

1 市场风险

1.1 Estimating VaR

1.1.1 问题描述: 如题

1.1.2 题目

A portfolio manager owns a portfolio of options on a non-dividend paying stock RTX.

The portfolio is made up of 10,000 deep in-the-money call options on RTX and 50,000 deep out-of-the money call options on RTX. The portfolio also contains 20,000 forward contracts on RTX. RTX is trading at USD 100. If the volatility of RTX is 30% per year, which of the following amounts would be closest to the 1-day VaR of the portfolio at the 95 percent confidence level, assuming 252 trading days in a year?

- A. USD 932
- B. USD 93,263
- C. USD 111,122
- D. USD 131,892

Correct Answer: B

解答:

这题整体的思路是：

先算出单个资产的年 VaR。这里要是用 delta-normal 的方法计算单子资产的 VaR。deep ITM call 的 delta 接近于 1，可以近似为 1. deep OTM 的 delta 接近于 0，可以近似为零。forward 的 delta，为 1。这个是一级的知识。

然后算出组合的年 VaR。注意的是，各个资产的标的资产是同一个股票，所以相关性是 1. 所以，组合的 VaR 就是各个资产的 VaR 直接相加。

最后，先算出一年的 VaR，再利用平方根法则，算出一天的 VaR。

$$1.645 \times 100 \times 30,000 \times 0.30 \times \sqrt{1/252} = 93,263$$

1.2 Expected shortfall

1.2.1 问题描述: C 是怎么算出来的

1.2.2 题目

Assume that an operational process has a 5% probability of creating a material loss and,

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otherwise, no material loss is experienced (i.e., Bernoulli). If the material loss occurs, the severity is normally distributed with a mean of \$4 million and standard deviation of \$2 million. What is the 95% expected shortfall?

- A. \$0.71 million
- B. \$3.29 million
- C. \$4.00 million
- D. \$7.29 million

Correct Answer: C

解答:

ES 是尾部损失的平均值。在题干中, 有这样一句话: if the material loss occurs, 并且给出 mean of 4 million。所以得出 ES 是 4。

1.3 Expected shortfall

1.3.1 问题描述: 如题

1.3.2 题目

Which of the following statements about expected shortfall estimates and coherent risk measures are true?

- A. Expected shortfall and coherent risk measures estimate quantiles for the entire loss distribution.
- B. Expected shortfall and coherent risk measures estimate quantiles for the tail region.
- C. Expected shortfall estimates quantiles for the tail region and coherent risk measures estimate quantiles for the non-tail region only.
- D. Expected shortfall estimates quantiles for the entire distribution and coherent risk measures estimate quantiles for the tail region only.

Correct Answer: B

解答:

coherent risk measures 并不是只关注 non-tail region, 它对所有的分位点都给予一定的权重, 包括尾部和非尾部区域。所以 C 不对。

B 说 coherent risk measures 考虑了尾部区域，所以是对的。

关于 ES，是只考虑了尾部

1.4 Backtesting VaR

1.4.1 问题描述：怎么理解这个表格。

1.4.2 题目

| C level | LR _{uc} Values for T=255 | | | | | | | | | | | |
|---------|-----------------------------------|------|------|------|------|------|------|------|------|-------|-------|-------|
| | N | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 97.50% | 7.16 | 4.19 | 2.27 | 1.04 | 0.33 | 0.02 | 0.06 | 0.39 | 0.98 | 1.81 | 2.84 | 4.06 |
| 98.00% | 5.01 | 2.49 | 1.03 | 0.26 | 0 | 0.15 | 0.65 | 1.44 | 2.48 | 3.76 | 5.25 | 6.93 |
| 99.00% | 1.24 | 0.13 | 0.08 | 0.71 | 1.86 | 3.42 | 5.32 | 7.51 | 9.97 | 12.65 | 15.55 | 18.63 |

解答：

这个是通过 kupiec 的这个公式方法算出来的统计量,这里的 N 就是整个的观测期 255 天。表格里的每个数字，都是通过这个公式算出来的，然后和 3.841 比较。比如这里的 4.19 (划掉的)，大于 3.841，是拒绝这个 VaR 模型的。而 2.27 (没有划掉的)，小于 3.841 的，是不拒绝这个 VaR 模型的

1.5 VaR mapping

1.5.1 问题描述：如题

1.5.2 题目

A \$200 million bond portfolio consists of two bonds with the cash flows and VaR percentages at the 95% confidence level presented in the following table. (Note that \$ figures are in millions.) Using the stress test methodology, what is the VaR for this portfolio?

| Year | Portfolio CF | Spot Rate | PV(CF) | VaR % | PV Factor |
|------|--------------|-----------|----------|--------|-----------|
| 1 | \$107 | 2.50% | \$104.39 | 0.4696 | 0.9756 |
| 2 | \$3 | 2.60% | \$2.85 | 0.9868 | 0.9500 |
| 3 | \$3 | 2.90% | \$2.75 | 1.4841 | 0.9178 |
| 4 | \$3 | 3.10% | \$2.66 | 1.9714 | 0.8850 |
| 5 | \$103 | 3.35% | \$87.35 | 2.4261 | 0.8481 |
| | | | \$200.00 | | |

- A. \$2.41 million.
- B. \$2.57 million.
- C. \$2.62 million.
- D. \$2.73 million.

Correct Answer: D

解答:

不要被 stress test methodology 吓到了。

题干给了百分比的 VaR 以及对应的 P, 只要相乘, 就可以得到每笔现金流对应的 VaR 了。

然后在求 5 笔现金流的组合 VaR。要考虑他们之间的相关性, 但是这题 “stress test methodology” 用压力的方法。其实就是考虑极端情况下的 VaR 是多少, 也就是各个现金流之间的相关性最大的时候, 得到的 VaR 是压力下的 VaR。也就是相关性为 1. 知道这样的话, 就好计算了。如下

$$04.39*0.4696\%+2.85*0.9868\%+2.75*1.4841\%+2.66*1.9714\%+87.35*2.4261\% = 2.73 \text{million}$$

1.6 VaR Mapping

1.6.1 问题描述: 在做对冲时 为什么不把 Duration 的 2.8 计算在内? 上课时讲义里面明明是讲了 Duration 应该乘进去的呀

1.6.2 题目

The VaR percentages (i.e., risk percentages) at the 95% confidence level for bonds with maturities ranging from one year to five years are as follows:

| <i>Maturity</i> | <i>VaR %</i> |
|-----------------|--------------|
| 1 | 0.4696 |
| 2 | 0.9868 |
| 3 | 1.4841 |
| 4 | 1.9714 |
| 5 | 2.4261 |

A bond portfolio consists of a \$100 million bond maturing in two years and a \$100 million bond maturing in four years. The duration of the bond portfolio is 2.8 years. What is the VaR of this bond portfolio using the duration VaR mapping method?

- A. \$ 1.484 million.
- B. \$1,974 million.
- C. \$2,769 million.
- D. \$2,968 million

Correct Answer: C

解答：

这个题中给的 VaR 是 bond 的 VaR 值表，要求的也是债券的 VaR。所以不需要再乘以久期。

而我们讲义上的 mapping，给的利率的 VaR，所以要求债券的 VaR，是需要在利率的 VaR 再乘以对应的久期的。

1.7 Copula

1.7.1 问题描述：如题

1.7.2 题目

Which of the following statements about correlation and copula are correct?

- I. Copula enables the structures of correlation between variables to be calculated separately from their marginal distributions.
- II. Transformation of variables does not change their correlation structure.
- III. Correlation can be a useful measure of the relationship between variables drawn from

a distribution without a defined variance.

- IV. Correlation is a good measure of dependence when the measured variables are distributed as multivariate elliptical.
- A. I and IV only.
 - B. II, III, and IV only.
 - C. I and III only.
 - D. II and IV only.

Correct Answer: A

解答:

- 1 选项, Copula 函数描述的是变量间的相关性, 实际上是一类将联合分布函数与它们各自的边缘分布函数连接在一起的函数, 也称为连接函数。所以 1 是对的。
- 2 选项, 变量的转换不会改变它们的相关结构。错误。变量的转换会改变他们的相关结构。比如本来 x、y 是线性相关的, 但是对 x 进行平方, 他们就没有线性相关关系了。
- 3 选项, 只有椭圆分布才可以计算方差, 才可以计算相关系数。所以不正确
- 4 选项, 在 FRM 的体系下是对的。multivariate elliptical 椭圆分布, 在 FRM 体系下一般指的是多元正态分布, 可以简单的看成是正态分布。

1.8 Dependence Structure

1.8.1 问题描述: 如题

1.8.2 题目

The dependence structure between the returns of financial assets plays an important role in risk measurement. For liquid markets, which of the following statements is incorrect?

- A. Correlation is valid measure of dependence between random variables for only certain types of return distributions.
- B. Even if the return distributions of two assets have a correlation of zero, the returns of these assets are not necessarily independent.
- C. Copulas make it possible to model marginal distributions and the dependence structure separately.
- D. With short time horizons (3 months or less), correlation estimates are typically very

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stable.

Correct Answer: D

解答:

A 选项, 只有椭圆分布(正态分布)才可以计算方差, 才可以计算相关系数

C 选项, Copula 函数描述的是变量间的相关性, 实际上是一类将联合分布函数与它们各自的边缘分布函数连接在一起的函数, 正确。

D 选项, 衡量的时间越短, 相关性越不稳定。举个极端的例子, 两只股票今天的价格都上涨了, 相关性是 1. 第二天, 一只股价上涨一只股价下跌, 相关性就变成了 -1.

1.9 Correlations

1.9.1 问题描述: 什么叫裸做空 cds 不懂。

1.9.2 题目

Credit Default Swaps

- CDSs can also be used as speculative instruments.
 - For example, the CDS seller (i.e., the insurance seller) hopes that the insured event (e.g., default of a company or credit deterioration of the company) will not occur.
 - In this case the CDS seller keeps the CDS spread (i.e., the insurance premium) as income.
- A CDS buyer who does not own the underlying asset is speculating on the credit deterioration of the underlying asset.
- The entire global financial crisis can be summed up in one word: **Greed!**

解答:

通常 CDS 的 buyer 是有一个标的资产, 比如某个公司债券, 但是它担心这个公司债违约, 这样的话, 它就会招收损失。此时它就可以去市场上买一个 CDS, 期初支付保费给 CDS 的卖方就好了。如果期间, 公司债违约了, 它就可以从 CDS 的卖方那里获取一定的赔付。所以, 通常说买 CDS 相当于买了一个保险。

所谓的裸做空, 其实 CDS 的 buyer 是没有标的资产, 但是它直接去市场上购买 CDS, 期初支付保费, 期间如果这个虚拟的 (buyer 没有实实在在拥有的资产) 的资产或者债券, 违约了。它就可以从 CDS 的卖方获得赔付。在这里, CDS 的 buyer 就是赌

这个标的资产会违约，它能够得到赔付，可以赚钱。这个其实就是裸做空，也就是一种投机行为。

1.10 Mean Reversion

1.10.1 问题描述：如题

1.10.2 题目

A risk manager uses the past 480 months of correlation data from the Dow Jones Industrial Average (Dow) to estimate the long-run mean correlation of common stocks and the mean reversion rate. Based on historical data, the long-run mean correlation of Dow stocks was 34%, and he regression output estimates the following regression relationship: $Y = 0.215 - 0.77X$. Suppose that in April 2014, the average monthly correlation for all Dow stocks was 33%. What is the estimated one-period autocorrelation for this time period based on the mean reversion rate estimated in the regression analysis?

- A. 23%
- B. 26%
- C. 30%
- D. 33%

Correct Answer: A

解答：

$$\frac{\partial(S_t - S_{t-1})}{\partial S_{t-1}} < 0$$

where

S_t : price at time t

S_{t-1} : price at the previous point in time $t - 1$

∂ : partial derivative coefficient

Equation (7.1) tells us: If S_{t-1} increases by a very small amount, $S_t - S_{t-1}$ will decrease by a certain amount, and vice versa. This is intuitive: If S_{t-1} has decreased and is low at $t - 1$ (compared to the mean of S_t , μ_s), then at the next point in time t , mean reversion will pull up S_{t-1} to μ_s and therefore increase $S_t - S_{t-1}$. If S_{t-1} has increased and is high in $t - 1$ (compared to the mean of S_t , μ_s), then at the next point in time t , mean reversion will pull down S_{t-1} to μ_s and therefore decrease $S_t - S_{t-1}$. The degree of the pull is the degree of the mean reversion, also called mean reversion rate, mean reversion speed, or gravity.

Let's quantify the degree of mean reversion. Let's start with the discrete Vasicek 1977 process, which goes back to Ornstein-Uhlenbeck 1930:

$$S_t - S_{t-1} = \alpha(\mu_s - S_{t-1})\Delta t + \sigma_s \varepsilon \sqrt{\Delta t} \quad (7.2)$$

where

由上图原版书内容可知，回归方程 $Y = 0.215 - 0.77X$, 0.77 就是 alpha, 就是 mean reversion rate。

reversion of 50% at each time step, and a mean reversion parameter α of 0 will result in no mean reversion.

Let's now quantify mean reversion. Setting Δt to 1, Equation (7.2) without stochasticity reduces to

$$S_t - S_{t-1} = \alpha(\mu_s - S_{t-1}) \quad (7.3)$$

or

$$S_t - S_{t-1} = \alpha \mu_s - \alpha S_{t-1} \quad (7.4)$$

To find the mean reversion rate α , we can run a standard regression analysis of the form

$$Y = \alpha + \beta X$$

Following Equation (7.4), we are regressing $S_t - S_{t-1}$ with respect to S_{t-1} :

$$\underbrace{S_t - S_{t-1}}_Y = \underbrace{\alpha}_{\text{a}} \underbrace{\mu_s}_{\text{px}} - \underbrace{\alpha S_{t-1}}_{\text{px}} \quad (7.5)$$

Importantly, from Equation (7.5), we observe that the regression coefficient β is equal to the negative mean reversion parameter α .

We now run a regression of Equation (7.5) to find the empirical mean reversion of our correlation data. Hence S represents the 30×30 Dow stock monthly average correlations from 1972 to 2012. The regression analysis is dis-

1.11 Empirical Approaches to Risk Metrics and Hedge

1.11.1 问题描述：如题

1.11.2 题目

Assume that a trader is making a relative value trade, selling a U.S. Treasury bond and correspondingly purchasing a U.S. Treasury TIPS. Based on the current spread between the two securities, the trader shorts \$100 million of the nominal bond and purchases \$89.8 million of TIPS. The trader then starts to question the amount of the hedge due to changes in yields on TIPS in relation to nominal bonds. He runs a regression and determines from the output that the nominal yield changes by 1.0274 basis points per basis point change in the real yield. Would the trader adjust the hedge, and if so, by how much?

- A. No.
- B. Yes, by \$2.46 million (purchase additional TIPS)
- C. Yes, by \$2.5 million (sell a portion of the TIPS)
- D. Yes, by \$2.11 million (Purchase additional TIPS)

Correct Answer:B

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解答:

题干问的是 adjust the hedge, 调整的对冲敞口是多少。也就是在原来的对冲的基础上，做了多少调整。具体如图

$$\text{原对冲: } MD_n * P_n * \Delta y_n = MD_r * P_r * \Delta y_r$$

$$MD_n * 100 * \Delta y_n = MD_r * 89.8 * \Delta y_r$$

$$\Delta y_n = \Delta y_r$$

$$\text{所以: } MD_n = 89.8 / 100 * MD_r$$

后来, Δy_n 与 Δy_r 不是 1:1 变化

$$\Delta y_n / 1.0274 = \Delta y_r / 1$$

设需要对冲头寸 x million, 则

$$MD_n * 100 * \Delta y_n = MD_r * x * \Delta y_r$$

$$89.8 / 100 * MD_r * 100 * \Delta y_n = MD_r * x * \Delta y_n / 1.0274$$

$$\text{所以: } x = 92.26 \text{ million}$$

$$\text{所以, 需新购 } 92.26 \text{ million} - 89.8 \text{ million} = 2.46 \text{ million}$$

1.12 Empirical Approaches to Risk Metrics and Hedge

1.12.1 问题描述: 如题

1.12.2 题目

If a trader is creating a fixed income hedge, which hedging methodology would be least effective if the trader is concerned about the dispersion of the change in the nominal yield for a particular change in the real yield?

- A. One-variable regression hedge.
- B. DV01 hedge
- C. Two-variable regression hedge.
- D. Principal components hedge.

Correct Answer: B

解答:

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题干说的是在进行对冲的过程中，如果交易者关注名义收益率的变化对于实际收益率的特定变化的偏离性，那么哪种套期保值方法效果最差？

显然是 DV01 对冲，这种对冲假设的是名义收益率的变化对于实际收益率的变化，是一比一的关系。但是事实上，名义收益率的变化对于实际收益率的变化，并不是一比一的。在这个章节中，就说了 DV01 对冲有缺陷，所以采用回归对冲的方式进行解决

1.13 Term Structure Models

1.13.1 问题描述：Drift 是 constant 或 changed 的？

1.13.2 题目

A hedge fund risk manager is looking at various models that are flexible enough to incorporate mean reversion and risk premium into term structure modeling. Which of the following is correct about the Vasicek model?

- A. It incorporates mean reversion feature and its drift is always zero.
- B. It incorporates mean reversion feature and models the risk premium as a constant or changing drift.
- C. It cannot incorporate risk premium and the term structure of interest rate volatility in the model is upward-sloping.
- D. It cannot capture the mean reversion feature but can be used to model the time-varying risk premium.

Correct Answer: B

解答：

首先，如图，是原版书中关于 Vasicek model 的解说。在 Vasicek model 中，是有 Lambda 的。

from then on. Another model might take the prices of 2-, 5-, 10- and 30-year bond or swap rates as given, thus assuming that the most liquid securities are fair while allowing the model to value other securities. The proper blending of the arbitrage-free and equilibrium approaches is an important part of the art of term structure modeling.

THE VASICEK MODEL: MEAN REVERSION

Assuming that the economy tends toward some equilibrium based on such fundamental factors as the productivity of capital, long-term monetary policy, and so on, short-term rates will be characterized by *mean reversion*. When the short-term rate is above its long-run equilibrium value, the drift is negative, driving the rate down toward this long-run value. When the rate is below its equilibrium value, the drift is positive, driving the rate up toward this value. In addition to being a reasonable assumption about short rates,⁵ mean reversion enables a model to capture several features of term structure behavior in an economically intuitive way.

The risk-neutral dynamics of the Vasicek model⁶ are written as

$$dr = k(\theta - r)dt + \sigma dw \quad (13.8)$$

Nevertheless, in order to understand whether or not the parameters of a model make sense, it is useful to make assumptions sufficient to separate the drift and the risk premium. Assuming, for example, that the true interest rate process exhibits mean reversion to a long-term value r_∞ and, as assumed previously, that the risk premium enters into the risk-neutral process as a constant drift, the Vasicek model takes the following form:

$$\begin{aligned} dr &= k(r_\infty - r)dt + \lambda dt + \sigma dw \\ &= k\left[\left(r_\infty + \frac{\lambda}{k}\right) - r\right]dt + \sigma dw \end{aligned} \quad (13.9)$$

The process in (13.8) is identical to that in (13.9) so long as

$$\theta = r_\infty + \frac{\lambda}{k} \quad (13.10)$$

Note that very many combinations of r_∞ and λ give the same θ and, through the risk-neutral process (13.8), the same market prices.

For the purposes of this section, let $k = .025$, $\sigma = 126$ basis points per year, $r_\infty = 6.179\%$, and $\lambda = .229\%$. According to (13.10), then, $\theta = 15.339\%$. With these parameters, the process (13.8) says that over the next month the expected change in the short rate is

$$.025 \times (15.339\% - 5.121\%) \frac{1}{12} = .0213\% \quad (13.11)$$

其次，Lambda，也就是这个 drift 项，短期来看，是由两个部分构成的，一个是真的利率的预期变化，也叫作 true drift。另一部分是 risk premium（长期来看这种说法是站不住脚的，那么也可以把 drift 叫作 risk premium）。(原版书在这里也特意做了一番讨论)。这里取得是短期的角度，他们的比例可以是任意的。比如 lambda 是 0.48%，true drift 可以 20BP，risk premium 是 28 个 BP。也可以是 true drift 可以 10BP，risk premium 是 38 个 BP. 所以 D 正确。所以，risk premium 可以是 constant 也可以是 changing 的。

1.14 Term Structure Models

1.14.1 问题描述：如题

1.14.2 题目

The term structure model that incorporates constant drift is referred to as Model 2. This model augments Model 1 and is expressed as: $dr = \lambda dt + \sigma dw$, where X is the drift term. Using Model 2, if we assume that the current short term rate is 8%, annual volatility is 200 bps, and annual drift is 0.48%, which of the following statements is incorrect?

- A. The expected value of $d w$ equals zero.
- B. The monthly drift is 4 basis points.
- C. The annual risk premium is 68 basis points.
- D. The drift may be attributed to a 20 basis point change in the rate and a 28 basis

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point risk premium.

Correct Answer: C

解答:

这个是一个比较什么深入的知识点。

A 选项, dw 均值是 0, 没有问题的。

B 选项, 一年的 drift 是 0.48%, 那一个月的 drift 是 $0.48\%/12,4$ 个 BP, 也没问题的。

lambda, 也就是这个 drift 项, 短期来看, 是由两个部分构成的, 一个是真实的利率的预期变化, 也叫作 true drift。另一部分是 risk premium (长期来看这种说法是站不住脚的, 那么也可以把 drift 叫作 risk premium)。他们的比例可以是任意的。比如这个题中的 lambda 是 0.48%, true drift 可以 20BP, risk premium 是 28 个 BP, 如 D 表述。也可以是 true drift 可以 10BP, risk premium 是 38 个 BP。所以 D 正确

所以 C 入选。

1.15 Term Structure Models

1.15.1 问题描述: B 和 D 能讲解一下吗?

1.15.2 题目

Model 1 assumes zero drift and is also called a normal model. Model 2 add a term for drift. Each of the following is true about these two models except for:

- A. A weakness of Model 1 is that the short-term rate can become negative.
- B. Model 1 implies a term structure that is perfectly flat at the current rate for all maturities, including the long-term rates.
- C. Model 2 is more capable of producing an upward-sloping term structure, which is often observed.
- D. Model 2 is an equilibrium model, rather than an arbitrage-free model, because no attempt is made to match the term structure closely.

Correct Answer: B

解答:

B 选项, 利率期限结构是 flat 的, 包括长期利率。不对的, 利率期限结构是 flat 说明不论

长期利率还是短期利率，或者中期利率，大家都是一样的，都是相等的。model 1 说的是利率是有波动的，而并不是一成不变的。而且说的是短期利率

D 选项，model 1 和 2 是 equilibrium model，均衡模型，特点就是和市场实际利率变动不挂钩，这个预期的利率可能和市场实际情况差异很大。比如市场实际利率会呈现均值回归，与短期利率有关。而 model 1 和 2 估计出来的都是理论值。

这个分类方法只是在 FRM 的体系下。在其他的资料中，还会有其他的分类方法

1.16 Term Structure Models

1.16.1 问题描述：如题

1.16.2 题目

John Jones, FRM, is discussing the appropriate usage of mean-reverting models relative to no-drift models, models that incorporate drift, and Ho-Lee models. Jones makes the following statement:

- I. Both Model 1 and the Vasicek model assume parallel shifts from changes in the short-term rate.
- II. The Vasicek model assumes decreasing volatility of future short-term rates while Model 1 assumes constant volatility of future short-term rates.
- III. The constant drift model is a more flexible model than the Ho-Lee model.

How many of his statements are correct?

- A. 0
- B. 1
- C. 2
- D. 3

Correct Answer: B

解答：

1 选项，parallel shifts 表示利率曲线结构的平行移动，就是不论是短期利率还是长期利率变化的幅度是一样的。和一级的概念是一致的。不过这里的 model 1 和 Vasicek 都不适合利率曲线结构的平行移动的。他们的利率变化是不一致的。

2 选项, Vasicek model assumes decreasing volatility of future short-term rates 因为利率最终回归到均值的, 所以利率的波动率是在慢慢减少的, 直到回归到均值。

3 选项, 正好说反了, 应该是 Ho-Lee model 更 flexible。

1.17 Term Structure Models

1.17.1 问题描述: 如题

1.17.2 题目

A risk manager is pricing a 10-year call option on 10-year Treasuries using a successfully tested pricing model. Current interest rate volatility is high and the risk manager is concerned about the effect this may have on short-term rates when pricing the option. Which of the following actions would best address the potential for negative short-term interest rates to arise in the model?

- A. The risk manager uses a normal distribution of interest rates.
- B. When short-term rates are negative, the risk manager adjusts the risk-neutral probabilities.
- C. When short-term rates are negative, the risk manager increases the volatility.
- D. When short-term rates are negative, the risk manager sets the rate to zero.

Correct Answer: D

解答:

这题考虑的是当出现负利率的时候怎么处理, 在 model 1 中有讲过。当出现负利率的时候, 可以有这么几种处理方式: 1.可以改变假设的模型, 比如由原来的假设服从正态分布, 变为对数正太分布。2.可以把这个负利率设置为零(本题即考察此知识点)。3.还可以假设有一定的趋势项。

1.18 Volatility Smile

1.18.1 问题描述: 如题

1.18.2 题目

An empirical distribution that exhibits a fatter right tail than that of a lognormal

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distribution would indicate:

- A. Equal implied volatilities across low and high strike prices.
- B. Greater implied volatilities for low strike prices.
- C. Greater implied volatilities for high strike prices.
- D. Higher implied volatilities for mid-range strike prices.

Correct Answer: C

解答:

题干问的是如果一个分布出现右肥，相对于一个正太分布，那么预示着什么。

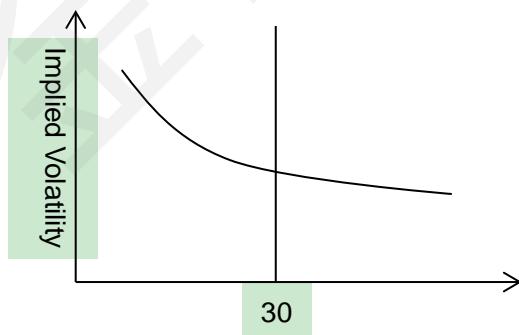
这题的解题思路可以对照着股票期权的波动率微笑，右边肥，也就是当执行价格比较高的时候，会出现大的波动。所以是 C。

1.19 Volatility Smile

1.19.1 问题描述：如题

1.19.2 题目

A risk manager is in the process of valuing several European option positions on a non-dividend-paying stock XYZ that is currently priced at GBP 30. The implied volatility skew, estimated using the Black-Scholes-Merton model and the current prices of actively traded European-style options on stock XYZ at various strike prices, is:



Assuming that the implied volatility at GBP 30 is used to conduct the valuation, which of the following long positions will be undervalued?

- A. An out-of-the-money call.
- B. An in-the-money call
- C. An at-the-money put

D. An in-the-money put

Correct Answer:B

解答:

一位风险经理正在对一只目前定价为 30 英镑的没有分红股票 XYZ 的欧式期权头寸进行估值。假设用 30 英镑的隐含波动率进行估值，下列哪个多头仓位将被低估？

这题考察的是股票期权波动率微笑，图形给的信息是执行价格是 30，股价也是 30，这个期权是 ATM 的。

并且期权的价格和他的波动率是成正比的，价格被低估，也就是波动率被低估。结合股票期权的波动率，得 B。或者是一个 OTM put。