Designing a hedge for a euro swap portfolio

George Dharma

I would use a €20m gross hedge for this €95m swap portfolio. Receiving fixed on €9.15m of five-year swaps and paying fixed on €10.85m of ten-year swaps cuts the largest loss across six design shocks from €469,000 to €179,000. It also gives the smallest loss across four additional shocks among the hedge limits tested.

The portfolio contains four hypothetical euro swaps at different maturities. I valued their remaining fixed and floating payments at €1.59m using the public sample market. The unhedged book loses roughly €9,804 for a one-basis-point rise across all market quotes. One basis point is 0.01 percentage points.[1]

What a larger hedge buys

Notional limit	Gross used	Entry cost	Worst design loss	Worst additional loss
€0m	€0.0m	€0.0k	€469k	€377k
€10m	€10.0m	€4.1k	€240k	€328k
€20m	**€20.0m**	**€7.7k**	**€179k**	**€235k**
€40m	€40.0m	€14.8k	€57k	€317k
€60m	€52.4m	€11.9k	€29k	€504k

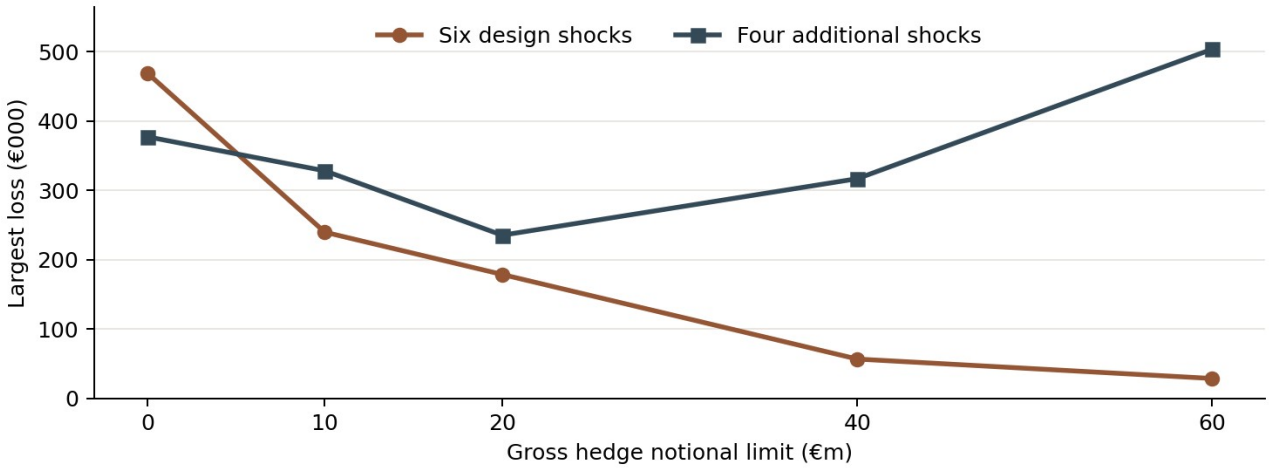
The €60m limit uses €52.4m and reduces the worst design loss to €29,000. A shock concentrated at the short end of the curve would then cost €504,000. The €20m limit keeps the largest loss across all ten specified shocks at about €235,000.[2]

1 Open Source Risk, EUR market sample, 5 February 2016

2 George Dharma, Designing a hedge for a euro swap portfolio, accompanying research files, Hedge desk, Hedge limits and Positions.

Where the protection weakens

A single ten-year swap can cancel the portfolio's sensitivity to a parallel rate move. It still loses €393,000 across the four additional shocks. Splitting the €20m hedge across two maturities gives more protection against a fall in five-year rates.



Losses and gains at the €20m limit

Scenario	Unhedged P&L	Hedged P&L after cost
All rates rise by 50 bp	−€469k	−€179k
Five-year rates fall	−€377k	−€235k
Discount and projection rates diverge	+€120k	+€21k
Short rates rise while long rates fall	−€8k	−€170k

The short-rate shock is the price of this protection. It costs the unhedged book about €8,000 and the €20m hedge about €170,000. A desk expecting short-end dislocations would want to include that shock when setting its hedge mandate.[3]

3 George Dharma, Designing a hedge for a euro swap portfolio, accompanying research files, Hedge desk, Hedge limits and Positions.

How the desk can reproduce the decision

I built two interest-rate curves from 40 sample market quotes. The overnight curve discounts cash flows to today. The six-month Euribor curve supplies the future floating payments. Bumping each quote and rebuilding both curves shows where the portfolio gains or loses value.

Reprice before sizing the trade

For each shock I revalued all four trades and each €1m hedge. A linear programme then chose two-, five- and ten-year hedge positions to minimise the largest after-cost loss across six shocks. The notional limit counts both long and short positions at their absolute size. A half-basis-point execution allowance on each hedge produces the €7,706 cost for the chosen trades.[4]

Follow one day of profit and loss

In an illustrative next-business-day move, overnight quotes rise 4 bp and projection quotes rise 10 bp. The unhedged book loses €93,530. The change from the passage of time is −€15, the first-order rate effect is −€93,859 and full repricing adds back €344. The bridge separates exposure to rates from the smaller valuation effects.[5]

Use the workbook or the pricing code

The Excel Hedge desk accepts a signed amount for each of the three maturities and shows the P&L after cost in every shock. The Python package rebuilds the curves and solves the hedge for each limit. The market date identifies the historical quotes. The trades and shocks are illustrative, so the reported loss is conditional on the ten moves specified here.

4 Open Source Risk, conventions and curve configuration · George Dharma, Designing a hedge for a euro swap portfolio, accompanying research files, Hedge desk, Hedge limits and Positions.

5 George Dharma, Designing a hedge for a euro swap portfolio, accompanying research files, Attribution and Quote risk.