Multi-Dimension Monitoring System for Regional Economy: Exploration and Practice in Xinjiang Autonomous Region

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2014.06.04
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1. Motivation

- **Leading index and Economic Early Warning:**
  
  Economic monitoring and early warning system has been successfully applied (such as UN, IMF, OECD, the European Central Bank and CEPR), which mainly focus on countries instead of regional economies.

- **Characteristics of Regional Economy:**
  
  i) independence, specialization, stability
  
  ii) the requirement for economic warning: central government focus on economic growth and price index; local government focus more on regional important industries
  
  iii) lead-lag relationship is more unstable, more challenging

- **The Characteristics of Xinjiang Economy:**
  
  northwest of China, resource industry oriented economy,
1. Motivation

• General Monitoring and Special Monitoring:

Traditionally, leading index systems focus on economic growth and inflation. For general situation, we take care of these two important aspects, let market work on other aspects. But Xinjiang is in a “great leap” period, the central government makes the whole national effort to promote the development of the region.

• Multi – dimension Monitoring:

Decision making need take care more aspects: economic growth, inflation, investment, consumption, exports and imports, industry enterprises, energy industry, service industry, connection with other regions

• Connection between Subjects:

Could information from different subjects present a comprehensive view?
1. Motivation

- **Monitoring Tools:**
  Composite index (CI) is the most frequent use tool for economic movement. A tool is a procedure under some assumptions to reveal some information. Single tool only reflects the economic movement from one cone. But the economic is very complexity, why not look at the economy from more cones?

- **Multi-methods:**
  - Composite index
  - Diffusion index
  - Signal lamps
  - Comprehensive monitoring index
  - Business cycle tracer
  ............
2. Framework of the Multi-Dimension Monitoring System

- **Objective:**
  - it is the requirement of macro-control and decision-making support for the local government.
  - the increased uncertainty of international economic environment and the demand for reform in China propose higher requirement for regional monitoring and early-warning.

- **multi-subjects:**
  - economic growth, investment, consumption, trade and prices;
  - important industries in Xinjiang province: industrial enterprises, coal industry and services

- **multi-methods:**
  - diffusion index, composite index, signal lamp, comprehensive monitoring index and business cycle tracer.

- **computer support system**
  - monitoring and early warning system for Xinjiang region
2. Framework of the Multi-Dimension Monitoring System

- computer support system
- system management: user access control, process configuration, display configuration
- data management: initialize and manage all types of data in the database, including external data and internal data
- scenario analysis: analyze the data and configure the model for each topic or subject, including analysis tools, theme analysis, correlation analysis and comprehensive analysis
- display layer: directly show the assumptions, outcomes and risks of the forecast
3. Framework of the Multi-Dimensional Monitoring System

- Early Warning System Cube
- Multi-Subject
- Multi-Methods

- Leading Indicator System
- Diffusion Index
- Composite Index
- Signal Lamp
- Comprehensive Monitoring Index
- Business Cycle Tracer

- System Management
  - System Administrator
  - User Access Controller
  - Process Configuration
  - Display Configuration

- Display Layer

- Scenario Analysis
  - Analysis Tools
  - Theme Analysis
  - Correlation Analysis
  - Comprehensive Analysis

- Data Management
  - External Data
  - Internal Data
3. Construction of Monitoring Instruments

- **screening process**

  - **Data collection**
    - Regional characteristics
    - Basic database

  - **Data process**
    - Seasonally adjustment
    - Benchmark and business cycle determination

  - **Index screening**
    - time difference analysis, KL analysis and BB algorithm analysis
    - trough-peak graphical analysis
3. Construction of Monitoring Instruments

- **Database**: capture the characteristics of China’s economy as a whole and Xinjiang’s regional economy

14 fields, 942 indicators
3. Construction of Monitoring Instruments

- Regional characteristic: trough and peaks of Y-to-Y growth of gasoline production stably precede the Y-to-Y growth of industrial added value for Xinjiang province.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Time analysis</th>
<th>Difference analysis</th>
<th>KL analysis</th>
<th>BB algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>order</td>
<td>coefficient</td>
<td>order</td>
<td>coefficient</td>
</tr>
<tr>
<td>Y-to-Y growth of gasoline production</td>
<td>-10</td>
<td>0.2678</td>
<td>-12</td>
<td>1838.07</td>
</tr>
</tbody>
</table>
3. Construction of Monitoring Instruments

- Diffusion Index

Note: The red line indicates the leading diffusion index. The green line indicates the consistent diffusion index. The yellow line indicates the lagging diffusion index. The sequence of the first column is economic growth, investment, consumption and trade. The sequence of the second column is prices, industrial enterprise, coal industry and services.
3. Construction of Monitoring Instruments

- **Composite Index**

  - **Note:** The red line indicates the leading diffusion index. The green line indicates the consistent diffusion index. The yellow line indicates the lagging diffusion index. The sequence of the first column is economic growth, investment, consumption and trade. The sequence of the second column is prices, industrial enterprise, coal industry and services.
### 3. Construction of Monitoring Instruments

#### Composite Index: the result of peak-trough graphical analysis

<table>
<thead>
<tr>
<th></th>
<th>Leading composite index</th>
<th>Consistent composite index</th>
<th>Lagging composite index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peak orders</td>
<td>Peak SD</td>
<td>Trough orders</td>
</tr>
<tr>
<td>Economic Growth</td>
<td>-7.25</td>
<td>4.27</td>
<td>-5.66</td>
</tr>
<tr>
<td>Investment</td>
<td>-3</td>
<td>1.732</td>
<td>-4</td>
</tr>
<tr>
<td>Consumption</td>
<td>-12</td>
<td>7.12</td>
<td>-9.67</td>
</tr>
<tr>
<td>Trade</td>
<td>-5.6</td>
<td>7.96</td>
<td>-4</td>
</tr>
<tr>
<td>Prices</td>
<td>-11.6</td>
<td>3.49</td>
<td>-5</td>
</tr>
<tr>
<td>Industrial enterprise</td>
<td>-5.33</td>
<td>3.32</td>
<td>-7.25</td>
</tr>
<tr>
<td>Coal industry</td>
<td>-6</td>
<td>1.15</td>
<td>-7.33</td>
</tr>
<tr>
<td>Services</td>
<td>-8</td>
<td>5.1</td>
<td>-7</td>
</tr>
</tbody>
</table>

The Composite Index is the result of peak-trough graphical analysis. Consumption has the longest leading periods and it can predict the fluctuations 9 to 12 months in advance. However, investment has the shortest leading periods for 3 to 4 months.
3. Construction of Monitoring Instruments

- Signal Lamp
3. Construction of Monitoring Instruments

- Comprehensive Monitoring Index
3. Construction of Monitoring Instruments

- Business cycle tracer for 8 subjects
4. Monitoring Cube

[Graph showing trends over time with various indices]

[Graph showing another set of trends]
4. Monitoring Cube
5. Practice in Decision Supporting

- The calculation process about the leading-lagging index and the presentation layer
5. Practice in Decision Supporting

- the correlation analysis and through graphical analysis in the basic analysis tools
5. Practice in Decision Supporting

- Bi-annual reports

- Policy reports:
5. Conclusion

- Construct a multi-dimension monitoring system for Xinjiang province
- Develop a computer support system for integrated monitoring and comprehensive early warning
Thanks