15.435x Derivatives Markets: Advanced Modeling & Strategies
Professor D. Lucas

Example extended to Gamma Hedging (Supplement to Slides)

P2 = **181,894** (amount to short in 10-yr bond)
P3 = **1,072,085** (amount to short in 3-yr bond)

5-yr bond (worth $1,000,000)

Delta predicted value change for a 1% yield increase:
dP = (-4.1688)(1M)(0.01) = **-41,688**

Delta-Gamma predicted value change for a 1% yield increase:
dP = (-4.1688)(1M)(0.01) + 0.5(21.038)(1M)(0.01^2) = **-40,636**

Actual value change for a 1% yield increase:
New price 959.34 per 1000 face
Old price 1000 per 1000 face
((959.34/1000)-1)(1,000,000) = **-40,656**

10-yr bond (worth $181,894)

Delta predicted value change for a 1% increase in yield:
dP = (-7.005)(181,894)(0.01) = **-12,742**

Delta-Gamma predicted value change for a 1% increase in yield:
dP = (-7.005)(181,894)(0.01) + 0.5(62.98)(181,894)(0.01^2) = **-12,169**

Actual value change for a 1% increase in yield:
New price 1034.74 per 1000 face
Old price 1109.05 per 1000 face
((1034.74/1109.05)-1)(181,894) = **-12,186**

3-yr bond (worth $1,072,085)

Delta predicted value change for a 1% increase in yield:
dP = (-2.700)(1,072,085)(0.01) = **-28,946**

Delta-Gamma predicted value change for a 1% increase in yield:
dP = (-2.700)(1,072,085)(0.01) + 0.5(8.939)(1,072,085)(0.01^2) = **-28,467**

Actual value change for a 1% increase in yield:
New price 981.35 per 1000 face

Old price 1008.13 per 1000 face
$$((981.35 / 1008.13) - 1)(1,072,085) = \textbf{-28,474}$$

Actual Delta-Gamma Hedging Performance:
Long 5-yr, Short 10-yr, Short 3-yr (values for each given above)

$-40,656 + 12,186 + 28,474 = \textbf{\$4}$

Note: Delta-Gamma hedging error is considerably smaller than Delta only hedging error (see class notes).