Financial Risk Management&Regulation (M5320)
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Homework 1

Due: 1:00 pm Thursday 15 September 2016

1. **Risk management definition**
   What is financial risk management?

   Solution: The practice of economic value in a firm by using financial instruments to manage exposure to risk.

2. **Risk management process**
   What are the steps involved in the risk management process?

   Solution: The steps involved are identifying the risks, assessing their impact and probability of occurring, and mitigating the risks by either reducing their probability of occurring or the impact of their occurrence.

3. **Risk identification**
   Classify each of the following risks and explain why that classification holds. Risk classifications are market risk, credit risk, idiosyncratic risk, counterparty risk, model risk, liquidity risk operational risk, compliance and regulatory risk, reputational risk, and moral hazard. (a) Risk that bond positions lose value due to rising interest rates.
   (b) Potential losses due to not being able to rebalance a hedge quickly enough.
   (c) Risk that equity prices might rise, causing a loss on puts that were purchased.
   (d) Risk to the bank that a corporate client might default, causing a loss on the swaps that the client entered into with the bank.
   (e) Risk to the bank that people who took out mortgages will be unable to make their monthly payments.
   (f) Risk that traders will take on large long term risks to effect short term gains that increase their bonuses.
   (g) Risk that parameter estimates are very noisy or inaccurate.
   (h) Risk that firm will go bankrupt due to inability to borrow additional funds.

   Solution:
   (a)Market risk, because it is the risk caused by rising interest rates, a market risk factor.
   (b)Liquidity risk, because it is caused by a lack of liquidity by not timely rebalancing a hedge.

(c)Market risk. An overall change in equity prices is a market risk factor.
(d)Credit risk and counterparty risk. Because a loss on default is a type of credit risk. Due to a corporate client's default, it is a counterparty default.
(e)Credit risk, because people failing to make payments amounts to a change in credit.
(f)Moral hazard, which taking on large long term risks is kind of rewarding behavior.
(g)Model risk. Because the model lacks accurate.
(h)Liquidity risk. It's a lack of liquidity.

4. **Position risks**

Give examples of at least 2 risks that each of the following positions are exposed to. For each risk, give an example of an event that would realize that risk.
(a) Long stock position
(b) Short stock position
(c) Long bond position
(d) Interest rate swap position
(e) Cross currency swap

Solution:
(a)Market risk - Economic slowdown in the company?s sector causes decrease in stock price.
Credit risk - Great losses causes company to go bankrupt.
Liquidity risk - Stock is hard to be traded, costly to close out the position.
(b)Market risk - Increasing demand for the products leads to stocks' rising.
Liquidity risk - Stock keeps rising, making it costly to buy the stock to close out the position.
(c)Market risk - Flight to quality causes spreads to rise, bond prices to drop.
Credit risk - Same as for stock.
Liquidity risk - Secondary market too thinly traded to be able to close out position.
(d)Market risk - The Federal Reserves drives rates down to spur on the economy.
Credit risk - Only through counterparty
(e)Market risk - RMB deteriorates on latest slowdown economic news from China.
Credit risk - Greece blowing up undermines Euro.

5. **Risk measures**

We defined the VaR of a portfolio with time t value of V_t as $V_0 - F^{-1}(1-p)$ and the PFE of the portfolio as $F^{-1}(p)$, where $F(x)$ is the CDF of the future portfolio values:

$$\mathrm{F(X)} = \mathrm{P(V}_t \leq X) = E^P[1_{V_t \geq X}]$$

Sometimes the VaR is expressed as $G^{?1}(p)$, where G(X) is the probability that the losses are less than X:

$$G(X) = P[V_0 - V_t < X]$$

(a) What is the relationship between F and G?

Solution:
$G(X) = P[V_0 - V_t < X] = P[-V_t < X - V_0] = P[V_t > V_0 - X] = 1 - P[Vt \leq V_0 - X] = 1 - F(V_0 - X)$

(b) Sometimes G is instead defined as the probability that the losses do not exceed X:

$$G(X) = P[V_0 - V_t < X]$$

How would this change the VaR?

Solution:
There is no difference If the CDF of V_t is continuous. They only differ when the CDF has jumps, in which case, at the jumps, one definition gets the left side of the jump and the other definition gets the right side of the jump.