

# ISO9000 Certification Effect: Evidence from China\*

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## Abstract

As a sign of international quality system, ISO9000 certification has been adopted by more and more enterprises. In recent five years, there have been 560,000 certified companies in Europe and America, and there have been more than 390,000 ones in China. It has being attracted many quality scholars' attentions whether ISO9000 certification can bring more benefits to certified companies or not. This paper investigates the ISO9000 certification effect on market performance by the samples from Chinese list companies in shanghai stock exchange. Considering ISO9000 certification as an event, a certification effect model will be set up by means of the event study method, which takes abnormal return rate as a basic indicator to measure the ISO9000 certification effect on Chinese market performance in different event times. Investigation results show that the Chinese certified companies have some positive effects on market performance in the short term. From a long standpoint, the relation between certification and performance has a positive trend.

**Key Words:** ISO9000 Certification, Market Performance, Event-study Method, Certification Effect

## 1. Introduction

The implementation of ISO9000 standards has been spread worldwide since 1990 in last decade. Many companies have built their own quality systems based on ISO9000 standards. This quality movement started in Europe, and has been especially significant in Europe and America. In recent five years, 560,000 enterprises have adopted ISO9000 certification in Europe and America, which have 56.55% of the total certificates in the world. Along with the rise of China's economy in recent years, the certification markets in East Asia have the signs of rapid development. Nowadays, China are of the most quality certificated companies and certification bodies in the worldwide, where 119 certification bodies have been registered in China by the end of 2007 and the numbers of certified enterprises are more than 390,000. The Quality Association of the United States appraised "the efficiency of Chinese certification

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and accreditation is so high that it is rare in the world” (Qiu, 2007).

However, some problems emerged in Chinese certifications, such as, several certification bodies’ irresponsible behaviors, some certified companies’ inconspicuous performances and a part of Chinese enterprise’s doubts for the certification effect. It has being attracted many quality researchers’ attentions whether ISO9000 certification can bring more benefits to certified companies or not.

Despite there being many researches for ISO9000 certification, most of them are limited to certification interviews descriptively or case studies prescriptively, especially, it is rare seen the empirical study for ISO9000 certification effect on Chinese firms’ performance. Although in Europe and America there are many articles investigated the relationship between ISO9000 certification and business performance, however, without an accordant conclusion. Although a lot of articles conclude that the ISO9000 certification is able to improve business performance, some of them give a less optimistic vision of their benefits.

Terziovski and Samson (1997) did not find any positive relationship between ISO9000 certification and business performance by use of the samples form Australian and New Zealand companies which they found that ISO9000 certification is helpful to break through the technology rampart in the world market, but they can’t be sure that the certification would benefit for improvement performance.

Lima *et al.* (2000) identified the relationship between quality certification and performance of Brazilian firms by sample matching test, which were not significant difference for ISO9000 registered companies and non-registered companies.

Michaela and Angel (2003) analyzed the effects of ISO9000 certification on performance from a market vision. Taking the stock price as market performance, they wouldn’t find clear evidence to affirm that the market values positively ISO9000 registration by samples from Spanish certified companies.

The above researchers can’t assure that there are positive relationship between ISO9000 certification and business performance. However, Docking and Downen (1999) found that the market responded positively to ISO9000 certification by use of the samples from North American small firms, which was not true for the medium and larger firms.

Simmons and White (1999) affirmed the relationship between ISO9000 certification and business performance. They investigated empirically 63 certificated firms and 63 non-certificated firms in American electronics industry by taking return on asset (ROA) as a profit measurement indicator, and firm size and registration time as joint variables. They found that ISO9000 registered firms had greater profitability than non-registered firms. On the other hand, ISO9000 certified firms did not have higher operational performance than non-certified firms. They also found that the sizes of ISO9000 certified firms are larger than non-certified firms.

Sun (2000) thought that ISO9000 certification is the first step in the implementation proc-

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ess of Total Quality Management system which focused on the relationship between certification benefits and the motivation.

Tsekouras *et al.* (2002) studied the effects of ISO9000 certification on firm performance by an analysis of 143 firms in the Greek manufacturing and service sectors. They made a regression model with eight variables, such as, capital structure, return on equity, firm size, ISO certified indicator and so on. They found that the business performances of ISO9000 registered firms were better than non-registered firms, and the companies used of ISO9000 quality assurance schemes were large companies produced intermediate goods. The effects of adopted an ISO9000 scheme on performance and especially on certain dimensions of profitability were not significant in a period of 5~6 years after adoption.

Beirao and Cabral (2002) investigated the ISO9000 certification impact on the Portuguese stock market, which also found the market responded positively to the ISO9000 certification by the performance analysis in 5-years before and after ISO9000 certification. However, the performance or profitability would decreased in next year after the certification, which suggested companies needed one more year to recover the certification cost.

Charles and Maria (2005) tested whether ISO9000 certification resulted to productivity improvements for American manufacturing firms by the ISO9000 certification samples from 1987 to 1997. They found that the firm performances are improved significantly in the first year after ISO9000 certification. However, the certified firms would not show their significant abnormal performance in three years after the certification.

Summing up the above discussions, some problems should be considered here. Can Chinese companies get better performance by their ISO9000 certification? Whether is it helpful for ISO9000 certification to increase the Chinese firm value? How to measure the market performance and compare Chinese market values between registered and non-registered companies?

This paper will investigate the effect of ISO9000 certification on market performance by the sample of Chinese listed companies. First, a certification event study model will be set up, and then the abnormal return rate (AR) will be taken as a basic tool to measure market performance. Further, the effect of ISO9000 certification on market performance will be analyzed in different event times by use of the samples of Chinese list companies from Shanghai stock exchange.

## **2. The certification event model and market performance indicator**

Two key problems will be solved in this sector. By means of the event study method, an event model described the effect of ISO9000 certification will be established. The abnormal return rate will be introduced so as to measure the market performance.

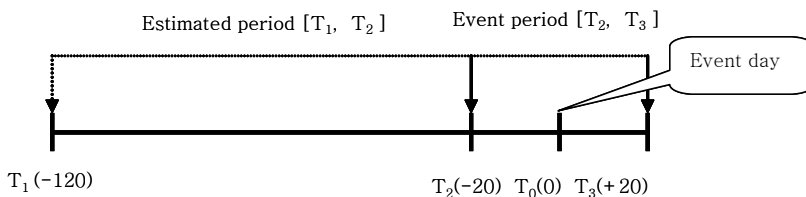
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## 2.1 Certification event model

In empirical analysis, the event study method is often used to measure the stock market variations and the market value changes for Chinese listed companies when it is affected by a special event. In order to show ISO9000 certification effect on stock prices or market value for Chinese listed companies by the event study method, the ISO9000 certification will be taken as an event and an event study model for ISO9000 certification will be introduced.

Usually, an event study model includes three elements, such as, event day, event period and estimated period. Most of event study researches often choose different event periods for different events (Boehmer, *et al.*, 1991; Frankfurter and McGoun, 1993; Seth, 1995; Craig, 1997; Binder, 1998), where an event period or event window is usually defined as 15 days to 30 days and an event estimated period is taken as 100 days.

Considering the divulgence the source of ISO9000 certification information and the certification impact on the stock market, an event day is taken as the certification announcement day for the sample companies and an event period is defined as 20 trading days before and after the event day. Since the sample companies don't trade in the event day, as a matter of convenience, the event day,  $T_0$ , is taken as zero, and the event window  $[T_2, T_3]$  is defined as  $[-20, +20]$ . In order to feel out the normal situation of stock market before ISO9000 certification, the estimated period  $[T_1, T_2]$  is defined as  $[-120, -20]$ . The event model for ISO9000 certification is showed in Figure 1.



**Figure 1.** The event model for ISO9000 certification

## 2.2 Market performance indicator

Since the event model for ISO9000 certification is set up, it is very important to find out an indicator measured the certification effect on market performance. Usually, a stock return rate at a day is high or low can reflect the stock market fluctuation. In order to find out a useful tool to measure the market performance, a stock abnormal return rate ( $AR$ ) will be introduced here, which is equal to the difference between normal return rate of a stock and that of certified company. The average abnormal return rate ( $AAR$ ) for all of stocks in the exchanges will reveal the certification effect on the whole stock market, which is taken as an indicator for measurement ISO9000 certification effect on market performance.

In order to look into the stock market fluctuation aroused by the certification, it has to consider the stock price change in abnormal situation. As above discussion, a stock return rate at a day in the event period will be estimated as follows.

Usually, the  $i$ th stock return rate at day  $t$ ,  $R_{it}$  can be easily obtained by its closing price at this day and before the day, that is,

$$R_{it} = \frac{P_{it} - P_{it-1}}{P_{it-1}} \quad (1)$$

Where  $P_{it}$  and  $P_{it-1}$  are represent the closing price of the  $i$ th stock at day  $t$  and day  $t-1$ , and  $t \in [-20, +20]$ .

$R_{it}$  of ex rights companies is calculated with the stock price after the restoration of rights by using formula (2),

$$R_{it} = \frac{1 + ns_i + np_i + C - P_{it-1} - np_i P_i}{P_{it-1}} \quad (2)$$

In formula (2), for  $t \in [-20, +20]$ ,  $ns_i$  is the stock shares which are sent or changed from provident fund of stock  $i$  for every share,  $np_i$  is the matching shares of stock  $i$  for every share,  $p_i$  is the price of matching shares,  $C$  is the quantity of send cash for every share.

### 3. Market performance model analyses

After determining the market performance indicator, it is very important how to get the sample data of the indicator for measurement market performance. Here a stock normal return rate model will be established, and the data of the indicator will be estimated by this model.

#### 3.1 Stock normal return rate model

For getting a stock abnormal return rate,  $AR$ , it has to observe the normal change of a stock price in event period. According to the assumption that stock returns are subject to joint normal distribution, a statistical model for stock normal return rate is set up, seen model (3).

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (3)$$

In the statistical model (3),  $R_{it}$  is the  $i$ th stock normal return rate at day  $t$ , where  $\alpha_i$  and  $\beta_i$  are parameters for stock  $i$ .  $\epsilon_{it}$  is the random errors of the model, and  $E(\epsilon_{it})=0$ ,  $Var(\epsilon_{it})=\sigma_{it}^2$ .  $R_{mt}$  represents the stock market return rate at day  $t$ .

Based on Shanghai Composite Index,  $R_{mt}$  can be easy obtained by the formula (4), that is,

$$R_{mt} = \frac{P_{mt} - P_{mt-1}}{P_{mt-1}} \quad (4)$$

Where  $P_{mt}$  is the closing price of A-share index of Shanghai stock exchange at day  $t$ .

In the estimate period  $[T_1, T_2]$ , using 100 sample data from each stock return rate at day  $t$ ,  $R_{it}$ ,  $t \in [-120, -20]$ , and the stock market return rate at day  $t$ ,  $P_{mt}$ ,  $t \in [-120, -20]$ ,  $\hat{\alpha}_i$  and  $\hat{\beta}_i$  in model (3) can be regressed. Then, the stock normal return rate model is formed, as seen as model (5).

$$\hat{R}_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt} \quad (5)$$

For each stock in stock market, the normal return rate at 40 trading days in the event period  $[T_2, T_3]$  can be estimated by model (5). The stock normal return rates describe the expected stock returns in the normal situation without ISO9000 certification.

### 3.2 Performance indicator estimation

Based on  $R_{it}$  and  $\hat{R}_{it}$  for  $t \in [-20, +20]$ , which are calculated respectively by formula (1) or (2) and model (5), the  $i$ th stock abnormal return rate,  $AR_{it}$ , of sample companies in event period can be obtained by using formula (6).

$$AR_{it} = R_{it} - \hat{R}_{it} \quad (6)$$

In order to reflect the changes of abnormal return rates for every stock in the whole event period, the cumulative abnormal return rate for stock  $i$ ,  $CAR_i$ , is calculated by formula (7) for  $t \in [-20, +20]$ , that is,

$$CAR_i = \sum_{i=-20}^{+20} AR_i \quad (7)$$

With the indicator of AAR, as seen as formula (8), the stock market fluctuation aroused

from the certification. AAR is the average abnormal return rate of all sample companies at trading day  $t$  in the event window, where  $n$  is the number of sample companies.

$$AAR_t = \frac{1}{n} \sum_{i=1}^n AR_{it} \quad (8)$$

### 3.3 Model Test

Because the indicator used to measure the effect of ISO9000 certification is estimate by the statistical model (3), its effectiveness should be test. As the mean and standard deviation of  $AAR$  and  $CAR$  are unknown, T-test is suitable to do this test. For the average abnormal return rate at day  $t$ ,  $AAR_t$   $t \in [-20, +20]$ , the statistic tested for model (3) is as the following formula (9),

$$T_{AAR_t} = \frac{AAR_t}{S_{AAR_t} / \sqrt{N}} \quad (9)$$

Where  $S_{AAR_t}^2 = \frac{1}{N-1} \sum_{i=1}^N (AR_{it} - AAR_t)^2$  for day  $t \in [-20, +20]$ , and  $N$  is the sample company numbers.

Using the data  $AAR_t$  in event period  $[T_2, T_3] = [-20, +20]$ , and selecting the confidence level  $\alpha = 0.05$ , T-values of the certification effect indicators can be calculated, seen Table 1, Table 2 and Table 3. When  $|T| \geq 1.812$ , it shows that ISO9000 certification has a significant impact on the stock market and the market value of listed companies. Otherwise the impact is not significant.

## 4. Empirical analyses

The sample consisted of 54 companies, comprising all the certified firms whose stocks were listed in the Shanghai Stock Exchange. Unfortunately, two of these companies had to be excluded because they were only listed after being ISO9000 certified. Considering some other events impact on the effect of ISO9000 certification, one more company was removed. Therefore, 51 sample companies were taken as useful data for measurement the effect of ISO9000 certification. In this paper, the event dates were obtained from the database of China Quality Certification Center. The financial data came from the database of Great Wise Securities Information Platform. The daily returns were then computed and SPSS13.0 was used of the following analyses.

Now the effect of ISO9000 certification on market performance will be analyzed in different event times by the certification event model seen as Figure 1. In order to compare short-term market performance with long-term one,  $[-1, 1]$  and  $[-5, 5]$  are taken as short-term event windows respectively, and  $[-20, 20]$  as a long-term event window.

#### 4.1 Empirical results at the event period $[-1, 1]$

According to formula (7) and (8), the effect of ISO9000 certification on short-term market performance will be shown in the event window,  $[-1, 1]$ , where significance level is at the 5% level, seen Table 1.

Table 1 shows that there are positive average abnormal returns in event period  $[-1, 1]$ . However, these average abnormal returns don't have statistical significance except the one at the previous day to the date of certification. These imply that the market values positively ISO9000 certification at short time and induce the price of stock rise transitorily. There is a steady increase in the cumulative abnormal returns (CAR), with an arrival of 1.67%, and they can pass the significance of 5% level test. So the results show that certification has a positive effect on share price in short term. As for the magnitude of the effect, a larger event period is needed to be analyzed.

**Table 1.**  $AAR_t$ ,  $CAR_t$  and their T-values in event period  $[-1, 1]$

Days	$AAR_t(\%)$	$T_{AAR_t}$	Days	$CAR_t(\%)$	$T_{AAR_t}$
-1	0.883	2.1335	-1	0.883	2.1335
0	0.303	0.4794	0	1.186	0.075
1	0.4846	1.3302	1	1.6706	1.042

Sources: the data collected by author.

#### 4.2 Empirical results at the event period $[-5, 5]$

Similarly, the effect of ISO9000 certification on short-term market performance will be also shown in the event window,  $[-5, 5]$ , where significance level is at 5% level, as seen as Table 2.

From Table 2, we can see when the event period was enlarged to  $[-5, 5]$ , there were still positive average abnormal returns in existence. But most of the returns hardly show enough statistical significance. At the second day before the event day, that is,  $T = 2$ , there appeared negative average abnormal return, which, however, became positive at the day -1 since the expected benefits of certification. But the good information of certification only had a limited influence to stock price. Although, the cumulative abnormal return arrived to 2.51%, unfortunately, this result is not significance. This fact suggests the stock price is stimulated to



rise momentarily by the certification event. However, the pull is weak very much. It is necessary to analyze a larger event period of [-20, 20].

**Table 2.**  $AAR_t$ ,  $CAR_t$  and their T-values in event period [-5, 5]

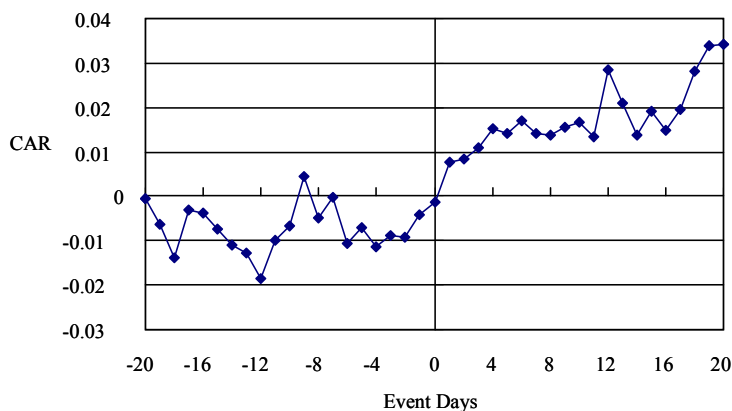
Days	$AAR_t$ (%)	$T_{AAR_t}$	Days	$CAR_t$ (%)	$T_{AAR_t}$
-5	0.3776	0.7750	-5	0.3776	0.452
-4	-0.438	-0.6452	-4	-0.06	1.095
-3	0.2459	0.6779	-3	0.1855	0.852
-2	-0.023	-0.0347	-2	0.1625	0.697
-1	0.883	2.1335	-1	1.0455	5.069
0	0.303	0.4794	0	1.3485	0.845
1	0.4846	1.3302	1	1.8331	0.767
2	0.0689	0.2074	2	1.902	1.706
3	0.2505	0.7641	3	2.1525	0.906
4	0.4345	0.6699	4	2.587	0.919
5	-0.08	-0.1847	5	2.507	0.952

Sources: the data collected by author.

### 4.3 Results of the event period [-20, 20]

In order to describe long-term market performance, the effect of ISO9000 certification in [-20, 20] will be seen in the Table 3. Here a significance level is taken as 5%. Table 3 shows that most of  $AAR_t$  of 41 trading days are not significance. But the positive average abnormal returns suggest ISO9000 certification has some impact on market performance of certified companies in the long-run.

Figure 2 describes the cumulative average abnormal returns for 41-days in event period [-20, 20]. From the pattern we can observe the trend of market performance in the event period.



**Figure 2.** The Curve of cumulative average abnormal returns

**Table 3.**  $AAR_t$  and their T-values in event period [-20, 20]

Days	$AAR_t$ (%)	$T_{AAR_t}$	Days	$CAR_t$ (%)	$T_{AAR_t}$
-20	-0.05	-0.1162	1	0.883	1.3302
-19	-0.59	-1.9667	2	0.0689	0.2074
-18	-0.741	-0.8690	3	0.2505	0.7641
-17	1.0637	1.8352	4	0.4345	0.6699
-16	-0.057	-1.1201	5	-0.08	-0.1847
-15	-0.361	-0.6314	6	0.2881	0.6460
-14	-0.352	-0.8723	7	-0.304	-0.9164
-13	-0.195	-0.4376	8	-0.046	-0.0885
-12	-0.577	-1.1276	9	0.2007	0.6641
-11	0.8541	0.8897	10	0.0949	0.3143
-10	0.3366	0.5946	11	-0.322	-0.0666
-9	1.1003	0.04964	12	1.4962	-2.0499
-8	-0.908	-0.16	13	-0.749	-0.05566
-7	0.4375	0.5941	14	-0.699	-0.06643
-6	-1.037	-1.9927	15	0.5167	1.07321
-5	0.3776	0.7750	16	-0.424	-0.07895
-4	-0.438	-0.6452	17	0.4722	-0.06605
-3	0.2459	0.6779	18	0.8692	-0.0673
-2	-0.023	-0.0347	19	0.5757	-1.75021
-1	0.883	2.1335	20	0.0165	3.04704

Sources: the data collected by author.

From day -20 to day -6, the cumulative average abnormal returns are negative and stay around values near 1%. The fact suggests that the market gradually learns about the forthcoming ISO9000 award. But investors couldn't clearly anticipate the effect of ISO9000 certification, and they are wait-and-see about the expected performance. From the -4 day to the event day, the  $CAR$  gradually drift up since investors are excited by the forthcoming certification and their confidence is increased. After the certification day ( $t=0$ ), the  $CAR$  increase to positive values. Especially, the slope of the  $CAR$  plot became to increase more quickly after day 16. The reasons are maybe that production and service are improved along with the implementation of ISO9000 standards. And stockholders will indeed get benefits from the better performance. These results can indicate that the market favorably anticipated the ISO9000 certification.

## 5. Conclusions

Based on the above discussion, there some conclusions and recommendations are provided as follows.

1. As shown in the Figure 2, the market has a pessimistic anticipation to the ISO9000 certification at the forefront of the event period. The investors' pessimistic expectation maybe comes from some certified companies' inconspicuous performances and several certification bodies' irresponsible behaviors. The adoption of ISO9000 certification needs a lot of money and a long time, however, some companies are impatient to yield their profits as a payment for the certification investment. As we know, ISO9000 certification as a continuous improvement process, it will take a long time for the effect of the certification to appear. All of those induce investors not to have enough confidence at forefront of the event period.

2. The results in different event period show that there are positive abnormal returns, however, which were hardly significance. The fact reveals that there are indeed a positive relationship between ISO9000 certification and the business value in the market. But the certification has a limited effect on the market performance of a company. What are the reasons for that? On the one hand, usually ISO9000 certification is viewed as an effective instrument of improving competitive advantage. But also the effects of certification are disputed among quality experts. On the other hand, the ISO9000 standard is a continual improvement process, the benefits of which maybe will be reflected in the long-run.

3. The *CAR* plot implies that the effect of ISO9000 certification on market performance is not significance in the short term. But from a long view, certified companies would have competitive advantages than non-certified, which can increase stockholders' investment confidence. And finally, certified companies will gain better market performance.

Our analysis reveals that Chinese certified companies have some positive effects on market performance in the short term. From a long standpoint, the relation between certification and performance has a positive trend. Although the effects of ISO9000 certification on market performances are not significance, there are several reasons shown above. However, we do believe that ISO9000 scheme has connection with firm long-term performance. For this reason, the future research attempting to investigate the effects of ISO9000 on firm performance should be carried out in the long term and, if possible, using data for three years or more.

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