HOW DO CHINESE STOCK INDEX FUTURES RESPOND TO STOCK-RELATED NEWS

by

JIALI LI

(Under the Direction of Jack E. Houston)

ABSTRACT

The market impact of news announcements has been a topic of heated debate. A large body of research has investigated how the markets respond to the release and dissemination of various kinds of information, including government announcements, corporate announcements, analysts' reports and user-generated contents on social media. However, most previous research focused on analyzing the influence of one specific kind of information. Little research comparing the relative importance of information can be found in the literature. This limitation draws a gap between the academic research and current trading practice, because according to efficient market hypothesis, all relative information are immediately incorporated into the equity prices. Our research incorporates econometric estimation of event intensity and compares the influence of various market-related information on the Chinese stock index futures contract. We discover that government announcements and corporate restructuring news are significantly associated with the return on stock index futures.

INDEX WORDS: Event Study, Government Announcement, Corporate Announcement, Social Media, Stock Index Futures, and Chinese Futures Market

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DEDICATION

I would like to dedicate this thesis to my parents, Ping Wang and Aiguo Li, who love me, encourage me and have supported me every step of the way. I'd also like to thank my boyfriend Liang Wang, for his love and inspirations.

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TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1

INTRODUCTION

Since the proposal of efficient market hypothesis, scholars and practitioners have increasingly called attention to analyzing the market impact of information disseminated by various sources. Empirical evidence has already shown that government announcements, corporate reports, and analyses from institutional investors are significantly correlated to various market behaviors such as returns, volume and volatility (Engle & Ng, 1993). Meanwhile, social media is becoming a burgeoning high-frequency, user-generated information source that has a profound influence on the equity markets. Several academic studies have found significant relationships between the market behavior and the user-generated contents on dedicated financial message boards, such as Yahoo! and StockTwits.

And yet, there is only very limited research that analyzes the relative importance of different information. Among the few studies that have explored this topic, Ryan and Taffler classified firm-specific events into 32 categories and compared the market impacts of different event categories. They found that some news categories have a pervasive impact on the price and volume activities of individual stocks (Ryan & Taffler, 2004), while others are not as influential. Bauwens et al. studied the reactions of euro/dollar FOREX market's volatility to nine categories of news announcements. Their results showed that the scheduled announcements lead to a rise in volatility, while unscheduled ones do not have such effect (Bauwens, 2005). These studies have established a good foundation for the comparative study of various market-related information.

However, market participants now face an overflow of information that includes much more than merely firm-specific events and scheduled macroeconomics announcements. With the contemporary information technology, investors can make decisions based on a much wider range of information sources than just a few years ago. For example, social media spreads rumors and unconfirmed data about companies' operations. Financial analysts review and synthesize information, and they offer equity trading suggestions on various web portals in a timely fashion. Although these emerging information sources attract many followers, academic research on the effect of these sources of information, and on how influential they are compared to the traditional ones such as corporate announcements, is relatively limited.

1.1 Research Objectives

Our study addresses the limitations of prior research, and models the return of the Chinese index futures market by considering a comprehensive set of market-related information. In particular, we try to understand whether the news released or generated by the government, companies, institutional investors and individual investors have an impact on the futures market in china, and we also analyze which source of information is most influential among all. The news data are gathered using a web crawler that monitors various internet sources, including government regulatory announcements, corporate announcements, analyses from institutional investors, and user-generated contents on social media. After processing the data to remove duplication and noise, we employ an extended event study methodology to build a model that shows whether excessive information on each news category is related to the return of a futures contract. Our results show that, on a daily data frequency, government regulations on the futures markets have a significant impact on the stock index futures, while most others do not. The influence of

government announcements is impounded into the futures price on the same day of their release. No lagged effects were found.

1.2 Contribution of Study

This study makes the following two major contributions to the existing literature. First, to the best of our knowledge, this research is the first to comprehensively explore the relative importance of contemporary information coming from various sources. Rational investors hardly restrict themselves to getting information from a single source. Thus, we believe it is important to model the market with as much publicly available information as possible.

Second, this paper extends the existing literature of analyzing the Chinese financial markets by investigating the stock index futures contract that was just introduced in April, 2010. Financial markets in China are unique in many ways. For example, it has always been suspected that the Chinese government has a profound influence on the financial markets with regulation and monetary policy (Demirer & Kutan, 2006). However, how the Chinese markets react to the government policy and regulation announcements have seldom been empirically studied in the literature. As another example, the initial margin requirement for opening a trading account in the China Financial Futures Exchange is 500,000 CNY. This is considered very high compared to the average annual wage of 51,474 CNY in 2014[1]. In other words, the Chinese futures market has a dramatic investor filtration based on their capital, since it is very hard for an individual investor who earns an average wage to enter the futures market. Due to these unique attributes, it is necessary to test our existing knowledge and theories about the mature markets within the developing Chinese markets.

[1] According to statistics published by Trading Economics http://www.tradingeconomics.com/china/wages

1.3 The Chinese Index Futures Market

The China Financial Futures Exchange (CFFE) was jointly founded by three futures exchanges and two stock exchanges in September 2006 in China. CFFE introduced the first stock index futures linked with CSI 300 Index in China in early 2008 and finally launched it on April 16th, 2010. The CSI 300 index is a stock index composed with the largest (in regarding to market share) 300 stocks traded in the Shanghai and Shenzhen Stock. Within the 300 constituent stocks, 179 stocks are from Shanghai Stock Exchange, and the rest are from Shenzhen Stock Exchange. The CSI 300 Index is a capitalization weighted index. The value of one contract is 300CNY times the value of the CSI300 Stock Index. Trading hours start from 9:15 a.m. to 11:30 a.m. and then from13:00 p.m. to 15:15 p.m. All transactions are settle in cash by the end of the day. Since the listing of IF0001, its trading volume has steadily increased from an average of 4.45 million contracts/month in 2010 to an astonishing 11.75 million contracts/month in 2014, the latter of which is worth more than 1.25 trillion U.S. dollars in market value. This dramatic increase not only shows the scale of the market, but it also indicates significant practical value in analyzing and understanding the behavior of both this contract and the market it is listed in.

1.4 Organization of Thesis

The rest of this thesis is organized as follows. Section two reviews the previous research in this area. We discuss various sources of information that had been empirically proved to be related to the market behavior, and we also list some methodologies used by previous research to analyze the effect of news. Section three describes the announcement data and trading data we use for this research. Section four illustrates the variables and model we use to analyze the relationship between several categories of information and the market behaviors. Results are

presented in Section five, which is followed by a section on conclusions and implications of the findings and a prospective about future research.

CHAPTER 2

PREVIOUS RESEARCH

2.1 Stock Market Impact of New Information

The linkage between news releases and equity markets has been a popular research field in the literature. Much effort has been devoted to understanding how markets are influenced by a variety of market-related information, including government announcements, firm-specific information, and social media.

2.1.1 Government and Regulatory Announcements

Various announcements made by the government may influence the market in a significant manner. Becker, Finnerty and Friedman discovered that macroeconomic announcements, such as PPI and inflation rates disclosures, are significantly related to the overnight return of S&P 500 markets and futures of FTSE and S&P 500 indices (Becker, Finnerty, & Friedman, 1995). Christiansen and Ranaldo compared the announcement and surprise effects of macroeconomic data disclosures on the realized correlation between bond and stock returns. They found that the mere fact that an announcement is made influences the bond-stock correlations, while the surprise component in the announcement does not (Christiansen & Ranaldo, 2007). Using a multivariate GARCH model, Karali demonstrated that several USDA reports, which mainly focus on the agricultural outlook developments in the US, have a significant effect on the conditional variances and covariances of returns on agricultural commodity futures contracts (Karali, 2012; Karali & Thurman, 2009).

Su and Fleisher examined the Chinese stock markets' reactions to the regulations and policies announced by the China Securities Regulatory Commission. They built a $SGARCH(1,1)$ model with maximum likelihood estimation to examine whether five selected regulatory announcements influenced the volatility of Chinese stock markets. Their results showed that, of the two major stock exchanges in China, the volatility of Shanghai Stock Exchange became smaller over time under the influence of those announcements, while the Shenzhen Stock Exchange remained unaffected (Su & Fleisher, 1998).

2.1.2 Corporate Announcements

Another important category of information is firm-related disclosures that are published by a large variety of sources, including the company's earnings reports, analyst's recommendations and forecasts, industry sentiments, announcements about company restructuring, etc. Early research in this field typically focused on studying the relationship between earnings reports and security prices. Brown and Kennelly found that information contained in the companies' quarterly earnings per share reports is reflected in securities abnormal return (P. Brown & Kennelly, 1972). This finding was confirmed by later research on different markets and finer trading data frequency (Brookfield & Morris, 1992; Firth, 1976).

Ryan and Taffler compared the relative importance of different firm-specific information events in driving the price and volume change activities. They demonstrated that analyst's recommendations and earnings forecast revisions were the most pervasive factors that affects the changes in equity price and trading volume (Ryan & Taffler, 2004).

2.1.3 Social Media Occurrences

With the increased role and proliferation of the social media in the past few years, analyzing the market impact of user-generated contents posted on message boards, blogs and microblogs is a

burgeoning branch in the literature. Antweiler and Frank studied how message posting on Yahoo! Finance and Raging Bull message boards influence 45 firms that together made up the Dow Jones Industrial Average and the Dow Jones Internet Commerce Index. They demonstrated a non-trivial relationship between stock market attributes (return, volatility, etc.) and the message board measures (bullishness and agreement indices). They also suggested that message posting does help to predict volatility both at daily and intraday frequencies (Antweiler & Frank, 2004). This result was supported by later research. Bollen, Mao and Zeng found that some public moods from twitter (happy, optimistic, pessimistic, etc.) are Granger causative of the DJIA index levels (Bollen, Mao, & Zeng, 2011). Rao and Srivastava discovered that twitter sentiment about a specific company has strong correlation with the stock return (Rao & Srivastava, 2012). Mao, Wei and Wang reported that twitter posting volume spikes (outliers) have significant correlation with stock volatility (Mao, Wei, & Wang, 2013).

2.2 The Event Study Approach

To analyze the equity markets' reactions to announcements or events, the event study approach formulated by Fama et al. (Eugene F Fama, Fisher, Jensen, & Roll, 1969) has been widely used. As suggested by Binder, the event study methodology has become the standard method in 1) testing whether the market efficiently incorporates new information and 2) examining the impact of some events on a firm's shareholder wealth under the efficient market hypothesis (Binder, 1998).

The original model developed by Fama et al. assesses the effect of events by capturing the abnormal return of the security over the pre-determined time window of influence for the event. The abnormal return is defined as the difference between actual ex post return minus the normal return. For firm i and event period t, the abnormal return is formulated as:

$$AR_{it} = R_{it} - E(R_{it}|X_t)$$

where AR_{it}, R_{it}, and $E(R_{it}|X_t)$ are the abnormal, actual and normal returns, respectively. The normal return is a theoretical value that needs to be estimated. There are two commonly used ex ante estimations of the expected normal return: constant mean model and market model.

The constant mean model is probably the simplest model in the sense that it assumes that the normal return is constant over time. Thus, for firm i and event period t,

$$AR_{it} = R_{it} - K_{it}$$

where K_{it} is the chosen constant that represents the normal return. Under the constant normal return assumption, several constant proxies, such as mean adjusted returns, market adjusted returns, market and risk adjusted returns, etc., can be calculated to estimate the normal return (S. J. Brown & Warner, 1980).

The market model assumes a stable linear relationship between the market return and the equity return. For firm i and event period t,

$$AR_{it} = R_{it} - \alpha_i + \beta_i R_{mt}$$

where R_{mt} is the return of the market portfolio, such as the return of a general stock index. A more prevalent representation of the above model is

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$

where ε_{it} encapsulates the abnormal return for firm i and event period t (MacKinlay, 1997).

Although the two basic models have many advantages, one of their limitations is the difficulty in comparing the relative importance of different events, when there are multiple events that contribute to the price adjustment. To remedy this, Izan introduced dummy variables D_{et} for each event e in period t to the market model (Izan, 1978):

$$R_{it} = \alpha_i + \beta_i R_{mt} + \sum_{e=1}^{E} \gamma_e D_{et} + \varepsilon_{it}$$

where $\hat{\gamma}_e$ is an estimator of the average abnormal return when event e occurs.

The event study model presented above analyzes how the occurrence (a binary dummy variable) of a given event or a specific category of news influences the equity markets. Some recent developments in the literature, however, focused on mining the relationship between the quantities or contents of news releases and the equity price. Antweiler and Frank showed that the volume of message postings on popular financial message boards can be used to predict returns and volume of succeeding stock trading (Antweiler & Frank, 2004). Sprenger, Tumasjan et al. studied the three aspects of the association between stock-related tweets and the market, namely, twitter sentiment (bullish or bearish mood in the content) and stock returns, message volume and trading volume, disagreement and volatility. Under daily data frequency, they found a significant association between twitter sentiment and the stock returns, yet no lagged relationship could be identified. They also discovered that disagreement in twitter contents has a significant association with an increase in trading volume (Sprenger, Tumasjan, Sandner, & Welpe, 2013).

Although previous studies have investigated how various information influences the markets, the relative importance of information released from different sources is largely unexplored. Thus, in our framework, we address the relative importance of information published by the government, corporates, financial analysts and individual investors in terms of their impact on the Chinese stock index futures.

CHAPTER 3

THEORETICAL BACKGROUND

3.1 Efficient Markets

Modeling the relationship between market-related information and equity prices is a problem that has been discussed for years in the economic literature. The Efficient Market Hypothesis (EMH) is the first formal hypothesis that clearly states the market impact of relevant information. This hypothesis gradually took shape from the beginning of the 20th century to the 1950s (Dimson & Mussavian, 1998). In the late 1960s, Fama formally defined EMH, and three forms of market efficiency in his seminal papers (E.F. Fama, 1965, 1970). According to Fama, the stock price fully reflects all publicly available information immediately, suggesting that information is a factor in stock price formulation. This hypothesis in its strong form, however, is not in support for predicting the market with newly released information. This is because Fama believed that the rational behavior of market participants will drive the stock price to reflect new information instantly, leaving no time lag between information release and the corresponding price correction for anyone to make profitable predictions.

Although market efficiency has many advocates, many empirical studies have yielded results contradicting this hypothesis (Bernard & Thomas, 1990; Jegadeesh & Titman, 1993; Loughran & Ritter, 1995). As an example, DeBondt and Thaler segmented stock price series into consecutive time periods and calculated the return of 35 stocks in each period. They discovered that past losers have a higher probability of being future winners, and vice versa (De Bondt &

Thaler, 1985). Such systematic patterns by hour, day, and other seasonal frequencies are often labelled anomalies to the EMH. To better interpret and understand these anomalies, several theories and hypotheses were proposed in the literature.

Behavioral finance theories conjecture that market participants may not be fully rational in trading, which allows a set of new information-market models to become viable candidates in explaining the impact of market-related information. Proponents suggest that behavioral finance "stands in sharp contradiction to much of efficient market theory" (Shiller, 2003, p. 83). And they further suggest that investors are not fully rational in decision making (N. Barberis & Thaler, 2003). For example, Baberis, Shleifer and Vishny demonstrated how market participants' over- and under- reactions to new information can affect security prices (Nicholas Barberis, Shleifer, & Vishny, 1998).

3.2 Adaptive Markets

Adaptive Markets Hypothesis (AMH) suggests that the market evolves over time and can endure temporary inefficiency (Lo, 2004). In this regard, the characteristics of the market microstructure, psychological biases, noise trading and the existence of market imperfections could be accepted as potential factors that can give rise to periods of departure from market efficiency (Self & Mathur, 2006). Aldridge used the following picture (Figure 3.1) to demonstrate how investors' over- and under-reactions could drive the stock price to temporarily deviate from its true value (Aldridge, 2010, p. 73). She further summarized several advances in testing the market efficiency in the literature.

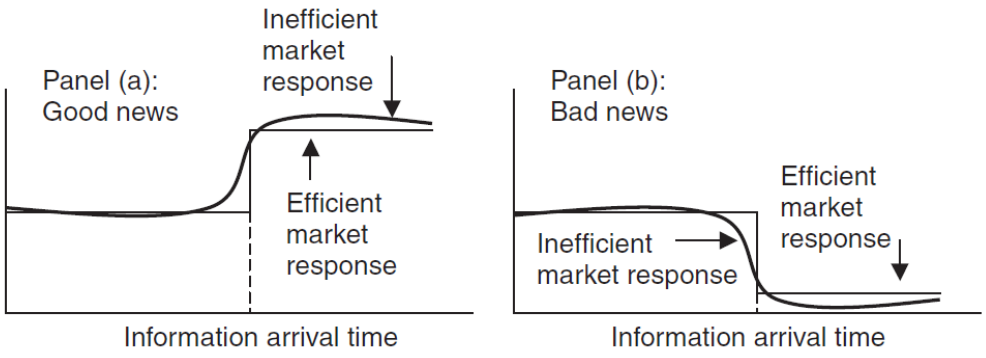

Figure 3.1 Information Response in Efficient Inefficient Markets.

Source: (Aldridge, 2010, p. 79)

The microstructure theory followers analyze the information-price correlation by investigating the order flow and possible informational asymmetries arising during the dissemination of information (Lyons, 1995). In the three forms of market efficiency, Fama suggested the existence of "insider" information, but did not specify the details about how the "insider" information affects the stock price. Glosten and Milgrom described the process of how the order flow from the well-informed traders can gradually convey and spread the information to the market makers and traders who are uninformed ex ante (Glosten & Milgrom, 1985).

In summary, there has been a long lasting controversy about market efficiency and investors' rationality. Due to the lack of an accurate pricing model for securities, it is intrinsically difficult to calculate an accurate stock price after incorporating new information. And thus, the market inefficiency and investors' irrationality can hardly be proven. On the other hand, facing the challenge of many empirical results that found numerous "anomalies" of market efficiency, Fama stated that the efficient market hypothesis is a faulty description of price formation that can be potentially rejected by empirical tests (E.F. Fama, 1998).

In this study, since we cannot find solid proof of investor irrationality, our hypothesis to the Chinese index futures market is that it is efficient under daily data frequency. Our model

analyzes the association between the news release and the futures index level of the same day, because, in China, the trading time in futures market is 30 minutes longer than that in the stock market on each trading day. More specifically the stock markets open at 9:30 and end at 15:00, while the index futures market opens at 9:15 and ends at 15:15. If a significant relationship does exist between the two, our study provides an empirical finding that supports market efficiency in China. If no significant relationship could be found, it could potentially indicate that the markets in China are not efficient under daily data frequency. Furthermore, despite these controversies in the economic theory, a large body of literature has been developed in understanding the impact of new information on the equity markets, both theoretically and empirically, and few, if any, studies reject the hypothesis that information influences the stock market. Our study goes beyond validating the effect of information to comparing the relative importance of information released from various sets of sources.

CHAPTER 4

METHODOLOGY

4.1 Information Source and Event Groupings

In order to analyze the relationship between relevant news events and the returns of stock index futures, we have collected both news data and the index future's trading data. In particular, we focus on analyzing a single contract (ticker: IF0001) that has been trading in the China Financial Futures Exchange since the market was opened in April 2010. The underlying asset of IF0001 is the CSI300 stock index, which is commonly used to show the overall performance of both the Shanghai and the Shenzhen stock markets in the mainland of China. It is composed of 300 stocks that are actively traded on both markets (179 from Shanghai stock exchange, 121 from Shenzhen stock exchange).

Since the listing of IF0001, its trading volume has steadily increased from an average of 4.45 million contracts/month in 2010 to an astonishing 11.75 million contracts/month in 2014, the latter of which is worth more than 1.25 trillion U.S. dollars in market value. This dramatic increase not only shows the scale of the market, but it also indicates significant practical value in analyzing and understanding the behavior of both this contract and the market it is listed in.

4.1.1 News Data

The sample of news data we collected contains news articles related to IF0001 from various sources on the internet, including popular financial web portals such as the official website of the China Financial Futures Exchange, finance.qq.com, and finance.sina.com. The data were

collected by implementing a computer program, called the web crawler, which systematically browses the internet. For example, starting from www.yahoo.com, the web crawler retrieves all webpages that are reachable by clicking links within www.yahoo.com. And then it iteratively does likewise for all retrieved pages until a stop criterion is met. We confine our crawler to only fetch pages within the given domains so as to avoid irrelevant noise.

The retrieved news documents are further processed to remove duplications and identify the date of publication, and then classified into eight different categories according to their contents and authors. In general, we classify the news documents into government announcements, five different kinds of corporate announcements, analysts' reports, and financial comments on popular web portals and social media. After the classification, the number of new articles are aggregated by date to form a numerical time series.

The contents of government announcements (later referred to as GA) are mostly involved with trading regulations and policies, listing of new contracts, changes in commissions and fees, etc. The official website of China Financial Futures Exchange has kept an archive of announcements released by the government with regards to the futures market. Our web crawler fetched 178 announcements in the period from 04/16/2010 to 04/30/2014.

Corporate announcements (later referred to as CA) are information disclosures made by companies of constituent stocks in the CSI300 Stock Index. The contents of corporate announcements can be classified into many categories. Olsen and Dietrich (1987) suggested comparing the impacts of different news categories as a potential research area. Ryan and Taffler further explored this topic and divided firm-specific news releases into 32 categories. They further concluded that "a limited number of news categories have a pervasive impact" on the related stocks. The categorization scheme that we adopt stems from that of Ryan and Taffler's,

but with some necessary changes to fit the Chinese markets[2]. In particular, we classify corporate announcements into the following categories:

CA1, Announcements from the board of directors and the board of supervisors: news related to the management of the companies listed on the index, invest plans, etc. that are approved on meetings of directors or supervisors.

CA2, Annual report and quarterly report: financial reports that state companies' earnings, profits, and other relevant information on performance and progress.

CA3, Announcements about company restructuring: information regarding to company restructuring, subsidiaries, merging and acquisition, etc., is required by the Chinese stock exchange regulations to be listed as an individual announcement with the "Important" keyword in the title.

CA4, Dividends and changes in the amount of outstanding shares: splits, dividends, issuing of new shares.

CA5, Others: company-specific announcements that are difficult to categorize. For example, land leasing, investment in LED product line, company's emergency reaction plan to natural disasters, etc.

Analysts' reports (later referred to as AR) are written by professional market analysts of institutional investors. Contents of such reports typically involve a compilation of the latest news about a specific company and an investment grading to reflect the analyst's perspective on future profitability of the stock.

Financial comments (later referred to as FC) on popular web portals and social media covers the rumors, discussions and forecasts about constituent stocks. These news articles are

[2] Not all information subcategories proposed by Ryan and Taffler apply to the Chinese markets. For example, they listed "Change in FTSE constituents" as a category. But constituent stocks of an index never change in Chinese markets.

written by individual market participants to express their opinions and sentiments on stocks and the overall market.

Among all 4 information sources, government and corporate announcements have the exact timestamp when they are first released, while analyst' reports and user generated contents may contain reposts or compilations of publicly known information which is hard to eliminate.

4.1.2 Trading Data

We gathered daily transaction data of IF0001 from the website of the China Financial Futures Exchange. Since it is retrieved from the official source, the data is complete (from 04/16/2010 to 04/30/2014) and of good quality. In total, we have collected 978 daily data entries since the listing of the IF0001 contract. The data entries contain the transaction date, open, high, low, closing, settlement prices, and open interest. We have also collected the transaction data of the Shanghai Composite Index in the same period. This is used to proxy the return of a market portfolio larger than CSI 300 in our model.

4.2 Estimation Techniques

Our study of the IF0001 information-return relationship falls into the broad category of event study in econometrics. The basic framework of the event study was proposed by Fama (Eugene F Fama et al., 1969). It starts by specifying the event of interest and the event's time window of influence. The effect of events is then assessed by calculating the abnormal return of a security in the pre-determined period of influence. In the literature, there are many models for calculating the abnormal return. Fama defined the most basic abnormal return model as the difference between actual ex post return and the normal return. Thus, for firm i and event period t, the abnormal return is formulated as below:

$$AR_{it} = R_{it} - E(R_{it}|X_t)$$

where AR_{it}, R_{it}, and $E(R_{it}|X_t)$ are the abnormal, actual and normal returns, respectively.

The basic abnormal return model imposes many underlying assumptions. For example, it assumes that the abnormal return of an equity can be attributed to a single event within the specified time window, and the effects of different events do not overlap in time. However, with the rapid growth of the internet and other electronic media, new information is released and updated in a scale of seconds. The market is under constant influence of a wide range of information, varying from official announcements to rumors, from prescheduled macroeconomic announcements to colloquial estimations and more. As a result, it becomes a very strong assumption to attribute the price change to any single event in contemporary markets. In order to resolve this problem, we implement the model proposed by Izan (1978), which attributed the price change to multiple events:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \sum_{e=1}^{E} \gamma_e D_{et} + \varepsilon_{it}$$

where D_{et} is the dummy variable that flags the occurrences of each specified event e.

Since we classify our data into eight categories, including government announcements, five different kinds of corporate announcements, analysts' reports and other financial comments, the model that we posit becomes:

$$R_t = \alpha + \beta MR_t + \sum_{C=1}^{8} \gamma_c D_{ct} + u_t$$

where,

R_t is the actual daily return of IF0001 on day t

MR_t is the actual return of the Shanghai Stock Exchange (SSE) Composite Index on day t

D_{ct} is the dummy variable for each announcement categories

α, β, γ_c, u_t are parameters to be estimated with our data

More specifically, we use the log returns for R_t and MR_t calculated as follows:

$$R_t = 100 \times (lnP_t - lnP_{t-1})$$

where P_t is the daily settlement price of the stock index future on day t, and

$$MR_t = 100 \times (lnMP_t - lnMP_{t-1})$$

where MP_t is the daily SSE composite index on day t. The log returns are often preferred to simple returns, because if the log returns are assumed to follow a normal distribution, then the underlying simple returns follow a lognormal distribution, which has many advantages in both calculation and model (Aldridge, 2010). For example, calculating the compound rate on the raw return would require to calculate the product of a series of returns.

$$Compound\ Return = \quad 1 + r_1 \quad 1 + r_2 \quad \dots \quad 1 + r_n$$

This is both computationally expensive (as compared to addition), and unfavorable because the product of normally-distributed variables is not normal. Computing the compound return on log returns, however, requires only addition and the resultant compound return is still normal:

$$Compound\ Return = \ ln\ 1 + r_1 \ + ln\ 1 + r_2 \ + \cdots + ln\ 1 + r_n$$

The market return term MR_t is used to estimate the normal return of the futures contract.

MacKinlay suggested that the market return can be used to proxy the actual return of an equity under the assumption of stable linear relationship between the market return and the equity return (MacKinlay, 1997). Typically, the return of a market portfolio can be calculated from the return of a general stock index, such as the Dow Jones Industrial Average Index. In this study, we use the daily return of the Shanghai Stock Exchange Composite Index (SSE Composite Index) as our market portfolio. This index is chosen because it is composed of 900

constituent stocks, which is a super set of constituent stocks of the CSI300 index. Additionally, since the future's market closes 15 minutes later than the stock market, we use the IF0001 market return at time t instead of a daily lagged one.

D_{ct} is the dummy variable for each of the announcement categories. A more traditional approach in building such dummy variables is to implement a binary value (either positive or negative) to indicate the existence of news release on a specific day (Izan, 1978; Mitchell & Mulherin, 1994). However, with the proliferation of the news media, and due to the nature of this research that considers as much market-related information as possible, the traditional approach would result in a non-discriminative variable that is always positive. For example, variable AR and FC are positive on all 978 observations. To resolve this problem, our dummy variable represents the abnormally large amount (outliers) of news on a given day. More specifically, the dummy variable for news category c on day t is calculated as:

$$D_{ct} = \begin{matrix} 1 & if\ Count_{ct} > \mu_c + 3\sigma_c \\ 0 & otherwise \end{matrix}$$

where μ_c and σ_c are the mean and the standard deviation of the number of news events in category c, respectively. The calculations are presented in Table 4.2. In this regard, our research mainly concerns about the relationship between excessive news occurrences and the change in futures price within the same day.

One advantage of this model is that once the parameters γ_c are properly estimated, it is easy to compare the relative importance among each news category. By taking a partial derivative of each dummy variable on the futures' actual daily return, it is determined that the parameter γ_c for each category c is an estimation of the abnormal return that can be attributed to this news category. That is,

$$\frac{\partial R_t}{\partial D_{ct}} = \frac{\partial \ \alpha + \beta MR_t + \ \sum_{C=1}^{8} \gamma_c D_{ct}}{\partial D_{ct}} = \ \gamma_c$$

where γ_c represents the estimated incremental return from abnormal intensity of that category of event.

Table 4.1 Summary of statistics of the raw data

Variable	Numbers of Observations	Mean	Std. Dev.	Min	Max	Total Number of News
News Data						
Government Announcements	978	0.18	0.57	0	4	178
Corporate Announcements 1	978	14	11	0	97	14,331
Corporate Announcements 2	978	8.5	19.5	0	174	8,352
Corporate Announcements 3	978	1.68	1.76	0	13	1,648
Corporate Announcements 4	978	1.05	1.49	0	13	1,028
Corporate Announcements 5	978	49	40	0	533	48,010
Analysts' Reports	978	42	52	1	343	41,207
Financial Comments	978	466	350	47	2891	456,430
Transaction Data						
Settlement Price of Stock Index Futures	978	2641.681	352.7342	2071	3581.2	
SSE Composite Index	978	2402.213	304.9405	1950.01	3159.51	

Table 4.2: parameters used for calculating the outliers in the number of news releases

Categories	Mean(μ_c)	Standard Deviation(σ_c)	$\mu_c + 3\sigma_c$
Government Announcements	0.18	0.57	1.89
Corporate Announcements 1	14	11	47
Corporate Announcements 2	8.5	19.5	67
Corporate Announcements 3	1.68	1.76	6.96
Corporate Announcements 4	1.05	1.49	5.52
Corporate Announcements 5	49	40	169
Analysts' Reports	42	52	198
Financial Comments	466	350	1516

CHAPTER 5

RESULTS

In this section, we demonstrate the empirical results from our regression model and show the announcement effects on the CSI300 Index futures contract. With the data that we gathered[3], we estimated the parameters in the linear regression model presented in last chapter with robust standard errors to resolve the heteroscedasticity problem. Our model is both unbiased and efficient. Table 5.1 shows the parameter estimates and their t-statistics for the regression.

Among the eight dummy variables for different news categories, only two of the estimated coefficients are significantly different from zero. First, our estimated coefficient for γ_{ga}, which encompasses regulatory changes or government announcements, is negative and statistically significant at the 10% level. This suggests that when the China Financial Futures Exchange releases two or more announcements on a trading day, the return of CSI300 stock index responds with a bearish move by 0.14%. The rationale behind this observed phenomenon may be partly attributed to the prevalent idea of avoiding political risk in trading when the level of government intervention is higher than normal.

Second, the estimated coefficient for company restructuring announcements (γ_{ca3}) is positive and statistically significant at the 10% level. An average increase of 0.20% in the abnormal return of CSI300 stock index is expected to happen when seven or more corporate announcements, which explicitly contain the "Important" keyword in the title, are released on a

[3] Details and statistics about the raw data and how the data is processed before building the model are presented in Table 4-1, and Table 4-2 in the Data and Methodology chapter.

single day. Most of the news in this category confers information about company restructuring. This suggests that the index futures contract benefits from an abnormally large number of company restructuring announcements. It has been a common perception among Chinese investors that mergers and acquisitions are a profitable opportunity to explore, especially for large companies whose stocks are major components of the CSI300 index. This result offers empirical evidence that is in support for the investors' positive conformity in the presence of restructuring news.

Our model does not show significant market impact from other events, including the analysts' reports, financial comments, and the other types of corporate news events. However, it would be premature to conclude that the market is insensitive to these categories of information, since there are many factors to be examined before reaching any solid conclusion. For example, we conjecture that some company-specific news events may not trigger an impact large enough to be detected consistently in the index futures. Whether these news events have significant impact on individual stocks or specific market segments, rather than the overall index, is a potential direction for later research. Furthermore, our study concentrates on analyzing how the amount of news announcements impacts the market. In order to fully understand the market's reaction to news, it is necessary to study the impact of news contents. Different sentiments (optimistic, pessimistic) expressed in the announcement can affect the market in drastically different ways. With no insight into the content of each news article, it is ambiguous to determine whether the insignificant relationship between market and news is due to market insensitivity or contradicting sentiments cancelling each other.

In general, our findings are in support for the efficient market hypothesis. We find government announcements and company restructuring events are significantly related to the

return of index futures on the same day of the news release. No lagged effects were found at a daily data frequency. Our results also support the hypothesis that there is a significant and negative relationship between an unusually large amount of government announcements, but significant and positive relationship exists between announcements of company restructuring events and abnormal return of IF0001 stock index futures. These two specific types of events are more important than others in terms of the impacts on the futures market performance of index futures.

Table5.1 Estimated Announcement Effects on IF0001 Index Returns (April/2010 to April/2014)

Variable	Estimated Coefficient	Robust Standard Error	T-statistic	P-value
Dependent Variable				
Return of IF0001 (R_t)				
Independent Variable				
Government Announcements	-0.144*	0.080	-1.80	0.072
Corporate Announcements 1	-0.004	0.114	-0.03	0.974
Corporate Announcements 2	-0.028	0.099	-0.28	0.779
Corporate Announcements 3	0.201*	0.105	1.91	0.056
Corporate Announcements 4	0.019	0.125	0.16	0.876
Corporate Announcements 5	-0.053	0.067	-0.79	0.431
Analysts' Reports	0.084	0.103	-0.82	0.411
Financial Comments	0.059	0.139	0.43	0.667
Intercept	0.006	0.015	0.43	0.669
Market Return (SSE Composite Index)	1.067	0.017	61.01	0.000

Note: * denotes significance at 10% levels.

CHAPTER 6

CONCLUSION

This research analyzes the Chinese index futures market's reaction to news events. The rationale for exploring this research topic is two-fold. First, past research in comparing the relative importance of different news events published from different sources was very sparse. Although there was ample empirical evidence that supports the market impact of government announcements, corporate reports, and reports from institutional investors, the question of which kind of event is the most influential has not been well addressed. In addition, some recent studies revealed that emerging sources of financial news, such as twitter and various discussion boards, have also grown into an influential factor on the stock markets in the U.S. This new development further expands the pool of news that investors need to consider in decision making.

In an effort to understand the relative importance of various news events, our research analyzes the market impacts of news published from different sources with the event study approach. Second, the index futures market in China are unique in several aspects. For example, the over-priced requirement on initial margin could hinder individual investors from entering the market. And investors in the Chinese market face potentially high political risks. These unique attributes make it worthy to re-examine the existing theories and models from the western financial markets on the market environment in China.

We have collected daily transaction data of the Chinese index futures market and related news events data from the World Wide Web in the period from April 16, 2010 to April 30, 2014. The news events are further classified into government announcements, five categories of corporate announcements, analyst's reports, and financial comments posted on web portals and social media. We use the event study approach to analyze the impact of market-related news and made two discoveries: 1) under daily data frequency, there is a significant association between the compound return of the index futures and excessive number of some specific news categories; 2) compared to all other news events, government announcements and company restructuring announcements are the most influential ones to the stock index futures.

Our results of analyzing the Chinese market are in line with the theories and empirical studies in other developed markets. First, our result shows that there is a significant relationship between index futures return and excessive amount of government announcements under daily data frequency. No lagged effect was observed. Thus our result is in support for the market efficiency with regards to the information released by the government. This finding agrees with some early discoveries in the U.S. market. For example, Mitchell and Mulherin showed that the number of Dow Jones announcements and market activity of NYSE, AMEX and OTC firms are directly related (Mitchell & Mulherin, 1994). Fair demonstrated that 69 events released in the period from 1982 to 1999, including government, macroeconomic and firm-specific announcements can be associated with S&P 500 futures price change (Fair, 2002). Our research validates their findings and shows that they still hold within the emerging Chinese market. Second, we also validated the necessity of avoiding political risk when there is a higher-than-normal level of government intervention. However, unlike some recent academic studies on the market impact of social media, we find that the correlation between market returns and the post

volume of social media is not statistically significant. Neither could we identify any significant impact from the analysts' reports, and some corporate announcements including annual reports. This difference suggests that, on the one hand, the Chinese markets may have their unique characteristics, and market participants should consider more about government policy announcements and company restructuring events. On the other hand, the impact of social media on specific stocks may be diluted in the stock index and became difficult to capture.

Analyzing the influence of various news sources on the market is a field with much potential. Our research reveals that excessive number of government announcements is negatively related to the index futures in Chinese markets. One possible extension to our study is to analyze whether the sentiment of the news (bullish, neutral, and bearish) could indicate the direction of the change succeeding the announcement. Furthermore, although we found the corporate announcements are not significantly related to the return on the index futures, it is still meaningful to examine whether corporate announcement will affect the return of the related individual stock.

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