

Sea Island, Georgia
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Federal Reserve Bank of Atlanta Financial Markets Conference Credit Derivatives: An Overview

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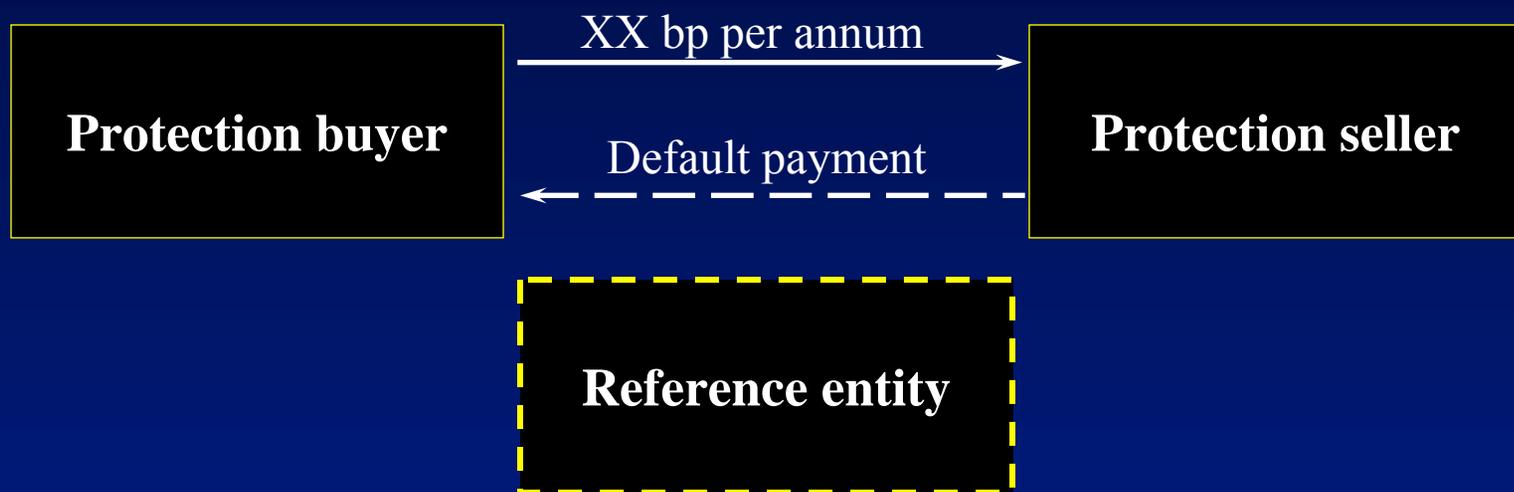
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Why credit derivatives?

- Hedging credit risk
 - Under traditional banking, hedging credit risk has not been feasible because of the inability to take a short position in credit
 - Selling a corporate bond short was theoretically possible, but generally not feasible because of difficulty in borrowing the underlying or sustaining a repo position
- Diversifying credit risk
 - Diversification reduces portfolio risk because it incorporates the effect of correlation between the individual loan losses
 - Diversification of credit risk has been difficult due primarily to relationship considerations
- Investing in credit risk
 - Access to investments in credit has been limited by corporate bond liquidity
 - Loans traditionally liquid and difficult to access without loan infrastructure
 - Exposure to corporate credit risk has traditionally meant taking on other risks such as interest rate risk as well

Credit default swap (CDS)



- Buyer pays premium for protection against default by *reference entity* on an underlying notional amount
 - In ISDA confirm, buyer is *fixed-rate payer* and seller is *floating-rate payer*
 - In a *funded* CDS (credit-linked note), buyer issues note that secures protection
- If reference entity defaults (or other *credit event* occurs), buyer receives compensation by means of one of the following:
 - Physical settlement: Par value in return for delivery of reference obligation; or
 - Cash settlement: Post-event fall in price of *reference obligation* below par; or
 - Digital settlement: Fixed amount or percentage of notional

Results of hedging with credit default swap

- Protection buyer (Short credit)
 - Gives up exposure to default of Reference Entity without removing reference asset from balance sheet
 - Also reduces concentration risk
 - Gives up opportunity to profit from taking on credit risk
 - Possible basis risk with Reference Entity
 - Takes on counterparty credit exposure to Protection Seller
 - Simultaneous default by Reference Entity and Protection Seller
 - Default by Protection Seller only, necessitating replacement of protection
- Protection seller (Long credit)
 - Takes on exposure to Reference Entity without need for funding underlying position
 - Possible counterparty exposure to default by Protection Buyer if CDS subject to close-out (i.e., loss of remaining premium income)

Profile of a vanilla CDS

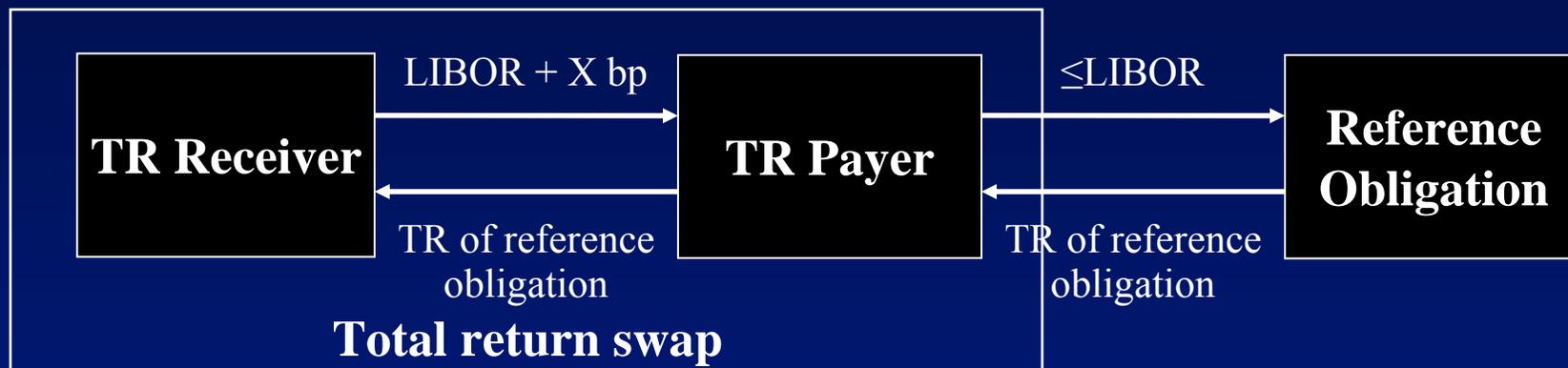
- Reference credits
 - Single names
 - Baskets (e.g., first to default)
 - Bespoke portfolios
 - Indices and tranches
 - Obligations such as ABS, CDO, and leveraged loans
- Five year maturity most common
- Typical sizes
 - USD 10–20mm notional amount for investment grade trade
 - USD 2–5mm for high yield trade
- Most common credit events
 - Failure to pay
 - Bankruptcy
 - Restructuring (investment grade)
- Cash settlement replacing physical settlement although parties can opt for physical
- Premium (*fixed rate*)
 - Annual percent of notional
 - Paid quarterly on standard settlement dates

Indicative CDS spreads

Name	Fitch/Moody's/S&P	Bid/Offer (bp)
Boeing	A+/A2/A+	8/12
Citigroup	AA+ /Aa1/AA	9/11
Cadbury Schweppes	BBB/Baa2/BBB	39/41
Dominion Resources	BBB+/Baa2/BBB	21/24
Dow Chemical	A-/A3/A-	31/34
GMAC	BB+/Ba1/BB+	166/170
General Motors	B/Caa1/B-	430/435
Ford Motor	B-/Caa1/CCC+	544/549
Saks	B/B3/B+	197/207
Hutchison Whampoa	A-/A3/A-	20/22
Russia	BBB+/Baa2/BBB+	40/42

Source: Bloomberg, May 3, 2007

Total return swap

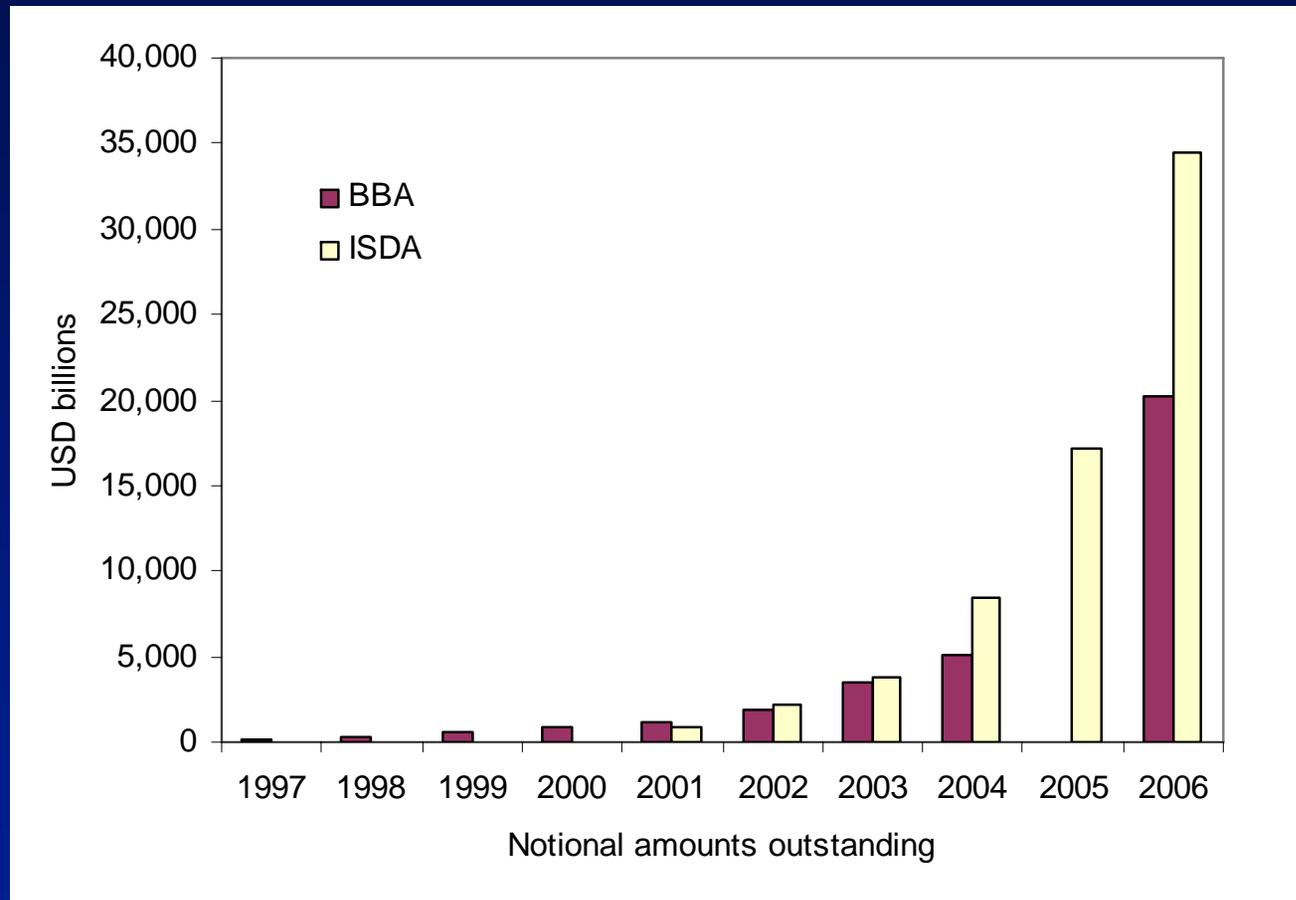


- Allows transfer of credit risk and market risk of a reference obligation
- Total return: Interest + Fees + (Final Value - Original Value)
 - TR Payer pays TR Receiver if total return is positive
 - TR Receiver pays TR Payer if total return is negative
- Result of hedging with TRS
 - TR Payer has short position in reference asset and counterparty exposure to Receiver
 - TR Receiver has long position in asset and exposure to credit and market risk

Stages in evolution of credit derivatives

- Stage 1: Ad hoc “defensive” attempts
- Stage 2: Emergence of intermediated market
 - Total return swaps versus credit default swaps
 - Synthetic securitization (1997)
 - Dealers laid off own risks and intermediated others
 - Banks enter as protection buyers
- Stage 3: Development of single-name CDS
 - ISDA Definitions and regulatory guidance added certainty
 - Tests: Enron and Worldcom; Argentina; National Power
 - Dealers warehouse risks by running hedged and diversified portfolios
 - Insurers enter as protection sellers
- Stage 4: Development of index CDS
 - Merger of index providers and rapid growth of index and tranche CDS
 - Adoption by dealers of standardized CDS terms and practices
 - Dealers run flow business
 - Entry of hedge funds

Growth of credit derivative notionals



Sources: *British Bankers Association and ISDA Market Survey*

Credit derivative product mix

	2000	2002	2004	2006
Single name CDS	38	45	52	33
Basket CDS	6	6	4	2
Index CDS			9	30
Tranched index CDS			2	8
Credit-linked notes	10	8	6	3
Credit spread options	5	5	2	1
CDS swaptions			1	1
Synthetic CDO – Fully funded			6	4
Synthetic CDO – Partially funded			10	13
Other (TRS, asset swaps, etc.)	41	36	8	6

Source: *British Bankers Association*

Most common reference entities

Bought protection, end-2005

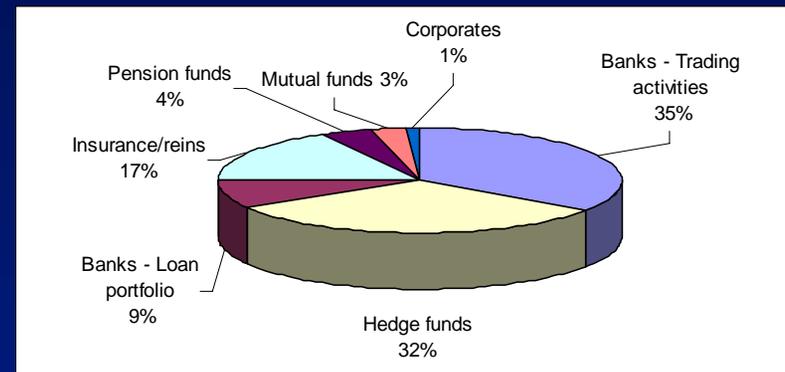
	By deal count	By notional amount
1	General Motors/GMAC	General Motors/GMAC
2	Ford/FMC	Ford/FMC
3	Daimler Chrysler	Brazil
4	France Telecom	Daimler Chrysler
5	Telecom Italia	Italy
6	Volkswagen	General Electric/GECC
7	Brazil	Russia
8	General Electric/GECC	France Telecom
9	Italy	Telecom Italia
10	Deutsche Telekom	Turkey

Source: Fitch ratings

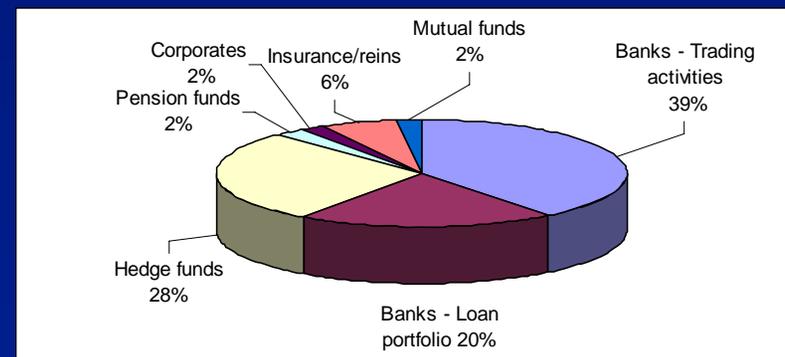
Buyers and sellers of protection

- Banks and securities firms
 - In 2000, were over 80% of buyers and over 60% of sellers
 - By 2006, had fallen to 60% of buyers and 44% of sellers
- Insurers
 - In 2000, 23% of sellers (7% of buyers)
 - In 2006, 17% of sellers (6% of buyers)
- Hedge funds
 - In 2000, hedge funds were 5% of sellers and 3% of buyers
 - In 2006, were 32% of protection sellers and 28% of buyers

Sellers of protection



Buyers of protection



Source: BBA Credit Derivatives Survey 2006

Current challenges

- Operations
 - Hedge funds' use of novations led to confirmation backlogs
 - ISDA Novations Protocol established procedure for assigning trades and Fed-18 large dealers group tracked progress in reducing backlogs
 - Recent ISDA Operations Benchmarking Survey results suggest increasing automation of CDS processing
- Settlement
 - Growth of index trading strained physical settlement capabilities because CDS outstandings far exceeded supply of deliverable debt
 - ISDA developed Cash Settlement Protocols and credit event auctions to manage transition to cash settlement
- Future growth
 - Increasing acceptance by “real money” investors
 - Non-financial corporations
 - Exchange-traded credit derivatives?

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Addendum: New settlement procedure

- Industry developed a credit event auction procedure consisting of the following elements:
 - Average price auction to determine starting inside market price
 - Market orders and limit orders
 - Market orders to determine net delivery and receipt obligation
 - Dealers also may submit limit orders to buy or sell at prices below or above their submitted inside market price
 - Dutch auction to determine market-clearing price
 - Cash settlement at the market-clearing price
- Delphi Corporation (DPH) filed for Chapter 11 on October 8, 2005
 - Approximately \$28 billion of CDS on \$2.0 billion of senior debt outstanding
 - Delphi CDS Index Protocol issued on October 27, 2005
 - 576 parties signed up
 - Auction on November 4, 2005
 - 15 dealers submitted bids
 - Settlement price fixed at 63.375%

Delphi Auction I: Inside market prices

- Average price auction to determine starting inside market price
 - Inside market price provides a starting point for price determination
- Each participating dealer must provide firm prices for defaulted bonds
- Crossing prices matched and bonds traded at mid-market
- Of the remaining bid and offer prices, the “best half” are used to determine inside mid-market price
- Delphi inside mid-market price was 66.0%

	Sorted descending	Sorted ascending	
	Bid (Buy)	Offer (Sell)	
UBS	67	64.875	Citi
RBOS	67	65	HSBC
Wach	66.5	65.5	JPMC
ML	66	66	DB
BofA	65.5	66	GS
Lehman	65.5	66.5	Barclays
Bear	65	67	Bear
CS	65	67	CS
MS	65	67	MS
Barclays	64.5	67.5	BofA
DB	64	67.5	Lehman
GS	64	68	ML
JPMC	63.5	68.5	Wach
HSBC	63	69	RBOS
Citi	62.875	69	UBS

Crossed trades

Best half

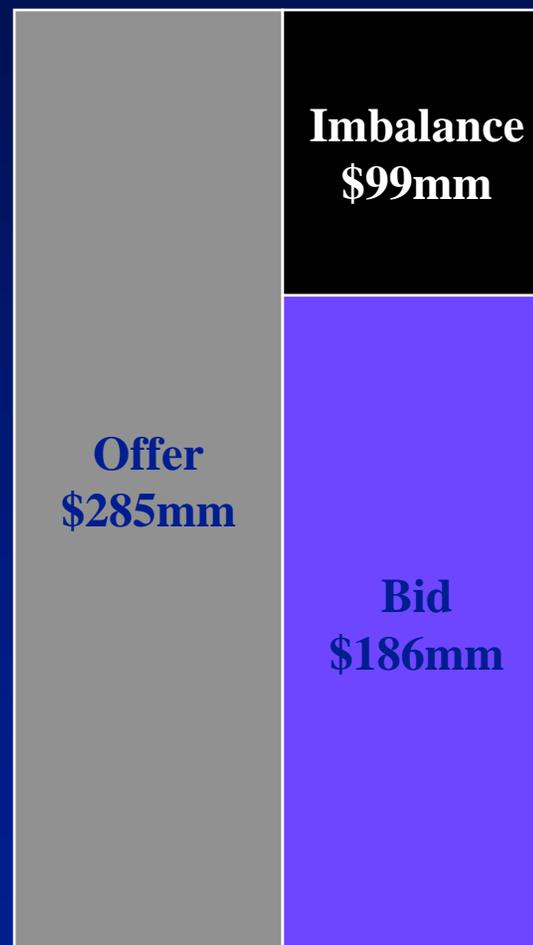
Inside market midpoint = 66%

Delphi Auction II: Market orders

- Objective of market orders is to determine net delivery and receipt obligations
- Dealers add up all delivery and receipt obligations for net exposure
 - Obligations are in terms of face value of underlying bonds
 - Includes client obligations submitted through dealers
- Each dealer must submit a market order representing its net exposure
 - Objective is to obtain same economic effect as receiving or paying par value in physical settlement
 - Obligations to deliver (bought protection) are on offer side because receiving bond price plus cash compensation is equivalent to receiving par value for bond in physical settlement
 - Obligations to receive (sold protection) are on bid side because paying bond price plus cash compensation is equivalent to paying par value for bond in physical settlement
- Combined dealer market orders will yield a net deliverable or receivable position

Delphi Auction II: Market orders

- Combined dealer market orders will yields a net deliverable or receivable position
- If the two sides balance, the cash settlement price is the inside market price
- If they do not balance, remaining “open interest” is matched against limit order book
- For Delphi auction, imbalance was \$99 million offered to sell



Delphi Auction III: Dutch auction

- If there is an imbalance, limit orders (and uncrossed inside market prices) are used in a Dutch Auction to determine a price that clears the entire net exposure
 - Move up or down the list of limit orders until bids and offers are equal (buy=sell)
 - The price at which bids and offers are equal is the cash settlement price
- Delphi Auction cash settlement price was 63.375%

	Size (\$mm)	Bid (\$)
BofA	10	65.5
Lehman	10	65.5
CS	10	65
MS	10	65
Bear	10	65
Barclays	10	64.5
Barclays	2	64.5
Lehman	2	64.5
Lehman	2	64.25
DB	10	64
GS	10	64
JPMC	10	63.5
Lehman	3	63.375
Total	\$99mm	