



SOCIETY OF ACTUARIES

**Equity-Based Insurance Guarantees Conference
March 2-3, 2009**

Hong Kong

**Risk and Capital Management
for Variable Annuities**

[Marc Saffon](#)

Risk and Capital Management for Variable Annuities



SOA Hong Kong Conference - March 2 & 3, 2009


 **SOCIÉTÉ GÉNÉRALE**
Corporate & Investment Banking

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■ Agenda

■ Current Hedging Environment: 2008: The Perfect Storm

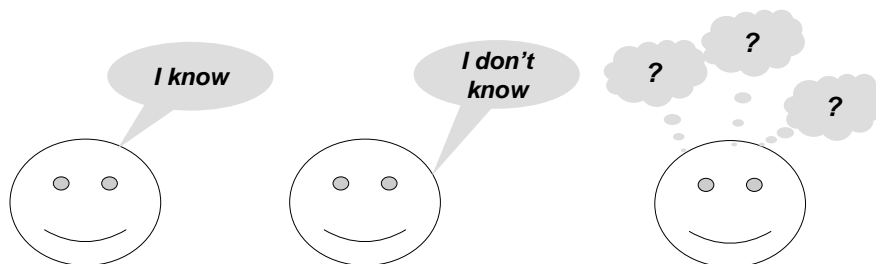
- Capital Market banks are a natural partner in the current storm
- Dynamic Hedge of GMAB: Case Study
- Conclusion and Next Steps



■ 2008: The Year of The Unknown Unknowns

■ The VA word before 2008

- ▶ There are **known knowns**. There are things we know that we know.
- ▶ There are **known unknowns**. That is to say, there are things that we now know we don't know.
- ▶ But there are also **unknown unknowns**. There are things we do not know we don't know...



2008: The Year of The Unknown Unknowns

The new VA world in 2008 and after

Reminder of events Q1

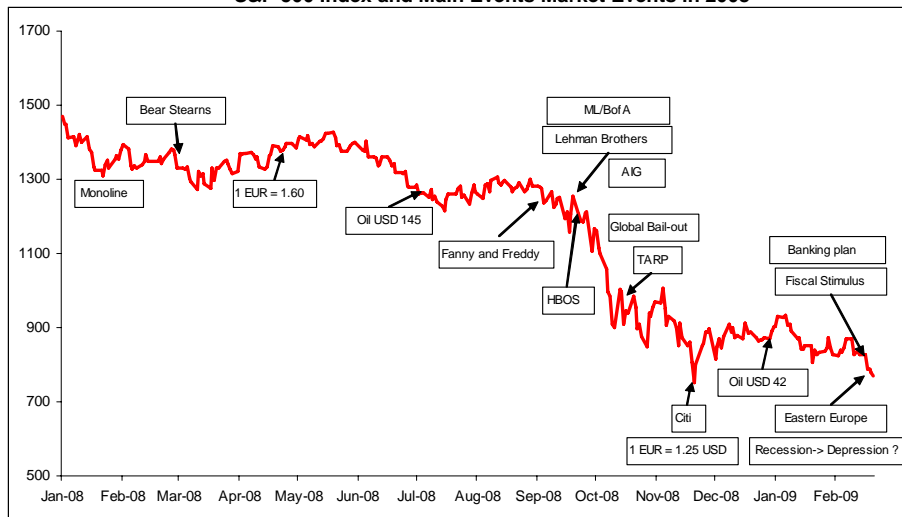
- Consumers Borrow too Much (consume beyond their means)
- Monoline
- Bear Sterns
- Oil price & food price
- From Weak to Strong USD (leverage)
- Fanny and Freddy
- AIG
- Lehman + Merrill Lynch/BOA
- HBOS
- TARP
- Libor Spread
- Credit Market Seizure
- Iceland Bust
- UK and European Bank bail out
- Citi
- Inflation to Deflation Fear
- Insurance Co
- Emerging scares

Q1 2009 is not pretty:

- World Recession or Recession=> Depression ? (Japan)
- Eastern Europe
- Stimulus
- Market continues to fall
- Consumer don't consume enough !!!

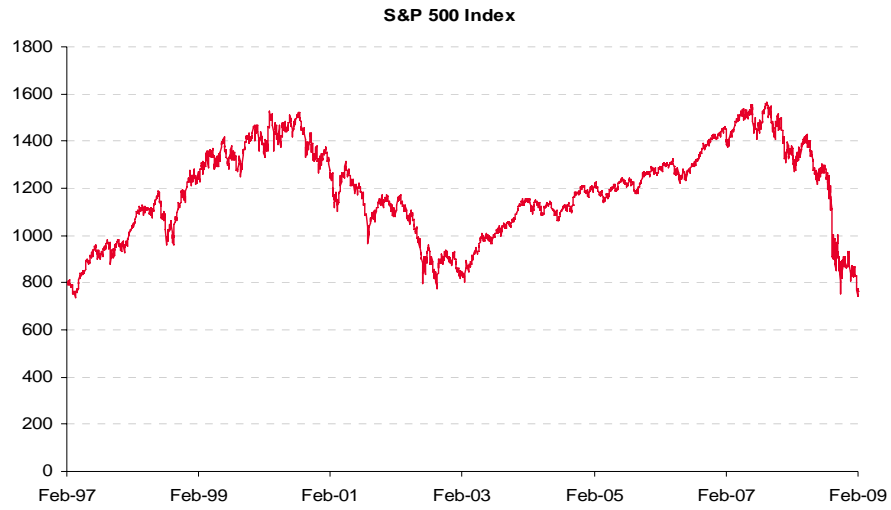
2008: The Perfect Storm

S&P 500 Index and Main Events Market Events in 2008



Source: Société Générale, Bloomberg

A Crashing Equity Market

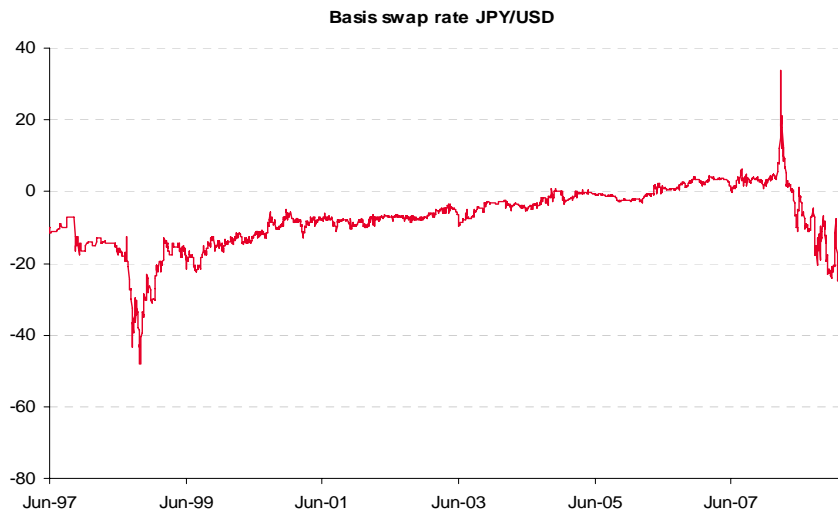


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An Example of Dislocation: The Basis Swap Rate JPY/USD



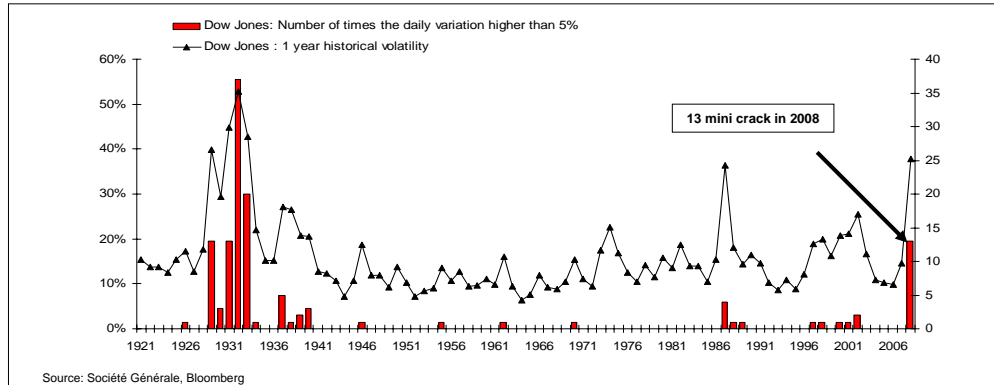
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■ **Short Term Volatility**
Very Large number of high daily variation

- **Short term implied volatility reached historical highs making delta hedging more expensive**
- **Impact on Insurance Companies: Large realized losses in dynamic hedging**



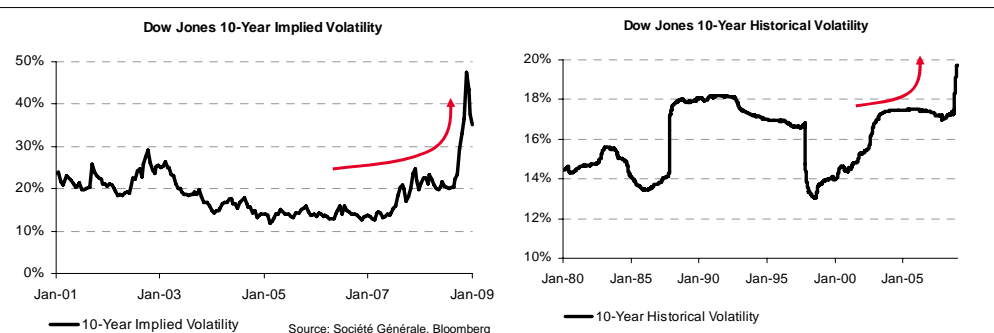
Source: Soci t  G n rale, Bloomberg

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■ **Long Term Volatility**

- **Implied long-term volatility increased dramatically (driven by the short term view).**
 - ▶ Current implied level is close to the highest historical ever.
 - ▶ Spread between historical and implied at its peak
- **Impact on Insurance Companies: Large losses in reevaluating the future liability (Vega loss)**



Source: Soci t  G n rale, Bloomberg

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Correlation

- Equity markets have historically shown high levels of correlation in times of severe market downturns: most broad-based equity indexes tend to decrease simultaneously

Recent market performances have further supported this theory

- Impact on Insurance Companies: Compounds the increase of volatility effect



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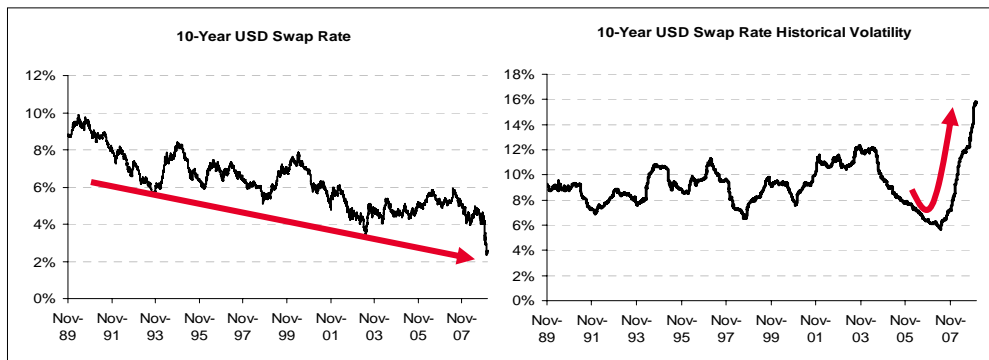
Source: Société Générale, Bloomberg

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Interest Rates

- Sharp decrease in interest rates
- Increase in interest rate volatility
- Impact on Insurance Companies: Increase of liabilities & Vega losses



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Source: Société Générale, Bloomberg

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■ Lessons Learned from Recent Market Performances

- All the delta hedging tools proved inefficient leaving the insurance company with large losses on their balance sheet that the tool provider (software company, actuarial consultant) did not share
- 2008 proved that market risk is very difficult to diversify unlike regular insurance risk:
 - The more insurance policies are sold, the more diversified the actuarial risk but the more concentrated the market risk.
- Market risk cannot be dynamically hedged with simple hedging tools:
 - It needs to be exchanged in as many forms as possible with other market participants
 - Such hedging solutions require huge infrastructure and access to large number of flows.
- Traditional reinsurance has simply disappeared (similar to 2001)

■ Insurance Companies CDS

5 Year CDS as of Feb 27th 2009					
MBIA	7538	Argentina	3135	Citi	415
Old Mutual	2760	Venezuela	2482	Morgan Stanley	398
AIG	1207	Iceland	1061	UBS	310
Lincoln National	912	Russia	760	Goldman	283
Hartford	829	Indonesia	650	BoA	241
Prudential	817	Philippine	446	Credit Suisse	210
Metlife	643	South Korea	433	Wells Fargo	206
Berkshire Hathaway	426	Poland	400	Barclays	205
Allstate	341	Thailand	296	RBS	195
Aegon	348	Malaysia	296	HSBC	150
Aviva	255	UK	164	JPMorgan	147
Axa	171	USA	99	Deutsche Bank	145
Allianz	122	France	95	SG	130
Ace	114	Germany	90	Commerzbank	100

■ Unk-Unk

■ The VA word before 2008

- ▶ There are known knowns. *There are things we know that we know.*
- ▶ There are known unknowns. *That is to say, there are things that we now know we don't know.*
- ▶ **But there are also unknown unknowns. *There are things we do not know we don't know.***

■ The VA word in 2008

- ▶ **But there are also unknown unknowns. *There are things we do not know we don't know***

■ Unk-Unk

■ The VA world beyond in 2009

- ▶ Mr Bad
 - ***But there are also the unknown knowns. There are things that we don't know or intentionally refuse to acknowledge that we know***
- ▶ Mr Good
 - ***“Don t violate the Noah rule: Predicting rain doesn't count; building arks does”***
 - ***i.e. Act systematically to cut financial risks and retain only the one you are truly comfortable with and are truly decorrated***

What next ?

Remember the past:

- ▶ The DJIA took 26 years to recover from the 1929 crisis
- ▶ The SP500 remained relatively flat for 15 years between 1966 and 1980
- ▶ The Nikkei lost more than 60% of its value twice during the last 2 decades.

Implied volatility is high today but might not go down much for the next 30 months

We might be going into the Japan scenario

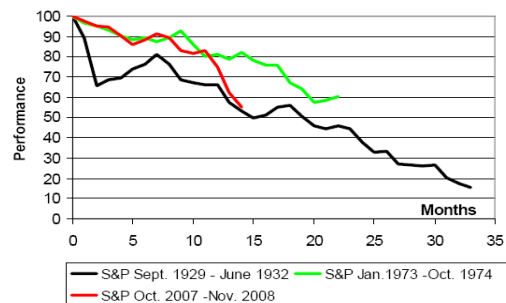
Insurance companies may consider hedging now and as much as possible

What next ?

“Black Swan logic makes what you don't know far more relevant than what you do know”

Nassim Taleb, author of the Black Swan

- The 1929 crisis lasted 3 years
- The 1974 crisis lasted 2 years
- Today the S&P has lost around 50% of its value over a period of 1 year



■ **Agenda**

- **Current Hedging Environment:
2008: The Perfect Storm**

■ **Capital Market banks are a natural partner in the current storm**

- **Dynamic Hedge of GMAB: Case Study**

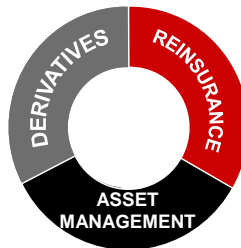
- **Conclusion and Next Steps**



■ **VA products are the most elegant (complex to hedge)
financial products**

- **A VA platform need to be well organized to offer insurance companies with an extensive range of hedging solutions & product design**

- **Hybrid Derivatives Expertise**
- **Strong Modeling capabilities**
- **Extensive market Access**



- **Strong credit standing**
- **Book diversification**
- **Product focus and consistency**

- **Expert asset manager with good tracking of benchmarks**
- **Liquid and simple strategy**

Hedge Effectiveness – Finding the Right Risk Allocation



■ Insurance company's skills:

- ▶ Expert at managing diversifiable actuarial risks and basis risks
- ▶ Long term view to take such risks
- ▶ Direct feedback to product design and product distribution
- ▶ More knowledgeable about policyholder behavior risks
- ▶ Lower capital charge for noises without trend

■ Capital Market Bank's competitive edge:

- ▶ Diversified market clients (investors, hedgers, hedge funds)
- ▶ Market risks offloaded as soon as possible and as much as possible
- ▶ Strong capital market risk management
- ▶ Market consistent derivatives modeling
- ▶ Much better equipped to manage hybrid and correlation risks

Solutions to look for

HEDGING SOLUTIONS FOR EXISTING BLOCKS

- **Delta Hedging**
 - ▶ Global Market Player
 - ▶ Efficient infrastructure
- **2/3- Greeks Hedging**
 - ▶ Global leader in Equity Derivatives
 - ▶ In depth expertise in cross-asset hedging
- **Structure Hedge**
 - ▶ Customized and Innovative solutions to optimize cost/risk ratio
- **Full Reinsurance**
 - ▶ Full Risk Transfer

PRODUCT DESIGN

- **Customizable risk transfer**
 - ▶ Full / Partial
- **Diverse product design capacities**
 - ▶ Accumulation, Death Benefits
 - ▶ Return On Premium / Roll up / Ratchet
 - ▶ CPPI-like structures
- **Underlying**
 - ▶ Indices, basket of indices
 - ▶ Dedicated Fund
 - Volatility Managed/Controlled Funds
 - Active Management
 - ▶ Access to new asset classes
 - Commodities, Custom Indices
 - Hedge Funds / Fund of Hedge Funds

■ Full Reinsurance vs Structured Hedge

- Insurance companies have a strong desire for full reinsurance but cost is often prohibitive.
 - ▶ More sophisticated companies search for core targeted capital market hedges from banks to complement their own hedging program.
- Structured Hedge may allow Insurance companies to reach efficient hedging solution while significantly reduce their hedging cost

		Principle	Pros	Cons	
Traditional Reinsurance		Complete Risk Transfer at policy level	Full risk relief, reserve and capital benefit	Costly and lack of providers	
		Principle	Pros	Cons	
Structured Hedge	Market assumption	Real World (Insurer's View)	Structured Hedge based on cash flows projection using insurer's market assumptions	Flexible target of risk exposure reduction	Risk if market assumptions do not realized
		Market Neutral (Market View)	Structured Hedge based on cash flows projection using insurer's market assumptions	No more market risk for the insurer	Less control over market assumptions for the insurer
	Modeling	Seriatim	Match payoff function at policy level	Better payoff function match down to the policy level	Less flexible as it ties in only with with specific block of business
		Model Cells	Match payoff function at macro level	Flexible pricing, and easy to understand and implement	More residual risk

■ Agenda

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■ ■ Table of Contents
Managing market risk is like sailing...

■ Sailing in 2003 – 2007...

Calm Sea



■ ■ Table of Contents
Managing market risk is like sailing...

■ Sailing in 2008...

The Perfect Storm



■ ■ **Table of Contents**
Managing market risk is like sailing...

■ **Sailing in 2009...**

Wreck?



Storm?



Calm Sea?



■ ■ **Sensitivities of a GMAB hedge to Financial Markets**
Case Study 1/3

■ **Study objective:**

- ▶ What would have been the profits or losses generated by a dynamic hedge?

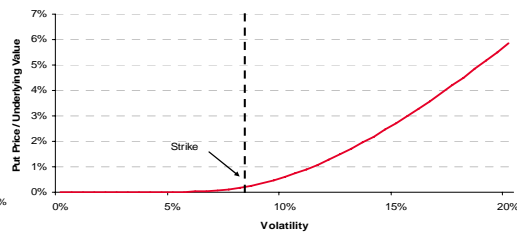
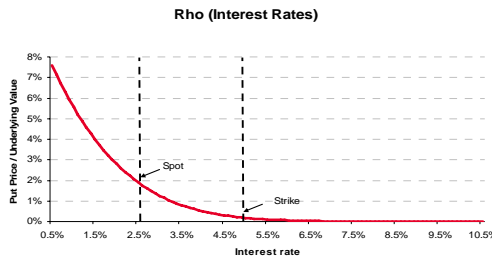
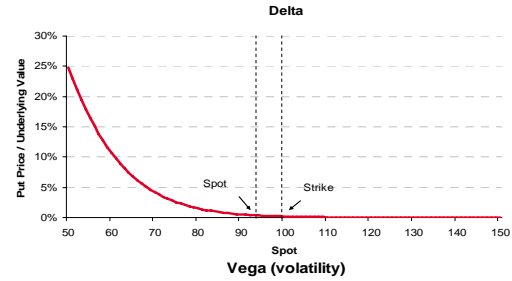
■ **Case Study based on the following GMAB parameters**

- ▶ 10 years maturity
- ▶ USD denominated
- ▶ 1% mortality p.a.
- ▶ 4% lapse rate p.a.
- ▶ GMAB @ 100% after 10 years
- ▶ Underlying: equally weighted basket (daily rebalancing)
 - 50% MSCI World Index
 - 50% JP Morgan Global Aggregate Bond Index

■ Sensitivities of GMAB hedge to Financial Markets
Case Study 2/3

■ 10-year Put Black & Scholes sensitivities based on 2006 parameters

- ▶ Volatility: 8%
- ▶ Interest Rate: 5%



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Source: Société Générale

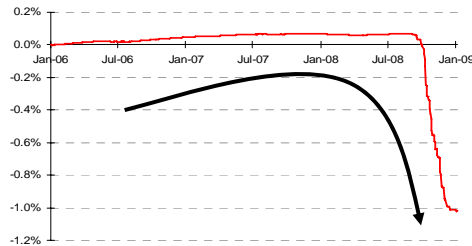
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■ Sensitivities of a GMAB hedge to Financial Markets
Case Study 3/3

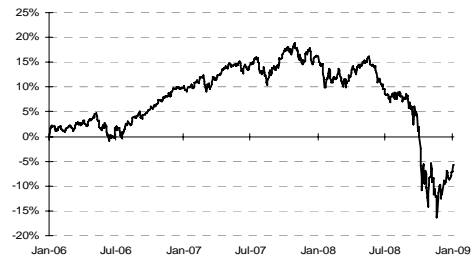
■ Results

- ▶ From Jan 2006 to Sept 2008, dynamic hedge was profitable
- ▶ **September 2008 market crack led to dramatic losses**
 - **Gamma losses**

Cumulative P&L of Dynamic Hedge



Performance since inception of the Underlying Basket



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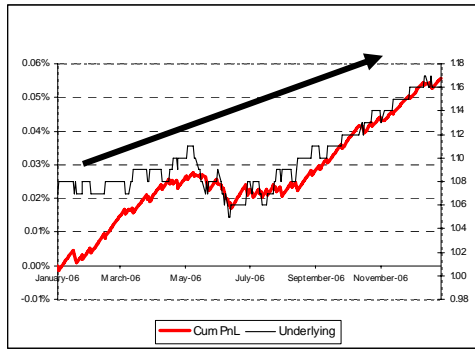
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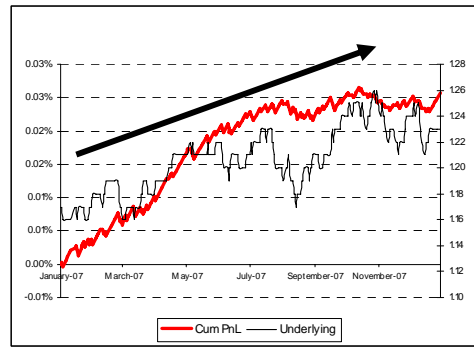
■ Results of delta hedging

■ The good years...

2006



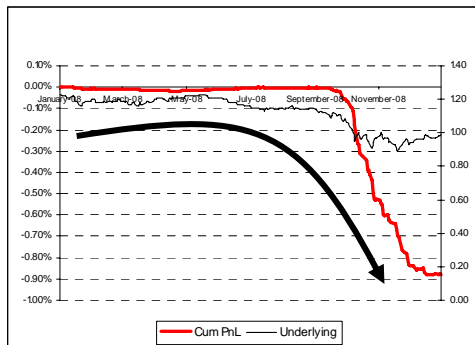
2007



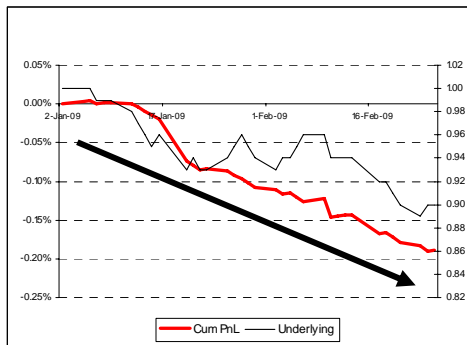
■ Results of delta hedging

■ ...are gone

2008



2009



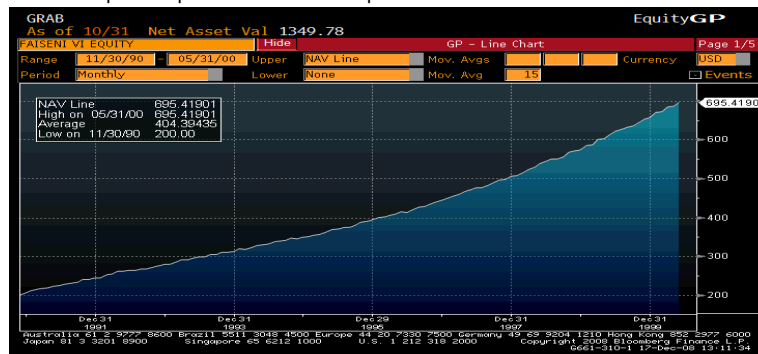
■ Agenda

- Current Hedging Environment: the 2008 horror movie
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■ Volatility is the invisible evil or good behind the 2008 catastrophe

- No volatility is BAD !!!!
 - ▶ Example of a public Ponzi scheme performance



Source: BloombergQ

- After all, you only find out who is swimming naked when the tide goes out...

■ ■ Golden rules of the good insurance company
(by warren buffet in his 2001 address to Berkshire shareholders) 1/2

- *Good insurers accept only those risks that they are able to properly evaluate (staying within their circle of competence) and that, after they have evaluated all relevant factors including remote loss scenarios, carry the expectancy of profit. These insurers ignore market-share considerations and are sanguine about losing business to competitors that are offering foolish prices or policy conditions.*

▶ Beware of financial risk

- *They limit the business they accept in a manner that guarantees they will suffer no aggregation of losses from a single event or from related events that will threaten their solvency. They ceaselessly search for possible correlation among seemingly-unrelated risks.*

▶ Beware that financial risks is not getting more diversified with the number of policies underwritten but on the contrary is getting more concentrated

■ ■ Golden rules of the good insurance company
(by warren buffet in his 2001 address to Berkshire shareholders) 2/2

- *They avoid business involving moral risk: No matter what the rate, trying to write good contracts with bad people doesn't work. While most policyholders and clients are honorable and ethical, doing business with the few exceptions is usually expensive, sometimes extraordinarily so.*

▶ Beware of behavioral risks

■ ■ Preparing for a better future

■ Credit issue:

- ▶ Collateral agreement with all counterparts

■ Risk evaluation:

- ▶ Permanent basis and check accuracy by effectively transacting in the market

■ Market access:

- ▶ Connect with market in efficient manners (DMAs tools, synthetic hedging)

■ Product design: go back to basics

- ▶ Profiling concept rather than menus with 50 funds
- ▶ Beware of ratchet of restrike feature but privilege lock in feature
- ▶ Indexing rather discretionary management (index of mutual fund is ok)
- ▶ Market or experienced linked exit fees

■ ■ Critical questions to ask yourselves

■ Do you have views of the future market?

- ▶ Market level: first dollar or last dollar
- ▶ Volatility: do you wish to pay implied or realized volatility?

■ Are you more concerned about

- ▶ Locking in the cost of the block to prevent further losses (full coverage or first dollar)?
- ▶ Or protecting the capital (last dollar tail protection)?

■ What are your accounting objectives?

■ Decide percentage of the business to hedge

■ We will work around your desired objectives.