Sample problem for final_01 – solution.

The Bogus bank has the following market value asset/liability structure:

<table>
<thead>
<tr>
<th>Assets</th>
<th>$10,000,000</th>
<th>Asset duration (modified)</th>
<th>8.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liabilities</td>
<td>9,000,000</td>
<td>Liability duration (modified)</td>
<td>2.0</td>
</tr>
</tbody>
</table>

The bank considers short-selling T-bonds with a modified duration of 10.0 and a price of $125.00 (percent of par).

What is the bank's interest rate exposure?

a) what is the bank equity Price Value of a basis point (PVBP)?

Define PVBP:

\[ PVBP = \text{Value} \times \text{modified duration} \times 0.0001 \]

\[ = \text{dollar change in value for 1 basis point increase in yield-to-maturity} \]

Asset PVBP = $10,000,000 \times 8.0 \times 0.0001 = $8,000.

Liability PVBP = 9,000,000 \times 2.0 \times 0.0001 = $1,800.

therefore, equity PVBP = Asset PVBP – Liability PVBP = $6,200

b) what is the equity duration?

Net exposure: Bogus Bank has more assets than liabilities, and the assets have more interest rate sensitivity. Thus the bank’s equity has $8,000 - $1,800 = $6,200 PVBP exposure. The effective modified duration of the bank’s equity can therefore be found as the solution to:

\[ $6,200 = $1,000,000 \times \text{Equity Duration} \times 0.0001 \]

so that the Equity effective modified duration is 62.0

How many (dollar value) T-Bonds should the Bogus bank trade in order to minimize interest rate risk? (Ignoring all other considerations).

The T-bond PVBP per $100,000 par is $125,000 \times 10.0 \times 0.0001 = $125.

Bank should sell $6,200/$125 = 49.6 bonds with par $100,000 each:

Sell $4.9 million par value, or (49 \times 125,000) = $6.125 million market value.