THE IMPACT OF
CHINESE COTTON AND TEXTILE NEWS ON COTTON FUTURES MARKET

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ABSTRACT

The purpose of this thesis is to empirically investigate the impacts of Chinese cotton and textile news events on the volatility of the cotton futures prices. To accomplish this objective, a series of augmented GARCH (1, 1) models that include news events as additional explanatory variable in the conditional variance equations are employed. The news effects on cotton futures market have three cases and are tested in four aspects for each case. With the exception of cotton news events under certain conditions there is no significant evidence that Chinese cotton and textile news events have impacts on the volatility of the cotton futures prices. The cotton news events have a significant overnight marginal effect of 1.7572 on the cotton futures prices volatility at the 95% level of confidence and a significant marginal effect of 34.3992 on the cotton spot market at the 99% level of confidence.

Chapter 1 Background Introduction

1.1 Introduction

China is the world's largest cotton producing and consuming country. It has also become the largest buyer in the world cotton market in recent years. Changes in China's cotton market, trade behavior and cotton technology have important implications for the world cotton market. With the global integration of textile trade in 2005, China's textile exports have been experiencing a steady overall increase. This increase stems from regions that previously maintained quota controls. China's consumption of cotton, which is a main input into textile production, has also increased dramatically. Thus, there remains a large increasing gap between China's cotton consumption and production. The result is that China has come to dominate not only international textile and apparel (T&A) trade but also the world cotton market.

Prices for cotton, as for most primary commodities, have been volatile (Cashin and McDermott 2001). Volatility is simply a characterization of price changes over time, which may be measured by the day-to-day percentage difference in prices. In the futures markets the volatilities occur both within and between trading days. The volatilities, in response to news, influence traders' views on whether it is opportune to buy or sell. Historically, the most important factor in the cotton price volatility has come from China. Price volatility in years when China was a major importer had been significantly higher than in years when they imported only a minimal amount (Cleveland 2005). This thesis will empirically investigate the effects of Chinese cotton and textile news on the volatility of world cotton futures prices. This has not previously been studied in the literature. Generalized Autoregressive Conditional Heteroscedasticity (GARCH) models are usually employed to study news effects on volatility.

The remainder of this chapter contains four sections. The next two sections outline the world cotton market and the cotton futures market. The fourth section describes the influence of China on the world cotton price. The last section outlines that the objective of this thesis is to determine if there exists a relationship between the volatility of cotton futures price and Chinese cotton and textile news events.

1.2 World Cotton Market

Cotton is the single most important textile fiber in the world, accounting for over 40 percent of total world fiber production. Throughout history, the world cotton production has accumulated rich planting experiences. Along with the progress of modern science and technology, world cotton production has been enormously impelled by breeding technology and planting craft revolution. Currently there are more than seventy countries planting cotton spanning Asia, Africa, America, Europe and Oceania. The broad cotton-producing region is mostly between the north latitude 40 to the south latitude 30.

In 2005, the world's top five cotton producing countries were China, Unites States, India, Pakistan, and Uzbekistan. These five countries account for roughly 70% of world production. The world's five largest cotton consuming countries are China, India, Pakistan, Turkey and the United States. Other important cotton consumers such as Indonesia, Mexico, and Thailand produce almost no cotton (see Table 1.1 and Table 1.2). As a result, around one-third of cotton production is traded internationally, a much larger share than for grain.

Table 1.1 World Cotton Production (1000 480-1b.bales)

Country	2000/01	2001/02	2002/03	2003/04	2004/05 (p)	2005/06 (f)
China	20,300	24,400	22,600	22,300	29,000	26,200
United States	17,188	20,303	17,209	18,255	23,251	23,719
India	10,931	12,300	10,600	14,000	19,000	18,600
Pakistan	8,200	8,300	7,800	7,750	11,300	9,750
Uzbekistan	4,400	4,900	4,600	4,100	5,200	5,600
Brazil	4,312	3,519	3,890	6,015	5,900	4,500
Turkey	3,600	3,975	4,179	4,100	4,150	3,550
Australia	3,700	3,340	1,680	1,700	3,000	2,600
Greece	2,035	2,093	1,715	1,530	1,800	1,975
Syria	1,675	1,660	1,126	1,300	1,600	1,600
Others	12,509	13,961	12,852	14,212	16,176	15,657
World Total	88,850	98,751	88,251	95,262	12,0377	113,751

Source: Foreign Agricultural Service, Official USDA Estimates for February 2006
(p) preliminary; **(f)** forecast

Table 1.2 World Cotton Consumption (1000 480-1b.bales)

Country	2000/01	2001/02	2002/03	2003/04	2004/05(p) (	2005/06(f)
China	23,500	26,250	29,900	32,000	38,500	45,000
India	13,544	13,275	13,300	13,500	14,800	16,750
Pakistan	8,100	8,500	9,400	9,600	10,750	11,750
Turkey	5,167	6,150	6,300	6,200	7,000	7,050
United	8,862	7,696	7,273	6,221	6,693	5,900
Brazil	4,200	3,800	3,600	3,950	4,200	4,000
Indonesia	2,450	2,300	2,250	2,150	2,250	2,300
Thailand	1,650	1,800	1,950	1,850	2,150	2,125
Mexico	2,100	2,200	2,100	2,000	2,100	2,000
Bangladesh	1,000	1,200	1,550	1,600	1,725	1,800
Others	21,591	21,148	20,684	19,009	18,479	18,119
World Total	92,164	94,319	98,307	98,080	108,647	116,794

Source: Foreign Agricultural Service, Official USDA Estimates for February 2006
(p) preliminary; **(f)** forecast

The four dominant cotton exporters—United States, Uzbekistan, Australia and Brazil—account for more than two-thirds of world exports. Four major cotton producers—China, India, Pakistan, and Turkey—import cotton to supply their textile industries (Baffes 2005). The eight largest importers account for more than half of world cotton imports (see Table 1.3). With the fast growth in global consumption of cotton, world cotton trade is forecast to reach an unprecedented level in 2005/2006 (Meyer, MacDonald and Skinner 2005).

Table 1.3 Global Cotton Trade (1000 480-1b.bales)

Country	2000/01	2001/02	2002/03	2003/04	2004/05(p)	2005/06
Exports						
United States	6,740	11,000	11,900	13,758	14,409	16,400
Uzbekistan	3,450	3,500	3400	3,100	3,950	4,450
Australia	3,903	3,130	2,655	2,157	2,002	3,050
Brazil	315	674	489	964	1,557	2,000
India	94	60	56	700	700	1800
Greece	1,424	1,000	1,150	1,225	1,150	1,550
Burkina Faso	520	650	725	950	975	1,350
Mali	575	925	850	1,175	950	1,150
Syria	1,050	1,000	750	700	700	825
Benin	625	650	725	675	575	650
Others	7,699	6,418	7,620	7,841	7,727	8,620
World	26,345	29,007	30,320	33,245	34,695	41,845
Imports						
China	230	449	3,127	8,832	6,385	17,000
Turkey	1,785	2,977	2,265	2,370	3,409	3,500
Indonesia	2,650	2,356	2,228	2,150	2,400	2,300
Thailand	1,573	1,882	1,945	1,678	2,282	2050
Bangladesh	1,000	1,200	1,600	1,540	1,700	1,750
Pakistan	450	1,000	850	1,850	1,700	1,700
Russian Federatic	1,650	1,800	1,650	1,475	1,450	1500
Mexico	1,865	2,065	2,330	1,858	1,810	1,400
Taiwan	1,040	1,531	1,219	1,011	1,337	1,225
Korea, Rep.	1,421	1,616	1,492	1,274	1,343	1,175
Others	12,576	12,587	11,408	9,862	9,317	8,806
World	26,213	29,463	30,114	33,900	33,133	42,406

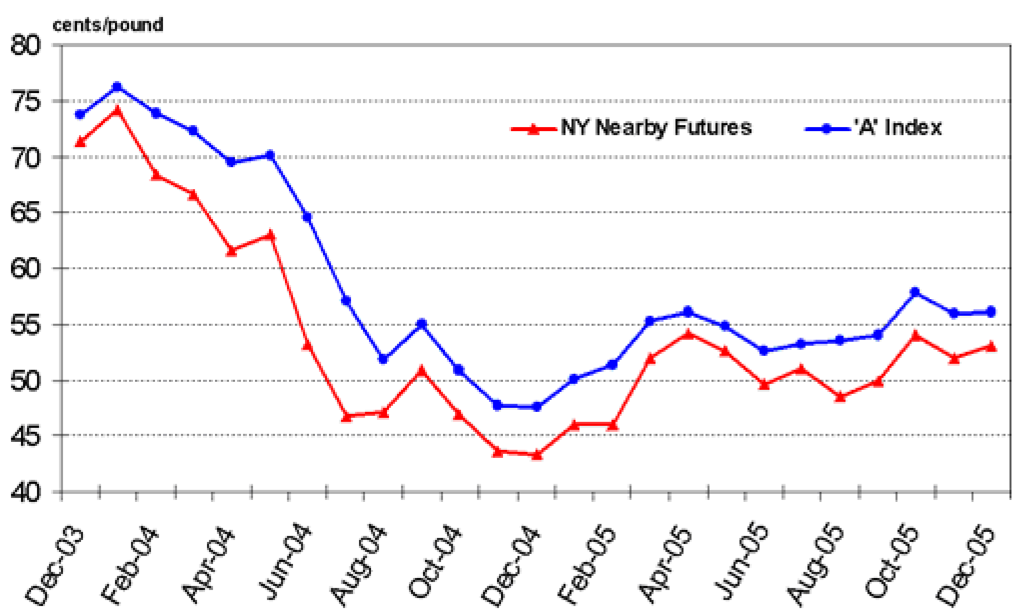
Source: Foreign Agricultural Service, Official USDA Estimates for February 2006
(p) preliminary; **(f)** forecast

Cotton production has been subject to considerable intervention, from subsidies in the United States, the European Union, and China to taxation in Africa and Central Asia (Baffes 2005). These market interventions send distorted price to the farm sector.

For example, cotton subsidies in rich countries encourage overproduction and depress world cotton prices.

At present, there are two authoritative cotton prices in the world market: one is a standard world price for cotton determined by market forces set daily at the New York Board of Trade (NYBOT), the other is Cotlook A index daily reported by the Outlook Group Limited in Liverpool, England, which is the actual transaction price. As can be seen from Figure1.1, these two prices have the same trends, however, the Cotlook A index is slightly higher than NY nearby futures prices.

Figure 1.1 Average Monthly Prices
(December 2003 – December 2005)



Source: NYBOT

The volatility of cotton daily cash prices is a notable feature of the world cotton market. The degree of volatility has changed considerably during the past 40 years. Cotton prices were at least twice as volatile between 1985-2002 versus 1960-1972; and half as volatile as 1985-2005 versus 1973-1984 (Baffes 2005).

1.3 Cotton Futures Market

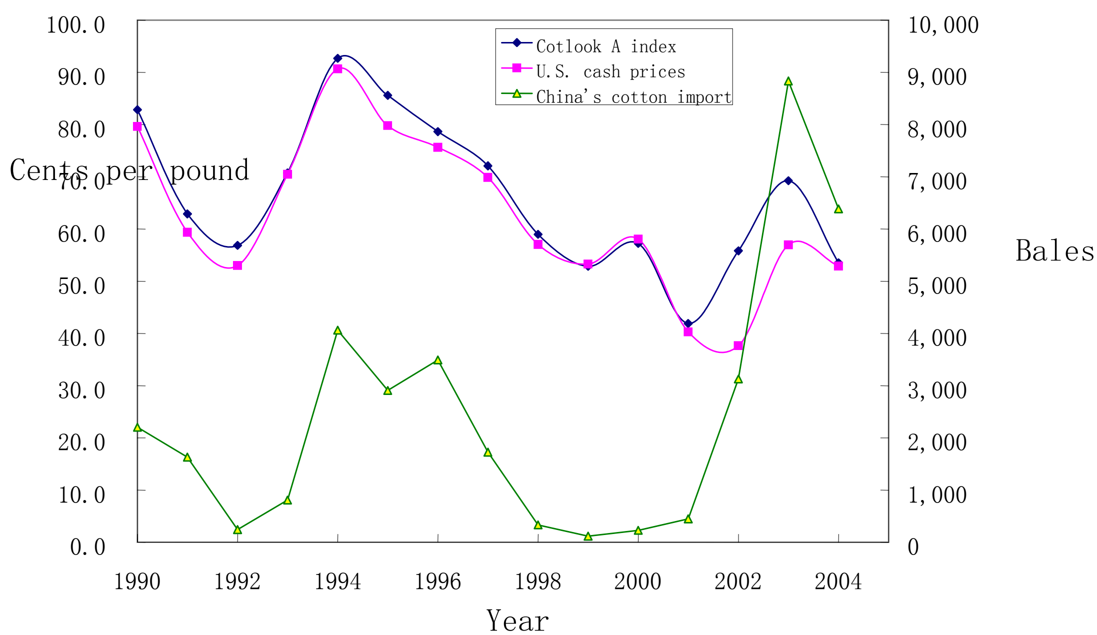
The New York Cotton Exchange (NYCE) is one of the two major exchanges of the NYBOT. It was founded in 1870 by a group of one hundred cotton brokers and merchants at One Hanover Square in New York City. In that era, other major exchanges existed in the United States such as the Savannah Cotton Exchange, the New Orleans Cotton Exchange, and the Houston Cotton Exchange plus the important Liverpool Cotton Exchange in Liverpool, England. Today, the NYCE is the sole survivor of that group and is the world's leading marketplace for cotton futures and options trading.

A futures contract is an agreement between a seller and a buyer that calls for the seller to deliver to the buyer a specified quantity and grade of an identified commodity, at a fixed time in the future and at a price agreed to when the contract is first entered into (Edwards and Ma 1992). Cotton futures contracts, traded at the NYBOT, are distinguished delivery months. The cotton futures delivery months are: March, May, July, October, and December. These months also indicate when the contract will cease to trade. The opening price, low and high price, closing price for each cotton contract are reported daily. The primary functions of the cotton futures market include price discovery, risk transfer, price dissemination, and intertemporal resource allocation. The prices of cotton on the world cotton market are at a premium or discount to the Cotton No. 2[sm] futures contract traded in New York. The stability and continuity of the futures market function is based on the contracts ability to reflect cash market conditions and practices

1.4 China Factor

Various reasons associated with the changes of world cotton prices include: climate, economics, war, and prices of chemical fibers, etc. However, fluctuations in China's cotton imports have been a key causal factor of world price fluctuations during the last 20 years. China's presence as a major importer tends to coincide with price peaks, and its absence tends to correspond to periods of price depression. As can be seen in figure 1.2, at the mid-1990s, a huge increase in cotton imports caused the world cotton price to reach a high of 90 cents/pound. After 1995, the world cotton price went down as Chinese cotton output gradually increased. Until the end of 1999, the import of Chinese cotton had decreased as the world cotton price had dropped to 48.86 cents/pound.

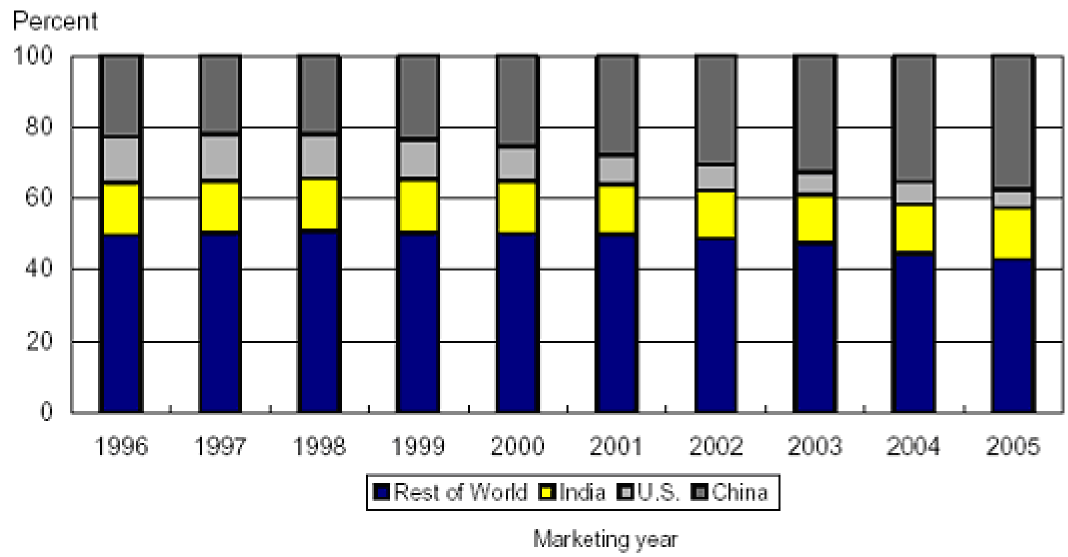
Figure 1.2 World Cotton Prices & China's Cotton Imports



Source: Based on data from Cotton Outlook, Cotlook Limited, and USDA

Currently, world cotton trade is relatively unencumbered by tariffs and other trade barriers (MacDonald, Somwaru and Tuan 2004). However, as an input into textile production, cotton trade could be substantially altered by the indirect effects of changes in world T&A trade policies. Just as China is the world's largest producer and exporter of textiles, it is often the largest consumer of cotton, and its share in the world cotton consumption increased from 20 percent to 40 percent during the period of 1996-2005 as can be seen in Figure 1.3.

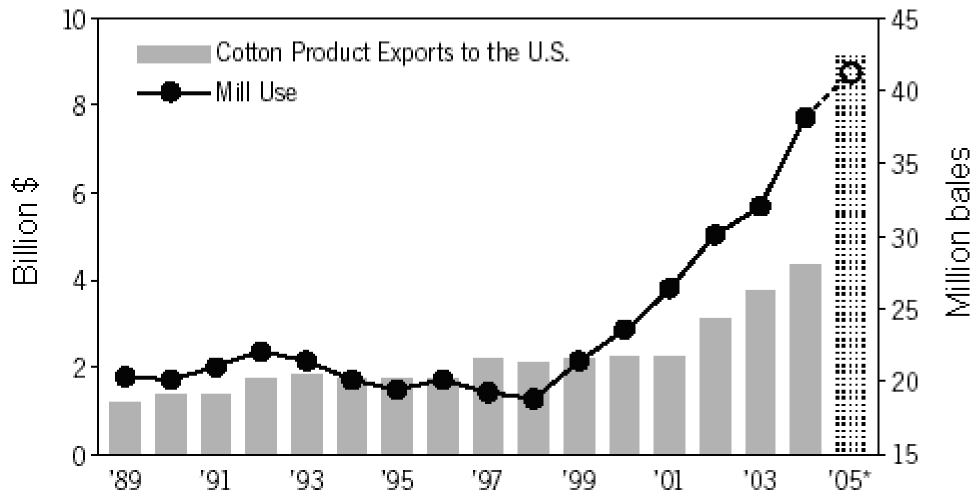
Figure 1.3 World Cotton Consumption Shares



Source: USDA

Since China's accession to the World Trade Organization (WTO) in December 2001, the growth of China's textile industry has been the dominant factor shaping world cotton and textile markets. China's T&A exports have grown by 50 percent since 2001. China has doubled its share of world T&A exports to about 25 percent in less than a decade. The export trade to several destinations, including the United States, is strong. For example, Figure 1.4 shows the dollar value of U.S. imports of Chinese cotton T&A has soared 91.4% from 2001 to 2004, reaching a record $4.4 billion in 2004.

Figure 1.4 Chinese Cotton Use & Exports to the United States



Source: USDA and U.S. Commerce Department

Until 2005, T&A exports from China and other developing countries had been constrained by quotas originally implemented by the developed countries under the Multi-fiber agreement (MFA). Under the Uruguay Round's Agreement on Textiles and Clothing (ATC), these quotas were phased out at the end of 2004. Since the completion of quota phase-outs, world volume of imported cotton T&A has climbed. For the first seven months of 2005, the dollar value of shipments expanded 12.9%, little higher than the 9.8% average annual growth over the last 15 years. This growth rate may seem marginal but if one focuses only on shipments from China, the growth is more pronounced. The value of U.S. imports of cotton T&A from China was up 122.3% for that period.[1] Correspondingly, China imported 2.57 million tons of cotton in 2005, an increase of 35.3 percent compared to that in 2004. In December 2005, China imported 350,000 tons of cotton, nearly six times the figure for the same period in 2004.[2]

The average nearby cotton futures closing price in December 2005 is 52.37 cents, compared to 44.13 cents that in December 2004. Since cotton prices are a function of

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[1] From Cotton, Inc. Textile Consumer, vol 36. Summer 2005 available at http://www.cottoninc.com/TextileConsumer/TextileConsumerVolume36/

[2] http://www.chinadaily.com.cn/english/doc/2006-01/20/content_514127.htm

cotton supply and cotton demand, it follows that volatility is a result of the underlying supply and demand fluctuation. Obviously, with the current oversupply situation in the international cotton market (see Table 1.4), China again is a dominant factor. The world cotton price volatility is affected by China's cotton imports. In addition to China's cotton trade polices and China's cotton production, an important factor determining China's cotton imports is the value of China's textile exports.

Table 1.4 World Cotton Balance Sheet (Millions of 480-1b.bales)

	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2005/06
Beginning Stocks	49.2	46.7	52.1	42	402	515	516
Production	88.8	98.8	88.3	95.1	120.4	112.4	112.4
Supply	138.0	145.4	140.4	137.2	160.6	163.8	164.0
Consumption	92.3	94.4	98.5	98.2	108.6	114.8	115.2
China	23.5	26.3	29.9	32.0	38.5	43.0	43.0
Non-China	68.8	68.2	68.6	66.2	70.1	71.8	72.2
Ending Stocks	46.7	52.1	42.0	40.2	51.6	50.9	50.8
China	18.4	17.2	12.8	12.4	10.6	10.0	10.0
Non-China	28.3	34.9	29.2	27.8	41.0	40.9	40.7
Stocks/Use Ratio	50.6	55.2	42.7	40.9	47.5	44.3	44.1

Source: 1.USDA
2. http://www.cottoninc.com/MarketInformation/MonthlyEconomicLetter/#wcbs

1.5 Objective and Plan of Study

The main objective of this thesis is to study the impact of Chinese cotton and textile news events on the price volatility of the cotton futures prices. The analysis will use a GARCH (p, q) model. A series of augmented GARCH models that includes news events as additional explanatory variable in the conditional variance equations are estimated. The response time of the cotton futures market participants (daytime news events, overnight news events, and day and night news events) are considered. For each case four sub-objectives are achieved by classifying the news events in four different aspects. First, the hypothesis that current and lag Chinese cotton and textile news has impacts on the volatility of cotton futures prices are tested. Second, Chinese cotton and textile news events are classified into three categories: cotton news, textile news headlines including "U.S.", and other textile news to test the hypothesis that different contents of news has different effects. Next, to test whether the volatility can be explained by the variation in the arrival of news, the augmented GARCH model is estimated by adding news variables sorted by initial news and follow-up news. Finally, the leading news effects are examined for the reason that the participants in the cotton futures market have the ability to forecast news events. In addition, because of the close relationship between the cotton futures market and the spot market, this thesis also investigated the impact of Chinese cotton and textile news on the cotton cash prices volatility.

This thesis is organized as follows. Chapter 2 provides a review of the world cotton market and cotton futures market, news effects on cotton prices and volatility, and empirical modeling of news effects. Chapter 3 describes the news data and price data employed. Chapter 4 presents the methodology and the various GARCH specifications used to examine the volatility of cotton futures prices. The empirical results and conclusion are presented in chapter 5 and chapter 6 respectively.

Chapter 2 Literature Review

2.1 Literature Relating to World Cotton Market and Cotton Futures Market.

2.1.1 World Cotton Market

Cotton prices are influenced by other factors such as trade policies, politics, prices of cotton substitutes, textile trade, and weather. They have received a great deal of attention in the literature because they guide the production, marketing, and consumption of cotton (Ethridge and Hudson 1998). Monke and Taylor (1985) find that elimination of trade barriers reduces price variability in the world cotton market. These results rest on testing a trade constrained model that accounts explicitly for quantitative controls on international trade with pooled time series-cross section data for the cotton market. Additionally, subsidies to cotton producers are an important variable in international cotton trade. Baffes (2005) points out that subsidies are detrimental to non-subsidized producers. Low prices combined with high domestic support give rise to the so-called cotton problem, which may be resolved through the policy that rich cotton-producing countries stop supporting their cotton sectors. Shepherd (2004) finds the effects of US subsidies on the world cotton market only have a limited impact on prices despite their effects on production and consumption. Even large reductions in US subsidies will not necessarily lead to significantly higher world prices.

Another reason for cotton price changes is the changes of the prices of substitutes and related products. Gohou,Gaston, and Baffes(2005) find this by examining the price linkages among polyester (the dominant chemical fiber), cotton (the dominant natural fiber), and crude oil (the dominant energy commodity). They find that: there is strong co-movement between cotton and polyester prices, well above the co-movement observed between these two prices and prices of other primary commodities; crude oil prices have a stronger effect on polyester prices compared with cotton prices; price shocks originating in the polyester market are transmitted at much higher speed to the cotton market than vice-versa.

The importance of China to world cotton prices has also been studied in literature. The Chinese cotton tariff rate quota (TRQ) has a negative impact on the world cotton price and the elimination of China's TRQ will increase the world cotton price and increase the quantity of world cotton traded (Pan, Mohanty, Ethridge, and Fadiga 2005). Under the Uruguay Round's Agreement on Textiles and Clothing (ATC), the impacts of China's textile industry on China's cotton consumption, cotton production, cotton imports, and world cotton prices are studied by MacDonald, Somwaru, Meyer, and Diao (2001).

2.1.2 World Cotton Futures Market

Cotton producers face a changing market environment. A key consideration for them is the decreasing variability in net prices (marked prices and tax amount) over time. One way in which producers can manage this variability is through the use of futures and options contracts. Research concerning the use of commodity futures markets finds that producers can take advantage of price volatility. Specifically, Johnson and Bennett (2000) find that cotton producers can use moving averages to identify changing cotton futures market trends and select entry and exit points for hedges. Similarly, Elam (2000) finds that the cotton futures market tended to revert back to a long-run average price and suggests that cotton producers could base hedging decisions on whether or not the current futures price is above or below the long-run average. Furthermore, Turner and Heboyan (2001) examine the use of the high volatility in futures prices to lock in favorable cotton prices through the use of a rollover hedging strategy.

Research about the impact of agricultural policies and information on cotton price volatility has been limited. A study by Hudson and Coble (1999) is among the few that have investigated the determinants of cotton futures price volatility focusing on the impact of changing agricultural policies. That study did not find any effect of changes in agricultural policies, such as the 1996 Farm Bill, on harvest contract price volatility.

Likewise, Patterson and Brorsen (1993) find no evidence that the U.S. export sales report provides new information to the cotton market and the impact of the report is also limited.

There is no literature regarding the impact of Chinese cotton and textile news on the volatility of cotton futures prices, though China is the most important cotton importer in the world. This thesis will focus on examining the hypothesis that whether Chinese cotton and textile news have effect on volatility of cotton futures prices.

2.2 Literature Relating to News Impacts on Prices and Volatility

A growing number of papers utilize daily price and volatility movements to investigate the news effects. Changes in prices and volatilities are measured over two successive days of market closing observations and they are regressed on the news components of economic announcements. The information content of scheduled announcements by relevant government authorities have been widely investigated. Most of these studies show that the impacts of regular announcements from governments are not significant. For example, Sumner and Mueller (1989) examine the information content of USDA harvest forecasts by analyzing movements in corn and soybean futures prices. The result indicates that the USDA did not contribute additional news relative to information already possessed by traders. Carter and Galopin (1995) find that the USDA Hogs and Pigs report has no significant impact on hogs market. Schroeder and Blair (1990) examine the abnormal returns in livestock futures prices around USDA inventory report releases. The result is that there are no significant abnormal returns in livestock markets following the quarterly inventory report releases. On the contrary, there is evidence that news does have a significant impact on financial markets. For instance, Ederington and Lee (1993) examine the impact of scheduled macroeconomic news announcements on interest rate and foreign exchange futures markets, and find that these announcements are responsible for most of the observed time-of-day and day-of-the-week volatility patterns in these markets.

But these papers generally have not distinguished between anticipated and surprise announcements.

Because the flow of information is very complex, it is necessary to use event study techniques to examine the impact of announcements. Colling and Irwin (1990) evaluate the reaction of live hog futures prices to new market information, and classify the information as anticipated or unanticipated. Colling and Irwin (1996) analyze the informational value of USDA "Export Inspections" reports to wheat, corn and soybean futures prices. Besides the anticipated and unanticipated information, they consider the conditions of seasonality and stocks-to-use ratio. Salin and Hooker (2001) use a partial event analysis technique in the investigation of firm-specific repercussions of incidents of microbiological contamination of food. The food recalls are categorized by product, company size and scope, and severity. Their effects on volatility of returns also are mixed. Isengildina, Irwin, and Good (2004) divide the USDA report into two groups: one is a "mix" of situation and outlook information, the other is "pure" outlook information. He finds that information released in the reports that contain both mixed situation and outlook reports has substantial impact on market prices and implied volatility, information released in the reports that are limited to outlook information has a marginal impact on futures return volatility. Rucker, Thurman and Yoder (2005) estimate and contrast the impacts of three different types of events: regular, periodic announcements concerning conditions in a particular market; irregular releases of potentially important information in the form of court decisions; and sporadic releases of information through the passage of legislation and through quasi-legislative rulings by government agencies and bureaucracies. They find that the structure of market response varies predictably across event types and can clearly be distinguished among the three classes of events.

The common theme in news-volatility literature is to explain price movements and the responses of various volatilities following scheduled economic announcements. With regard to the speed of the arbitrage processes, inter-day changes are inadequate for revealing micro-structural aspects of the price adjustment mechanism (Kim and

Sheen, 2001). Thus, the major focus is the detection of and direction of intra-day movements in price and volatility of financial assets. Linn and Zhu (2004) examine the impact of the Weekly American Gas Storage Survey report on the short-term futures price volatility of natural gas through an examination of the intraday prices of the nearby natural gas futures contract. Darrat, Zhong and Cheng (2005) examine the intraday stock relations between trading volumes and return volatility of large and small stocks with and without identifiable public news. Kim and Sheen (2001) also use the intraday price to investigate the response efficiency of the Australian Commonwealth bond futures market to the scheduled information.

However, the above empirical works take a partial view, in that public information is restricted to specific announcements or approximated by dummy variables. There is little literature defining the flow of public information as the number of news items. Berry and Howe (1994) use the number of news releases by Reuters North American Securities News, but find no significant relationship with the volatility of the New York Stock Exchange (NYSE). Mitchell and Mutherin (1994) use the daily number of news headlines released by Dow Jones, and report weak correlation (6%) with the volatility of several US stock indices. Chang and Taylor (1998) find that Reuters headline news counts have significant impact on volatility of the US dollar/German mark. Janssen (2004) explores the relationship between daily market volatility and the arrival of public information in four different financial markets, using daily time series that represent the volume of news in four specific economic news categories. But all this research did not note that there may be several follow-up releases to the initial release that cause the event to appear more dramatic than it really is. In this thesis, the daily time series that measured as the daily number of the news headlines relating to Chinese cotton and textile will be used. The news releases will be sorted not only by the categories but also by arrival time.

2.3 Literature Relating to Modeling of News Effects

ARCH (autoregressive conditional heteroskedasticity) and GARCH (generalized ARCH) models are well documented in literature of news effects on volatility. ARCH models recognize the presence of successive periods of relative volatility and stability. The error variance, conditional on past information, evolves over time as a function of past errors. The model is introduced by Engle (1982). Bollerslev (1986) proposed the GARCH conditional variance specification that allows for a parsimonious parameterisation of the lag structure. Considerable interest has been in applications of ARCH/GARCH models to high frequency financial time series. Yang and Brorsen (1992, 1993) use GARCH processes to describe the time-varying pattern of price volatility or risk. Mu (2004) studies the impact of weather surprises on short-term price dynamics in the natural gas futures market within a GARCH framework. The GARCH model allows exogenous variables to affect both the conditional mean and the conditional variance. Yang, Haigh, and Leatham (2001) use an AR(k)-GARCH(p, q) model with a dummy variable to capture the possible changes in commodity price volatility to the agricultural liberalization policy. Since GARCH modeling requires a stationary data-generating process, the non-stationarity of levels and first differences for each price series was tested, using the augmented Dickey-Fuller test. As a result, the first difference of the logarithm of prices which equals the daily return ($R_t = \ln(P_t / P_{t-1})$ is used in GARCH models. Kim and In (2002) conduct an empirical study of the impact of the major stock markets (US, UK and Japan) and of the domestic and US macroeconomic news announcements on Australian financial markets using a bivariate GARCH (1,1) with two-step estimation procedure.

Other research finds that volatility tends to respond differently to positive news versus negative news. Depken (2001) examines whether GARCH is driven by negative or positive information flows into the market. He assumes that positive information flows increase the price of a financial asset while negative information flows decrease the price. The Threshold GARCH Model employed by Glosten, Jagannathan, and

Runkle (1993) utilizes an additive modeling structure incorporating a dummy variable according to whether the previous innovation is positive or negative. Nelson (1991) uses the conditional variance of the exponential GARCH (EGARCH) model to take into account the asymmetric response of volatility to positive and negative shocks in financial time series. Brännäs and De Gooijer (2004) propose a nonlinear time series model where both the conditional mean and the conditional variance are asymmetric functions of past information for analyzing impact of positive news and negative news on volatility transmission. De Gooijer and Marquering (2004) analyze the inter-temporal interaction between the stock and bond market returns, allowing for asymmetric effects in conditional variances and covariance in a multivariate GARCH process. Brooks and Persand (2003) consider the impacts of the asymmetric response on value at risk measurement. The methods they employed are based on the multivariate GARCH, Threshold GARCH, and EGARCH models.

This thesis recalls the literature of the world cotton market, the cotton futures market, news impacts on prices and volatility, and modeling of news effects. The hypothesis of this thesis is that there is an impact of Chinese cotton and textile news on the volatility of cotton futures prices. Like studies of Berry and Howe (1994), Mitchell and Mutherin (1994), and Chang and Taylor (1998), this thesis uses the daily number of related news headlines instead of specific announcements to test the news effects. Janssen (2004) classifies news by four specific economic news categories. However, in this thesis the Chinese cotton and textile news events are not only by types (cotton news, textile news headlines including "U.S.", and other textile news) but also by time (initial news and follow-up news). Like previous research (Bollerslev, 1986; Yang and Brorsen, 1992, 1993; Mu, 2004; Kim and In, 2002), GARCH models are also employed in this thesis. Instead of testing the hypothesis that positive news and negative news affect variance asymmetrically (Depken, 2001), this thesis tests that Chinese textile news and cotton news affects variance in four aspects (see section 1.5). Unlike the GARCH model proposed by Brannas and De Gooijer (2004), both the conditional mean and the conditional variance are augmented, in this thesis the news variables only appear in variance. Additionally, since the news may be released on weekends and holidays, while the cotton futures contracts do not trade on weekends and holidays, so the impacts of Mondays and the first day after holidays are also examined.

Chapter 3 Data Collection and Analysis

3.1 News Data

Historical news data from the Lexis Nexis service has been used in this thesis to represent public information. Lexis Nexis is the largest worldwide news and business online information service, which covers daily business newspapers, trade journals, press releases, and news wires. The following publications are selected in this thesis: Financial Times (London), Japan Economic Newswire, New York Times, and Wall Street Journal (Eastern edition). The period studied is the 2191 days from January 2000 through December 2005. The number of news headlines including "China", "Chinese", or "Yuan", and including "cotton" or "textile" is counted. 225 pieces of news were released on 148 days. The daily number of news items ranges from 0 to 11. Table 3.1 reports the number of the news events by information source and year.

Table 3.1 Number of News Releases by Source and Year

Source	Number of News Releases*						
	2000	2001	2002	2003	2004	2005	Total
Financial Times (London)	1	1	5	5	17	57	86
Japan Economic Newswire	1	3	1	3	1	38	47
New York Times	1	0	0	3	3	23	30
Wall Street Journal	0	2	0	10	13	37	62
Total	3	6	6	21	34	155	225

* Searched on (China or Chinese or Yuan) and (cotton or textile).

Among these news events, the cotton news provides direct information to the cotton futures markets, while the textile news provides indirect information. Moreover, due to the recent large textile trade between China and U.S., the textile news relating to these two countries should be considered specially. Consequently, the Chinese cotton and textile news events are classified by three categories: cotton news, textile news headlines including "U.S.", and other textile news. Table 3.2 illustrates the number of news items by category and year.

Table 3.2 Number of News Releases by Category and Year

Categories	Number of News Releases						
	2000	2001	2002	2003	2004	2005	Total
Cotton News	1	1	2	4	1	3	12
U.S. Textile News	1	4	2	11	9	51	78
Other Textile News	1	1	2	6	24	101	135
Total	3	6	6	21	34	155	225

Cotton futures contracts are not traded every day, while news events may occur daily. Therefore, it is possible that the cotton futures prices are not available on the days when the news is released. Usually this situation happens on weekends and holidays. In this research, the total number of news events on weekends and holidays is 28, accounting for 12.4 % of the total news events. This problem is addressed by adding the numbers of news events on weekends and holidays to the nearest following trading days. This results in three time series of 1493 observations each, with weekends and holidays aggregated into the next available trading day. Each time series reflects the quantity of news as well as the specific category of news.

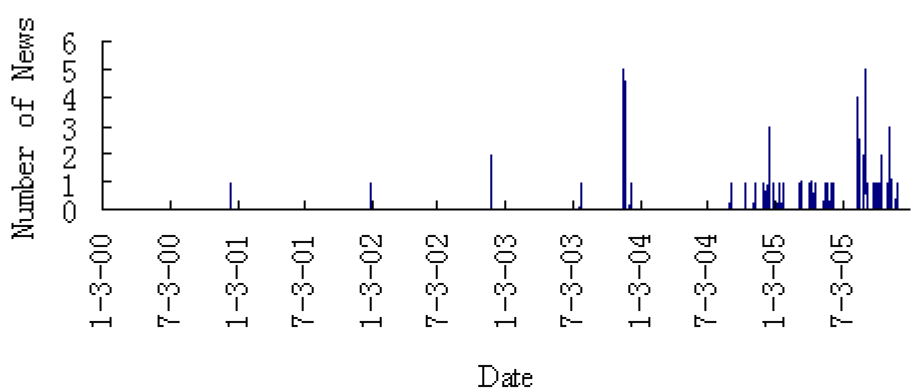
Table 3.3 reports the numbers of news events and other standard statistics. The average number of daily news events is less than 1 for all categories. All medians are consistently 0, which indicates that there is no news on more than half of the days. This is confirmed by the positive skewness statistics. The high skewness of each category characterizes an asymmetric tail extending toward positive value. The high kurtosis is another indication of non-normality.

Table 3.3 Descriptive Statistics of News Data

News category	Number of news releases	Number of news per day						
		Ave.	Median	Max	Min	St. Dev.	Skew.	Kurt
Cotton News	12	0.01	0	2	0	0.10	13.18	194
U.S. Textile News	78	0.05	0	5	0	0.32	9.23	109
Other Textile News	135	0.09	0	11	0	0.45	11.99	237

A graphical depiction of the news series is given in Fig. 3.1. It shows the daily number of Chinese textile news headlines that contain "U.S." in the 2000-2005 period. Two peaks of 5 news headlines correspond to the U.S.'s decision to impose quotas on Chinese textile goods on Nov.19, 2003 and the Fourth Round of Textile Talks between U.S. and China on Sep.1, 2005.

Fig. 3.1 Chinese Textile News Headlines Including " U.S."



To assess problems with multicollinearity, the correlations between news categories are investigated. Table 3.4 reports correlation coefficients among the three news categories. Cotton news has low negative correlations with the other news categories. And there is a positive correlation (0.17) between textile news headlines including “U.S.” and other textile news.

Table 3.4 Correlation Between Categories of News

News category	Cotton	Textile News Headlines Including “U.S.”	Other Textile News
Cotton News	1	-0.0136	-0.0166
U.S. Textile News	-0.0136	1	0.1695
Other Textile News	-0.0166	0.1695	1

Because an initial report may spawn several follow-up reports, the autocorrelation of the data series is examined for 5 lags. The results, presented in Table 3.5, reveal that the autocorrelation coefficient for lag 2 is 0.459 when measured on all three categories. Table 3.6 is the backward elimination of autoregressive terms report. It shows that the autoregressive parameters at lags 3 and 5 are insignificant and should be eliminated.

Table 3.5 Estimates of News Autocorrelations

Lag	Covariance	Correlation
0	0.366	1.000
1	0.128	0.349
2	0.168	0.459
3	0.084	0.219
4	0.114	0.311
5	0.058	0.157

Table 3.6 Backward Elimination of Autoregressive News Terms

Lag	Estimate	t Value	Pr>|t|
5	0.012139	0.47	0.6397
3	0.044710	1.7	0.0900

Based on the autocorrelation analysis, it is reasonable to classify the news by arriving time. There are 137 pieces of initial news and 88 pieces of follow-up news.

3.2 Cotton Futures Prices

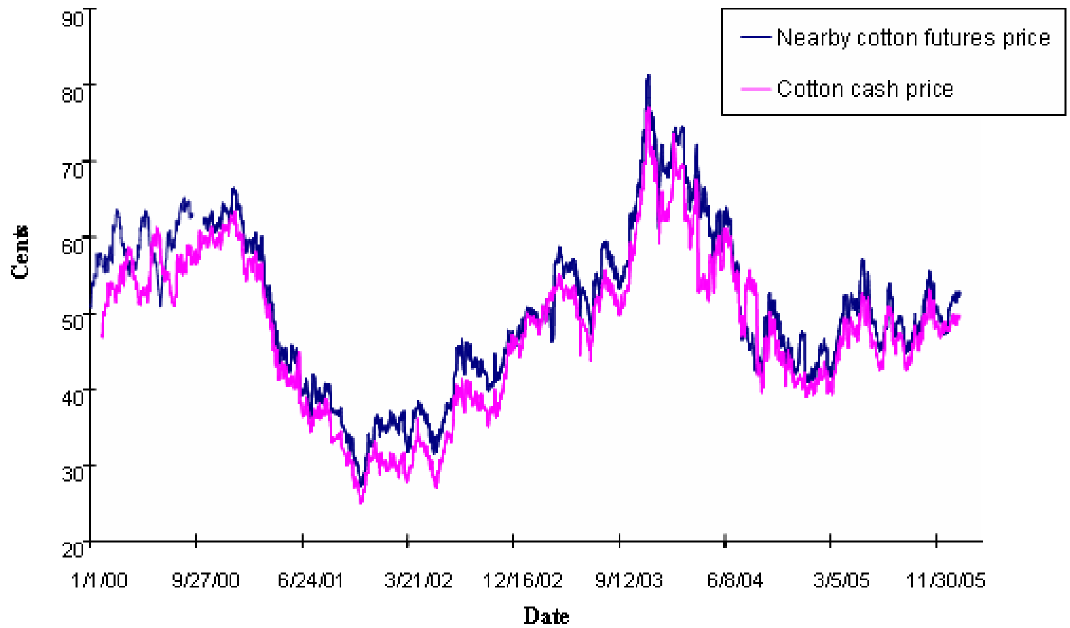
The cotton futures prices employed in this study are collected from the New York Board of Trade website. Daily opening and closing nearby cotton futures contract prices are collected for the January 2000 through December 2005 time period. There are1493 observations. From a time-to–expiration perspective, nearby contracts are most heavily traded, while more distant contracts have very little activity. The prices of nearby contracts during the expiration month are not included to avoid biases caused by the unusual market activities near expiration. These data reflect the heaviest trading, with high open interest and trading volume. The five cotton futures contract expiration months are March, May, July, October, and December. To imitate the actions of a market participant who decides not to complete the transaction but instead to roll over to the next contract when expiration nears, the next nearby contract replaces the nearby contract in the price series on the first trading day of the expiration month. Generally, the nearby and distant contracts move together. The contracts switching is presented in Table 3.7.

Table 3.7 Switching of Futures Contracts

Months	March-April	May-June	July-September	October-November	December-February (next year)
Futures Contract	May	July	October	December	March (next year)

The cotton spot, or cash, price is the prevailing market price of cotton for immediate delivery. The relevant cotton cash price with which to compare futures prices is determined by the delivery requirements of the futures contract. The cotton cash prices used in this thesis are collected from Barchart.com. Figure 3.2 shows the relationship between daily cash and nearby futures prices of cotton during Jan. 2000-Dec. 2005. It is clear that cash and nearby cotton futures prices are very closely related, as they should be.

Fig. 3.2 NYBOT Cotton Futures Prices & U.S. Cotton Cash Prices



Source: 1. Nearby cotton futures price is from NYBOT
2. Cotton cash is from http://www.barchart.com

The daily returns in cotton spot market are obtained by taking the difference of log of daily cash prices, $R_t^c = \ln \frac{p_t}{p_{t-1}}$, where p_t represents the cash price on day t. In the cotton futures market, it may take time for participants to respond the news events. The impact of the news may occur during the daytime and/or the overnight on a certain trading day. Because of this, daily futures returns are computed in three ways.

Case 1: In order to examine the intraday news effects: $R_t^1 = \ln \frac{f_t^c}{f_t^o}$, where f_t^c is the closing price on day t, and f_t^o is the opening price on day t.

Case 2: In order to examine the overnight news effects: $R_t^2 = \ln \frac{f_t^o}{f_{t-1}^c}$

Case 3: In order to examine the interday news effects: $R_t^3 = \ln \frac{f_t^c}{f_{t-1}^c}$

At contract rollover in cases 2 and 3, daily returns are computed within maturities rather than across maturities.

Figure 3.3 through Figure 3.6 shows plotting of cash returns, intraday returns, overnight returns and interday returns with date.

Fig. 3.3 Daily Cash Returns

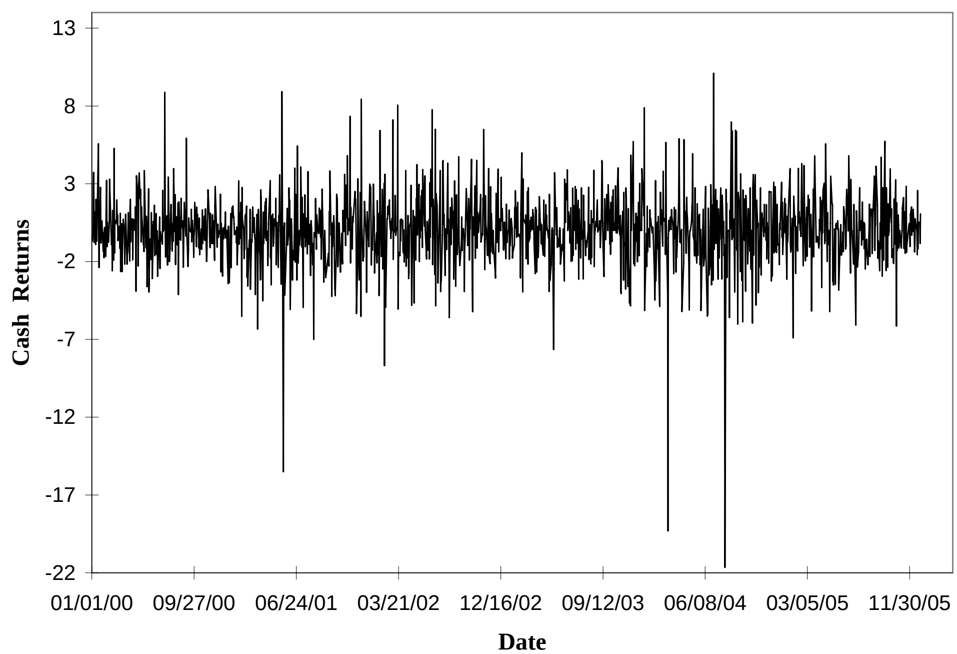


Fig. 3.4 Intraday Returns

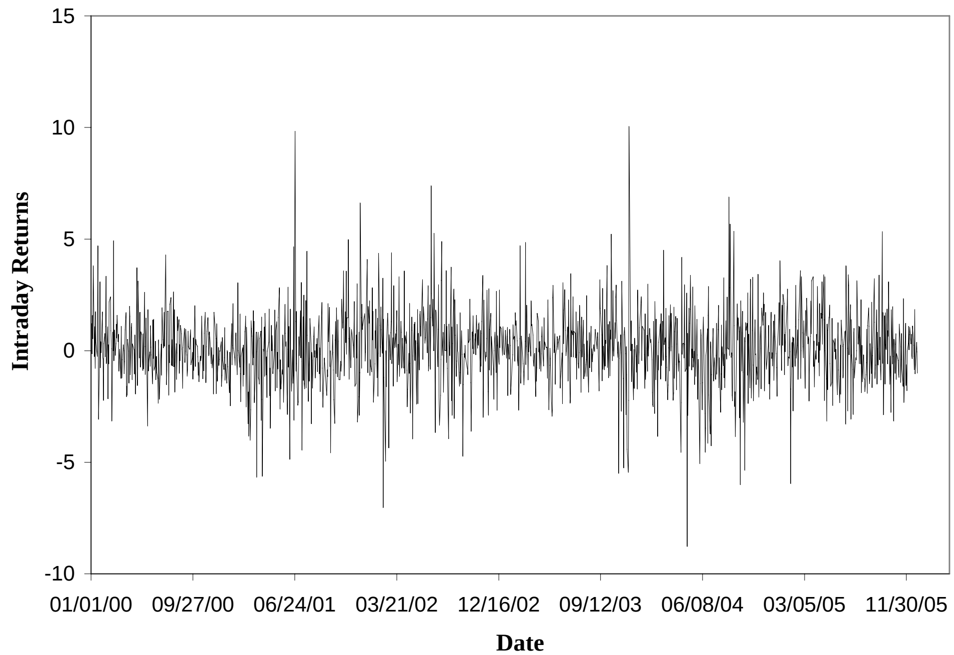


Fig. 3.5 Overnight Returns

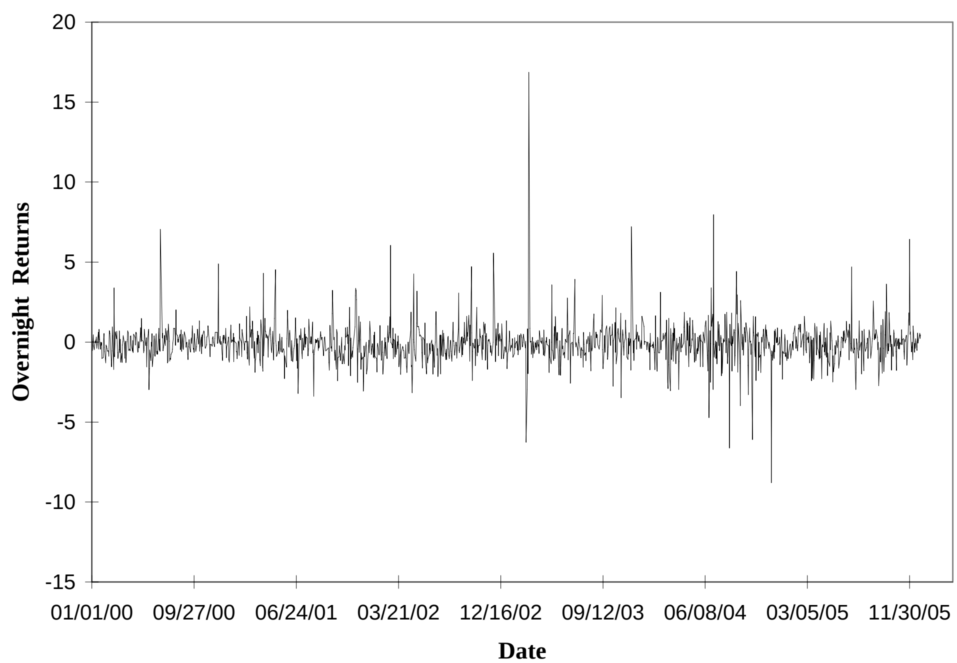
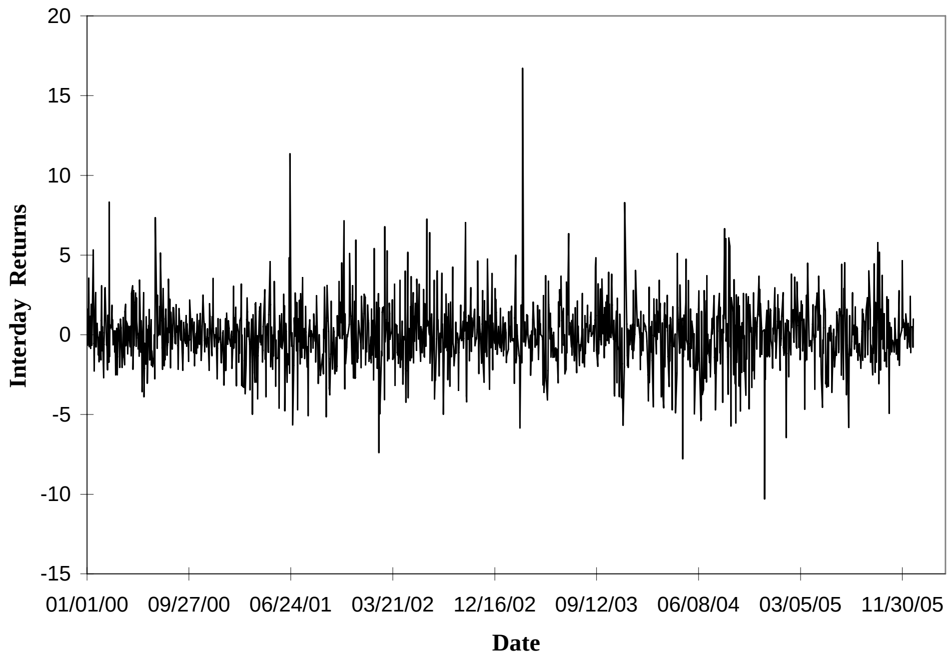


Fig. 3.6 Interday Returns



The statistical properties of the daily returns are displayed in Table 3.8. The values of skewness and kurtosis indicate that R_t^1 approximately follows a normal distribution. The kurtosis values of R_t^c, R_t^2 and R_t^3 are greater that 3, this means that the cash, overnight and interday returns display the characteristic of leptokurtosis.

Table 3.8 Statistical Properties of Daily Returns

	Number of Observations	Mean	Median	Max	Min	St.Dev.	Skew.	Kurt.
R_t^c	1492	3.52E-5	0	0.101	-0.217	0.023	-0.968	11.033
R_t^1	1493	8.83E-4	5.17E-4	0.101	-0.088	0.017	0.146	3.059
R_t^2	1492	-8.35E-4	-5.3E-4	0.169	-0.088	0.012	2.262	33.673
R_t^3	1492	3.97E-5	-2.6E-4	0.167	-0.103	0.020	0.590	5.086

Chapter 4 Methodology

ARCH/GARCH model accounts for the heteroscedasticity and the leptokurtosis characteristics of financial time series. In this chapter, GARCH model is used to measure the news effect on the volatility.

4.1 Basic ARCH/GARCH Process

ARCH (autoregressive conditional heteroskedasticity) models recognize the presence of successive periods of relative volatility and stability. The error variance, conditional on past information, evolves over time as a function of past errors. The model was introduced by Engle (1982). Bollerslev (1986) proposed the GARCH (generalized ARCH) conditional variance specification that allows for a parsimonious parameterization of the lag structure. ARCH/GARCH models are applied mainly in high frequency financial time series. In this thesis, the basic GARCH model presented to measure the news effect on the volatility of cotton prices is written as follows:

$$p_t = a_0 + \sum_{i-1}^{k} a_i p_{t-i} + \varepsilon_t$$

$$\varepsilon_t \big| (\varepsilon_{t-1}, \varepsilon_{t-2,} ...) \sim N(0, h_t)$$

$$h_t = \omega + \sum_{i=1}^{q} \alpha_t \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \beta_j h_{t-j}$$

The basic ARCH(q) model (p=0) is a short memory process in that only the q most recent squared residuals are used to estimate the changing variance. The GARCH model (p>0) allows long memory processes, which use all past squared residuals to estimate the current variance. The main reason to choose a GARCH specification instead of an ARCH specification is that a higher order ARCH representation is indistinguishable from a GARCH specification but the GARCH is parsimonious and easier to identify and estimate (Enders, 2004).

Consider the stationary ARMA model $p_t = a_0 + a_1 p_{t-1} + \varepsilon_t$, the conditional mean of p_{t+1} is $E_t p_{t+1} = a_0 + a_1 p_t$, the forecast error variance is $E_t[(p_{t+1} - a_0 - a_1 p_t)^2] =$

$E_t\varepsilon_{t+1}^2 = \sigma^2$. However, the unconditional forecast is the long-run mean of the $\{p_t\}$ sequence that is equal to $a_0/(1-a_1)$ and the unconditional forecast error variance is

$$E\{[p_{t+1} - a_0/(1-a_1)]^2\} = E[(\varepsilon_{t+1} + a_1\varepsilon_t + a_1^2\varepsilon_{t-1} + a_1^3\varepsilon_{t-2} + ...)^2] = \sigma^2/(1-a_1^2)$$

Since $1/(1-a_1^2) > 1$, the unconditional forecast has a greater variance than the conditional forecast. Thus, conditional forecasts are preferable.

If the variance of $\{\varepsilon_t\}$ is not constant, one simple strategy is to forecast the conditional variance as an AR (q) process using squares of the estimated residuals. For example, let $\{\hat{\varepsilon}_t\}$ denote the estimated residuals from the model $p_t = a_0 + a_1 p_{t-1} + \varepsilon_t$ so the conditional variance of p_{t+1} is

$$Var(p_{t+1} \mid p_t) = E_t[(p_{t+1} - a_0 - a_1 p_t)^2] = E_t(\hat{\varepsilon}_{t+1})^2$$

$$\hat{\varepsilon}_t^2 = \alpha_0 + \alpha_1\hat{\varepsilon}_{t-1}^2 + \alpha_2\hat{\varepsilon}_{t-2}^2 + ... + \alpha_q\hat{\varepsilon}_{t-q}^2 + v_t \qquad (4.1)$$

where v_t is a white-noise process. An equation like (4.1) is called an autoregressive conditional heteroskedastic (ARCH) model.

Engle (1982) specifies v_t as a multiplicative disturbance:

$$\varepsilon_t = v_t\sqrt{\alpha_0 + \alpha_1\varepsilon_{t-1}^2} \qquad (4.2)$$

where v_t =white-noise process such that $\sigma_v^2 = 1$, v_t and ε_{t-1} are independent of each other, and α_0 and α_1 are constants such that $\alpha_0 > 0$ and $0 < \alpha_1 < 1$.

Consider the properties of the $\{\varepsilon_t\}$ sequence. Since v_t is white noise and is independent of ε_{t-1}, the elements of the $\{\varepsilon_t\}$ sequence have a mean of zero and are uncorrelated. The derivation of the unconditional variance of ε_t is $\dfrac{\alpha_0}{1-\alpha_1}$. Thus, the unconditional mean and variance are unaffected by the presence of the error process given by (4.2). Similarly, conditional mean of ε_t is zero, and the conditional variance of ε_t is $\alpha_0 + \alpha_1\varepsilon_{t-1}^2$. In order to ensure that the conditional variance is never negative, it is necessary to assume that both α_0 and α_1 are positive. Moreover, to ensure the stability of the process, it is necessary to restrict α_1 such that $0 < \alpha_1 < 1$.

The conditional heteroskedasticity in $\{\varepsilon_t\}$ will result in $\{p_t\}$ being heteroskedastic. Thus, the ARCH model is able to capture periods of tranquility and volatility in the $\{p_t\}$ series. The conditional mean and variance of $\{p_t\}$ are $a_0 + a_1 p_{t-1}$ and $\alpha_0 + \alpha_1(\varepsilon_{t-1})^2$.

Engle's (1982) original contribution considered the entire class of higher-order ARCH (q) processes:

$$\varepsilon_t = v_t \sqrt{\alpha_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2} \tag{4.3}$$

In (4.3), all shocks from ε_{t-1} to ε_{t-q} have a direct effect on ε_t, so that the conditional variance acts like an autoregressive process of order q.

Bollerslev (1986) extended Engle's original work by developing a technique that allows the conditional variance to be an ARMA process. Let the error process be such that $\varepsilon_t = v_t \sqrt{h_t}$, and

$$h_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \beta_j h_{t-j} \tag{4.4}$$

Since $\{v_t\}$ is a white-noise process, the conditional and unconditional means of ε_t are equal to zero. The important point is that the conditional variance of ε_t is given by $E_{t-1}\varepsilon_t^2 = h_t$. Thus, the conditional variance of ε_t is the ARMA process given by expression h_t in (4.4)

This GARCH(p, q) model − allows for both autoregressive and moving average components in the heteroskedastic variance. If $p = 0$ and $q = 1$, it is clear that the first-order ARCH model given by (4.4) is simply a GARCH(0, 1) model. Hence, if all values of β_i equal zero, the GARCH(p, q) model is equivalent to an ARCH(q) model.

All coefficients in (4.4) must be positive. Moreover, to ensure that the variance is finite, all characteristic roots of (4.4) must lie inside the unit circles.

In order to decide the degree of GARCH (p, q), different combinations of p and q will be experimented with. The suitable combinations of p and q for all cases are decided using the AIC and SBC criterion. Table 4.1.1-Table 4.1.4 show the results of the experiment. It can be seen that GARCH (1, 1) is the best model for all cases.

Table 4.1.1 Regression Results for GARCH Models with Different Degrees in the Cotton Futures Market (Case 1)

Model	AIC	SBC	Insignificant coefficient
GARCH(1,1)	6340	6366	
GARCH(1,2)	6353	6379	ARCH 1 ARCH 2
GARCH(2,1)	6354	6381	ARCH 0 ARCH 1 GARCH 1 GARCH 2
GARCH(2,2)	6356	6388	ARCH 0 ARCH 1 ARCH 2 GARCH 1 GARCH 2

Table 4.1.2 Regression Results for GARCH Models with Different Degrees in the Cotton Futures Market (Case 2)

Model	AIC	SBC	Insignificant coefficient
GARCH(1,1)	6435	6462	
GARCH(1,2)	6438	6469	ARCH 1
GARCH(2,1)	6532	6559	ARCH 0 ARCH 1 GARCH 1 GARCH 2
GARCH(2,2)	6534	6566	ARCH 0 ARCH 1 ARCH2 GARCH1 GARCH2

Table 4.1.3 Regression Results for GARCH Models with Different Degrees in the Cotton Futures Market (Case 3)

Model	AIC	SBC	Insignificant coefficient
GARCH(1,1)	6346	6372	
GARCH(1,2)	6359	6386	ARCH 1 ARCH 2
GARCH(2,1)	6363	6387	ARCH 0 ARCH 1 GARCH 1 GARCH 2
GARCH(2,2)	6363	6394	ARCH 0 ARCH 1 ARCH2 GARCH1 GARCH2

Table 4.1.4 Regression Results for GARCH Models with Different Degrees in the Cotton Spot Market

Model	AIC	SBC	Insignificant coefficient
GARCH(1,1)	6647	6673	
GARCH(1,2)	6683	6710	GARCH 1
GARCH(2,1)	6696	6722	ARCH 0 ARCH 1 GARCH 1 GARCH 2
GARCH(2,2)	6698	6730	ARCH 0 ARCH 1 ARCH2 GARCH1 GARCH2

4.2 Augmented GARCH Specification with News Effects

The basic GARCH (1, 1) specification is augmented by news variables. In order to determine the relative contribution to the conditional variance, the numbers of days to expiration and a dummy variable for Mondays are also included in the conditional variance. The following equation represents the augmented conditional variance:

$$h_t = \omega + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1} + \sum_{k=0}^{n} \gamma_k news_{t-k} + \delta expiring\_days_t + \phi D_M$$

For different test objectives, the news item $\sum_{k-0}^{n} \gamma_k news_{t-k}$ could be changed accordingly. The test objectives of this thesis are as follows:

1) To test the current news and lag news impacts:

$$h_t = \omega + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1} + \sum_{j=0}^{2} \gamma_j news_{t-j} + \delta expiring\_days_t + \phi D_M \qquad (4.2.1)$$

2) To test the impacts of cotton news, textile news headlines including“U.S.”, and other textile news:

$$\begin{aligned} h_t = {} & \omega + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1} + \gamma_0 cnews_t + \gamma_1 us\_tnews_t + \gamma_2 other\_tnews_t \\ & + \delta expiring\_days_t + \phi D_M \end{aligned} \qquad (4.2.2)$$

3) To test the impacts of initial news and follow-up news:

$$\begin{aligned} h_t = {} & \omega + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1} + \gamma_1 initial\_news_t + \gamma_2 followup\_news_t \\ & + \delta expiring\_days_t + \phi D_M \end{aligned} \qquad (4.2.3)$$

4) To test the impact of leading news:

$$h_t = \omega + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1} + \sum_{j=0}^{2} \gamma_j news_{t+j} + \delta expiring\_days_t + \phi D_M \qquad (4.2.4)$$

Chapter 5 Empirical Results

In order to test the hypothesis that Chinese cotton and textile news has an impact on the volatility of the cotton futures prices, the estimation results of the GARCH (1,1) models augmented with news effect are discussed in this chapter. There are three different cases according to three different assumptions on news impacts: daytime news impacts, overnight news impacts, day and night news impacts. The estimation results of the impacts of news events which are classified by categories and arriving time are also included in each case.

Finally the news impact on the volatility of the cotton cash prices is examined because cotton futures prices and cash prices have a significant correlation.

5.1 The Results of the Futures Market

5.1.1 Impacts of news on intraday futures returns (Case 1)

Table 5.1.1.1 presents the results for the current news and lag news impacts on intraday futures returns. The results of news impacts by categories and arriving time are illustrated in Table 5.1.1.2 and Table 5.1.1.3. Table 5.1.1.4 gives the results of leading news impacts.

All these tables show the parameter estimates (coefficients) for the variables used in the models, standard errors, p-values. The p-values in the tables show that the impacts of current news, news of one day back, news of two days back, the number of days to the expiring day, and news of Mondays are all insignificant.

Table 5.1.1.1 The Results for the Current News and Lag News Impacts (Case 1)

Variable	Coefficient	Standard error	P- value
Intercept	4.3486	2.1902	0.0471
Lag1(Daily Return)	0.9949	0.002601	<.0001
ARCH 0	3.8554	0.1986	<.0001
ARCH 1	0.0279	0.0156	0.0727
GARCH 1	-1.06E-24	3.7489E-9	1.0000
NEWS	-2.55E-24	1.7051E-7	1.0000
Lag1(NEWS)	-6.88E-23	3.92E-13	1.0000
Lag2(NEWS)	1.939E-25	4.423E-14	1.0000
EXPIRING_DAY	0.003111	0.003142	0.3221
DUMMY_Mon.	0.5381	1.7898	0.7637

Table 5.1.1.2 The Results for the Impacts of Cotton News, Textile News Headlines including "U.S.", and Other Textile News (Case 1)

Variable	Coefficient	Standard error	P- value
Intercept	4.3978	2.1902	0.0446
Lag1(Daily Return)	0.9948	0.002601	<.0001
ARCH 0	3.8547	0.1985	<.0001
ARCH 1	0.0279	0.0156	0.0741
GARCH 1	8.354E-20	6.2487E-13	1.0000
COTTON NEWS	0.0383	1.6450	0.9814
USTNEWS	3.102E-25	6.532E-13	1.0000
OTNEWS	3.821E-23	4.605E-13	1.0000
EXPIRING_DAY	0.003124	0.003143	0.3202
DUMMY_Mon.	0.5172	1.7785	0.7712

Table 5.1.1.3 The Results for the Impacts of Initial News and Follow-up News (Case 1)

Vareiable	Coefficient	Standard error	P- value
Intercept	4.3993	2.1899	0.0445
Lag1(Daily Return)	0.9948	0.002601	<.0001
ARCH 0	3.8547	0.1986	<.0001
ARCH 1	0.0280	0.0156	0.0720
GARCH 1	-5.6E-20	1.9483E-7	1.0000
Initial NEWS	1.058E-22	1.704E-12	1.0000
Follow-up NEWS	3.49E-23	9.834E-14	1.0000
EXPIRING_DAY	0.003122	0.003142	0.3205
DUMMY_Mon.	0.5207	1.7757	0.7693

Table 5.1.1.4 The Results for the Impact of Leading News (Case 1)

Variable	Coefficient	Standard error	P- value
Intercept	4.3496	2.1908	0.0471
Lag1(Daily Return)	0.9949	0.002602	<.0001
ARCH 0	3.8544	0.1986	<.0001
ARCH 1	0.0281	0.0156	0.0720
GARCH 1	2.54E-24	2.6397E-8	1.0000
NEWS	-2.02E-24	2.8918E-8	1.0000
NEWS LEAD1	-3.84E-24	8.899E-13	1.0000
NEWSLEAD2	3.66E-23	6.111E-13	1.0000
EXPIRING_DAY	0.003155	0.003144	0.3157
DUMMY_Mon.	0.5376	1.7898	0.7639

5.1.2 Impact of news on overnight futures returns (Case 2)

The following tables (Table 5.1.2.1, 5.1.2.2, 5.1.2.3, and 5.1.2.4) indicate the results for the models of overnight news effect. Same as section 5.1.1, this section also gives the results in four aspects. From the estimated coefficients and P-values in Table 5.1.2.1, it is clear that there are no impacts of current news events, lag news events, Monday news events and expiring day on the cotton volatility.

Table 5.1.2.1 The Results for the Current News and Lag News Impacts (Case 2)

Variable	Coefficient	Standard error	P- value
Intercept	3.5150	1.8518	0.0577
Lag1(Daily Return)	0.9959	456.44	<.0001
ARCH 0	0.3272	0.0765	<.0001
ARCH 1	0.1258	0.0153	<.0001
GARCH 1	0.8136	0.0277	<.0001
NEWS	1.4925E-9	3.119E-10	<.0001
LAG1(NEWS)	1.03E-18	1.1427E-9	1.0000
LAG2(NEWS)	4.927E-23	1.1732E-6	1.0000
EXPIRING_DAY	4.529E-23	4.4705E-9	1.0000
DUMMY_Mon.	1.001E-18	3.683E-15	0.9998

Table 5.1.2.2 shows the overnight news effect by categories. It can be seen that with the exception of cotton news events all influence factors in the variance of the model are insignificant. The cotton news events are significant at 95% level of confidence. The marginal effect of the cotton news events is 1.7572, which means that as the number of cotton news events increase by 1 on a certain day the volatility increases by 1.7572. The more cotton news events the higher cotton futures prices volatility.

Table 5.1.2.2 The Results for the Impacts of Cotton News, Textile News Headlines including "U.S." , and Other Textile News (Case 2)

Variable	Coefficient	Standard error	P- value
Intercept	3.0628	2.0656	0.1381
Lag1(Daily Return)	0.9964	0.002441	<.0001
ARCH 0	0.3144	0.0790	<.0001
ARCH 1	0.1292	0.0159	<.0001
GARCH 1	0.8105	0.0283	<.0001
COTTON NEWS	1.7572	0.7141	0.0139
USTNEWS	-1.34E-24	1.3175E-7	1.0000
OTNEWS	-4.96E-24	2.799E-12	1.0000
EXPIRING_DAY	-6.23E-21	0.003143	1.0000
DUMMY_Mon.	0.0105	0.5366	0.9843

Based on the results in Table 5.1.2.3 and Table 5.1.2.4, it's easy to see that there is no significant evidence that the initial news events, the follow-up news events and leading news events have impacts on the volatility of cotton price. The leading news effects are also insignificant.

Table 5.1.2.3 The Results for the Impacts of Initial News and Follow-up News (Case 2)

Variable	Coefficient	Standard error	P- value
Intercept	3.4113	1,8605	0.0667
Lag1(Daily Return)	0.9960	0.002192	<.0001
ARCH 0	0.3272	0.0794	<.0001
ARCH 1	0.1259	0.0154	<.0001
GARCH 1	0.8135	0.0279	<.0001
Initial NEWS	0.001459	0.1376	0.9915
Follow-up NEWS	6.1E-23	1.111E-6	1.0000
EXPIRING_DAY	-4.53E-23	7.9818E-6	1.0000
DUMMY_Mon.	-4.14E-17	5.571E-14	0.9994

Table 5.1.2.4 The Results for the Impact of Leading News (Case 2)

Variable	Coefficient	Standard error	P- value
Intercept	3.5205	1.8519	0.0573
Lag1(Daily Return`	0.9959	0.002182	<.0001
ARCH 0	0.3272	0.0765	<.0001
ARCH 1	0.1258	0.0153	<.0001
GARCH 1	0.8136	0.0277	<.0001
NEWS	5.937E-23	1.548E-10	1.0000
NEWSLEAD1	4.362E-20	7.192E-8	1.0000
NEWSLEAD2	-8.92E-24	7.192E-8	1.0000
EXPIRING_DAY	0	0.003144	1.0000
DUMMY_Mon.	-1.95E-21	1.7898	1.0000

5.1.3 Impact of news on interday futures returns (Case 3)

The tables in this sub-section present the estimation results for the interday news effects. AS before, the news events impacts are tested in four aspects: the current news events and the lag news events, different news events categories, arriving time of the news events, and the leading news events. Consistently, all the results for the four aspects indicate that the news events don't have any significant impacts on the volatility of the cotton futures prices.

Table 5.1.3.1 The Results for the Current News and Lag News Impacts (Case 3)

Variable	Coefficient	Standard error	P- value
Intercept	4.4043	2.1985	0.0451
Lag1(Daily Returi	0.9948	0.002611	<.0001
ARCH 0	3.8588	0.1996	<.0001
ARCH 1	0.0291	0.0156	0.0629
GARCH 1	1.869E-23	7.294E-10	1.0000
NEWS	3.635E-24	1.722E--7	1.0000
LAG1(NEWS)	-5.6E-23	1.36E-13	1.0000
LAG2(NEWS)	3.994E-24	1.614E-13	1.0000
EXPIRING_DAY	0.003577	0.003161	0.2577
DUMMY_Mon.	0.5420	1.7973	0.7630

Table 5.1.3.2 The Results for the Impacts of Cotton News, Textile News Headlines including"U.S." , and Other Textile News (Case 3)

Variable	Coefficient	Standard error	P- value
Intercept	4.4252	2.1981	0.0441
Lag1(Daily Return)	0.9948	0.002611	<.0001
ARCH 0	3.8589	0.1996	<.0001
ARCH 1	0.0291	0.0157	0.0639
GARCH 1	1.271E-21	2.804E-8	1.0000
COTTON NEWS	0.0602	1.6710	0.9713
USTNEWS	-6.56E-23	1.548E-12	1.0000
OTNEWS	-3.2E-23	1.371E-12	1.0000
EXPIRING_DAY	0.003540	0.003149	0.2625
DUMMY_Mon.	0.5227	1.7877	0.7700

Table 5.1.3.3 The Results for the Impacts of Initial News and Follow-up News (Case 3)

Variable	Coefficient	Standard error	P- value
Intercept	4.4226	2.1990	0.0443
Lag1(Daily Return)	0.9948	0.002612	<.0001
ARCH 0	3.8582	0.1998	<.0001
ARCH 1	0.0293	0.0157	0.0617
GARCH 1	1.371E-19	8.5024E-8	1.0000
Initial NEWS	-2.39E-23	1.276E-14	1.0000
Follow-up NEWS	1.132E-23	4.406E-14	1.0000
EXPIRING_DAY	0.003606	0.003163	0.2543
DUMMY_Mon.	0.5157	1.7770	0.7717

Table 5.1.3.4 The Results for the Impact of Leading News (Case 3)

Variable	Coefficient	Standard error	P- value
Intercept	4.3680	2.1980	0.0469
Lag1(Daily Return)	0.9948	0.002610	<.0001
ARCH 0	3.8578	0.1997	<.0001
ARCH 1	0.0298	0.0158	0.0594
GARCH 1	1.422E-23	3.2516E-8	1.0000
NEWS	-7.5E-24	1.8685E-7	1.0000
NEWSLEAD1	3.894E-24	8.316E-14	1.0000
NEWSLEAD2	-6.81E-23	7.582E-13	1.0000
EXPIRING_DAY	0.003532	0.003159	0.2636
DUMMY_Mon.	0.5097	1.7706	0.7734

5.2 Impacts of News on Spot Price Returns

The high correlation between cotton futures prices and cotton cash prices has been described in chapter 3. Table 5.2.1- 5.2.4 in this section present the estimated results for the news impacts on the cotton cash prices. As expected the results are similar as the results for the futures market in general. One notable result is that the impact of cotton news events is significant at 99% level of confidence. The marginal effect is as high of 34.3992. This value is 20 times higher than the cotton news marginal effect in the futures market with the assumption of overnight news effect.

Table 5.2.1 The Results for the Current News and Lag News Impacts on the Cotton Spot Market

Variable	Coefficient	Standard error	P- value
Intercept	4.2418	2.1546	0.049
Lag1(r)	0.9950	0.002563	<.0001
ARCH 0	0.0520	0.0112	<.0001
ARCH 1	0.0214	0.002879	<.0001
GARCH 1	0.9694	0.003570	<.0001
NEWS	-9.78E-20	6.4156E-7	1.0000
LAG1(NEWS)	-1.2E-23	1.1192E-7	1.0000
LAG2(NEWS)	1.991E-19	9.075E-10	1.0000
DUMMY_Mon.	3.404E-17	1.009E-14	0.9973

Table 5.2.2 The Results for the Impacts of Cotton News, Textile News Headlines including"U.S." , and Other Textile News on the Cotton Spot Market

Variable	Coefficient	Standard error	P- value
Intercept	3.9512	2.2004	0.00725
Lag1(r)	0.9953	0.002633	<.0001
ARCH 0	4.9058	0.0855	<.0001
ARCH 1	0.002086	0.0119	0.8609
GARCH 1	-7.68E-19	6.9589E-7	1.0000
COTTON NEWS	34.3992	9.0405	0.0001
US_TEX. NEWS	8.437E-23	7.699E-13	1.0000
OTHER_TEX.NEWS	-2.12E-23	6.92E-14	1.0000
DUMMY_Mon.	1.3355	2.3134	0.5638

Table 5.2.3 The Results for the Impacts of Initial News and Follow-up News on the Cotton Spot Market

Variable	Coefficient	Standard error	P- value
Intercept	4.2418	2.1546	0.049
R_{t-1}	0.9950	0.002563	<.0001
ARCH 0	0.0520	0.0112	<.0001
ARCH 1	0.0214	0.002879	<.0001
GARCH1	0.9694	0.003570	<.0001
INITIAL NEWS	-1.81E-18	1.9587E-7	1.0000
FOLLOWUP NEWS	-7.03E-24	1.9731E-6	1.0000
DUMMY_Mon.	-1.36E-19	1.534E-15	0.9999

Table 5.2.4 The Results for the Impact of Leading News on the Cotton Spot Market

Variable	Coefficient	Standard error	P- value
Intercept	4.2419	2.1546	0.049
Lag1(r)	0.9950	0.002563	<.0001
ARCH 0	0.0520	0.0112	<.0001
ARCH 1	0.0214	0.002879	<.0001
GARCH 1	0.9694	0.003570	<.0001
NEWS	1.326E-19	5.8756E-8	1.0000
LEAD1(NEWS)	-6.79E-23	7.1569E-8	1.0000
LEAD2(NEWS)	4.264E-10	9.075E-10	1.0000
DUMMY_Mon.	-6.61E-18	1.391E-14	0.9996

5.3 Summary

Estimation results of the GARCH (1, 1) models augmented with news events variables are presented in this chapter. In the cotton futures market, the news effects are examined in three cases, the intraday effects, the overnight news effects, and the interday news effects. For both cotton futures prices volatility and cotton cash prices volatility, the current news effects, the lag news effects, the leading news effects, cotton news effects, the effects of textile news headlines including "U.S." , other textile news effects, initial news effects, and the follow-up news effects are tested in details. The results can be summarized as below: The cotton news events have a significant overnight marginal effect of 1.7572 on the cotton futures prices volatility at 95%level of confidence. More significant marginal effect of the cotton news occurs in the cotton spot market, and the value is 34.3992 at the 99% level of confidence. Other examinations conducted in this thesis have the similar conclusion that Chinese cotton news and textile news events have no impacts on the cotton prices volatility.

Chapter 6 Conclusions

The objective of this thesis is to explore relationships between Chinese cotton news and textile news events and the price volatility in the cotton futures markets. This objective has been accomplished through a series of augmented GARCH (1, 1) models that include news events as additional explanatory variable in the conditional variance equation. Unlike other approaches, such as the study of specific events like government announcements, the daily number of Chinese cotton and textile news headlines are measured in this thesis.

The effect of news on cotton futures prices was measured in three ways. The first one is intraday effect. In this case, the daily returns are computed by log of the ratio of the closing prices and the opening prices on the same day. The second one is overnight effect. The daily returns of this case are obtained by log of the ratio of the opening prices and the previous day's closing prices. The last one is interday effect. The daily returns in this case are simply the log of the ratio of the closing prices on the two successive days. It is known that the relevant cotton cash price with which to compare futures prices is determined by the delivery requirements of the futures contract, the impacts of Chinese cotton and textile news events on cotton spot market are also examined. In terms of methodology, the contribution of this paper is twofold. On the one hand, not only are the impacts of multiple categories of Chinese cotton and textile news examined but also the impacts of the arrival of news. One the other hand, it is the first time in the literature that the impact of leading news is examined.

The results of this thesis are as follows: The cotton news events have a significant overnight marginal effect of 1.7572 (Table 5.1.2.2) on the cotton futures prices volatility at 95%level of confidence. More significant marginal effect of the cotton news occurs in the cotton spot market, and the value is 34.3992 (Table 5.2.2.4) at the 99% level of confidence. Other examinations made in this thesis have the similar results that Chinese cotton news and textile news events have no impacts on the cotton prices volatility. These results indicate that, in the cotton futures market with the assumption of overnight news effects and the cotton spot market, Chinese cotton news events influence the volatility of the cotton prices more directly than Chinese textile news. But the lag news effects, leading news effects, Monday news effects, initial news effects and follow-up news effects are insignificant in all cases of cotton futures markets and the cotton spot market.

Generally, Chinese cotton and textile news events do not have significant impacts on the cotton futures market. This can be explained by information economics theory. If the market is efficient with respect to some information, then that information cannot be used to direct a trading strategy to beat the market. In other words, the volatility of prices is not affected by well known information. In this thesis, Chinese cotton and textile news events, as public information, are provided to all the participants in the cotton futures market, and it is noticed by all the participants. (From the results of significant overnight effects of cotton news events on the cotton futures market, there is a probability that the textile news events are more popular then the cotton news events.) Consequently, no traders will use this information to direct their trade behaviors. Thus, Chinese cotton and textile news dose not influence the volatility of the cotton futures prices.

Another possible explanation for the results is the daily price limits. The NYBOT imposes daily price limits of 3 cents above or below previous day's settlement price. The daily prices limits may be able to control the prices volatility. However, during the period studied in this thesis, only 14 days have price limits that account for less than 10 percent of the observations. Thus, price limits will not change the results obtained in this research.

References

Baffes, John. “The Cotton Problem.” *Oxford Journals* 20(2005):109-44.

Berry,T., and K.M.Howe. “Public Information Arrival.” *Journal of Finance* 49(1994):1331-46.

Bollerslev, T. “Generalized Autoregressive Conditional Heteroscedasticity.” *Journal of Econometrics* 31(1986):307–27.

Brännäs, Kurt, and Jan G. De Gooijer. “Asymmetries in Conditional Mean and Variance: Modelling Stock Returns by as MA–as QGARCH.” *Journal of Forecasting* 23(2004):155–71.

Brooks, Chris, and Gita Persand. “Volatility Forecasting for Risk Management.” *Journal of Forecasting* 22(2003):1– 22.

Carter, Colin A., and Carl A. Galopin. “Informational Content of Government Hogs and Pigs Reports: Reply.” *American Journal of Agricultural Economics* 77(1995):703-5.

Cashin, Paul, and C. John McDermott. “The Long-Run Behavior of Commodity Prices-Small Trends and Big Variability.” Working Paper No. 01/68, International Monetary Fund, Washington, DC, 2001.

Chang, Yuanchen and Stephen J. Taylor. “Intraday Effects of Foreign Exchange Intervention by the Bank of Japan.” *Journal of International Money and Finance* 17(1998):191-210.

Cleveland, O.A. “More Export Dependent.” Cotton Grower (April 2005). Online. Available at http://www.allbusiness.com/legal/contracts-agreements-sales/1138579-1.html.

Colling, Phil L., and Scott H. Irwin. “The Reaction of Live Hog Futures Prices to USDA Hogs and Pigs Reports.” *American Journal of Agricultural Economics* 72(1990):84-94.

Colling, Phil L., and Scott H. Irwin. “Reaction of Wheat, Corn, and Soybean Futures Prices to USDA “Export Inspections” Reports.” *Review of Agricultural Economics* 18(1996):127-36.

Darrat, Ali F., Maosen Zhong, and Louis T.W. Cheng. "Trading Without Public News: Another Look at the Intraday Volume-Volatility Stock Relations." Online. Available at http://wwwdocs.fce.unsw.edu.au/banking/seminar/2005/ Zhong_Trading_without_News.pdf.

De Gooijer, Peter, and Wessel Marquering. "Modeling the Conditional Covariance Between Stock and Bond Returns: A Mutivariate GARCH Approach." Journal *of Financial Econometrics* 2(2004):531-64.

Depken, Craig A., II. "Good News, Bad News and Garch Effects in Stock Return Data." *Journal of Applied Economics* 0(2001):313-27.

Ederington, Louis H. and Jae Ha Lee. "How Markets Process Information: News Releases and Volatility." *Journal of Finance* 48(1993):1161-91.

Edwards, Franklin R., and Cindy W. Ma. *Futures and Options*. New York: McGraw-Hill, Inc., 1992.

Elam, E. "A Marketing Strategy for Cotton Producers Based on Mean Reversion in Cotton Futures Prices." Paper presented at Beltwilde Cotton Conf., San Antonio, TX.,4-8 Jan.2000.

Enders, Walter. Applied Econometric Time Series. Second Edition.Univ. of Alabama, 2004.

Engle, R. F. "Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation." *Econometrica* 50(1982):987-1006.

Ethridge, Don and Darren Hudson. "Cotton Market Price Information: How it Affects the Industry." *The Journal of Cotton Science* 2(1998):68-76.

Gohou, Gaston, and John Baffes. "The co-movement between cotton and polyester prices." Policy Research Working Paper Series 3534, The World Bank, 2005.

Glosten,L.R., R. Jagannathan, and D.E. Runkle. "On the Relation Between the Expected Value and the Volatility of the Nominal Excess Return on Stocks." *The Journal of Finance* 48(1993):1779-1801.

Hudson, Darren, and Keith Coble."Harvest Contract Price Volatility for Cotton." *Journal of Futures Markets* 19(1999):717-33.

Isengildina, Olga, Scott H. Irwin, and Darrel L. Good. "Are Revisions to USDA Crop Production Forecasts Smoothed?" Paper presented at the American Agricultural Economics Association Annual Meetings, Denver, CO, August, 2004.

Janssen, Gust. “Public Information Arrival and Volatility Persistence in Financial Markets.” *The European Journal of Finance* 10(2004):177-197.

Johnson, J., and B. Bennett. “Using Moving Averages as a Cotton Pricing Tool.” Paper presented at Beltwide Cotton Conf., San Antonio. TX. 4-8 Jan. 2000.

Kim, S., and F. In. “The Influence of Foreign Stock Markets and Macroeconomic News Announcements on Australian Financial Markets.” *Pacific-Basin Finance Journal* 10 (2002):571-582.

Kim, S.J., and J. Sheen, “Minute-by-Minute Dynamics of the Australian Bond Futures Market in Response to New Macroeconomic Information.” *Journal of Multinational Financial Management* 11(2001):117-37.

Linn, S., and Z. Zhu. “Natural Gas Futures Prices and the Gas Storage Report: Public News and Volatility in Energy Markets.” *Journal of Futures Markets* 24(2004):283-313.

MacDonald, Stephen, A.Somwaru, L. Meyer, and X. Diao. “The Agreement on Textiles and Clothing : Impact on U.S. Cotton.” *Cotton and Wool Situation and Outlook*, November(2001):26-29.

MacDonald, Stephen, Agapi Somwaru, and Francis Tuan. “China’s Role in World Cotton and Textile Markets.” Paper presented at 7th Annual Conference on Global Economic Analysis , Washington, DC, June 2004.

Meyer, Leslie, Stephen MacDonald, and Robert Skinner.“Cotton and Wool Situation and Outlook Yearbook.” November 2005. Online. Available at http://usda.mannlib.cornell.edu/reports/erssor/field/cws-bby/cws2005.pdf .

Mitchell,M. and J.Mutherin. “The Impact of Public Information on the Stock Market.” *Journal of Finance* 49(1994):923-50.

Monke, Eric A., Lester D. Taylor. “International Trade Constraints and Commodity Market Models: An Application to the Cotton Market.” *The Review of Economics and Statistics* 67(1985):98-107.

Mu, Xiaoyi. “Weather, Storage, and Natural Gas Price Dynamics: Fundamentals and Volatility.” Working paper, Department of Economics, University of Oklahoma, Norman, OK, December, 2004.

Nelson, D. “Conditional Heteroskedasticity in Asset Returns: A New Approach.”

Econometrica, 59(1991):347-370.

Pan, S., S.Mohanty, D.Ethridge, and M. Fadiga. "The Impacts of U.S. Cotton Programs on the World Market: An Analysis of Brazilian WTO Petition." Working Paper, Texas Tech University Department of Agricultural and Applied Economics, 2005.

Patterson, Paul M. and B. Wade Brorsen. " USDA Export Sales Report: Is It News?" *Review of Agricultural Economics* 15(1993): 367-78.

Rucker, Randal R., Walter N. Thurman, and Jonathan K. Yoder. "Estimating the Structure of Market Reaction to News: Information Events and Lumber Futures Prices." *American Journal of Agricultural Economics* 87(2005):482-500.

Salin, Victoria, and Neal H. Hooker**. "**Stock Market Reaction to Food Recalls." *Review of Agricultural Economics*. 23(2001):33-46.

Schroeder, Ted, and Joanne Blair. "Abnormal Returns in Livestock Futures Prices Around USDA Inventory Report Releases." *North Central Journal of Agricultural Economics* 12(1990):293-304.

Shepherd, Ben. "The Impact of US Subsidies on the World Cotton Market: A Reassessment." Economics Working Paper No. International Trade0511012, Archive EconWPA, 2004.

Sumner, D. A., and R. Mueller. "Are Harvest Forecasts News?" *American Journal of Agricultural Economics* 71(1989):1–8.

Turner, S.C., and V. Heboyan. "Managing Price Risk in Cotton Production Using Strategic rollover hedging." Working Paper No. FS01-09, Dep.Agric. Appl. Econ., College Agric. Environ. Sci, Univ. Georgia, Athens. GA. 2001.

Yang, Jian, Michael S. Haigh, and David J. Leatham. "Agricultural Liberalization Policy and Commodity Price Volatility: A GARCH Application." *Applied Economics Letters* 8(2001):593-98.

Yang, Seung-Ryong, and B.Wade Brorsen. "Nonlinear Dynamics of Daily Cash Prices." *American Journal of Agricultural Economics* 74(1992):706-715.

Yang, Seung-Ryong, and B.Wade Brorsen. "Nonlinear Dynamics of Daily Futures Prices: Conditional Heteroscedasticity or Chaos?" *Journal of Futures Markets* (13)1993:175-191.