

The Impact of Online Sales on Corporate Financing Constraints

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Abstract: China's online sales platforms have surged in the past 15 years, meeting the needs of the majority of consumers and leading economic growth, while also affecting many e-commerce enterprises in terms of investment and financing mechanisms. The ratio of e-commerce online sales to main business income as alternative data contains corporate investment and financing information, and KZ index is finally selected to describe the financing constraints after comparative validation. Using online sales data from Chinese A-share listed companies and some financial data of enterprises in 2016-2022, this paper conducts regression analysis on KZ index and empirically finds that the increase in the online sales ratio is strongly negatively correlated with the degree of funding constraints faced by businesses. With a high degree of participation in e-commerce activities, enterprises will have less financing pressure. This finding brings some inspiration for enterprise operation and financing decisions. Enterprises can reduce the degree of financing constraints by increasing the online sales ratio, so as to better obtain external financing and improve the growth and development of enterprises.

Keywords: online sales, financing constraints, alternative data, e-commerce

1. Introduction

Now, many enterprises also face the problems of financing constraints to varying degrees. Financing constraints refer to the various restrictions and difficulties encountered by enterprises in the financing process, such as excessive debt and high financing costs. Now, the global economy is developing rapidly and digital technology is known and used for more places. In this background, online sales have become an integral part of the business environment. Compared with traditional physical stores, online sales offer a broader market, a wider variety of products for customers to choose from, and a more convenient shopping experience. In the process of online sales, consumers generate a large amount of data when purchasing goods or services. Since it is collected from non-standard sources as compared to traditional financial information data, these data are referred to as alternative data [1]. Alternative data are non-traditional data sources that complement traditional financial data and can be used to measure information on market trends, consumer behavior, and business performance [2].

We focus on online sales and corporate finance constraints, trying to reveal the importance of online sales embodied in alternative data in terms of enterprise financing ability and enterprise development.

Currently, the research hot spot of some scholars is increasingly focusing on corporate finance constraints. They analyze what may influence financing constraints from a macro-level perspective and a micro-level perspective. At the macro level, the reasons include the lack of integrity of the overall financial market [3] and the inefficiency of the credit environment [4]. At the micro level, there are reasons for differences in the enterprise's financial situation [5] and differential treatment of ownership [6]. However, regarding the relationship between alternative data and corporate financing constraints, some articles have investigated that alternative data represented by regional digital finance can help alleviate the firms' financing constraints through discrimination of enterprise operation scale, ownership discrimination, and mismatch of financial resources [7]. In addition, for governments and financial institutions, understanding the impact of online sales on corporate finance constraints can increase financial availability and competition in banking outlets, as well as help formulate more effective policies to promote sustainable economic development [8].

However, there are fewer studies by the above scholars on how the degree of online sales will have a direct impact on corporate finance constraints. Therefore, this paper selects the online sales ratio in alternative data as the core of the study, trying to explore the influence of online sales on corporate finance constraints. The research is mainly divided into the following parts. Firstly, we read the relevant literature to understand the content of existing studies on corporate finance constraints and the factors that may affect corporate finance constraints. And then we formulated the hypotheses. Then, we use the alternative data of online sales data to mine the relevant information reflecting the business development of companies. The online sales ratio in the Wind database is chosen as a measure of online sales, and for the measure of financing constraints, we decided to use the KZ index in the CSMAR database, and regression analyses are carried out by using the two-way fixed effect model of enterprise and year, and the data for regression analyses are adopted from the relevant data of 144 enterprises within 2016-2022, and the results can prove the rationality of hypotheses.

Considering the main contributions of our paper, firstly, it provides enterprises and financial decision-makers with solution paths to address the financing difficulty of SMEs. By studying the relationship between online sales and financing constraints, we can better understand the mechanism by which online sales affect business financing and provide a basis for enterprises to make more informed decisions on debt financing. Second, this study establishes for the first time the relationship between the demand side and business financing and reinvestment based on alternative data. Based on online sales, it predicts the financial situation of enterprises and then learns the demand for business financing. At the same time, it can also provide some predictive indicators on credit rating and enhance one of the rating criteria for its own credit rating.

It is hoped that the discussion in this study will provide more comprehensive and practical financing strategies and decision support for companies, as well as new insights for academics about the relationship between online sales and corporate finance constraints.

We briefly summarize the paper's framework. In the beginning, we mainly review some of the relevant literature that we have read and present the hypotheses of this study. Then, we present the data situation, variable selection situation, and model situation of this paper and analyze and show the results of descriptive statistics and correlation tests of the sample data. Then we state the main regression analysis and robustness test of this study. The hypotheses proposed in this study can be verified as valid. Finally, we draw research conclusions and present relevant policy recommendations on developing online sales and coping with financing constraints.

2. Literature Review

Early scholars at home and abroad have conducted research on corporate finance constraints. Farag and Johan argued that alternative financial businesses can solve the problem of corporate finance constraints by resolving information asymmetry, improving information disclosure, preventing adverse selection, and providing new types of alternative financing channels such as angel investment, risky investment, private equity, crowdfunding, and so on [9]. Guo et al. empirically proved that big data-related fintech data can reduce corporate finance constraints through corporate direct and indirect financing in order to promote inter-bank competition [4]. The study of Wang et al. focused on financing constraints faced by firms and disclosure of information. Firms need to recognize the advantages and risks associated with disclosure and choose the appropriate disclosure way [10]. Ye et al. showed that differences in strategies adopted by firms, such as capital intensity, advertisement intensity, and so on, compared to the industry standards in which they operate, increase their debt financing cost. Some risks due to deviations make creditors require higher returns [11]. Furthermore, a study by Néstor et al. states that less than 100 percent of consumer purchases are shifted from online to offline for all three products without online sales channels for three electronic products. Moreover, when there are online sales channels, the increase in consumer surplus is higher [12]. Combined with related literature, we determine the hypotheses of this study:

Hypothesis: The better the online sales, the lower the level of financing constraints on publicly traded firms.

3. Data Description, Modelling and Statistical Analysis

3.1. Data Description

This paper continues the online sales data used by Wang et al. as the main data source of this study, which is taken from the Wind Information data and the database of CSMAR. Wind Information released the non-traditional data product of "online sales" in December 2018, which covers thousands of brands of more than 200 A-share listed companies. Wind Information uses web crawlers and artificial intelligence technology to analyze the online sales of e-commerce categories, brands, and all products of listed companies [13]. In this paper, the company's annual online sales index is selected as the research object, and the sample interval is from 2016 to 2022, totaling seven trading years. In order to avoid the interfering factor of listing year, the data of each company's listing year is excluded in the data processing process, and finally, 144 A-share listed companies are obtained as samples, which belong to the seven Ali-e-commerce first-level categories of electronics and electrical appliances, building materials and home furnishings, food & beverages, pharmaceuticals & biotechnology, textiles & garments, culture & education, sports & recreation, and handicrafts & household chemicals. In addition, this paper also uses different firms' financial data rows for analysis. To assure the reliability of the results, all continuous variable data are taken as 1 percent and 95 percent quartiles for upward and downward shrinkage.

3.2. Definition of Variables

3.2.1. Explained Variable: KZ

This paper investigates how online sales will affect corporate financing constraints, drawing on Kaplan and Zingales' method of constructing indicators of financing constraints. The KZ index is used in this study as a proxy for business funding limitations [14], which is chosen as an explanatory variable in this paper, and its specific construction method is as follows:

Firstly, $\text{Cash Flow}_{i,t}/\text{Asset}_{i,t-1}$ is used to calculate the impact factor for every year in the full sample, and $\text{Dividends}_{i,t}/\text{Asset}_{i,t-1}$, the $\text{Cash Holding}_{i,t}/\text{Asset}_{i,t-1}$, Lev and Q value.

Secondly, if the $\text{Cash Flow}_{i,t}/\text{Asset}_{i,t-1}$ value falls below the median, KZ_1 takes 1, otherwise, it takes 0; the $\text{Dividends}_{i,t}/\text{Asset}_{i,t-1}$ value is less than the median, KZ_2 will be 1, if not 0; the $\text{Cash Holding}_{i,t}/\text{Asset}_{i,t-1}$ value is lower than the median, KZ_3 is 1, or else is 0; if the LEV value is greater than the median, KZ_4 retrieves 1, if not then 0; if the Q value is greater than the median, KZ_5 takes 1, otherwise takes 0.

Finally, KZ is calculated and logistic regression is applied to the following equation (1), where a larger value of KZ means that the firm faces a higher degree of financing constraints.

Model (1):

$$KZ = KZ_1 + KZ_2 + KZ_3 + KZ_4 + KZ_5 \quad (1)$$

3.2.2. Explanatory Variable: Salesrate

In this paper, 144 enterprises from seven industries, namely, electronics & electrical appliances, textile & apparel, household chemicals, building materials & home furnishings, food & beverages, culture & education, sports recreation & handicrafts, and pharmaceuticals & biotechnology, were selected from 2016-2022, and the ratio of the online sales of these enterprises to the main business revenue of these enterprises for the year was regarded as an explanation variable, which is hereinafter referred to as the "online sales ratio".

3.2.3. Financial Data in the Model

By referring to previous literature, the control variables that affect the financing constraints of the firms are selected by this paper in Table 1. Thus we choose the net rate of total assets (ROA), firm growth (Growth), gearing ratio (Lev), fixed assets ratio (Fixed), cash holding ratio (Cash), and asset size (Size) to control for the effects of these factors on firm financing constraints in the regression [15].

Table 1: Variables selection and interpretation.

Variables	Representation	Definition
Financing constrains	KZ	The greater the KZ index, the more firm's financing constraints.
Online sales ratio	Salesrate	$P = (\text{Sales}/\text{Income}) \times 100000$
Return on assets	ROA	$\text{ROA} = \text{Net profit}/\text{Size}$
Company Growth	Growth	$\text{Growth} = (\text{Income}_T - \text{Income}_{T-1}) / \text{Income}_{T-1}$
Assets-liability ratio	Lev	$\text{Lev} = \text{Debt}/\text{Size}$
Fixed asset ratio	Fixed	$\text{Fixed} = \text{Net Fixed Assets}/\text{Size}$
Cash holding ratio	Cash	$\text{Cash} = \text{Cash and cash equivalents} / \text{Asset Size}$
Asset size	Size	Natural measure of Asset Size

3.3. Modelling

To study the impact of online sales on funding constraints for companies, i.e. to test hypothesis 1, the model (2) is constructed after referring to the factors affecting financing constraints:

Model (2):

$$KZ = \beta_0 + \beta_1 * \text{Salesrate} + \beta_2 * \text{ROA} + \beta_3 * \text{Growth} + \beta_4 * \text{Lev} + \beta_5 * \text{Fixed} + \beta_6 * \text{Cash} + \beta_7 * \text{Size} + \Sigma \text{Year} + \Sigma \text{Company} + \varepsilon_1 \quad (2)$$

This model is used to explore the impact of online sales as a share of main business revenue on the firm's financing constraints, and considers control variables such as return on assets, firm growth, and so on.

3.4. Statistical Distribution of the Main Variables

Table 2 provides a visual representation of the main variables. The mean value of financing constraint (KZ) is 0.440, and there is a standard deviation: 2.306 is between the interval [-7.760,8.505], stating that funding constraint varies greatly among different enterprises, but is in a balanced state in general. The mean value of online sales ratio (Salesrate) is 2.096, and the standard deviation is 8.466, which demonstrates that the proportion of online sales of e-commerce companies varies greatly in the Internet financial environment.

Table 2: Statistical distribution of the main variables.

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
KZ	1,008	0.4398	2.3065	-7.7596	8.5046
Salesrate	1,007	2.0967	8.4660	0.0003	161.4696
ROA	1,008	6.2125	9.1776	-89.4354	46.9797
Lev	1,008	0.4012	0.1864	0.0384	1.9566
Fixed	1,008	18.8698	12.2835	0	64.6391
Cash	1,008	0.2097	0.1338	0.0049	0.7842
Growth	1,008	0.1541	1.7483	-0.8563	55.0444
Size	1,008	22.6950	1.1588	19.5046	26.7696

3.5. Correlation Test

The correlation test is conducted on the data, and Table 3 presents the test results. The online sales ratio and KZ index have a negative correlation coefficient, and this correlation is significant, which is an indication of a negative correlation between online sales and corporate financing constraints, which is in line with the hypotheses put forward in the previous section, and proves that the main regression test has a certain degree of feasibility.

Table 3: Results of correlation test.

	KZ	Salesrate	ROA	Lev	Fixed	Cash	Growth	Size
KZ	1							
ROA	-0.078**	1						
Lev	0.629***	0.042	1					
Fixed	0.576***	0.108***	0.431***	1				
Cash	-0.009	0.154***	-0.041	0.138***	1			
Growth	0.417***	0.135***	0.284***	0.148***	0.245***	1		
Size	0.082***	0.002	0.028	0.003	0.022	0.014	1	
Salesrate	0.116***	0.122***	0.229***	0.238***	0.139***	0.115***	0.056*	1

Notes: *** p<0.01, ** p<0.05, * p<0.1

4. Regression Analysis

The effect of online sales on firms' financing constraints is tested using a fixed effects model in this study. Firstly, the results of the regression analysis using the enterprise KZ index to represent the degree of financial stress are presented in Table 4. The regression results proved that controlling for the year and the firm, for every 0.1 per cent increase in the firm's online sales ratio, the KZ index decreases by 0.9, and this result is significant at the 0.05 level of significance. It can be proved that an increase in online sales causes a decrease in the KZ index, which is equivalent to a decline in the degree of corporate financing constraints. The study proves that hypothesis of this paper is valid.

Table 4: Results of regression test of KZ index.

VARIABLES	KZ	KZ
Salesrate	-0.021**	-0.009**
	(-2.47)	(-2.10)
ROA	-	-0.022**
	-	(-2.16)
Lev	-	3.276***
	-	(4.91)
Fixed	-	0.015
	-	(1.47)
Cash	-	-5.968***
	-	(-9.24)
Growth	-	-0.064***
	-	(-8.69)
Size	-	-0.040
	-	(-0.21)
Constant	0.482***	0.460
	(6.45)	(0.11)
Observations	1,007	1,007
Numbers	144	144
R ²	0.411	0.411
Company	NO	YES
Year	NO	YES
Test of F	0.0138	0
r ² _adjust	0.00503	0.403
F values	6.082	66.81

Notes: *** p<0.01, ** p<0.05, * p<0.1

5. Robustness Tests

Referring to Hadlock and Pierce, in order to avoid endogenous interference, only firm size and firm age are used to build the SA, which is calculated by the following formula [16]:

Model (3):

$$SA = -0.737 \times \text{Size} + 0.043 \times \text{Size}^2 - 0.04 \times \text{Year} \quad (3)$$

When Size is the size of the business and Year is the number of years the business was enrolled, and both are truncated above the 95 percent quartile in the calculation. The SA index is indicating a

negative trend, with higher absolute values indicating a higher degree of corporate financial constraints.

For the robustness test, the SA was selected to measure the degree of financing constraints of the firms in this study, and the regression analysis results are presented in Table 5. The interpretation of this regression result is that for every 1 percent increase in the online sales ratio of firms, the SA index increases by 0.5. Moreover, this result is significant at the significance level of 0.01. Therefore, using the SA as a gauge of funding limitations may also prove this: The financing constraints faced by firms are mitigated by the increase in online sales of firms.

In summary, the results of the robustness test show that modifying the SA as a proxy for business funding constraints may lead to the same conclusion. As a result of increasing online sales, enterprises will face fewer financing constraints, as shown by the results, which can prove that the model for this article is properly defined and that the conclusions are solid.

Table 5: Results of regression test of SA index.

VARIABLES	SA
Salesrate	0.0005***
	(2.85)
ROA	-0.0002
	(-0.75)
Lev	-0.014
	(-0.40)
Fixed	-0.0001
	(-0.18)
Cash	-0.036
	(-1.39)
Growth	0.001**
	(2.31)
Size	0.022*
	(1.81)
Constant	-4.357***
	(-15.97)
Observations	1,007
Numbers	144
R ²	0.894
Company	YES
Year	YES
Test of F	0
r ² _adjust	0.892
F value	305.1

Notes: *** p<0.01, ** p<0.05, * p<0.1

6. Conclusion

The issue being investigated in this study is the impact of online sales on corporate financing constraints, flexing the effect model returning analysis of the research method, online sales data from Wind information data and CSMAR database. This paper draws on the previous method of constructing financing constraint indicators and adopts the KZ index as a gauge of corporate financial limitation.

This paper adopts the research method of fixed-effects model regression analysis, and the results demonstrate that increased online sales are significantly negatively correlated with corporate financing constraints. That is a growth in the proportion of online sales is able to effectively reduce the financial limitations that exist in enterprises. As businesses continue to grow their online sales channels, their sales also visibility are increased, thus reducing the need for external financing.

In view of the findings, it is recommended that the government strengthen the supervision of online sales platforms to ensure the legitimacy and effectiveness of their financing support services; at the same time, enterprises should actively expand their online sales channels to increase the visibility of their products and reduce the need for external financing. Banks and other financing institutions can develop more flexible and low-cost financing products to meet the financing needs of enterprises based on their online sales.

Finally, alternative data is currently developing very rapidly and has become active in the public eye, but there are still only a few academic studies on alternative data. The research in this paper not only deals with online sales data in China's A-share market, a typical alternative data that provides new perspectives and grounds for the previous queries, but also provides capital market participants with information to understand the characteristics and delivery methods of alternative data. We hope that regulators and investors will recognize the informational value of alternative data and promote the dissemination of alternative data in the market through practical actions to improve market efficiency. However, it should also be mentioned that the collection channels of alternative data are currently fewer and need to be further improved in terms of accuracy and real-time. Therefore, in future studies, we will continue to look for data with accuracy and timeliness from many different channels to explore the useful information contained in alternative data.

Authors Contribution

All the equitably each author contributed and their names were arranged alphabetically.

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