

# Impact of Conducting Mergers and Acquisitions on Relieving Financial Constraint

Based on the Evidence from Chinese Listed Companies

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**Abstract**—This paper studies the relationship between M&A and relieving financial constraint. This paper hypothesizes that M&A transactions can relieve the financial constraint of firm. It models the relation between investment expenditure and internal cash flow. The extent to relieved financial constraint is captured by sensitivity of investment to interaction term between cash flow and dummy MA. Study empirically tests the sensitivities by using 150 Chinese listed companies who conducted M&A transactions during 2011 to 2014. By using both Eviews 8 and SPSS 17.0 for data analysis and processing, the conclusion is obtained that the financial constraint is relieved after conducting M&A.

**Keywords**—financial constraint; M&A; cash flow; Tobin Q

## I. INTRODUCTION

A firm's investment expenditure mainly depends on the capital which comes from internal such as internal free cash flow, retention and external such as bank loans and bonds. In a real world with imperfection in capital market, firms' managers know more about the value, risk and profitability of the firm than typical stakeholders. Due to such asymmetric information, firms tend to suffer the financing frictions which mean that they may face higher financing cost from external capital market than financing from internal, and as a consequence, firms with financial constraint have to abandon some investment opportunities with positive NPV. The fact is that this may happens more often in small and young firms. To solve such problems, these firms try to expend their size for relieving the financial constraint.

Mergers and acquisitions is regard as an effective way of expanding scale and reallocating social resources. Theoretically, one mechanism behind conducting M&A is that it builds internal market capital which enables headquarters to have the right transferring capital from one segment to another segment within firm. Capital transferring across the projects solves the problem that the single project is suffering the disadvantage of external financing cost. Empirically, whether the mergers and acquisition activity can significantly relieve the financing constraints has already drawn many researchers' attention. Many researchers have investigated the link between the investment and level of

financial constraint. Most of the studies adopted the investment/ cash flow sensitivity estimation to test the extent of financial constraint. However, few studies estimated changes in investment / cash flow sensitivity before and after the M&A. Therefore, it is meaningful to empirically investigate the economic relation between M&A and changes in the sensitivity of investment to cash flow.

Knowing the relation between conducting M&A transactions and extent of relieved financial constraint helps firms who are financial constrained to make a better decision in terms of getting involved into M&A.

## II. LITERATURE REVIEW

Plenty of empirical evidence has test the relationship between cash flow and investment expenditure. The most of results are consistent with Modigliani and Miller (1958) irrelevance theory. MM assume that adverse selection problem will arise when managers within firm have more information about their value, risk and profitability than outside investors. It leads firms to give up positive net present value in order to avoid the disadvantage of external financing cost. This implication has been identified by Fazzari, Hubbard and Petersen in 1988. Fazzari, Hubbard and Petersen have discussed the cost disadvantage of equity and debt financing. They believe that under the imperfect capital market, asymmetric information makes external financing costly. Therefore, internal and external capital is not perfect substitute. They conduct sample of manufacturing firms' data during 1970-1984, and sample was divided into subsamples according to ratio of dividends to income. Another important explanation of imperfection information—agency problem was explored by Jensen (1986) who stated that managers may peruse personal wealth by investing firm's free cash flow in negative NPV project instead of spending these funds on dividends to shareholders. Further study to estimate the financial constraint is conducted by Campello and Chen in 2010. They deeply discuss the economic effects on financial constraints based on the evidence from firm fundamentals and stock returns. In 1988, Hill proposed that unrelated diversification with deficient control system in internal capital market would result in inferior financial performance. Khatami, Marchica,

Mura, (2015) conduct a large sample (3146) of mergers and acquisition transactions which took place in America market at the period of 1985 to 2013. The finding is that the reduction in financial constraints appears more significant in small targets. Erel, Jang, Weisbach (2015) state target firms benefit from the acquirers' access to capital, which enables target firms to undertake more positive NPV project. Shin and Park conducted the research that investigate can affect of internal capital market on relation between investment and liquidity. Apart from testing the sensitivity of cash flow to investment, Abel & Eberly (2010) further developed the effect of Tobin Q on investment by using.

The closed-form solution in a random dynamic frame work. They adopt a simple neoclassic model in study even they do not take the adjustment cost and financial frictions into account. In 2015, Aber further extends the relation among Tobin Q, cash flow and investment. Hossein Khatami (2011) tests the extent to which financial constraint have effect on M&A premium and return. Their study illustrates that financial constrained firms present a strong positive sensitivity of cash to cash flow. Almeida, Campello and Weisbach (2014) have investigated the relation between financial constraint and firms' liquidity. Another related empirical study is conducted by Han & Qiu (2006) who have examined the strong relation between cash holdings and cash flow volatility.

From the previous studies, we find that many researchers have examined the relation between investment spending and cash flow. Some have investigated the relation between cash holding and cash flow. Even though these studies employ different sample and model, they have one common implication which illustrates the financial constraint of the firm. However, few studies pay attention to the changes in the financial constraint before and after a time.

Another field of research has talked about the role of internal capital market in a multidivisional company. Most the results show internal capital market plays role on transferring the capital across projects. It enables investment to be financed from headquarter rather than to be financed from external as stand-alone. Therefore, this study assumes that through M&A, firm's financial constraint could be relieved. Or it can be assumed that M&A could lower the sensitivity of investment to cash flow.

### III. RESEARCH MODEL AND HYPOTHESIS

#### A. Hypothesis 1: Firms with M&A Transactions Have the Sensitivity of Investment Expenditure to Cash Flow

This paper first detect whether the firms who acquired the targets during 2011 to 2014 have the sensitivity of investment to cash flow. For acquires who involved in M&A transactions, takeover targets can be considered as a kind of important investment behavior. In early study, the cash flow to investment relationship shows that firms' investment decision is partly dependent on their free cash flow. Besides, internal free cash flow become more importantly when firms are highly financial constrained, because they face excessive

cost of external financing caused by asymmetric information. Therefore, in this paper, I assume there is cash flow to investment sensitivity existing in 150 firms who acquired targets during period of 2011-2014. The reduced-form of investment equation in this paper is initially adopted from FHP's study, and then I have adjusted most variables (except Tobin Q) into similar accounted items. The principle of testing the sensitivity of cash flow to investment is the same as that of FHP. The parameter estimates on cash flow are mainly observed after regression. In order to not miss some important factors, I also add some related variables in model (sales, cash holding, Tobin Q).

The investment/cash flow sensitivity adopt two forms: model without lagged cash flow and model including lagged cash flow.

Model IA:

$$\frac{I_{i,t}}{K_{i,t-1}} = \alpha_0 + \beta_1 \left( \frac{CF_{i,t}}{K_{i,t-1}} \right) + \beta_2 \left( \frac{CASH}{K} \right)_{i,t-1} + \beta_3 \left( \frac{SALES}{K} \right)_{i,t-1} + \beta_4 Q_{i,t-1} + \varepsilon$$

Model IB:

$$\frac{I_{i,t}}{K_{i,t-1}} = \alpha_0 + \beta_1 \left( \frac{CF}{K} \right)_{i,t-1} + \beta_2 \left( \frac{CASH}{K} \right)_{i,t-1} + \beta_3 \left( \frac{SALES}{K} \right)_{i,t-1} + \beta_4 Q_{i,t-1} + \varepsilon$$

The equation models the proportion of initial investment spending on fixed plant and equipment and other long-term assets to firms' market capitalization in last period ( $I/K$ ) as a function of: (1) firms' free cash flow during period (model IA) or during last period (model IB) divided by the market capitalization at the beginning period; (2) cash holding divided by the market capitalization at the beginning of period; (3) sales of last period divided by the market capitalization at the period of beginning; (4) Tobin's Q at the beginning of period. At the first stage, this paper compares the cash flow in two periods having the effect on investment spending on fixed plant and equipment. The magnitude and significance of parameter estimates on cash flow would predict whether firm's investment decision is dependent on cash flow created by this period or last period.

#### B. Hypothesis 2: Relieving the Financial Constraint Is One of Primary Reasons for Listed Companies to Announce Takeover

Firms with limited access to capital tend to diversify the business by acquiring other companies to relieve the financial constraint. This can be explained by the function of internal capital market. Diversified companies can build its internal capital market which enables headquarter to transfer the funds from one business to another business under one roof. The mechanism behind the internal capital market in transferring funds is that headquarter allocate the cash flow to the project which is under-invested rather than over-invested. One way to estimate the extent to which the internal capital market across business within one company can relieve the financial constraint is to analysis the effect of cash flow-financed projects on Q (Vogt, 1994). Therefore, an interaction variable ( $CF*Q$ ) is added into the model to estimate this effect. Both free cash flow theory and pecking order theory can explain that cash flow would affect the

investment spending. Each theory suggests that strong relationship between cash flow and investment spending is presented in companies who do not willing to pay dividends, while weak relationship is exhibited in firms paying out high dividends. The main distinction between these two theories is reflected on the prediction of interaction between the Tobin's Q and the impact of cash flow on investment spending.

Model II:

$$\frac{I_{i,t}}{K_{i,t-1}} = \alpha_0 + \beta_1 \left( \frac{CF}{K} \right)_{i,t-1} + \beta_2 \left( \frac{CASH}{K} \right)_{i,t-1} + \beta_3 \left( \frac{SALES}{K} \right)_{i,t-1} + \beta_4 Q_{i,t-1} + \beta_5 \left( \frac{CF}{K} \right)_{i,t-1} * Q_{i,t-1} + \varepsilon$$

Driving factors estimation model is based on the first two models and add the interaction term. It, as a function, is followed by: (1) CF/K; (2) CASH/K; (3) SALES/K; (4) Q; (5) Q\*CF/k.

### C. Hypothesis 3: Financial Constraint is Relieved after Mergers and Acquisitions

Internal capital market can be regarded as a soft landing in firms when there are frictions between internal financing and external financing. Stein has did research from internal capital market perspective which suggests that compared with external capital market, internal capital market tend to take effect of mechanism by distributing capital resource efficiently. Therefore this study assumes that firms taking Mergers and Acquisitions can relieve their financial constraint in some extent by building internal capital market. According to FHP (1988), the sensitivity of investment to cash flow can be a reliable indicator of the extent to financial constraint. Financial constrained firms are more likely to rely on their internal cash flow, while unconstrained firms have weak cash flow/ investment sensitivity. To test whether the financial constraint be relatively relieved after the M&A transactions, we add the interaction variables (CF\*MA) and MA into model. MA is a dummy variable. This study sets MA = 0 when accounting period of data is before the year of conducting M&A. Nevertheless, MA=1. The interaction term presents the effect of M&A on the sensitivity of investment to cash flow. Compared with the model I, the added interaction variable in model III exhibits the changes in cash flow/ investment sensitivity which are affected by conducting M&A. Therefore, the magnitude and sign of the predicted parameter estimate on interaction item are deserved to pay attention.

The last estimation investigates whether M&A relieve financial constraint.

Model III:

$$\frac{I_{i,t}}{K_{i,t-1}} = \alpha_0 + \beta_1 \left( \frac{CF}{K} \right)_{i,t-1} + \beta_2 \left( \frac{CASH}{K} \right)_{i,t-1} + \beta_3 \left( \frac{SALES}{K} \right)_{i,t-1} + \beta_4 Q_{i,t-1} + \beta_5 \left( \frac{CF}{K} \right)_{i,t-1} * MA + \beta_6 MA + \varepsilon$$

## IV. DATA ANALYSIS

TABLE I. VARIABLES AND DEFINITION

variables	Definition
I/K	Initial investment spending divided by market capitalization
CF/K	Internal free cash flow divided by market capitalization
CASH/K	Cash holdings divided by market capitalization
SALES/K	Sales revenue divided by market capitalization
Tobin Q	Market value divided by the book value of total asset
(CF/K)*Q	Interaction term between free cash flow to market capitalization and Tobin Q
MA	Dummy variable, if time is before M&A transaction, then MA=0. Nevertheless, MA=1
(CF/K)*MA	Interaction term between free cash flow to capitalization and MA

TABLE II. DESCRIPTIVE STATISTICS

	I K	CF K	SALE K	CASH K	Q
Mean	0.066265	0.003204	0.546094	0.156045	2.972907
Median	0.025530	0.002859	0.272219	0.097741	1.953084
Maximum	2.462727	1.054953	8.078141	3.776716	154.1205
Minimum	2.70E-05	-1.095033	0.005791	2.67E-05	0.150262
Std. Dev.	0.180426	0.127389	0.844567	0.249667	8.126652
Skewness	9.663845	1.420718	4.649978	8.777856	15.46358
Kurtosis	116.6563	36.68136	31.70884	110.8262	276.8794
Sum	29.28917	1.416086	241.3738	68.97182	1314.025
Sum Sq. Dev.	14.35610	7.156502	314.5625	27.48901	29124.73
Observations	442	442	442	442	442

Regression analysis: Sensitivity of investment to cash flow test.

We first test whether there is cash flow/ investment sensitivity in firms with M&A transactions and investigate the investment is more sensitive to which period of cash flow. Therefore, the sample is took a regression into Model IA and IB. "Table III" gives the result of regression IA. "Table IV" gives the result of regression IB.

TABLE III. DEPENDENT VARIABLE: I\_K

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.015402	0.010230	1.505651	0.1329
CF_K	0.015628	0.032796	0.476505	0.6340
SALE_K	0.100480	0.010361	9.697576	0.0000
CASH_K	-0.086410	0.035090	-2.462497	0.0142
Q	0.003273	0.000959	3.411238	0.0007
R-squared	0.196990	Mean dependent var		0.066265
Adjusted R-squared	0.189640	S.D. dependent var		0.180426
S.E. of regression	0.162419	Akaike info criterion		-0.786022
Sum squared resid	11.52809	Schwarz criterion		-0.739740
Log likelihood	178.7108	Hannan-Quinn criter.		-0.767767
F-statistic	26.80063	Durbin-Watson stat		1.796529
Prob(F-statistic)	0.000000			

TABLE IV. DEPENDENT VARIABLE: I\_K

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.015798	0.010140	1.557885	0.1200
CF_K	0.169851	0.061023	2.783383	0.0056
SALE_K	0.095894	0.010408	9.213105	0.0000
CASH_K	-0.077850	0.034929	-2.228784	0.0263
Q	0.003264	0.000949	3.440199	0.0006
R-squared	0.210568	Mean dependent var		0.066265
Adjusted R-squared	0.203342	S.D. dependent var		0.180426
S.E. of regression	0.161040	Akaike info criterion		-0.803075
Sum squared resid	11.33317	Schwarz criterion		-0.756793
Log likelihood	182.4796	Hannan-Quinn criter.		-0.784820
F-statistic	29.14066	Durbin-Watson stat		1.802233
Prob(F-statistic)	0.000000			

TABLE V. DEPENDENT VARIABLE: I\_K

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.015552	0.010179	1.527859	0.1273
CF_K	0.180411	0.069338	2.601901	0.0096
SALE_K	0.095743	0.010430	9.179906	0.0000
CASH_K	-0.077347	0.035000	-2.209919	0.0276
Q	0.003305	0.000958	3.449236	0.0006
Q_CF_K	-0.017498	0.054360	-0.321889	0.7477
R-squared	0.210756	Mean dependent var		0.066265
Adjusted R-squared	0.201705	S.D. dependent var		0.180426
S.E. of regression	0.161206	Akaike info criterion		-0.798788
Sum squared resid	11.33047	Schwarz criterion		-0.743250
Log likelihood	182.5321	Hannan-Quinn criter.		-0.776882
F-statistic	23.28543	Durbin-Watson stat		1.802390
Prob(F-statistic)	0.000000			

TABLE VI. DEPENDENT VARIABLE: I\_K DEPENDENT

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.025218	0.011728	2.150308	0.0321
CF_K	0.266622	0.078810	3.383113	0.0008
SALE_K	0.097821	0.010358	9.443566	0.0000
CASH_K	-0.079690	0.034957	-2.279657	0.0231
Q	0.003176	0.000944	3.364282	0.0008
MA_CF_K	-0.254431	0.122291	-2.080542	0.0381
MA01	-0.031760	0.016196	-1.960992	0.0505
R-squared	0.225183	Mean dependent var		0.066265
Adjusted R-squared	0.214496	S.D. dependent var		0.180426
S.E. of regression	0.159909	Akaike info criterion		-0.812712
Sum squared resid	11.12335	Schwarz criterion		-0.747917
Log likelihood	186.6093	Hannan-Quinn criter.		-0.787155
F-statistic	21.07048	Durbin-Watson stat		1.828446
Prob(F-statistic)	0.000000			

F-statistic and R-squared generally shows that the goodness-of-fit is good.

The main variables in model III is interaction term: MA\*CF/K.. From table, we can see this variable is statistically significant at 5% level. The parameter is -0.254, which means the sensitivity of investment to cash flow decreased by 0.254 after M&A. According to FHP's suggestion that the sensitivity of investment to cash flow implies the level of financial constraint, the higher sensitivity indicates the higher financial constraint. Therefore, negative parameter of interaction term further predicts that the financial constraint is relieved after conducting M&A.

"Table VII" gives the summary of regression results.

TABLE VII. PARAMETER ESTIMATES

	Model IA	Model IB	Model II	Model III
CF/K	0.015628 (0.0328)			
Lagged CF/k		0.1698 (0.0610)	0.1804 (0.0693)	0.2666 (0.0788)
Sale/K	0.1004 (0.0104)	0.0958 (0.0104)	0.0957 (0.0104)	0.0978 (0.0103)
Cash/K	-0.0864 (0.0350)	-0.0778 (0.0349)	-0.0773 (0.0350)	-0.0797 (0.0349)
Q	0.0033 (0.0010)	0.0033 (0.0010)	0.0033 (0.0010)	0.0032 (0.0010)
Q*CF/K			-0.0174 (0.0543)	
MA*CF/K				-0.2544 (0.1223)
MA				-0.0318 (0.0162)
c	0.0154	0.0157	0.0156	0.0252
R2	0.1970	0.2105	0.2107	0.2252

Residual normality test:

Statistically, the distribution of t-statistic test and F-statistics test is affected by the distribution of residual. However, the default of OLS tests from Eviews is based on the assumption that residual obey the normality distribution. Therefore, if the distribution of residual violate from normality, T test and F test will deviate from true value.

We run residual normality diagnostic through histogram normality test. "Fig. 1", "Fig. 2", "Fig. 3" gives the result of residual normality test of model IB, II, III respectively.

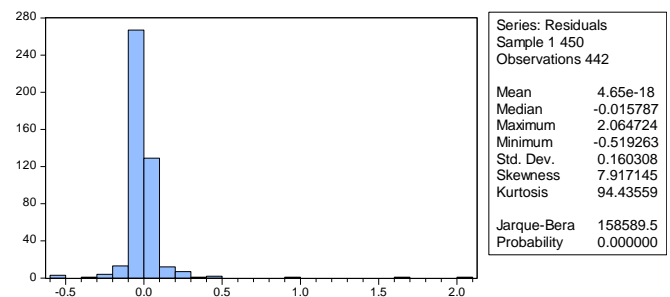


Fig. 1. The result of residual normality test of model IB

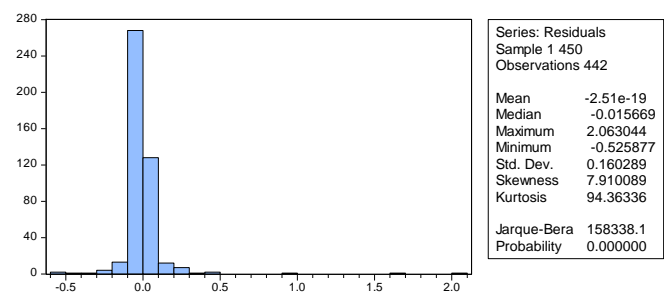


Fig. 2. The result of residual normality test of model II



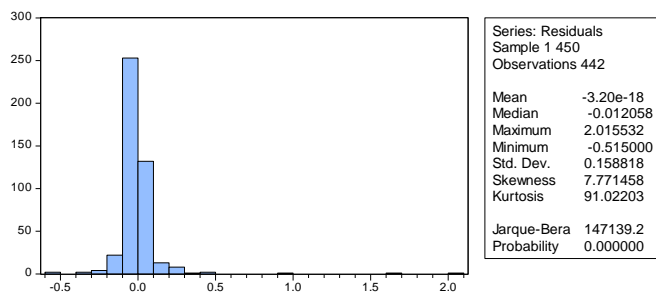


Fig. 3. The result of residual normality test of model III

According to these graphs we can totally reject the null hypothesis that residual obey normality distribution. This means the distribution of T test and F test are not perfectly normality. The reason for this problem may due to small size of sample. This happens very often in empirical research. Even so, there is nothing could remedy.

#### Heteroskedasticity Test :

Study runs a Heteroskedasticity Test by means of Breusch-Pagan-Godfrey. Generally speaking, as the cross-sectional sample is collected from different area, other factors (i.e. local policy) tend to make some noise on the quality of sample. Thus heteroskedasticity problem usually appears in cross-sectional sample. "Table VIII", "Table IX", "Table X", give the results of heteroskedasticity test result of model IB, II, III respectively.

TABLE VIII. HETEROSKEDASTICITY TEST: BREUSCH-PAGAN-GODFREY

F-statistic	17.60132	Prob. F(4,437)	0.0000
Obs*R-squared	61.32993	Prob. Chi-Square(4)	0.0000
Scaled explained SS	2800.742	Prob. Chi-Square(4)	0.0000

TABLE IX. HETEROSKEDASTICITY TEST: BREUSCH-PAGAN-GODFREY

F-statistic	14.19402	Prob. F(5,436)	0.0000
Obs*R-squared	61.87500	Prob. Chi-Square(5)	0.0000
Scaled explained SS	2810.542	Prob. Chi-Square(5)	0.0000

TABLE X. HETEROSKEDASTICITY TEST: BREUSCH-PAGAN-GODFREY

F-statistic	12.50412	Prob. F(6,435)	0.0000
Obs*R-squared	65.01826	Prob. Chi-Square(6)	0.0000
Scaled explained SS	2834.576	Prob. Chi-Square(6)	0.0000

According to the result of Heteroskedasticity Test, the value, Prob( $\chi^2$ )=0, indicates that the  $\chi^2$  is significant at any level. Therefore, reject the null hypothesis.

#### Correction estimation:

To solve this problem, we need to run correction estimation (White heteroskedasticity ) for each model. "Table XI", "Table XII", give the results of correction estimation of model IB, II, III respectively.

TABLE XI. DEPENDENT VARIABLE: I\_K

White heteroskedasticity-consistent standard errors & covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.015798	0.018259	0.865197	0.3874
CF_K	0.169851	0.118389	1.434682	0.1521
SALE_K	0.095894	0.035690	2.686828	0.0075
CASH_K	-0.077850	0.070620	-1.102376	0.2709
Q	0.003264	0.004190	0.779136	0.4363
R-squared	0.210568	Mean dependent var		0.066265
Adjusted R-squared	0.203342	S.D. dependent var		0.180426
S.E. of regression	0.161040	Akaike info criterion		-0.803075
Sum squared resid	11.33317	Schwarz criterion		-0.756793
Log likelihood	182.4796	Hannan-Quinn criter.		-0.784820
F-statistic	29.14066	Durbin-Watson stat		1.802233
Prob(F-statistic)	0.000000	Wald F-statistic		2.041914
Prob(Wald F-statistic)	0.087605			

The true value of the T-test and F-test can be obtained through White heteroskedasticity correction estimation. At first step, from the value of F-statistic and R-squared, it can be concluded that the variables are joint significant and with well goodness-of-fit. The sign and magnitude of parameter estimate on each variable is nearly unchanged. However, when it comes to the significance of parameter estimates on every variables, study finds that the confidence interval of each variable has experienced a decline, which means it fails to reject the null hypothesis at previous significant level. More specifically, because the standard error of cash flow increase from 0.061 (in uncorrected estimation) to 0.118 (in corrected estimation), the T-statistic decrease to 1.434. Thus we fail to reject the null hypothesis at 5% significant level, but we nearly can reject it at 15% significance level.

TABLE XII. DEPENDENT VARIABLE: I\_K

White heteroskedasticity-consistent standard errors & covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.015552	0.018494	0.840935	0.4008
CF_K	0.180411	0.142656	1.264662	0.2067
SALE_K	0.095743	0.035640	2.686409	0.0075
CASH_K	-0.077347	0.070593	-1.095681	0.2738
Q	0.003305	0.004236	0.780075	0.4358
Q_CF_K	-0.017498	0.051987	-0.336578	0.7366
R-squared	0.210756	Mean dependent var		0.066265
Adjusted R-squared	0.201705	S.D. dependent var		0.180426
S.E. of regression	0.161206	Akaike info criterion		-0.798788
Sum squared resid	11.33047	Schwarz criterion		-0.743250
Log likelihood	182.5321	Hannan-Quinn criter.		-0.776882
F-statistic	23.28543	Durbin-Watson stat		1.802390
Prob(F-statistic)	0.000000	Wald F-statistic		1.777010
Prob(Wald F-statistic)	0.116213			

This corrected estimation is to test the driving factors of firms conducting M&A. Generally, the independent variables are joint significant and model have a well goodness-of-fit. Regarding to interaction term (Q\*CF/K), parameter is still greatly insignificant different from zero, thereby failing to reject the null hypothesis. Therefore, the result fails to suggest any information about purpose of firm conducting M&A transaction.

TABLE XIII. DEPENDENT VARIABLE: I\_K

White heteroskedasticity-consistent standard errors & covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.025218	0.018468	1.365519	0.1728
CF_K	0.266622	0.167709	1.589794	0.1126
SALE_K	0.097821	0.035717	2.738761	0.0064
CASH_K	-0.079690	0.070624	-1.128368	0.2598
Q	0.003176	0.004160	0.763390	0.4456
MA_CF_K	-0.254431	0.233717	-1.088631	0.2769
MA01	-0.031760	0.012988	-2.445383	0.0149
R-squared	0.225183	Mean dependent var		0.066265
Adjusted R-squared	0.214496	S.D. dependent var		0.180426
S.E. of regression	0.159909	Akaike info criterion		-0.812712
Sum squared resid	11.12335	Schwarz criterion		-0.747917
Log likelihood	186.6093	Hannan-Quinn criter.		-0.787155
F-statistic	21.07048	Durbin-Watson stat		1.828446
Prob(F-statistic)	0.000000	Wald F-statistic		2.077036
Prob(Wald F-statistic)	0.054734			

This estimation result has amended the model III by removing the affection of heteroskedastic problem. Overall, the result of correction estimation also obtains an acceptable R-squared and F-statistic test. The main variable observed in this model is interaction term---MA\*CF/K, which suggests that taking M&A will affect the sensitivity of investment to cash flow. However, we cannot reject the null hypothesis on parameter estimate on this variable where the T-statistics indicate an insignificant signal. On the other hand, we find that M&A transaction has a negative effect on investment expenditure, and this effect is significant at 5% significance level. It means firm's expenditure will experience a decline after the firm completing M&A. Another finding is that sales will positively affect the investment expenditure at any time.

## V. ANALYSIS AND CONCLUSIONS

This paper has model the relation between conducting M&A and extent to relieve financial constraint. Chinese listed companies who conducted M&A during 2011 to 2014 are employed into research. Study models the relation between initial investment and cash flow. Also, it further considers other factors such as sales, cash holdings and Tobin Q.

We firstly investigate the degree of financial constraint in firms and find that there is relation between initial investment expenditure and internal cash flow. However, according to the result of heteroskedasticity correction estimation, this relation is only significant at 15% significance level. Therefore we claim that most of the firms in sample is financial constrained.

Next we detect the driving factors behind the M&A transactions. In this study, we find that the parameter of interaction term  $Q*CF/K$  is insignificant different from zero. Therefore, we fail to find the exactly reason for firms in samples conducting M&A transaction. The interpretation for failure is because the sample is collected from China where state-owned enterprises are more likely to suffer agency problem but private enterprises tend to face disadvantage of external capital cost. Firms with different reasons to conduct M&A lead to unobvious characteristic of driving factors behind M&A transaction.

Finally, we test whether firms through M&A transactions can relieve their financial constraint. We introduce dummy variable MV into model. Before conducting M&A transaction, MA equal to 0. After conducting M&A transaction, MA equal to 1. In order to investigate how M&A will affect the sensitivity of investment to cash flow, we combine the cash flow with MA as an interaction term ( $MA*CF/K$ ). We find that the sign of parameter estimate is negative, which means M&A transactions lower the sensitivity of investment to cash flow. In other words, negative parameter estimate on interaction term  $MA*CF/K$  implies that conducting M&A has relieved the financial constraint. However, due to the inferior quality of sample collection, result of heteroskedasticity correction estimation does not give really strong evidence. This is not surprising because we already know that Chinese firms conducting M&A transactions have different aims. Indeed, the root cause for less confidence of result is associated with sample collection which is under the Chinese peculiar economy and period.

This study examined the relation between M&A transactions and financial constraint. However, the result is not as confident as we anticipated. Therefore, we expect that future studies can extend the sample size. It may help to improve the significance of result. Besides, we suggest that time frame would cover a long period such as 10 years. This helps research to avoid the temperate effect of economic environment on regression result. Another suggestion from this study is that if the characteristic of sample is affected by geographical factors, it is necessary to add a dummy variable indicating geographic character into model.

We expect that sample could be grouped according to level of financial constraint when further studies develop this topic.

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