

# Influence of Financial Derivatives on Innovation Behavior of Listed Companies -- Based on the Empirical Research of Listed Manufacturing Companies in China

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## ABSTRACT

In recent years, with the economy of our country gradually transforming from high speed growth to quality development, due to the upgrading sino-US trade friction, the complicated international political relations, the increasing RMB exchange rate volatility and the impact of rising labor costs, many manufacturing listed companies in our country faces various risks, and their innovation behavior have been affected a lot as well. At the same time, with the emergence of financial derivatives, many listed manufacturing companies began to increase capital allocation of financial derivatives to hedge risks, trying to stabilize corporate cash flow, increase investment in R&D innovation. Therefore, this paper takes China's A-share listed manufacturing companies from 2018 to 2020 as the research object to conduct an empirical study on the relationship between the use of financial derivatives and enterprise innovation behavior of listed manufacturing companies. The results show that : (1) in the context of sino-US trade friction, the use of financial derivatives still has a positive effect on firms' innovation behavior; (2) If enterprises use financial derivatives for speculative purposes, it will not promote the innovation of enterprises.

**Keywords:** financial derivatives; innovation behavior; sino-US trade friction

## 1. RESEARCH BACKGROUND AND LITERATURE REVIEW

At present, there are a large number of literatures studying the motivation and economic impact of the use of financial derivatives at home and abroad (Sohnke M. Bartram et al.<sup>[1]</sup>, 2009; Francisco, etc.<sup>[2]</sup>, 2013; Zhao Xu etc.<sup>[3]</sup>, 2013; Yang Shenggang et al.<sup>[4]</sup>, 2021), but few literatures directly study the relationship between financial derivatives and micro firms' innovation behavior. A few literatures have studied the relationship between financial derivatives and enterprises' innovation behavior (Hao Xiangchao et al.<sup>[5]</sup>, 2019), but they have ignored the influence in the context of Sino-US trade friction. China's financial derivatives market is exerting more and more influence on micro enterprises. Therefore, in the context of China's double-cycle development pattern and globalization, it is of great theoretical and practical significance to study the influence of financial derivatives on enterprises' innovation behavior.

The existing literature at home and abroad mainly focuses on the study of financial derivatives and enterprise value, enterprise business performance, enterprise risk management and other aspects. In terms of enterprise value, Erik and Jerome<sup>[6]</sup>(2017), Du Jian et al.<sup>[7]</sup>(2019) believe that enterprises can reduce financial distress by hedging risks by using financial derivatives, and exert tax shield effect to reduce tax burden and increase enterprise value. Zhao Xin et al.<sup>[8]</sup>(2019) found that financial derivatives can alleviate underinvestment and reduce agency costs, thus improving enterprise value. Guo Fei et al.<sup>[9]</sup>(2013) believe that financial derivatives can improve enterprise value by reducing foreign exchange risk, but they believe that the reliability of research is affected by endogeneity. In terms of business performance, Yang Shenggang et al. (2021) further study found that the use of financial derivatives by enterprises is conducive to reducing the volatility of corporate performance and stabilizing corporate performance. Wang Chengguang<sup>[10]</sup>(2020) points out that although financial derivatives can improve the performance of

listed companies, the effect is relatively small. In terms of enterprise risk management, Almeida et al.<sup>[11]</sup>(2017) proved the important role of financial derivatives in enterprise risk management through research. Li Lin<sup>[12]</sup>(2016) believes that enterprises can actively and effectively manage interest rate risk by using financial derivatives. Si Wen<sup>[13]</sup>(2014) agrees that financial derivatives have inhibitory effects on individual risks and system risks, but thinks that different financial derivatives have different effects on individual risks.

There are few domestic literatures that analyze the direct impact of financial derivatives on enterprise innovation behavior. Hao Xiangchao and Liang Qi (2019) found the promotion effect of foreign exchange derivatives hedging on enterprises' innovation behavior. Li Qinghua et al.<sup>[14]</sup>(2021) believe that in the process of hedging financial derivatives, the risk preference of executives is the main reason for the increase of enterprise innovation behavior. Therefore, in order to prove the influence mechanism between financial derivatives and enterprises' innovation behavior, these studies involve the influence of financial derivatives on enterprises' innovation behavior, but ignore the context of Sino-US trade friction. Therefore, this paper proposes the first hypothesis:

Hypothesis  $\alpha$ : In the context of Sino-US trade frictions, the use of financial derivatives by enterprises can still promote their innovative behaviors

Meanwhile, Geczy et al.<sup>[15]</sup>(2007) also proposed that if enterprises use financial derivatives for speculative purposes, it will destroy the stability of cash flow and is not conducive to the smooth progress of enterprise innovation. Since the innovation behavior itself is highly risky, the innovation behavior of enterprises is highly dependent on stable cash flow. Therefore, the second hypothesis is proposed in this paper:

Hypothesis  $\beta$ : If an enterprise uses financial derivatives for speculative purposes, the use of financial derivatives will not promote the innovative behavior of the enterprise

## 2. EMPIRICAL ANALYSIS

### 2.1 Sample selection and modeling

This paper collected the relevant data of 2842 Chinese A-share manufacturing listed companies by Wind database and the annual reports of listed companies, and processed them as follows: (1) Excluded the abnormal enterprise samples such as ST, \*ST, PT and financial companies; (2) Eliminate the enterprise samples with gaps in relevant data. Finally, 2223 observations of 247 listed manufacturing companies are obtained, which are mixed cross-section data.

The disclosure on the usage of financial derivatives of current domestic manufacturing industry listed companies is not detailed enough. So in this article, the data about financial derivatives (forwards, swaps, futures, options, etc.) are collected through Wind database and manual sorting, and eventually get enterprise's financial derivatives, namely the derivative financial assets.

Referring to the research of Hao Xiangchao et al. (2019) and Li Qinghua et al. (2021), this paper adopts the following econometric model:

$$INNO_{it} = a_0 + a_1DER_{it} + a_2CV + a_3Code + a_4Year + \epsilon_{it} \quad (1)$$

Where,  $INNO_{it}$  is the innovation behavior of company  $i$  in the year  $t$ , and uses R&D input to measure innovation input.  $DER_{it}$  is the use of financial derivatives of company  $i$  in the year  $t$ , which is, the sum of all financial derivatives.

$CV$  is a series of control variables, mainly includes enterprise size ( $SIZE$ ), asset-liability ratio ( $LEV$ ), return on total assets ( $ROA$ ), company establishment years ( $FA$ ), free cash flow ( $CF$ ) and other financial variables, as well as corporate governance variables such as shareholding ratio of the largest shareholder ( $FIRST$ ), board size ( $BDSIZE$ ) and property rights ( $STA$ ). Code and Year are dummy variables, controlling the influence of individuals and time. The main variables used in this paper are defined in the following table:

Table 1 Variables and Variable definitions

	Variable	Variable definitions
<b>Explained variable</b>		
The innovation	<i>INPUT</i>	Corporate R&D expenditure (R&D expenditure)
<b>Explanatory variables</b>		
Financial derivatives	<i>DERI</i>	Total data of various financial derivatives of the enterprise (derivative financial assets)
<b>Control variables</b>		
Assets	<i>SIZE</i>	The natural log of total assets
Asset-liability ratio	<i>LEV</i>	Total liabilities/total assets

Return on total assets	<i>ROA</i>	Operating profit/Total assets
Company Establishment Year	<i>FA</i>	Total years of the Company from inception to 2020
Free cash flow	<i>CF</i>	Free cash flow/Total assets
Shareholding ratio of the largest shareholder	<i>FIRST</i>	Number of major shareholders/number of common shares
Board size	<i>BDSIZE</i>	Number of board members
Property rights	<i>STA</i>	Whether the enterprise is state-owned property right, state-owned take 1, otherwise take 0

**2.2 Descriptive statistical analysis**

**Table 2** Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
INPUT	247	12.058	21.851	027.	109.056
DERI	247	952.	2.48	0	15.608
LEV	247	49.43	15.38	15.241	77.713
ROA	247	052.	046.	- 08	176.
FA	247	23.421	5.976	5.8	41.726
CF	247	015.	07.	- 181.	15.
FIRST	247	37.297	16.647	9.98	93.05
BDSIZE	247	8.312	1.941	0	14
STA	247	36.	481.	0	1

We made a simple descriptive statistical test in order to observe the data distribution of the selected variables. According to the descriptive statistical test in Table 2, listed companies have different allocation of R&D expenditures, and the difference is great, which is closely related to the asset scale and the establishment years of listed companies. At the same time, the minimum return on assets and free cash flow of the sample enterprises are negative, indicating that some enterprises are under great pressure in capital operation and business management

during the sino-US trade war, which increased the motivation to speculate or hedge risks through financial derivatives. In addition, the proportion of non-state-owned enterprises in sample enterprises is as high as 64%, indicating that non-state-owned enterprises are more inclined to use financial derivatives than state-owned enterprises.

**2.3 Regression analysis**

**Table 3** Regression results

VARIABLES	INPUT	VARIABLES	INPUT
DERI	0.478*** (3.161)	SIZE	12.451*** (4.192)
LEV	-0.076 (-0.935)	ROA	13.719 (0.962)
CF	4.835 (1.138)	FIRST	-0.067 (-1.019)
BDSIZE	-0.270 (-1.122)	Constant	-272.779*** (-3.983)
Observations	209	R-squared	0.992
Code	YES	Year	YES

r2\_a 0.985 F 5.116

t-statistics in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 3 reports the regression results of corporate R&D spending and financial derivatives. It can be seen that DERI's regression coefficient is 0.478 and is significant at the 1% level. This fully shows that listed companies use financial derivatives to promote its own innovation behavior, the results support the hypothesis H1 of this paper effectively, namely under the background of the sino-US trade friction, the use of financial derivatives can still promote enterprise innovation behavior. At the same time, the relationship between the size of companies and R&D expenditure is also significantly positive. It is speculated that because some enterprises have more assets to protect, they are more motivated to use financial derivatives.

Although the above research results support the promotion effect of enterprises' use of financial derivatives on enterprises' innovation behavior, the influence of enterprises' use of financial derivatives for speculative purposes on enterprises' innovation behavior

cannot be excluded. Due to the limited information disclosure of financial derivatives by sample enterprises, it is relatively difficult to accurately identify the purpose and impact of the use of corporate financial derivatives. Generally speaking, when enterprises stock rights are relatively centralized, most economic subjects are more inclined to use financial derivatives for speculation because the strong stockholders are more likely to sacrifice the benefit of the minority shareholders in order to maximize their own profit. When the stock rights are relatively scattered, enterprises are more inclined to use financial derivatives for hedging, since the strong stockholders can be restricted by other stockholders. Although the above method cannot completely identify the impact of speculative purpose on the innovation behavior of financial derivatives, it is still feasible to use "the concentration ratio of stock rights" as a tool to identify the purpose of use. Therefore, this paper divided 247 enterprise samples into two groups according to the median of the index 'First'.

**Table 4** Grouping regression results

VARIABLES	A	B	VARIABLES	A	B
	(The bigger)	(The smaller)		(The bigger)	(The smaller)
	INPUT	INPUT		INPUT	INPUT
DERI	-0.089 (-0.532)	0.855*** (3.074)	BDSIZE	0.195 (0.671)	-0.448 (-0.997)
SIZE	4.856 (1.179)	6.271 (1.348)	Constant	-120.217 (-1.309)	-119.831 (-1.102)
LEV	0.165 (1.545)	-0.112 (-0.880)	Observations	95	103
ROA	1.948 (0.098)	-2.101 (-0.109)	R-squared	0.993	0.995
CF	6.182 (1.374)	5.443 (0.871)	code	YES	YES
FIRST	0.136 (1.512)	-0.116 (-0.608)	Year	YES	YES
			F pvalue	0.0230	0.0230
			r2_a	0.985	0.991
			F	1.531	2.596

t-statistics in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

According to the specific regression results of group A and B in Table 4, when an enterprises' stock rights are centralized, that is, when an enterprise uses financial derivatives for the purpose of speculation, the impact on enterprise innovation behavior is no longer significant at all. However, when enterprises' stock rights are scattered, that is, enterprises use financial derivatives for hedging purpose, the impact on enterprise innovation behavior is still significantly positive at the level of 1%, even performed better than the first regression. It indicates that if an enterprise uses financial derivatives for speculative purposes, the use of financial derivatives by an enterprise cannot effectively promote the innovation behavior of the

enterprise, which fully supports hypothesis H2 of this paper.

**3. ROBUSTNESS TEST**

Because this paper takes "R&D expenditure" as a variable of enterprise innovation behavior, to exclude the influence of other potential explained variables, this paper adopts "patent number" as a new explained variable for regression. Since "R&D expenditure" belongs to innovation input and "patent number" belongs to innovation output, it is also reasonable to study the relationship between "patent number" and financial

derivatives of enterprises. As a new explained variable, OUTCOME includes the invention patent, utility model

patent and design patent of the enterprise, and the regression results are as follows:

**Table 5** Regression results

VARIABLES	OUTCOME
DERI	0.163** (0.080)
LEV	0.019*** (0.007)
ROA	4.592** (2.292)
FA	0.017 (0.016)
CF	0.876 (1.247)
FIRST	0.007 (0.006)
STA	0.187 (0.189)
Constant	0.969* (0.548)
Observations	115
R-squared	0.169

Standard errors in parentheses  
 \*\*\* P <0.01, \*\* P <0.05, \* P <0.1

The regression results in Table 5 show that no matter r&d investment or patent number is used as the explained variable, the impact of financial derivatives on enterprise innovation behavior is always significantly positive, which further supports hypothesis 1 of this paper. Although the effect of derivatives on the number of patents is significant only at the 5% level, it is within the margin of error.

**4. CONCLUSIONS**

This paper collected the relevant data of 247 listed manufacturing companies from 2018 to 2020, and studied the use of financial derivatives and enterprises' innovation behavior. The results show that under the background of Sino-US trade war, the use of financial derivatives still has a positive effect on firms' innovation behavior. At the same time, if enterprises use financial derivatives for speculative purposes, it has no significant promotion effect on enterprise innovation behavior. When the speculative purpose is excluded, the promotion effect of financial derivatives on innovation behavior is still very significant.

Based on the above research conclusions, this paper puts forward the following suggestions:

On the one hand, enterprise managers should enhance their understanding of financial derivatives, and learn to be good at using financial derivatives, so as to improve the risk resistance of the overall financial system of enterprises, so as to better serve the innovation behavior of real enterprises. At the same time, enterprises should also strengthen the effective disclosure of the use of financial derivatives, so as to facilitate investors to re-evaluate the innovation ability and investment value of enterprises. On the other hand, on the premise of ensuring the security of the national financial market, the country should promote the development and improvement of the financial derivatives market, increase the varieties of financial derivatives, strengthen the supervision over the use of financial derivatives by enterprises, and provide favorable external financial environment for the development of enterprises.

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