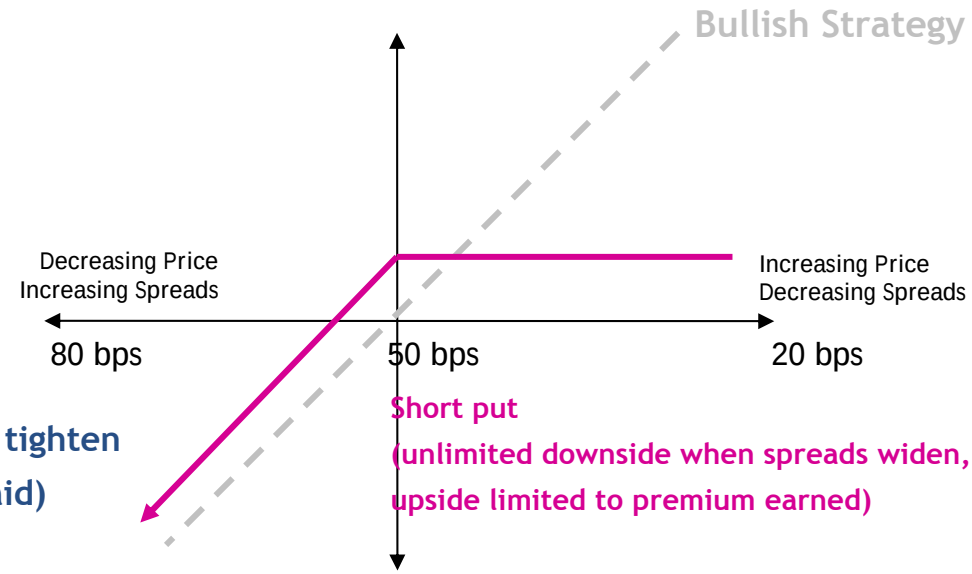
Options terminology

- A call on a credit default swap is the right to buy risk/sell protection (receiver option)
- A put on a credit default swap is the right to sell risk/buy protection (payer option)
- A straddle is a combination of a put and a call at the same strike
- ATM denotes an option struck at-the-money
- OTM denotes an option struck out-of-the-money

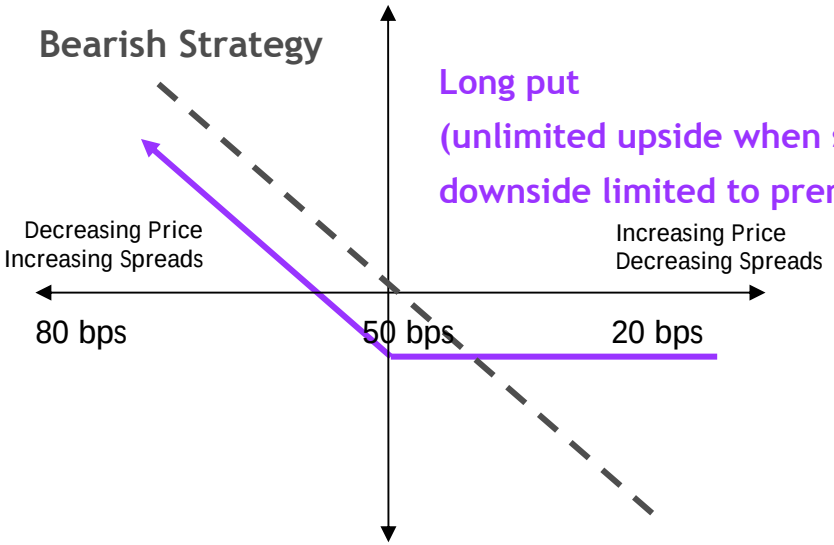
Options payout diagrams



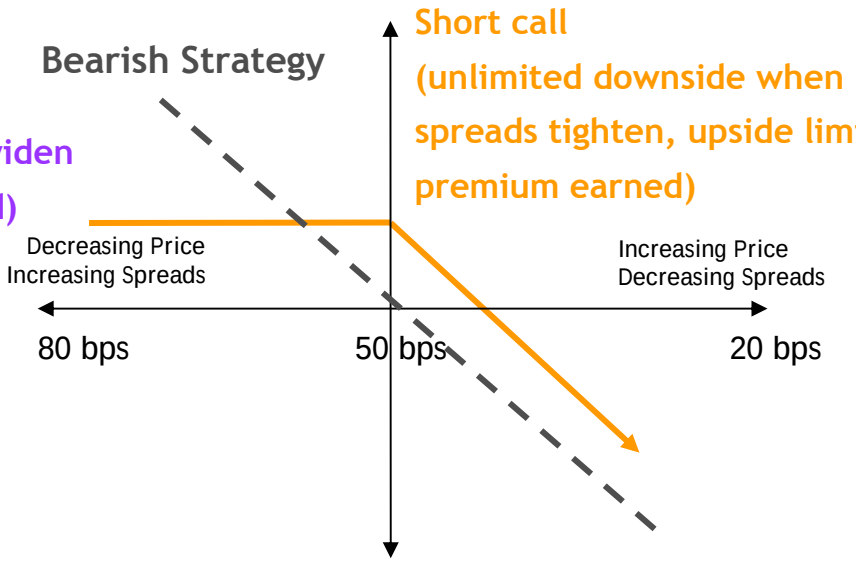
Long call
(unlimited upside when spreads tighten
downside limited to premium paid)



Short put
(unlimited downside when spreads widen,
upside limited to premium earned)



Long put
(unlimited upside when spreads widen
downside limited to premium paid)



Short call
(unlimited downside when
spreads tighten, upside limited to
premium earned)

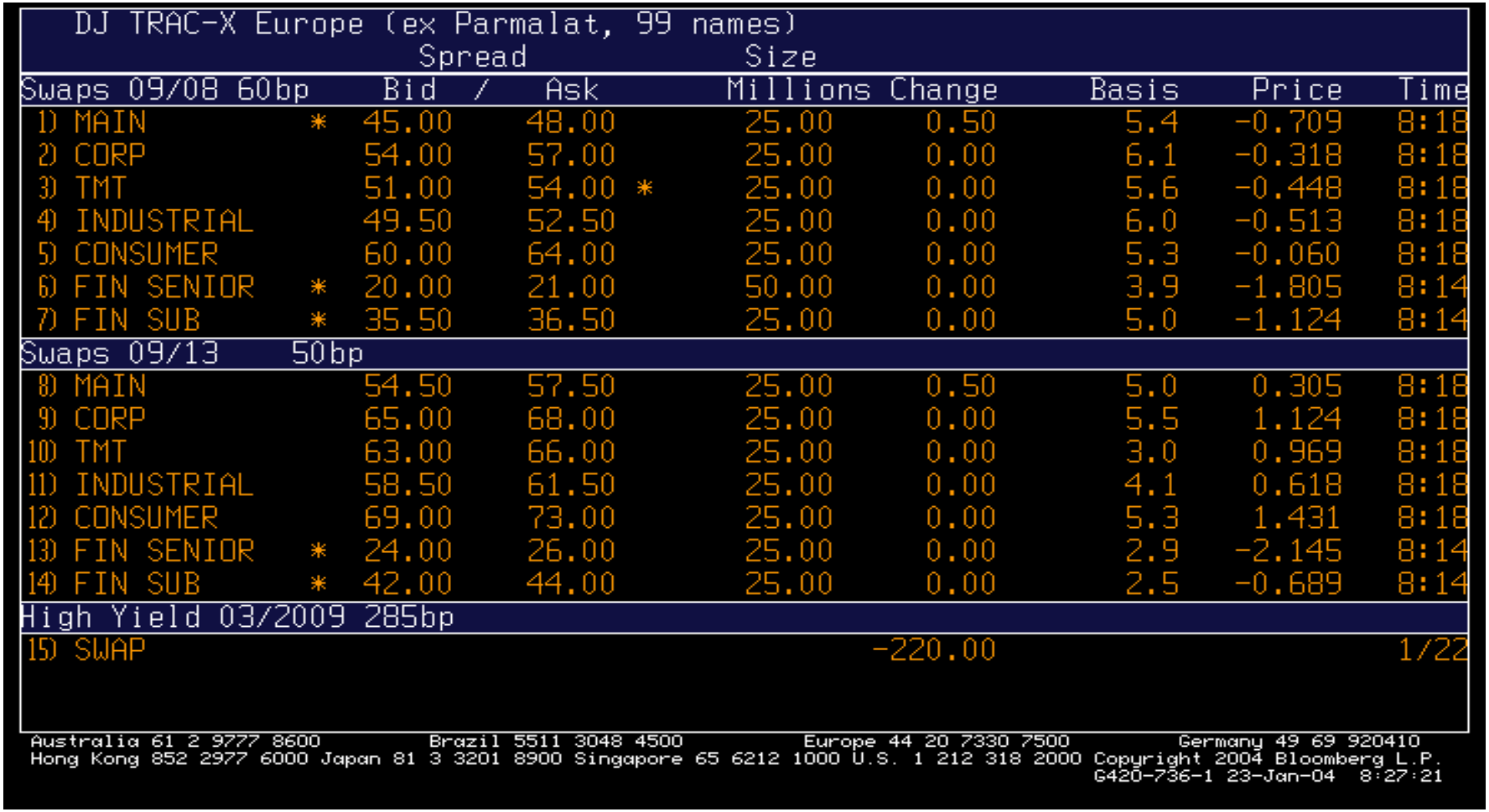
Options on single name credit default swaps

- Underlying: 5yr CDS on a single Reference Entity
- Maturity: 3 months
- Premium: prices are quoted in cents, premium is paid T+3 business days
- Strike: At-the-money-spot spread of the 5yr CDS derived from the current trading level at the time of the trade
- Exercise: European (only at the maturity of the option)
- Settlement:
  - Physical: into the 5yr CDS upon exercise at the pre set strike
  - Cash: option is unwound upon exercise and cash paid out to client
- Knock out:
  - Both calls and puts knock out in case of a Credit Event on the Reference Entity

Options on TRAC-X Europe

- TRAC-X Europe options are a liquid, standard product to trade credit volatility on a macro basis
- Underlying: TRAC-X Europe 99 Swaps with 20 September 2011 maturity
- Maturity: 3 months or 6 months
- Premium: prices are quoted in cents, premium is paid T+3 business days
- Strike: Preset strikes of 30, 35, 40, 45, 50 and 55, chosen to reflect ATM and OTM forward levels in increments of 5 bps
- Exercise: European (only at the maturity of the option)
- Settlement: Physical, into TRAC-X Europe 99 Swaps upon exercise at the pre set strike
- Knock out: No knock out in case of a Credit Event in TRAC-X Europe 99 Swaps

TRAC-X



DJ TRAC-X Europe (ex Parmalat, 99 names)

Swaps 09/08 60bp		Spread Bid	/	Ask		Size Millions	Change	Basis	Price	Time
1) MAIN	*	45.00		48.00		25.00	0.50	5.4	-0.709	8:18
2) CORP		54.00		57.00		25.00	0.00	6.1	-0.318	8:18
3) TMT		51.00		54.00	*	25.00	0.00	5.6	-0.448	8:18
4) INDUSTRIAL		49.50		52.50		25.00	0.00	6.0	-0.513	8:18
5) CONSUMER		60.00		64.00		25.00	0.00	5.3	-0.060	8:18
6) FIN SENIOR	*	20.00		21.00		50.00	0.00	3.9	-1.805	8:14
7) FIN SUB	*	35.50		36.50		25.00	0.00	5.0	-1.124	8:14
Swaps 09/13 50bp										
8) MAIN		54.50		57.50		25.00	0.50	5.0	0.305	8:18
9) CORP		65.00		68.00		25.00	0.00	5.5	1.124	8:18
10) TMT		63.00		66.00		25.00	0.00	3.0	0.969	8:18
11) INDUSTRIAL		58.50		61.50		25.00	0.00	4.1	0.618	8:18
12) CONSUMER		69.00		73.00		25.00	0.00	5.3	1.431	8:18
13) FIN SENIOR	*	24.00		26.00		25.00	0.00	2.9	-2.145	8:14
14) FIN SUB	*	42.00		44.00		25.00	0.00	2.5	-0.689	8:14
High Yield 03/2009 285bp										
15) SWAP							-220.00			1/22

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 920410
Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2004 Bloomberg L.P.
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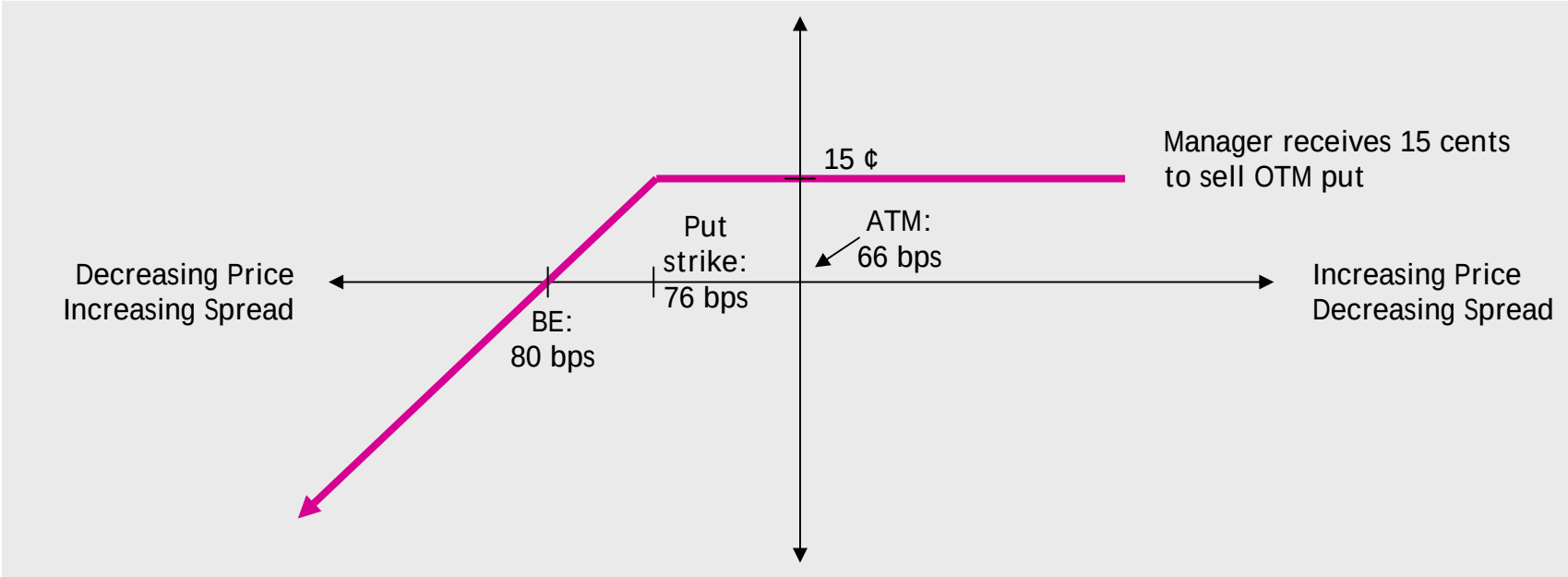
Trade Idea 1: Long credit trade to earn premium

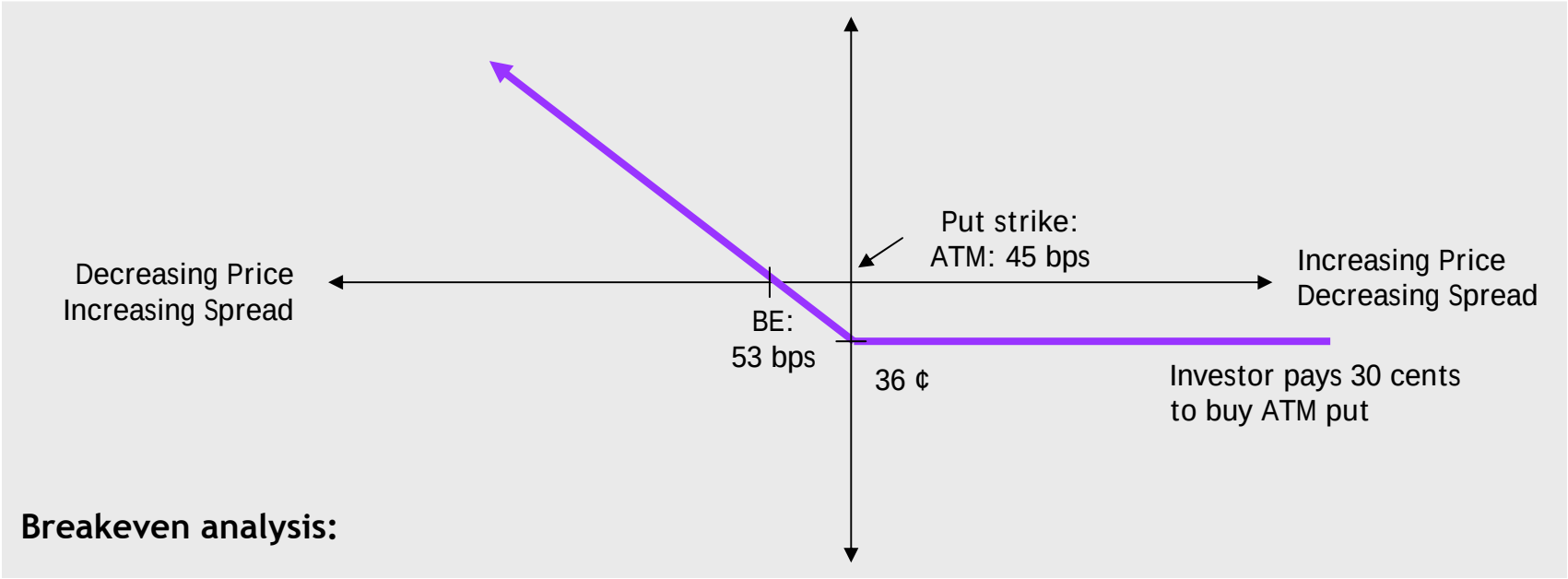
- A fund manager who finds France Telecom too tight compared to his target investment levels could sell an OTM put on France Telecom to earn premium



- Breakeven analysis:
  - Investor receives 15 cents to sell a 3-month European put on France Telecom struck at 76 bps
  - If France Telecom widens by more than 4 bps (= 15 bps / 4.3 duration) from the strike in 3 months, the investor will lose money on the option (I.e., if France Telecom widens beyond 80 bps, the investor will lose more on the option than the option premium earned)
    - However, the manager will be put into France Telecom risk at a strike corresponding to his target investment level

Trade Idea 2A: Short credit trade

- An investor who believes the market will widen in the short to medium term could buy an ATM put on TRAC-X Europe to benefit from spreads widening

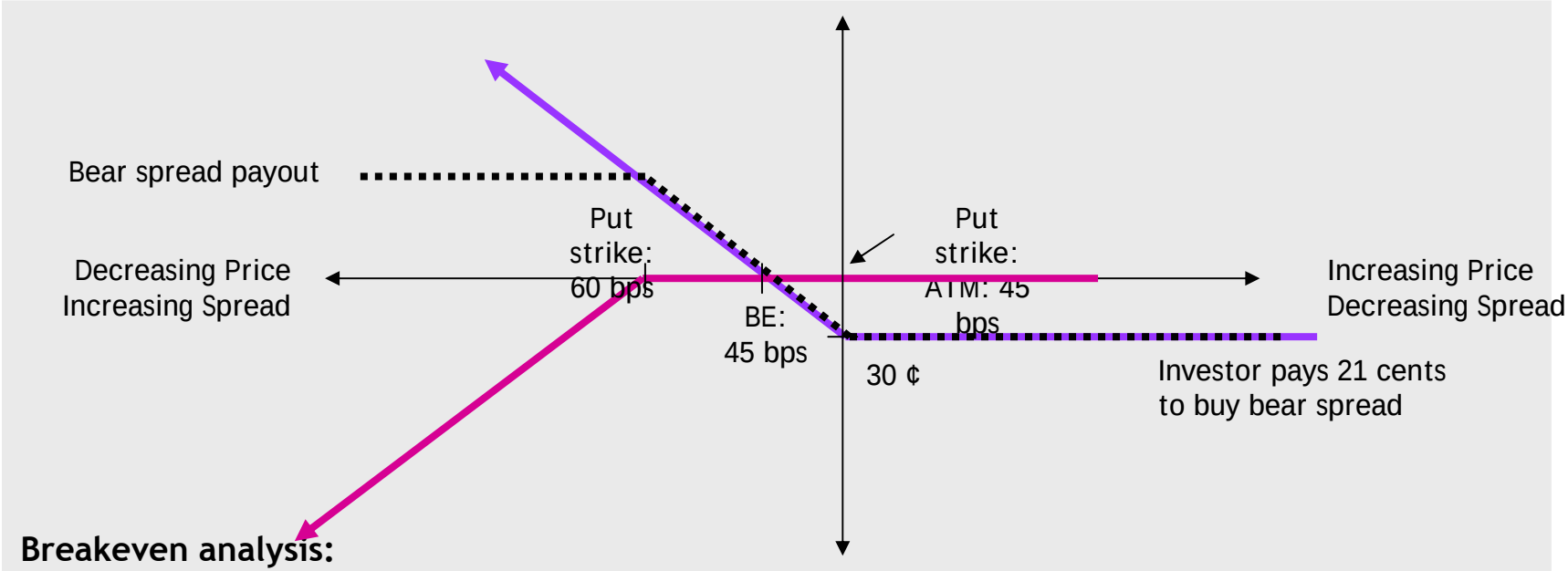


Breakeven analysis:

- Investor pays 36¢ to buy a 3-month maturity European put on TRAC-X Europe struck at 45 bps
- If TRAC-X Europe widens by more than 8 bps (= 36¢ / 4.3 duration) from the strike in 3 months, the investor will make money from exercising his ATM put (i.e., if TRAC-X Europe widens beyond 53 bps, the investor will make more on the option than the option premium paid)
- If TRAC-X Europe widens to 60 bps in 3 months, the investor will make 64.5¢ (= (60-45) bps x 4.3 duration) from exercising his ATM put. The investor's payout ratio in this case will be 1.79 (= 64.5¢ payout / 36¢ option premium paid)
- If TRAC-X Europe widens to 70 bps in 3 months, the investor will make 1.1% (= (70-45) bps x 4.3 duration) from exercising his ATM put. The investor's payout ratio in this case would be 2.99 (= 1.1% payout / 36¢ option premium paid)

Trade Idea 2B: Short credit trade with capped upside

- If the same investor finds the ATM put too expensive and thinks market spreads will widen but not by too much, he could buy an ATM put and sell an OTM put to subsidise cost of the ATM put

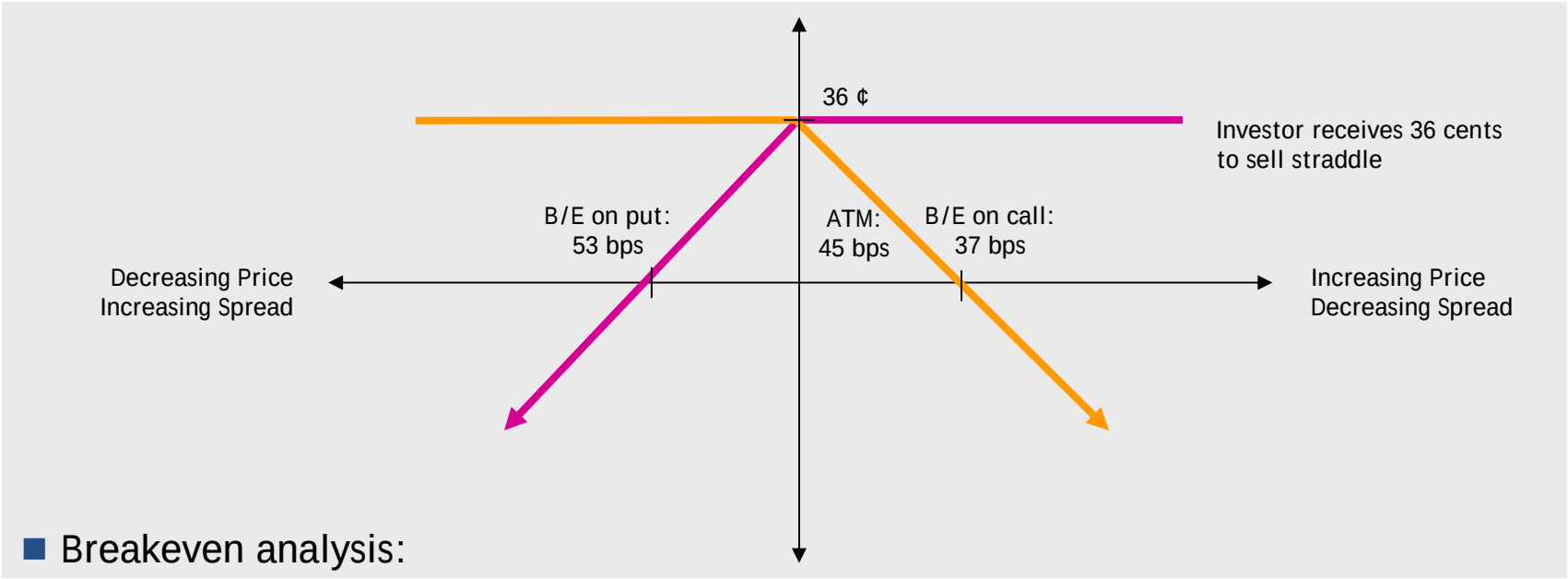


Breakeven analysis:

- Investor pays 30¢ net to buy a 3-month maturity European put on TRAC-X Europe struck at 45 bps and sell a 3-month European put on TRAC-X Europe struck at 60 bps
- If TRAC-X Europe widens by more than 7 bps (= 30¢ / 4.3 duration) from 50 bps in 3 months, the investor will make money on the ATM put he bought (i.e., the upside from buying the option will be higher than the option premium paid)
- Maximum payout on this trade will be 64.5¢, if TRAC-X Europe goes to 60 bps or wider (= {60 bps – 45 bps} x 4.3 duration). The investor's payout ratio in this trade is 2.15 (= 64.5¢ / 30¢ option premium paid)
- If investor thinks the market will not widen beyond 60 bps, he should put on the bear spread (payout ratio of 2.15) instead of buying the ATM put outright (payout ratio of 1.79 when spreads are at 60 bps)

Trade Idea 3: Short volatility trade

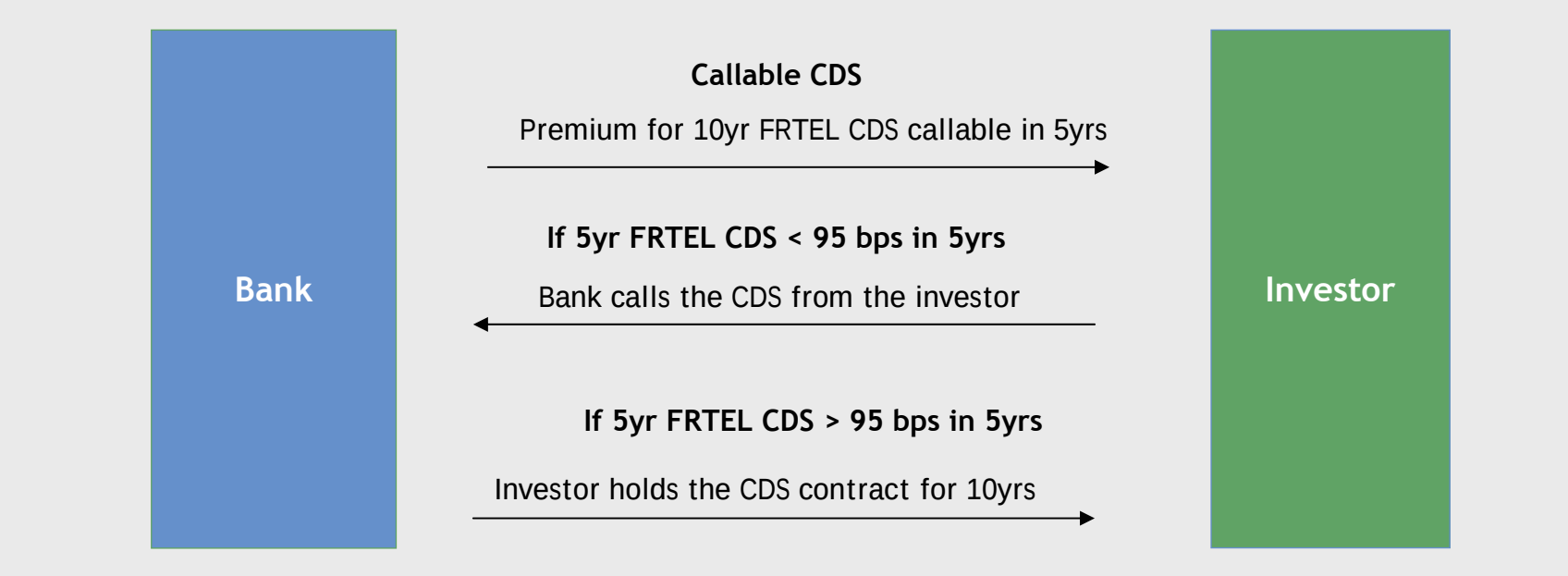
- A hedge fund does not have a strong credit view but believes that credit market will experience little volatility in the short to medium term could trade volatility and earn premium by selling a 3-month ATM straddle on TRAC-X Europe



- Breakeven analysis:
  - Hedge fund receives 36 cents to sell a 3-month maturity European straddle on TRAC-X Europe struck at 45 bps
  - If TRAC-X Europe tightens or widens by more than 8 bps (= 36¢ / 4.3 duration) from the strike in 3 months, the fund will lose money on the option (i.e., the downside from selling the option will be higher than the option premium earned)

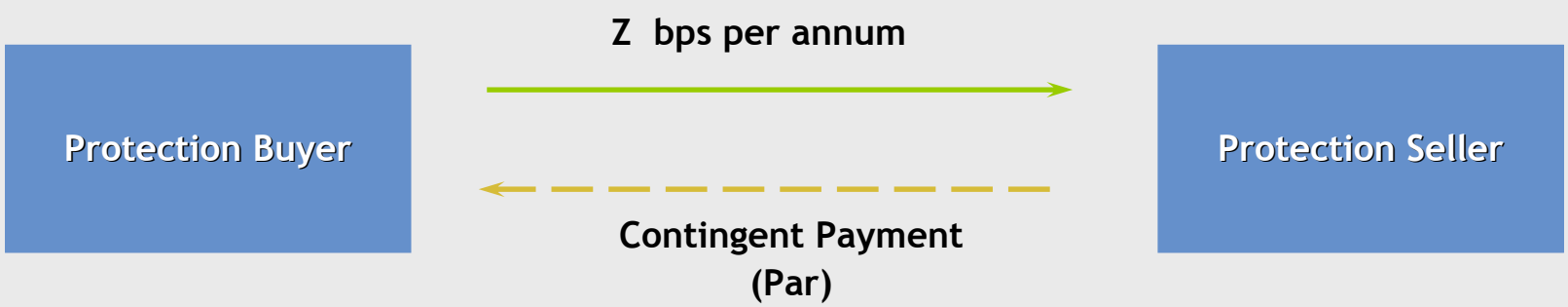
Trade Idea 4: Callable CDS

- A CDS investor with investment targets that are higher than current market levels could sell 10yr France Telecom protection callable by bank in 5 years that pays more than the 10yr plain-vanilla CDS



- Breakeven analysis:
  - 5yr France Telecom CDS: 66 bps, 10yr France Telecom CDS: 89 bps
  - 10yr France Telecom CDS callable in 5 years pays 95 bps (**WHAT IS THE CATCH HERE?**)
  - If Bank calls the CDS in 5 years, investor will have earned 29 bps (44%) more running than the 5yr CDS, and FRTEL 5yr CDS would have to tighten by more than 29 bps for investor to lose the 29 bps earned in the first 5 years to enter into a new France Telecom CDS
  - If Bank does not call the CDS, investor will have earned 6 bps (7%) more running than selling plain-vanilla 10yr protection

Binary (Digital) Credit Swaps



Clients looking for leverage opportunities on a single name can sell protection in a binary swap

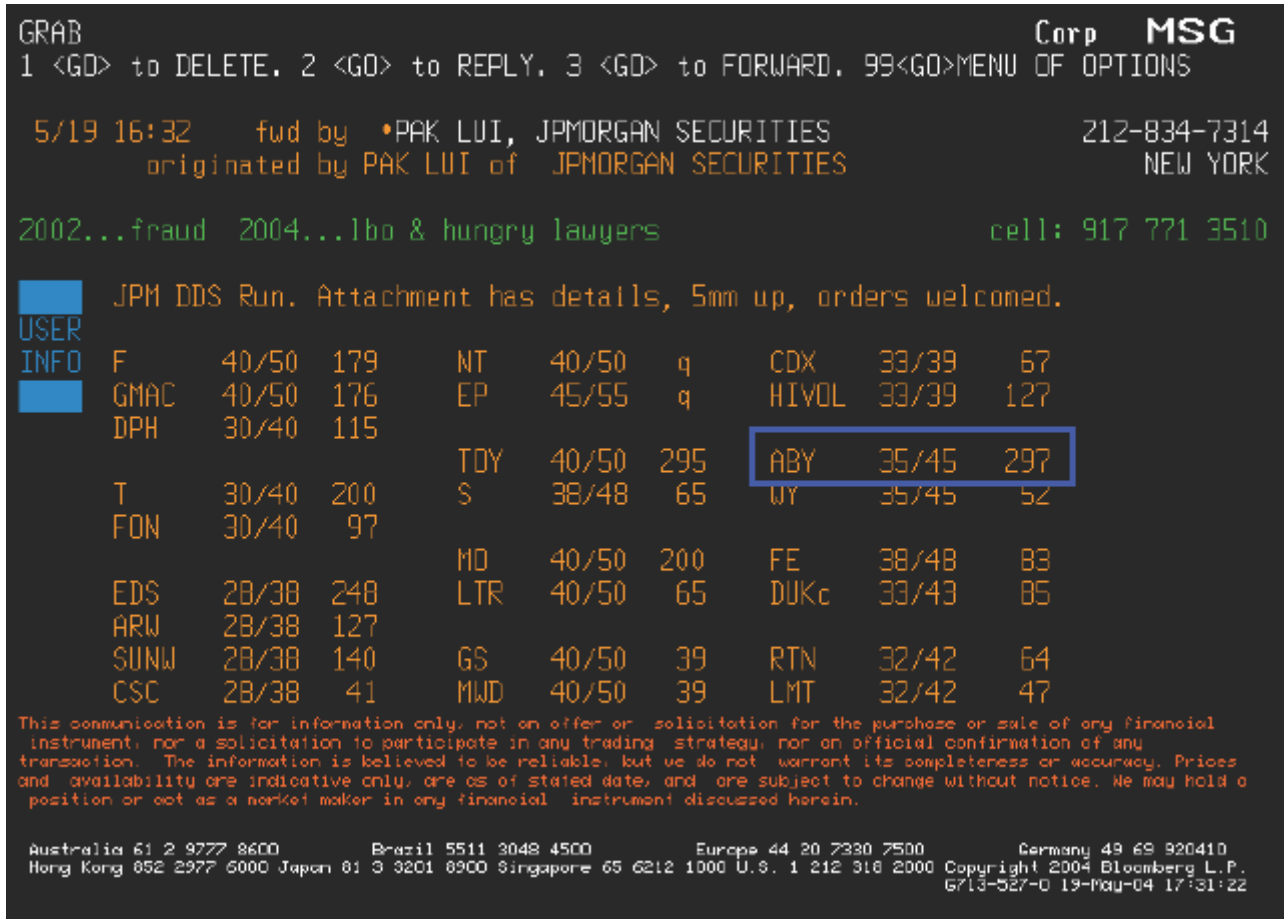
- In a plain-vanilla credit swap, the protection seller would receive the recovery value of the Reference Credit in a credit event
- In a binary swap, the protection seller receives no recovery value in a credit event
- Client receives a higher spread to compensate for zero recovery in a credit event

Digital (Binary) Default Swaps

- Digital default swaps will demand a higher premium than a standard default swap
- Its price will be sensitive to the recovery rate that has been assumed in the calibration procedure
- The higher the recovery rate in the calibration, the higher the calibrated hazard rates will be
- Since a digital default swap depends only on the hazard rates and not on the recovery rate, it has a price that effectively increases with the assumed recovery

Digital Default Swaps

- Based on run above the quote on ABY offers a recovery bid-offer of 35-45 with the underlying ABY 5yr CDS spread at 297bp
- An investor who believes the recovery rate on ABY will be below 35 in the future should sell ABY recovery at 35



Digital Default Swaps

Executing this position will result in two trades:

- Investor will be short protection on a DDS (Digital Default Swap) with a recovery rate fixed at 35, a spread of 297bps, 5yr maturity
- Investor will be long protection on a standard CDS, spread of 297bps, same maturity date
- The net of the two positions has zero carry

Profiting in Default:

- If ABY defaults and bonds are trading at 20 (i.e. actual recovery is 20) investor earns 15 points on the combined position:
- On short protection position (DDS) investor loses 65 (100 – fixed recovery rate of 35)
- On the long protection position (regular CDS) investor earns 80 (100 less cost to buy bond in market at 20)

Calculate MTM on DDS

Calculate the MTM after one year assuming DDS is now trading at 20 instead of 35

Original positions:

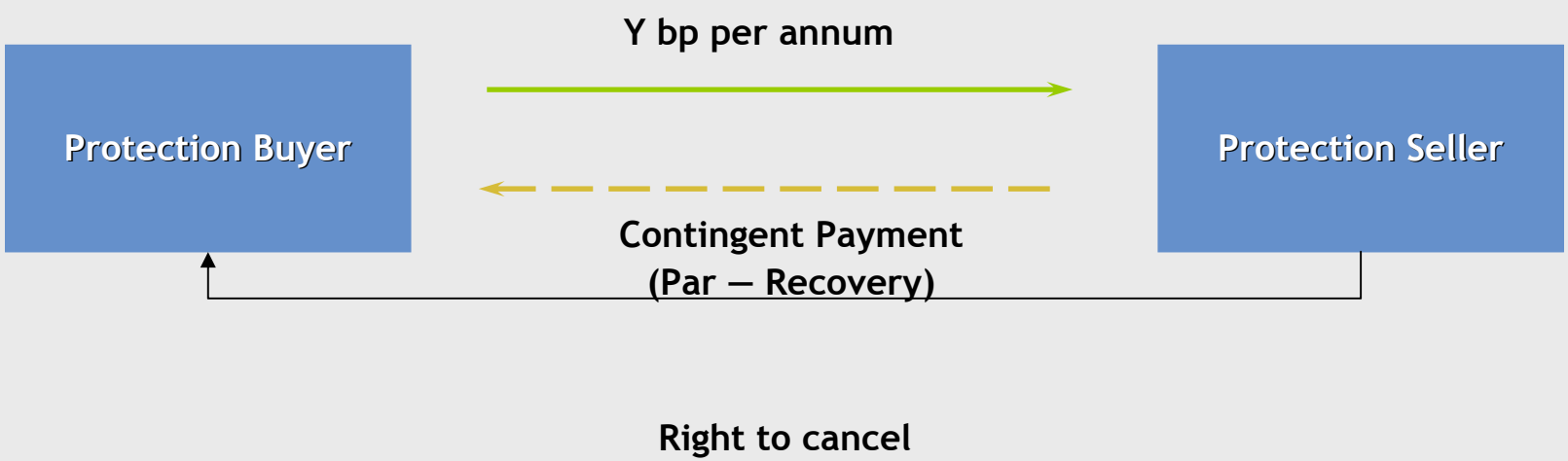
- Short fixed recover position at 35 (Loss on default is 100 – 35 = 65)
- Long regular CDS position (Gain on default is 100 – R)

Unwind Positions:

- Long fixed recovery position at 20 (Gain on default is 100 – 20 = 80)
- Short regular CDS position (Loss on default is 100 – R)
- Notional: USD 10 million, ignore discount rates

Year	Survival Probability
2	0.95
3	0.90
4	0.85
5	0.80

Cancelable Credit Swaps



- Seller receives a fee in return for making a Contingent Payment if there is a Credit Event of the Reference Credit
- Buyer decreases exposure to Reference Credit(s), but assumes contingent ("two-name") exposure to Seller
- Buyer has the right to cancel the trade (European or American option)

Yield Pickup on structured CDS

Vanilla Mitsubishi Corp. CDS

- 3yrs @ 14bps, 5yrs @ 18bps, 10yrs @ 30bps

Cancelable Mitsubishi Corp. CDS

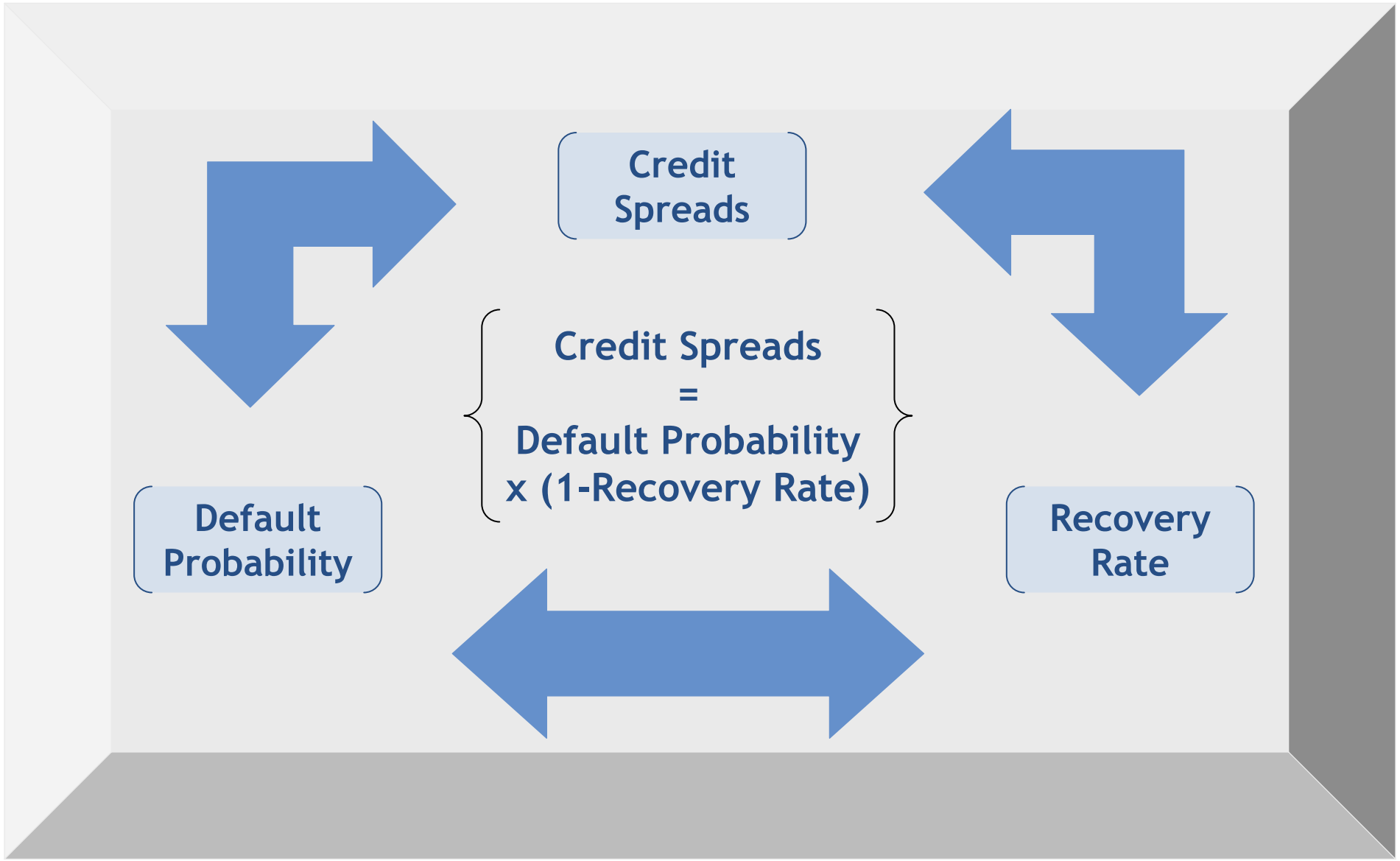
- 3yrs @ 15.5bps, 5yrs @ 20.5, 10yrs @ 33.5

Binary Mitsubishi Corp. CDS

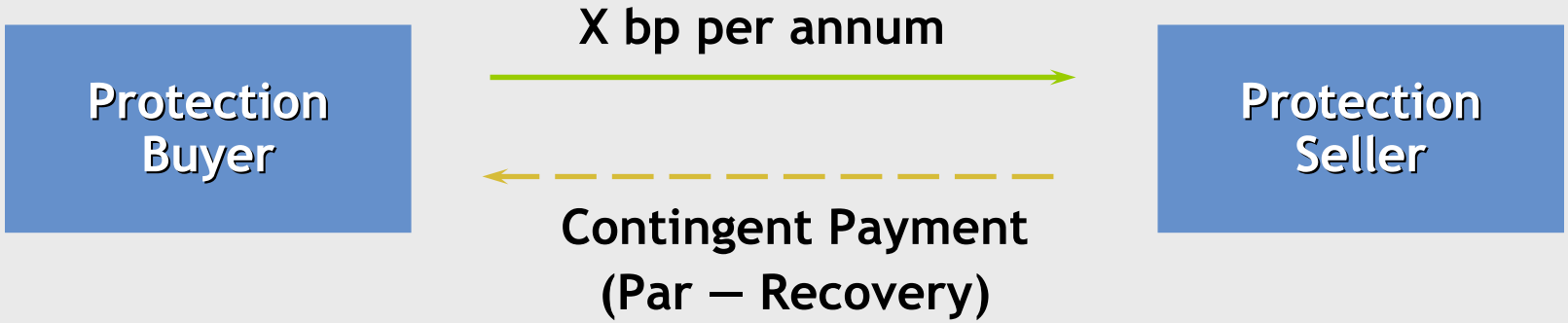
- 3yrs @ 18.6bps, 5yrs @ 24bps, 10yrs @ 40bps

Outline

Credit Spreads

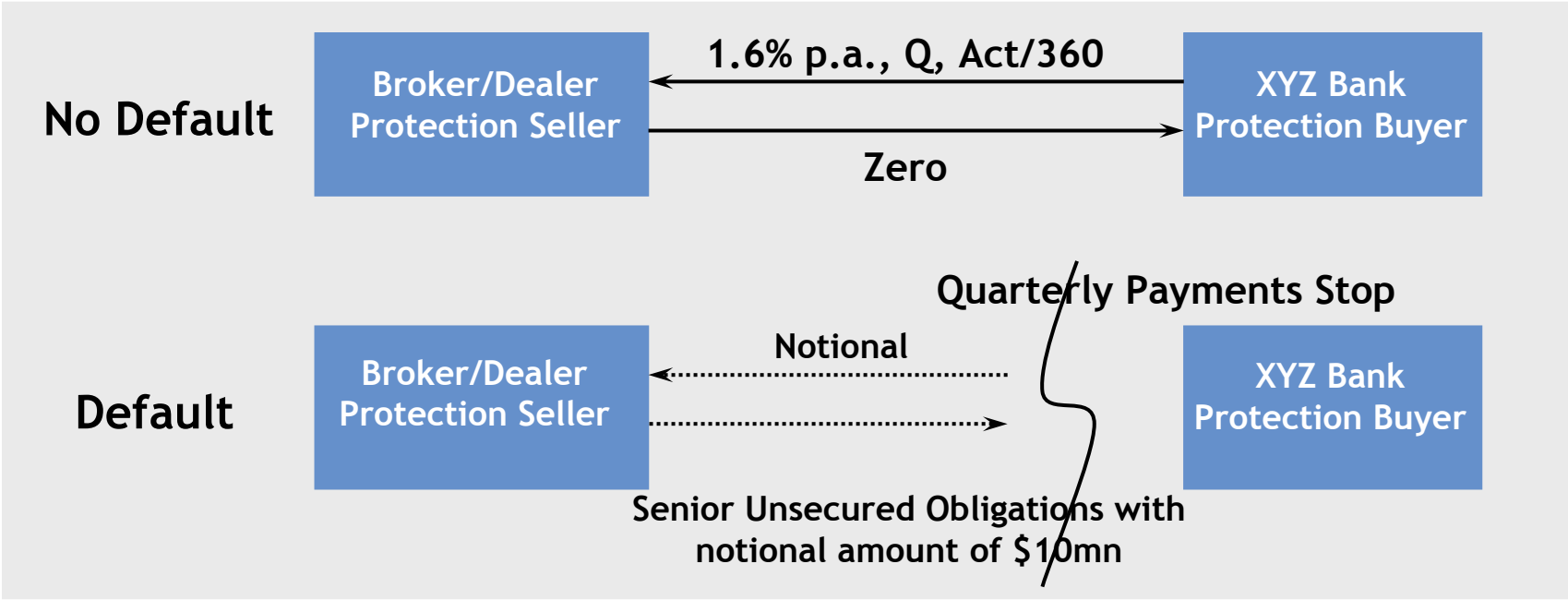


Credit Default Swaps transfer default risk



- Via a Credit Default Swap, the Protection Buyer transfers risk that the Reference Entity will default
- Protection Seller receives a fee, similar to an insurance premium, and assumes the risk that the Reference Entity will default
- Upon a default or Credit Event, protection seller makes a contingent payment to the protection Buyer calculated according to the actual losses (e.g. if Reference Entity recovers at 60%, protection seller pays 40%)

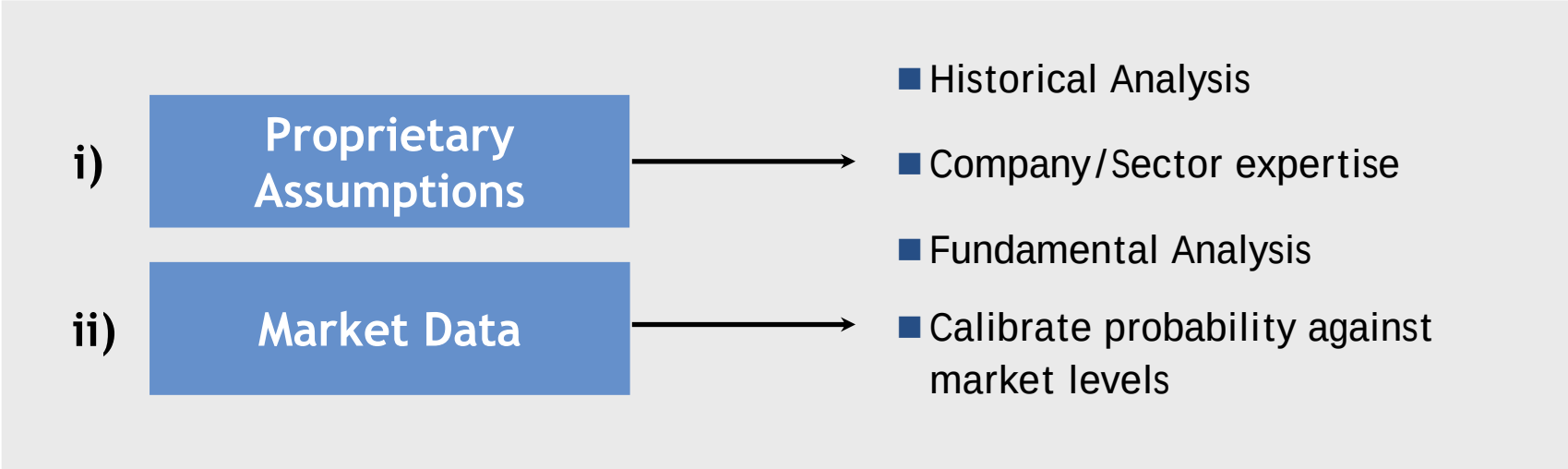
Caselet - EuroAutos



	No EuroAutos Credit Event		EuroAutos Credit Event At 2 Years	
	XYZ Bank	Broker/Dealer	XYZ Bank	Broker/Dealer
Pays	160bps for 5 years	zero	160bps for 2 years, then EuroAutos Deliverable Obligation	$10mn
Receives	zero	160bps for 5 years	$10mn	160bps for 2 years, then Recovery Value

Measure of default probability is required to price risky cash flow

- Two sources exist:



- Since we will be hedging with market instruments, it is essential that we derive our default probabilities from the same instruments
- As hedging instruments, credit default swaps offer superior liquidity, lowest cost, and maximum flexibility

Specifications of credit markets are similar to interest rate markets

Market Details	
Currency	**USD**
Trade Date	16-May-06
Days to Spot	2
Value Date	18-May-06

Conventions	
Swap Basis	360
Swap Days	B
MMkt DCC	Act/365
Swap DCC	Act/365
Swap cpns PA	2
Swap BDC	M
MMkt Basis	360
MMkt freq.	4
Mean Reversion	0.00
Interpolation type	1
Libor Holidays	GBP

Yield Curve

Spd to Mid: 2

#	Swap Maturity	Maturity Dates	Actual Times	Mid yield	Spreads Bid	Spreads Mid	Spreads Ask	Swap rates	Zero rates
1	1D	19-May-06	0.003	3.500%	2.00	0.00	2.00	3.50%	3.56%
2	1M	19-Jun-06	0.088	3.700%	2.00	0.00	2.00	3.70%	3.76%
3	2M	18-Jul-06	0.167	3.785%	2.00	0.00	2.00	3.79%	3.85%
4	3M	18-Aug-06	0.252	3.870%	2.00	0.00	2.00	3.87%	3.93%
5	4M	18-Sep-06	0.337	3.909%	2.00	0.00	2.00	3.91%	3.96%
6	5M	18-Oct-06	0.419	3.948%	2.00	0.00	2.00	3.95%	3.99%
7	6M	20-Nov-06	0.510	3.987%	2.00	0.00	2.00	3.99%	4.03%
8	9M	20-Feb-07	0.762	4.065%	2.00	0.00	2.00	4.07%	4.08%
9	1Y	18-May-07	1.000	4.130%	2.00	0.00	2.00	4.13%	4.13%
10	18M	19-Nov-07	1.507	4.177%	2.00	0.00	2.00	4.18%	4.22%
11	2Y	19-May-08	2.005	4.207%	2.00	0.00	2.00	4.21%	4.25%
12	3Y	18-May-09	3.003	4.254%	2.00	0.00	2.00	4.25%	4.30%
13	4Y	18-May-10	4.003	4.284%	2.00	0.00	2.00	4.28%	4.33%
14	5y	18-May-11	5.003	4.319%	2.00	0.00	2.00	4.32%	4.37%

Same as money market conventions

Market Conventions								
CCY	AUD	EUR	GBP	HKD	JPY	SGD	USD	USR
Days2Spot	1	1	1	1	1	1	1	1
Float Cnv	Act/365F	Act/360	Act/365F	Act/365F	Act/360	Act/365F	Act/365	Act/360
Fixed Cnv	Act/365F	30/360	Act/365F	Act/365F	Act/365F	Act/365F	Act/365	30/360
MM Basis	365	360	365	365	360	365	360	360
MM Freq	2	2	2	4	2	2	4	4
Swap CPA	2	1	2	4	2	2	2	2
Swap Days	A	B	A	A	A	A	B	B
Swap Basis	365	360	365	365	365	365	360	360
Swap Bad Day Conv	M	M	M	M	M	M	M	M
LIBOR Hol	AUD	EUR	GBP	HKD	JPY	SGD	GBP	USR

Additional aspects

Reference Details	
Currency	**USD**
Trade Date	16-May-06
Days to Spot	3
Settlement Date	19-May-06

Credit Reference Parameters							
Fee Interval	**Pay Accrued**	**Index**	Payment Day Count Convention	Payment Bad Day Convention	Mean Reversion	Spread Interpolation	**Recovery Rate (%)**
Q	FALSE	Q	Act/365	M	0.00	1	**50.00%**

Credit Spreads							
Tenors	1D	1M	3M	6M	1Y	2Y	3Y
Dates	22-May-06	19-Jun-06	21-Aug-06	20-Nov-06	21-May-07	19-May-08	19-May-09
Bid-Offer Spread	**3.0**	**3.0**	**3.0**	**3.0**	**3.0**	**3.0**	**3.0**
Bid Spread			98.50	98.50	118.50	138.50	148.50
Mid Spread			**100.0**	**100.0**	**120.0**	**140.0**	**150.0**
Ask Spread			101.50	101.50	121.50	141.50	151.50
Clean Spreads	2.005%	2.005%	2.005%	2.005%	2.417%	2.836%	3.049%
Duration			0.254	0.496	0.967	1.860	2.689

Credit Reference Volatility Structure							
Tenors	1D	1M	3M	6M	1Y	2Y	3Y
Dates	20-May-06	19-Jun-06	19-Aug-06	19-Nov-06	19-May-07	19-May-08	19-May-09
ATM Volatilities			15.00%	15.00%	15.00%	15.00%	

Trade Specifications

Trade Summary	
CDS Price (Deterministic)	**372,020.31**
CDS Price (Tree)	**360,488.06**
Opt. Premium (Tree)	**0.00**
Opt. Premium(Deterministic)	**0.00**
Hedge Cost	**0.00**
Total	**360,488.06**

Trade Inputs	
Trade Notional	100,000,000.00
Trade Date	**16-May-2006**
Sttlement Date	**19-May-2006**
Forward Start Time(eg. 1M, 1Y)	**1y**
Call / Put	**Call**
CDS (Long / Short)	**Long**
Option (Long / Short)	**Long**

Option References	
Option Maturity	1Y
Exercise Interval	Q
Exercise Effective Date	19-May-2006
Maturity Date	21-May-2007

CDS References	
CDS Fee	120.00 bp
Trade Recovery Rate	50.00%
Maturity	2Y
Coupon Interval	Q
First Fixing Date	**19-May-2006**
Next Regular Fixing Date	**19-May-2006**
Maturity Date	19-May-2008
Fee Day Count	ACT/365
Accrual Bad Day	M
Payment Bad Day	M

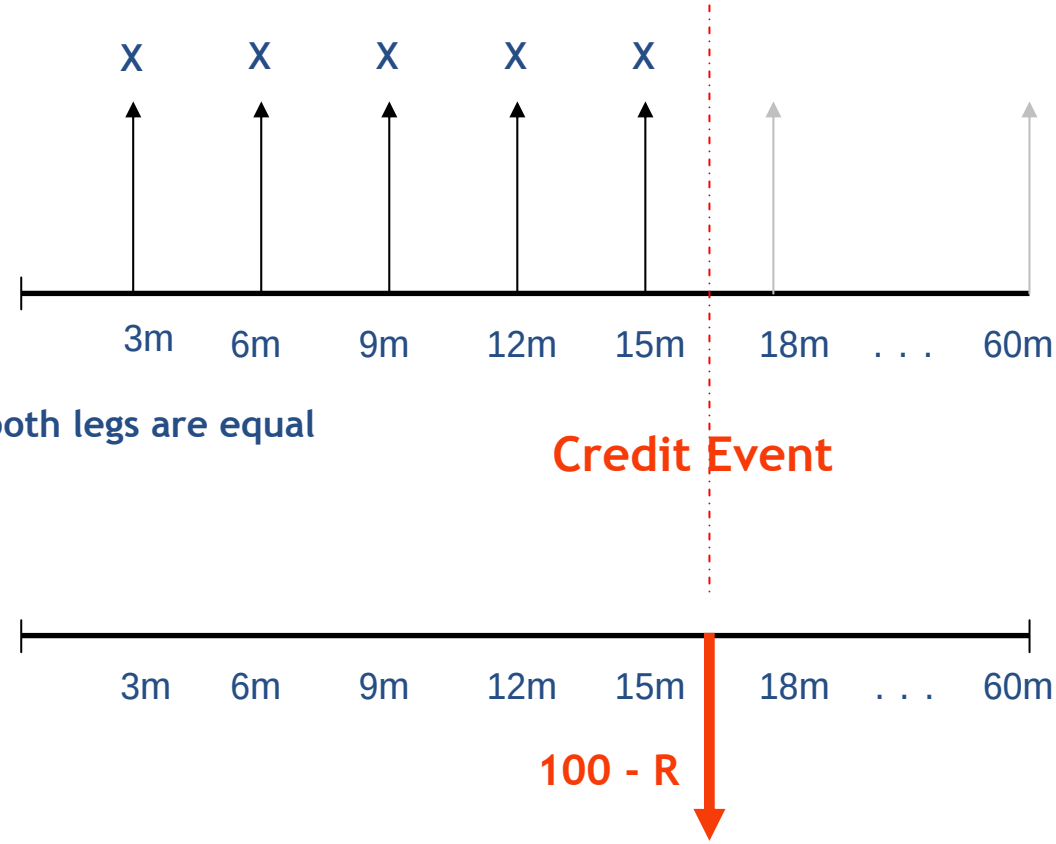
CDS Structure	
Pay Accrued Fee on Default	FALSE
Pay at Maturity	FALSE
CDS Fee payment tIll maturity	FALSE

Option Exercise Schedule

#	Exercise Unadjusted	Exercise Adjusted	Strike Date(s)
0	19-May-06	19-May-06	19-May-06

CDS Cashflow due from Buyer and Seller of Protection

Buyer of protection pays quarterly premium to seller until the earlier of a credit event or maturity



At inception: PV of both legs are equal

The seller of protection pays par less recovery to the protection buyer if there is a credit event during the life of the contract

CDS Cashflow due from Buyer and Seller of Protection

$$Risky\,PV_{FIXED} = \sum_{i=1}^{N} S.DF_i.SP_i.\alpha_i$$

S is the per-annum CDS spread

N is the number of coupon periods

DF_i is the riskless discount factor from time t_0 to t_i

SP_i is the Survival Probability of the reference entity from time t_0 to t_i

α_i is the accrual factor from t_{i-1} to t_i

R is the recovery rate on the delivered obligation

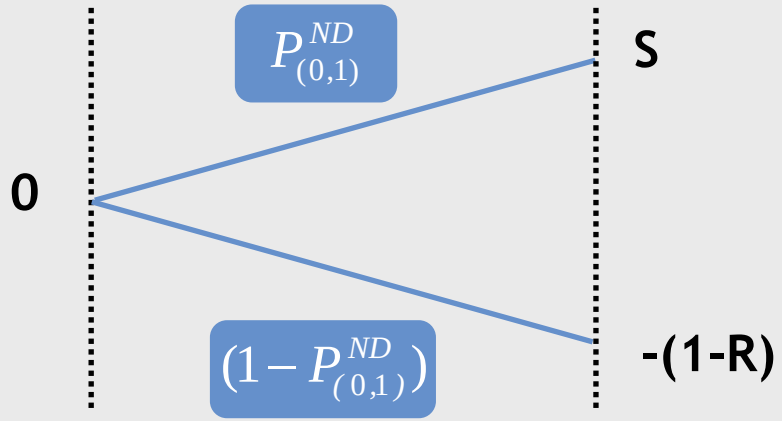
$$Risky\,PV_{FLOATING} = \sum_{i=1}^{N} (1-R).DF_i.(SP_{i-1} - SP_i)$$

Valuation of any risky cash flow is based on concept of risky PV

- As default risk increases, the PV of a risky cash flow decreases
- This corresponds to discounting a risky cash flow with a risky discount factor
  - A risky discount factor is alternatively expressed as the product of a risk-free discount factor and a survival probability
- To price a “risky” instrument we therefore need
  - Payment structure
  - Risk free discount curve
  - Default probability curve

Deriving default probability from CDS spreads

A 1-year default swap with annual coupon



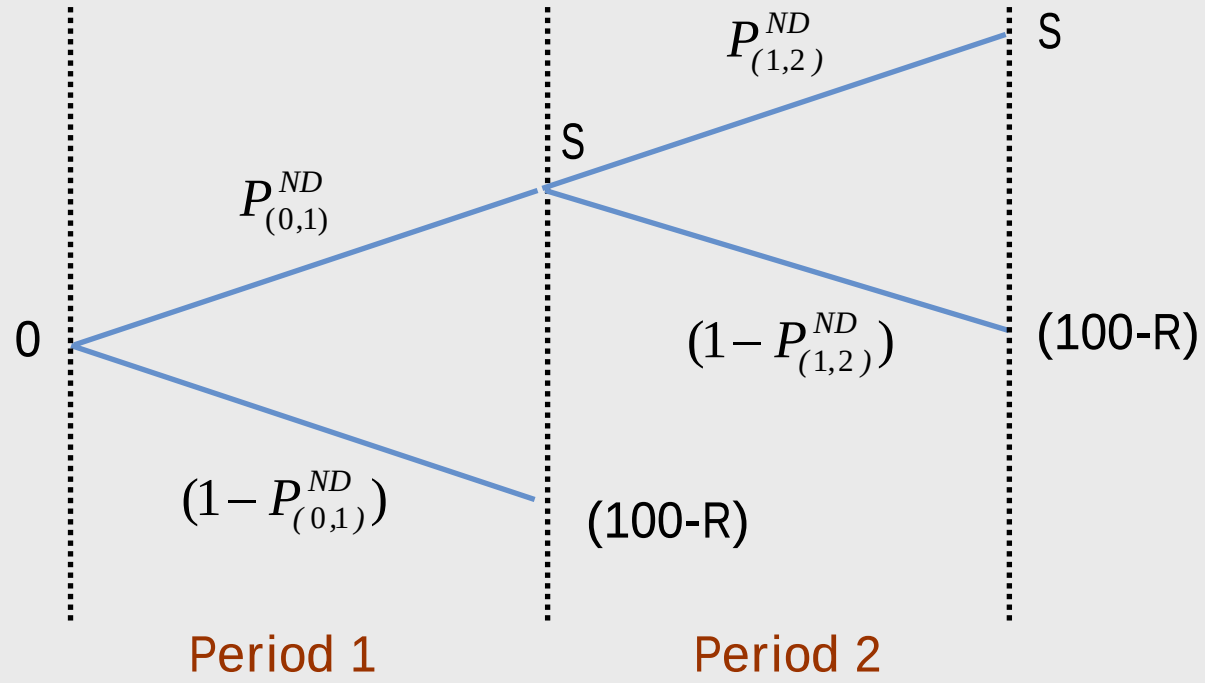
1 year annual CDS

Period 1

$$0 = \frac{1}{(1+r_{risk\ free})}\left[P^{ND} \text{ x S} - (1-P^{ND}) \text{ x } (1-\text{R})\right]$$

By bootstrapping, a term structure of default prob can be estimated

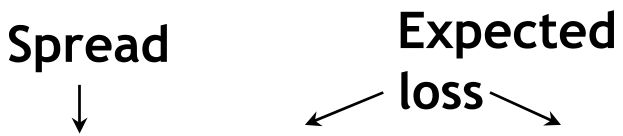
Default probability tree construction



Using bootstrapping method we can use $P^{ND}_{(0,1)}$ solved in Period 1 to deduce $P^{ND}_{(1,2)}$ in Period 2

Useful Rule of Thumb

- Market equilibrium should ensure that expected loss is equal to the PV of any spread paid in compensation for bearing the risk:



$$S = P^D(1-R)$$

- Rearranging gives a simple expression for default probability in terms of CDS spread and recovery rate

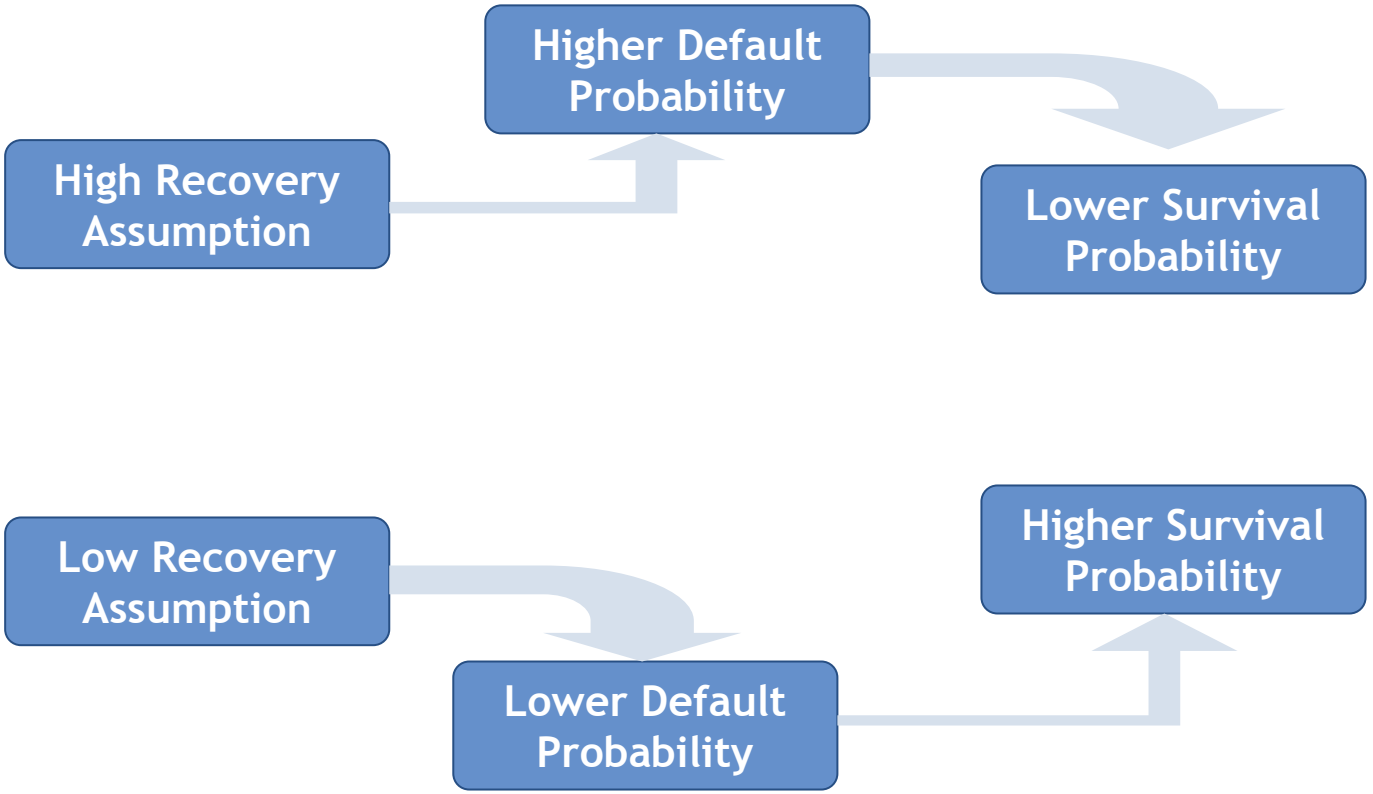
$$P^D = \frac{S}{(1-R)}$$

$$p(t,T) = \frac{1-\frac{1}{\left(1+s(t:t,T)^n\right)}}{1-\theta}$$

Calculation of default prob is complicated by a number of factors

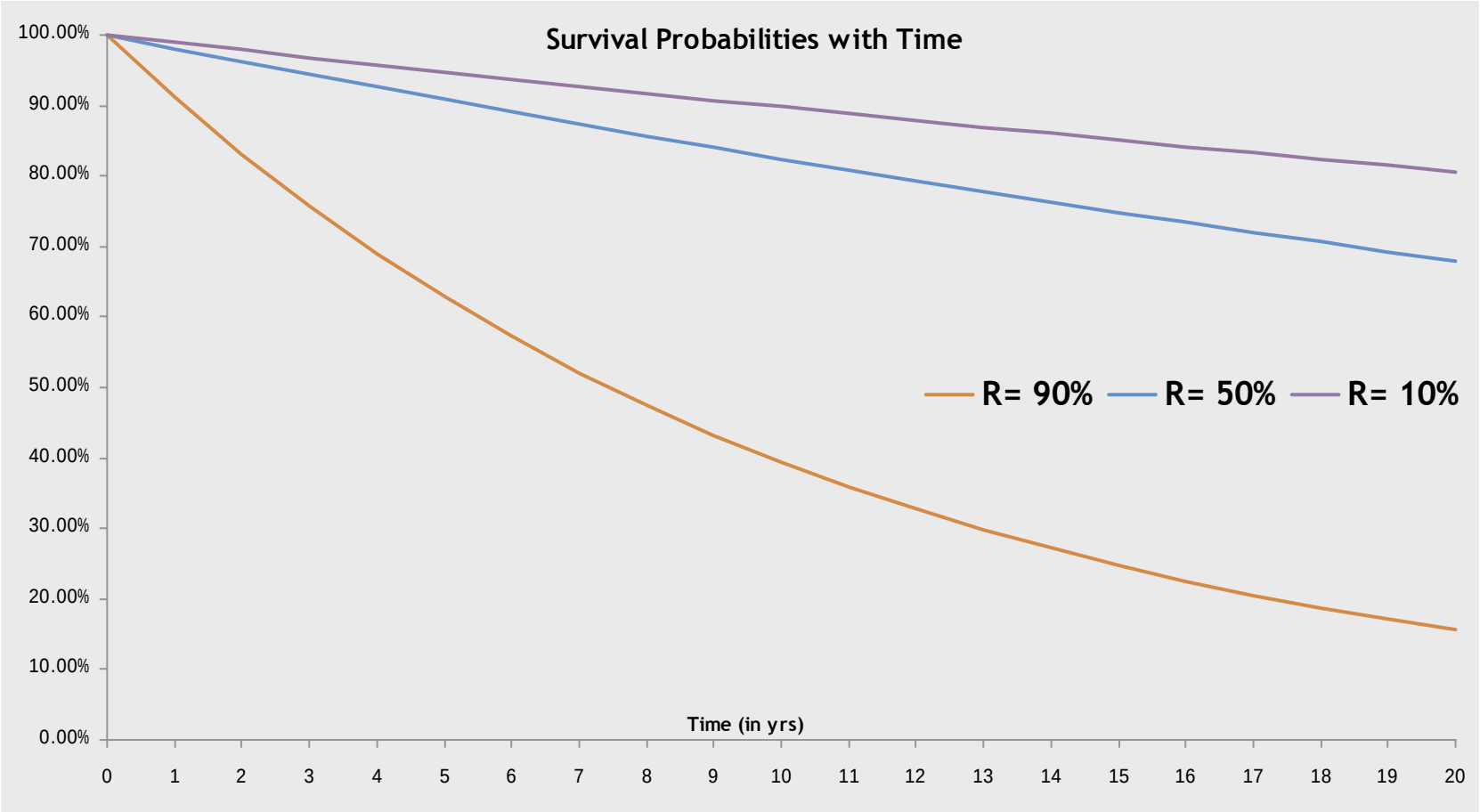
- Recovery assumptions
  - Recovery amount cannot be known in advance; therefore an assumption must be made
  - Assumptions about what will be recovered can vary:
    - Recover a flat cash amount
    - Recover a percentage of risk free PV
    - Recover a percentage of outstanding notional plus accrued interest
- Interpolation
  - Credit default swaps typically pay fee quarterly
- Fee accrual
  - In a standard CDS, only the accrued spread is usually paid at time of default

Effect of recovery assumption on implied survival probability



Survival probability with time for different recovery rates

Survival probability with time for different recovery rates (CDS Spread = 100 bps)



For low recovery rate assumptions, survival probability decreases approximately linearly over time. For high recovery rate assumptions, this relationship is more 'convex'

Decline in survival probability with higher recovery rates

Survival probability with time for different recovery rates (CDS Spread = 100 bps)

Maturity	R= 90%	R= 50%	R= 10%
0	99.99%	100.00%	100.00%
1	91.12%	98.09%	98.93%
2	83.02%	96.21%	97.87%
3	75.64%	94.37%	96.82%
4.0027	68.92%	92.56%	95.78%
5.0027	62.80%	90.79%	94.75%
6.0027	57.21%	89.05%	93.74%
7.0027	52.13%	87.35%	92.73%
8.0055	47.50%	85.67%	91.73%
9.0055	43.28%	84.04%	90.75%
10.0055	39.43%	82.43%	89.78%
11.0055	35.93%	80.85%	88.82%
12.0082	32.73%	79.30%	87.86%
13.0082	29.82%	77.78%	86.92%
14.0082	27.17%	76.29%	85.99%
15.0082	24.76%	74.83%	85.07%
16.011	22.55%	73.40%	84.15%
17.011	20.55%	72.00%	83.25%
18.011	18.73%	70.62%	82.36%
19.011	17.06%	69.27%	81.48%
20.0137	15.55%	67.94%	80.60%

Caselet: a typical problem of front & middle office folks

Client entered into the following CDS trade a year back

- Reference Entity: AT&T Corporation
- Maturity: 5 years
- Notional: USD 10 million
- Contract Spread: 150 bps
- Current bid/offer for AT&T is as below
- Calculate the MTM on the trade

Tenors	Bid Spread	Mid Spread	Ask Spread
1D	98.5	100	101.5
1M	98.5	100	101.5
2M	98.5	100	101.5
3M	98.5	100	101.5
4M	98.5	100	101.5
5M	98.5	100	101.5
6M	98.5	100	101.5
9M	98.5	100	101.5
1Y	98.5	100	101.5
18M	98.5	100	101.5
2Y	98.5	100	101.5
3Y	98.5	100	101.5
4Y	98.5	100	101.5
5Y	98.5	100	101.5

Survival Probabilities As Weighting Factors

$$MTM = \sum_{i=1}^{K} (Current\,CDS - Contract\,CDS).DF_i\,.SP_i$$

Current CDS is the CDS spread currently prevailing in the market

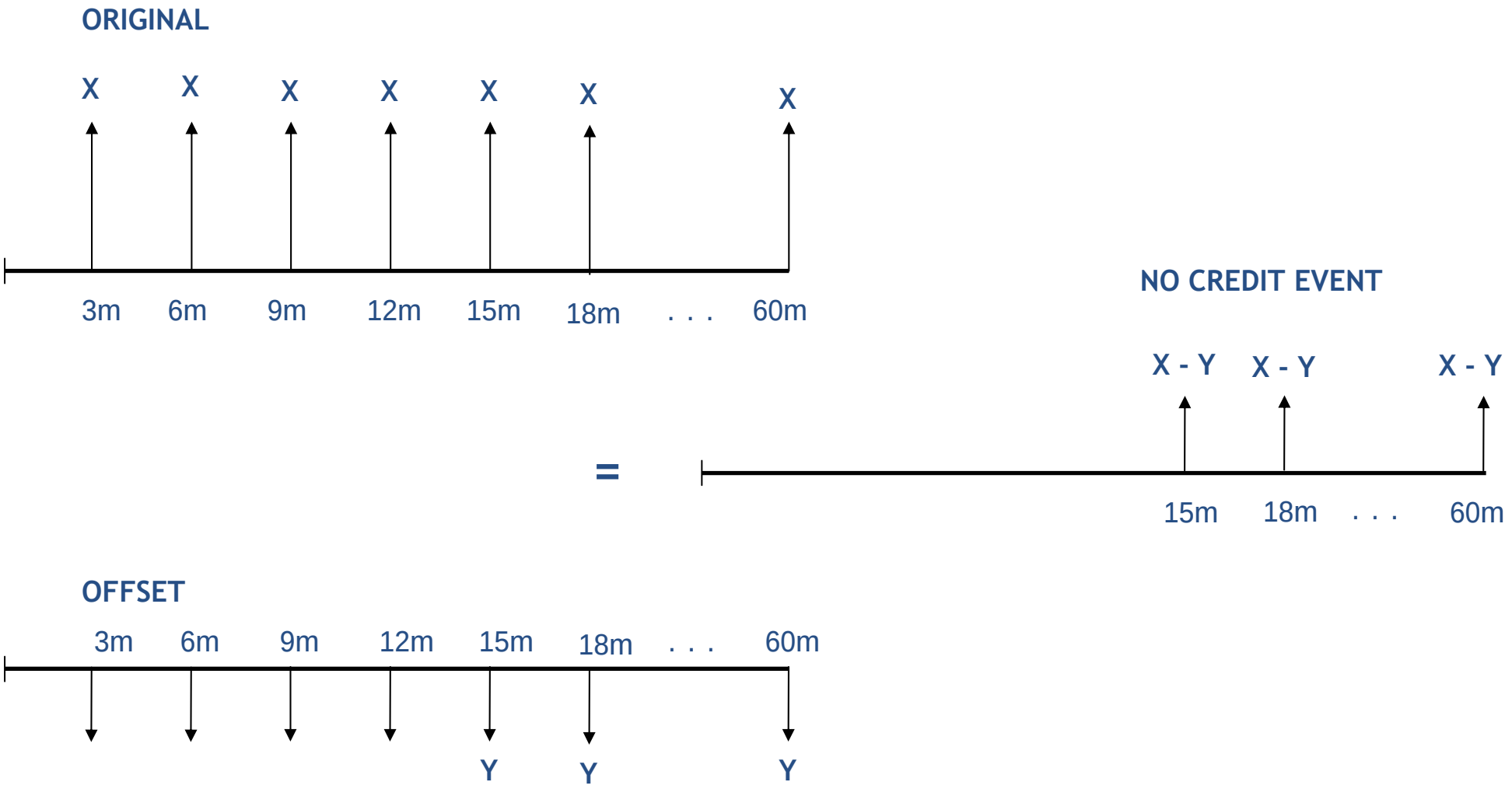
Contract CDS is the CDS spread at which the trade was entered

K is the number of coupon periods

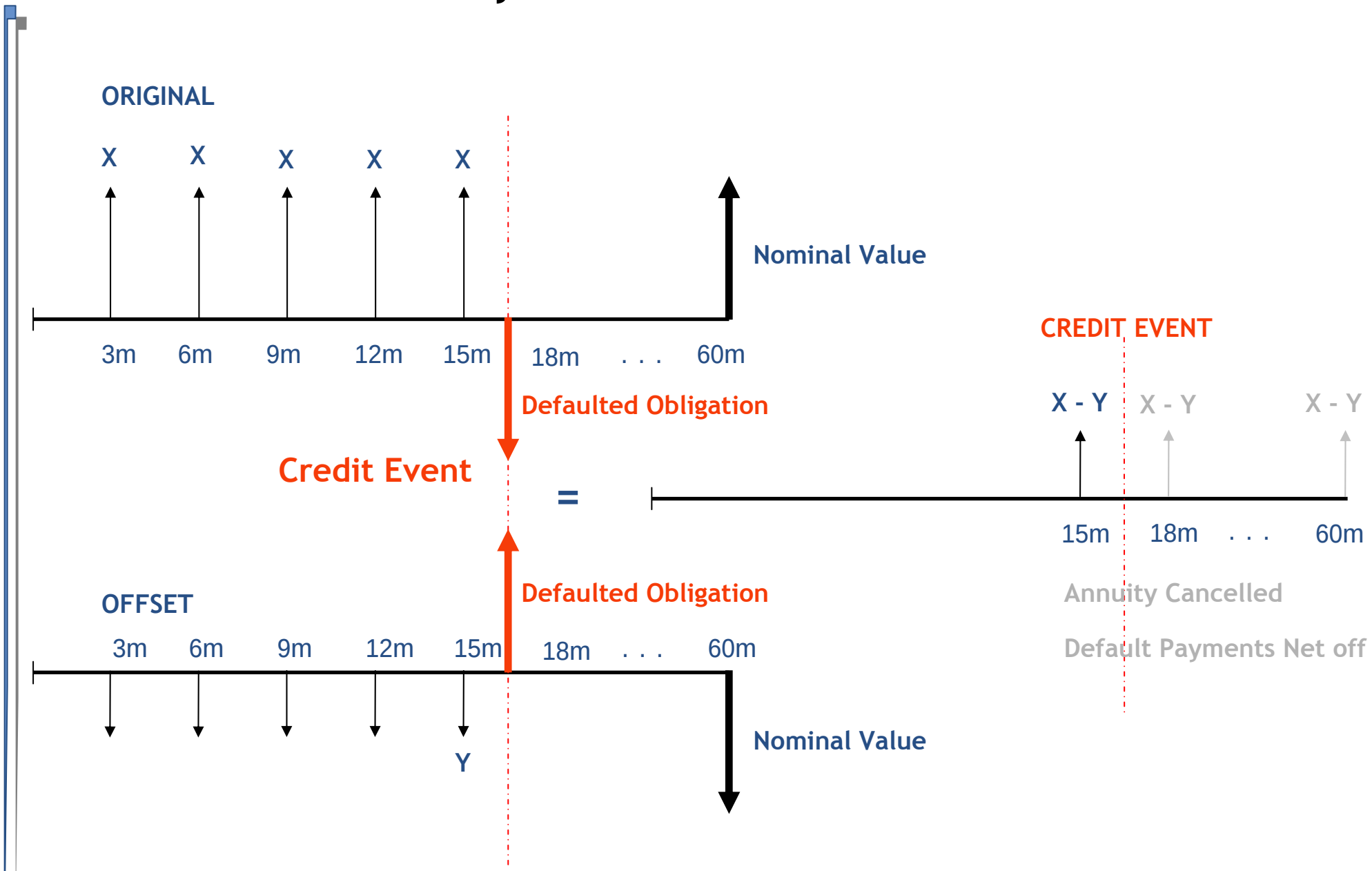
DF_i is the riskless discount factor from time t_0 to t_i

SP_i is the Survival Probability of the reference entity from time t_0 to t_i

Conceptualising CDS Mark-to-Market

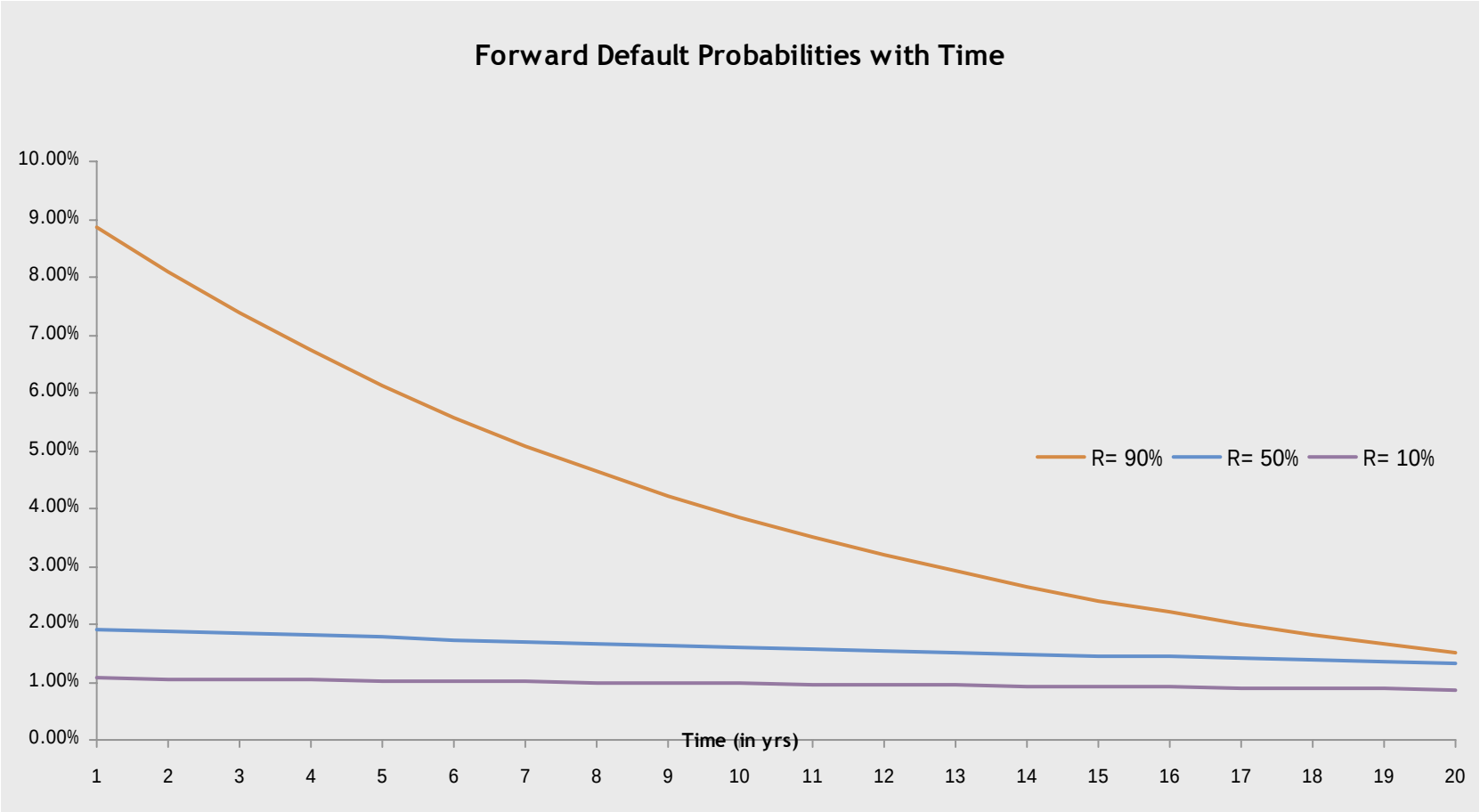


But the Cash Flows are risky …



Forward default probability for different recovery rates

Forward default probability with time for different recovery rates (CDS Spread = 100 bps)



For low recovery rate assumptions, forward default probability decreases approximately linearly over time. For high recovery rate assumptions, it decreases exponentially

Increased forward default probability with higher R

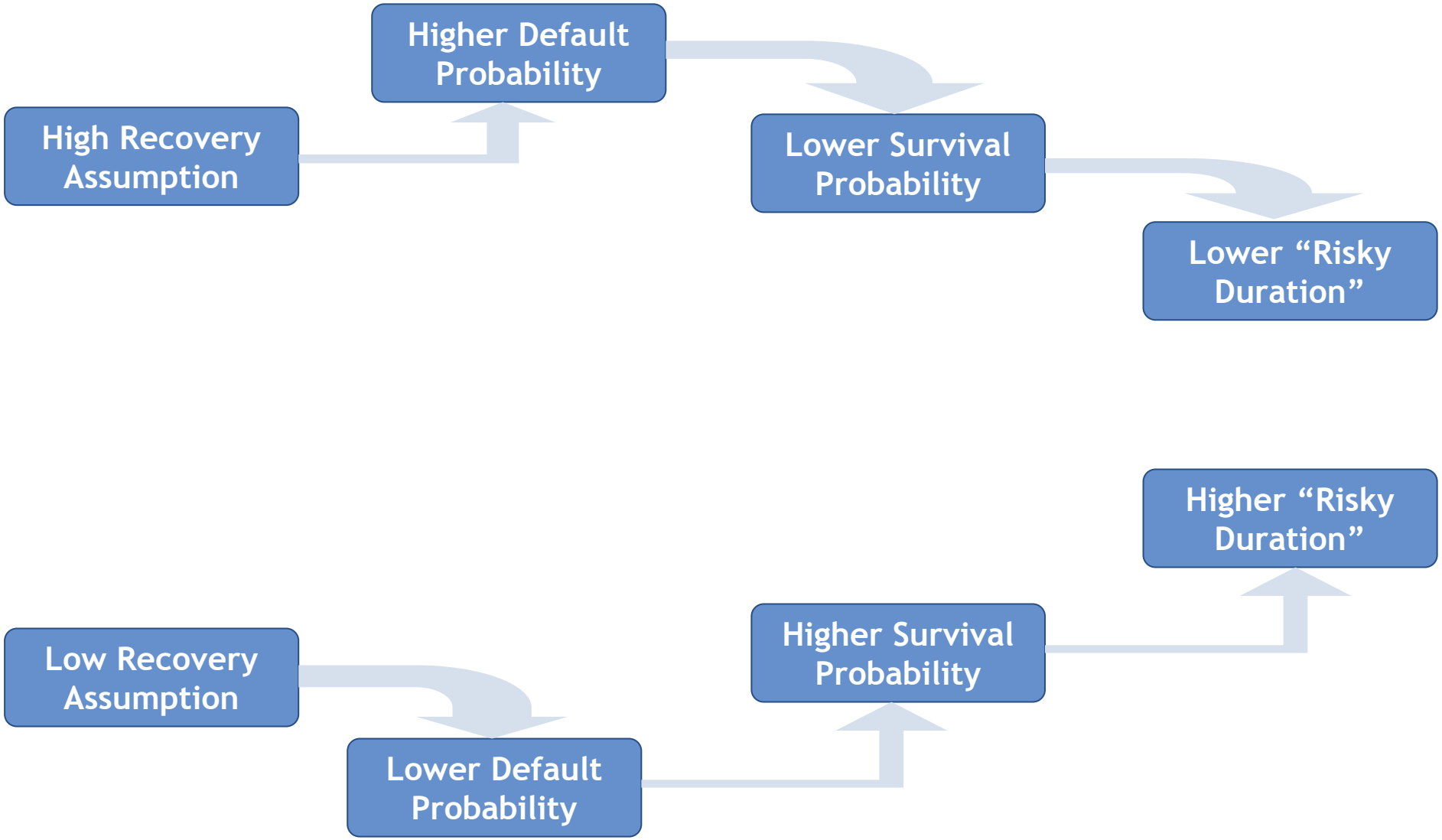
Forward default probability with time for different recovery rates (CDS Spread = 100 bps)

Maturity	R= 90%	R= 50%	R= 10%
1	8.87%	1.91%	1.07%
2	8.10%	1.88%	1.06%
3	7.38%	1.84%	1.05%
4.0027	6.72%	1.81%	1.04%
5.0027	6.12%	1.77%	1.03%
6.0027	5.58%	1.74%	1.02%
7.0027	5.08%	1.70%	1.01%
8.0055	4.63%	1.67%	0.99%
9.0055	4.22%	1.64%	0.98%
10.0055	3.85%	1.61%	0.97%
11.0055	3.50%	1.58%	0.96%
12.0082	3.20%	1.55%	0.95%
13.0082	2.91%	1.52%	0.94%
14.0082	2.65%	1.49%	0.93%
15.0082	2.41%	1.46%	0.92%
16.011	2.20%	1.43%	0.91%
17.011	2.00%	1.40%	0.90%
18.011	1.82%	1.38%	0.89%
19.011	1.66%	1.35%	0.88%
20.0137	1.52%	1.33%	0.88%

Issuer-Weighted Recovery Rate Descriptive Statistics

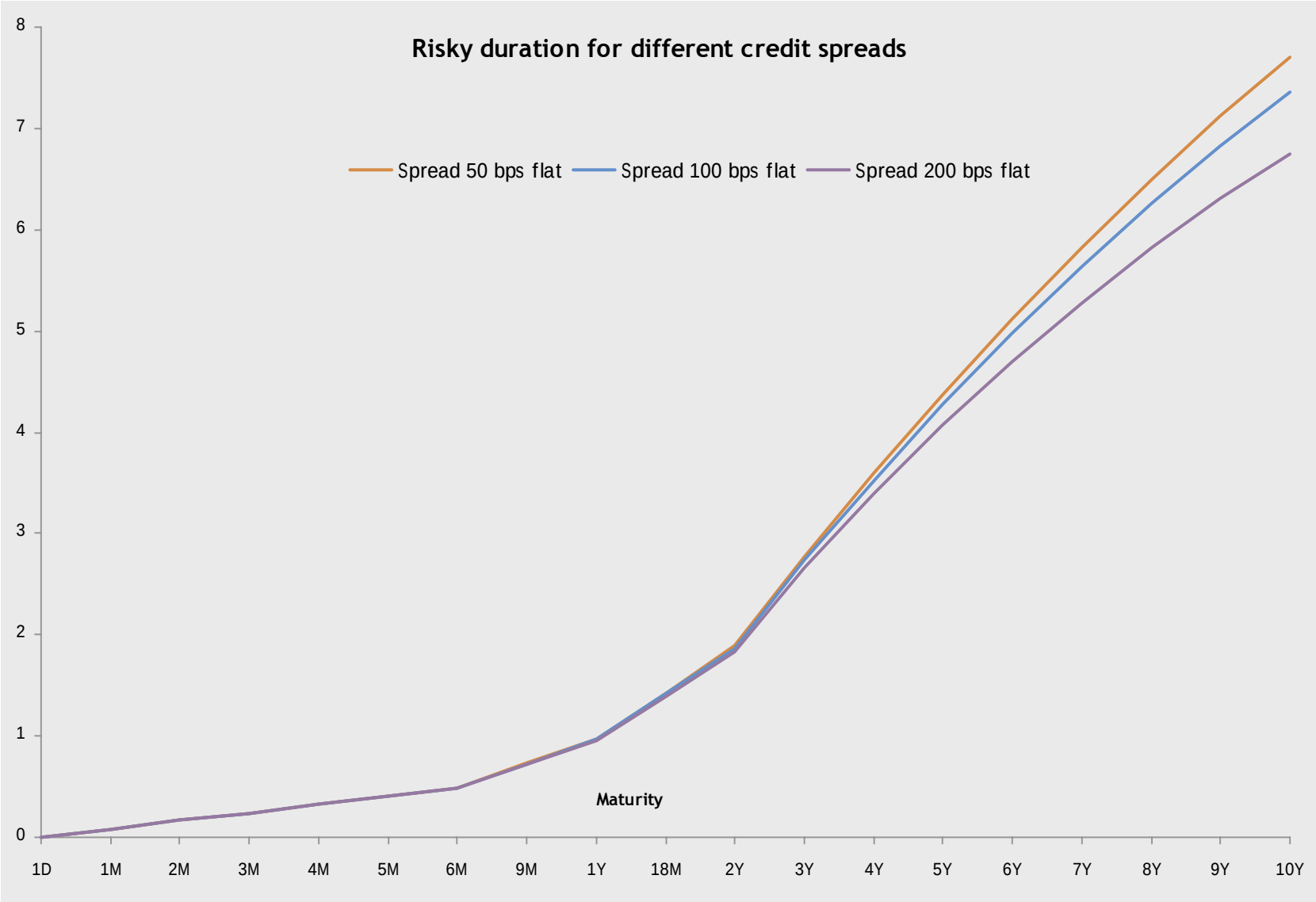
Priority in Capital Structure	Mean (1982 - 2003)	Mean (2004)
Senior Secured	57.4%	80.8%
Senior Unsecured	44.9%	50.1%
Senior Subordinated	39.1%	44.4%
Subordinated	32.0%	NA
Junior Subordinated	28.9%	NA
All Bonds	42.2%	54.3%

Effect of recovery assumption on risky duration



Risky Duration for different credit spreads

Risky Duration for constant term structure of credit spreads



Nonlinearity of risky duration

Nonlinearity of risky duration for half and double credit spreads

Maturity	Mat times	Spread 50 bps flat	Duration	Spread 100 bps flat	Duration	Spread 200 bps flat	Duration
1D	0.003	50.0	0.0027	100.0	0.0027	200.0	0.0027
1M	0.077	50.0	0.0764	100.0	0.0764	200.0	0.0763
2M	0.170	50.0	0.1684	100.0	0.1681	200.0	0.1675
3M	0.244	50.0	0.2410	100.0	0.2404	200.0	0.2392
4M	0.329	50.0	0.3245	100.0	0.3237	200.0	0.3220
5M	0.416	50.0	0.4100	100.0	0.4087	200.0	0.4061
6M	0.496	50.0	0.4869	100.0	0.4851	200.0	0.4816
9M	0.748	50.0	0.7297	100.0	0.7261	200.0	0.7190
1Y	1.000	50.0	0.9693	100.0	0.9634	200.0	0.9517
18M	1.496	50.0	1.4316	100.0	1.4194	200.0	1.3955
2Y	2.000	50.0	1.8893	100.0	1.8687	200.0	1.8285
3Y	3.008	50.0	2.7721	100.0	2.7330	200.0	2.6604
4Y	4.005	50.0	3.5954	100.0	3.5253	200.0	3.3929
5Y	5.003	50.0	4.3756	100.0	4.2687	200.0	4.0663
6Y	6.003	50.0	5.1179	100.0	4.9708	200.0	4.6947
7Y	7.005	50.0	5.8222	100.0	5.6303	200.0	5.2733
8Y	8.014	50.0	6.4956	100.0	6.2596	200.0	5.8261
9Y	9.011	50.0	7.1196	100.0	6.8308	200.0	6.3039
10Y	10.008	50.0	7.7092	100.0	7.3654	200.0	6.7428

Outline

Framework

- Every credit default swap is documented in a contract based on the ISDA format - called the Confirmation
- The terms used in the Confirmation are defined in the 2003 Credit Derivatives Definitions (formerly 1999 Definitions)
- A high level of standardisation of documentation exists in the market
- Standardization makes credit default swaps easier to trade, creates transparency and facilitates market participation

Key Contract Terms

- **Reference Entity** - the entity that credit protection covers
- **Obligations** - Borrowed Money, Bonds or Loans are types of obligations that the protection covers
- **Credit Events** - the triggers are Bankruptcy, Repudiation/Moratorium, Failure to Pay and Restructuring, Obligation Acceleration
  - **Bankruptcy** – covers insolvency, appointment of administrators/liquidators, creditor arrangements, etc
  - **Failure to Pay** – on one or more Obligations after expiration of any applicable grace period
  - **Restructuring** – agreement between Reference Entity and holders of any Obligation (and such agreement is not provided for under the terms of that Obligation) with respect to reduction of interest or principal, postponement of payment of interest or principal, change of currency (other than "Permitted Currency") and subordination
- **Deliverable Obligations** - settle contracts with Bonds or Loans with predefined characteristics

Key Contract Terms - Deliverable Obligations

- If a Credit Event occurs, the Buyer of protection can deliver Deliverable Obligations to the Seller
- Deliverable Obligations are not the same as Obligations — they are more narrowly defined

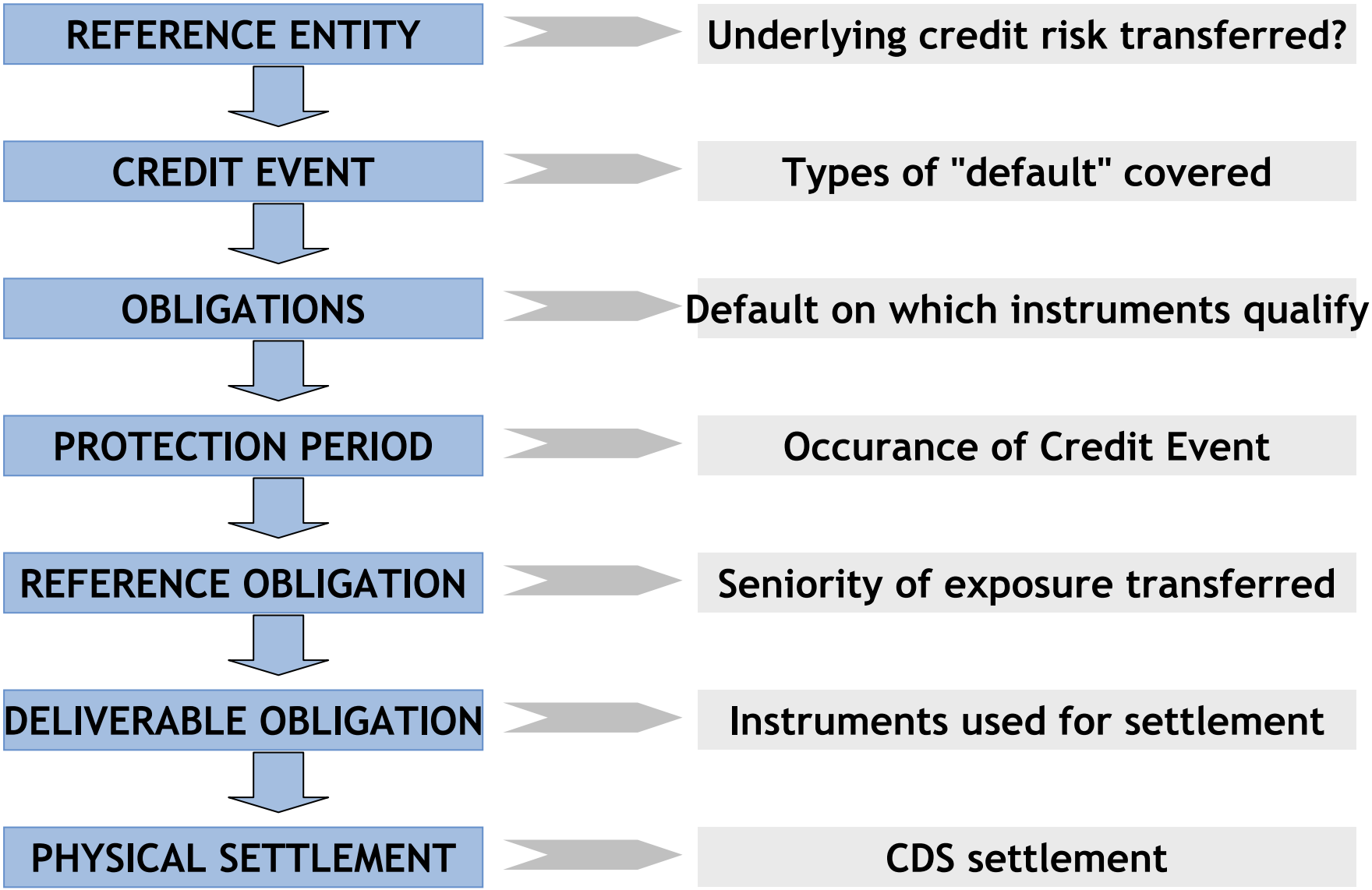
Deliverable Obligation Categories:		Deliverable Obligation Characteristics:	
No	Payment	Yes	Not Subordinated
No	Borrowed Money	Yes	Specified Currency - Standard Specified Currencies
No	Reference Obligation(s) Only	No	Not Sovereign Lender
No	Bond	No	Not Domestic Currency
No	Loan	No	Not Domestic Law
Yes	Bond or Loan	No	Listed
		Yes	Not Contingent
		No	Not Domestic Issuance
		Yes	Assignable Loan
		Yes	Consent Required Loan
		No	Direct Loan Participation
		No	Indirect Loan Participation
			Qualifying Participation Seller
		Yes	Transferable
		30 years	Maximum Maturity
		No	Accelerated or Matured
		Yes	Not Bearer

2003 Definitions - Why Introduce and Key Changes

- Why Introduce
  - To consolidate market experience - the 2003 Definitions represent a development of the 1999 Definitions.
  - Too many supplements (now incorporated)
  - Modified Restructuring was not adopted in Europe
  - Time to overhaul and clean up definitions

- Key Changes
  - Modified Modified Restructuring for Europe
  - New Settlement Fallbacks
  - New Guarantee provisions

CDS Structural Roadmap



Caselet: Armstrong World Industries

US company Armstrong World Industries missed payments on its debt

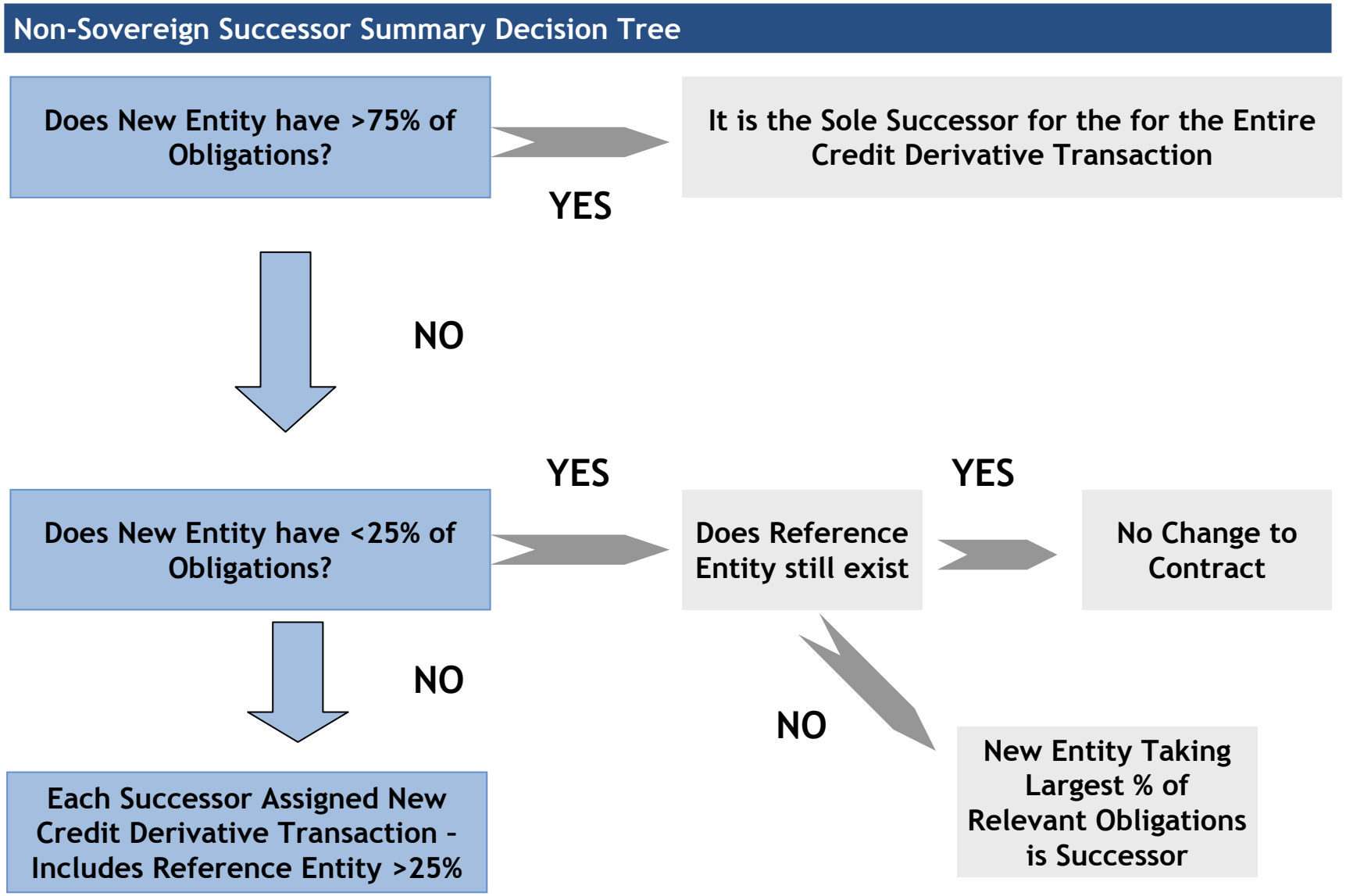
- US company Armstrong World Industries missed payments on its debt, which triggered credit default swaps
- Its parent company Armstrong Holdings however, did not default
- Many market participants had treated the parent and principal subsidiary interchangeably and had hedged positions with offsetting contracts in the other entity
- The lesson here is that there may be substantial credit basis risk between different entities in the same group
- Worse still, certain contracts in the market had referenced simply Armstrong without clarifying to which specific entity the contract referred

Caselet: National Power

National Power PLC demerged certain assets and subsidiaries into two entities

- In November 2000, National Power PLC of the UK demerged certain assets and subsidiaries into two entities: Innogy and International Power
- In consideration for the transfer of assets to Innogy, shareholders were given holdings in the new entity
- National Power then changed its name to International Power
- Innogy also assumed certain debt obligations of National Power
- This demerger prompted substantial debate as to whether Innogy had become a Successor

Non Sovereign Decision Tree



Caselet: Xerox Corporation

Xerox extended the date for repayment of principal

- In the summer of 2002, as part of a wider agreement with its banks, Xerox extended the date for repayment of principal
- This was in respect of a major syndicated bank facility that was due for repayment in September
- However, market participants entered a legal dispute about whether this was a result of a deterioration in creditworthiness
- And over what period prior to Restructuring such deterioration could reasonably have occurred

Caselet: Argentina

Obligation Exchange requirements

- Obligation Exchange requirements became the subject of legal disputes
- Argentina was facing a tight liquidity situation
- It “requested” local investors to exchange $50bn of bonds for new issues with lower coupons
- In question was the meaning of “mandatory” in such circumstances

Caselet: Railtrack

Bankruptcy Credit Event

- On 7 October 2000, Railtrack plc was placed by the UK government into Special Railways Administration
- This constituted a Bankruptcy Credit Event
- The announcement date was a Saturday
- Investors who bought credit default swap protection on the Wednesday, Thursday or Friday of the previous week would have not been covered for this Credit Event
- Under the current conventions, however, such risks are considerably reduced

Caselet: Railtrack CTD Obligation

"Widows and orphans" clause

- Following the Railtrack Bankruptcy Credit Event in 2000, the cheapest-to-deliver obligation was the 3.5% of 2009 exchangeable bond
- Most of the market took the view that, provided the bond is exchangeable or convertible at the option of the holder, the bondholder should be the beneficiary and the exchange or conversion option within its control
- One further complication in the Railtrack case was the inclusion of a so called "widows and orphans" clause in the exchangeable bond which gave the trustee the right to force conversion of the bond on the holder in certain circumstances where it was viewed as being in the interests of the investor
- After a protracted legal dispute, in February 2003, UK courts ruled in favour of deliverability

Caselet: Marconi

Somewhat unusual guarantee structure

- The Marconi group had a somewhat unusual guarantee structure
- The holding company Marconi PLC provided lenders and bondholders of subsidiary Marconi Corporation PLC with a guarantee
- Although the bond guarantees were stated to be “unconditional” they contained a provision that they would fall away upon the repayment of certain other guaranteed obligations
- In 2002 a Bankruptcy Credit Event occurred in relation to Marconi, and the approach of market participants was to deliver loans instead of bonds, so as to avoid the risk that the guarantee structure would render the bonds undeliverable (under 1999 Definitions)
- The main exception to this, was where the bond in question was stated as the Reference Obligation since in most circumstances this is deliverable

Caselet: Xerox Syndicated Bank Loan extension

Pressure on Mod-R

- Mod-R worked pretty well in the US till it came under pressure
- In summer 2002, Xerox extended maturities of a syndicated bank loan
- In this case the maturity limitation requirements of Mod-R did not really insulate Sellers of protection from the “cheapest-to-deliver” risk
- This was because, although not long dated, Xerox’s yen bonds were trading about 15-20 points lower than where the dollar bank loans were quoted

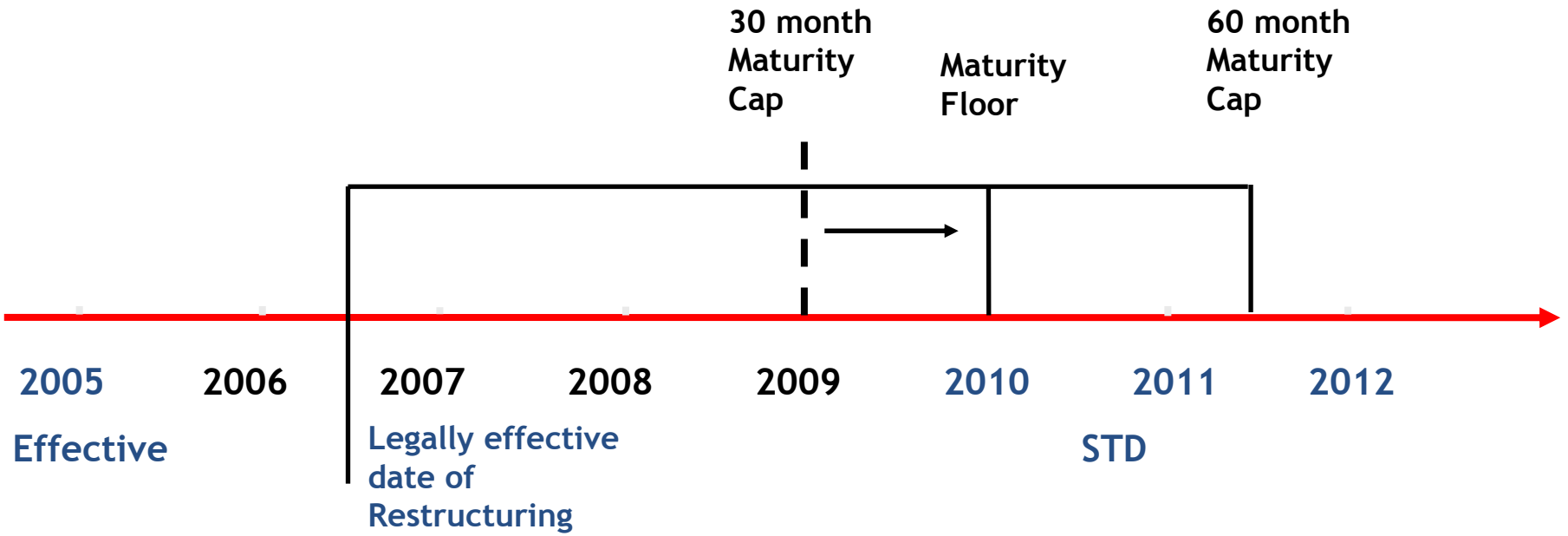
Modified Modified Restructuring

New features:

- The Restructured Obligation must be a **Multiple Holder Obligation** (i.e. more than three holders)
- If Buyer triggers the contract
  - Deliverable Obligations subject to a maturity cap of 60 months for the Restructured Bond or Loan, 30 months for others AND must be Conditionally Transferable Obligations (matches LMA standard)
  - Buyer may elect to partially settle

Modified Modified Restructuring

- In 2005, a customer buys 5 year protection on EnergyCo
- June 2006, EnergyCo enters legally binding agreement to restructure certain of its bonds
- **You can deliver (1) restructured bonds maturing before mid 2011 and (2) non restructured bonds maturing before 2010**



Modified Modified Restructuring - US and Europe

Feature:	MR (US standard)	MMR (European Standard)
Maturity Cap:	30 month cap Floored at STD	• 30 month cap for non restructured obligations • 60 month cap for restructured obligations • Floored at STD
Transferability:	Must be transferable to extensive list of entities without consent.	Must be transferable to entities regularly engaged in loan and securities markets with consent not to be unreasonably withheld
Obligations covered:	At least three holders and requires a 2/3 majority to implement restructuring.	At least three holders and in the case of a Loan, requires a 2/3 majority to implement restructuring

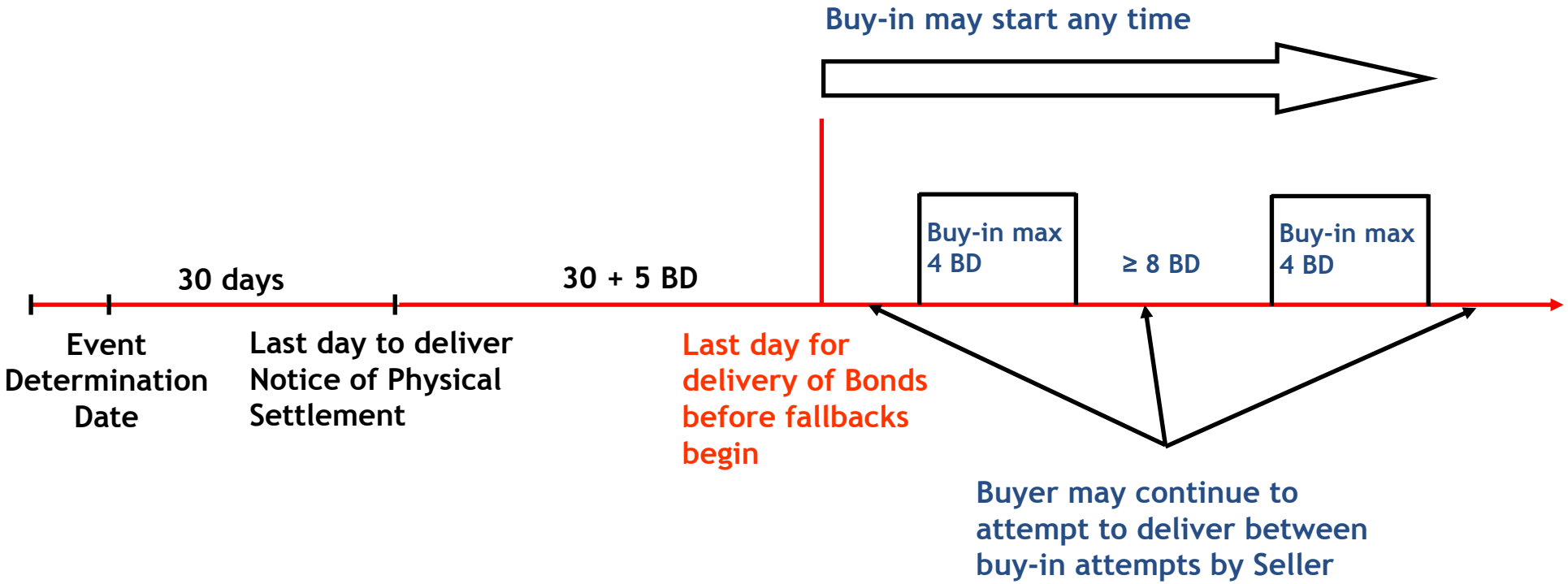
New Settlement Fallbacks

- To avoid failed contracts, parties now have an indefinite period of time to settle the contract
- Buyer must attempt scheduled settlement but if this fails, fallbacks will apply
- Buyer may continue to attempt delivery
- Seller may close out by buying in the Deliverable Obligation or nominating an alternative for delivery

New Settlement Fallbacks - Bond Delivery

- Buyer has 30 calendar days to deliver a Settlement Notice
- Buyer has 30 Business Days + 5 Business Day fallback to effect delivery of the Bonds
- If Delivery has not occurred by this date, Seller may **buy the Bond in at the lowest offer**. Seller has 4 Business Days to complete the process
- If Seller fails to complete the process, **Buyer may continue to attempt delivery**. Buyer can not deliver whilst the buy-in process is in operation
- Seller may try to buy the Bond in again, but must wait at least 8 Business Days before restarting the process

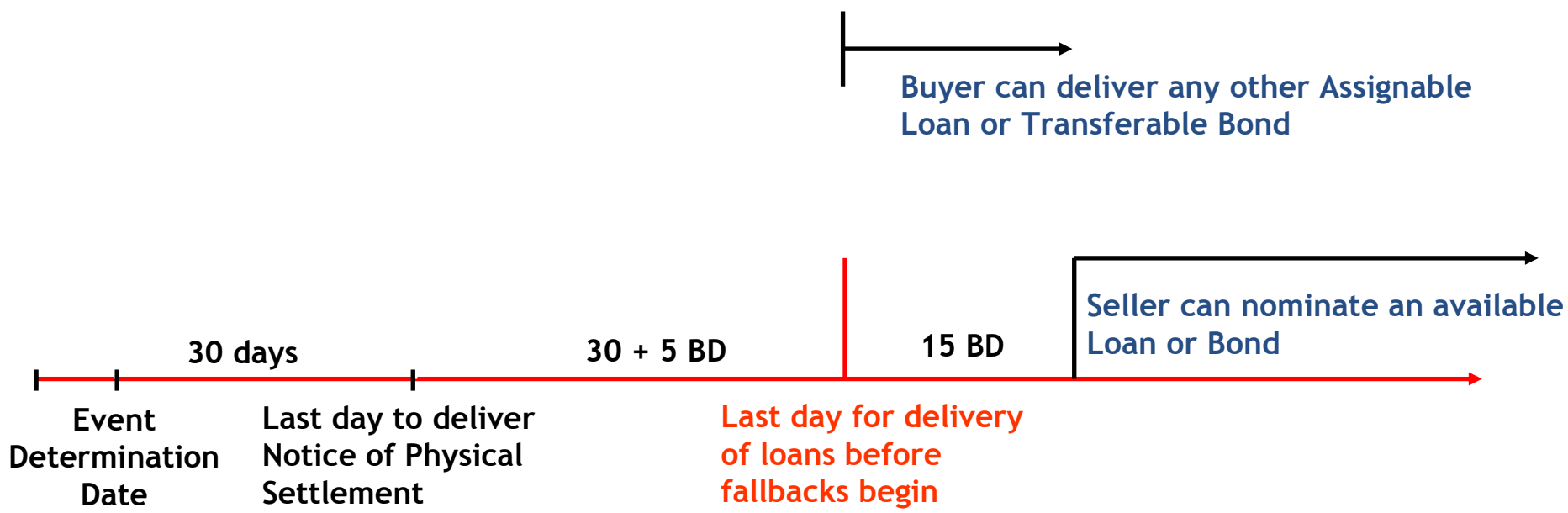
New Settlement Fallbacks - Bond Delivery



New Settlement Fallbacks - Loan Delivery

- Buyer has 30 calendar days to deliver a Settlement Notice
- Buyer has 30 Business Days + 5 Business Day fallback to effect delivery of the Loan
- If Delivery has not occurred by this date, **Buyer may deliver a Transferable Bond or an Assignable Loan instead** provided that Buyer provides certification from a Managing Director that reasonable efforts were used to get consent
- If Buyer has not delivered anything for a further 15 Business Days, Seller may nominate an Assignable Loan or a Transferable Bond and require Buyer to purchase and deliver

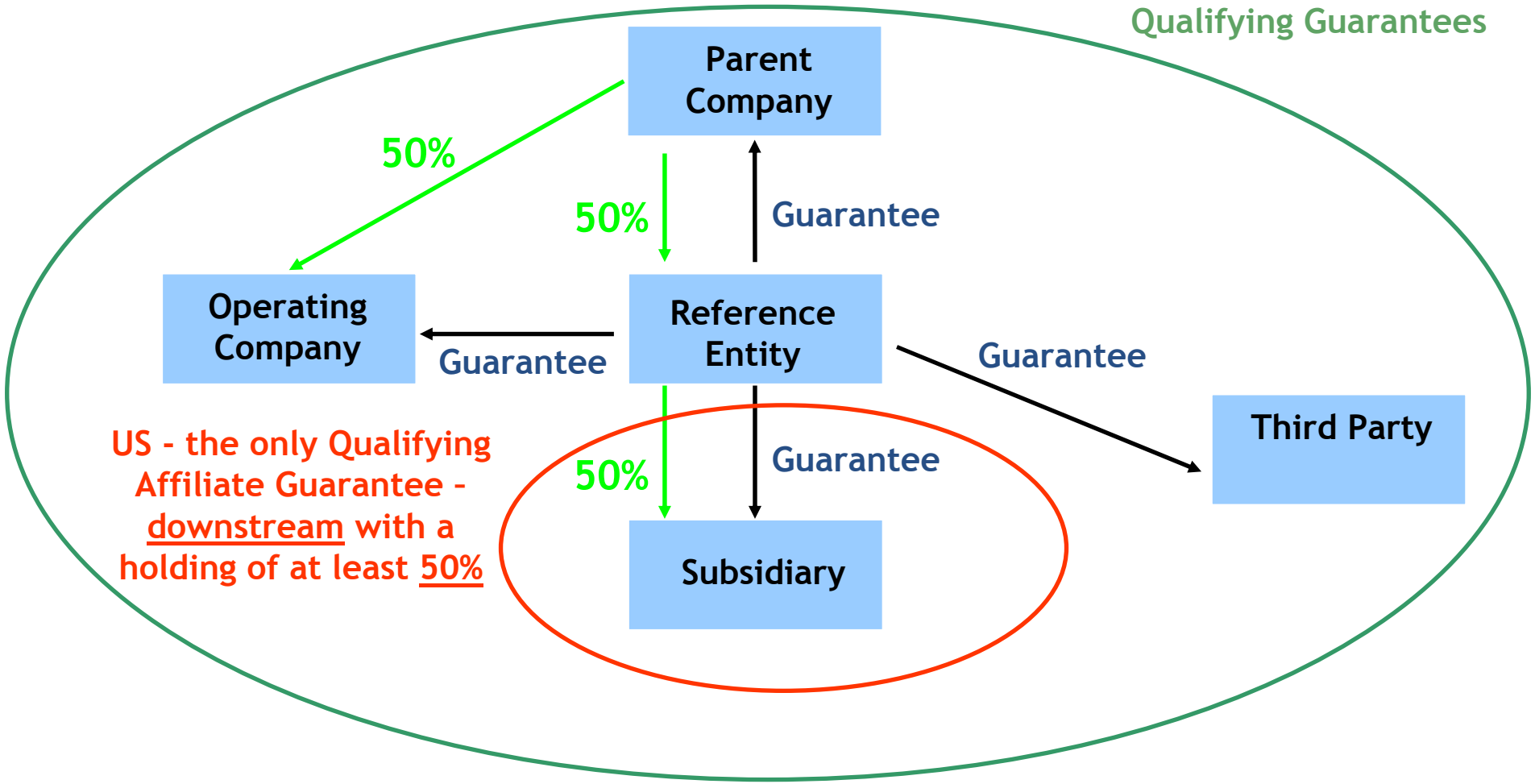
New Settlement Fallbacks - Loan Delivery



New Guarantee Provisions

- Users can now select what type of guarantees can trigger the contract and what is deliverable
- Guarantee has to be a "Qualifying Guarantee" i.e. a written instrument where Reference Entity irrevocably agrees to make payment
- Upstream, downstream, side-stream and third party guarantees may be identified and treated separately
- Europe "All Guarantees" will be adopted. In US "Qualifying Affiliate Guarantees" will be adopted
- Qualifying Affiliate Guarantee – Reference Entity guarantees debt of an affiliate where it owns more than 50 percent of the voting shares of that affiliate

New Guarantee Provisions



Other Key Changes

- CHF is now a standard deliverable currency
- Notice of Intended Physical Settlement becomes Notice of Physical Settlement ("NPS")
- Pari Passu Ranking becomes Not Subordinated
- Minor amendments to Restructuring definition, Successor definitions
- Not Contingent definition revised to remove need for a coupon
- Convertibles language broadened to accommodate wider range of deliverables
- Public Sources broadened to include Australian Financial Review et al plus the main source of business news in country of Reference Entity
- Scheduled Termination Date no longer subject to adjustment

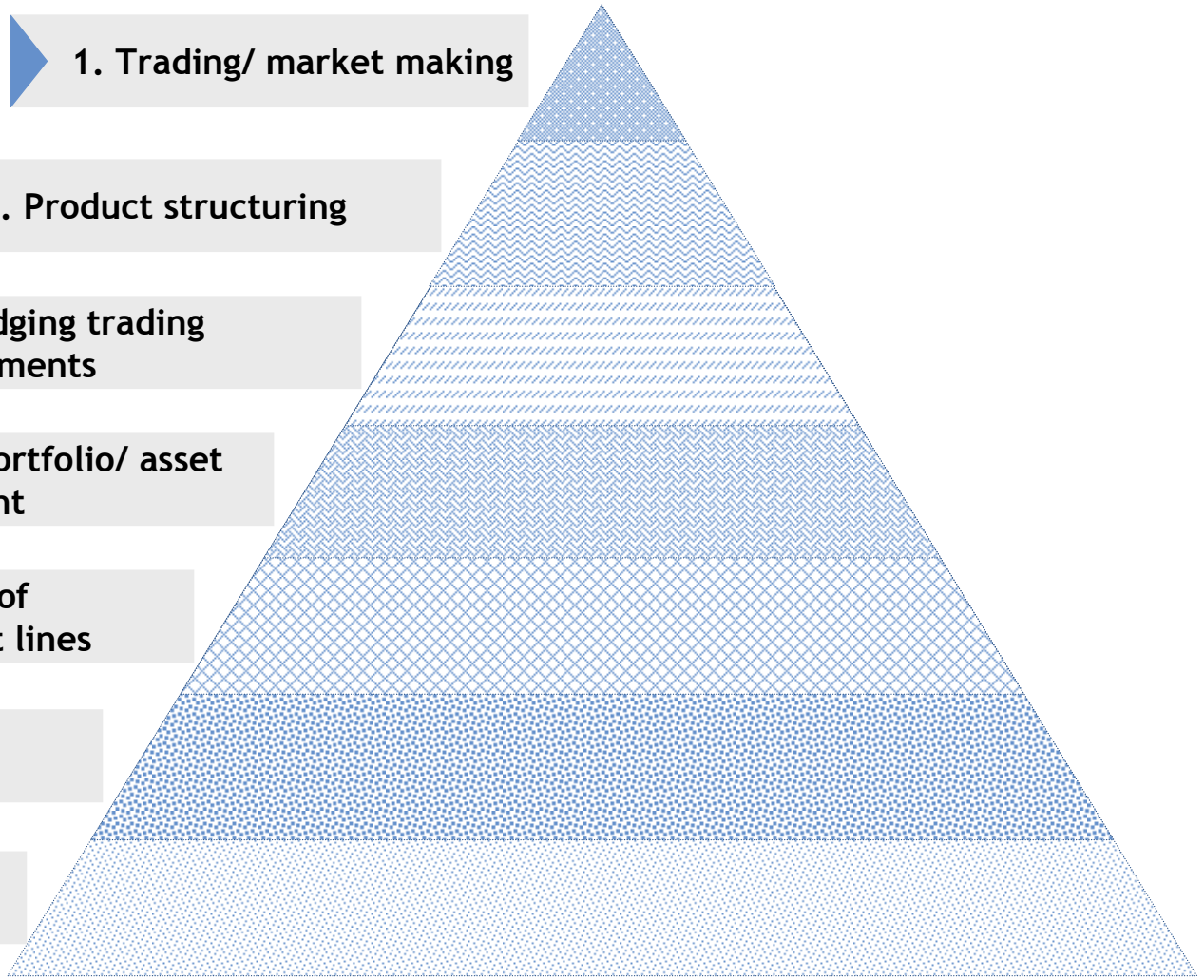
Other Key Changes

- Modified Following replaced with Following as standard convention for all trades
- Valuation provisions restructured so that all Firm Bids are used regardless of Quotation Size, with zero only deemed for the no bid portion
- Repudiation/Moratorium redrafted to require a subsequent Failure to Pay (in any size) before the earlier of (a) 60 days and (b) the next payment date for the instrument. Buyer must also deliver a notice of a Potential Repudiation/Moratorium

Outline

Applications for credit derivatives in the global market

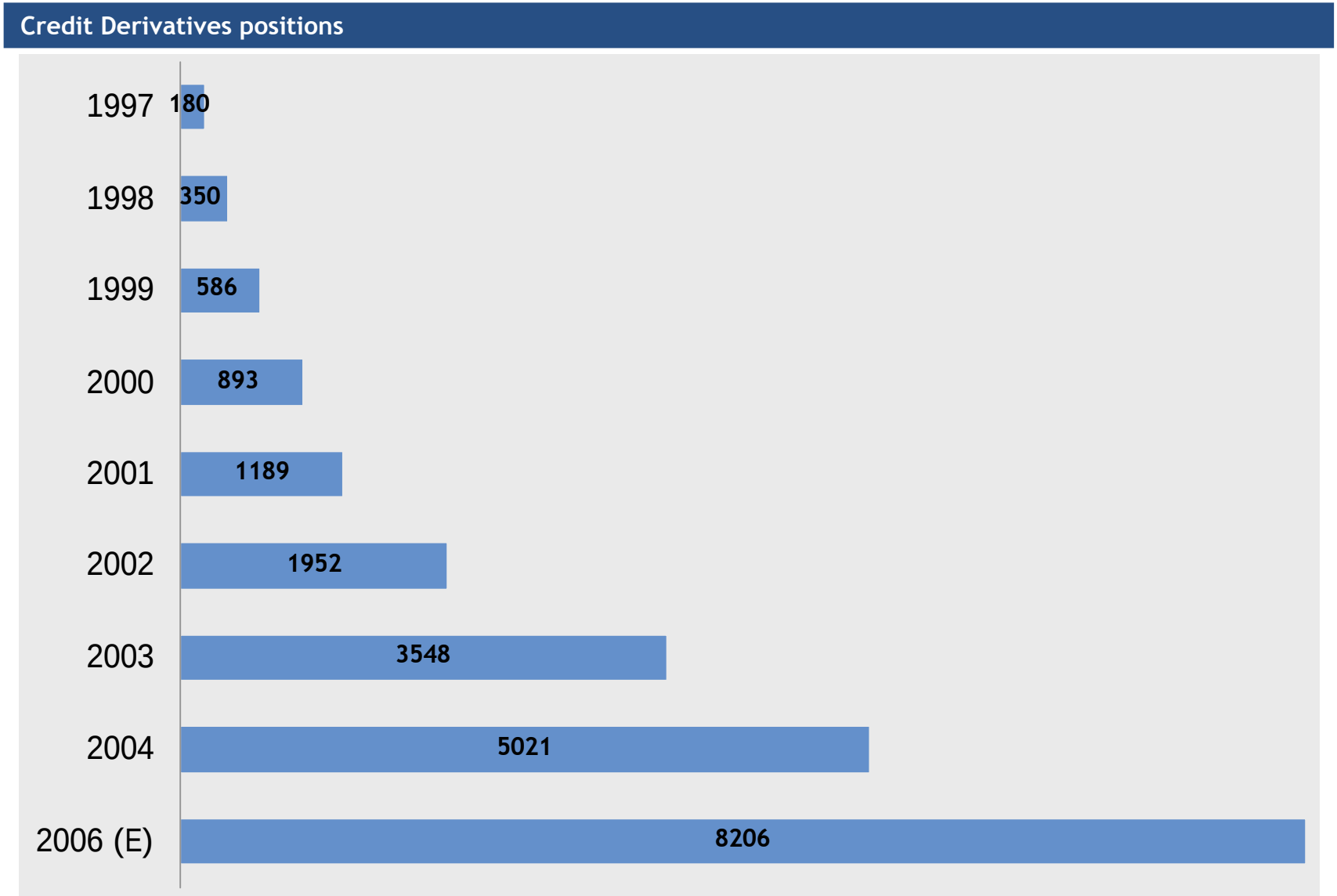
Motivations for using Credit Derivatives



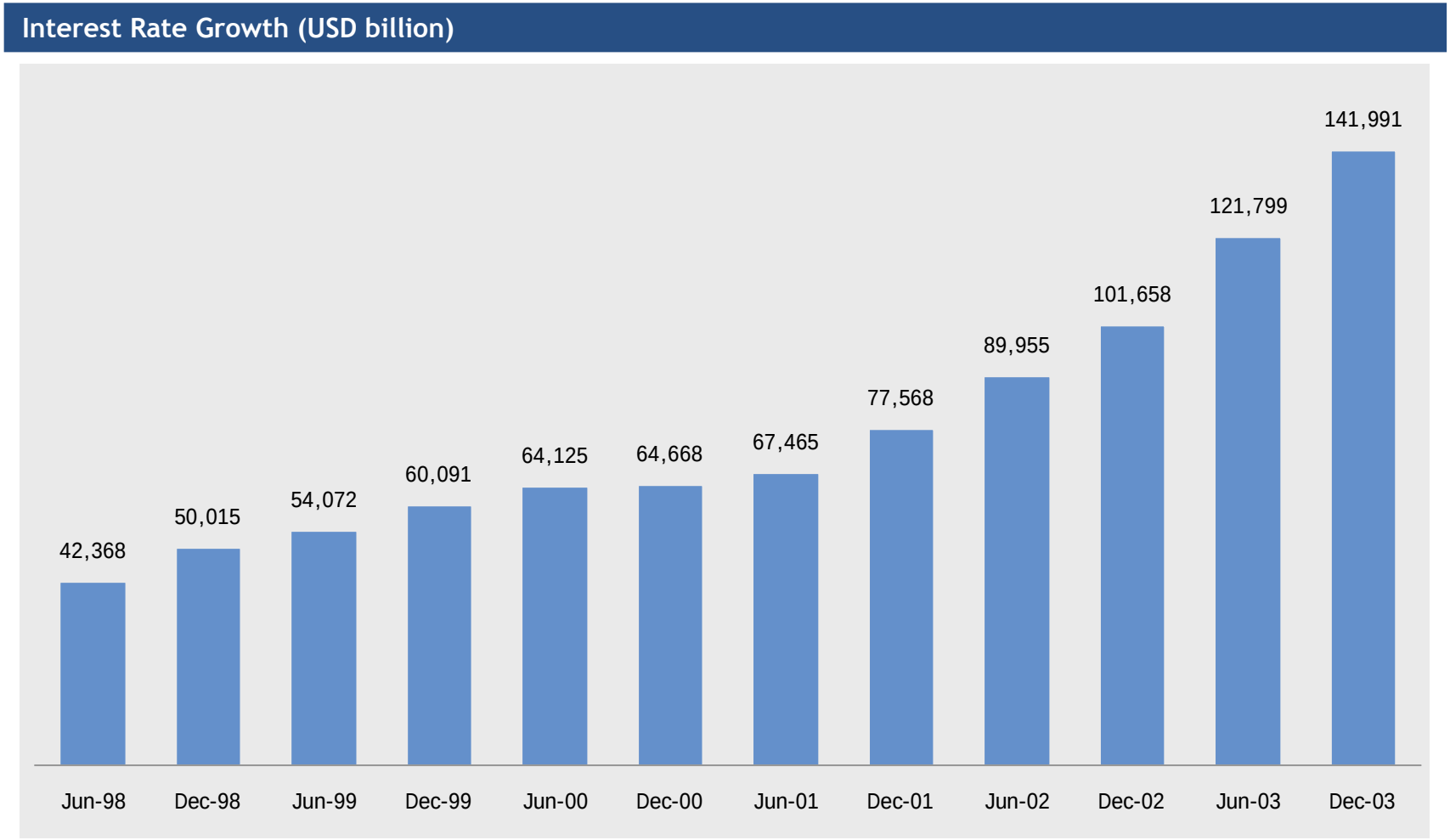
Rankings for application of Credit Derivatives

Applications for credit derivatives	Rankings 2003	Rankings 2006 (E)
Trading/market making	1	1
Product structuring	2	2
Hedging trading instruments	3	4
Active portfolio/asset management	4	3
Management of individual credit lines	5	5
Management of regulatory capital	6	7
Management of economic capital	7	6

Credit Derivatives positions

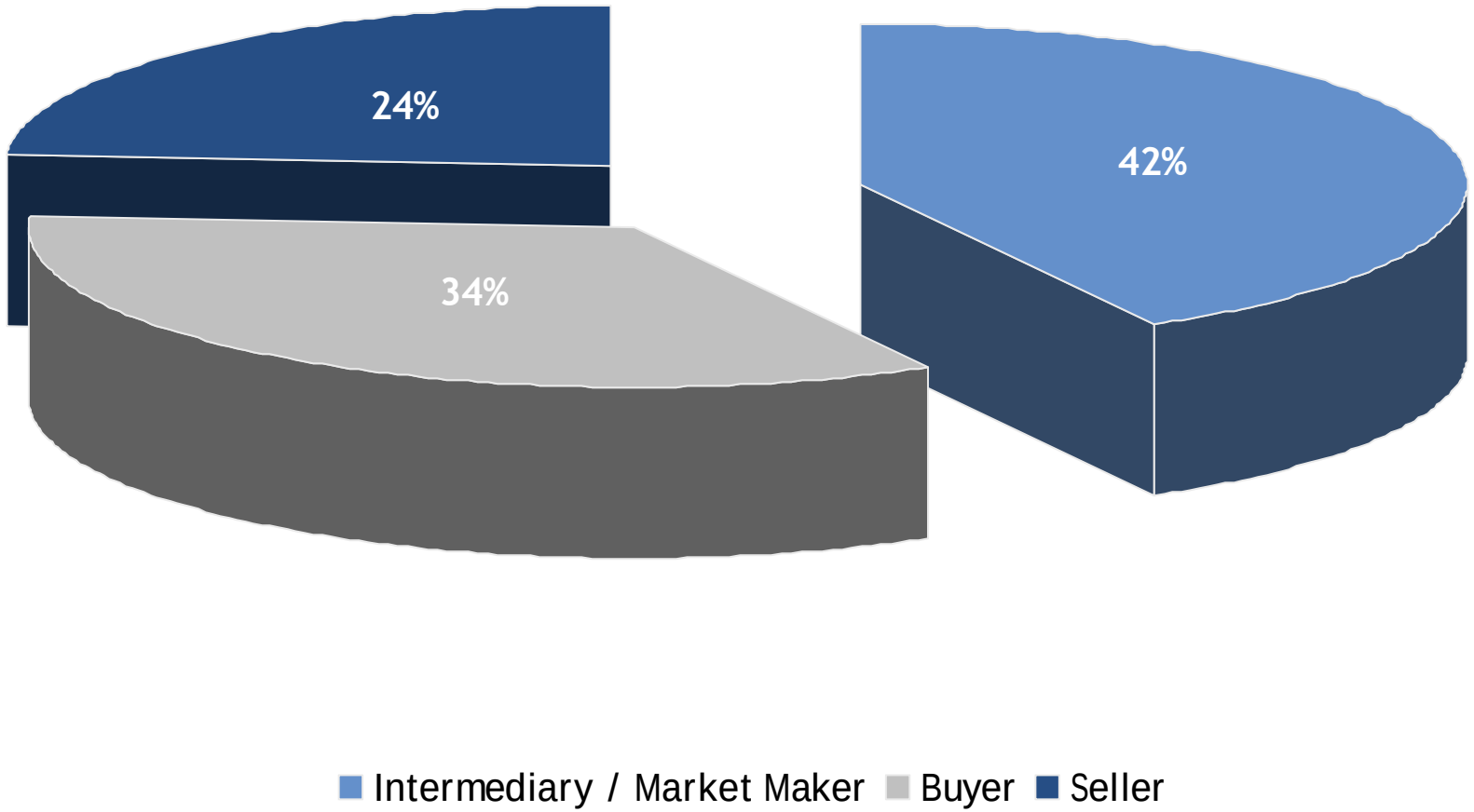


Comparative Interest rate derivatives growth



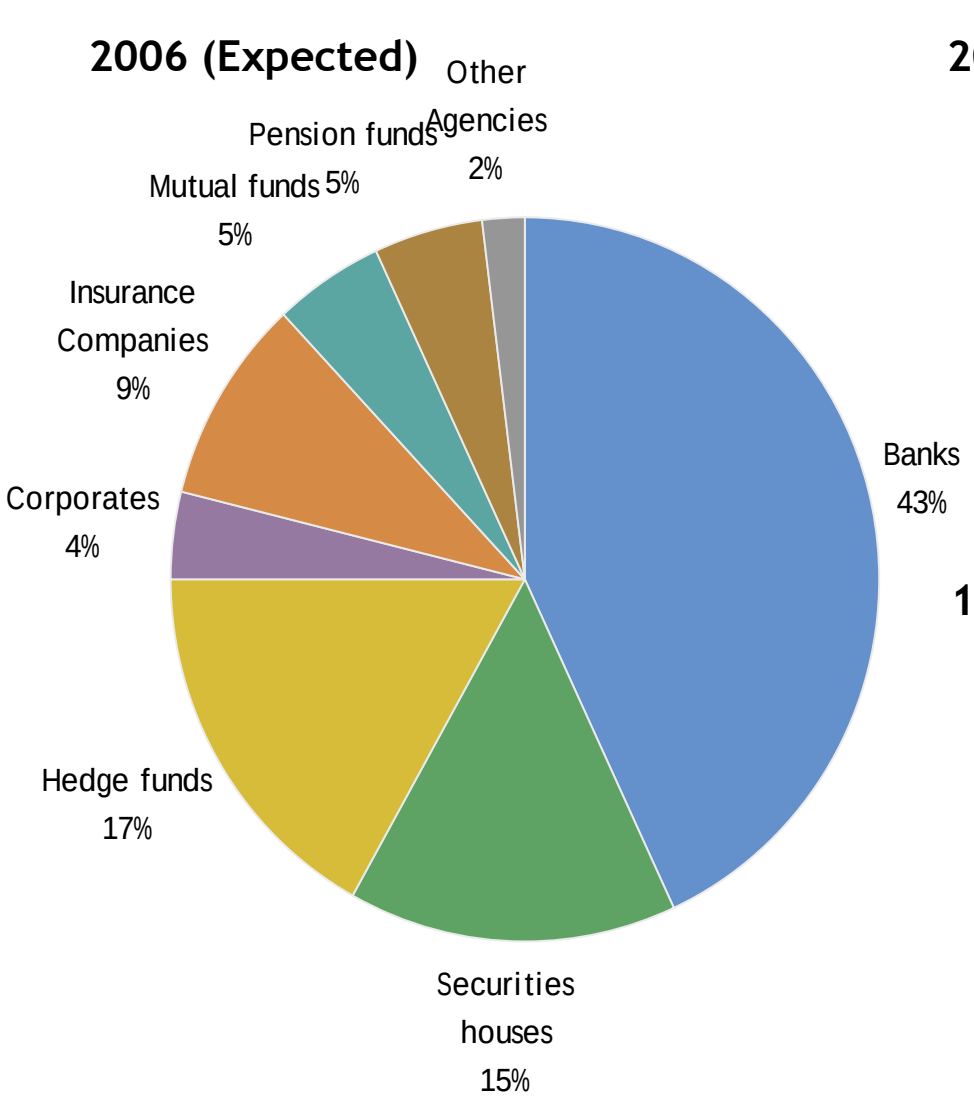
Breakdown of market participation

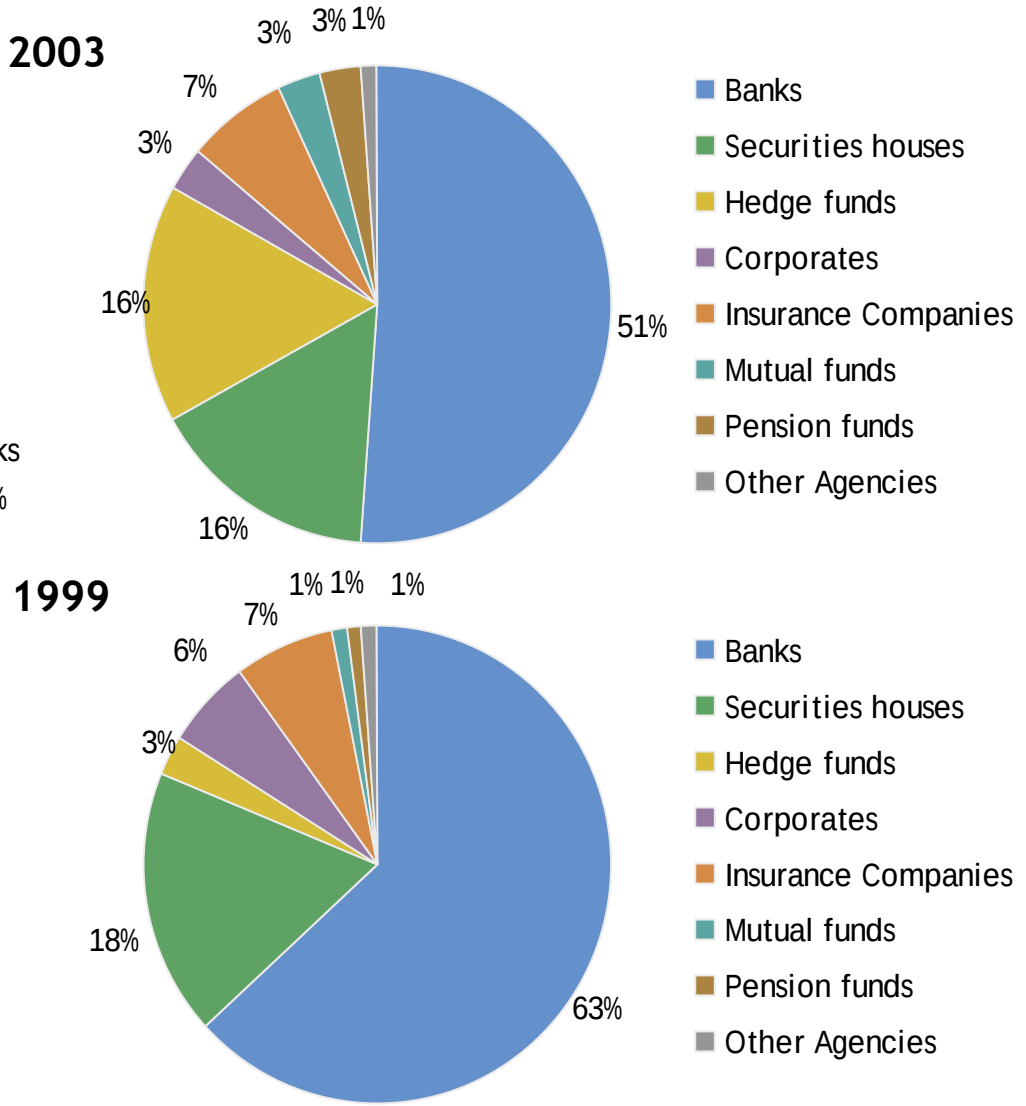
Market Composition



Institutions using credit derivatives to buy protection

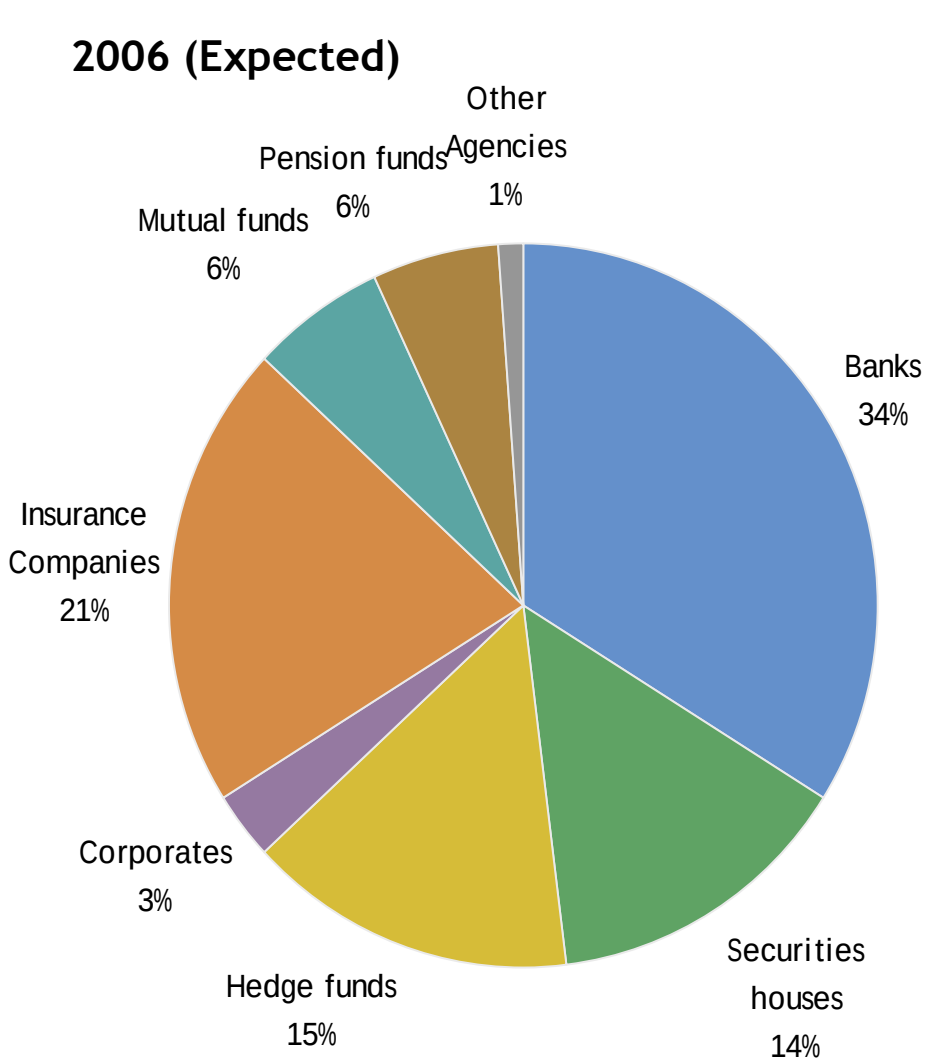
Buyers of credit protection

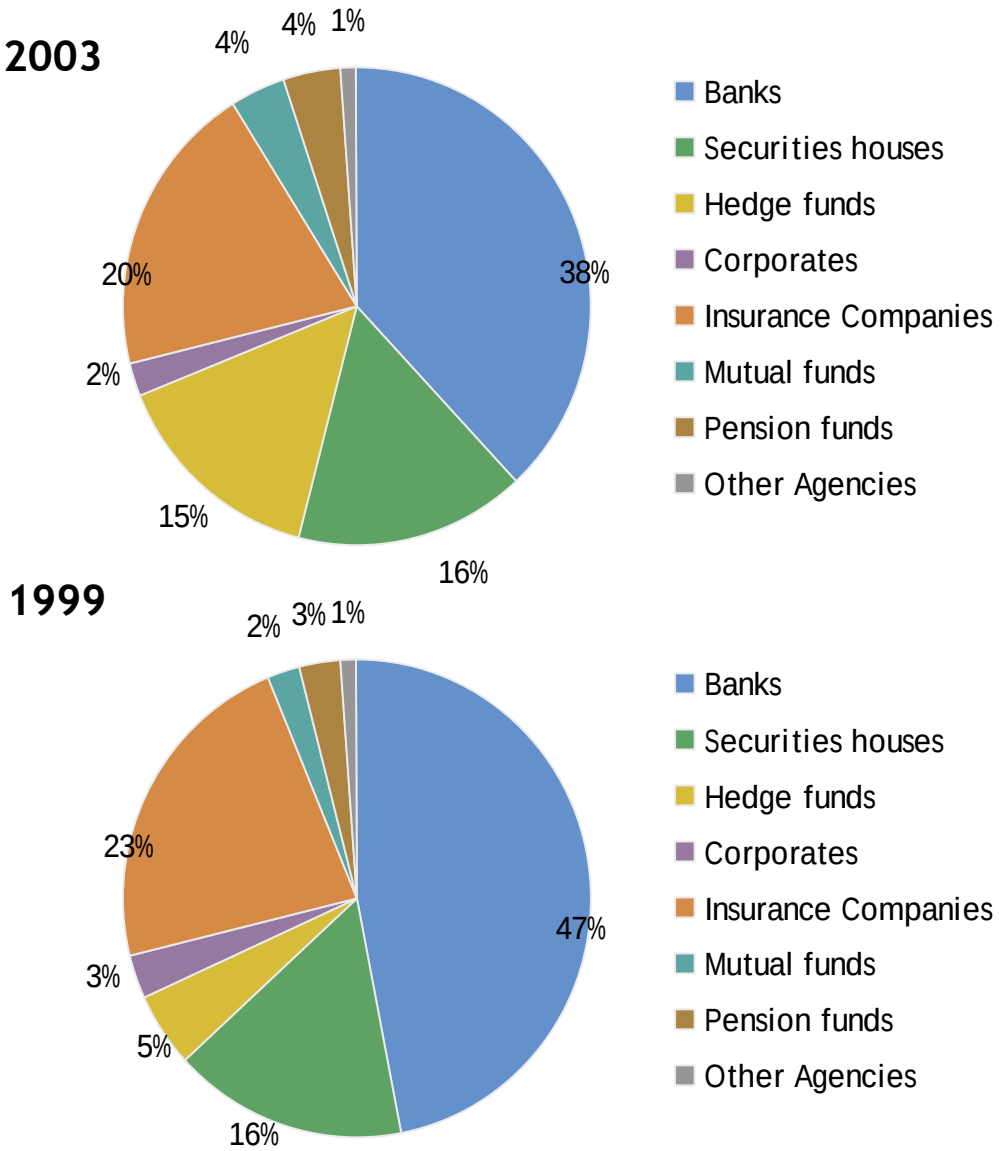




Sellers of credit protection

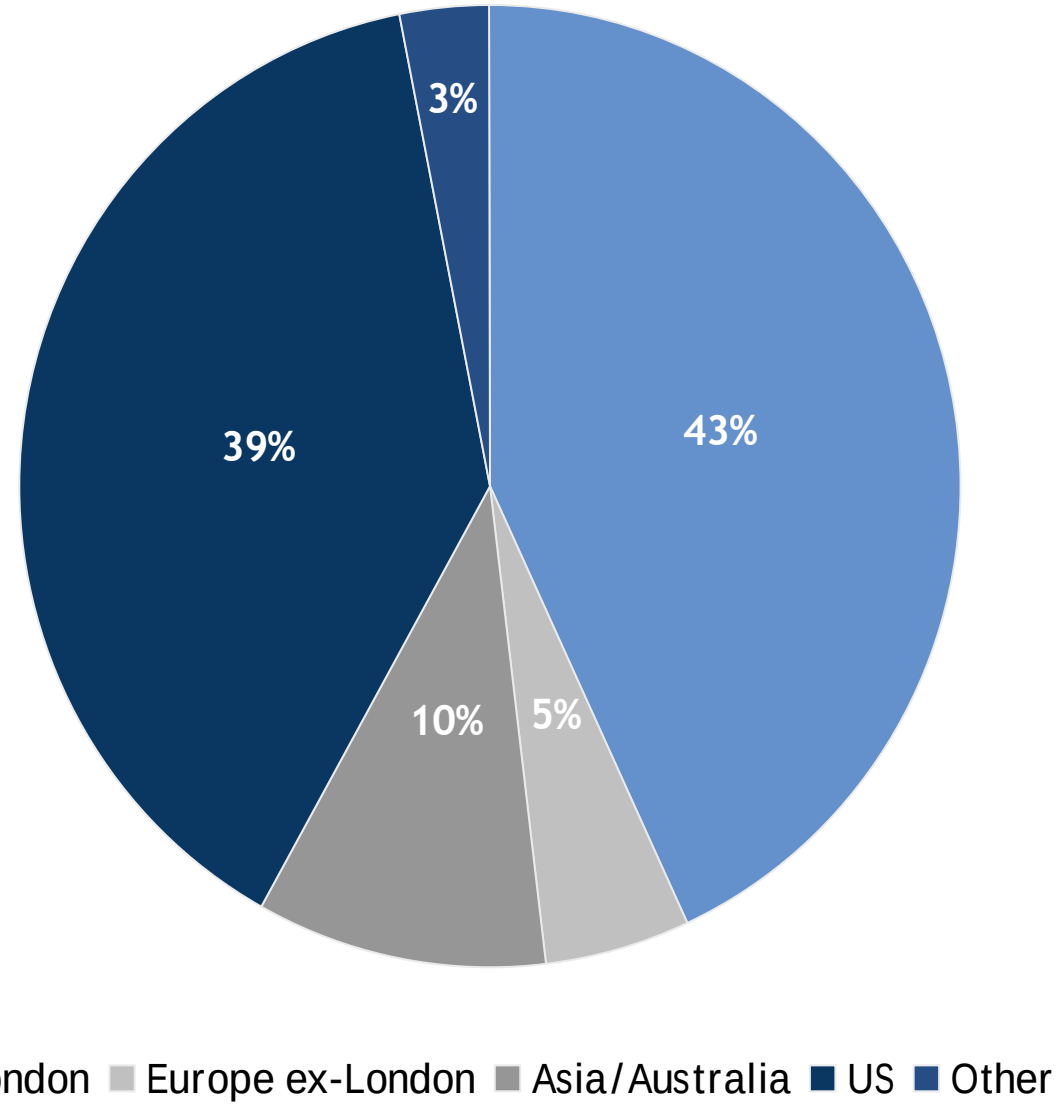
Institutions using credit derivatives to sell protection



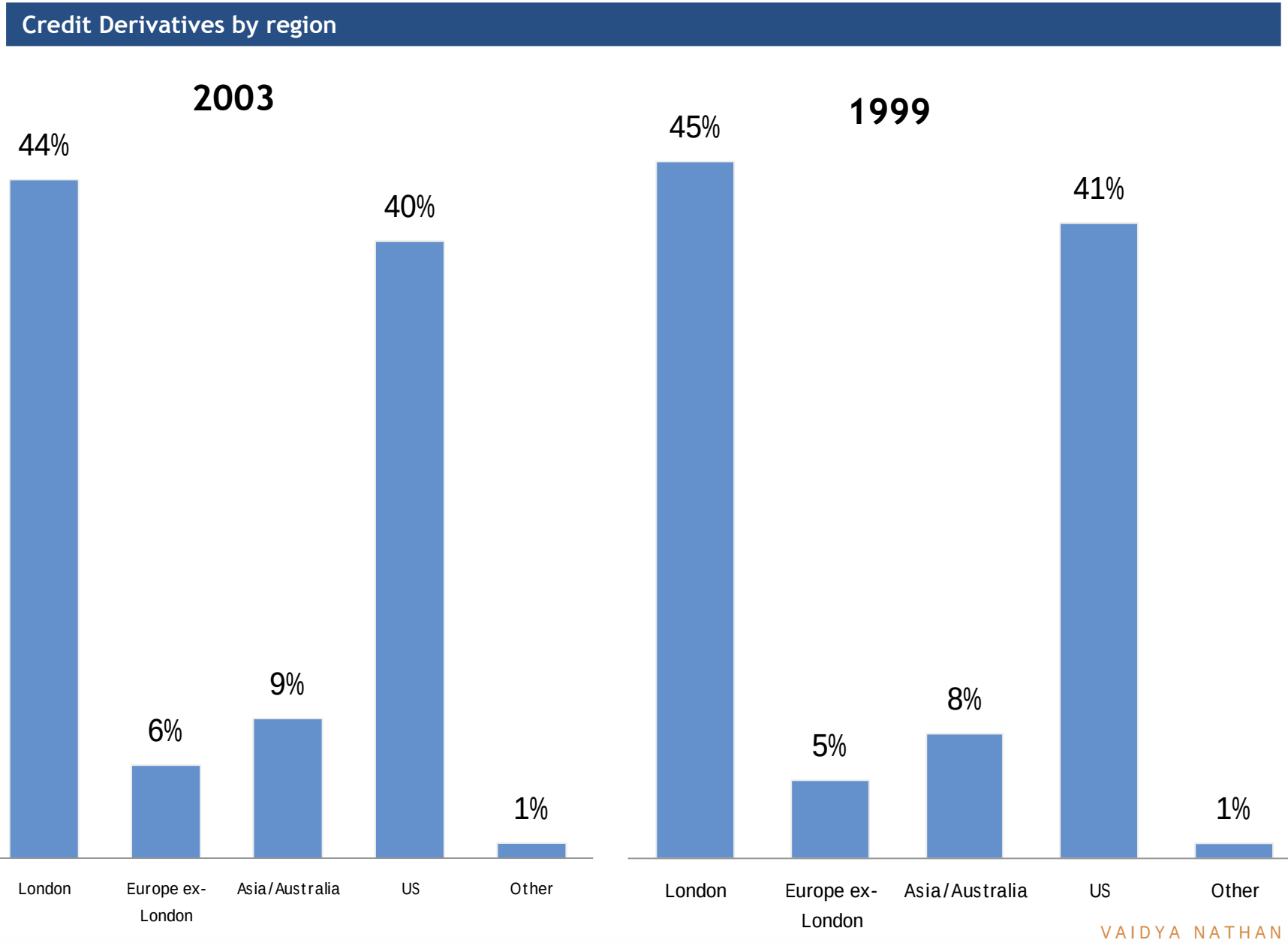


Credit Derivatives by region

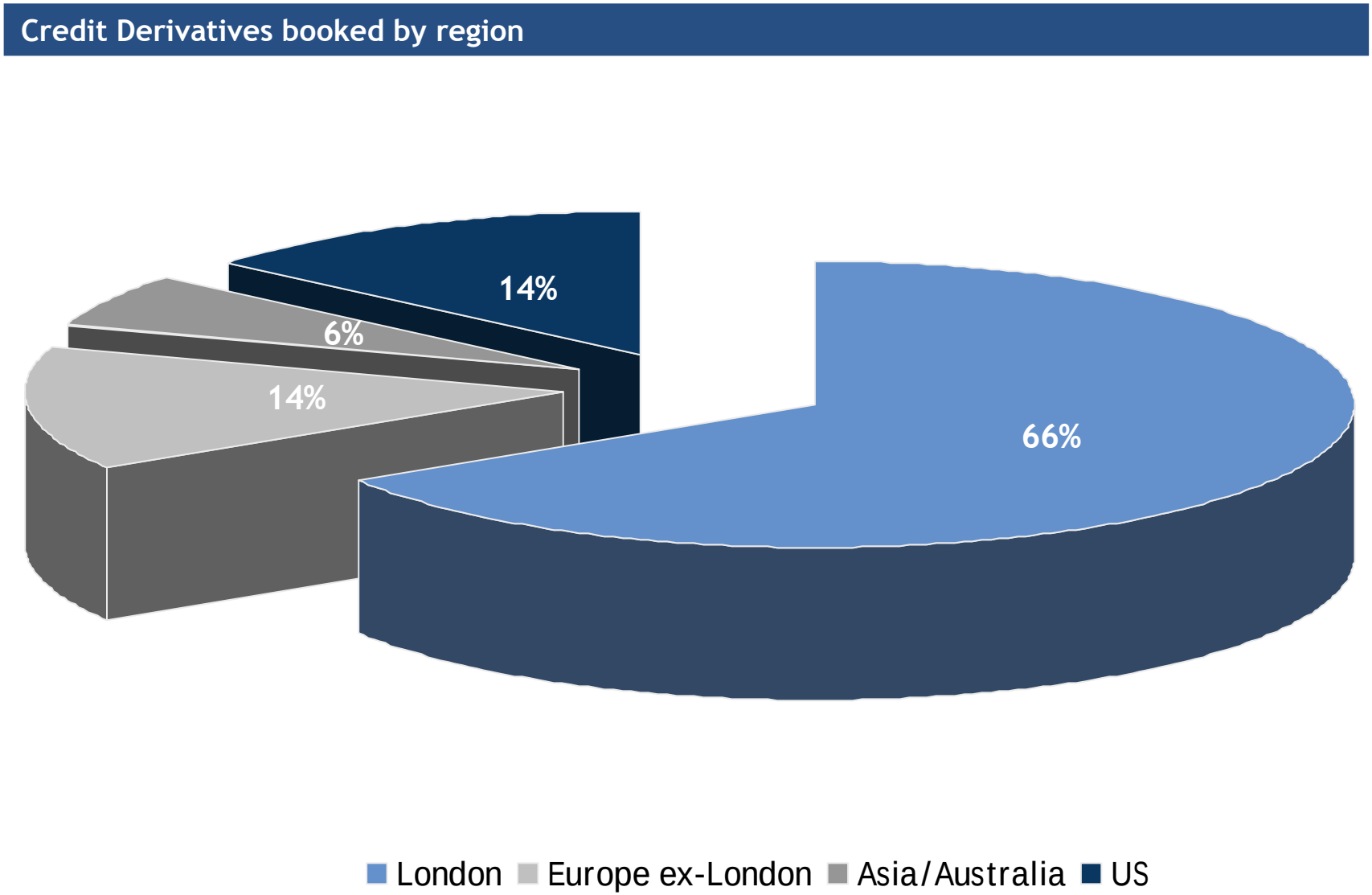
Credit Derivatives by region in 2006 (Expected)



Credit Derivatives by region in 2003 & 1999



Credit Derivatives booked by region

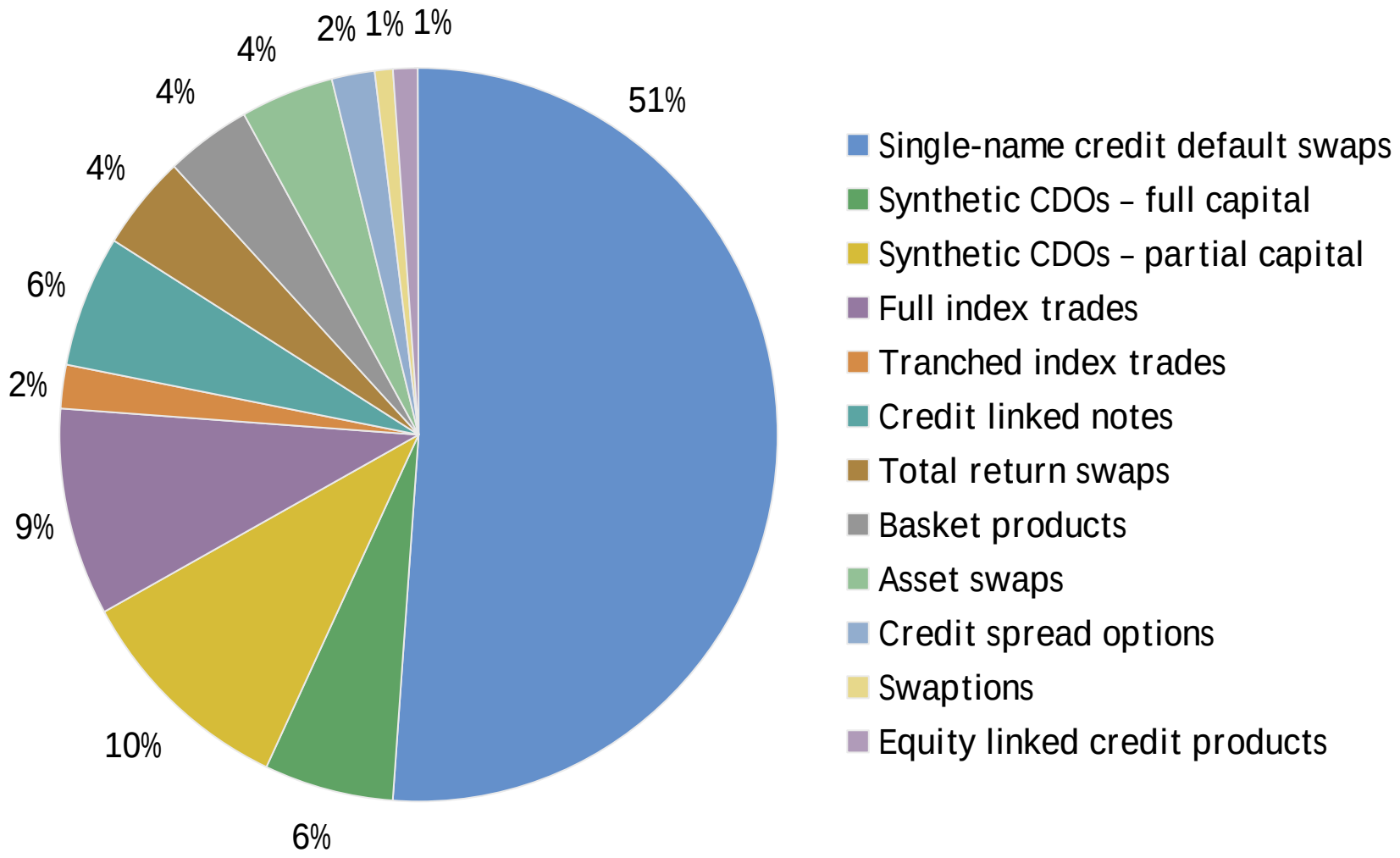


Credit Derivatives Market Size by region

Credit Derivatives Market Size (US$ bn)	2003	2004	2006
Global market size	3,548	5,021	8,206
London market size	1,586	2,230	3,563
Americas market size	1,459	2,000	3,173
Asia/Australia market size	287	446	858
Other Europe/Rest of World	216	345	612

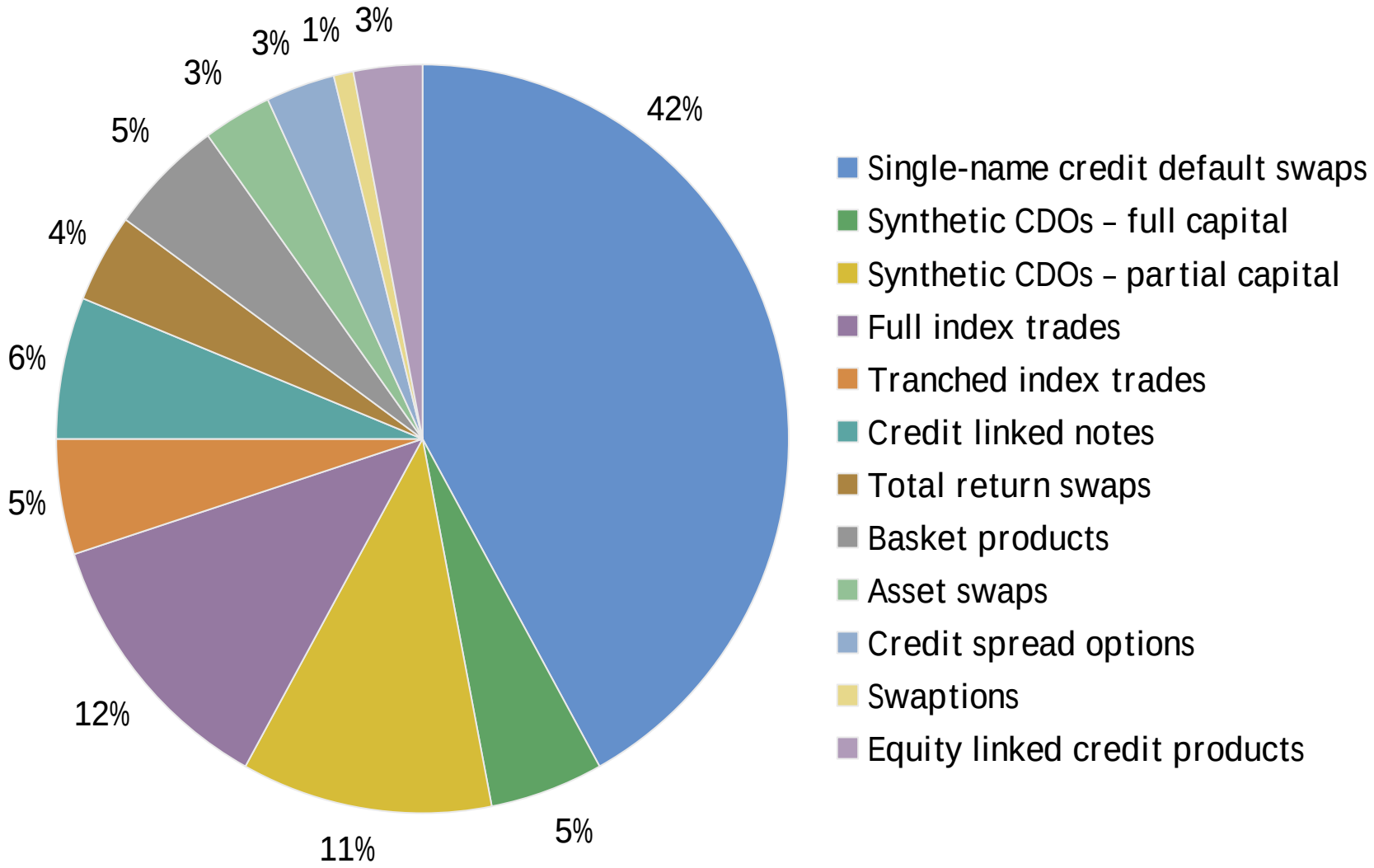
Global Credit Derivatives Product Usage

Global Credit Derivatives Product Usage



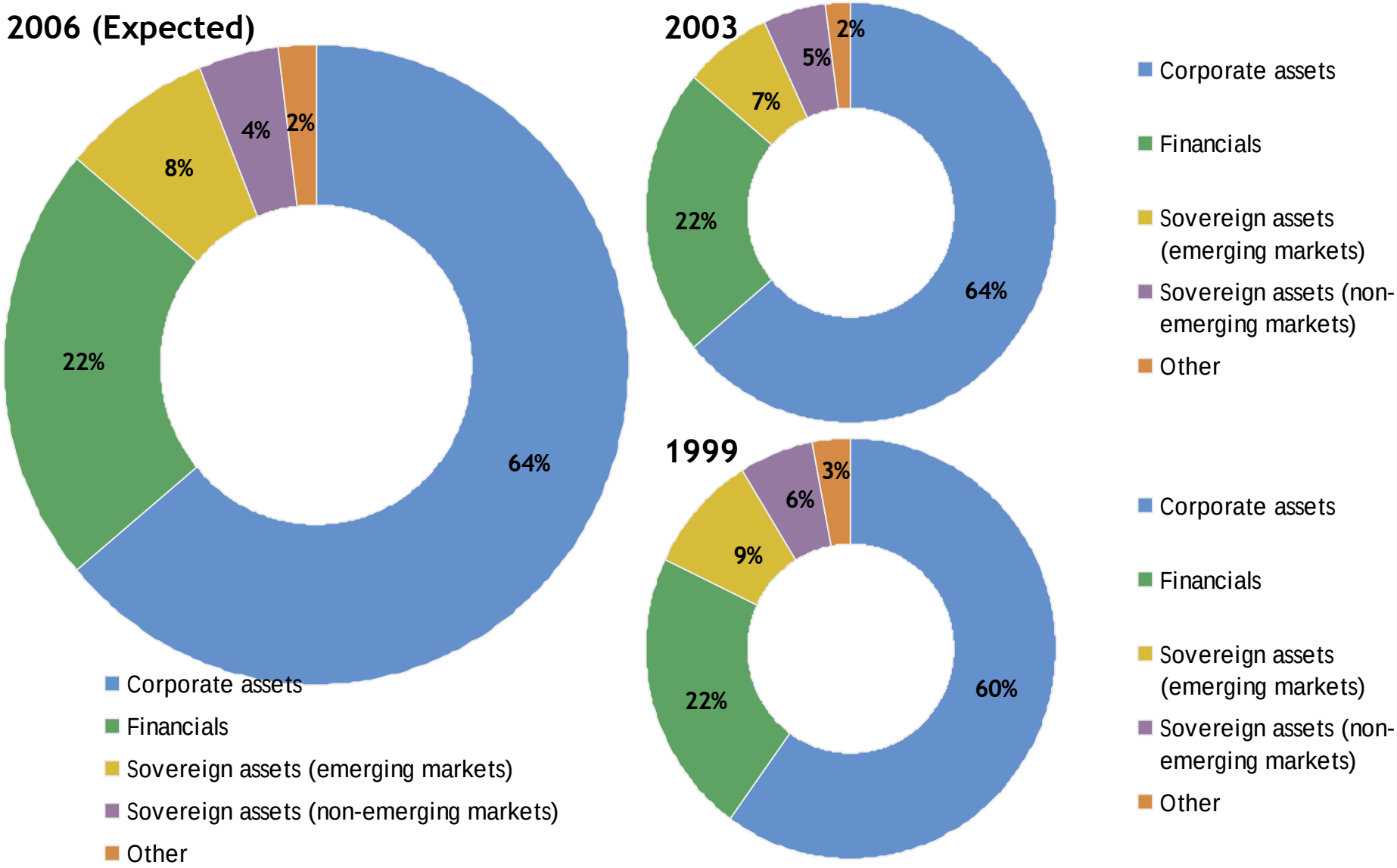
Current Product Usage

Global Credit Derivatives Product Usage - 2006 (Expected)



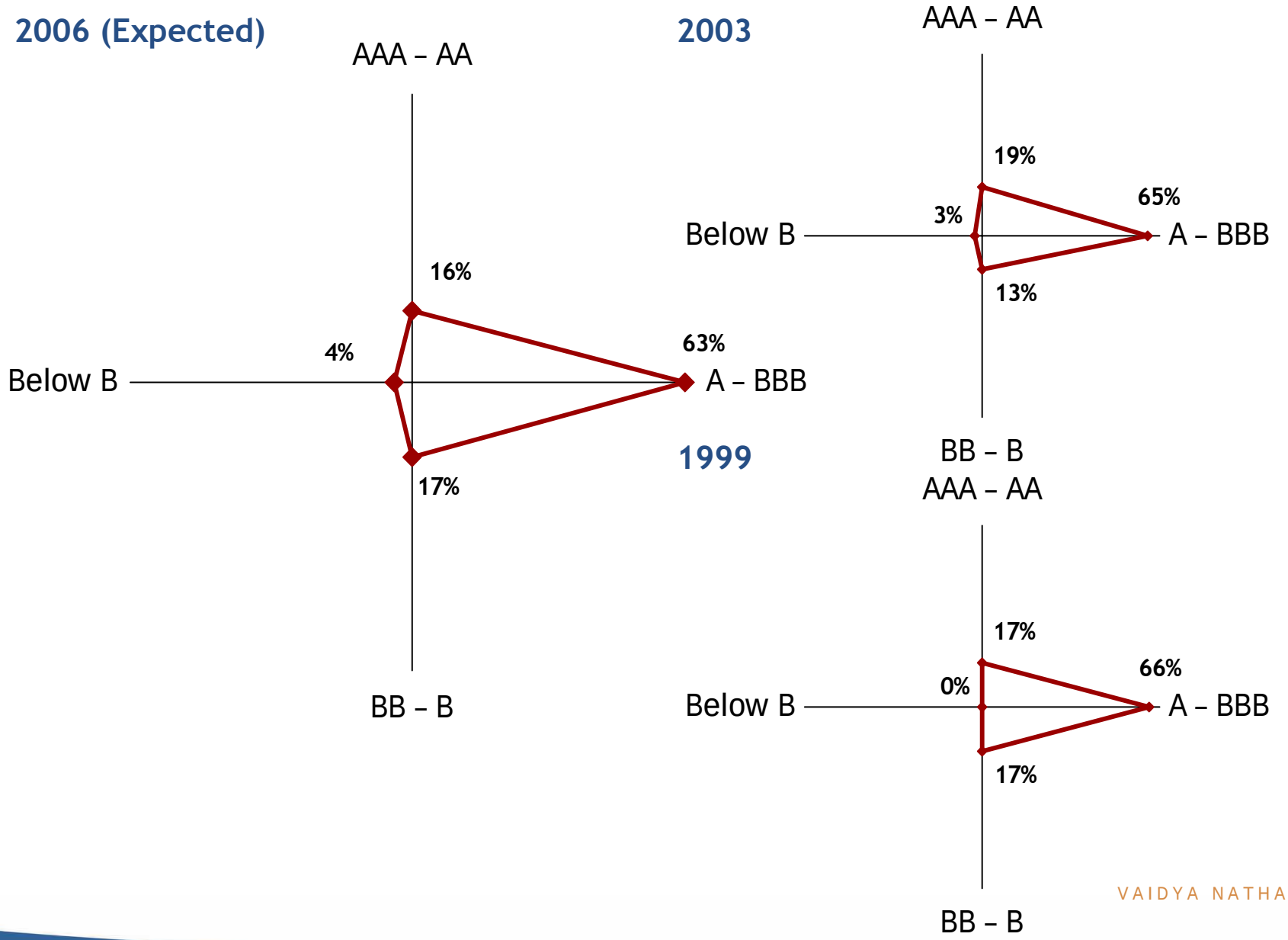
Underlying reference entity

Category of underlying reference entity



Credit rating of underlying reference entity

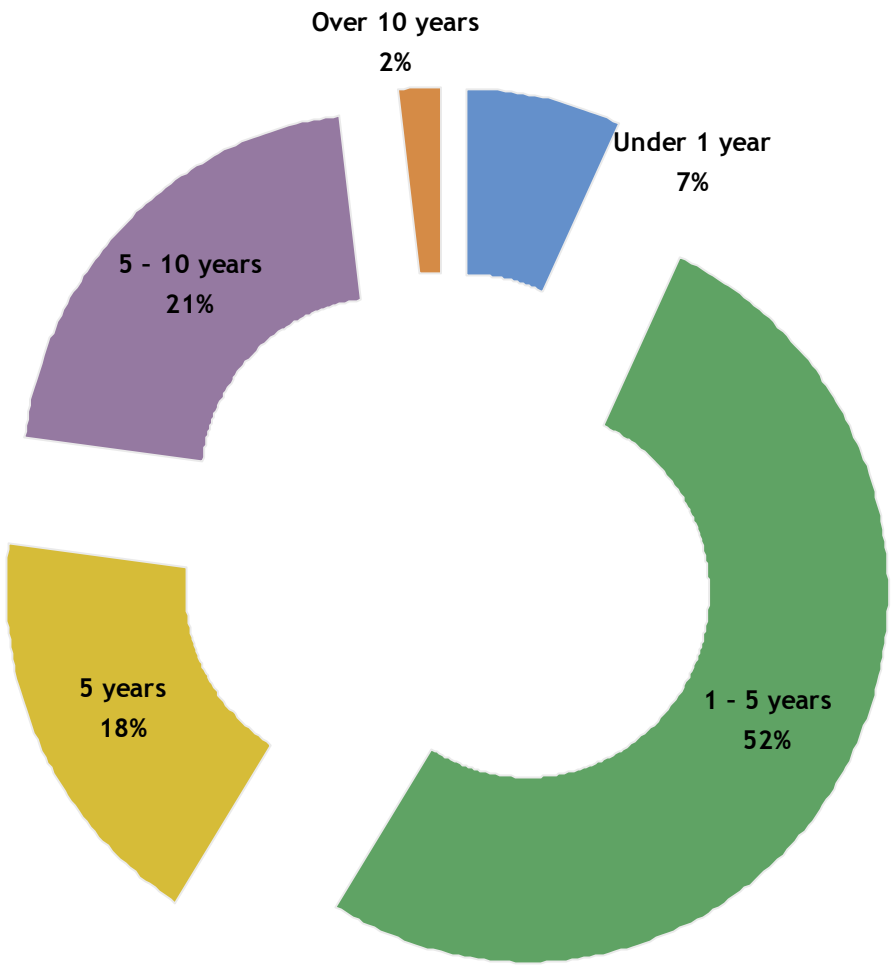
Credit rating of the underlying reference entity



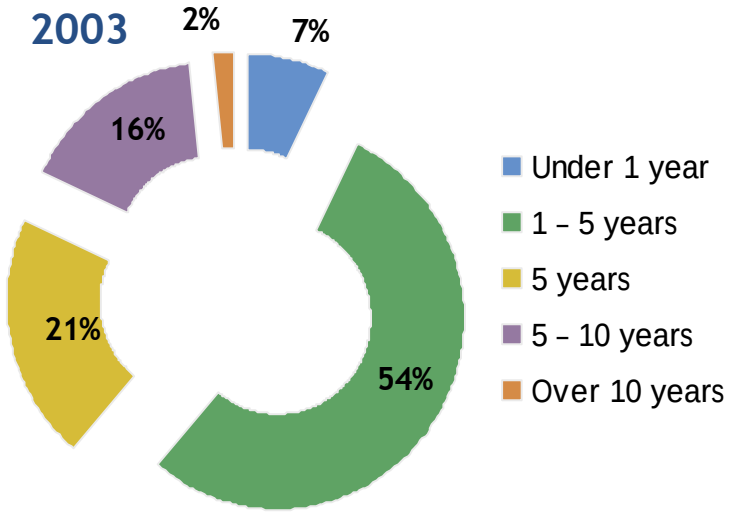
Tenor distribution

Maturity

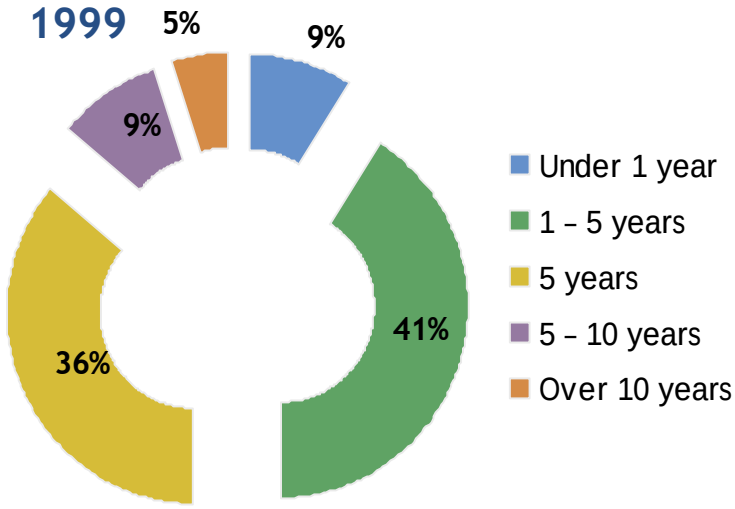
2006 (Expected)



2003

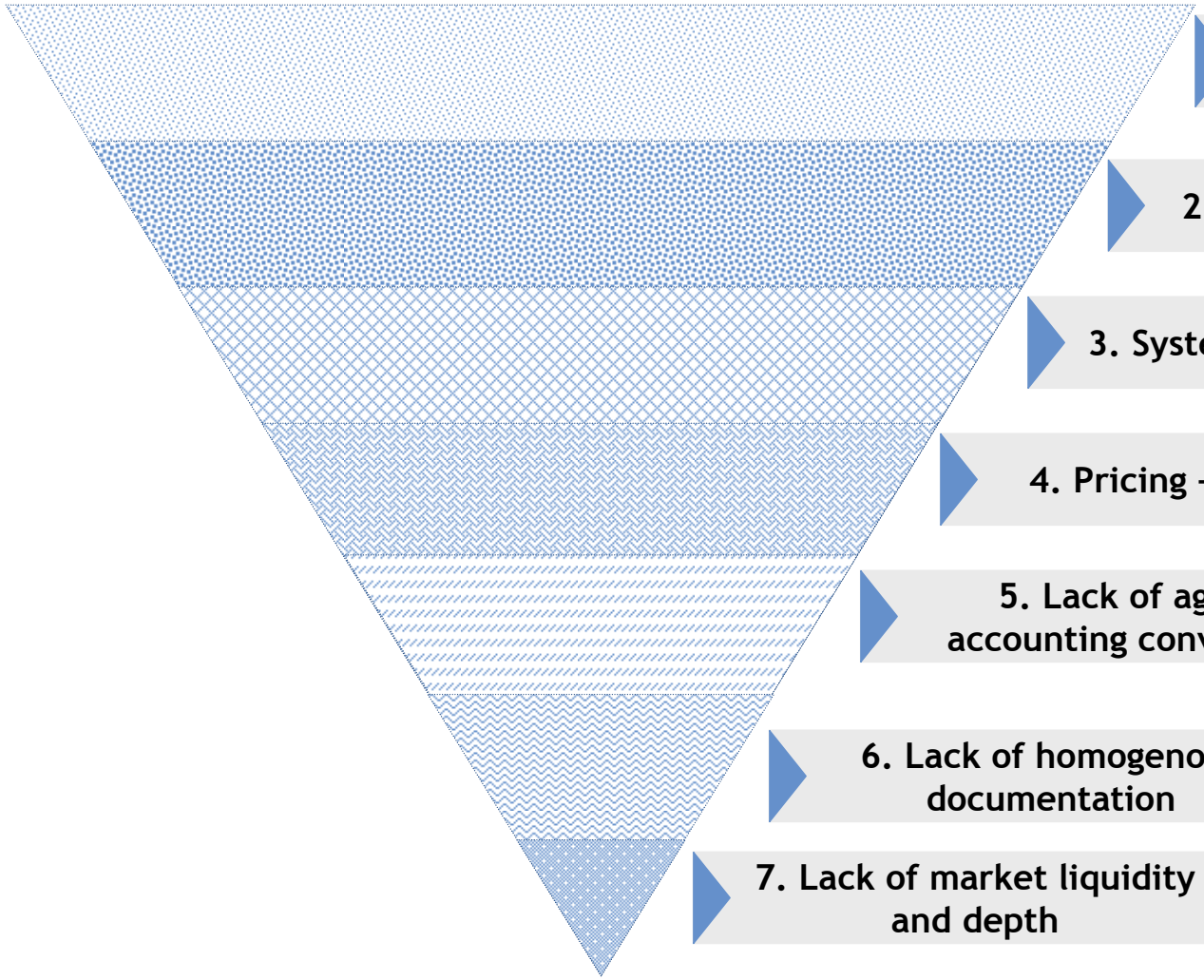


1999



Market Constraints

Constraints in using Credit Derivatives



1. Lack of client knowledge of the product
2. Regulatory constraints
3. Systems / Infrastructure
4. Pricing - lack of data
5. Lack of agreed accounting conventions
6. Lack of homogenous documentation
7. Lack of market liquidity and depth