Modeling and analysis the competition dynamics among container transshipment ports: in case of East-Asian ports

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Abstract: This paper studies the competitiveness and complementary among the major container ports in East Asia by analyzing their extensive and intensive dynamics in recent 8 years (2008-2015). Time series data on container throughput dividing into O-D and transshipment for the ports of Hong Kong, Kaohsiung, Shanghai, Busan, Ningbo-Zhoushan, and Shenzhen are calculated based on VAR and VECM model.

Keywords: Container throughput, Transshipment competition, Cointegration test, VAR and VECM model.
2. Literature Review

<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Highlight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lee &amp; Lan (2013)</td>
<td>DEA and DEA methods</td>
<td>Comparison among major container ports in East Asia</td>
</tr>
<tr>
<td>Khorramshahi &amp; Lan (2012)</td>
<td>Annotated</td>
<td>Note: new port concept in a competitive environment</td>
</tr>
<tr>
<td>Khorramshahi et al. (2011)</td>
<td>Strategic analysis</td>
<td>Competitive strategies in high potential market efficiently</td>
</tr>
<tr>
<td>Song et al. (2010)</td>
<td>A liner network structure</td>
<td>The competitiveness of major container ports and their performances</td>
</tr>
<tr>
<td>Lin et al. (2010)</td>
<td>A liner network structure</td>
<td>The competitiveness of major container ports and their performances</td>
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<td>Song (2009)</td>
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<tr>
<td>Pan et al. (2010)</td>
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</tr>
<tr>
<td>Tan et al. (2009)</td>
<td>A liner network structure</td>
<td>The competitiveness of major container ports and their performances</td>
</tr>
<tr>
<td>Yip &amp; Lam (2009)</td>
<td>A liner network structure</td>
<td>The competitiveness of major container ports and their performances</td>
</tr>
</tbody>
</table>

3. Problem Statement

- Need to analyze the competition among major ports in East Asia in focusing on transshipment and O-D container dynamics.
- Need to check robustness of the model.
- Need to evaluate recent trends.
- Method: Cointegration test, Granger causality, VAR & VECM models.

4. Methodology

\[
WTT_i = WOD_i + WTS_i
\]

\[
WOD - \text{World Total O/D}
\]

\[
WTS - \text{World Total T/S}
\]

\[
\Delta WOD_i = WOD_{i,t} - WOD_{i,t-1}
\]

\[
TS_{i,T-1} = \alpha_{i,T-1}(\Delta WOD_{T-1}) + \alpha_{i,T-1}\Delta WOD_{T-2}
\]

\[
TS_T = \alpha_{i,T}(\Delta WOD_T) + \alpha_{i,T}\Delta WOD_{T-1}
\]

\[
TS_U = \beta_{i,T}(\Delta WOD_{T}) + \beta_{i,T}\Delta WOD_{T-1}
\]

4. Methodology

\[
TS_{x,j} = \sum_{j=0}^{m} T_{x,j} + \sum_{j=0}^{m} \delta_{x,j}\Delta O_D
\]

\[
TS_{y,j} = \sum_{j=0}^{m} T_{y,j} + \sum_{j=0}^{m} \delta_{y,j}\Delta O_D
\]

\[
\Delta O_D = O_D(x,t) - O_D(x,t-1)
\]

Here: \( j = 0, 1, \ldots, n \), \( x = 1, \ldots, k \), \( y = 1, \ldots, k \)

5. Results

Johansen Cointegration test

Unrestricted Cointegration Rank Test (Trace)

<table>
<thead>
<tr>
<th>Hypothesized No. of Coint Eq(s)</th>
<th>Trace Statistic</th>
<th>Critical Value</th>
<th>Prob**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.2093923</td>
<td>111.2441</td>
<td>0.0535</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.380757</td>
<td>75.9437</td>
<td>0.0479</td>
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<tr>
<td>At most 2</td>
<td>2.94073</td>
<td>43.8229</td>
<td>0.0480</td>
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<td>At most 3</td>
<td>17.3989</td>
<td>25.9830</td>
<td>0.0480</td>
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<tr>
<td>At most 4</td>
<td>52.2635</td>
<td>15.3447</td>
<td>0.0501</td>
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<tr>
<td>At most 5</td>
<td>50.0000</td>
<td>8.3494</td>
<td>0.0079</td>
</tr>
</tbody>
</table>

Trace test indicates 2 cointegrating equation(s) at the 0.05 level.

* denotes rejection of the hypothesis at the 0.05 level.

5. Results

VAR: Granger causality test

5. Results

VAR: Impulse response function

6. Conclusion

Reference