

# The Effect of Non-financial Factors on Credit Level: An Empirical Study of Supply Chain Finance Based on E-commerce Platform

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**Abstract.** With the development of Internet finance, the traditional supply chain finance is being extended to financial service based on e-commerce. In this condition, except for the financial data that traditional credit evaluation focuses on, non-financial factors based on the Internet and e-commerce platform should also be considered. This paper adopted empirical research method, building the structure equation model to verify some key non-financial factors which influenced supply chain finance credit level. We demonstrated that the transaction credit of financing enterprise, e-commerce platform credit and other specific factors had positive impact on supply chain finance credit level. This article provided some references for the credit risk management of supply chain finance under the environment of Internet and e-commerce.

## Introduction

The problem of financing small and medium-sized enterprises (SMEs) in an effective and efficient way has attracted much attention from both academics and practitioners. In recent years, supply chain finance (SCF), as a new type of financing model, has developed rapidly in China. Meanwhile, with the emergence of Internet finance and e-commerce, an increasing number of enterprises began to adopt online financing. According to the report from Chinese Electronic Commerce Research Center, the number of small and medium-sized enterprise users that using third-party e-commerce platform had exceeded 19.5 million by June 2014, which continued to keep a steady growth. Alibaba, one of the famous micro lending platforms in China, had attracted 650000 members and facilitated over 170 billion RMB in loans by 2013. These data shows supply chain finance based on e-commerce has a promising prospect. The e-commerce credit can be an important supplement to traditional financial credit for e-commerce platform can record enterprises' behaviors incurred within transactions, which makes the logistic, capital flow and information flow more transparent.

Basic model of *Supply Chain Finance Based on E-commerce* has been proposed in previous study. This financing method not only helped SMEs solve financing difficulties, but also promoted banks profit structure innovation. However, despite SCF based on e-commerce has many advantages, such as timeliness, high efficiency and low cost, there inevitably appears some new problems for bank's credit risk management because of the virtual network environment and more complex participators. In addition, the online supply chain finance is newly developed and the lack of a legal basis in supervision is also an important problem, which forced banks to re-examine the influencing factors and change the traditional way of credit risk assessment.

## Literature Review

Several studies have been conducted on financing that involve e-commerce. Kaplan and Sawhney introduced the concept of electronic hubs, or e-hubs, which could provide financing services both for buyers and sellers<sup>[1]</sup>. Pennathur analyzed electronic banking risk management, revealing banking risks were magnified in an electronic medium<sup>[2]</sup>. Aberdeen group made an explanation of supply chain finance from the perspective of information technology platforms<sup>[3]</sup>. In the supply chain activities, the

platform played a role as information provider, which provided the related financing information in real time. E-commerce held the potential to transform banking and financial systems. Some other literatures focused on summarizing practical phenomenon with analyzing different models. Li and Ma<sup>[4]</sup> proposed two main application modes, electronic order financing and electronic warehouse receipt financing. SCF based on B2B e-commerce could not only improve the overall economic efficiency, but also reduced the financing risk. Yun<sup>[5]</sup> analyzed the characteristics of SCF based on simplex trading platform and non-simplex trading platform. Tu and Yang<sup>[6]</sup> discussed four financing models based on e-commerce platform and applied Balanced Score Card to its performance evaluation system. Yan et al.<sup>[7]</sup> made a comparison of the online and offline SCF and found risk factors appeared in online mode were different from those in offline business. As most of the previous study focused on model analysis, researches on SCF based on e-commerce were scarce, it was significant to put emphasis on risk management of SCF.

Compared with the traditional model, the credit risk of SCF based on e-commerce has changed in many aspects. Previous studies have investigated antecedents of credit risk from a variety of perspectives in the e-commerce context, such as online purchasing, the adoption of Internet banking and mobile payment. However, few studies consider this issue in the context of the SCF based on e-commerce. We adopted the empirical method to find out the effects that different factors on SCF credit level.

### Conceptual Model and Hypothesis

Previous studies analyzed credit risk factors according to the supply chain finance participators<sup>[8]</sup>. The participators of SCF based on e-commerce include banks, SMEs, core enterprise and e-commerce platform. We analyzed the credit risk from the bank's perspective. Since many mature researches had been conducted on the credit evaluation of SMEs, we did not consider the SMEs' financial factors in our model. Instead, we put emphasis on the non-financial factors and other factors related with e-commerce platform. The conceptual model is shown in Fig. 1.

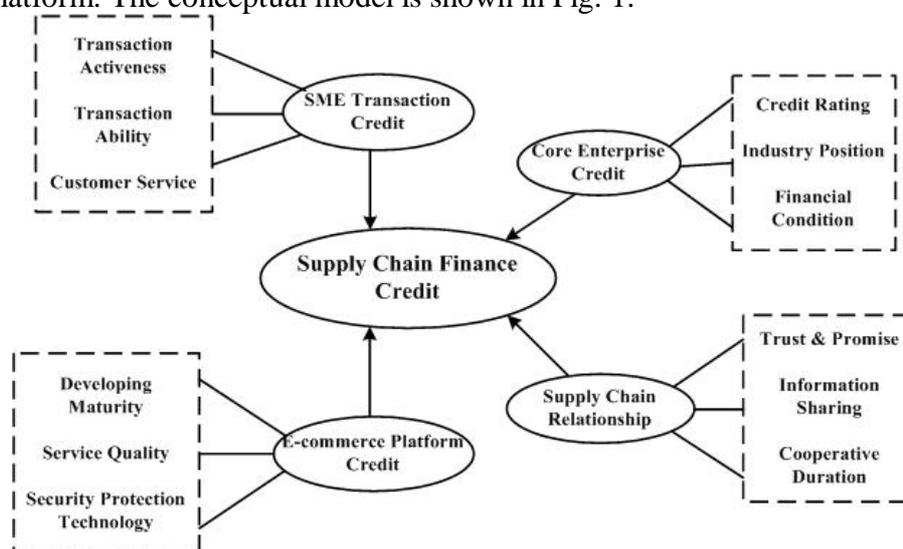


Figure 1. Conceptual Model

**SMEs Transaction Credit.** Compared with traditional transaction, e-commerce has the advantage that all transaction-related data can be accurately recorded in the database. Based on this feature, we can evaluate dynamic transaction credit of an enterprise. Piao<sup>[9]</sup> pointed out the credit of an enterprise on a B2B website can be divided into basic credit and transaction credit. Transaction credit referred to dynamic indicator, including the total transaction amounts, the total transaction value and transactions account return rate. Wang et al.<sup>[10]</sup> built an online credit scoring model, which identified important non-financial factors that could improve the prediction accuracy. Hypotheses of transaction activeness, transaction ability and customer service are as follows:

H1: SMEs' transaction credit has positive impact on the supply chain finance credit level;

H1-a: The transaction activeness of SME has positive effect on its transaction credit level;

H1-b: The transaction ability of SME has positive effect on its transaction credit level;

H1-c: The customer service of SME has positive effect on its transaction credit level.

**Core Enterprise Credit.** No matter the traditional SCF or the newly developed financing model, core enterprises always play an important role. In supply chain finance, commercial banks mitigating credit risk mainly depend on core enterprises, whose repayment willingness and repurchase pledge have significant impacts on loans given by commercial banks <sup>[11]</sup>. Industry status and reputation of core enterprises also had important influence on its credit level. If the credit level of core enterprise was higher, the moral hazard risk would be smaller and it was less prone to default motives. Accordingly, in this paper, we put forward the following hypotheses about core enterprise credit.

H2: The core enterprises' credit has positive impact on supply chain finance credit;

H2-a: The credit rating of core enterprise has positive effect on core enterprise credit;

H2-b: The industry position of core enterprise has positive effect on core enterprise credit;

H2-c: The financial condition of core enterprise has positive effect on core enterprise credit.

**Supply Chain Relationship.** Different research literatures assess the supply chain relationship from different dimensions. Naude and Buttel <sup>[12]</sup> held that trust and commitment were two important dimensions for assessing supply chain relationship. If the supply chain enterprises did not trust each other, the risk of default in supply chain would rise and the stability of partnership would be reduced. Chinho L et al. <sup>[13]</sup> made an empirical research, finding that information sharing and trust between partnerships positively impact enterprise performance. Fynes and DeBurca <sup>[14]</sup> found information sharing between supply chain enterprises had positive effect on corporate performance. To sum up, the dimensions that we could use to assess supply chain relationship level include trust and commitment, information sharing and cooperative duration.

H3: Supply chain relationship has positive impact on supply chain finance credit level;

H3-a: Trust and commitment between enterprises positively affects supply chain relationship;

H3-b: Information sharing between enterprises positively affects supply chain relationship;

H3-c: Cooperative duration of enterprises positively affects supply chain relationship.

**E-commerce Platform Credit.** The e-commerce platform is a lending intermediary that uses Internet structure to facilitate loans. Pavlou <sup>[15]</sup> investigated the influencing factors of credit level of B2B e-commerce platform. The bank's trust in the e-commerce platform was based on transaction safety the platform could provide, such as fraud protection, authentication and verification. Chen et al. <sup>[16]</sup> made an empirical research on P2P platform, revealing that the credit level of an e-commerce platform was generally based on whether it was safe for the transaction and whether it provided high-quality services. The e-commerce platform which was assessed high credit helped banks mitigate SMEs' financing risk. Other than safety and protection, lenders also expected the platform to provide high-quality service to facilitate the transactions. According to the previous researches, we raised the following hypotheses:

H4: E-commerce platform credit has a positive impact on supply chain finance credit level;

H4-a: Developing maturity of e-commerce platform positively affects its credit level;

H4-b: Service quality of e-commerce platform positively affects its credit level;

H4-c: Security protection technology of e-commerce platform positively affects its credit level.

## Research Method

To ensure the content validity of the measures, we designed the questionnaire after reviewing a large amount of literatures and visiting several experts in supply chain finance field. We also made adaptations before the formal data collection. Our finalized questionnaire comprised two parts. The first part was the main content, including extent of the influencing factors. We used the 7-point Likert Scale to measure the importance of detailed factors, ranging from 1 to 7. The second part collects respondents' demographic information.

**Data Collection and Descriptive Statistics.** Empirical data for this study was obtained through questionnaire survey. A total of 465 responses were collected. After a careful comparison of the data, invalid responses were screened out and a total of 446 valid responses were obtained for analysis. The effective recovery rate reached 95.91%. Basic information of respondents was shown in Table 1.

Table 1 Basic information of respondents

Information	Detail	Percentage
Age	23-30	31.8%
	31-40	34.8%
	41-50	26.5%
	Above 50	6.8%
Profession	University Professors	36.1%
	Bank Clerk	50.4%
	Firm Manager	13.5%
	Less than 1 year	9.8%
Study/Working years	1-3 years	47.4%
	3-5 years	36.1%
	More than 5 years	6.8%

**Results and Data Analysis.** SPSS 19.0 and structural equation model with AMOS 17.0 was applied to analyze the data. A two-step procedure was followed. First, the measurement model was examined to assess construct reliability and validity. Then, the structural model was tested to evaluate the causal relationships among the theoretical constructs.

The reliability analysis was shown by Table 2. Except for cooperative duration (0.669), the value of Cronbach's Alpha were all >0.7. All composite reliability values were >0.7, suggesting acceptable reliability.

Table 2 Cronbach's Alpha Analysis

Main Factors	Detailed Factors	Cronbach's Alpha	
SME Transaction Credit (SME TC)	Transaction Activeness (TAC)	0.794	0.834
	Transaction Ability (TAB)	0.831	
	Customer Service (CS)	0.802	
Core Enterprise Credit (CEC)	Credit Rating (CR)	0.768	0.776
	Industry Position (IP)	0.749	
	Financial Condition (FC)	0.854	
	Trust & Promise (TP)	0.716	
Supply Chain Relationship (SCR)	Information Sharing (IS)	0.750	0.709
	Cooperative Duration (CD)	0.669	
	Developing Maturity (DM)	0.776	
E-commerce Platform Credit (EPC)	Service Quality (SQ)	0.827	0.854
	Security Protection Technology (SPT)	0.925	

Construct validity was also tested by SPSS. The composite KMO was 0.814 and chi-square significant level was 0.000, suggesting it was suitable for factor analysis.

Table 3 KMO Test and Bartlett Test

Kaiser-Meyer-Olkin Test	.816
Bartlett sphericity test	Approximate chi-square
	1682.853
	df
	231
	Sig.
	.000

Next, structure model was also analyzed using SEM. The results were shown in Table 4. We adopted maximum likelihood method to estimate parameters. In this paper, we set the non-standardized regression coefficient of EPC→SCFC as fixed parameter. So this item did not have a significant test on path coefficient and the Critical Ratio (C.R.), sig. p value was vacant.

In structural equation modeling, when the absolute value of C.R. exceeded 1.96, the regression coefficient made difference under the significant level of 0.05. In this paper, according to the parameters provided by AMOS 17.0, we firstly analyzed whether the standardized path coefficient was consistent with the relationship between the variables that proposed by above hypotheses, and then analyzed whether hypothesis reached significant level.

As shown in Table 4, among the four main factors that influencing supply chain finance credit, the influences were all significant, suggesting support for H1, H2, H3 and H4. SME TC→SCFC, CEC→SCFC, EPC→SCFC showed significant under the 0.001 level, while SCR→SCFC ( $p=0.023$ ) had a significant impact under 0.05 level. From the standardized path coefficient, the coefficient of core enterprise was 0.810, which indicated core enterprise credit still played an important role.

Table 4 Hypothesis Testing Result

	Hypothesis	Standardized path coefficient	C.R.	P	Label
H1	SME TC→SCFC	0.796	5.649	***	
H2	CEC→SCFC	0.810	6.087	***	
H3	SCR→SCFC	0.470	2.279	0.023	
H4	EPC→SCFC	0.780			
H1-a	TAC→SME TC	0.647	6.725	***	
H1-b	TAB→SME TC	0.778	7.713	***	
H1-c	CS→SME TC	0.664	6.893	***	
H2-a	CR→CEC	0.598	6.924	***	
H2-b	IP→CEC	0.392	4.338	***	
H2-c	FC→CEC	0.850	9.871	***	
H3-a	TP→SCR	0.800	2.691	0.009	
H3-b	IS→SCR	0.688	2.613	0.009	
H3-c	CD→SCR	0.528	2.502	0.012	
H4-a	DM→EPC	0.513	6.173	***	
H4-b	SQ→EPC	0.407	4.748	***	
H4-c	SPT→EPC	0.934	14.073	***	

(Note: \*\*\*  $P<0.001$  significant)

Table 5 shows the structure model indicators. The model fits the data well, with  $CMIN=270.873$  and  $df=131$ . The goodness-of-fit indexes are  $GFI=0.940$ ,  $TLI=0.944$ , and  $CFI=0.981$ , greater than the limit of 0.90. The RMSEA is 0.062, lower than 0.10.

Table 5 Structure Model Indicators

Item	CMIN	CMIN/df	RMSEA	GFI	TLI	CFI
Value	270.873	2.068	0.062	0.940	0.944	0.981

## Conclusion and Suggestions

This paper investigated the factors that influence supply chain finance credit in the e-commerce market. We analysed the difference between SCF based on e-commerce platform and the traditional SCF, then proposed a conceptual model. The influencing factors were tested through questionnaire survey from 446 respondents. Results show that SME transaction credit, core enterprise credit, SC relationship and e-commerce platform credit have positive impact on the credit level of SCF.

According to the major findings, we proposed the following suggestions for supply chain finance credit risk management from different perspectives.

(1) Banks and other financial institutions should adapt traditional risk management techniques to address the new concerns that arise with electronic business. Moreover, some key non-financial factors should be taken into consideration when evaluating the SME credit. Transaction records in e-commerce platform can be a supplement to traditional credit risk control.

(2) SMEs should attach importance to the indicators that set by intermediaries. Transaction data recorded by e-commerce platform is an important part for SME credit evaluation. In traditional financing, SMEs have less advantage in financial data, while in ecommerce market they can use the transaction records to make up the lack of financial information.

(3) For e-commerce platform operators there are two implications. On one hand, it is extremely important for e-commerce platform to improve their service quality and to ensure the safety of funds, which can significant improve its creditability. On the other hand, e-commerce platform need to strictly control the market access conditions and set more stringent entrance requirements so as to provide a good environment for the supply chain financing.

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