Impact of Foreign Currency Derivatives on Value of Chinese Non-financial firms

Md Kamal Hossain & Mammadova Gulay

Abstract

Newly reformed global economy has the widespread of using foreign exchange derivatives as a risk management tool. Recent trends lead Chinese firms into high financial risk, thus inevitable choice for Chinese companies are using derivative for mitigate risks arising from fluctuations. Purpose of this research is to investigate foreign exchange derivatives effect on value for Chinese companies, 36 non-financial company's data are used as sample and time frame will be 2013-2017. After controlling for several fundamental firm specifications, this study has shown that there is a positive and significant relationship with a simple decision for using foreign currency derivatives and firm value. Furthermore, result shows using foreign exchange derivatives significantly add value of the firms as higher Tobin's Q ratio. This finding indicates that especially companies with high firm value can further expand their values through actively participating in hedging activities. Results also indicate that foreign exchange derivatives are more likely to raise large corporation's value. Another finding is that effect of value-enhancing on degree of derivative use of foreign exchange is weaker for profitable firms than for less profitable ones. This means that increasing derivative holdings by more profitable non-financial firms are unlikely to contribute to their performance.

Keywords: Chinese Non-financial firms, foreign exchange derivatives, risk management, firm value.

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1. Introduction

Over last two decades, problems of managing risk arising from the fluctuations of exchange rate acquired particular urgency. This is due to the national economies integration into global economy, strengthening economies interrelation as a whole, their financial sphere, intense competition in the financial derivatives market, as well as increasing financial transactions volume with financial instruments developments. Especially, after financial crisis and European sovereign debt crisis, external economic uncertainty has increased, along with increased exchange market. Recently, foreign currency derivatives use to mitigate risks arising from currency fluctuations, which have impact on foreign currency derivatives for corporate value of firms; it also received considerable critical attention by scholars. The first serious discussions and analyses emerged during 1970s with Bretton Woods system collapse, companies have faced greater financial risks and many scholars have begun research on the relationship of derivatives with company value. In contradiction with classic MM (Modigliani and Miller, 1958)[1] theory which argues that hedging activities do not affect firm's value, some scholars claim that derivative use has a pivotal influence on firm value in real imperfect market conditions. For instance, theory by Smith and Stulz (1985) proved use of hedging is a crucial tool in managing risk for maximizing their value. From starting 1990, USA and some western countries introduced financial reporting standards and disclosure requirements, which have encouraged scholars to do more research on the impact of derivatives on firm value based on data in annual reports. However, a few sets of researches attempted to study whether derivatives add value to firms in emerging markets, particularly in China. The Chinese context provides an interesting institutional setting because it is significantly different circumstances compared with USA and European countries.

After exchange rate reform at 2005, there was an urgent need to manage currency risk of both financial and non-financial Chinese firms. It not only helps Chinese firms in risk hedging under floating rate for RMB, but also makes reform process easier for currency rate and Chinese currency internationalization, along with enhances China's financial market. Problems associated with hedging foreign currency rate risks reflect an urgent need for theoretical, methodological and practical solution, which indicates the relevance of the study. However, firms belonging from other industries may also expose to currency fluctuations and thus use currency derivatives. Therefore, this study seeks to fill gap by providing materialistic information on the impact of foreign exchange derivatives on firm's value for Chinese non-financial companies belonging to various industries.

There are several primary objectives for this study. Firstly, to determine whether decision to use currency derivatives has an impact on Chinese non-financial company's value; Secondly, investigate how using derivatives is related with firms particularly low or high value; Third, determine relationship among the degrees in which company should use foreign exchange derivatives and firm value; And finally, investigate whether this impact varies across firm-specific features such as size and profitability. The methodological approach taken in this study is a methodology based on panel data analysis with fixed effects. Data for this study were obtained from companies financial reports. This study aims to contribute a growing area for research by exploring impacts of the use of derivatives on Chinese non-financial firm's value, which is beneficial for exploring risk management practices for non-financial

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[1]See AllayannisGeorge, and WestonJames P., "The use of foreign currency derivatives and firm value," The review of Financial studies 14-1, 2001, 243-276.

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firms along with China's actual situation. From a company level, studying derivatives effects on firm value can provide necessary guideline for policy making with theoretical assistance to choose better risk management solutions. As per regulatory body, China has certain restrictions for firms' participation to derivatives trading. Deepening upon financial reforms, these restrictions have gradually been liberalized, so Chinese government still needs to improve its regulatory mechanisms for derivatives. Based on the empirical conclusions, this paper proposes policy recommendations in line with China's circumstances and provides suggestions as promoting a stable development of China's foreign currency derivatives market.

2. Literature Review
2.1 Rationales for hedging
A large and growing body of literature has investigated motives behind the hedging activities. Smith and Stulz (1985) developed a theory on positive hedging for maximize market value of firms in their study following modern finance theory. Authors studied the reasons why some companies engage in hedging actions while others do not. They have introduced three reasons for hedging, which help the organizations in maximizing their values: (1) taxes, (2) financial distress expenses, and (3) managerial risk aversion. Authors stated that the results of their studies should be tested empirically in subsequent studies. The survey conducted by Nance (1993) showed that incentives to hedge are to reduce expected tax liabilities, lower expected transaction costs and control agency costs. In his study, the author argued that firms with higher convex tax schedules hedge higher. Geczy et al. (1997) said that large currency rate exposures and scale economy firms continue for using foreign exchange derivatives of hedging activities, firms' decision for applying of various type currency derivatives is associated with exposure sources of currency rate. In their analysis for Australian companies, Nguyen et al. (2002) identified financial constraints, financial distress and setup costs as the main determinants of derivatives use. Their study revealed that important motives behind hedge activities by Australian firms are to increase firm value rather than to maximize managerial wealth. Brunzell et al. (2011) analyzed the data from Nordic countries and concluded that besides hedging, additional income is also an important motive to use derivatives. Lel's cross-country analysis (2012) showed that firms with strong corporate governance are more likely to use derivatives for mitigate risks arising from foreign currency fluctuations. Allayannis et al. (2012) and Simpson (2016) examined the data from firms across the world and concluded that the use of foreign currency derivatives for firms with strong internal firm-level or external country-level governance is associated with a significant value premium. Krause et al. (2016) examined 70 studies worldwide and summarized incentives of firms to take part in hedging activities as the creation of firm value, cost of capital reduction, and financial distress cost.

2.2 Empirical facts about derivatives using with firm value
Several literatures have been already published on the foreign exchange derivatives effects on the firm's values. Together, these studies provide important insights into foreign currency derivatives link with firm value. Bartov and Bodnar (1994) studied exchange rate movement's effect on firm's achievement by analyzing data from 208 companies over the period 1978-1989. In their studies, authors did not find any significant link for firm's performances and exchange rate movements in the same period, they discovered that variations in exchange rates affected firms performance and return. Allayannis and Weston (2001) analyzed 720 non-financial institutions of United States 1990 to 1995, and tried to explain currency derivatives have a potential effect on value. During this study, they revealed

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a positive link among foreign currency derivatives use with firm value. Pramborg (2004) studied hedging and overseas operations effects on Swedish firm's value over a period between 1997 and 2001. He identified that a positive relationship exists among firms value with hedging from currency exchange exposure, however, hedging from foreign exchange translation effects does not significantly add value to firms. While determining impacts for hedging on firm value, Magee et al. (2009) highlighted a need of control process about chances for feedback from previous amounts of firm value against present amount of hedging. In a study which set out to examine valuation effect of derivatives use, Khediri (2010) found that decision of using derivatives does not increase firm values, however, extent for hedging is related to lower firm value. In 2012, Belghitar et al. found that derivatives help firms to reduce overall exposure of foreign exchange. However, authors concluded that foreign currency derivatives do not have any significant impact over firm value when exposure model and various derivative products were considered. For energy companies use of derivative tools increases firm value (Perez-Gonzalez and Yun, 2013). Panaretou (2014) investigated impact about financial risk management on firm value by analyzing large non-financial firms. During his study, using foreign currency derivatives effects on firm value were found statistically and economically significant. Jankensgard (2015) discussed whether centralization of foreign exchange derivative usage affects firm value. He revealed that derivative use adds more value to firms with a centralized foreign exchange exposure management system rather than to firms with a decentralized system. Ayturk et al. (2016) studied impact of currency derivatives on firm's value for non-financial companies over the period 2007-2013. Detailed examination by authors showed that use of financial derivatives only increased firm value when Tobin's Q ratio with system GMM estimators was applied. A recent study by Merkel (2018) investigated whether using foreign currency derivatives affects firm value in a large sample from German non-financial firms with exposure to exchange rates over the period 2004-2013. The study suggests that there is a positive relationship of firm value with foreign exchange derivatives application. Furthermore, firms with high values can increase their value by increasing number of foreign currency derivatives.

2.3 Empirical studies on using derivatives in China

Clark et al. (2006) examined a sample of 227 companies listed at Hong Kong Stock exchange. Authors found strong proof regarding to hedge decision and expected costs of financial distress. Moreover, this study also revealed foreign currency exposure, economies of scale in hedging and liquidity as determinants of hedging. Chao et al. (2006) also studied determinants of foreign exchange hedge activities of non-financial firms listed on Hong Kong Stock Exchange. Authors claimed currency policy and manager's incentive and knowledge as major factors for taking hedge action. They concluded that determinants of hedging vary across markets. After analyzing 300 Chinese firms, Guo et al. (2010) said financial distress and taxes were two main motives behind derivatives application. Chen and Shen (2006) studied about the effects for derivatives on firm value of Chinese companies in the non-ferrous metal industry. They concluded that currency derivatives do not have any major impact on analyzed company's performance.[2] In contrast to earlier finding, Jia and Chen Baofeng (2009) published a paper in which they described a positively significant relationship about usage of derivatives with firm efficiency by analyzing a sample of 1151

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[2]See Hong, Zhou., Luzhuang, Wang., and Jiamin Wu, "Impacts of Derivatives on Firms' Value Empirical Results from Chinese Companies," Mao E., Xu L., Tian W. (eds) Emerging Computation and Information technologies for Education. Advances in Intelligent and Soft Computing 146, 2012

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non-financial Chinese companies issued a shares. Furthermore, the authors found that firm size and managerial risk aversion are the key reasons behind hedging activities. Yin et al. (2010) examined non-financial Chinese firms with commodity price and foreign currency exposure during 2007 to 2009. This study demonstrated a significantly positive relationship of derivative use with firm value. Furthermore, authors argued about hedging methods are more effective compared with non-hedging methods. Similarly, Hong et al. (2012) analyzed data about 119 Chinese resource-type firms and concluded that derivatives use increases firms' Tobin's Q, but decreases ROA. A systematic study on foreign exchange risk hedge and firms value about Chinese firm was reported by Luo et al. in 2018. In their study, authors found that Chinese firms that participate into hedging activities with derivatives for reducing their foreign exchange exposure tend in achieving higher firm value. Furthermore, they ended up with foreign currency hedging effects on firm value vary throughout industries.

3. Research Methodology

3.1 Sample Selection

A dataset of 36 listed Chinese non-financial companies was assembled for determining foreign currency derivatives impact over firm value. Only non-financial firms were included as sample, since financial firms may have different incentives for engage in derivative market , with their utilization for derivatives may be completely determined by other factors to compare with non-financial companies. The initial analysis covers 180 yearly observations starting from 2013 till 2017. The sample includes non-financial firms listed on the New York Stock Exchange (NYSE), NASDAQ and Hong Kong Stock Exchange. Data[3] for this study were collected from company's financial reports. Form 20-F and 10-K companies reports listed on NYSE and EDGAR database were extracted for NASDAQ. Annual reports for companies listed in Hong Kong Stock Exchange were obtained from the websites of companies. Finally, hand-collected panel dataset was constructed.

3.2 Dependent variable

Following the previous studies, Tobin's Q was used as a proxy for firm value.A low Tobin's Q (between 0 and 1) indicates that the firm's stock value is lower than the cost to replace a firm's assets. This implies that the company's stock is undervalued. In contrast, a high Tobin's Q (greater than 1) reveals that the firm's stock is more expensive than the cost of replacing its assets. [4] The main advantage of using Tobin's Q is its simplicity, which helps to generate values foralmost all the companies in the sample group. Another advantage of using Tobin's Q is that it helps to compare firms easily. However, other methods, such as stock returns or accounting techniques require risk adjustment or normalization (Stulz 1994, Allayannis 2001). Allayannis and Weston (2001) analyzed the various techniques of Tobin's Q calculation by following the methods presented by previous studies (Lewellen and Badrinath (1997), Perfect and Wiles (1994)). Based on different procedures, the authors concluded that results for various measures about Tobin's Q are corresponding. During this study, a simple method recommended by Allayannis and Weston (2001) was employed to measure the firm value. Tobin's Q ratio was defined as total market value of a firm to total asset value. Firm's total value was calculated by multiplying outstanding shares with their share prices. Stock price, closing price of last commercial day was obtained from Yahoo Finance for each

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[3]Some data and stock prices were converted from US Dollar and HK dollar to RMB at the exchange rate provided by The People's Bank of China for the years 2013-2017.

[4]See Adam Hayes, "Tobin's Q Ratio,"February 8, 2019,<https://www.investopedia.com/terms/q/qratio.asp>, accessed February 15, 2019

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company over the period 2013-2017. After the detailed analysis of annual reports, the stock price was calculated by considering the fact that ADS represent how many ordinary shares for each company.

3.3 Independent variables

Following previous research, it is assumed that companies take hedging actions by using of derivatives. Two different measurements were used to determine the effects of foreign currency derivatives on firm value. First, foreign currency derivatives were taken as dummy variable for determining how using derivatives affects firm value. If firms use any foreign exchange derivatives is equal to one or zero (Allayannis et al. 2001). Secondly, in order to define magnitude effect of foreign exchange derivative holdings on firm value, extent in hedge activities was employed. Hedge extension was calculated as proportion from whole notional value for foreign financial derivatives to revenue. Conversely of binary variable, hedging degree captures foreign currency hedging extension and differentiates whether firm hedges fully or partially. According to the Financial Accounting Standards Board Accounting Standards, Codification 815 - Derivatives and Hedging[5]rules, firms listed in USA must disclose their derivatives with the purposes of using them on Form 20-F. Likewise, firms listed at Hong Kong include information about their derivatives' positions in their annual reports. Financial reports have been analyzed for determine whether companies are derivative operators. Based on the "keyword" research method, each financial statement were analyzed by searching "derivative", "hedge", "foreign currency risk", "foreign currency risk", "forward", "swap", "future" and "option" terms. If a company does not use an open derivative position during reporting period, but they reports about foreign financial derivatives are used as risk management instrument, the company was taken as a derivative user. Current accounting standards do not require firms for disclosing the amount of the hedge, therefore the notional amount of hedging is not available for all companies those have used foreign currency derivatives. Figure 1 below shows gross notional quantity of foreign exchange derivative contracts held by companies under investigation over the five years.
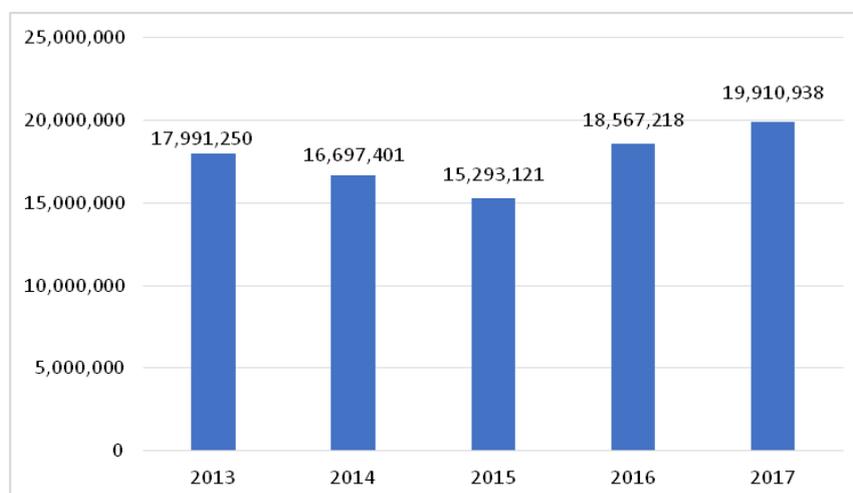
Figure 1: The gross notional amount of foreign currency derivatives held (Yuan in thousands)

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[5]See "ASC 815-Derivatives and Hedging," *Deloitte USA,* <https://www.iasplus.com/en-us/standards/fasb/broad-transactions/asc815>, accessed November 25, 2018

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3.4 Control variables

Based on the existing empirical literature, this study includes firm size, gain/ loss from exchange rate fluctuations, leverage, liquidity, profitability, investment growth, dividend per share and industrial diversification for explaining the value of firm as control variables.

3.5 Firm size

Several studies thus far have linked firm size with firm value. Allayannis and Weston (2001) found that Tobin's Q is lower for large firms as compared to small firms. Although it may be hard to manage a firm with large size, but it have positive impact on the value of firm and firm can get benefit from economies of scale. Allayannis et al. (2001) argued that companies with large firm size are much better in hedging operations than small firm size. Referring from previous researches, natural logarithm from total assets was taken as firm size.

3.6 Foreign exchange gain/loss

For foreign currency asset or liability owners, foreign exchange risk may have two uncertain outcomes: loss and gain. Allayannis and Weston (2001) checked how dollar appreciation and depreciation affects hedging premium. Authors found that hedging premium is higher under dollar appreciation period compared with depreciation period. During the study, face value proportion of gain or loss from foreign exchange changes to profits was taken for control impact of gain or loss from currency depreciation and appreciation on firm value.

3.7 Leverage

In real imperfect financial market, information asymmetry, transaction costs, and other issues are widespread, so capital structure has pivotal impact on firm value. Some previous studies found that there is a negative relationship within leverage and firm value (Allayannis and Weston (2001), Kedhiri (2010), Lau (2016), Giraldo-Prietoaet al. 2017)). Leverage is often measured by dividing the total debt to total shareholder's equity. Most commonly used formula for overall debt is the total short-term borrowings and long-term borrowings. In our investigated sample, the majority of companies do not report the number of short-term borrowings in their annual report, therefore long-term debt for shareholder's equity proportion was applied for controlling impact of capital structure on the value of firm.

3.8 Liquidity

Liquidity management is a core content for a company's working capital management as well as short-term financial management. A company's financial liquidity affects that company's value. According to the free cash flow theory, companies with more available cash flow tend to invest in negative NPV projects. Therefore, free cash flows cause decline in firm value. During the research, for determining the financial liquidity current ratio (current assets/current liabilities) was used.

3.9 Profitability (ROA)

As per corporate value theory, companies with strong profitability may have higher stock prices, which in turn may have a greater premium in corporate value. Furthermore, ability of a firm to generate profits is an important factor while making investment decisions. Risk-averse investors prefer profitable companies rather than companies experiencing losses. Therefore, Tobin's Q of a profitable firm is likely to be higher. Since one of the indicators of profitability is the return on assets (ROA), it was used as a control variable reflecting a firm value. ROA was calculated as the ratio on after-tax EBIT from total assets.

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3.10 Investment growth

Myers (1977) and Smith & Watts (1992) [6]pointed out that there is a large amount of evidence that future investment opportunities are an important factor affecting firm value.According to the underinvestment theory, the high value of investment opportunities increases the focus on risk management. Because problems that can prevent the realization of the investment program make it more costly (Froot et al. (1993)[7]).Some studies argued that hedgers have more chances to get better investment opportunities (Géczy et al. (1997), Allayannis and Weston (2001)). In this study,investment growth was calculated as the ratio of capital expenditures to sales.

3.11 Dividend per share

Dividend policy plays an important role in the company's business decision-making process. When hedgers forego projects because of lack of funding, Tobin's Q may be high since they will only favor projects with positive NPV (Allayannis and Weston (2001)). According to Jin and Jorion (2006), if hedgers have limited access in financial markets, their Tobin's Q would be high. Because they will prefer the projects with the highest NPV. If sample firms issues dividends during a certain observation period, the declared amount of dividend per share was taken, 0 otherwise.

3.12 Industrial diversification

Some research studies claim that there is a negative relationship between industrial diversification and Tobin's Q (Khediri (2010), Lau (2016)). It can be difficult to manage a diversified company by a manager. Moreover, diversification can also cause agency problems since managers may have personal interests in increasing firm size. A dummy variable was employed to control industrial diversification impact on firm value. Here the dummy variable was 1 when firm operates more than one product segments, 0 otherwise.

3.14 Time effects

Changes in market value may affect Tobin Q's overall level over time. In this study, year dummies were applied to control time effects in all regressions.

3.15 Industry effects

Companies belonging to different industries may have different Tobin's Qs. Industry may require a company to invest in fixed assets at a different level. High Tobin's Q may result in higher firm value, which may not be related to the firm's participation in hedging activities. Industry dummy was used to control these effects.

3.16 Model

Following previous studies, with a focus on the impact of foreign exchange derivative use on the value of firm, two measurements, namely FC derivatives and hedging extension were used along with relevant control variables. Following table (1) illustrates definitions for using all variables.

Here we try to determine a relationship among a firm's market value, use of derivatives with firm-specific variables as follows:

$$Tobin's\ Q_{it} = f(Derivatives_{it},\ FC\ gain/loss_{it},\ Size_{it}, Liquidity_{it},\ Leverage_{it},\ ROA_{it},\ Growth_{it}, Diversification_{it}, Dividend_{it},\ Company_{it}, Year_{it}) \qquad (1)$$

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[6]See Merkel, Matthias F., "Foreign exchange derivative use and firm value: Evidence from German non-financial firms," *Passauer Diskussionspapiere – Betriebswirtschaftliche Reihe,* No. B-33-18, 2018
[7]See Jankensgard, Hakan, "Does Centralisation of FX Derivative Usage Impact Firm Value?" European Financial Management 21-2, 2015, 309–332.

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For estimation, Model I, which takes into account time and company-specific fixed effects was specified as below:

$$Y_{it}=\alpha_i+y_t+\beta Derivative\ Use_{it}+\delta X_{it}+\varepsilon_{it} \tag{2}$$

It is expected that Model I will probably not strongly capture potential effects for foreign exchange derivatives on firm value. For the purpose of showing impact of hedging magnitude on firm value, hedging extension variable was used as an independent variable into the equation of Model II.

$$Y_{it}=\alpha_i+y_t+\varphi Extent\ of\ Hedging_{it} + \delta X_{it}+\varepsilon_{it} \tag{3}$$

To examine whether derivatives impact on firm value varies across firm-specific features such as size and profitability, Model III and Model IV were determined as follows:

$$Y_{it}=\alpha_i+y_t+\beta^* Derivative\ Use_{it}+\delta Derivative\ Use_{it}*Size_{it} + \delta X_{it}+\varepsilon_{it} \tag{4}$$

$$Y_{it}=\alpha_i+y_t+\varphi Extent\ of\ Hedging_{it}+\omega Extent\ of\ Hedging_{it}*ROA_{it} + \delta X_{it}+\varepsilon_{it} \tag{5}$$

Where Y_{it} is the firm value (Tobin's Q) for firm i , Derivatives Use is dummy variable for measuring derivatives use, Extent of Hedging consider as a continuous variable for measuring the extent of hedging, X_{it} is used of a proxy for control variables (lnsize, FX gain/loss, leverage, liquidity, ROA, investment growth, dividend, industrial diversification), $Derivative\ Use_{it}*Size_{it}$ and $Extent\ of\ Hedging_{it}*ROA_{it}$ are interactions between derivative use and firm size, and extent of hedging and profitability, respectively, ε_{it} is random error term, α_i controls for company specific fixed effects, y_t controls for time-specific fixed effects, the subscripts i and t represent company and time period respectively.

Table 1: Variable description

Variables	Definitions
Tobin's Q	Total market value/Total asset value
FC Derivatives	A dummy with value=1 if a firm is identified as FC derivative user
Extent of hedging	Total notional value of foreign exchange derivatives/Revenues
FC gain/loss	Gain or loss from exchange rate changes divided by profits
Ln size	Natural logarithm of assets
Liquidity	Current ratio (Current assets/Current liabilities)
Leverage	Long-term debt/Shareholder's equity
ROA	EBIT (1-T_c)/total assets
Growth	Capital expenditures/Sales
Diversification	A dummy with value =1 if the company operates in two or more product segments
Dividend	Dividend per share

4. Data analysis
4.1 The foreign exchange derivatives use and firm value

Table 2 reports correlation coefficients between independent variables. As can be seen from the table below, correlation level between explanatory variables is relatively low, which indicates empirical model set above, does not have an obvious multicollinearity problem. Therefore, the above Model I is appropriate.

Table 2: Pearson correlation coefficients among independent variables

	FCD	FC gain/ loss	Lnsize	Liq.	Lev.	ROA	Growth	Div.	Divers.
FCD	1.0000								
Gain/loss	0.0435	1.0000							
Lnsize	0.4900	-0.2130	1.0000						
Liq.	-0.1274	0.0420	-0.3031	1.0000					
Lev.	0.3124	-0.0643	0.2129	-0.2539	1.0000				
ROA	0.0669	0.0369	0.2232	0.1285	0.0673	1.0000			
Growth	0.1711	0.0676	0.0692	-0.1590	0.4681	-0.1274	1.0000		
Div.	-0.1201	0.0196	-0.1196	0.0193	0.0043	0.1903	-0.1147	1.0000	
Divers.	0.4515	0.1097	0.2280	-0.0654	0.1188	0.1169	0.0861	-0.0827	1.0000

Table 3: Descriptive statistics results

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
Tobin's Q	178	1.54	2.33	0	16.15
FC Derivatives	180	0. 33	0.47	0	1
FC gain/loss	173	-0.14	2.65	-28.86	6.13
Firm size (log)	180	17.43	2.44	12.69	23.24
Liquidity	179	1.97	2.92	0.08	26.82
Leverage	179	0.39	0.52	-0.72	2.30
ROA	180	0.03	0.10	-0.73	0.17
Investment Growth	179	0.14	0.19	0	1.59
Diversification	178	0.62	0. 49	0	1
Dividend per share	180	0.35	0.96	0	6.14

Table 3 provides the summary statistics for variables used to study relationship among foreign exchange derivatives use with firm value for the sample of 180 firm observations. Mean value of the Tobin's Q ratio, representing a firm's value is equal to 1.54 (Tobin's Q>1), which implies that anticipation for firms is positive.

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Table 4: Regression analysis about the impact of foreign exchange derivatives on firm value

Dependent variable: Tobin's Q	
Regressors	(1)
FC Derivatives	1.632**
	(0.54)
FC gain/loss	-0.039
	(0.32)
lnsize	-0.482*
	(0.21)
Liquidity	0.026
	(0.03)
Leverage	-0.562
	(0.31)
ROA	0.375
	(1.64)
Growth	-0.026
	(0.62)
Dividend	0.066
	(0.10)
Diversification	-0.971*
	(0.40)
Constant	10.55**
	(3.74)
Observations	170
Number of ID	36
R-squared	0.28

Standard error in parentheses
        * significant at 5%; ** significant at 1%

Significance levels were set at 1% and 5%. Data management and analysis were performed using Stata 13. All outcomes were presented into Table 4 along with time fixed effects as well as company-specific fixed effects. Findings of Table 4 indicate there is a positively significant relationship between using foreign exchange derivative with firm value. This finding shows that the decision for using foreign exchange derivatives is correlated along higher firm value. This result is consistent with the findings of Allayannis and Weston (2001), Pramborg (2004), Yin et al. (2010), Fei (2012), Panaretou (2014), Merkel (2018) and Luo et al. (2018). Regression results also demonstrate, some control variables can explain a firm value. There is a significant negative correlation among firm size with firm value. This finding implies that firms with large asset had lower Tobin's Q. The result obtained is compatible with previous studies. (Allayannis et al. (2001), Pramborg (2004), Khediri (2010), Luo et al. (2018), Merkel (2018)). Likewise, industrial diversification has also a negatively significant effect upon firm value. These results are also expected and consistent with previous findings (Allayannis et al. (2001), Lau (2016)). Contrary to the findings by Allayannis and Weston (2001), it was found that investment growth, dividends, and leverage are not related to value of the firm. Table 4 also indicates that other control variables coefficients are not statistically significant. Coefficients on leverage and growth both are negative, while coefficients for liquidity, ROA and dividend are positive.

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4.2 Foreign currency derivatives use and firm value for high and low-value firms

For determining whether firm value in different level were linked with foreign exchange derivative use, two groups with high and low Tobin's Q value were constructed with using entire sample of firms. High Tobin's Q group was constructed with combining firm value exceeds mean Tobin's Q score, 1.54. While the low Tobin's Q group was formed with selecting firms whose Tobin's Q were lower compared with sample mean value. Low Tobin's Q group includes 121 observations, while high Tobin's Q group consist 49 observations. It shows majority of firms in our sample have low Tobin's Q. Comparisons between the two groups can be seen from the below-given table. As Table 5 shows, there are significant deviations between those two groups. Contrary of Merkel (2018), a significantly positive link was found among derivative use with Tobin's Q for high-value firms, which presents that using exchange instruments adds firm's value. A single most striking observation arises from regression result that is significant and negative coefficient from foreign exchange gain or loss.

Table 5: Regression analysis for high and low Tobin's Q groups

	High Q (Q>1.54)	Low Q (Q<1.54)
Dependent variable: Tobin's Q		
Regressors	(1)	(2)
FC Derivatives	5.698**	0.059
	(1.44)	(0.12)
FC gain/loss	-1.177*	-0.007
	(0.47)	(0.01)
Lnsize	-1.233	-0.068
	(0.78)	(0.04)
Liquidity	0.028	0.007
	(0.06)	(0.01)
Leverage	-1.435	-0.040
	(0.99)	(0.06)
ROA	1.554	0.027
	(3.01)	(0.61)
Growth	2.648	-0.149
	(2.05)	(0.13)
Dividend	-0.190	0.014
	(0.27)	(0.02)
Diversification	-0.486	0.033
	(0.73)	(0.18)
Constant	22.96	1.756*
	(12.70)	(0.75)
Observations	49	121
Number of ID	13	29
R-squared	0.73	0.23

Standard error in parentheses
* Significant at 5%; ** significant at 1%
A comparison of the two results reveals that the coefficients of the other conditioning variables are statistically insignificant. As shown in Table 5, return on assets, investment growth, dividend, and industrial diversification have opposite signs for two groups.

4. 3 Degree of foreign exchange derivative use and firm value

The extent of hedging impact on firm value was determined with replacing aggregate derivative use substitute with a variable representing degree for foreign exchange hedging. New sample group with 32 observations was constructed. As it was mentioned before, not all

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derivative users report the notional amount of hedging in their annual reports, therefore, the sample size is limited compared to the previous sample group of 180 observations.

Table 6: Summary statistics for the sample of 32 observations

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
Tobin's Q	32	1.75	3.05	0.06	16.15
Extent of Hedging	32	0.06	0.17	0	0.91
FC gain/loss	32	0.08	0.32	-0.15	1.75
Firm size(log)	32	17.54	2.21	13.39	20.16
Liquidity	32	2.68	5.69	0.08	26.82
Leverage	32	0.58	0.55	0.01	1.78
ROA	32	0. 06	0.05	-0.08	0.14
Investment Growth	32	0.12	0.08	0.01	0.31
Diversification	32	0. 88	0. 34	0	1
Dividend per share	32	0.38	0.45	0	1.5

Table 6 reports the number of observations along with the means, standard deviations, minimums and maximums for firm characteristics. As can be seen from the table above, the mean value of Tobin's Q is equal to 1.75, which is higher than the value (1.54) for the entire sample with 180 observations. For the sample of 32 observations, firms have average leverage of 0.58, average (logged) size of 17.54, the average return on assets of 0.06, average investment growth of 12 percent, and average business segments of 0.88. The results of the co-relational analysis among independent variables are presented in Table 7. Correlation coefficients between independent variables are relatively low, implying that no serious multicollinearity problem exists. Thus, the above-mentioned Model II was applied.

Table 7: Pearson correlation among independent variables

	Extent	Gain/ loss	Lnsize	Liq.	Lev.	ROA	Growth	Div.	Divers.
Extent	1.0000								
Gain/loss	-0.0848	1.0000							
Lnsize	-0.2121	0.2759	1.0000						
Liq.	-0.0006	-0.0321	-0.3944	1.0000					
Lev.	0.2915	-0.0919	0.1073	-0.4034	1.0000				
ROA	-0.5165	0.0439	-0.0019	0.2722	-0.6822	1.0000			
Growth	-0.0940	-0.0110	0.5321	-0.3829	0.3588	-0.2992	1.0000		
Div.	-0.2326	-0.1983	-0.1622	0.0196	-0.5222	0.7599	-0.2826	1.0000	
Divers.	0.1024	-0.0388	0.4023	-0.3806	0.3545	-0.3085	0.3065	-0.2921	1.0000

As shown in Table 8, there is no evident about relationship among extent of hedging with firm value. Contrary to the findings of Luo et al. (2018), it was not possible to investigate any relevant relationships of firm value with extent of hedging. This might be related to small sample size. As can be seen from Table 8, the coefficient on the FC gain/loss is positive with statistically valid, which was not in line with the result for 180 observations. Liquidity coefficient was also positive and significant, implying that value-enhancing effect is greater for firms with more free cash flows. Table 8 presents there was a negatively significant

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relationship among industrial diversification with firm value, suggesting that the more firm is diversified, the lower the firm value is experienced.

R-squared is equal to 0.92, which indicates that independent variable and control variables explain 92% of the dependent variable, Tobin's Q.

Table 8: Regression analysis for extent of foreign exchange derivative hedging impact on firm value

Dependent variable: Tobin's Q	
Regressors	(1)
Extent of Hedging	0.072
	(0.92)
FC Gain/Loss	2.058**
	(0.56)
Lnsize	-0.237
	(0.47)
Liquidity	0.103**
	(0.02)
Leverage	-0.148
	(0.37)
ROA	-0.201
	(7.25)
Growth	0.322
	(2.22)
Dividend	0.547
	(0.56)
Diversification	-1.028*
	(0.44)
Constant	6.028
	(8.39)
Observations	32
Number of ID	10
R-squared	0.92

Standard error in parentheses
* significant at 5%; ** significant at 1%

4.4 Foreign Exchange derivatives use and firm size

In order to determine whether foreign exchange derivatives effect on firm value varies across firm size, an indicator for foreign exchange derivatives, FC Derivatives interacted with firm size and estimations were repeated (See Table 9). After adding interaction between FC Derivatives and Lnsize in the model, the coefficient on this interaction appears highly significant. It proves using foreign exchange derivatives influence on firm value varies across firm size. This finding is not consistent with the finding of Luo et al. (2018). It is apparent from Table 9 that coefficient on liquidity was positive with statistically significant, which is not in line with the result reported in Table 4. The most striking observation to emerge from regression analysis is that the coefficient on FC Derivatives changed sign from positive to negative after interaction was added.

Table 9: Regression analysis of foreign exchange derivatives use and firm size

Dependent variable: Tobin's Q	
Regressors	(2)
FC Derivatives	-21.53**
	(5.39)
FC Derivatives*lnsize	1.293**
	(0.29)
FC gain/loss	-0.043

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	(0.03)
lnsize	-0.689**
	(0.20)
Liquidity	0.070*
	(0.03)
Leverage	-0.427
	(0.29)
ROA	0.645
	(1.53)
Growth	-0.038
	(0.58)
Dividend	0.067
	(0.09)
Diversification	-0.825*
	(0.38)
Constant	13.363**
	(3.56)
Observations	170
Number of ID	36
R-squared	0.38

Standard error in parentheses
> * significant at 5%; ** significant at 1%

4.5 Degree of foreign exchange derivative use and firm profitability
For examine whether extent of hedging on firm value varies across profitability, a interaction among extent of hedging with ROA was included. After including an interaction term in extent of hedging with ROA, coefficient on the extent of hedging appears to be sensitive to the inclusion of interaction term and becomes significant at 5% level. As shown in Table 10, both the coefficient on the stand-alone extent of hedging, and the coefficient on the interactive term (the extent of hedging*ROA) are negative but significant. This result suggests that value-enhancing effect is greater for less profitable firms than for more profitable ones. Results imply that less profitable firms benefit more from foreign exchange derivative use. These results are contrary from findings of Luo et al. (2018), firms with greater profitability achieve more benefits by using foreign exchange derivatives for hedging foreign exchange risk.

Table 10: Regression analysis of the degree of foreign currency derivative use and ROA

Dependent variable: Tobin's Q	
Regressors	(2)
Extent of Hedging	-2.388*
	(0.78)
Extent of Hedging*ROA	-52.121**
	(12.01)
FC Gain/Loss	2.257**
	(0.33)
Lnsize	-1.325**
	(0.37)
Liquidity	0.095**
	(0.01)
Leverage	0.054
	(0.22)

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ROA	6.058
	(4.44)
Growth	-0.512
	(1.30)
Dividend	-0.056
	(0.35)
Diversification	-0.831*
	(0.26)
Constant	25.041**
	(6.54)
Observations	32
Number of ID	10
R-squared	0.98

Standard error in parentheses
* significant at 5%; ** significant at 1%

5. Conclusion and Implications

Findings from this study indicate that there was a positive relationship among derivatives use with firm value of Chinese non-financial firms. The evidence suggests that China's non-financial companies can increase firm value by applying foreign exchange derivatives in managing foreign currency risks. Finding was consistent with existing empirical research in this field. Second major finding was, using foreign exchange derivatives adds value to firms with high values. This finding implies that non-financial firms with high firm value can further increase their firm value through using foreign exchange derivatives. This study has also shown that foreign exchange derivatives effects on firm value vary across fundamental specifications of firm, namely firm size, profitability, etc. Results indicate that it is more likely to increase the value of firms with large asset sizes. The econometric analysis reveals that there is no statistically significant relationship among firm value with extent of hedging. However, after adding interaction among extent of hedging with ROA, coefficients on stand-alone extent of hedging and extent of hedging*ROA showed significantly negative signs. This indicates that a higher intensity of foreign exchange derivative use adds more value to the firms with lower profitability. This study has shown that, although the Chinese foreign exchange derivative market has achieved substantial improvements over the past two decades, it is insufficient to compare with the derivatives market of advanced countries. Therefore, it seems that China's foreign exchange derivative market is unable in satisfying all needs for China's financial and economic development. This study also found that generally Chinese non-financial companies do not actively participate in the foreign exchange derivative market to compare with Chinese financial institutions. This is mostly related with companies' knowledge of foreign exchange derivatives and market regulations. On the one hand, ability of Chinese non-financial firms to use derivatives is weak. On the other hand, because of government regulation on foreign exchange market, companies are reluctant in using foreign exchange derivatives.

5.1 Limitations of this study

First, since a vast majority of firms listed in Mainland China do not publish their financial reports in English, the dataset was constructed by including only Chinese non-financial firms listed in the USA and Hong Kong. Secondly, current derivative disclosures do not require to disclose the notional amount of hedging, thus the number of observations to check whether the degree of hedging affects firm value was limited. This study could be further extended by adding firms listed in Mainland China in order to check the impact of the extent of hedging on

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firm value based on the large sample size. The significance of this study is that research findings provide important policy suggestions. Based on the above research results, this paper proposes recommendations for both policymakers and companies as follows.

5.2 Suggestions for policymakers:

Accelerate the development in Chinese foreign exchange derivatives market and expand market players

There is a definite need for the relaxation of the qualification restrictions of participating entities and encouragement of more listed companies to use derivatives to hedge risks arising from exchange rate changes. The regulatory authorities should encourage non-financial companies for participating in domestic foreign exchange market, expand and facilitate participation for foreign institutions in the onshore market as well. The market environment needs to be improved for attracting new entrants into foreign exchange derivative market. Regulatory authorities should simplify administrative approval process, reduce market transaction costs, and improve operations efficiency, thus facilitating companies for participating in hedging foreign currency risks. It is also necessary to introduce foreign exchange future contracts in RMB against the leading currencies in the onshore market. Building a domestic RMB foreign exchange futures market can effectively reduce counterparty credit risk, provide effective exchange rate risk hedging instruments for participants in market, help for enriching various types of participants in foreign exchange market and finally expand its market.

Increase the OTC derivatives market transparency and strengthen supervision

Chinese foreign exchange market players face issues related to lack of transparency within the system. A key policy priority should, therefore, be to improve financial supervision and promote financial innovation as an opportunity to accelerate in establishment for a fully transparent OTC derivatives market framework and strengthen government regulation by improving monitoring as well as risk prevention for foreign exchange market.

Develop a more detailed accounting system for financial derivatives

The regulatory authorities should improve the accounting system and information disclosure mechanism of derivatives, and clarify that market participants should disclose derivatives. China's accounting system and information disclosure system should require listed companies to disclose fully their use of derivatives in their periodic reports, especially regarding the extent of hedging, introduce external supervision mechanisms, strengthen internal audit and external audit and make corporate behavior more transparent.

5.3 Suggestions for companies:

Strengthen the construction of enterprise risk management mechanism

Non-financial Chinese firms should establish effective internal control and risk management systems. Well-established risk management and control mechanisms can help them actively participate in derivatives trading and effectively prevent losses in derivative hedging.

Improve expertise in the use of derivatives

Professionals in the use of derivatives (in both designing and trading derivative products) are scarce. In order to make hedging activities more effective, companies should actively cultivate talents in hedging. To increase the knowledge in derivative use, companies should conduct training sessions regarding the use of derivative instruments. Firms can also develop internal benchmarking for good management in derivatives application. Furthermore, they can co-operate and obtain from experience from local and international organizations which have advanced experience in derivatives activities.

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Appendix
Table 11: List of companies analyzed in this study

Company name	Listed on	Company name	Listed on
1. Ata	NASDAQ	19.New Oriental Education	NYSE
2.Changyou	NASDAQ	20.Ossen Innovation	NASDAQ
3.China Distance Education	NYSE	21.Petro China	NYSE
4.China Eastern Airlines	NYSE	22.Phoenix Media	NYSE
5.China Lodging Group	NASDAQ	23.Rene Sola	NYSE
6.CNOOC	NYSE	24.Renren	NYSE
7.China New Borun	NYSE	25.Sinopec Corporation	NYSE
8.China Southern Airlines	NYSE	26.Sohu.com	NASDAQ
9.China Telecom	NYSE	27.TAL Education	NYSE
10.China Unicom	NYSE	28.The9	NASDAQ
11.Concord Medical Services	NYSE	29.Vip.com	NYSE
12.Ctrip International	NASDAQ	30.YY.inc	NASDAQ
13.Fangs Holdings	NYSE	31.Alibaba	NYSE
14.Guangshen Railway	NYSE	32.Conch	Hong Kong Stock Exchange
15.Huaneng Power International	NYSE	33.BYD	Hong Kong Stock Exchange
16.Jd.com	NASDAQ	34.China Shenhua	Hong Kong Stock Exchange
17.Jinko Solar	NYSE	35.Autohome	NYSE
18.Netease	NASDAQ	36.Baidu	NASDAQ

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