Third-Party Credit Research of Cross-Border E-Commerce Based on Game Theory

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Abstract. Due to the lack of strict supervision mechanism, a mass of fakes are scattered in the market. It is very significant to establish a reasonable third-party evaluation system. This paper analyzed the system based on game theory, which conclude that short-term gains need more supervision. And in terms of the current situation, it makes suggestions on relevant managements and institutions of cross-border e-commerce.

Introduction

Cross-border e-commerce refers to the trading subjects belonging to different customs frontier conclude the transactions, make payment and settlement through e-commerce platform, and through cross-border logistics service delivery merchandise, which is a kind of international business activities to complete the transaction. [1]With the "Internet +" arrives and the communication between various countries is continually strengthening, cross-border e-commerce has been continuously developing. In China, for example, in 2015, China cross-border e-commerce transaction scale was 5.5 trillion RMB, rose 28.6%. [2] It can be seen that cross-border e-commerce has become mainstay of transnational trade. However, because supervision mechanism is not incomplete, some e-commerce platforms through intermediaries, persons or institutions selling fakes, which leads to fakes on the market prevails. [3] Therefore, it is imperative to establish third party credit evaluating system. [4,5]

B2C Third-party Platform Credit Research Based on Seller, Buyer Game Theory

Mathematical Research

Reference Description

Find the substitution variables of measuring credit
U: practical profit that the consumers get
M: risk that the vendors need to take when fraud or deception

Quantize Credit factor and Introduce Game Theory

Make assumptions:
The transmission function of credit information: the degree of credit increases, consumer utility U increases, risk M decreases.
The amplification of platform credit: the trust group enlarges the probability that consumers purchase merchandise Ra increases.
Trading decisions and credit options on both sides are two ideal conditions, integrity and fraud modes.

Theoretical basis

Build a complete static information game model which is among e-commerce transaction. [6] Set the vendor revenue obtaining by honesty and trustworthiness for Eh, and the revenue obtaining by fraud for Ef. Generally, it can be obtained that Eh<Ef. Meanwhile, vendor will take a risk which is
set for M when they conduct fraudulent (Referring to legal action, administrative penalties, and losses due to defamation caused by fraud).

When vendor chooses trading strategy, there exist:
The profit if select the integrity mode:

\[ P_h = E_h \]  \hspace{1cm} (1) 

The profit if select the fraud mode:

\[ P_f = E_f - M \]  \hspace{1cm} (2) 

<table>
<thead>
<tr>
<th>Transaction</th>
<th>Ra</th>
<th>U, E_h</th>
<th>1-Ra</th>
<th>0, 0</th>
<th>0, -M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seller Strategy</td>
<td>Buyer Strategy</td>
<td>Integrity Mode</td>
<td>Fraud Mode</td>
<td></td>
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</tr>
<tr>
<td>Transaction</td>
<td>Rb</td>
<td>1-Rb</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Transaction</td>
<td>1-Ra</td>
<td></td>
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</tbody>
</table>

Table 1. Probability and utility of transaction.

Note:
Ra is the probability that buyers choose to trade
1-Ra is the probability that buyers choose not to trade
Rb is the probability that sellers select integrity mode
1-Rb is the probability that sellers select fraud mode.
Assuming that the game has an optimal hybrid strategy, the mixed Nash equilibrium can be solved.

Buyers expected utility:

\[ U_a = R_a [R_b * U + (1-R_b) * (-U)] + (1-R_a) [0 * R_b + 0 * (1-R_b)] = R_a (2R_b * U - U) \]  \hspace{1cm} (3) 

Differentiate for the above-mentioned equation:

\[ \frac{\partial U_a}{\partial R_a} = 2R_b * U - U = 0 \]  \hspace{1cm} (4) 

When Rb=1/2, which means that seller has 1/2 probability to select integrity mode and the other 1/2 probability to select fraud mode, the trading strategy for buyer is the optimization. In a similar way, sellers expected utility:

\[ U_b = R_b [R_a * E_h + (1-R_a) * 0] + (1-R_b) [R_a * (E_f - M) + (1-R_a) * (-M)] = R_b R_a E_h + (1-R_b) R_a E_f - M \]  \hspace{1cm} (5) 

\[ \frac{\partial U_b}{\partial R_b} = R_a * E_h - R_a * E_f + M = 0 \]  \hspace{1cm} (6) 

\[ R_a = M / (E_f - E_h) \]  \hspace{1cm} (7) 

Eq.1 means that if the probability of buyers’ choose to trade is less than M/(E_f - E_h), sellers will select fraud mode. Otherwise, they will select integrity mode.

Changes When Introducing B2C Credit Platform

Short-Term Behavior

Assume that the degree of credit increases, U will increase, the risk that is found to be fraud, M will decrease. And Eq.1 will decrease. When the probability that consumer makes a deal is less than Eq.1, vendor will choose to be fraud, which leads to that the consumers have more advantages.
Long-Term Behavior
When Ef-M ≤ Eh constantly sets up, sellers will choose long-term integrity mode.
When Ef-M > Eh, if and only if (Ef-M) approaches to Eh, the profit of fraud mode is completely low, sellers will choose integrity mode.
Each time the trade is found to be fraud, the degree of trust will decrease, and the same as U. And in the next time, the probability of a successful deal will decrease. Until U is completely low and it limits to Eh. And finally the sellers choose the integrity mode.
As a result, B2C credit platform should focus on and strengthen supervision of the merchants which are short-term gains.

Credit Analysis of B2C Third-Party Platform Based on Multiplier Model
There is a proliferation and strengthening mechanism of credit in the market, making the credit from individual or local expansion to the whole market system, which is the multiplier effect of credit.
Assume that Q indicates multiplier
\[ Q = \frac{\Delta T}{\Delta C} \] (8)
\[ \Delta T \text{ means that credit increases, } \Delta C \text{ indicates spontaneous credit including initial trust investment or exogenous credit. According to the above, when credit circle expands, the probability of consumers make a deal will increase, which means that Ra increases. } U^*Ra + 0^*(1-Ra) \text{ will increase, which means that the buyers expected utility will increase.} 
At the same time, if the amount of consumers in the network is n, and each consumer has the same value, then the whole value of the network will be n(n-1). Therefore, the expansion of credit increases the amount of consumers, which means a massive scale of economic prospect. [7]

The Perfection of Relevant Systems
Cultivate Consciousness of Masses
The construction of third party credit mechanism is completely a complex and lengthy process, which require the community’s efforts. According to the government’s vigorously publicity, it can be achievable to enhance the awareness of integrity of the masses. Meanwhile, the cross-border e-commerce participant will recognize that the integrity is an essential competitive edge. While the whole society has the sense of credit, there will have credit culture. And a good social credit atmosphere will be formed, which is conducive to build a good market.

Strengthen Legal Protection
Having an awareness of social credit is not enough to protect cross-border e-commerce robust operation, legal protection is indispensible. At the same time, a sound cross-border e-commerce system requires not only the consumers and merchants mutual restraint and common maintenance, but also the need to legislate supervision and relevant laws to direct constraints. Although the current market has some mature law to constraint, for cross-border e-commerce participants, there is a problem which is particularly prominent, cross-border means that transactions will occur in different countries, consumers and vendors may belong to two places. On the legal side, different countries mean different legal systems. This also means that there may be contradictions in the law between two different countries. Signing the contract and determine the question of jurisdiction, which can greatly avoid the dispute. Providing that the consumer’s rights are violated, consumer should sue in the jurisdiction of the country in a time manner, which is aimed at maximizing the protecting of the interest.
**Strengthen Industry Self-Discipline**

E-commerce has three unique characteristics: remoteness, alterable record, the complexity of the subject, resulting in the transaction, consumers feel frustrated, and be worried about their rights that will be infringed. And in cross-border e-commerce, these features are more obvious. Through the establishment of a global cross-border e-commerce association, the platform has a duty to develop the common principles that all cross-border electronic business participants need to comply with to protect the effective rights of consumers. For some do not abide by the common business rules, there will have punishment. At the same time the platform establish public information file for each cross-border electronic participants to record the credit of their own. [8] And In Japan, credit evaluation of enterprises, is not only relying on trade association promoting while using membership, led only member companies, was able to obtain evaluation of opportunities.

**Summary**

In a conclusion, regulate cross-border electricity business credit have a long way to go. The establishment and perfection of third-party evaluation mechanism does not mean that the fake is no longer, it also needs cooperation of all aspects, theoretical exploration, sound protection of the law, the supervision of the strengthening of consumer rights awareness. All of these require to be explored continually.

**Reference**


