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THE IMPACT OF QUANTITATIVE EASING MONETARY POLICY ON AMERICAN CORPORATE PERFORMANCE

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Abstract: *We aim to identify whether the implementation of quantitative easing monetary (QE) policy by the Federal Reserve Board will improve American firm's profitability and value. Empirical results show that firm performance after QE policy implementation are significantly higher than those in non-implemented years, and that corporate performance increases after QE policy implementation. Moreover, quantitative easing monetary policy has significantly positive impacts on return on assets, Tobin's Q, industry-adjusted return on assets, and industry-adjusted Tobin's Q, indicating that QE policy implementation helps improve corporate performance.*

Keywords: *Monetary Policy; Quantitative Easing; Corporate Performance; Government Policy*

JEL: *E52, G38*

1. INTRODUCTION

Quantitative easing (QE) is a monetary policy. Quantitative refers to the creation of a certain amount of money. Easing refers to the central bank increasing money supply by buying national debt and enterprise bond in the open market to ease bank funding pressure. Compared with short-term government bond trades that the central bank generally makes, government bonds issued according to QE policy are in much larger scale with a longer time limit.

Japan is the first country that adopted QE policy, when its central bank implemented the policy in 2001. To fight deflation, huge sums of money are injected

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in the bank system. In this process, government bonds are bought to release capital and decrease long-term interest rate. While QE policy stimulates the economy, it also can reduce capital costs of firms and increase private consumption. QE policy helps the economy recover and grow; however, in the long term, it sows the seed of inflation. The stagnation of economic growth is likely to lead to inflation. Moreover, QE policy will cause a substantial depreciation of the currency due to printing of a lot of money. Other national currencies will appreciate as the export market is stimulated. For export-oriented countries facing economic crisis, the effect is a heavy blow, even resulting in trade friction.

In terms of the implementation of American QE policy, the Federal Reserve Board (FED) implemented the first QE policy (QE1) from November 2008 to March 2010, buying mortgage backed securities (MBS) and approximately USD 1.75 trillion real estate-related debts of Federal Home Loan Banks. From November 2010 to June 2011, the FED implemented the second QE policy (QE2) to drive down long-term interest rates and reduce the unemployment rate high to 9.6% by buying USD 600 billion government bonds. From September 2012 to October 2014, the FED implemented the third QE policy (QE3), and invested USD 40 billion to MBS monthly.

The main purpose of FED implementing QE policies is to decrease long-term interest rate, increase investment and consumption, and promote economic growth by expanding market liquidity. No literature has reported the impact of QE policy on corporate performance in the past. We suggests that QE policy helps improve money supply in the market, decrease capital costs of enterprises, and improve corporate investment, thus improving firm performance. Therefore, we will verify the impact of QE policy on American firm's profitability and value.

The second part of this paper presents the research method, including the introduction of data source and research method, and the calculation and measurement of relevant variables. Empirical analysis is described in the next part. Finally, the findings are summarized.

2. RESEARCH METHOD

2.1. Data and sample selection

In this paper, firms listed on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and National Association of Securities Dealers Automated Quotation (NASDAQ) were used as study samples. The study period is from 1994 to 2013, totaling 20 years. Financial statements and materials about the market values of samples were collected from Compustat and Worldscope.

For sample screening, Standard Industrial Classification Code (SIC code) is used to determine industrial classifications of samples. Due to regulatory restrictions on the financial industry and public utilities and the differences in the industry, financial stocks (SIC codes between 6000 and 6999) and public utilities (SIC codes between 4900

and 4999) were excluded. Moreover, firms with incomplete related variables were deleted. To avoid the extreme values of the related variables influencing the empirical results, we deleted the extreme values accounting for 1% of the top and bottom of all variables.

2.2. Research model and variables

2.2.1. The empirical model

First, we aims to construct a panel regression model by combining time series and cross-section data to probe into the impact of quantitative easing monetary policy on corporate performance. The model is set as:

$$\begin{aligned} ROA_{i,t} = {} & \alpha_0 + \beta_1 QE_{i,t-1} + \beta_2 SIZE_{i,t-1} + \beta_3 CAPEXP_{i,t-1} + \beta_4 DEBT_{i,t-1} + \\ & \beta_5 ROA_{i,t-1} + \beta_6 RDR_{i,t-1} + \beta_7 RISK_{i,t-1} + Firm\ dummies + \\ & Year\ dummies + \varepsilon_{i,t} \end{aligned} \tag{1}$$

$$\begin{aligned} Tobin's\ Q_{i,t} = {} & \alpha_0 + \beta_1 QE_{i,t-1} + \beta_2 SIZE_{i,t-1} + \beta_3 CAPEXP_{i,t-1} + \beta_4 DEBT_{i,t-1} + \\ & \beta_5 ROA_{i,t-1} + \beta_6 RDR_{i,t-1} + \beta_7 RISK_{i,t-1} + Firm\ dummies + \\ & Year\ dummies + \varepsilon_{i,t} \end{aligned} \tag{2}$$

$$\begin{aligned} IndAdjROA_{i,t} = {} & \alpha_0 + \beta_1 QE_{i,t-1} + \beta_2 SIZE_{i,t-1} + \beta_3 CAPEXP_{i,t-1} + \beta_4 DEBT_{i,t-1} + \\ & \beta_5 ROA_{i,t-1} + \beta_6 RDR_{i,t-1} + \beta_7 RISK_{i,t-1} + Firm\ dummies + \\ & Year\ dummies + \varepsilon_{i,t} \end{aligned} \tag{3}$$

$$\begin{aligned} IndAdjTobin's\ Q_{i,t} = {} & \alpha_0 + \beta_1 QE_{i,t-1} + \beta_2 SIZE_{i,t-1} + \beta_3 CAPEXP_{i,t-1} + \beta_4 DEBT_{i,t-1} + \\ & \beta_5 ROA_{i,t-1} + \beta_6 RDR_{i,t-1} + \beta_7 RISK_{i,t-1} + Firm\ dummies + \\ & Year\ dummies + \varepsilon_{i,t} \end{aligned} \tag{4}$$

In Eqs. (1) to (4), corporate performance variables include return on assets (*ROA*), *Tobin's Q*, industry-adjusted *ROA* (*IndAdjROA*), and industry-adjusted *Tobin's Q* (*IndAdjTobin's Q*). *Q E*refers to quantitative easing monetary policy variable, and its regression coefficient is β_1. $Control_{n,i,t}$ refers to the numerical value of control variable *n* of sample *i* in the year *t*. Calculation and introduction to related variables are shown in the next section. Based on the Hausman test results, the regression model in this paper is in fixed effect mode, so the heterogeneity and time trend of the sample firms should be considered. Fixed effect of firm and time dummy variables are added in Eqs. (1) to (4), namely, *Firm dummies* and *Year dummies*. Based on the method that

Petersen (2009) suggested, we adopt Newey-West estimated value to adjust the standard errors for heteroskedasticity and autocorrelation problems possibly existing in panel data (Newey & West, 1987).

2.2.2. Corporate performance variables

2.2.2.1. Profitability

We use *ROA* as the indicator of measuring a firm's profitability. *ROA* equals after-tax profit before interest divided by average total assets.

2.2.2.2. Firm value

We adopt *Tobin's Q* as the indicator of measuring firm value. *Tobin's Q* refers to La Porta, Lopez-De-Silanes, Shleifer, and Vishny (2002). The equation is shown below:

Tobin's Q= (equity market value+book value of liabilities) / book value of total assets

We further calculate industry-adjusted corporate performance variables for industrial competitors, including industry-adjusted *ROA* (*IndAdjROA*) and industry-adjusted *Tobin's Q* (*IndAdjTobin's Q*). *Ind Adj ROA* is equal to *ROA* of individual sample firm minus the industry average *ROA* value. *Ind Adj Tobin's Q* is equal to *Tobin's Q*of individual sample firm minus industry average *Tobin's Q* value.

2.2.3. Quantitative easing monetary policy variable

QE refers to a dummy variable of quantitative easing monetary policy. A year after the United States implemented quantitative easing monetary policy, the dummy variable is set to 1; 0 if otherwise.

2.2.4 Control variables

2.2.4.1 Size

Referring to Core, Guay, and Rusticus (2006), we use the natural logarithm of market value as the acting indicator of the firm size. The equation is shown below:

SIZE= natural logarithm of market value (firm's stock price multiplied by the number of shares outstanding)

2.2.4.2. Capital expenditure ratio

Based on McConnell and Muscarella (1985), we adopt capital expenditure ratio to control its impact on corporate performance. The equation is shown below:

Capital expenditure ratio (*CAPEXP*) = capital expenditures / net revenue

2.2.4.3. Debt ratio

Referring to Cho (1998), we use debt ratio to control the impact of the degree of financial operating leverage on corporate performance:

Debt ratio (*DEBT*)= total liabilities/total assets

2.2.4.4. Previous ROA

Existing literature shows that early *ROA* is significantly related to the current corporate performance (Kim, 2005; Lskavyan & Spatareanu, 2006). Therefore, we use previous ROA(ROA_{t-1}) as a control variable.

2.2.4.5. Research and development expenditure ratio

Referring to Agrawal and Knoeber (1996) and Morck, Shleifer, and Vishny (1988), we adopt research and development expenditure ratio to control the impact of growth opportunities on corporate performance. The equation is shown below:

Research and development expenditure ratio (*RDR*)= research and development expenditure / total assets

2.2.4.6. Corporate risk

Based on Core, Holthausen, and Larcker (1999), we use standard deviation of *ROA* as the acting indicator of corporate risk. The equation is shown below:

Corporate risk (*RISK*) = the standard deviation of the *ROA* over the preceding five-year period

3. THE EMPIRICAL ANALYSIS

3.1. Industrial distribution of samples

The samples in this paper cover a total of 14,253 firms. Companies in the Business Services industry account for 15.10%, totaling 2,152. Retail companies account for 6.18% of the total sample size, while Electronic equipment companies account for 6.03%. Firm-years samples in this paper total 110,125. Firm-years samples from Business Services companies total 13,158, accounting for 11.95%. Electronic equip companies account for 7.20%, while Retail companies total 7,319, accounting for 6.65%.

3.2. Descriptive statistics

3.2.1. Descriptive statistics of full sample

Among all samples, the mean values of *ROA*, *IndAdjROA*, *Tobin's Q*,and *IndAdjTobin's Q* are -0.0067, -0.0375, 1.6960, and 0.3044, respectively. The mean value in the firm size is 4.9424. The mean size of sample firms is approximately USD140 million. The mean values of capital expenditure ratio and research and development expenditure ratio are 0.0826

Table 1
Industrial distribution of samples

The research period is from 1994 to 2013. The samples include 14,253 firms, and firm-years samples total 110,125. According to Fama and French (1997), the samples are divided into 43 industries.

Industry	*Number of firm-years*	*Percentage*	*Number of firms*	*Percentage*
Agriculture	445	0.40%	79	0.55%
Food Products	2,420	2.20%	252	1.77%
Candy & Soda	337	0.31%	39	0.27%
Beer & Liquor	469	0.43%	53	0.37%
Tobacco Products	79	0.07%	13	0.09%
Recreation	1,206	1.10%	157	1.10%
Entertainment	1,970	1.79%	322	2.26%
Printing and Publishing	1,048	0.95%	113	0.79%
Consumer Goods	2,617	2.38%	306	2.15%
Apparel	2,002	1.82%	213	1.49%
Healthcare	2,332	2.12%	329	2.31%
Medical equip.	3,837	3.48%	490	3.44%
Pharmaceutical Products	3,942	3.58%	670	4.70%
Chemicals	2,636	2.39%	252	1.77%
Rubber and Plastic Products	1,353	1.23%	173	1.21%
Textiles	930	0.84%	108	0.76%
Construction Materials	2,963	2.69%	318	2.23%
Construction	1,695	1.54%	229	1.61%
Steel Works Etc	2,178	1.98%	222	1.56%
Fabricated Products	543	0.49%	63	0.44%
Machinery	4,942	4.49%	481	3.37%
Electrical equip.	2,328	2.11%	227	1.59%
Automobiles and Trucks	2,192	1.99%	219	1.54%
Aircraft	694	0.63%	61	0.43%
Shipbuilding	265	0.24%	32	0.22%
Defense	217	0.20%	24	0.17%
Precious Metals	981	0.89%	149	1.05%
Mining	703	0.64%	110	0.77%
Coal	227	0.21%	36	0.25%
Petroleum and Natural Gas	5,503	5.00%	837	5.87%
Communication	3,612	3.28%	622	4.36%
Personal Services	1,472	1.34%	193	1.35%
Business Services	13,158	11.95%	2,152	15.10%
Computers	5,262	4.78%	759	5.33%
Electronic equip.	7,932	7.20%	859	6.03%
Measuring equip.	3,075	2.79%	308	2.16%
Business Supplies	2,074	1.88%	185	1.30%
Shipping Containers	434	0.39%	45	0.32%
Transportation	3,421	3.11%	431	3.02%
Wholesale	5,375	4.88%	660	4.63%
Retail	7,319	6.65%	881	6.18%
Restaraunts, Hotels, Motels	2,516	2.28%	328	2.30%
Other	1,421	1.29%	253	1.78%
SUM	110,125	100.00%	14,253	100.00%

and 0.0317, respectively. The 99th percentile is 0.3310 and 0.2431, respectively. In other words, some companies are aggressively engaged in capital expenditure and research and development expenditure investment. For debt ratio, the mean value of total samples is 0.4817 and the median is 0.4861, indicating a corporate debt level close to 50%. Corporate risk is evaluated using standard deviation of *ROA*, and its mean value is 0.0906.

Table 2
Descriptive statistics-full sample

In the table, return on assets (*ROA*) refers to the ratio of after-tax net income before interest to average total assets; industry-adjusted *ROA* (*IndAdjROA*)is equal to *ROA* of individual sample firms minus industry average*ROA*; *Tobin's Q* is the ratio of the market value of equity plus the book value of debt divided by the book value of the total assets; industry-adjusted*Tobin's Q* (*IndAdjTobin's Q*) is *Tobin's Q* of individual sample firms minus industry average *Tobin's Q*; firm size (*SIZE*) is the natural logarithm of market value; capital expenditure ratio (*CAPEXP*) is the ratio of capital expenditures to net revenue; debt ratio (*DEBT*) is the ratio of total liabilities to total assets; research and development expenditure ratio (*RDR*) is the ratio of research and development expenditure to total assets; and corporate risk (*RISK*) refers to the standard deviation of the *ROA* over the preceding five-year period.

Variable	*Mean*	*Median*	*StdDev*	*1th*	*5th*	*25th*	*75th*	*95th*	*99th*
ROA	-0.0067	0.0346	0.1861	-4.3278	-0.7517	-0.3113	-0.0190	0.0735	0.1438
IndAdjROA	-0.0375	0.0002	0.1822	-4.2663	-0.7641	-0.3307	-0.0492	0.0393	0.1136
Tobin'sQ	1.6960	1.3296	1.1509	0.1104	0.5320	0.7395	1.0224	1.9304	3.9401
IndAdjTobin'sQ	0.3044	0.0026	1.0849	-2.3318	-1.0562	-0.6969	-0.2706	0.5046	2.3739
SIZE	4.9424	4.8398	2.2505	0.6233	1.4467	3.2105	6.5620	8.8754	10.0144
CAPEXP	0.0826	0.0594	0.0748	0.0003	0.0060	0.0279	0.1139	0.2465	0.3310
DEBT	0.4817	0.4861	0.2062	0.1012	0.1495	0.3185	0.6323	0.8267	0.9282
RDR	0.0317	0	0.0556	0	0	0	0.0408	0.1606	0.2431
RISK	0.0906	0.0424	0.1401	0.0036	0.0072	0.0204	0.0965	0.3451	0.7539

3.2.2. Descriptive statistics before and after the implementation of quantitative easing monetary policy

Comparing the differences in empirical variables between a non-implementation year of QE policy and a year of implementation of QE policy, the mean values of *ROA*, industry-adjusted *ROA*, *Tobin's Q*, and industry-adjusted *Tobin's Q* after implementing QE policy for a year are 0.0122, -0.0215, 1.8780, and 0.4815, respectively, which are higher than the mean values in a non-implementation year, i.e., -0.0085, -0.0390, 1.6813, and 0.2901. This result indicates that the value of an enterprise is improved after QE policy implementation. In terms of firm size, the mean values in a non-implementation year and a year of implementation of QE policy are 4.8483 and 5.9438 respectively. This result indicates that firm sizeis improved after implementing QE policy for a year. In terms of debt ratio, the mean values in a non-implementation year and a year of QE policy implementation are 0.4823 and 0.4758, respectively, which are both close to 50%. Thus, the debt ratios before and after QE policy implementation are similar. After QE policy is implemented for a year, the mean value of *ROA* standard deviation is 0.0981, which is higher than that in a non-implementation year (0.0899), indicating that corporate risk increases after QE is implemented.

Table 3
Descriptive statistics before and after the implementation of quantitative easing monetary policy

In the table, the differences between non-implementation year of QE policy and a year of implementation of QE policy. Return on assets (*ROA*) refers to the ratio of after-tax net income before interest to average total assets; industry-adjusted *ROA* (*Ind Adj ROA*) is equal to ROA of individual sample firms minus industry average ROA; *Tobin's Q* is the ratio of the market value of equity plus the book value of debt divided by the book value of the total assets; industry-adjusted *Tobin's Q* (*Ind Adj Tobin's Q*) is *Tobin's Q* of individual sample firms minus industry average *Tobin's Q*; firm size (*SIZE*) is the natural logarithm of market value; capital expenditure ratio (*CAPEXP*) is the ratio of capital expenditures to net revenue; debt ratio (*DEBT*) is the ratio of total liabilities to total assets; research and development expenditure ratio (*RDR*) is the ratio of research and development expenditure to total assets; and corporate risk (*RISK*) refers to the standard deviation of the *ROA* over the preceding five-year period.

Panel A. Non-implementation year of QE policy

Variable	*Mean*	*Median*	*Std. Dev.*	*1th*	*5th*	*25th*	*75th*	*95th*	*99th*
ROA	-0.0085	0.0345	0.1909	-4.3278	-0.7756	-0.3184	-0.0197	0.0736	0.1434
IndAdjROA	-0.0390	0.0002	0.1869	-4.2663	-0.7935	-0.3373	-0.0497	0.0397	0.1135
Tobin'sQ	1.6813	1.3169	1.1480	0.1104	0.5221	0.7287	1.0126	1.9127	3.9086
IndAdjTobin'sQ	0.2901	0.0000	1.0814	-2.3318	-1.0690	-0.7097	-0.2814	0.4869	2.3432
SIZE	4.8483	4.7239	2.2279	0.6076	1.4095	3.1344	6.4378	8.7573	9.9499
CAPEXP	0.0828	0.0598	0.0745	0.0003	0.0062	0.0282	0.1139	0.2461	0.3306
DEBT	0.4823	0.4870	0.2059	0.1013	0.1502	0.3196	0.6324	0.8264	0.9287
RDR	0.0318	0	0.0556	0	0	0	0.0412	0.1605	0.2427
RISK	0.0899	0.0418	0.1401	0.0036	0.0072	0.0202	0.0950	0.3446	0.7541

Panel B. Next year of QE policy implementation

Variable	*Mean*	*Median*	*Std. Dev.*	*1th*	*5th*	*25th*	*75th*	*95th*	*99th*
ROA	0.0122	0.0356	0.1193	-0.6173	-0.4679	-0.2348	-0.0117	0.0718	0.1494
IndAdjROA	-0.0215	0.0001	0.1170	-0.6682	-0.4934	-0.2613	-0.0432	0.0358	0.1142
Tobin'sQ	1.8780	1.4783	1.1708	0.8854	0.8972	0.9378	1.1499	2.1452	4.2750
IndAdjTobin'sQ	0.4815	0.1286	1.1132	-1.5421	-0.7814	-0.4973	-0.1449	0.7146	2.6726
SIZE	5.9438	6.0859	2.2465	1.0127	2.0789	4.2758	7.6118	9.5001	10.3385
CAPEXP	0.0809	0.0544	0.0771	0	0.0045	0.0243	0.1133	0.2535	0.3345
DEBT	0.4758	0.4769	0.2086	0.1006	0.1428	0.3082	0.6302	0.8299	0.9215
RDR	0.0313	0	0.0561	0	0	0	0.0366	0.1626	0.2494
RISK	0.0981	0.0502	0.1400	0.0035	0.0074	0.0226	0.1126	0.3511	0.7539

3.3. Difference analysis on corporate performance before and after QE policy implementation

We further identify the difference in corporate performance between before and after the implementation of QE policy. The samples are divided into two groups, namely, non-implementation of QE policy and a year of implementation of QE policy, to conduct a difference analysis. We find that in non-implementation of QE policy group, the

mean values of *ROA* and industry-adjusted *ROA* are -0.0085 and -0.0390, respectively; in a year of implementation of QE policy group, the values are 0.0122 and -0.0215, respectively; and the differences in the mean values reach a 1% significance level. A consistent empirical result is also obtained for the difference in medium, indicating that the implementation of QE policy helps improve the profitability of enterprises. Meanwhile, empirical results show that during non-implementation of QE policy, either *Tobin's Q* or the mean value and medium of industrially adjusted *Tobin's Q* are lower than those during a year of implementation of QE policy. Therefore, these results show that the value of enterprise is significantly improved after QE policy is implemented.

Table 4
Difference analysis on corporate performance between before and after implementing QE policy

We divide the samples into non-implementation year of QE policy group and next year of QE policy implementation group. In the table, return on assets (*ROA*) refers to the ratio of after-tax net income before interest to average total assets; industry-adjusted *ROA* (*Ind Adj ROA*) is equal to ROA of individual sample firms minus industry average ROA; *Tobin's Q* is the ratio of the market value of equity plus the book value of debt divided by the book value of the total assets; industry-adjusted *Tobin's Q* (*IndAdj Tobin's Q*) is *Tobin's Q* of individual sample firms minus industry average *Tobin's Q*. Differences in mean and median are assessed using a *t*-test and a Wilcoxon rank-sum test. * refers to 10% significance level; **refers to 5% significance level; and *** refers to 1% significance level.

		Non-implementation year of QE policy	*Next year of QE policy implementation*	*The difference of mean and median*
ROA	Mean	-0.0085	0.0122	0.0207***
	Median	0.0345	0.0356	0.0011***
IndAdjROA	Mean	-0.0390	-0.0215	0.0175***
	Median	0.0002	0.0001	-0.0001
Tobin'sQ	Mean	1.6813	1.8780	0.1967***
	Median	1.3169	1.4783	0.1614***
IndAdjTobin'sQ	Mean	0.2901	0.4815	0.1914***
	Median	0.0000	0.1286	0.1286***

3.4. Correlation coefficient analysis

Pearson correlation coefficient analysis results show that quantitative easing monetary policy variables have a significantly positive relationship with *ROA* and that quantitative easing monetary policy variables have a significantly positive relationship with *Tobin's Q*. Therefore, correlation coefficient analysis results show that after QE policy is implemented, *ROA* in the current year is improved, which is positively related to the firm profitability.

Moreover, a consistent empirical result is obtained for industry-adjusted *Tobin's Q*. Quantitative easing monetary policy variables have a significantly positive relationship with industry-adjusted *Tobin's Q*, indicating that the implementation of QE policy is positively related to the firm value.

Table 5
Correlation coefficient analysis

We use Pearson correlation coefficient to identify the correlation between quantitative easing monetary policy and corporate performance. In the table, return on assets (*ROA*) refers to the ratio of after-tax net income before interest to average total assets; industry-adjusted *ROA* (*IndAdjROA*) is equal to ROA of individual sample firms minus industry average ROA; *Tobin's Q* is the ratio of the market value of equity plus the book value of debt divided by the book value of the total assets; industry-adjusted *Tobin's Q* (*Ind Adj Tobin's Q*) is *Tobin's Q* of individual sample firms minus industry average *Tobin's Q*. QE refers to quantitative easing monetary policy variables. During a year of implementation of American QE policy, the dummy variable of quantitative easing monetary policy is set to 1, and 0 if otherwise. Firm size (*SIZE*) is the natural logarithm of market value; capital expenditure ratio (*CAPEXP*) is the ratio of capital expenditures to net revenue; debt ratio (*DEBT*) is the ratio of total liabilities to total assets; p revious ROA (ROA_{t-1}) is the *ROA* of the previous period; research and development expenditure ratio (*RDR*) is the ratio of research and development expenditure to total assets; and corporate risk (*RISK*) refers to the standard deviation of the *ROA* over the preceding five-year period. The P-value is reported in parentheses. * refers to 10% significance level; **refers to 5% significance level; and *** refers to 1% significance level.

	ROA	*IndAdj ROA*	*Tobin's Q*	*IndAdj Tobin's Q*	*QE*	*SIZE*	*CAPEX*	*DEBT*	*RDR*
IndAdjROA	0.9931***								
	(<0.0001)								
Tobin'sQ	-0.0002	0.0026							
	(0.9608)	(0.3901)							
IndAdj	0.0153***	0.0177***	0.9622***						
Tobin'sQ	(<0.0001)	(<0.0001)	(<0.0001)						
QE	0.0066**	0.0028	0.0081***	0.0129***					
	(0.0282)	(0.3579)	(0.0073)	(<0.0001)					
SIZE	0.2901***	0.2924***	0.2349***	0.2263***	0.1364***				
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)				
CAPEX	0.0644***	0.0654***	0.0860***	0.0954***	-0.0070**	0.1459***			
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.0212)	(<0.0001)			
DEBT	-0.0698***	-0.0772***	-0.2742***	-0.2269***	-0.0088***	0.0153***	0.0004		
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.0034)	(<0.0001)	(0.8901)		
RDR	-0.2043***	-0.1941***	0.2701***	0.1863***	-0.0026	-0.0397***	-0.1001***	-0.2668***	
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.3878)	(<0.0001)	(<0.0001)	(<0.0001)	
RISK	-0.3686***	-0.3565***	0.1981***	0.1611***	0.0164***	-0.2287***	-0.0562***	-0.1058***	0.2625***
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)

3.5. The impact of quantitative easing monetary policy on ROA

The empirical results in Table 6 show that quantitative easing monetary policy variables (*QE*) have a positive effect on *ROA*, reaching statistical significance. In other words, after QE policy is implemented, the profitability of enterprises is improved. Among control variables, regression coefficient for firm size (*SIZE*) is significantly positiveat 1% significance level, which indicates that if the firm size increases, *ROA* will rise. Debt ratio (*DEBT*) has a significantly positive effect on *ROA*, which suggests that a higher debt ratio can increase *ROA*. Previous ROA (ROA_{t-1}) has also a positive effect on *ROA*, reaching 1% significance level, which means that if previous ROA is higher, future *ROA* is also higher. Regression coefficient of research and development

expenditure ratio (*RDR*) is positive and is statistically significant, which suggests that if research and development expenditure ratio increases, *ROA* will rise.

In addition, we use industry-adjusted *ROA* (*Ind Adj ROA*) as a dependent variable, obtaining a consistent empirical result. Quantitative easing monetary policy variables (*QE*) have significantly positive effect on *Ind Adj ROA*. In other words, industry-adjusted *ROA* shows a rising trend after implementing QE policy for a year. Control variables are consistent with the previously mentioned empirical result. The firm size (*SIZE*), debt ratio (*DEBT*), Previous ROA (ROA_{t-1}), and research and development expenditure ratio (*RDR*) have significantly positive effects on industry-adjusted *ROA*.

Table 6
The impact of quantitative easing monetary policy on firm profitability

We construct a panel regression model to investigate the impact of the implementation of quantitative easing monetary policy on profitability of corporate. In the table, return on assets (*ROA*) refers to the ratio of after-tax net income before interest to average total assets; industry-adjusted *ROA* (*Ind Adj ROA*) is equal to ROA of individual sample firms minus industry average ROA. QE refers to quantitative easing monetary policy variables. During a year of implementation of American QE policy, the dummy variable of quantitative easing monetary policy is set to 1, and 0 if otherwise. In control variables, firm size (*SIZE*) is the natural logarithm of market value; capital expenditure ratio (*CAPEXP*) is the ratio of capital expenditures to net revenue; debt ratio (*DEBT*) is the ratio of total liabilities to total assets; previous ROA (ROA_{t-1}) is the *ROA* of the previous period; research and development expenditure ratio (*RDR*) is the ratio of research and development expenditure to total assets; and corporate risk (*RISK*) refers to the standard deviation of the *ROA* over the preceding five-year period. Newey-West's (1987) heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. * refers to 10% significance level; **refers to 5% significance level; and *** refers to 1% significance level.

Dependent variable *Independent variable*	*ROA*	*IndAdjROA*	*ROA*	*IndAdjROA*
Intercept	-0.0433***	-0.0764***	-0.0613***	-0.0912***
	(0.0019)	(0.0019)	(0.0028)	(0.0028)
QE_{t-1}	0.0102***	0.0069***	0.0060**	0.0066**
	(0.0018)	(0.0018)	(0.0027)	(0.0027)
$SIZE_{t-1}$	0.0064***	0.0068***	0.0033***	0.0033***
	(0.0002)	(0.0002)	(0.0004)	(0.0004)
$CAPEXP_{t-1}$	-0.0131*	0.0042	-0.0016	-0.0001
	(0.0068)	(0.0067)	(0.0068)	(0.0068)
$DEBT_{t-1}$	0.0345***	0.0293***	0.0606***	0.0582***
	(0.0025)	(0.0025)	(0.0031)	(0.0031)
ROA_{t-1}	0.4653***	0.4475***	0.2176***	0.2111***
	(0.0025)	(0.0025)	(0.0030)	(0.0030)
RDR_{t-1}	0.0135	0.0335***	0.1039***	0.1102***
	(0.0097)	(0.0096)	(0.0135)	(0.0134)
$RISK_{t-1}$	-0.1390***	-0.1264***	0.0327***	0.0319***
	(0.0039)	(0.0038)	(0.0044)	(0.0044)
Firm dummies	No	No	Yes	Yes
Year dummies	No	No	Yes	Yes
Adjusted R^2	0.2959	0.2842	0.5163	0.5036
Pr> F	<0.0001	<0.0001	<0.0001	<0.0001

3.6. The impact of quantitative easing monetary policy on Tobin's Q

The empirical results in Table 7 show that quantitative easing monetary policy variables (*QE*) have a significantly positive effect on *Tobin's Q*, which indicates that the implementation of QE policy helps improve the value of enterprises. In terms of control variables, firm size (*SIZE*) has a significantly positive effect on *Tobin's Q*. Therefore, if the firm size increases, the firm value will rise. Research and development expenditure ratio (*RDR*) also has a significantly positive effect on *Tobin's Q*, which suggests that a higher research and development expenditure ratio can increase the future value of a firm. Moreover, regression coefficient of corporate risk is a positive value, reaching

Table 7
The impact of quantitative easing monetary policy on firm value

We construct a panel regression model to investigate the effect of the implementation of quantitative easing monetary policy on firm value. In the table, *Tobin's Q* is the ratio of the market value of equity plus the book value of debt divided by the book value of the total assets; industry-adjusted*Tobin's Q* (*Ind Adj Tobin's Q*) is *Tobin's Q* of individual sample firms minus industry average *Tobin's Q*. QE refers to quantitative easing monetary policy variables. During a year of implementation of American QE policy, the dummy variable of quantitative easing monetary policy is set to 1, and 0 if otherwise. In control variables, firm size (*SIZE*) is the natural logarithm of market value; capital expenditure ratio (*CAPEXP*) is the ratio of capital expenditures to net revenue; debt ratio (*DEBT*) is the ratio of total liabilities to total assets; previous ROA (ROA_{t-1}) is the *ROA* of the previous period; research and development expenditure ratio (*RDR*) is the ratio of research and development expenditure to total assets; and corporate risk (*RISK*) refers to the standard deviation of the *ROA* over the preceding five-year period. Newey-West's (1987) heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. * refers to 10% significance level; **refers to 5% significance level; and *** refers to 1% significance level.

Dependent variable	*Tobin's Q*	*IndAdj Tobin's Q*	*Tobin's Q*	*IndAdj Tobin's Q*
Independent variable				
Intercept	1.3551***	-0.0130	1.2704***	-0.1005***
	(0.0129)	(0.0124)	(0.0169)	(0.0166)
QE_{t-1}	0.0601***	0.0743***	0.1788***	0.1845***
	(0.0128)	(0.0123)	(0.0170)	(0.0167)
$SIZE_{t-1}$	0.0855***	0.0754***	0.0558***	0.0519***
	(0.0016)	(0.0015)	(0.0024)	(0.0024)
$CAPEXP_{t-1}$	0.4518***	0.5126***	-0.1794***	-0.1695***
	(0.0450)	(0.0433)	(0.0411)	(0.0406)
$DEBT_{t-1}$	-0.6573***	-0.4976***	0.2589***	0.2520***
	(0.0167)	(0.0161)	(0.0186)	(0.0183)
ROA_{t-1}	-0.3788***	-0.2896***	0.1023***	0.0852***
	(0.0166)	(0.0159)	(0.0178)	(0.0175)
RDR_{t-1}	3.2853***	1.9700***	0.4382***	0.4755***
	(0.0644)	(0.0619)	(0.0809)	(0.0798)
$RISK_{t-1}$	0.9480***	0.7905***	0.1463***	0.1389***
	(0.0256)	(0.0246)	(0.0266)	(0.0262)
Firm dummies	No	No	Yes	Yes
Year dummies	No	No	Yes	Yes
Adjusted R^2	0.1007	0.0647	0.4911	0.4428
Pr> F	<0.0001	<0.0001	<0.0001	<0.0001

1% significance level, indicating that when the operating risk of a firmincreases, *Tobin's Q* will rise.

Furthermore, we use industry-adjusted *Tobin's Q* (*Ind Adj Tobin's Q*) as a dependent variable, obtaining a consistent empirical result. Regression coefficient of quantitative easing monetary policy variables (*QE*) is a positive value, reaching 1% significance level, which indicates that the implementation of QE policy causes the value of corporate to increase. Control variables are consistent with the aforementioned empirical result. Firm size (*SIZE*), research and development expenditure ratio (*RDR*), and corporate risk (*RISK*) have significantly positive effects on *IndAdjTobin's Q.*

4. CONCLUSION

We employ firms listed on NYSE, AMEX, and NASDAQ as study samples. The study period is from 1994 to 2013, totaling 20 years. We aim to identify whether the implementation of quantitative easing monetary policy by Federal Reserve Board will improve American firm's profitability and value.

Empirical results show that, comparing the differences in empirical variables between non-implementation year of QE policy and year of implementation of QE policy, *ROA*, industry-adjusted *ROA*, *Tobin's Q,* and industry-adjusted *Tobin's Q* after implementing QE policy for a year are higher than those in the non-implementation year. This result indicates that firm's profitability and value are improved after implementing QE policy. Moreover, quantitative easing monetary policy variables have significantly positive effect on *ROA*, industry-adjusted*ROA*, *Tobin's Q,* and industry-adjusted *Tobin's Q.* In other words, firm's profitability and value are improved after implementing QE policy, which indicates that the implementation of QE policy helps improve corporate performance. The contribution of this paper can understand the impact of quantitative easing monetary policy on American corporate performance, and empirical results also can be provided to governments, enterprises, and investors for reference.

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