

Regression Hedge

变化守恒原理

- TIPS: real interest, T-Bond: nominal interest
- DV01 Neutral hedge
 - $F_r \times DV01_r = F_n \times DV01_n$
- Regression Hedge
 - $F_r \times DV01_r \times \Delta y_r = F_n \times DV01_n \times \Delta y_n$

Question

- Short 100 million nominal bond, purchase 89.8 TIPS. Nominal yield change by 1.0274bp per bp change in real yield, find the new hedge?

nominal yield for a ...

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

2. Assume that a trader is making a relative value trade, selling a U.S. Treasury bond and correspondingly purchasing a U.S. 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).

3. What is a key advantage of using a regression hedge to fine tune a DV01 hedge?

A. It assumes that term structure changes are driven by one factor.

Handwritten notes: 89.8, 100x, 100x Δy, 89.8 x 1.0274 = 92.26, 92.26 - 89.8 = 2.46

Solution

- 把 face value, DV01 和 change in yield 按照产品分类

Items	Nominal	TIPS	Nominal/TIPS	Note
F	100m	89.8m		Based on DV01 hedge
DV01	DV01 _n	DV01 _r	89.8/100=0.898	$\frac{DV01_n}{DV01_r} = 0.898$
Δy	Δy _n	Δy _r	1.0274	$\frac{\Delta y_n}{\Delta y_r} = 1.0274$
New Face Value	100m (fixed)	X=100*(0.898*1.0274)		Based on regression hedge

- 计算 DV01, 用第一个等式
 - $F_n \times DV01_n = F_r \times DV01_r$
 - $\Rightarrow 100 \times DV01_n = 89.8 \times DV01_r$
 - $\Rightarrow \frac{DV01_n}{DV01_r} = 0.898$

- 算 change in yield, 题目已知
 - $\frac{\Delta y_n}{\Delta_r} = 1.0274$
- 计算新的 TIPS (因为 TIPS 这是用来 hedge 的, 考虑 regression 后需要调整)
 - 用第 2 个等式
 - $F_r \times DV01_r \times \Delta y_r = F_n \times DV01_n \times \Delta y_n$
 - $\Rightarrow F_r = F_n \times \frac{DV01_n}{DV01_r} \times \frac{\Delta y_n}{\Delta y_r} = 100 \times 0.898 \times 1.0274 = 92.26$
- 因此还需要买 $92.26 - 89.8 = 2.46$ 的 TIPS