Issuing GDP-linked bonds: demand and supply can match

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## Demand and supply – Government and investors

<table>
<thead>
<tr>
<th>Government</th>
<th>Investors</th>
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<tbody>
<tr>
<td>• What is the government’s willingness to pay to insure its budget?</td>
<td>• What is the growth risk premium that investors will demand?</td>
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<td>• What drives the stabilisation properties of GLBs, e.g. persistence.</td>
<td>• Estimates from a CAPM taking persistence of shocks into account.</td>
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</table>
Reduction of debt uncertainties

- Conventional bonds:
  \[ \text{Var}(\Delta d_t) = \text{Var}(pb_t) + \]
  \[ d_{t-1}^2 \text{Var}(r_t - g_t) - \]
  \[ d_{t-t} \text{Cov}((r_t - g_t), pb_t) \]
Reduction of debt uncertainties

Italy: GDP-linked debt

\[ \text{GDP linked debt} : \]

\[ Var(\Delta d_t) = Var(pb_t) \]
Insurance against tail events – an acceptable premium

Density of debt-to-GDP ratio

- Dashed lines at the 90th percentiles.
- What risk premium makes the two lines coincide?
The average of the acceptable premium is 1.25%.
Magnitudes and drivers of the premium

- Persistence matters more than fat tails.
Demand side: what risk premium compensates for GDP volatility

Estimation steps

1. Estimating the growth process (ARMA or VAR)

2. Extracting the persistence factor and the innovation

3. Calculating the risk premium (CAPM)
Demand side: the return on a GLB

- The price of a GLB depends on the expected pay-off.
- The change of the price in each period reflects changes in the GDP forecast for all future periods $k$: $E(g_k|I_t) - E(g_k|I_{t-1})$.
- Thus the higher the persistence the higher the risk that is insured.
- For the CAPM this implies:

$$RP = (r_m - r_f) \frac{\text{Cov}(r_m, \sum_{k=t-1}^{+\infty} \frac{1}{(1 + r)^{k-t}} (E(g_k|I_t) - E(g_k|I_{t-1}))V)}{\text{Var}(r_m) P_{t-1}}$$
The estimated premiums and the acceptable premiums

Demand and Supply, Bonds and Equity

Demand and Premiums - CAPM

Acceptable Risk Premiums, Baseline
Conclusion

• The persistence of shocks captured by a VAR structure matters.

• Persistence has also to be taken into account on the investor side: it increases the risk premium. → “There is more to insure”.

• The risk-premium that compensates for GDP volatility looks acceptable: this risk premium shifts the median debt level upwards but extremely high debt levels remain less likely.

• Government thus might want to “tap the market”.