Foundation of Risk Management

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- A Helicopter View
- Corporate Risk Management: A primer
- Corporate Governance and Risk Management
- Beta
- The Credit Crisis of 2007

"Risk, in traditional terms, is viewed as a negative. The dictionary defines risk as "exposing to danger or hazard."

Expected Loss:
•Already accounted for in our annual plans. Eg: Food, College fees, etc
Unexpected Loss:
•The daily life costs will suddenly rise in an entirely unexpected way

Classification of Risks:
•Financial Risk
•Operational Risk
•Legal and Regularity Risk
•Business Risk
•Liquidity Risk
•Strategic Risk
•Reputation Risk

Risk Management Process
1. Identify Risk Exposure
   - Measure & Estimate Risk Exposure
     Assess effects of Exposures
   - Find instruments & facilities to shift or trade risks
   - Assess costs & benefits of Instruments
2. Form a Risk Mitigation Strategy:
   Avoid Transfer Mitigate Keep
3. Evaluate Performance

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  - Hedging Operations : Example: When an American manufacturing company buys components from French company in euros, the American company can opt to avoid the foreign currency risk by hedging the exposure
  - Hedging Financial Positions: When financial markets are not perfect, company will benefit by hedging its balance sheet. It may have tax advantage, benefits from economies of scale
  - Financial Products for hedging:
    - Over The Counter (OTC) Derivatives
    - Exchange Traded Derivatives
    - Securitizations
    - Exotic Options, Structured Products and Non-Traditional Derivatives
  - Steps of Risk Management into Practice:
    1. Determining the Objective :
       - Hedging Short term profit vs long term profit, accounting p profit vs economic profit
    2. Mapping the Risks
       - Estimating current and future magnitudes
    3. Instruments for Risk Management
       - Evaluate the likely costs and benefits
    4. Constructing and Implementing Strategy
       - Form specific strategies
    5. Performance Evaluation
       - Evaluating performance periodically
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- A Helicopter View
  - Roles and Responsibilities of board:
    1. Look after shareholder's interest
    2. Alertness for "Agency Risk"
    3. Establish ethical standards
- Corporate Risk Management: A primer
- Corporate Governance and Risk Management
  - Committees & Risk Limits
    - Audit Committee
    - Risk Advisory Director
    - Risk Management Committee
    - Compensation Committee
- Beta
  - **Systematic risk (non-diversifiable risk or beta):** individual security's risk that arises because of the positive covariance of the security's return with overall market return's. Beta (βa) = Cov (r_a, r_p)/Var(r_p)
  - **Unsystematic risk (diversifiable risk):** part of the volatility of a single security's return that is uncorrelated with the volatility of the market portfolio.
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The U.S. Housing Market

- Low interest rate between 2002 to 2005
- Many families purchased house that were previously not considered to qualify for a mortgage
- Relaxation of lending standards created a bubble in house prices
- In the 2nd half of 2006, house prices started to come down : Supply of house increased
- The amount owing on the mortgage was greater than the value of the house

Securitization

Structure of ABS : Example
Asset of $100 million (principal)
Company transferred it to SPV
ABS structure

- Senior Tranche; Principal: $75 million ; Return = 6%
- Mezzanine Tranche; Principal: $20 million; Return = 10%
- Equity Tranche ; Principal: $5 million ; Return = 30%

Lessons for Risk Managers

1. Correlations always increase in stressed markets
2. Recovery rates decline when default rates increase
3. Investors should not only rely on ratings
4. Transparency is important in financial markets

The crises

1. Investors who bought the tranches of ABSs and ABS CDOs lost money
2. Credit spread increased
3. Interbank lending rates increased
4. The tranches of ABS became very illiquid
5. Banks suffered huge losses
6. Lehman Brothers was allowed to fail

Foundation of Risk Management

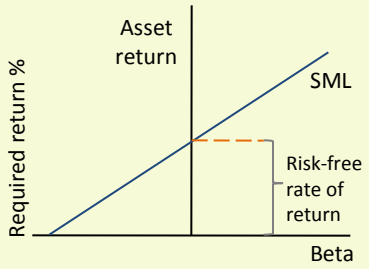
The Standard CAPM | APT and multifactor model | ERM | Performance Measurement | **GARP Code of Conduct**

- Investors will only be compensated systematic risk since Unsystematic risk can be diversified.
- **SML**: indicates a return an investor should earn in the market for any level of Beta risk.
- The equation of the SML is CAPM (return & systematic risk equilibrium relationship
- **CAPM**: $E(R_i)=R_F+\beta_i[E(R_{mkt})-R_F]$
- $[E(R_{mkt})-R_F]$ is the risk premium

Efficient-market hypothesis: it is impossible to consistently outperform the market by using any information that the market already knows

The three forms of market efficiency

- **Weak-form efficiency:** future prices cannot be predicted by analyzing price from the past
- **Semi-strong-form efficiency**: prices adjust to publicly available new information very rapidly and in an unbiased fashion
- **Strong-form efficiency**: prices reflect all information, public and private, and no one can earn excess returns



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Single factor risk model:

Multifactor model

Multifactor SML

$E(r) = rf + \beta GDP(RPGDP) + \beta IR(RPIR)$

- APT model – prices of portfolios are restored to equilibrium due to arbitrage activities
- APT does not have restrictive assumption of CAPM

- Risk appetite - is the amount of risk, on a broad level, an entity is willing to accept in pursuit of value. It reflects he entity's risk management philosophy, and in turn influences the entity's culture and operating style.
- Factors affecting risk appetite: existing risk profile; risk capacity; risk tolerance; and attitude towards risk
- Adopting risk appetite, steps – Develop risk appetite, communicate risk appetite (risk appetite statement); and monitor

Foundation of Risk Management

The Standard CAPM

APT and multifactor model

ERM

Performance Measurement

GARP Code of Conduct

Treynor Ratio: Is the excess return divided by per unit of market risk (Beta) in an investment asset $[E(R_P)-R_F]/\beta_p$

Sharpe Ratio: Is the excess return divided by per unit of total risk in an investment asset: $[E(R_P)-R_F]/\sigma_p$, where R_p = portfolio return, R_f = risk free return

Sortino Ratio (SR): Excess return divided by Semi standard deviation(SSD) which considers only data points that represent a loss. More relevant when the distribution is more skewed to the left. $(R_p - MAR)$ / SSD, MAR is minimum accepted return, Higher the SR, lower is the risk of large losses

Alpha: measure of assessing an active manager's performance as it is the return in excess of a benchmark index.

- $\alpha_i < r_f$: the manager has destroyed value
- $\alpha_i = r_f$: the manager has neither created nor destroyed value
- $\alpha_i > r_f$: the manager has created value
- The difference $\alpha_i - r_f$ is called Jensen's alpha

Jensen's α excess return of a stock, over its required rate of return as determined by CAPM: $\alpha = R_p - R_c$; where R_p = portfolio return, R_c = return predicted by CAPM

Tracking error (TE): $TE = \sigma_{E_p}$ (Std. dev. of portfolio's excess return over Benchmark index); Where $E_p = R_p - R_b$; R_p = portfolio return, R_b = benchmark return

- Lower the tracking error lesser the risk differential between portfolio and the benchmark index

TE Volatility(TEV) = $\omega = \sqrt{(\sigma_A^2 - 2*\rho_{AB}*\sigma_A*\sigma_B + \sigma_B^2)}$

Relative Risk
W= ω *P

Information ratio: is defined as excess return divided by TE.
$E(R_P)-E(R_b)/TE$

Q.
Last 4 years, the returns on a portfolio were 6%, 9%, 4%, & 12%. The returns of the benchmark were 7%, 10%, 4%, & 10%. The minimum acceptable return is 7%. What is the portfolio's SR?
0.4743

Q.
Value of portfolio =100,
Portfolio return σ_p = 25%
Portfolio benchmark σ_B = 20%
Correlation, ρ_{PB} =0.961
Calculate TEV
Ans. $\omega = \sqrt{(0.25^2 + 0.20^2 - 2*0.961*0.25*0.20)} = 8\%$
Relative risk = 8%*100 =8

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- **GARP Code of Conduct**
  - Code of Conduct
    - Principals
      1. Professional Integrity and Ethical Conduct
      2. Conflicts of Interest
      3. Confidentiality
    - Professional Standards
      1. Fundamental Responsibilities
      2. Adherence to generally accepted practices of risk management

Foundation of Risk Management (Case Studies)

Types of Risk Management Failure

- Risk metrics failure. Ex: MRM & LTCM
- Incorrect measurement of known risks. Ex: MRM & LTCM.
- Ineffective risk monitoring. Ex: Barrings & Sumitomo
- Ineffective risk communication
- Ignorance of significant known risks. Ex: MRM & LTCM.
- Unknown risk.

LTCM

- LTCM was a hedge fund using highly leveraged arbitrage trading activities in fixed income in addition to pairs trading. Before failing in 1998, it had given spectacular returns in 1995-97 periods (upto 40% post-fees). Post Russian default on its ruble denominated debt, LTCM lost more than 4bn USD in 4 months.
- LTCM used proprietary mathematical models to engage in arbitrage trading in U.S., Danish, Russian, European and Japanese Govt. bonds. In 1998, LTCM's positions were highly leveraged (1:28) with ~ USD 5: 130 billion of equity and assets.
- LTCM's model assumed maximum volatility of 20% annually. Based on its models, it was expected to losses more than ~500 million USD in once in 20 months.
- It had its bet on convergence of Russian & American G-sec yield, which however diverged after Russian default.. Its failure led to a huge bailout by large commercial & merchant banks under the guidance of Federal Reserve
- It had various risk exposures ….such as Model Risk, Funding liquidity risk, Sovereign Risk, Market Risk.

Metallgesellschaft (MRM)

- It used Stack and roll hedging strategy
- In 1991, it offered fixed price contract for supplying gasoline for 5 to 10 years. In order to hedge MG took long positions in near month futures and rolled the stack into next near month contract every time by decreasing the trade size gradually so as to match the stack with pending short position (in long term supply contracts).
- MG bought futures on NYMEX to offset its forward commitments exposure with hedge ratio of one (every barrel was hedged).
- As these derivatives were short-term thus MRM had to roll them forward every month-end or term-end till 5-10 years or the contract's end.
- Company was exposed on rising spot prices. It eventually lost more than USD 1.5bn in 1993.
- It had various risk exposures ….such as Basis Risk, Market Risk, Funding Liquidity Risk.

Q.
Which of the following reasons does not help explain the problems of LTCM in August and September 1998?

a. A spike in correlations
b. An increase in stock index volatilities
c. A drop in liquidity
d. An increase in interest rates on on-the-run Treasuries

Ans.
D, An increase in interest rates on on-the-run Treasuries

Baring

- Nick Lesson, trader at Baring PLC, took concentrated positions Nikkei 225 derivatives for bank in Singapore International Monetary Exchange (SIMEX). He took arbitrage positions on Nikkei derivatives on different exchanges viz. Osaka, Tokyo & SIMEX.
- Lesson was solely responsible for back & front office operations of Singapore. He used an error account hide his losses by fraudulently transferring funds to & from his error accounts
- He kept on selling straddles on Nikkei futures with an assumption that Nikkei is under-priced. He took double long exposure on the same index from different exchanges.
- He kept on building his positions even after Nikkei kept on falling, however after Jan'95 earthquake, he could not sustain his positions & failed to honor the margin calls
- It eventually led to the collapse of Barings bank, when it was sold to ING for mere $1.60 only
- It had various risk exposures …such as Operational Risk, Market risk, Employee/People risk

Sumitomo

- Yasuo Hamanaka - copper trader at Sumitomo manipulated copper prices on London Metal Exchange.
- Fall in copper prices in June 1996 after revelation of Hamanaka's unfair dealings led to ~2.6bn USD loss for Sumitomo
- Positions were so large that company could not liquidate them completely
- Hamanaka used his independence to trade in the market on behalf of the company and manipulated the copper prices by buying physical copper in large quantities and storing in the warehouse thereby creating lack of copper in the market
- He sold put options to collect the premiums as he thought he can push the prices up & thus writing put options was not risky for him
- Though, he never imagined that he could be susceptible to steep decline of copper prices
- It had various risk exposures ….such as Operational Risk, Employee/ People Risk, Liquidity Funding Risk, Market Risk

Foundation of Risk Management (Case Studies)

Types of Risk Management Failure

Drysdale

Capital: $20 Mn
Borrowed
Debt Market: $300 Mn
(Unsecured Loan)

Chase Manhattan Bank

Inexperienced Mangers:
1. Thought they were just middlemen
2. Didn't realize contract indicated Chase taking full responsibility of debt

Investors

LTCM

UBS

LTCM

- Losses between 1.1 Bn and 1.4 Bn from 1997-8
- UBS held a large position in LTCM (40% direct, 60% Options)
- Equity Derivatives team not scrutinized by Corporate Risk Team
- Head of Analytics – compensation was in line with fund performance
- Equity Derivative Losses due to:
  - Change in British Tax Laws regarding valuation of long dated stock options
  - Large position in Japanese Bank Warrants (were not adequately hedged)
  - Correlation assumptions on long dated equity options was not in line with the rest of the market
  - Modeling Deficiencies

Thank you!

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