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The True Cost of Derivatives?

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Commenting in 1998 on the proposed repeal of the 1933 **Glass-Steagall Act** *separating commercial and investment banking* " **an archaic set of restrictions**"

Lawrence Summers

US Secretary of the Treasury & Future President, Harvard University & Advisor, Citigroup

Bloomberg Business Week, 12th August 2013

"Commentators speak loosely about going back to **Glass-Steagall**. But the Glass-Steagall Act was **introduced to deal with a problem that no longer exists: the distribution of fraudulent securities to uniformed customers**"

Martin Jacomb

Chairman, Share PLC & Former Chancellor, Buckingham University

Financial Times, 14th September 2011

Outline

- **Financial Market Developments**
- **Derivative Products**
- **The Rôle of Structured OTC Derivatives**
- **Evolving Regulation of OTC Derivatives**

Financial Market Developments 1980-2007

- **Technical changes** (market data, pricing calculations, spreadsheets, global communications, state-of-the-art computing hardware)
- **Regulatory changes** (Basel I and II)
- **Changing product paradigms** (risk transfer, transferring property, exchanging contractual obligations) leading to exponential growth of **over-the-counter** (OTC) **structured products**

Financial Services Trading Background 1980-2007

- From customer benefit to **shareholder benefit**
- Profits in **complexity of structured products**
- **Risk management** and **hedge portfolios**
- Risk-adjusted return on capital (**RAROC**)
- Ever **increasing leverage** due to global **lax regulation**
- Using **counterparty assets to preserve** banks' **regulatory capital**

Power of OTC Structured Products for Clients

- Optimising **interest rate** and **FX liabilities** – options and swaps
- Hedging **default risk** - credit default swaps (CDSs) and collateralized debt obligations (CDOs)
- Profiting from **tax arbitrage** – cross-border leasing agreements

Financial Crises 1980-2013

- **Caused by**
  - **Inflation**
    - Russian default August 1998
  - **Currency crashes**
    - Mexican peso crisis 1995. After NAFTA (Canada, Mexico, US)
  - **Currency debasement**
    - Argentine default 2001. Failed US$ peg with horrifying domestic consequences
  - **Asset price bubbles**
    - South American debt crisis in the 1980s. Recycling 'petrodollars' in the 1970s
    - Black Monday October 1987. US credit expansion by Savings & Loans sector
    - Japanese crisis 1990. Property bubble fuelled by export led growth
    - Asian crisis 1997. Corporate debt burden financed by property bubbles & "hot" money
    - Internet bubble 2000. Irrational exuberance ?
    - US subprime crisis 2008. (Self) deception
    - Euro crisis 2010. Reality avoidance
    - China crisis 201?. Credit expansion to fuel export led growth

This Time It's Different

- Financial crises have marked the development of capitalism since the Renaissance
- These have historically been connected with sovereign credit over the past 800 years Reinhart & Rogoff (2010)
- In his famous book Kindleberger (1989) gives a detailed account of financial crises in Europe and North America from 1618

We have nothing to fear but fear itself

32nd President of the United States March 1933

This sucker could go down

43rd President of the United States September 2008

Current State of Derivatives Dealing

- Structured fixed income and credit derivative instruments over the past two decades have enormously increased in value (c. $1 T notional CDOs issued in 2006 and 2007) and complexity (e. g. cash CDOs with 10,000 page contracts and no formal pricing)
- Their uses have been both good and bad!
- The ABS markets are reviving
- The cash CDO market has totally collapsed
- The synthetic CDO market has declined
- Swaps and CDS contracts are being moved to cleared exchanges and all OTC contracts severely regulated with substantial reductions in dealing profits

2. Derivative Products

What is a Future?

- A forward contract is an agreement for delivery of an underlying commodity, security or index value at a specified future maturity date at a fixed price
- The only option connected to such a contract is default – a frequent event by speculators in 19th Century agricultural commodity markets
- A future contract is a forward contract in which the discrepancy between the market price of the underlying and the fixed contract price – the margin – is regularly passed between the two counterparties through an organized futures market up to maturity

What is an Option?

- An option is a derivative security
  - Its value depends on the value of another asset called the underlying asset e.g. a stock, a bond, a currency exchange rate, a future, an index, etc.
- Ownership of an option gives you the right but ***not the obligation*** -- unlike a future -- to buy or sell the underlying asset
  - At a fixed price: the strike (or exercise) price
  - Over a specified period of time

It is indeed the truth; one can do more fascinating things with an option than an inventive boy can do with a set of Meccano *New Yorker* (1937)

Call and Put Options

- **Call Option**
  - Gives you the right to **BUY** at the agreed *strike* price

- **Put Option**
  - Gives you the right to **SELL** at the agreed *strike* price

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European Style vs. American Style Options

- **European**
  - Exercise **only at maturity**

- **American**
  - Exercise at **anytime**

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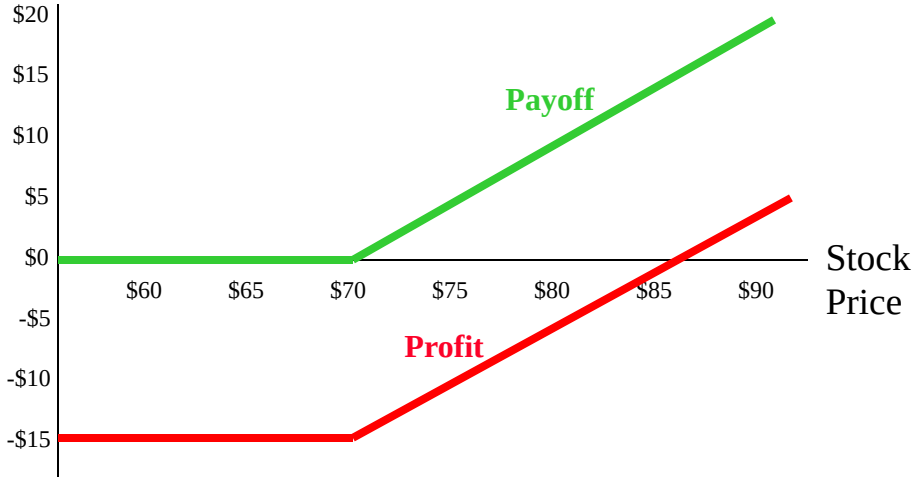
Call Payoff Diagram



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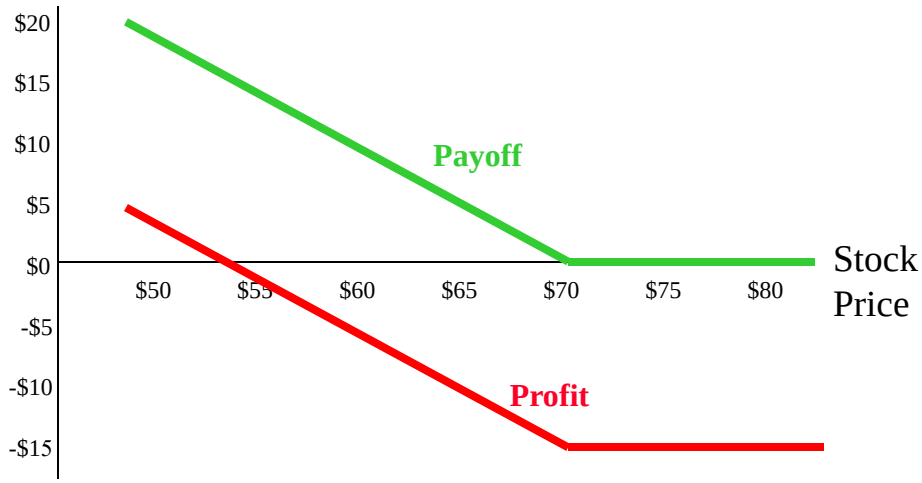
Put Payoff Diagram



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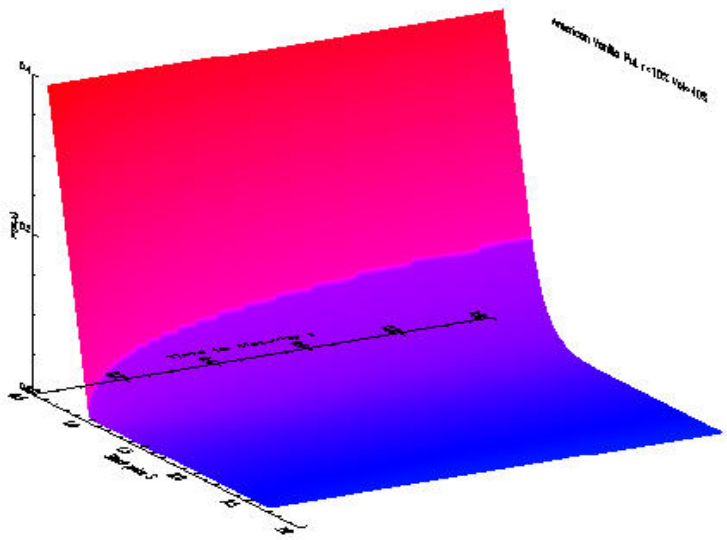
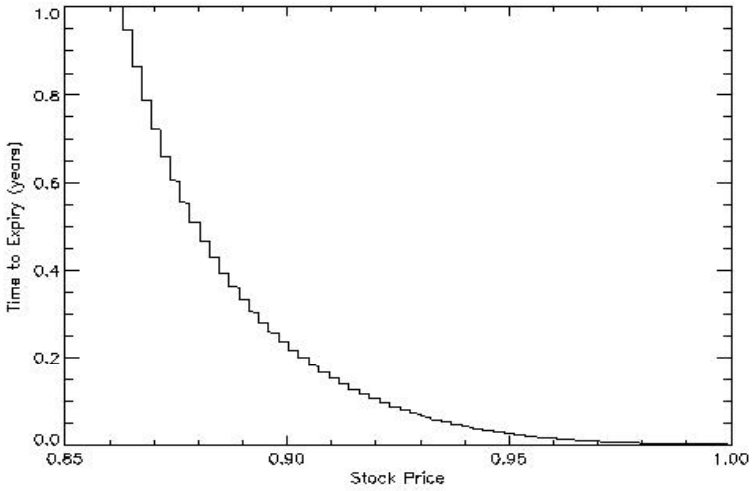


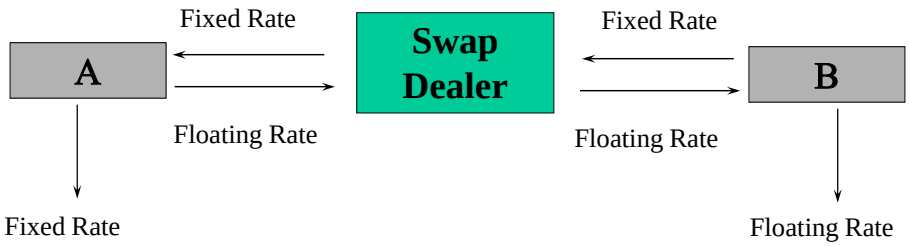
Excercise Boundary



What is a Swap?

- An agreement to exchange one stream of cash flows for another
  - **Example**: a fixed versus a floating interest rate paid on a notional principal amount – a par swap
  - Two different floating rates
  - Two different currencies
  - Different assets e.g. equities

Generic Rate Swap Structure



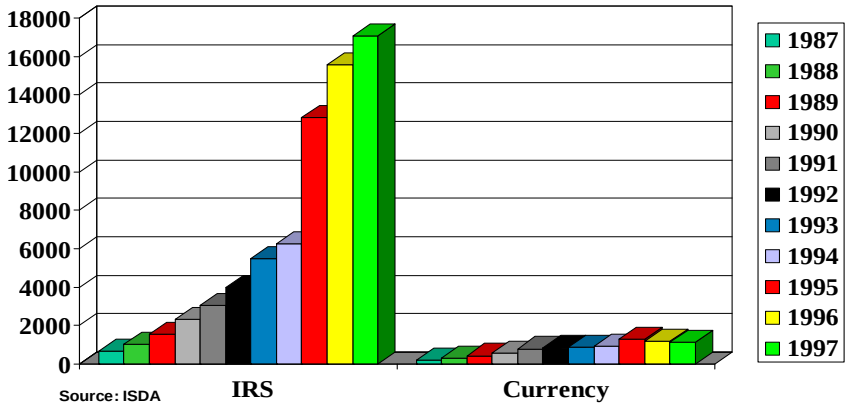
- Counterparty A converts from fixed to floating
- Counterparty B converts from floating to fixed
- Through an over the counter (OTC) product of a swap dealer who charges both parties a spread

Evolution of the Swap Market

- Began in the early 1970's
  - Collapse of Bretton Woods: floating currency rates and FX volatility
  - UK exchange controls
  - Parallel/back-to-back loans
  - IBM-World Bank swap of 1981
- Regulation & standardization
  - International Swap Dealers Association (ISDA) formed in 1985
    - Development of Master Swap Agreement led to market takeoff
  - Capital Adequacy
    - Basle Accord (1987), Federal Reserve Guidelines (1989)
  - Risk Measurement: VaR G30 (1993)

First Decade Market Growth

Market volume by end 1997 about $17 trillion in notional principal and about $490 trillion now

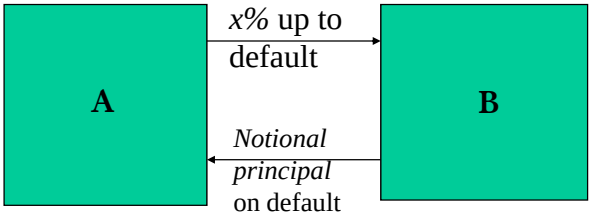


What is a Credit Derivative?

- A financial contract with a payout linked to
  - Loan, bond or securitised credit cash flow (e.g. mortgage) values
  - Default or credit events
  - Credit spreads
  - Credit ratings
- With cash settlement or delivery of the relevant underlying asset or portfolio if appropriate
- On single (borrower) names, baskets (of names) or indices
- Delivery as notes or OTC contracts
- Delivery as swaps or options

Credit Default Swap (CDS)

- Party A pays default premium x % until default
- Party B pays agreed notional principal on default (relative to underlying reference loan or security)



- Bank A can take cost of the swap into account in pricing an underlying loan and removes credit risk of perhaps a valued customer by what is in effect a default put – a major ingredient of the crisis!

3. The Rôle of Structured OTC Derivatives

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Views on the Rôle of Derivatives

- **Guns don't kill people. People kill people!** — **US National Rifle Association**
- **Derivatives are weapons of mass destruction** — **Warren Buffet**
- **There are two types of derivatives – "bought" and "sold" – in proportion 30% to 70%** — City MD
- **Banking is the last industry to go "high tech" after aerospace, oil, manufacturing, airlines, logistics, film making, etc.**

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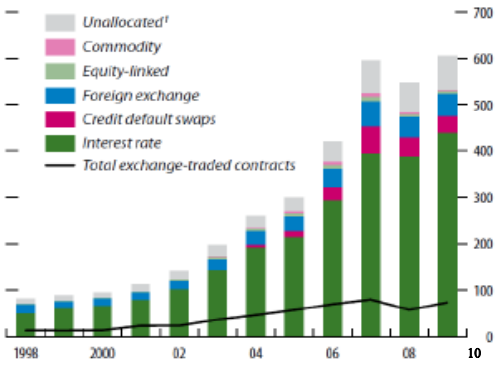
Asset Value Proportions of 2009 Global GDP

▪ **Derivatives** (notional)	1012%	**$ 600 T**	80%
▪ Debt & ABS	129%	$ 77 T	10%
▪ Broad Money	115%	$ 69 T	9%
▪ Money	9%	$ 5 T	1%

Global OTC Derivatives Markets

(In trillions of U.S. dollars; notional amounts of contracts outstanding)



Source: Bank for International Settlements.
Note: Over-the-counter data through June 2009; exchange-traded data through December 2009.
[1]Includes foreign exchange, interest rate, equity, commodity, and credit derivatives of nonreporting institutions.

Current Derivative Valuations

Table 19: Amounts outstanding of over-the-counter (OTC) derivatives
By risk category and instrument
In billions of US dollars

BIS Semiannual Report (2013)

	Notional amounts outstanding					Gross market values				
Risk Category / Instrument	Dec 2010	Jun 2011	Dec 2011	Jun 2012	Dec 2012	Dec 2010	Jun 2011	Dec 2011	Jun 2012	Dec 2012
Total contracts	**601,046**	**706,884**	**647,777**	**639,366**	**632,579**	**21,296**	**19,518**	**27,278**	**25,392**	**24,740**
Foreign exchange contracts	**57,796**	**64,698**	**63,349**	**66,645**	**67,358**	**2,482**	**2,336**	**2,555**	**2,217**	**2,304**
Forwards and forex swaps	28,433	31,113	30,526	31,395	31,718	886	777	919	771	803
Currency swaps	19,271	22,228	22,791	24,156	25,420	1,235	1,227	1,318	1,184	1,247
Options	10,092	11,358	10,032	11,094	10,220	362	332	318	262	254
Interest rate contracts	**465,260**	**553,240**	**504,117**	**494,427**	**489,703**	**14,746**	**13,244**	**20,001**	**19,113**	**18,833**
Forward rate agreements	51,587	55,747	50,596	64,711	71,353	206	59	67	51	47
Interest rate swaps	364,377	441,201	402,611	379,401	369,999	13,139	11,861	18,046	17,214	17,080
Options	49,295	56,291	50,911	50,314	48,351	1,401	1,324	1,888	1,848	1,706
Equity-linked contracts	**5,635**	**6,841**	**5,982**	**6,313**	**6,251**	**648**	**708**	**679**	**645**	**605**
Forwards and swaps	1,828	2,029	1,738	1,880	2,045	167	176	156	147	157
Options	3,807	4,813	4,244	4,434	4,207	480	532	523	497	448
Commodity contracts	**2,922**	**3,197**	**3,091**	**2,994**	**2,587**	**526**	**471**	**481**	**390**	**358**
Gold	397	468	521	523	486	47	50	75	62	53
Other commodities	2,525	2,729	2,570	2,471	2,101	479	421	405	328	306
Forwards and swaps	1,781	1,846	1,745	1,659	1,363					
Options	744	883	824	812	739					
Credit default swaps	**29,808**	**32,400**	**28,626**	**26,931**	**25,069**	**1,351**	**1,345**	**1,586**	**1,187**	**848**
Single-name instruments	18,145	18,105	16,865	15,566	14,309	884	854	958	715	527
Multi-name instruments	11,753	14,305	11,761	11,364	10,760	466	490	628	472	321
of which index products	7,476	12,473	10,514	9,731	9,663					
Unallocated	**39,536**	**46,498**	**42,610**	**42,057**	**41,611**	**1,543**	**1,414**	**1,976**	**1,840**	**1,792**
Memorandum Item:										
Gross Credit Exposure						3,480	2,971	3,912	3,668	3,626

c. 6% global GDP

Cui Bono? Whose Risk Is It Anyway?

- **Hedging bank** interest rate and forex **strategies** with swaps
- **Managing banks' counterparty risk** with cross-border leasing deals incorporating credit default swaps
- **Who's insuring whom?** – collaterized debt obligations (CDOs) in the **retail market**
- **Playing poker against the client** – swaps with **issuers' cancellation rights** and CDOs with **issuers' substitution rights'**

Different Rules for Derivatives?

- Structured derivatives which lead to problems are not directly comparable with normal market commodities because they tend to be individually customized and thus largely outside the pervue of the ideal market mechanism – namely open price competition
- Pricing over-the-counter (OTC) structured derivatives is usually beyond the scope of anyone other than investment banks or specialist corporations
- Thus in modern financial markets there may be many situations where clients are in principle unable to apply pricing competition
  - This is recognised by regulatory measures such as the division of clients into *retail*, *professional* and *eligible counterparty* and concepts such as (non-)complex instruments (MiFiD and Dodd-Frank)
- But the **implications** have **not so far** been adequately **recognized by courts**

Caveat Emptor Revisited

- It has been said that 30% of OTC derivatives are bought and 70% are sold (recently revised to 20 vs. 80%)
- Meaning that only 30% of deals are between counterparties who are professionally able to assess the risks involved while 70% involve counterparties who have no idea of what they are buying
- A rule of thumb is that such a counterparty should never accept a restructuring of an existing losing deal but rather cut their losses then and there

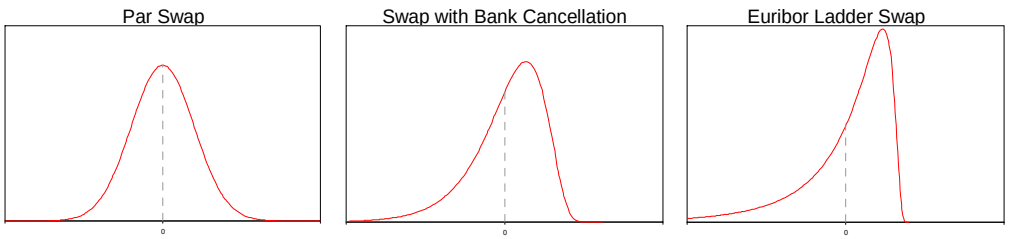
Representative OTC Derivative Deals

- Issued by banks in the 2004-2006 boom period through the crisis to the **present**
- Deals with maturities from 6 months to indefinite (*consol bonds*)
- Clients are SME's, local authorities and wealthy individuals in Europe and the UK
- Contracts involve structured versions of swaps, bonds raising capital for financial institutions and foreign exchange (FX) hedging programmes
- Representation of the risks involved to clients is typically stated as "*unlimited*" and/or ignored egregious features of the contract structuring like *one-sided cancellation options without compensation*
  Dempster, Medova & Roberts (2011)

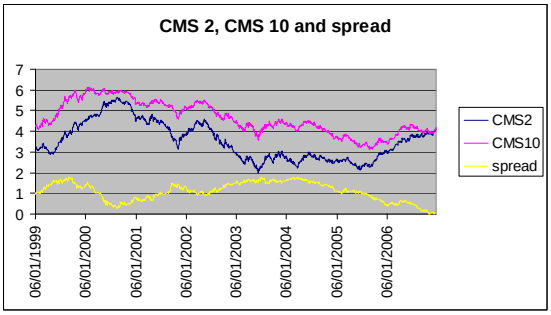
Stylized Features of OTC Derivative Deals

- Each deal represents a play by the issuing bank that exploits their superior knowledge of possible future market evolution relative to the client's
- Issuers are usually the client's commercial bank and the term sheets/contracts usually bear a feminine bank signature
- Often the bank **requires** the deal as a condition of a loan, refinancing or bond floatation
- Each deal is structured to have the enticement of a short term client "sweetener" which can sometimes be very subtle
- Often enticement can be buried in a programme of successive similarly structured deals which only in the latter stages become egregious – playing the "fish"
- Due to severe asymmetry of information the client is in no position to understand the relative risks to client and bank which are often extreme for the client
- When a deal begins to go wrong for the client the bank offers to postpone the agony by restructuring the deal(s) to one even worse!

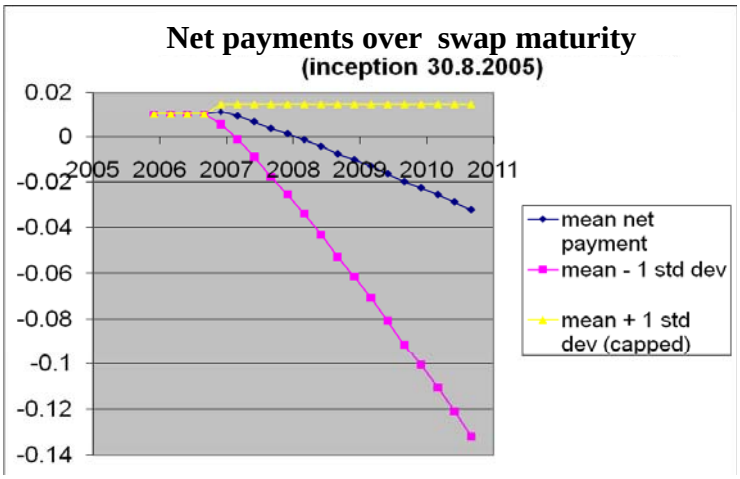
Swap NPV Distributions



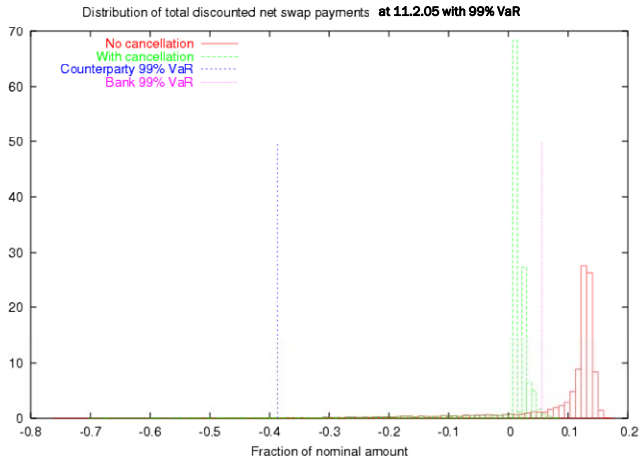
Play on Declining Spread From Increasing Short Rates



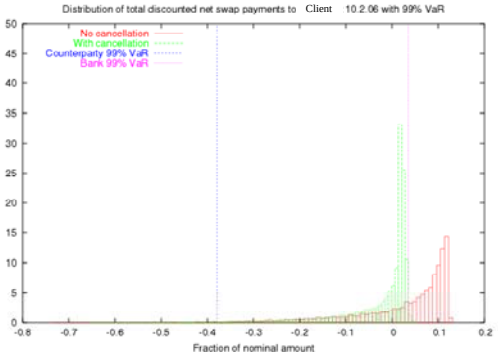
Declining Spread Increases Client Payments



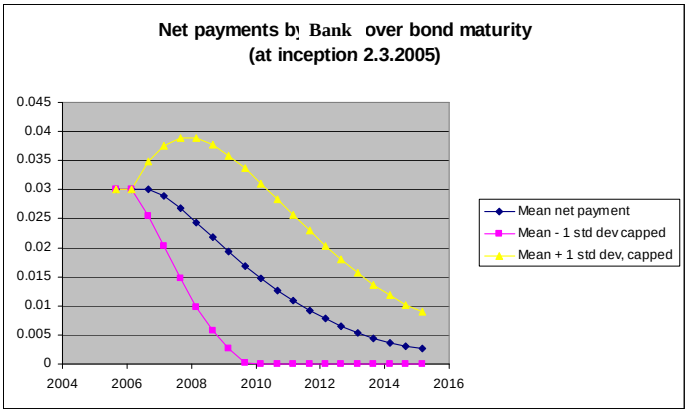
To Result in Serious Potential Losses



Which Just Get Worse



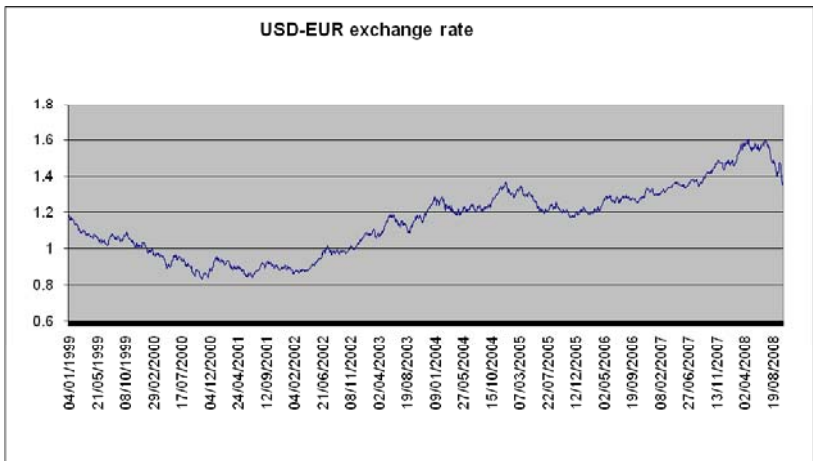
Structured Bond Tier 1 Capital Bond Coupons



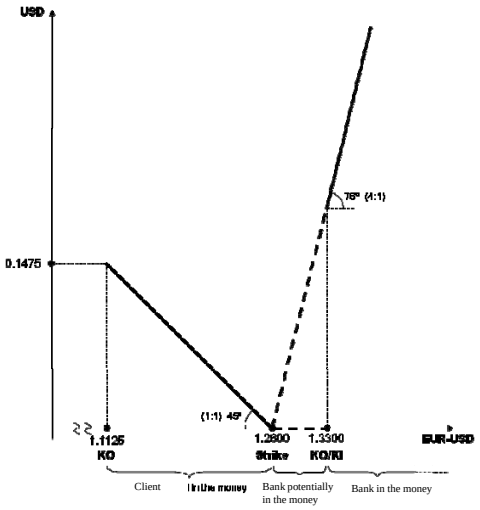
Client FX Hedging Programme

- **Over 70 option pairs** over a 33 month period in which 26 struck between March 2007 and February 2008 resulted in *substantial losses*
- **Mispricing** of both paired options involving *negative smile corrections*
- **Multiple restructurings** *incorporating losses in notional* and *improving knock-in points* for bank amounting to 28% of client losses
- **Contract exercise changes** involved in a total of **€ 30.5 M** losses on 26 losing deals which were billed over 5 days to the client when some *European options* had *not yet expired*

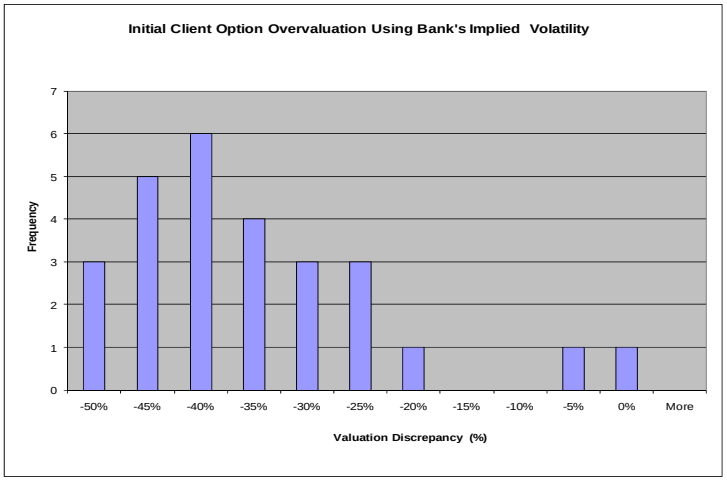
USD-EUR Evolution



4:1 Asymmetric Option Pair Payoffs (Later 6:1)



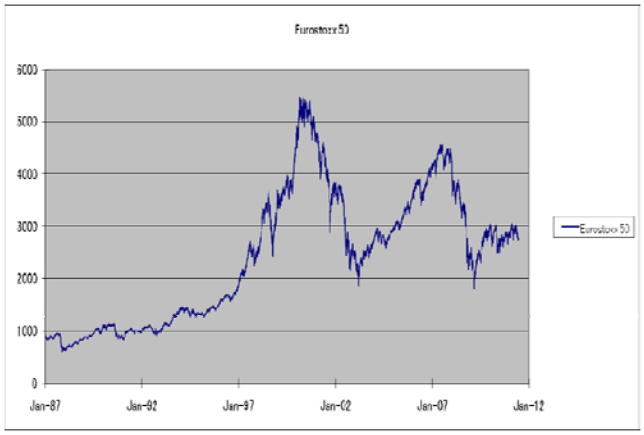
36% Average Initial Client Option Overvaluation



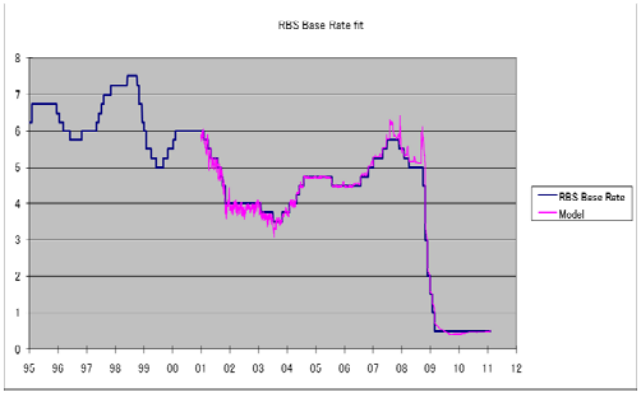
Bank Plays Seen More Recently

- As Lehman's and other bank's positions worsened over 2008 and short rates dropped precipitously CMS spread ladder swaps began to be based on yield curve *steepening*
- Projected drops in the Eurostoxx50 as the crisis deepened based on earlier internet bubble behaviour of the index
- UK banks sold vanilla fixed floating swaps to retail customers – or ***required*** them as "hedges" on loans! – with no warning of the imminent downside short rate risks
- (Slightly) more sophisticated clients were sold structured collars
- Many cross currency or currency related swaps with clients were based on the strengthening of the Swiss franc against other currencies with the "flight to quality" as the euro crisis developed
- Projected drops in the 10 year constant maturity swap rate CMS10 as the crisis deepened with current artificially low rates due to quantitative easing (QE)
- Projected strengthening or currently (Abe) weakening of the JPY-USD exchange rate with short maturity high frequency structured target profit forward contracts

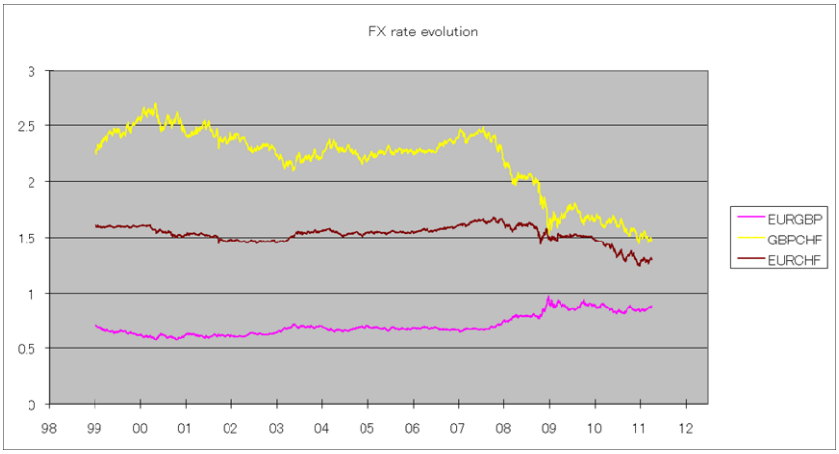
EuroStoxx50 Evolution



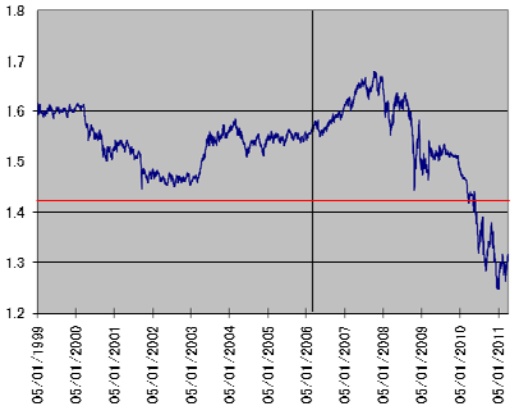
UK Base Rate Evolution



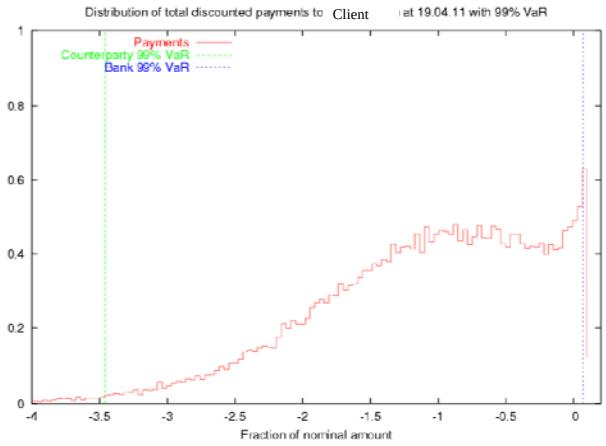
EUR-GBP, GBP-CHF & EUR-CHF Evolution



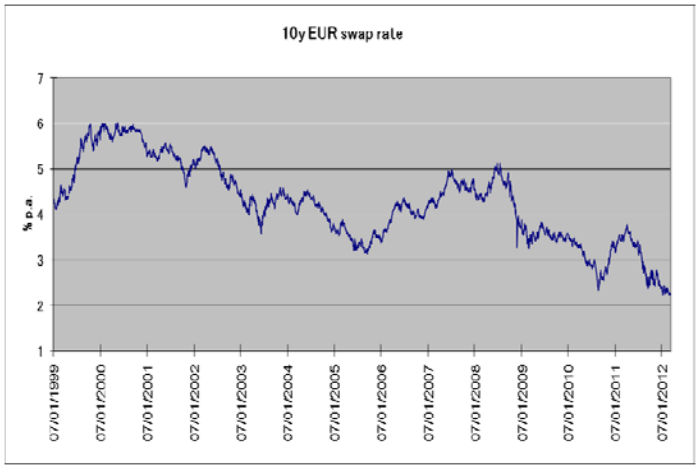
EUR-CHF Evolution



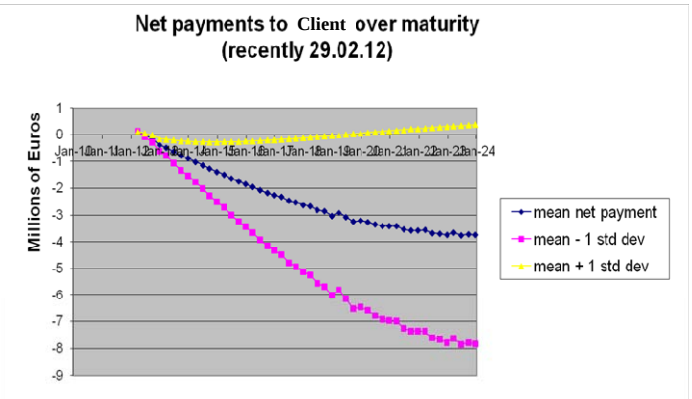
NPV VaR of a Restructured Currency Swap



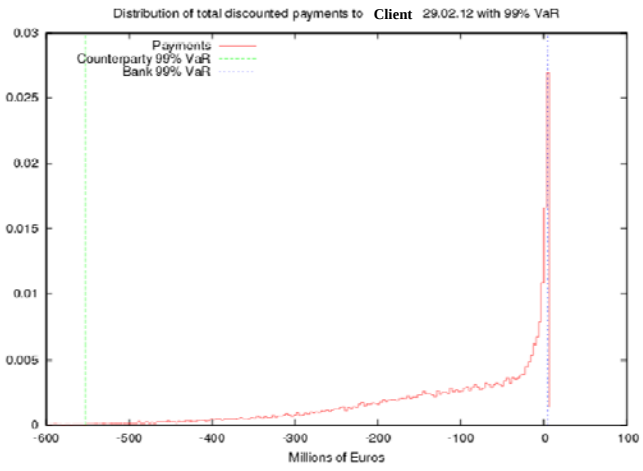
CMS10 Rate Evolution



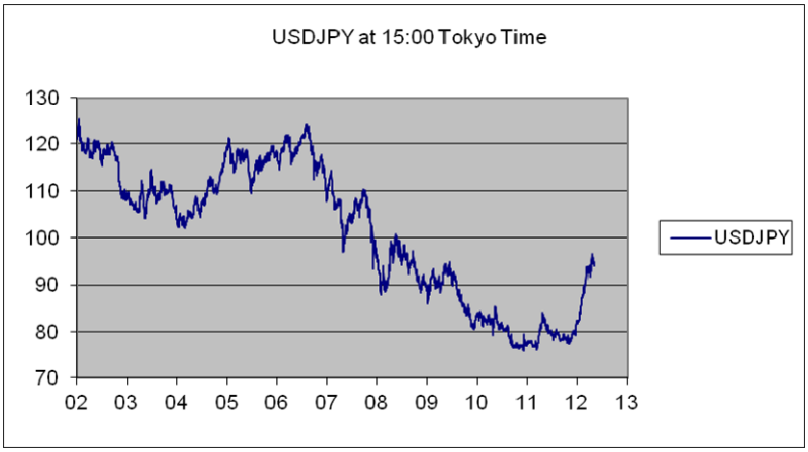
2nd Restructured CMS10 Memory Swap Amortised NP €10.5M



NPV of 2nd Restructured CMS10 Memory Swap



JPY-USD Evolution



Bank Issuance of OTC Derivative to Clients Summary

- Products are invariably mispriced in favour of the bank at inception and get worse over time
- It's like going to the track having fixed the horse race
- You are not absolutely guaranteed to win but you surely have an edge on the punters!

4. Evolving Regulation of OTC Derivatives

Why Do Clients Sign OTC Contracts? Theory

- In over-the-counter markets "buyers and sellers and sellers negotiate terms privately, often in ignorance of the prices currently available from other potential counterparties and with limited knowledge of trades recently negotiated elsewhere in the market ... (illiquidity) premia are higher when counterparties are harder to find, when *sellers* have less bargaining power, when the fraction of qualified owners is smaller, and when risk aversion, volatility, or hedging demand is larger"

  Based on random search by rational risk neutral investors and the central limit theorem

  Duffie (2012)

- Structured investment products offer no gain after fees to such investors and **appear** to do so only if investors misestimate outcome likelihoods by overweighting favourable relative to unfavourable outcomes – a theory of gullability?

  Hens & Rieger (2013)

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Why Do Clients *Actually* Sign OTC Contracts?

On a scale from the honest weak to the powerful

- **Desperation**
  - City of Detroit
- **Coercion**
  - Bank loan or loan rollover ***requires*** accompanying "hedge" derivatives (UK & US SMEs)
- **Trust**
  - Ille Papier v DB German Supreme Court case (2011)
- **Gullability**
  - German Landesbanken (unknown B €)
  - Austrian National Railways (€ 90 M)
  - Milan, Pisa, Sicily, Monte Casino, ... (600 municipalities, over 1000 global deals, c. € 2.5 B lost)
- **Complicity**
  - Italian (1999) (c. € 31 B to 2012) and Greek (2001) (unknown B €) governments for Eurozone entry
  - Monte dei Paschi di Sienna (c. € 600 M to € 1.5 B)
  - Stichting Vestia Group (€ 700 M)

US Dodd-Frank and Consumer Protection Acts

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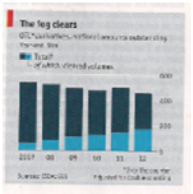
- Much media attention has been focussed on the **Volker rule** which **partially restores** the **Glass-Steagall Act** of 1933 separating commercial and investment banking (broker-dealers) and **moving OTC derivative trading to cleared exchanges** under the direction of the Commodity Futures Trading Commission
- Specifically **investment banks** must **cease proprietary trading** (i.e. on their own account) and **divest** themselves of **solely-owned hedge and private equity funds**
- The SEC and CFTC have detailed the *implementation* of these acts in July 2013 but much must still be done internationally and it remains to be seen how much teeth they will have
- However clear rules enforcing **duty of care** and **separating advice and trading with clients** specifically for ***all*** *governmental entities*, *pension funds* (Erisa entities) and *foundations* have been overlooked or played down by banks and the media – especially possible retroactive application
- In essence this is the motivation behind the **US government's law suits** of **18 global derivative issuers over CDO's**

Client Protection?



- Moving some OTC structured products to cleared exchanges mainly addresses **interbank** derivative trading to which most current regulation is addressed
- **Client** problems could be alleviated by regulation to require the *visual display* by banks of the *asymmetric risks* involved in remaining OTC structured products along the lines of the diagrams we have shown for swaps, bonds and FX contracts – unfortunately unlikely for the ongoing Dodd-Frank implementation by the CFTC
- This would result in **fairer products** and encourage the widespread **proper** use of derivatives by clients for hedging various risks
- The concomitant would be a **smaller margin for banks!**

Barclays Balance Sheet 2012

Assets £ M		Liabilities £ M	
Derivatives 469,146		Derivatives 462,468	
6,679 net			
Loans 425,729		Deposits 385,707	
Other 509,270		Other 579,190	
Cash 86,175		Equity 62,957	4.2 % 24:1
£ 1,490,322 M		£ 1,490,322 M	

£ 1.5 T or 61% of UK £2.44 T GDP

Systemic Consequences of Derivative Practice

- S&P estimated in 2011 that the top 20 derivatives dealers with 90% of the OTC market (those sued by the US government plus UniCredit and Intesa) currently have over $500 B each in these assets – a staggering total of **$10 T** and over 3 times the $3 T global bank *eventual* markdowns estimated at the end of 2008 which are still being realized

- The BIS total estimate as of end 2012 was **$ 21.1 T** gross hedged mark-to-market interbank and corporate plus a further **$3.6 T** net MTM of un-hedged credit exposure – in large part due to deals of the type we have discussed

- What would be the systemic consequences if a significant part of these cash flows and profits were to disappear due to regulation/litigation/default? Exit from serious investment banking is already underway for UBS and under discussion at Credit Suisse and Barclays

- Does Jamie Dimon, CEO of JP Morgan Chase, know something that we don't (even before the 2012 JPM $6.2 B loss) ? On 12th September 2011 he was quoted in the *Financial Times* as saying "It could be '10 years' before the (financial) industry emerges from lawsuits brought by investors seeking compensation"

References

- J S Chadha, M A H Dempster & D S Pickford (2012). *The Euro in Danger: Reform and Reset*. Searching Finance, Cambridge
- M A H Dempster, E A Medova & M Villaverde (2010). Long term interest rates and consol bond valuation. *Journal of Asset Management* **11.2-3** 113-135
- M A H Dempster, E A Medova & J Roberts (2011). Regulating complex derivatives: Can the opaque be made transparent? *Journal of Banking Regulation* **12.4** 308-330
- M A H Dempster, J Evans & E A Medova (2013). Developing a practical yield curve model: An odyssey. In: J S Chadha & M Joyce, eds. *The Yield Curve in Macroeconomics.* Cambridge University Press (2013). Available on SSRN
- D Duffie (2012). *Dark Markets: Asset Pricing and Information Transmission in Over-the-Counter Markets*. Princeton University Press
- T Hens & M O Rieger (2013). Can utility optimization explain the demand for structured investment products? *Quantitative Finance*, Special Issue on Behavioural Finance, to appear
- C P Kindleberger (1989). *Manias, Panics and Crashes: A History of Financial Crashes*. Basic Books, New York
- C M Reinhart & K S Rogoff (2009). *This Time is Different: Eight Centuries of Financial Folly*. Princeton University Press