

# **The CDS market: A primer**

**Including computational remarks on “*Default Probabilities online*”**



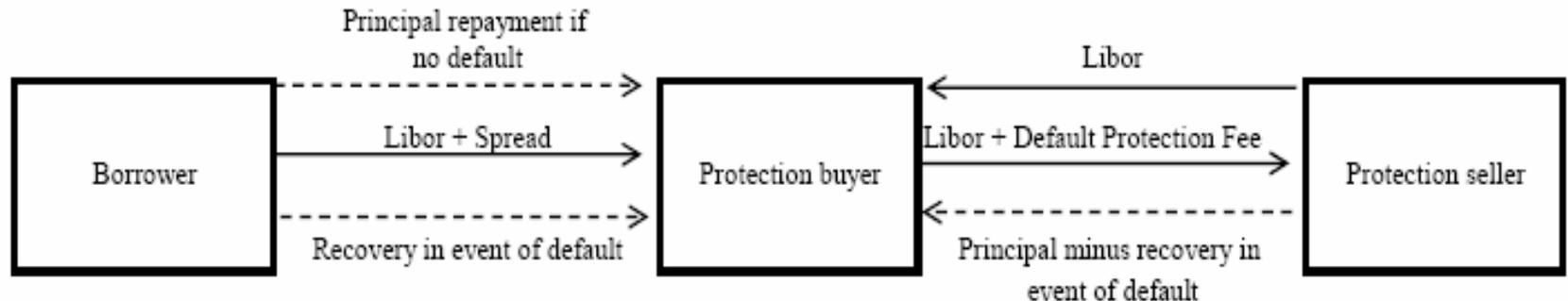


# The CDS market: A primer

# Credit Default Swaps

## Short Introduction

- CDS are similar to buying insurance against default or covered credit events
- Protection buyer pays so called default swap premium, usually expressed in basis points
- If specified event (mostly default) is triggered, protection seller covers occurred losses
- In practice, buyer delivers specific predefined asset (bonds, loans) to seller and receives 100% of the notional specified in the CDS contract



## CDS: Methods of Settlement

- Physical delivery of the reference security
- Physical delivery of equivalent asset
- Cash Settlement

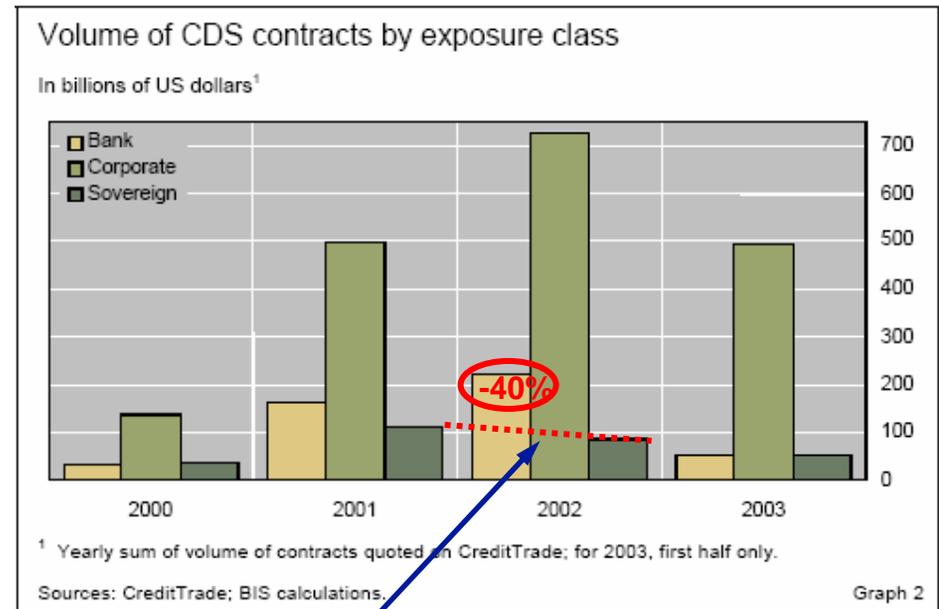
Example, Argentine plain vanilla bond, actual price = 20

- Physical settlement: Protection buyer delivers reference security, protection seller has to pay 100
- Cash settlement: Protection buyer receives  $100 - 20 = 80$  from protection seller and keeps security

# Credit Default Swaps

## Historic Market Development

- Since early 1990's CDS market evolved into a major component of capital markets
- Removal of current regulatory uncertainty (Basle II) is expected to lead to further rapid market growth
- Sovereign CDS benefited from standardisation in '98/'99 as well as successful execution in recent defaults



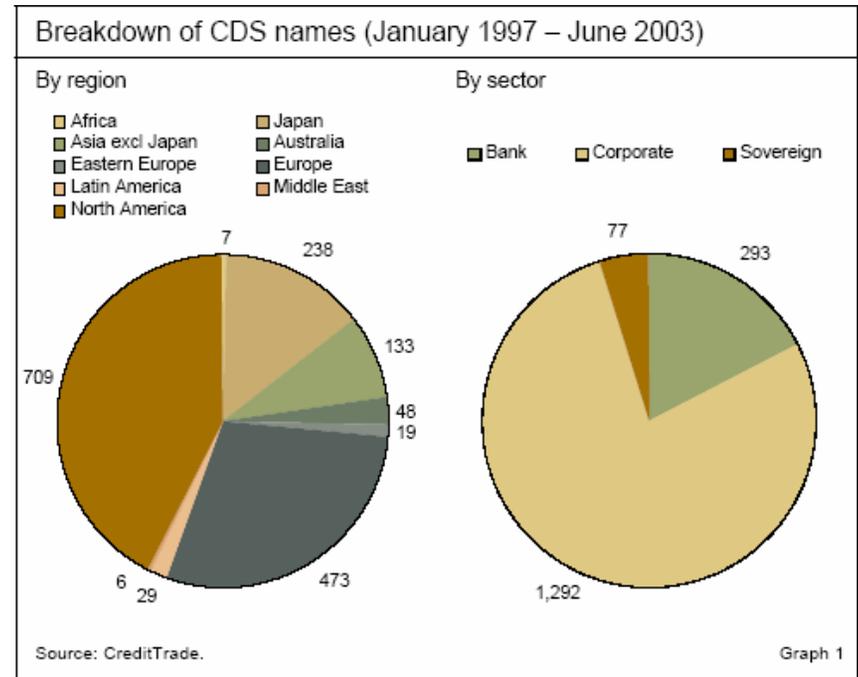
**Elimination of Argentine reference assets after default in 2001**



# Credit Default Swaps

## Emerging Markets Focus

- Emerging Markets are relatively small in absolute size
- Strong focus on Sovereign CDS as they are considered the most liquid derivatives in Emerging Markets
- Market liquidity generally shows strong dependency on liquidity of respective bond markets
- Emerging Markets Sovereign CDS are highly concentrated in relatively few names (Top 7 account for 50% of total market)



# Credit Default Swaps

## Latin America – Brazil bond spreads and external factors

**Mid '98** – Russian crisis emerges

**Jan '99** – BRL allowed to move freely, markets rally

**Jul '02** – BRL at all-time low, financial markets panic

**Oct '02** – Lula da Silva wins presidential elections

**Oct '97** – Asian crisis hits Indonesia, Japan and Korea

**Apr '04** – Greenspan announces possibility of Fed rate increase

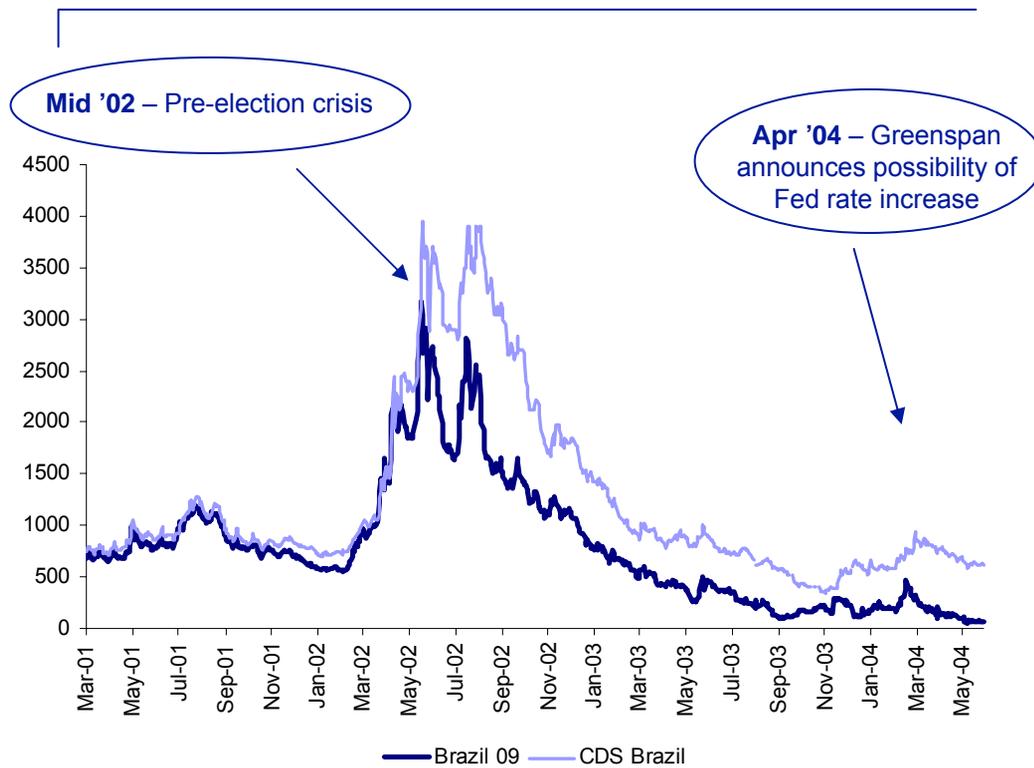


# Credit Default Swaps

## Brazil – CDS as Early Warning Indicator

- CDS movements generally leading bond spread movements
- Applies especially for longer term changes in Sovereign risk
- CDS liquidity and volumes tend to increase in view of looming crisis while bond market activity tends to shrink/dry up

### Spread Comparison Brazil '09 vs. 5y CDS



# CDS spreads versus bond spreads

## Shortcomings in imperfect markets

- No arbitrage conditions should exist
- Credit risk prices for bonds and CDS are equal over the long term
- Price differentials can appear due to:
  - Information unrelated to the credit risk is priced in, especially liquidity
  - Contractual arrangements, i.e. Sovereign CDS mostly use old ISDA '99 restructuring clauses
  - Accrued interest premium for CDS
  - Cheapest to deliver option for protection buyer
  - CDS spreads are quoted on Act/360 basis while bond spreads are quoted on 30/360 basis



# Computational remarks on “*Default Probabilities online*”

# What are CDS spreads?

**Definition:** CDS spread = Premium paid by protection buyer to the seller

**Quotation:** In basis points per annum of the contract's notional amount

**Payment:** Quarterly

**Example:** A CDS spread of 593 bp for five-year Brazilian debt means that default insurance for a notional amount of USD 1 m costs USD 59,300 p.a. This premium is paid quarterly (i.e. 14,825 per quarter).

**Note:** Concept of CDS spread (insurance premium in % of notional)

≠ Concept of yield spread (yield differential of a bond over US Treasury yield)

**However:** Arbitrage ensures that CDS spread  $\approx$  bond yield spread

# How do CDS spreads relate to the probability of default?

## The simple case

Consider a 1-year CDS contract and assume that the total premium is paid up front

Let  $S$ : CDS spread (premium),  $p$ : default probability,  $R$ : recovery rate

The protection buyer expects to pay:  $S$

His expected pay-off is  $(1-R)p$

When two parties enter a CDS trade,  $S$  is set so that the value of the swap transaction is zero, i.e.

$$S=(1-R)p \leftrightarrow S/(1-R)=p$$

If  $R=25\%$ , a spread of 500 bp translates into  $p =6.6\%$ .

If  $R=0$ , we have  $S=p=5\%$ .

# How do CDS spreads relate to the probability of default? The real world case

Consider now the case where

Maturity =  $N$  years

Premium is paid in fractions  $d_i$  (for quarterly payments  $d_i=0.25$ )

Cash flows are discounted with a discount factor from the U.S. zero curve  $D(t_i)$

For convenience, let

$$q=1-p$$

denote the survival probability of the reference credit with a time profile

$$q(t_i), i=1 \dots N$$

Assume that there is no counterparty risk.

# Valuation of a CDS contract in the real world case

With proper discounting and some basic probability math, you get

$$PV[\text{fixed payments}] = \underbrace{\sum_{i=1}^N D(t_i) q(t_i) S d_i}_{\text{Discounted premium payments if no default occurs}} + \underbrace{\sum_{i=1}^N D(t_i) \{q(t_{i-1}) - q(t_i)\} S \frac{d_i}{2}}_{\text{Accrued premium payments if default occurs between payments dates}} \quad (1)$$

$$PV[\text{contingent payments}] = \underbrace{(1-R)}_{\text{Compensation payment}} \sum_{i=1}^N D(t_i) \underbrace{\{q(t_{i-1}) - q(t_i)\}}_{\text{Prob. of default in respect. period}} \quad (2)$$

Note that the two parties enter the CDS trade if the value of the swap transaction is set to zero, i.e. (1)=(2)