Security levels in countries for international maritime industries

［課程博士・論文博士共通］

博士学位論文内容要旨
Abstract

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This paper presents a practical tool for assessing security levels in countries so that international maritime industries might be able to select new countries for ports of call or terminal operations. For example, a shipping line has incentives to capture more cargoes in economically developing countries. However, the countries' potential for growth of trade volume should be carefully examined along with the future stability of the countries. Failure to assess risks and rewards properly might lead to great effects of security incidents on shipping lines as such as those of the terrorist attack on an international factory in Algeria in 2013, which terminated the supply chains connecting to the country's ports.

Nevertheless, few studies have targeted exploration of practical assessments of security levels in countries for ports of call. This paper describes development of a useful statistical modeling tool by which shipping lines can evaluate security levels in countries with candidate ports for new services.

When shipping lines decide ports of call on their routes, cargo demand in countries has traditionally been assigned priority for the decision. The cargo demand might be divided into two categories: that already existing and that expected in the near future. Typical examples of the former are Singapore and Shanghai, where huge volumes of cargo are available as major hub ports. The general purpose of shipping lines to call such hub ports is transshipment or gateway operations to connect with feeder ports or greater hinterlands, rather than earning new cargoes there. In contrast, the latter are local ports mostly found in economically developing countries where rapid economic growth is forecasted and possible cargo demand is expected, although it has not yet been realized. Because major shipping lines have occupied major hub ports, such local ports might be attractive for shipping lines that are exploring new cargo demand to catch up with their competitors.

Nevertheless, security risks can arise in economically developing countries where demand is expected, but where domestic affairs are unstable such as piracy, terrorism, the collapse of the country's economy, and prolonged troubles related to such difficulties.

As described above, a shipping line must choose a country for ports of call to capture new cargo demand in the country. Therefore, shipping line must find a gateway port in a country likely to have future stability without posing considerable risk. The country mentioned above might have appeared safe and attractive for shipping lines before difficulties first occurred there. Misjudgment of each port's risks and rewards must be avoided.

Forecasting future difficulties in various countries might be difficult, but it might be possible to evaluate their vulnerability, by which security levels of the countries might be predicted. A fundamental cause from which a country suffers from vulnerability might be defined simply as the balance between the "Benefit" and "Cost" of the country. For example, the necessities of life and industries such as water, food, fuel, and electricity come at a high cost. The populace must earn benefits from economic activities by which people can improve their quality of life.

The relation of vulnerability to benefits and costs of countries can be described as follows, which is the new approach innovated by the authors.

$$S_i = \sum_{j=1}^{m} \sum_{k=1}^{l} \left(\frac{T_{ik}}{T_{ij}} \right)^{r_{jk}}, \qquad (1)$$

where the followings are used as variables.

S_i: Security level of country i.

i: Country designation $(i = 1, 2, \cdots, n)$,

n: Number of countries.

T_{ij}: T score of value or amount returned by economic activities giving benefits in a country *i*,

T_{ik}: T score of resources or consumption for people or industries creating costs in a country *i*,

j: Item of benefits in statistics, $(j = 1, 2, \cdots, m)$,

m: Number of items in statistics.

k: Item of costs in statistics, $(k = 1, 2, \cdots, l)$,

l: Number of items in statistics.

r_{jk}: Degree of correlation between T_j and T_k.

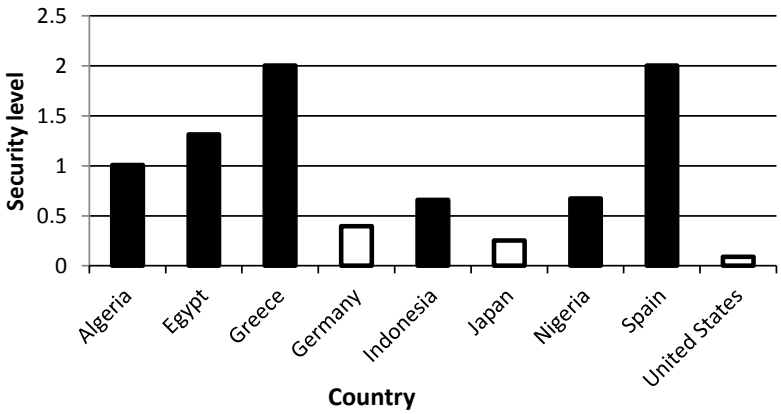
Application of equation (1) requires the collection of appropriate data related to benefits and costs according to security levels in various countries. Some statistics reported in each country might be useful for assessment using the equation. However, many items in such data might not be appropriate for use with the equation. In this respect, the author produced a questionnaire in March, 2012 soliciting information for various nationalities for selecting appropriate statistics.

Foreign volunteers from the Tokyo International Exchange Center (TIEC) were asked to complete a questionnaire. They were 25–35 years old, representing 21 nationalities. They were asked to check items related to the benefit or cost of port operations in their respective home countries.

Questionnaire results are presented in Table—2, in which the percentage of checked items varies between 23% and 100%. Presuming that those items scoring more than 80% might be adopted as data for use in equation (1), then the 16 items shown in Table—2 can be selected: population, unemployment rate, GDP, FDI, oil consumption, oil production, imports, exports, national debt, wheat, cotton, coal, gas, steel, copper, and aluminum. Because cargo demand in countries has conventionally attracted shipping lines to ports of call as presented in section 2.1, Twenty Equivalent Unit of counting marine containers (TEU) is also included in the results.

Figure—1 presents an example of results obtained using equation (1) with datasets established by the results of the questionnaire. The degree to which security levels practically function is readily apparent when comparing the troubled countries with typically stable economically developed countries as shown in Figure—1. Security of the former greatly exceeds that of the latter.

Results suggest the necessity for shipping lines to evaluate not only the potential volumes of shipments at ports, but also the future risks of countries providing the ports. To realize the concept, this paper has introduced a model for estimating security levels of countries. The model uses data that are widely available worldwide. The datasets of this paper applied to the model were limited to a certain number of countries and data items only because of the scope of the authors' efforts during a limited research period. The authors shall dedicate further efforts to development of a precise database for the model including more countries of the world.



Figure–1 Security levels of recently troubled economically developing countries and stable economically advanced countries.