Quant Task

In Raiffeisenbank, we customize solutions according to our clients needs. Corporate and retail customers may want to have flexibility in day-to-day businesses and personal finance, therefore they enjoy optionalities embedded into our products. For example, Raiffeisenbank offers deposits with an opportunity to withdraw or replenish funds before contractual maturity. This kind of optionality represents risk to the bank, and Treasury Team hedges from potential losses.

1. Your task is to price the following derivatives using file Rates1.xlsx:
   - Interest rate floor. Strike = ATM%, Tenor = 2 years, quarterly payment. Notional = 1 000 000.
   - Interest rate cap. Strike = ATM+1%, Tenor = 1 year, quarterly payment. Notional = 1 000 000.

   Assume that implied volatility surface is flat at 25%.

   Find DV01 and Vega of the contract.

2. Imagine that 3 months pass, and you are asked to reprice the contracts. Use file Rates2.xlsx and assume that volatility surface is flat at 20%.

   Find DV01 and Vega of the contract.

3. Try to give an example of product/optionality, which would be hedged with the instruments from the tasks 1 and 2.
   Is it possible to have a cheaper hedge? Propose an instrument and explain your choice (no pricing needed here).

Please use provided data only. If you think that some additional data is needed, feel free to do any plausible assumptions you want, but justify your choice. You can choose any model to price the derivatives, but please explain your choice and assumptions. You may also support your analysis by referencing textbooks or papers. Any programming language may be used, but Python is preferred. We would appreciate if you use object-oriented programming paradigm. Your solution should include working code and brief report with analysis.