Using Artificial Intelligence to Detect the Relevance of Abnormal Returns in News Events Declaration

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Abstract

Keywords	
Artificial intelligence, Initial public offerings, Five factor model, Event study	Numerous companies in Taiwan, transferred their stock trading market from over - the-counter (OTC) market to the Taiwan Stock Exchange Corporation (TSEC). In past 9 years, there were 216 OTC-to-TESC Stock Market Transfer events. Suspected abnormal returns appeared when companies transferred their trading market from OTC to TSEC. This study is searching the relationship between multi-announcement and abnormal returns, otherwise, event study method and five factor models will be applied to analyze the announcement of 216 OTC-TSEC market transfer events. The results from this empirical study show the significant evidence in support of our proposition. It explores an important result that abnormal returns occurred in the short time, and not good in the long time.

1. Introduction

With the economic advancement, many enterprises enter the market in order to raise capitals in succession. Enterprises actively guide OTC market to transfer to the Taiwan Stock Exchange Corporation in order to broaden the scope of capital markets and improve the international competency. According to the statistics of Taiwan Stock Exchange, since the 1st OTC-to-TESC transfer event, Nantex Industry Co., Ltd., on July of 1992, there were already 216 companies had obtained permission from Taiwan Stock Exchange to do this transfer. With the

development of capital markets, initial public offering and stock traded over the counter as publicly-held company had already become the best way to engage in Direct Financing. Also it is the important access for small and medium-sized enterprises to raise funds. Besides, investors consider it as one of the good choices of portfolio. The importance of this transfer is steadily on the increase.

After reading some relevant documents from abroad, we figure out that all of them just probe into the abnormal returns when companies transferred their trading market from OTC to

TSEC. Instead, this research is going to probe into the relationship between multi-announcement of different mass media and abnormal returns. It means that we are aiming at single event to do research by using multi-announcement standpoint. Therefore, the purpose of this research is to probe into the relationship and influence that both OTC-to-TESC news announcements and the instant state of stock price result in abnormal returns. Five factor models will be applied to forecast stock price in order to get the statistics of abnormal returns. Do the proper statistical testing. Analyze the influence of multi-announcement on stock price returns.

The research uses the 216 companies which transferred their stock trading market from OTC to TSEC as the object of observation. However, on the basis of the laws and market liquidity, some TSEC stocks which have poor market liquidity and no trading records won't be included in. In addition, the samples of this research have to conform to OTC companies for one year and transfer to TSEC by authority's permission. Those samples don't belong to beneficiary certificates.

2. Literature Review

This part is going to probe into the studies that the factors which have influence OTC-to-TSEC stock prices, long-term and short-term abnormal returns, Five Factor Model, and Event study.

2.1 The factors which have influence OTC-to-TSEC stock prices

Numerous scholars have great interests in the relevant issues for IPOs since U.S. Securities and Exchange Commission began to do the systematic research of IPOs in 1963. And then the 1st study of IPO sourced from 1963. During 1959 to 1961, U.S. Securities and Exchange Commission got the information from 1671 listed companies, and then they did the research that IPOs' current price and offering price were compared to the price one month later. Finally, they calculated the ratio of the relative price, and they figured out that the abnormal returns definitely existed in short-term

period. Therefore, numerous scholars began to do the research for this issue and tried hard to find the proper explanations for this phenomenon.

McConnell and Sanger's study (1987) points out that there were the obvious negative abnormal returns in the 1st month after stocks transferred from Curb/AMEX to NYSE during 1926 to 1982. Merton's study (1987) points out that mass media will keep reporting the information about this company which decided to transfer their stocks to another bigger market. This way will make the instability of stock lower while the skewness of information was improved. Finally, the investors buy much more the stocks of this company, and the stock price will higher than before. In addition, Baker and Edelman's study (1991) refers to the exchange between stock price's positive and negative abnormal returns, before and after going public. Dharan and Ikenberry's study (1995) refers that not all stocks appear negative abnormal returns when they transfer the trading post from one to another. It is easier for those companies which are in poor financial condition and have unstable management to go through some bad conditions, including stock price dropped, economic recession occurred, and negative abnormal returns appeared. According to the research of Ibbotson and Ritter (1995), the trading markets can't reflect the normal stock price and certain industry will be evaluated higher than before, when most investors are readily accessible to this situation. Some companies have got a good hold of the opportune moment, however, the kind of TSEC companies will make an adjustment in the stock price that will have been reduced from higher price after the investors return to the normal judgment. Yuan-Jiun Huang (2000) pointed out that before and after transference, the variations of stock price appear the same positive abnormal returns during 1994 to 2000. But the performance of TSEC companies is inferior to OTC companies.

According to Bassin's study (2000), there were about thirty-five companies that transferred their trading markets from OTC to TSEC in U.S. Stock Exchange Market during 1980s to1990s. And the main reason for the kind of transference is to

accelerate the liquidity of stock. In addition, Arbel (1985) considered it as the key media to promote the company awareness when the transference happens. Baker, Powell, and Weave (1999) all thought that the kind of transference can increase the wealth and benefits for shareholders. Most OTC-to-TSEC companies had a short period of OTC actually. It means that those companies considered OTC trading markets as a shortcut to the transference. Since the first time that OTC trading markets became available in United States Stock Exchange Market or New York Stock Exchange Market, all the reports showed that stock price will appear the positive abnormal returns before going public; on the contrary, it will appear negative returns after going public.

According to the relevant documents from abroad, most scholars only make a study of daily abnormal returns for OTC-to-TSEC. Or they just use the company which only publishes single announcement as the object of observation instead of researching the relationship between multi-announcement of different mass media and abnormal returns. Therefore, this research is going to use the multi-announcement of 216 OTC-to-TSEC companies to probe into the variation of stock price and the abnormal returns of stocks. It means that we are aiming at single event to do research by using multi-announcement standpoint in order to know the relationship between multi-announcement and abnormal returns before OTC-to-TSEC.

2.2 The relevant theory of Five Factor Model

The period of the samples which were observed by Black, Jensen and Sholes (1972) is during January of 1926 to December of 1965. Those samples were the stocks from New York Stock Exchange. They calculated the market risk, , for all samples during January of 1926 to December of 1930, and then averagely divided them into ten portfolios by using the differences of coefficient . Further, they calculated the monthly ROI from January to December of 1931 by using the ten portfolios, and the next following years all repeated the same steps as above. They used the monthly ROI of those portfolios to make a model

to calculate every portfolio's regression polynomial with intercept and coefficient . And it proved that there was a positive relationship between the market risk and ROI.

Fama and French (1992) took the TSEC companies' monthly returns information of NYSE and NASDAQ which were recorded from July of 1963 to December of 1990 as the objects of observation. Finally, the results showed that small-sized enterprises have higher ROI, and also have the positive size effect.

Viewed in its BE/ME aspect, Fama and French (1992) took the TSEC companies' monthly returns information of NYSE which were recorded from July of 1963 to December of 1990 as the objects of observation. And then the results showed that there is an obvious positive relationship between stocks returns and BE/ME.

The principal study of Chan, Jegadeesh and Lakonishok (1996) is the stock price momentum. The findings discovered that the effects of good-performing stocks will only last about one year. Comparing the effects of those stocks with the overall average, the difference is not big after one year. Therefore, most companies can use this momentum phenomenon to earn excess returns. Besides, Rouwenhorst (1998) took twelve countries, except America, as the samples of observations. The results showed that there is always momentum effect existing in stock returns, and the kind of phenomenon will last about one year.

Hu (1997) took the statistics about the liquidity of Japanese stocks, which were recorded from 1976 to 1993, as the objects of observation. The results of the study showed that Turnover Rate can be used to expect the future stock returns. And this contention is the same as the prediction of Transaction Cost Model, which was theorized by Amihud and Mendelson (1986). Hence, there is a negative relationship between Turnover Rate and Expected Returns. Chui and Wei (1997) used Fama and French's Three Factor Model with Turnover Rate to analyze the information from some Pacific countries, including Hong Kong,

Korea, Malaysia, Taiwan and Vietnam. The results showed that there is an obvious negative relationship existing in Turnover Rate whether the multiple regression analyses or single regression analyses.

This research is going to combine three theories, including the Three Factor Model of Fama and French, Momentum Theory of Jegadeesh and Titman (1993), and the Volume of Trade of Brennan, Chordia and Subrahmanyam (1996), in order to form Five Factor Model. And then according to Five Factor Model, we examine how the market risk, the size of a company, BE/ME, Momentum, and Volume of Trade can respond to the stock returns.

2.3 Event Study

Event Study can be used to measure how the stock prices respond to occurrence or announcement of a particular type of corporate event. This method results was conducted by Fama, Fisher, Jensen and Roll in 1969. They used Event Study to examine the relationship between stock splits and efficient market hypothesis. Dodd (1999) said that there was no apparent discovery that the certain event affected on the stock prices when studying the relevant documents in the past. The main reason which resulted in this phenomenon is that most scholars took the real timing as the event day instead of the first announcement day. Stock price had already reacted to others. Therefore, it is much more reasonable to take the time, when the markets gain the real information, as the event announcement day. Through the method of Event Study, there may have numerous incident announcement days, especially, single event will lead to this results commonly. For example, many bills have gone through a long time to be discussed before reaching a conclusion and announcing. In this period, those mass media may have lots of time to do the reports. It is possible that each report in different time may change the expectations that the market expects the securities' price of related companies to be. However, viewed in the documents from abroad

aspect, most scholars will take the first announcement day as the standard.

When calculating the expected returns, observers have to pick a certain period in order to form the expected model. And that period is called 'Estimation Period.' If the period may be effected by other events, we called it as Event Period or Event Window instead of Estimation Period. Usually, we will choose the time before or after Event Period as Estimation Period. Or we can also choose both before and after Event Period separately. According to Peterson's advices（1989, because those events, which are studied, won't change the structure of the expected model, we put Estimation Period before the event. On the contrary, if events can change the structure of the expected model, we put Estimation Period after the event or choose the two periods (before and after the event) at the same time to be Estimation Period.

A financial news headline agent is proposed to assisting the investors in deciding to buy and to sell stocks in Taiwan market after receiving the essential real-time news headline disseminated by the agent. It was a research and development project funded by the European Union whose main goal was to provide tools which can help the news agencies to address all the previously described difficulties. In order to do so, the project partners applied state of the art technologies, like Semantic Web (Lee et al., 2001) technologies and Web services, to the news agencies' production environment. The news domain has a number of features that make it interesting for running experiences using artificial intelligence techniques in real business: data heterogeneity, huge amounts of information to manage, multilingualism, economic and social interest, etc. It describes the NEWS ontology, its intended uses in the context of the production and distribution processes of a news agency, and the NEWS Plugin, a Portege extension developed to partially automate its maintenance (Huang et al., 2010; Norberto et al., 2010). It presents a financial news semantic search engine based on Semantic Web technologies. The search engine is

accompanied by an ontology population tool that assists in keeping the financial ontology up-to-date. In addition, a further module has been developed that is capable of crawling the Web in search of financial news and annotating it with knowledge entities from the financial ontology that match with the contents of the news.(Eduardo et al., 2011)

The applications of Event Study have been based on an ideal setting of Event Window. However, there is no an objective standard of the size of Event Window now. In the past, scholars usually used subjective judgment to adopt Fixed Time Window. If the size of Event Window is too big, this situation may result in noise jamming. On the contrary, if the size of Event Window is too small, this situation may result in missing some follow-up influence caused by events. This research takes those days before and after the event announcements about two days, five days, fifteen days and thirty days of as examples. We examine the abnormal returns of multi-announcements in OTC-to-TSEC companies.

3. Methodology

This study is about to examine the relationship between multi-announcement and abnormal returns when companies transferred their trading market from OTC to TSEC. The 1st section introduces the period and samples. And the 2nd section introduces the study hypothesis. At last, the 3rd section introduces the calculation and statistical testing of Five Factor Model.

3.1 The samples The research adopted the OTC-to-TESC Stock Market Transfer internal events as the objects of observation in order to examine the development of Taiwan's OTC-to-TSEC. According to Taiwan Economic Journal, we gained the sources and OTC-to-TSEC information of the study period. By the help of Commercial Times and Economic Daily News, we do the double check and get other relevant information about OTC-to-TSEC.

In the empirical analyses of this research, the sources of each variable were all from Taiwan Economic Journal's data bank. The samples sifted out the Taiwan's OTC companies from all kinds of companies. OTC companies needed to have the stock trading records before and after claiming the OTC-to-TSEC announcement about sixty days. Those OTC companies had possessed the stock rights' information. According to the principles the above, there were 216 OTC-to-TSEC transfer events as samples, shown in Table 1.

Table 1 OTC-to-TSEC transfer events

Class	Count	Rate%
E-class	135	63%
Financial	18	8%
Electro-mech	15	7%
Other classes	11	5%
Textiles class	5	2%
Cable type	5	2%
Chemical	12	6%
Food	5	2%
Plastic	2	1%
Steel classes	4	2%
Building class	4	2%
Total	216	100%

Source: The Stock Exchange

3.2 Study hypotheses

When it comes to the theory of the motivation which leaded the companies to choose different listed market, Baker and Petit (1982) had already addressed that the reason why America enterprise transferred their stock trading markets from NASDAQ to AMEX or NYSE is to promote their reputation in order to attract more investors. Besides, Arbel and Strebel (1982, 1983) figured out that the performance of the stock price was superior to those hot issues, after the transference happened. In addition, transferring to different listed market will benefit not only the promotion of the reputation and the obtainment of attentions, but also the reduction of asymmetric in formation. Barry and Brown (1986) discovered that we may face the fewer problems about asymmetric information, if we invest in the reputable companies. Merton (1987) had referred that the degree which investors pay attention to the stocks of that company can influence the ROI of that company. Therefore, Hypothesis 1 is going to test the relationship between the multi-announcement of 216 OTC-to-TSEC companies and the abnormal returns of stocks.

After announcing that the company transferred to another listed market, mass media will keep reporting the news, and also reduce the situation about asymmetric information. Besides, this way will make the instability of the company's stocks reduced, too. Finally, the stock price may rise or fall because those investors will buy more stocks than before. Hence, in Hypothesis 2, we will check the stocks' abnormal returns and its relationship to multi-announcement and single announcement by the abnormal returns in the announcement period. And then Hypothesis 3 is going to test that if there is an obvious difference, when we do compare magnitude of information of multi-announcement with magnitude of information of single announcement.(if there is an obvious difference existing in magnitude of information, when comparing multi-announcement with single announcement)

3.3 The calculation and statistical testing of Five Factor Model

In Event Study, there are three categories of Share Price Forecasting Model, including Mean-adjusted Model, Market-adjusted Model Method, and Risk-adjusted returns model. Especially, Risk-adjusted returns model has always been popular among most scholars, such as Market Model Method, CAPM, Fama & French's Three Factor Model, Five Factor Model and APT, etc. They are best forecasting and analyzing model to get the best stock price by some factors which influence stock price. Fama & French's Three Factor Model, Jegadeesh & Titman's Momentum, and Brennan, Chordia and Subrahmanyam's Volume of Trade are to combine to form Five Factor Model. Right after that, we use Five Factor Model to examine how Market Risk, the scale of the company, BE/ME, Momentum, and the Volume of Trade can respond to the stock returns. The formula is shown below:

$$R_i - R_f = a_i + b_i [R_M - R_f] + s_i SMB + h_i HML + m_i MO + t_i TR + \epsilon_i$$

($R_M - R_f$) Market risk factors, SMB Size of company-related risk factors, HML (BE/ME), MO (Momentum), TR (Turnover Rate)

4. The Analysis of the Results from this Empirical Study

The purpose of this research is to examine the relationship between multi-announcement and abnormal returns. And this research takes the listed companies which are published by Taiwan Stock Exchange Corporation. Those sample companies' daily stock return, Stocks' Rates of Return, BE/ME, and Volume of Trade are all from the database of Taiwan Economic Journal. Besides, we got the information about the three month interest rates of the fixed deposit of First Bank from AREMOS. And then we change the three month interest rates of the fixed deposit to daily rates.

The open announcement day of OTC-to-TSEC Stock Market Transfer events is decided by the dates from United Daily News, China Times, Central Daily News, Economic Daily News, and Commercial Times which were all provided by full text of newspaper titles indexed in real time and video database. However, because certain sample companies had already been out of stock, merged, consolidated or the incomplete information, they were deleted. And the stock documents of this research. These documents are the complete relevant information of OTC-to-TSEC stock market transfer events and the stocks. The cases total 96.

Viewed in its program aspect, the programming languages are predominantly based on VBA with databases. And the software of information analysis is predominantly based on SPSS. And the software of display of the images is predominantly based on EXCEL 2016. Among those multi-announcements about OTC-to-TSEC transfer events, if there are two announcements which are only separated by two days, we consider two of them as one announcement. Of course, we should choose the information, which had great influence on the events, from the two announcements.

There are multi-announcement for one event. Along with this situation, we hypothesize that the market has complete efficiency further. According to the above I've mentioned, most scholars usually suppose subjectively that the day of the 1st time published on the newspaper is the announcement day. And then they also deleted other duplicated announcements. However, this research differs from those opinions of most scholars. We examined that if there are abnormal returns existing in multi-announcement days of single event. By testing the averagely abnormal returns of Event Window of the 2nd announcement day, we can judge that if there are averagely abnormal returns before and after the multi-announcement day for single event. So we examined that if there are obvious abnormal returns (differ from zero) existing in the relationship between the stock price and the averagely abnormal returns, which were produced

by the Even Window of the testing announcement day, by the averagely abnormal returns of multi- and single announcement, accumulation abnormal returns, and the statistic T. By the empirical study, we prove that single event declared more than once will product cumulative abnormal return of significantly. In addition, for the listed stocks, in short-term period, it may have the problem about stock excess return. And in long-term period, the effects of those listed stocks are not good popularly.

In order to know that if there is an obvious difference between the averagely abnormal returns of multi-announcement and single announcement, we applied One Way Analysis of Variance to do the Sensitivity Analysis. And the study period is the days before and after Event Window about two days, five days, ten days, fifteen days and thirty days. According to the statistics of Table 2, we can know that there is not any obvious difference between the averagely abnormal returns of multi-announcement and single announcement.

On the other hand, viewed in the recession of the magnitude of information aspect, we applied Paired Test to examine the single event which had been announced for more than four times. And the results of this analysis are shown in Table 3. We configure out that for the averagely abnormal returns of multi-announcement and single announcement, there are obvious differences only existing in the 1st & 2nd announcement, and 1st & 3rd announcement after announcing five days. And there is no obvious difference existing in the rest of those announcements. In addition, according to the reports of the mean, we figured out that if the mean of the 1st announcement is positive, the mean of the 1st announcement is greater than the means of the 2nd, 3rd and the last announcement. On the contrary, if the mean of the 1stannouncement is negative, the mean of the 1st announcement is smaller than the means of the 2nd, 3rd and the last announcement.

Table 2 T test of different declared cumulative abnormal return

Announcement	Declared period	Cumulative rate	SD	T Value
First announcement	[-30,30]	15.18042	4.070032	28.89*
	[-15,15]	10.51303	3.533829	-10.7*
	[-10,10]	4.734345	3.017626	-3.59*
	[-5,5]	-1.78551	2.460759	-2.29*
	[-2,2]	-0.22903	3.549478	-0.12905
Second Announcement	[-30,30]	-62.3377	6.519568	-1142.79*
	[-15,15]	-28.5285	3.408382	119.51*
	[-10,10]	-5.86446	1.836694	-14.27*
	[-5,5]	-3.85835	1.111862	-10.97*
	[-2,2]	-2.92604	1.63132	-3.58*

SD (Standard Deviation)

Table 3 T test of recession declared information strength many times

Declared day	Announcement	Average	Variance	T Value	P Value
5	First announcement	1.09	5.50	2.84	0.007*
	Second announcement	-1.56	8.81		
	First announcement	1.09	5.50	2.57	0.012*
	Third announcement	-1.36	7.14		
	First announcement	1.09	5.50	0.83	0.210
	Last announcement	0.35	9.19		

5. Conclusions and Future work

According to the results of the Empirical Study, we figure out that for the listed stocks, in short-term period, it may have the problem about stock excess return. And in long-term period, the effects of those listed stocks are not good popularly. Besides, the higher the frequency of the OTC-to-TSEC announcements is, the bigger the range of the price fluctuation is. In addition, the stock price of most stocks tends to be positive abnormal returns before going public. And the stock price of most stocks tends to be negative abnormal returns after going public. Because announcement may hide some valuable information, multi-announcement will cause abnormal returns.

There are multi-announcement for one event. Along with this situation, we hypothesize that the market has complete efficiency further. According to the above I've mentioned, most scholars usually suppose subjectively that the day of the 1st time published on the newspaper is the announcement day. And then they also deleted other duplicated announcements. However, this research differs from those opinions of most

scholars. We examined that if there are abnormal returns existing in multi-announcement days of single event. By testing the averagely abnormal returns of Event Window of the 2nd announcement day, we can judge that if there are averagely abnormal returns before and after the multi-announcement day for single event. By the empirical study, we prove that single event declared more than once cumulative abnormal return of significantly.

Based on the viewpoint of Behavioral Finance, the multi-announcement for single event should have the function of magnifying the magnitude of information. Therefore, when the researchers examine the effects of the multi-announcement of different single events or what kind of single event for multi-announcement has possess the function of strengthening, they can base on the viewpoint of Psychology and different classifications. By this way, we also can examine the reasonable hypothesis of the Traditional Finance at the same time.

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