

Credit Default Swaps

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April 15, 2014

- CDS can be thought of as insurance contract written on the default of a bond.
- Thus, a long position in a defaultable bond + CDS on the bond protects the buyer in the case of default. In principle.
- The valuation of CDS is actually simple.
- A CDS can also be purchased (sold) directly to speculate on the survival (default) of a bond, or to get exposure to the credit spread itself.

- Long side is called the “Protection Buyer”
- Short side is called the “Protection Seller”
- The buyer pays premium every quarter
- The seller pays the buyer in the case of default
- The seller pays even if the buyer does not own the bond

An Example

- Suppose a Hedge Fund believes that ABC corp will go bankrupt. They purchase CDS on 100 M notional of a bond issued by ABC corp.
- ABC corp is a high risk issuer and the CDS cost 500BP.
- Every Quarter the hedge fund pays

$$100 \times 0.05 \times \frac{1}{4} = 1.25$$

- Suppose ABC defaults after 12 quarters. Investors recover 40 cents on the dollar.
- The hedge fund there receives
 $60M = 100M(1 - \text{recovery rate})$
- They have paid out $12 \times 1.25 = 15M$ and thus pocket $60 - 15 = 45M$ ignoring time-value of money

Contracts are generic

- You can only buy generic CDS contract (not tied to a specific bond issue).
- These contracts will pay the recovery rate in the case of default for a specific class (senior/ junior) as the recovery rate will be the same
- You can trade a 5 year CDS even though there may not be a 5 year bond
- There may not be a 9 year CDS to hedge a 9 year bond. You can buy a 10 year in that case. Or a 5 year to hedge for only the first 5 years.

Example: AXP 2.65, 2022 Bond

- To load a specific bond, type the company's ticker, say AXP for American Express and then Corp. This gives you an overview of all bond issues by Amex.
- We'll look at the 2012 maturity 2.65. This compares (roughly) to the 10 year Treasury (with a 1.7 ytm)
- The AMEX bond trades with a spread of 92BP to the Treasury, at a YTM of 1.68
- Bloomberg reports the 10 yr CDS spread at 92 (bid) or 117 (ask) for A

- Using a constant probability of default (hazard rate), we use the spreadsheet from Credit I to find that the implied probability of default.
- The bond is trading at 101.36. YTM is 92 BP above the treasury.
- Using our spreadsheet along with a 40% recovery assumption we find that the implied default probability is 0.01296

Pricing the CDS

It used to be that a CDS was actually a swap - no money would change hands at inception. The CDS rate would be set such that the present value of the protection payment would equal the present value of the expected default payment so that the value of the CDS would be zero.

As CDS rates changed, a buyer would have to purchase a slightly different contract to get out of a trade. The two contracts would not exactly cancel, thus creating a complicated financial accounting. This was exasperated by counterparty defaults on the CDS themselves.

Since the CDS are traded with generic spreads with non-zero present value, the buyer compensates the seller up front. This is called point upfront. Points upfront can be negative or positive.

Pricing CDS is in essence easy. The cash flows are as follows

- Every period the buyer pays a premium (called "fee" or "spread")
- In the case of default the intermediate payments cease and the buyer recovers $100 - X$ where X is the recovery ratio (in percent).
- Thus, with a 40% recovery the buyer recovers 60
- Notice that a bond holder is in principle 100% hedged against losing the principal, but may not be indifferent as the default event shortens the life of the bond which is bad if the bond pays high coupon.

To proceed we need to repeat a little basic algebra:

The value of the bond at time T (maturity) if no default prior to that time is

$$V_T^b = (1 - p)(100 + c) + pX \quad (1)$$

where again c is the coupon and X is the recovery.

Likewise, the value of the CDS is

$$V_T^c = (100 - X)p - s \quad (2)$$

where s is the CDS spread.

Note that if you own both you're hedged since

$$V_T^b + V_T^c = 100 + c \quad (3)$$

At time $T - 1$ the value of the bond is

$$V_{T-1}^b = (1 - p)(V_T^c/(1 + y) + c) + pX \quad (4)$$

where we have "fudged" the discounting by using a constant treasury yield y to discount all the cash flows.

The value of the CDS

$$V_{T-1}^c = (1 - p)V_T^c/(1 + y) + p(100 - X) - s \quad (5)$$

and so on.

Notice that the value of the CDS + the risky bond is not equal to the value of the benchmark Treasury bond except at expiration. This is because if the bond defaults, its life is shortened.

It is approximately true if the risky bond is selling near par.

A

AXP 2.65 12/02/22 Corp

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Description: Bond

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66) Send Bond

Issuer Information

Name AMERICAN EXPRESS CO
 Industry Consumer Finance

Security Information

Mkt of Issue Global
 Country US Currency USD
 Rank Sr Unsecured Series Fixed
 Coupon 2.65 Type Fixed
 Cpn Freq S/A
 Day Cnt 30/360 Iss Price
 Maturity 12/02/2022

BULLET

Issue Spread

Calc Type (1) STREET CONVENTION

Announcement Date 01/28/2013
 Interest Accrual Date 12/03/2012
 1st Settle Date 02/26/2013
 1st Coupon Date 06/02/2013

ISS'D IN EXCH OF 144A/REGS SEC; SEE CUSIP 025816BC2/ISIN USU02581AG81.

Identifiers

BB Number EJ5340157
 CUSIP 025816BD0
 ISIN US025816BD05

Bond Ratings

Moody's A3
 S&P BBB+
 Fitch A+
 DBRS AH

Issuance & Trading

Amnt Issued/Outstanding
 USD 1,266,364.00 (M) /
 USD 1,266,364.00 (M)

Min Piece/Increment

2,000.00 / 1,000.00

Par Amount 1,000.00

Book Runner

Reporting TRACE

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2013 Bloomberg Finance L.P.
 SN 827136 EDT GMT-4:00 H426-2043-2 18-Apr-2013 01:03:19



AXP 2022, approximately 10 year maturity. First coupon in June. We will price a hypothetical CDS on this bond. We will compare the CDS spread to that in the market.

Bond is trading at 101.14

AXP is rated A- (S&P).

Excel spreadsheet gives an implied default probability of 1.297%.

Pricing with a fixed spread

Pricing with a fixed 100 BP spread gives a present value of the CDS to the buyer of -2.92. This means that for the buyer to be willing to buy, he must be compensated \$ 2.92 upfront. This is the upfront points.

We can also solve directly for the spread needed to make sure the present value is zero. By solving this with the Excel solver we find that the spread is 69.69 BP.

If you load a bond in Bloomberg, you can enter the Bloomberg CDS valuation screen through the command CDSW.

<HELP> for explanation, <MENU> for similar functions.

90 Actions		91 Products		92 View		Credit Default Swa	
CDS CNTRPARTY	Client	CCP	OTC	Ticker /	AXP	Series	Deal#
31) Load	32) Save	33) Share	34) Ticket	35) Refresh	36) Settings		
Notional	10 MM	USD	Contract	SNAC	Market	Curve Date	04/17/13
Entity	American Express Co			Swap Curve	260	Mid	
mt Type	Senior	Restructuring	NR	5) View USD ISDA Standard Curve			
Obligation	US025816BD05	RED Pair Code	027D97AD8	CDS Curve			
de Date	04/17/13	Trd Sprd (bp)	59.3400	6) View AXP USD Senior Curve (CDS)			
Accr Start	03/20/13	Backstop Date	02/16/13	Recovery Rate	0.40		
Coupon	06/20/13	Coupon (bp)	100.000	Term	Pts Upf	Spread	P
Coupon	03/20/18	Day Cnt	ACT/360	06/20/18	-2.0449125	59.3400	0.0
urity	5Y	06/20/18	Pay AI	True	Date Gen	I	
Curve Recovery Rate	True	Business Days	50	View			
Recovery Rate	0.40	Bus Day Adj	1	Amrt	N	Term Structure	
culator	ISDA Standard Upfront Model (I)*			View			
h Settled On	04/22/13	Valuation Date	04/17/13				
h Calculated On	04/22/13						
ce	102.04491258	Spread DV01	5,114.99				
ncipal	-204,491	IR DV01	54.37				
ured (29 Days)	-8,056	Rec Risk (1%)	86.93				
h Amount	-212,547	Def Exposure	6,204,491				
<p>is application is based on the ISDA Std Model v1, developed and supported in collaboration with Markit Group Ltd.</p> <p>ustralia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 600 pan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2013 Bloomberg Finance L.P. SN 827136 EDT GMT-4:00 H426-2043-3 18-Apr-2013 00:03:0</p>							

Two main providers of CDS info

- Markit in the US, and
- Itrax in Europe

Both provide indices for various tenors and credit quality. On the next page is the CDX (markit) index of investment grade, 5yr. Notice how it correlates with VIX.

CDX IG CDSI GENERIC 5Y

84.138 --

83.888 / 84.388

At 19:17

Op 84.203

Hi 84.203

Lo 84.114

Prev 84.138

CBIN

CDX IG CDSI GENE

99 Save As

90 Actions

97 Edit

90 Table

Line Chart

01/03/2003 - 04/18/2013

1) Compare

Mov. Avgs

1D

3D

1M

6M

YTD

1Y

5Y

Max

Weekly

<

Security/Study

Event

Settings

Normalized As Of 10/22/2004

CDX IG CDSI GENERIC 5Y Corp - Ask Price 147.081
VIX Index - Last Price 66.896



Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2013 Bloomberg Finance L.P.
SN 827136 EDT GMT-4:00 H426-2043-3 18-Apr-2013 01:50:04

The London Whale

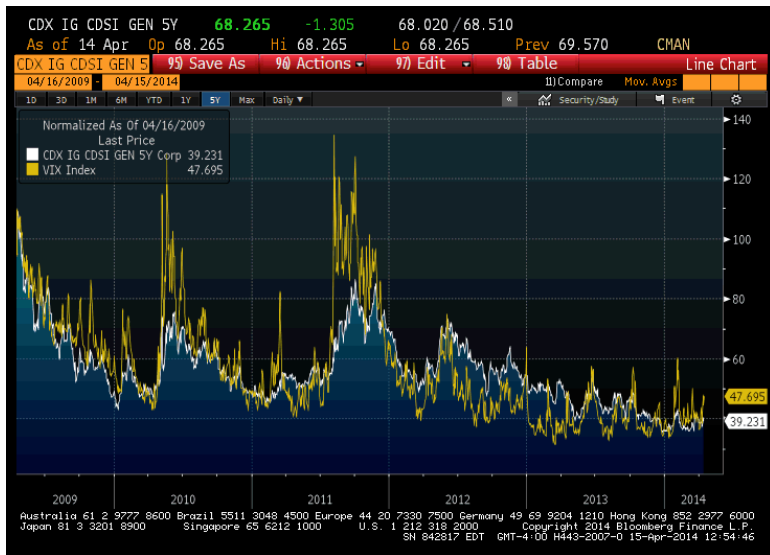
The JP Morgan trader Bruno Iksil, aka the London Whale, was reportedly responsible for multibillion losses at JP Morgan. Iksil was betting on a bearish global macro economy, purchasing CDS. This trade was then partially hedged by selling short term CDS.

This now gives a neutral short term, but bearish long term view.

Exact trades are not known, and difficult to assess. However, he was reportedly long CDX.NA.IG.9.

- Remember the structural view of credit risk: a corp bond is a treasury + short put
- Therefore, a CDX should be similar to a portfolio of puts
- ... so the CDX spread should correlate with the relative prices of equity put options
- ... so lets see how it correlates with VIX

5y CDX Investment grade vs VIX



- CDS are cheap ways of taking large credit risk positions (cost little or nothing up front)
- Buffett famously referred to CDS as financial weapons of mass destruction
- You can almost replicate a CDS by buying a corp bond, selling a similarly dated treasury to finance
- No big deal then. Right?