SHIPPING LOGISTICS RISK APPRAISAL BASED ON BP NEURAL NETWORK

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1. INTRODUCTION

• Shipping market competition is becoming increasingly fiercely, many shipping companies rely on lower cost to improve economic efficiency, but it generates many negative effects such as capacity surplus.

• Logistics theory provides shipping enterprises an opportunity of getting rid of economic downturn, it makes shipping enterprises turn from cost-saving to value-added with logistics services.

• At present, study on logistics risk management mostly concentrated in comprehensive evaluation using fuzzy evaluation and AHP, less concreted to the shipping logistics.

• This paper introduces related theory of shipping logistics, evaluates risks involved in shipping logistics activities using BP neural network model, puts forward countermeasures of shipping logistics risk, analyzes related legal issues and gives some measures for improvement.
• Yang (2000) introduced the basic model and system objectives of shipping logistics system.

• Li (2007) discussed the intelligent management of shipping logistics.
2. SHIPPI NG LOGI STI CS OUTLI NE

• The shipping logistics is a branch of transportation logistics, its scope is a geographical wide range, is intercontinental and international, has an international logistics nature.

• We think that the shipping logistics refers to a logistics activity which is backing for the water transportation profession resources and related function expansion.

• The shipping logistics is according to the international convention, using internationalized logistics network, the logistics facility and technology, achieves the international cargo flowing and the international exchange, promotes the regional economies development and the world resource optimized disposition.

• The shipping logistics' essential goal is serving for the international trade and the transnational operation, namely choice the best way, with the lowest expense and the smallest risk, guarantee the quantity and the quantity, at the right moment to transport the cargo from some country's supplier to another country's consumer.
Shipping logistics flow chart

1. Shipper
2. Inland warehouse
3. Port
4. Information flow
5. Land transportation
6. Shipping
7. Land transportation
8. Inland warehouse
9. Consignee
3. SHIPPING LOGISTICS RISK

ANALYSIS

3.1 Shipping logistics risk

• The definition of shipping logistics risk.

  The risk refers to the difference between the subjective forecast and the actual situation which is result from people’s inaccurate forecast.

• The factors that shipping logistics risk influence enterprise.
3.2 Risk influencing factors

**General risk origin**

- Risk from external environment
- Risk with the logistics decision-making
- Risk with the logistics process

**Shipping logistics unique risk origin**

- First, the link to chose shipping logistics suppliers.
- Second, shipping logistics design link.
- Third, shipping logistics implementation process.
4. SHIPPING LOGISTICS RISK ASSESSMENT

4.1 BP neural network theory synopsis

The three levels BP neural network structure chart
The concrete BP algorithm is as follows:

### Initialization

BP network’s three level node are described:

- **Input node** is: \( x_j \)
- **Hidden node** is: \( y_i \)
- **Output node** is: \( Q_l \)

The network weight between the input node and the hidden node is: \( W_{ij} \)

The network weight between the hidden node and the output node is: \( T_{li} \)

\( \theta_i \) \( \theta_l \) respectively are hidden node and output level node valve value.
Carries on the study to the network

(1) The exports equation between the concealed level and the output level respectively is:

\[ y_i = f \left( \sum_j w_{ij} x_j - \theta_i \right) \quad i = 1, 2, \ldots, u \]

\[ Q_l = g \left( \sum_i T_{li} y_i - \theta_l \right) \quad l = 1, 2, \ldots, n \]
(2) The error computation between actual value of exports and expectation value of exports in output level node:

\[ E = g\left( \sum_{i} T_{li} y_i - \theta_1 \right) \left[ 1 - g\left( \sum_{i} T_{li} y_i - \theta_1 \right) \right] t_1 - g\left( \sum_{i} T_{li} y_i - \theta_1 \right) \]

(3) Reversely assignment error to concealment level node:

\[ e_i = y_i (1 - y_i) \left( \sum_{l=1}^{n} T_{li} E_1 \right) \]
(4). To adjust connect weight and valve value between concealment level and the output level node.

\[ \Delta T_{li} = \eta y_i E_1 \]

\[ \Delta \theta_1 = \eta E_1 \]

and \[ \eta \in (0,1) \] for study speed

(5). Adjust connect weight between input level and concealment level node and value of concealment level.

\[ \Delta W_{ij} = \eta x_j e_i \]

\[ \Delta \theta_i = \eta e_i \]
4.2 Shipping logistics project risk assessment based on BP neural network

Risk assessment's methods have many, for instance Deerfei, analytic hierarchy process, fuzzy judgment method and so on.

But BP neural network, because it is from self study, the self organization, the auto-adapted ability, enables its to be possible to simulate any function which has the limited break point, in the mature appraisal sample existence situation, may through obtain the neural network model which to the network training needs, thus carries on the appraisal to the new similar risk.
<table>
<thead>
<tr>
<th>Environment risk</th>
<th>Operation risk</th>
<th>Market risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipping market laws and regulations</td>
<td>Logistics technology service condition</td>
<td>Customer demand degree</td>
</tr>
<tr>
<td>Political context</td>
<td>Basic equipment situation</td>
<td>Service innovation</td>
</tr>
<tr>
<td>Economic environment</td>
<td>Operator situation</td>
<td>Service competitor</td>
</tr>
<tr>
<td>Natural environment</td>
<td>Operation standardization</td>
<td>Shipping market growth</td>
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<tr>
<td>Benefit risk</td>
<td>Management risk</td>
<td>Technological risks</td>
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<td>Social efficiency</td>
<td>Management quality</td>
<td>technology serviceable</td>
</tr>
<tr>
<td>investment returns ratio</td>
<td>Management decision</td>
<td>technology advanced</td>
</tr>
<tr>
<td>interest rate exchange rate</td>
<td>enterprise culture</td>
<td>technology reliable</td>
</tr>
<tr>
<td>Logistics expense frugal</td>
<td>investment situation</td>
<td></td>
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<tr>
<td>investment situation</td>
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</tbody>
</table>

The evaluation index system of logistics risk
The structure of neural network
Here concealment level's neuron number has chosen 22, other parameter establishes following chart:

**BP Neural network set up option**

- Network Name: network3
- Network Type: Feed-forward backprop
- Input ranges: $[1, 0.1; 1, 0.1; 1, 0.1]$ Get from inp...
- Training function: TRAINGDA
- Adaptation learning function: LEARNGDM
- Performance function: SSE
- Number of layers: 2
- Properties for: Layer 2
  - Number of neurons: 1
  - Transfer Function: LOGSIG

**BP Neural network training option**

- Training Info
  - Epochs: 10000
  - Goal: 0.00001
  - Min_grad: 1e-006
  - Show: 250
  - Time: Inf
  - Mac_fail: 5

- Training Parameters
  - Learning parameter: 0.001
  - Learning rate: 1.05
  - Learning increment: 0.7

- Optional Info
  - Train Network
Induct array A and B to input and target, and carries on the training with these two data to the network:

The BP neural network training graphical representation
The simulation results of training data and examination data

<table>
<thead>
<tr>
<th>Project NO.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tr>
<td>Appraisal</td>
<td>0.7122 4</td>
<td>0.7665 5</td>
<td>0.9287 2</td>
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<td>0.3412 1</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
5. PREVENTION COUNTERMEASURE OF SHIPPING LOGISTICS RISK

5.1 Selection of shipping logistics businessman

5.2 Selection of risk treatment
   • Conventional risk treatment
   • Selection of conventional risk treatment

5.3 Points for attention coping with shipping logistics risks
   • Establish good information sharing mechanism
   • Establish effective revenue sharing and risk sharing mechanism
The chooses of risk tackle methods

- High loss frequency, high loss magnitude: Risk avoid
- High loss frequency, low loss magnitude: Insurance/Professional insurance
- Low loss frequency, high loss magnitude: Risk prevention / Self-retention risk
- Low loss frequency, low loss magnitude: Self-retention risk
6. LEGAL ANALYSIS OF SHIPPING LOGISTICS

- shipping logistics contract risk
- infringement risk
- Risk caused by force majeure
- Current legislation of Chinese shipping logistics
7. CONCLUSION

• With the development of shipping logistics, it will bring opportunities, convenience and profit, but also accompanied with new risks.

• Especially when Chinese shipping logistics market is not sound enough, it is of important significance that all parties involved in logistics process learn how to correctly assess and manage risk.

• This paper introduces simply shipping logistics related theory, evaluates risk involved in shipping logistics activities using BP neural network model, puts forward countermeasures of shipping logistics risk, theory and quantitative analysis are very rough, this is a complex field of theoretical and practical value deserving constantly thinking and research.
THANKS FOR YOUR ATTENTION!