## A Debt Problem

Debt repayments by state of nature:

<table>
<thead>
<tr>
<th>state of nature</th>
<th>bad state</th>
<th>good state</th>
</tr>
</thead>
<tbody>
<tr>
<td>probability</td>
<td>2/3</td>
<td>1/3</td>
</tr>
<tr>
<td>payment</td>
<td>25</td>
<td>100</td>
</tr>
</tbody>
</table>

Nominal Debt = 100

Expected payments: \[
\frac{1}{3}100 + \frac{2}{3}25 = 50
\]

Price of debt, security per dollar: \[
= \frac{50}{100} = 0.5
\]
Buy Back: External Funding

Amount of debt reduction = 25

<table>
<thead>
<tr>
<th>Probability</th>
<th>Payment</th>
<th>Expected Payments</th>
<th>Price per debt security</th>
<th>$ cost of buy back</th>
</tr>
</thead>
<tbody>
<tr>
<td>bad state</td>
<td>2/3</td>
<td>25</td>
<td>41.66/75</td>
<td>56.075 x 25 = 14</td>
</tr>
<tr>
<td>good state</td>
<td>1/3</td>
<td>75</td>
<td>41.66/75</td>
<td></td>
</tr>
</tbody>
</table>

Expected payments = \( \frac{2}{3} \times 25 = 41.66 \)

Price per debt security = \( \frac{41.66}{75} = 0.56 \)

$ cost of buy back = 0.56 \times 25 = 14
\[ P = \text{price of debt security} = 0.50 \]

\[ P' = \text{new price of debt security} = 0.56 \]

\[ \text{gain to creditors (sellers & holders)} = 100 \times 0.56 - 100 \times 0.50 \]

\[ = 56 - 50 = 6 \]

\[ \text{debt relief} = 50 - 42 = 8 \]

\[ \text{the externally funded costs} = 0.56 \times 25 = 14 \]
gain to sellers       \[25 \times (0.56 - 0.50) = 1.5\]

gain to holdout creditors \[75 \times (0.56 - 0.500) = 4.5\]

total gain to creditors \[100 \times (0.56 - 0.50) = 6.0\]
AV = Average Value of debt = 0.5  (Price)

MV = Marginal value of debt = 0.33  (1/3)

MV < AV

MV is the change in the market value of debt (= Expected repayment to creditors) if the NOMINAL debt is increased by 1 unit.
Gain to creditors = A+B+C
Gain to debtor = D+E-C
Cost to IMF = A+B+D+E