A Real Options Perspective on the Euro

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Discussion by Dave Backus
Perpetual options

- State $x_t$ is Markov

- Value of underlying asset (ex-dividend)

$$V(x_t) = E_t m(x_t, x_{t+1}) [d(x_{t+1}) + V(x_{t+1})]$$

- Bellman equation for perpetual option with strike $k$

$$J(x_t) = \max \left\{ E_t m(x_t, x_{t+1}) J(x_{t+1}), V(x_t) - k \right\} \begin{cases} \text{wait} \quad & \text{buy now} \end{cases}$$

- With structure: threshold property, exercise if $V(x_t) \geq V^*$

$$V^* \gg k \text{ ("value of waiting"), } V^* \text{ increasing in volatility}$$
Alvarez-Dixit: model

- Country $i$ has state $X_{it} \sim AR(1)$

- Policy $Z_{it}$ generates deviation $x_{it} = X_{it} - Z_{it}$

- With independent monetary policies set $Z_{it} = X_{it}$, get
  \[ u_i(x_{it}) = -x_{it}^2 = 0 \]

- With common monetary policy set $Z_{it} = n^{-1} \sum_j X_{jt}$, get
  \[ u_i(x_{it}) = \alpha - x_{it}^2 \]
  \[ U = \sum u_i = n\alpha - \sum x_{it}^2 \]
For the zone, breakup option has cost $nk$ [their Φ]

Breakup indicator

$$Y_t = \sum x_{it}^2 \text{ (!) (square-root process)}$$

Bellman equation (perpetual option)

$$J(Y_t) = \max \left\{ n\alpha - Y_t + \delta E_t J(Y_{t+1}), 0 - nk \right\}$$

Break up if $Y_t \geq Y^*$ [they call it $\bar{Y}$]
Alvarez-Dixit: results

- Small premium over now-or-never
  \[ Y^* > \hat{Y} \]
- Ambiguous effect of volatility
  - \( Y^* \) can be increasing or decreasing in volatility
  - But \( Y^* - \hat{Y} \) is increasing
- Exit by a single country at cost \( k \) may[?] come earlier
  - Side payments to misaligned countries?
- System will eventually break up
What does this have to do with the euro?

- **One view:** debt crisis, not euro crisis
  - High debt ratios in many countries
  - Greece, Ireland, and Portugal locked out of debt markets
  - Sovereign default is never clean

- **Another view:** the euro ...
  - Enabled debt issue on attractive terms
  - Reduced flexibility of prices and wages [this paper]
  - Eliminated inflation finance
  - Created uncertainty about budget constraints
Open questions

- How much exchange rate “misalignment” do we have?
- How much do we need? (“We’ve been repriced”)
- What if two groups had high and low $\sigma$? Asymmetric loss functions?
- What happens to euro-denominated debt if you leave?
- Do we really need continuous time here?
Real effective exchange rates