A Smooth Transition SEM Approach to Measure Contagion in International Markets

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OBJECTIVE & MOTIVATION

In this paper...

- We investigate from an asset-pricing perspective the cross-asset and cross-country contagion phenomenon in the sovereign Credit Default Swap (CDS) market and the banking sector in the euro area, U.S. and U.K.
- Based on the Nonlinear SEM model of Pesaran and Pick (2007) we develop a more flexible specification with smooth transition of shocks.

Why study contagion?

- Contagion has strengthened during the global financial crisis and the euro area sovereign debt issue.
- Contagion may have important implications for policy and portfolio diversification decisions which aim to restrain its adverse effect.

References


DATA GENERATING PROCESS

$$y_t = 1 + 3.5 x_t + 2.5 G(y_{t-3}, 3.5, 1.5) + u_{t-3}$$
$$y_{t-3} = 1 + 3.5 x_{t-3} + u_{t-2}$$

$$x_{t-3} \sim N(0, 4), u_{t-3} \sim N(0, 1), \rho \equiv \text{corr}(u_{t-1}, u_{t-2}) = 0.5$$

$$T = 500, \text{Simulations} = 1,000, \text{Polynomial degree} = 6$$

Use of stochastic algorithms for the minimization of SSR with respect to $\gamma_1$ and $c_2$:
- Simulated annealing
- Differential evolution

SIMULATION RESULTS (1)

Figure 3: Simulation results for the parameters of Equation 1

Testing for Contagion

$H_0 : \beta_1 = 0$ versus $H_1 : \beta_1 \neq 0$

Nuisance parameter issue solved by Taylor expansion around $\gamma_1 = 0$.

Table 2: Rejection frequency of $H_0$ if $H_0$ is false

<table>
<thead>
<tr>
<th>$\gamma_1$</th>
<th>0</th>
<th>1</th>
<th>3</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_1$</td>
<td>0.0506</td>
<td>0.0283</td>
<td>0.0184</td>
<td>0.0173</td>
</tr>
<tr>
<td>$\beta_1 = 1.5$</td>
<td>0.0473</td>
<td>0.0270</td>
<td>0.0188</td>
<td>0.0181</td>
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<tr>
<td>$\beta_1 = 5$</td>
<td>0.0602</td>
<td>0.0360</td>
<td>0.0265</td>
<td>0.0241</td>
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<tr>
<td>$\rho = 0$</td>
<td>0.0487</td>
<td>0.0264</td>
<td>0.0194</td>
<td>0.0174</td>
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<tr>
<td>$\rho = 0.5$</td>
<td>0.0473</td>
<td>0.0270</td>
<td>0.0188</td>
<td>0.0181</td>
</tr>
<tr>
<td>$\rho = 0.9$</td>
<td>0.0530</td>
<td>0.0283</td>
<td>0.0294</td>
<td>0.0177</td>
</tr>
</tbody>
</table>

CONCLUSION & FURTHER RESEARCH

Concluding remarks
- Flexible methodology to measure contagion.
- Asymmetric and time-varying contagion effect with an endogenously defined parameter of smoothness.
- Endogenous identification of the crisis periods through a threshold parameter.
- Control for contagion, interdependence, local and global shocks.

Further research
- Estimation results for our case study.
- Extension of the model to a larger system of equations.
- Nonparametric specification of the $G(\cdot)$ function.

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