How virtual is financial risk?

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Risk Management Debacles

- **1992:** Credit Lyonnais – Real Estate, $10+ bln
- **1994:** Orange County – Bob Cintron, $1.6 bln
- **1995:** Barings Banks – Nicholas Leeson, $1.4 bln
- **1998:** Long-Term Capital Management – $4.6 bln
- **1998:** Bankers Trust – Russian Default, $350 mln
- **2000:** Daiwa Bank Group – Toshihide Iguchi, $1 bln
- **2001:** Enron – Jeffrey Skilling, $74 bln (accounting debacle)
- **2002:** Worldcom – Bernard Ebbers, $11 bln (accounting debacle)
- **2002:** Allied Irish Banks – John Rusnak, $691 mln
- **2005:** Mizuho Securities Co. – Typo, $347 mln
- **2006:** Amaranth Advisors – Natural Gas, $6 bln
- **2008:**
  - Bear Stearns – Matthew Tannin and Ralph R. Cioffi, $4.2 bln
  - Merrill Lynch – $30+ bln
  - Lehman Brothers – $6+ bln
  - Societe Generale – Jerome Kiervel, €4.9 bln

Major Types of Financial Risk

- **Market Risk**
  Risk that changes in financial market prices and rates will reduce the value of the financial positions
- **Credit Risk**
  Risk that a change in the credit quality of a counterparty will affect the value of financial positions
- **Operational Risk**
  Risk that potential losses will resulting from inadequate systems, management failure, faulty controls, natural disaster, and human errors

Additional Types of Financial Risk

- Liquidity Risk
- Legal and Regulatory Risk
- Business & Strategic Risk
- Reputational Risk
- Model Risk

Risk Management Process

- Formulating the organization's risk appetite
- Identifying the sources of risk
- Quantifying the likelihood of losses and their severity
- Controlling risk through the following techniques:
  - Avoidance
  - Mitigation
  - Transfer
  - Retention
- Evaluating the performance of the process

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Challenges in Risk Management: Measurements

- In order to effectively **manage** risks, one must take care to properly **measure** the risks that are present
- Without an appropriate risk management infrastructure, risks may not be properly quantified
  - Data collection may be inhibited
  - Uncertainty in the risk management system may lead to nonstationary P&L
  - Conflicts of interest among risk managers may lead to biases in risk measurement

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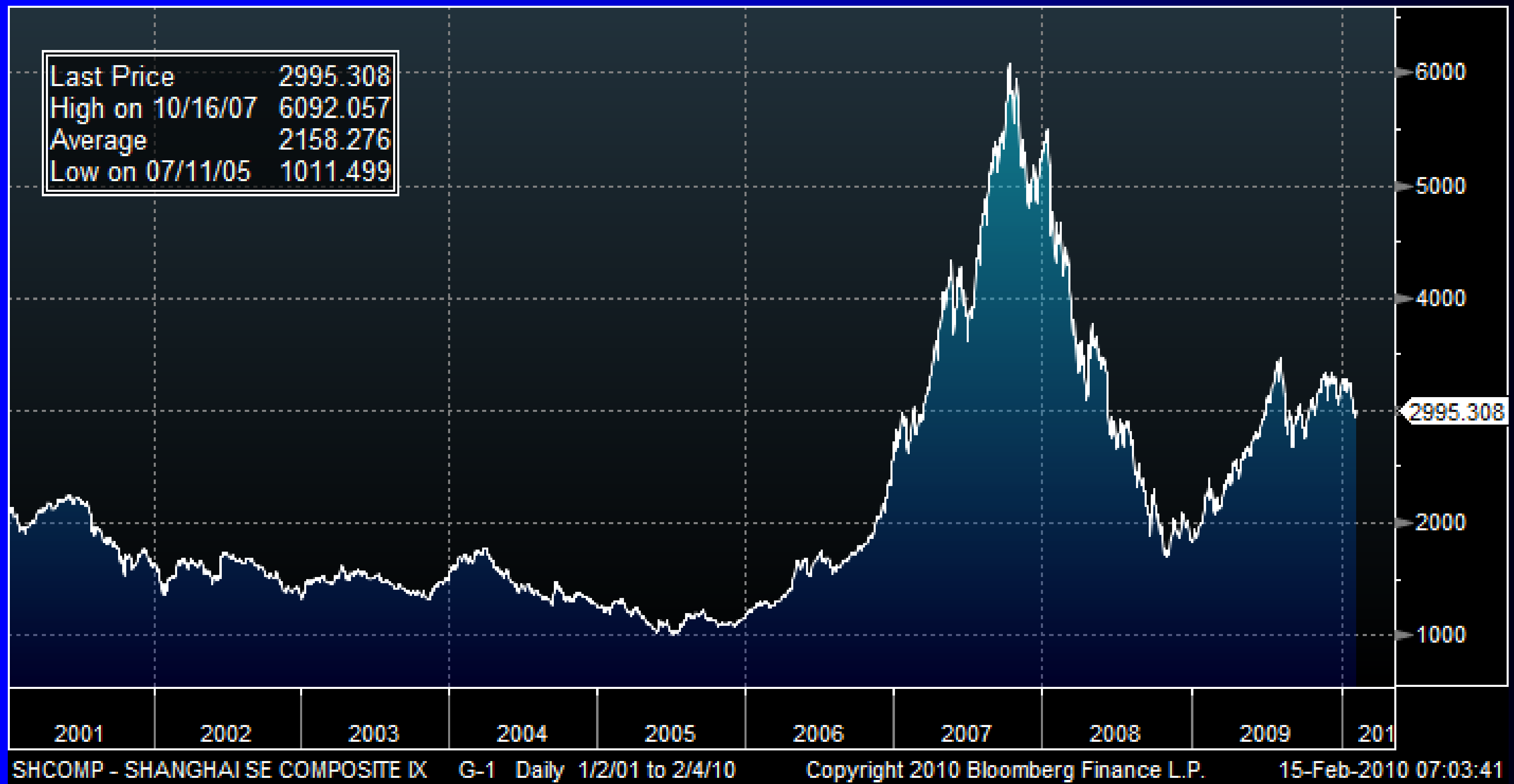
Challenges in Risk Management: Modelling

- Extreme and abnormal outcomes are the most important, yet most difficult events to predict
- Measuring temporal changes in risk is difficult
- Because aggregate risk is of primary concern, dependence among risk factors must be modeled
- Dependence among extreme outcomes for risk factors may differ from dependence among normal outcomes for these same risk factors
  - Example: phase-locking phenomenon is where seemingly uncorrelated risks become highly correlated

China’s Financial Markets (1)

- Stock markets (dd. 15 December 2009): Shanghai & Shenzhen
  - Shanghai: $913 bln (A & B)
  - Shenzhen: $855 bln (A, B, & Gem)
  - HongKong: $252 bln (H & Red Chip)
- Stock markets growing
  - Worst performer in Asia in 2008 – down by 65%
  - High performer in 2009 – up by ~80%
  - Volatility remains high
  - New issuance market buoyant
    - IPOs resumed in June 2009
    - Newly established Gem Board (ChiNext – China’s NASDAQ)
    - Return of H share and Red Chip companies to domestic market?
    - Listing of foreign companies in Shanghai?
  - Decoupling from international equity markets?

China's Financial Markets (2)



China's Financial Markets (3)

- Bond interbank market (2008)
- Total amount of bonds issued: ¥6.9 tln
  - Treasury bonds: ¥ 708.5 bln,
  - Agency bonds: ¥1.2 tln,
  - Central bank notes: ¥4.3 tln,
  - Corporate bonds: ¥249.3 bln.
- Trading value totaled ¥98.9 tln .

Financial Risk

- Defined by many as:
  "The chance that an investment's actual return will be different than expected."

- However, this implies symmetry.
  Is that correct?

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Risk Measures

- A **risk measure** is a function that maps risks into a real number
- Examples of important risk measures:
  - Standard Deviation (SD): shows how much variation there is from the "average" (mean)
  - Value at Risk (VaR): VaR_p is the threshold over which one would expect losses to breach (100%-p) during the specified time horizon
  - Expected Shortfall (ES): ES_p is the expected loss size given that a loss has exceeded the VaR_p for the confidence level p

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Risk Measures: EVT

- Extreme Value Theory:
  "To come up with a statistically justified, non-zero probability of extreme short-term market movements."
- "Extreme" in the sense that:
  - historical data are of little use,
  - or, arbitrary parameters would have to be fed to standard distributions.

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Appendix: Bear Stearns (1)

Source: Investopedia

The strategy employed by the Bear Stearns funds was actually quite simple and would be best classified as being a leveraged credit investment. In fact, it is formulaic in nature and is a common strategy in the hedge fund universe:

- **Step #1**: Purchase collateralized debt obligations (CDOs) that pay an interest rate over and above the cost of borrowing. In this instance 'AAA' rated tranches of subprime, mortgage-backed securities were used.
- **Step #2**: Use leverage to buy more CDOs than you can pay for with capital alone. Because these CDOs pay an interest rate over and above the cost of borrowing, every incremental unit of leverage adds to the total expected return. So, the more leverage you employ, the greater the expected return from the trade.
- **Step #3**: Use credit default swaps as insurance against movements in the credit market. Because the use of leverage increases the portfolio's overall risk exposure, the next step is to purchase insurance on movements in credit markets. These "insurance" instruments are called credit default swaps, and are designed to profit during times when credit concerns cause the bonds to fall in value, effectively hedging away some of the risk.
- **Step #4**: Watch the money roll in. When you net out the cost of the leverage (or debt) to purchase the 'AAA' rated subprime debt, as well as the cost of the credit insurance, you are left with a positive rate of return, which is often referred to as "positive carry" in hedge fund lingo.

In instances when credit markets (or the underling bonds' prices) remain relatively stable, or even when they behave in line with historically based expectations, this strategy generates consistent, positive returns with very little deviation. This is why hedge funds are often referred to as "absolute return" strategies.

Appendix: Bear Stearns (2)

Source: Wikipedia

- **Financials**
  - As of November 30, 2006, the company had total capital of approximately $66.7 billion and total assets of $350.4 billion. According to the April 2005 issue of *Institutional Investor* magazine, Bear Stearns was the seventh-largest securities firm in terms of total capital.
  - As of November 30, 2007 Bear Stearns had notional contract amounts of approximately $13.40 trillion in derivative financial instruments, of which $1.85 trillion were listed futures and option contracts. In addition, Bear Stearns was carrying more than $28 billion in 'level 3' assets on its books at the end of fiscal 2007 versus a net equity position of only $11.1 billion. This $11.1 billion supported $395 billion in assets,[7]which means a leverage ratio of 35.5 to 1. This highly leveraged balance sheet, consisting of many illiquid and potentially worthless assets, led to the rapid diminution of investor and lender confidence, which finally evaporated as Bear was forced to call the New York Federal Reserve to stave off the looming cascade of counterparty risk which would ensue from forced liquidation.
- **Subprime mortgage hedge fund crisis**
  - On June 22, 2007, Bear Stearns pledged a collateralized loan of up to $3.2 billion to "bail out" one of its funds, the Bear Stearns High-Grade Structured Credit Fund, while negotiating with other banks to loan money against collateral to another fund, the Bear Stearns High-Grade Structured Credit Enhanced Leveraged Fund. Bear Stearns had originally put up just $35 million, so they were hesitant about the bailout, however CEO James Cayne and other senior executives worried about the damage to the company's reputation. The funds were invested in thinly traded collateralized debt obligations (CDOs). Merrill Lynch seized $850 million worth of the underlying collateral but only was able to auction $100 million of them. The incident sparked concern of contagion as Bear Stearns might be forced to liquidate its CDOs, prompting a mark-down of similar assets in other portfolios.[10][11] Richard A. Marin, a senior executive at Bear Stearns Asset Management responsible for the two hedge funds, was replaced on June 29 by Jeffrey B. Lane, a former Vice Chairman of rival investment bank, Lehman Brothers.[12]
  - During the week of July 16, 2007, Bear Stearns disclosed that the two subprime hedge funds had lost nearly all of their value amid a rapid decline in the market for subprime mortgages.
- **Fed bailout and sale to JPMorgan Chase**
  - On March 14, 2008, JP Morgan Chase, in conjunction with the Federal Reserve Bank of New York, agreed to provide (under terms and conditions to be agreed) a (up to) 28-day emergency loan to Bear Stearns in order to prevent the potential market crash that would result from Bear Stearns becoming insolvent.[18] Despite, or because of, this, belief in Bear's ability to repay its obligations rapidly diminished among counterparties and traders. Seeing that the terms of the emergency loan was not enough to bolster Bear Stearns, and worried that a still-floundering Bear would result in systemic losses if allowed to open in the markets on the following Monday, Federal Reserve ChairmanBen Bernanke and Treasury Secretary Henry Paulson Jr. told CEO Alan Schwartz that he had to sell the firm over the weekend, in time for the opening of the Asian market. [19] Two days later, on March 16, 2008, Bear Stearns signed a merger agreement with JP Morgan Chase in a stock swap worth $2 a share or less than 10 percent of Bear Stearns' market value just two days before.[20] This sale price represented a staggering loss as its stock had traded at $172 a share as late as January 2007, and $93 a share as late as February 2008.

Appendix: Merrill Lynch (1)

Source: Wikipedia

On November 1, 2007, Merrill Lynch CEO Stanley O'Neal left the company, after being criticized for the way he handled the firm's risk management and the subprime mortgage crisis, which resulted in about US $2.24 billion in unexpected losses, and for discussing in public the possible merger with Wachovia banking corporation, without being authorized by the board to do so. He left Merrill Lynch with about US $161 million worth of stock options and retirement benefits.[11] John Thain, CEO of the New York Stock Exchange, succeeded him as CEO on December 1, 2007.

On January 17, 2008, Merrill Lynch reported a $9.83 billion fourth quarter loss incorporating a $16.7 billion write down of assets associated with subprime mortgages. On April 17, 2008, Merrill Lynch reported a net loss of $1.97 billion for the first quarter of 2008. [12] Merrill responded to its losses by raising capital through the sale of preferred shares, however experts suggest that such a strategy may pose a risk to the company's credit rating which could cause an increase to the company's borrowing costs.[13]

On January 22, 2009 John Thain resigned as CEO of the company after it was disclosed that he had rushed to pay out $3–4 billion dollars in fourth quarter bonuses to Merrill employees by the end of 2008, just prior to Bank of America's acquisition of the company became final.[14]Thain allegedly did not disclose the bonus payouts to Bank of America negotiators. Bank of America has recently asked the United States Treasury for an additional $20 billion in emergency capital, primarily in order to cover losses at its Merrill Lynch subsidiary.[15] Thain was also named as a co-defendant in a class-action lawsuit filed by shareholders against Bank of America and Merrill Lynch on January 22, 2009. The suit alleges that Bank of America CEO Ken Lewis, ex-Merrill Chief Financial Officer Nelson Chai, ex-Merrill Chief Accounting Officer Gary Carlinand, and Thain failed to warn shareholders of the magnitude of Merrill's losses prior to the Bank of America acquisition.

Subprime mortgage crisis

- In November 2007, Merrill Lynch announced it would write-down $8.4 billion in losses associated with the national housing crisis and remove E. Stanley O'Neal as its chief executive.[16] O'Neal had earlier approached Wachovia bank for a merger, without prior Board approval, but the talks ended after O'Neal's dismissal.[16] In December 2007, the firm announced it would sell its commercial finance business to General Electric and sell off major shares of its stock to Temasek Holdings, a Singapore investment group, in an effort to raise capital.[17] The deal raised over $6 billion.[17] In July 2008, the new CEO of Merrill Lynch, John Thain, announced $4.9 billion fourth quarter losses for the company from defaults and bad investments in the ongoing mortgage crisis.[18] In one year between July 2007 and July 2008, Merrill Lynch lost $19.2 billion, or $52 million daily.[18] The company's stock price had also declined significantly during that time.[18] Two weeks later, the company announced the sale of select hedge funds and securities in an effort to reduce their exposure to mortgage related investments.[19]Temasek Holdings agreed to purchase the funds and increase its investment in the company by $3.4 billion.

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Appendix: Merrill Lynch (2)

Source: Wikipedia

- Andrew Cuomo, New York Attorney General, threatened to sue Merrill Lynch in August 2008, over their misrepresentation of the risk on mortgage-backed securities.[21] A week earlier, Merrill Lynch had offered to buy back $12 billion in auction-rate debt and said they were surprised by the lawsuit.[21] Three days later, the company froze hiring and revealed that they had charged almost $30 billion in losses to their subsidiary in the United Kingdom, exempting them from taxes in that country.[22] On August 22, 2008, CEO John Thain announced an agreement with the Massachusetts Secretary of State to buy back all auction-rate securities from customers with less than $100 million in deposit with the firm, beginning in October 2008 and expanding in January 2009.[23] On September 5, 2008 Goldman Sachs downgraded Merrill Lynch's stock to "conviction sell" and warned of further losses from the company.[24] Bloomberg reported in September 2008 that Merrill Lynch had lost $51.8 billion in mortgage-backed securities as part of the subprime mortgage crisis.

Sale to Bank of America

- Significant losses were attributed to the drop in value of its large and unhedged mortgage portfolio in the form of Collateralized Debt Obligations. Trading partners' loss of confidence in Merrill Lynch's solvency and ability to refinance short-term debt ultimately led to its sale.[25][26] On September 14, 2008, Bank of America announced it was in talks to purchase Merrill Lynch for $38.25 billion in stock.[27] *The Wall Street Journal* reported later that day that Merrill Lynch was sold to Bank of America for 0.8595 shares of Bank of America common stock for each Merrill Lynch common share, or about US$50 billion or $29 per share.[28] This price represented a 70.1% premium over the September 12 closing price or a 38% premium over Merrill's book value of $21 a share,[29] but that also meant a discount of 61% from its September 2007 price.[30] Congressional testimony by Bank of American CEO Kenneth Lewis, as well as internal emails released by the House Oversight Committee, indicate that Bank of America was threatened with the firings of the management and board of Bank of America as well as damaging the relationship between the bank and federal regulators, if Bank of America did not go through with the acquisition of Merrill Lynch.

Appendix: Lehman Brothers (1)

Source: Wikipedia

- In August 2007, the firm closed its subprime lender, BNC Mortgage, eliminating 1,200 positions in 23 locations, and took an after-tax charge of $25 million and a $27 million reduction in goodwill. Lehman said that poor market conditions in the mortgage space "necessitated a substantial reduction in its resources and capacity in the subprime space".[39]
- In 2008, Lehman faced an unprecedented loss to the continuing subprime mortgage crisis. Lehman's loss was a result of having held on to large positions in subprime and other lower-rated mortgage tranches when securitizing the underlying mortgages; whether Lehman did this because it was simply unable to sell the lower-rated bonds, or made a conscious decision to hold them, is unclear. In any event, huge losses accrued in lower-rated mortgage-backed securities throughout 2008. In the second fiscal quarter, Lehman reported losses of $2.8 billion and was forced to sell off $6 billion in assets.[40] In the first half of 2008 alone, Lehman stock lost 73% of its value as the credit market continued to tighten.[40] In August 2008, Lehman reported that it intended to release 6% of its work force, 1,500 people, just ahead of its third-quarter-reporting deadline in September.[40]
- On August 22, 2008, shares in Lehman closed up 5% (16% for the week) on reports that the state-controlled Korea Development Bank was considering buying the bank.[41] Most of those gains were quickly eroded as news came in that Korea Development Bank was "facing difficulties pleasing regulators and attracting partners for the deal."[42] It culminated on September 9, when Lehman's shares plunged 45% to $7.79, after it was reported that the state-run South Korean firm had put talks on hold.[43]
- On September 17, 2008 Swiss Re estimates its overall net exposure to Lehman Brothers as approximately CHF 50 million.[44]
- Investor confidence continued to erode as Lehman's stock lost roughly half its value and pushed the S&P 500 down 3.4% on September 9. The Dow Jones lost 300 points the same day on investors' concerns about the security of the bank.[45] The U.S. government did not announce any plans to assist with any possible financial crisis that emerged at Lehman.[46]
- The next day, Lehman announced a loss of $3.9 billion and their intent to sell off a majority stake in their investment-management business, which includes Neuberger Berman.[47][48] The stock slid seven percent that day.[48][49] Lehman, after earlier rejecting questions on the sale of the company, was reportedly searching for a buyer as its stock price dropped another 40 percent on September 11, 2008.[49]
- Just before the collapse of Lehman Brothers, executives at Neuberger Berman sent e-mail memos suggesting, among other things, that the Lehman Brothers' top people forgo multi-million dollar bonuses to "send a strong message to both employees and investors that management is not shirking accountability for recent performance."[50]
- Lehman Brothers Investment Management Director George Herbert Walker IV dismissed the proposal, going so far as to actually apologize to other members of the Lehman Brothers executive committee for the idea of bonus reduction having been suggested. He wrote, "Sorry team. I am not sure what's in the water at Neuberger Berman. I'm embarrassed and I apologize."[50]
- On Saturday September 13, 2008, Timothy F. Geithner, the president of the Federal Reserve Bank of New York called a meeting on the future of Lehman, which included the possibility of an emergency liquidation of its assets.[51] Lehman reported that it had been in talks withBank of America and Barclays for the company's possible sale. However, both Barclays and Bank of America ultimately declined to purchase the entire company.[51][52]
- The International Swaps and Derivatives Association (ISDA) offered an exceptional trading session on Sunday, September 14, 2008, to allow market participants to offset positions in various derivatives on the condition of a Lehman bankruptcy later that day.[53][54] Although the bankruptcy filing missed the deadline, many dealers honored the trades they made in the special session.[55]
- In New York, shortly before 1 a.m. the next morning, Lehman Brothers Holdings announced it would filefor Chapter 11 bankruptcy protection[56] citing bank debt of $613 billion, $155 billion in bond debt, and assets worth $639 billion.