# CHINESE NEW YEAR AND INTERNATIONAL GOLD MARKETS

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**Abstract**

Today, China is the world's leading gold producer and its second largest consumer. Traditionally imposing strict regulations on its gold market, China has ushered in a process of liberalisation a decade ago, encouraging individual gold trading, gold import and export. A boom in domestic demand for gold has been triggered, the majority of which is constituted by purchases of jewelry. Demand seasonality is, among others, determined by the Chinese New Year festival, as the traditional gift of red envelopes with cash has, in recent years, increasingly been replaced by jewelry.

The present study is an effort to investigate whether there is a discernible impact of this festival on the distribution of returns on gold prices, as fixed at the London bullion market. Specifically, we fit a combined GARCH and regression model, including dummy variables indicating the festival, to daily gold price changes.

We show that a significant impact could be observed shortly after the beginning of the Year of the Dragon on February 5th, 2000, for the first time, and has persisted since then in the sense that conditional return expectation increases with the festival and stays at an elevated level for some days after the festival, while there is no significant impact on return variability. Our findings help investors in the gold market understand market dynamics and provide empirical evidence for a phenomenon which is not comprehensively covered in official statistics. Finally, we point out consequences of our findings concerning the Chinese gold market to economic policy formulation.

**Key words**: Gold prices; Chinese New Year festival; combined GARCH and regression model with covariates

## 1 Introduction

Over the past decade gold has witnessed a "stellar run", an analyst phrased recently[1], in review of the more than sevenfold surge of prices since 2001, which seemed to have finally ended over the weekend then, as price slumped sharpest in three decades. Though, among financial investors, the prominence of gold has been always controversial,[2], demand for gold as jewelry, bars and coins (accounting for 72% of global demand in 2012, cf. [16]) is hardly on the wane. The recent collapse in prices has been preceded by strong physical demand from Asia and the US, with a new first-quarter record consumption in China[3].

Within few years, China, the world's leading gold producer, has been catching up with the world's largest consumer, India. Figure 1 shows the two countries' recent proportions of global consumer demand.

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[1]FT, 2013-04-15, "Gold hit by sharpest tumble in 30 years".

[2]FT, 2013-04-19, "Don't write gold's obituary just yet".

[3]Bloomberg, 2013-07-05, "China's gold consumption jumps 26% in first quarter before rout".

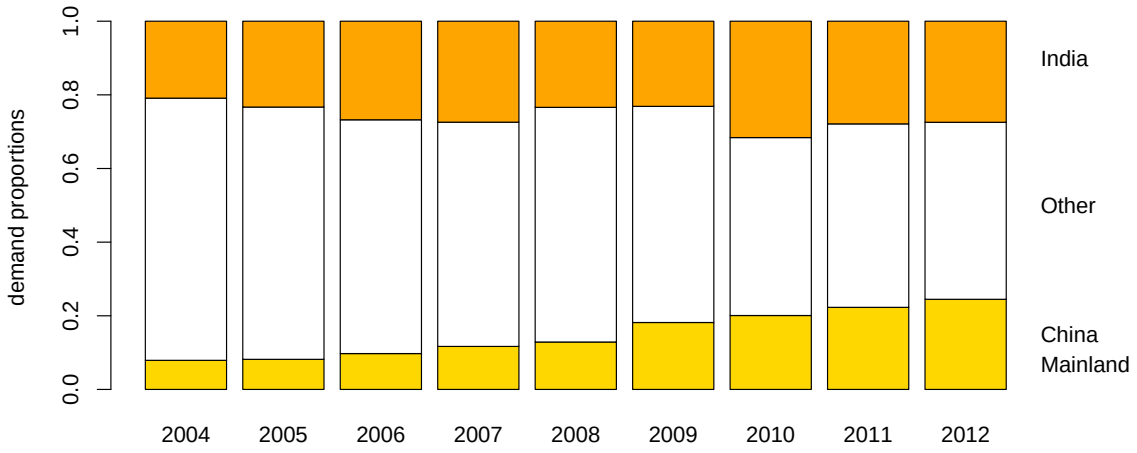



Figure 1: Consumer demand proportions: gold jewelry, bars and coins[4]

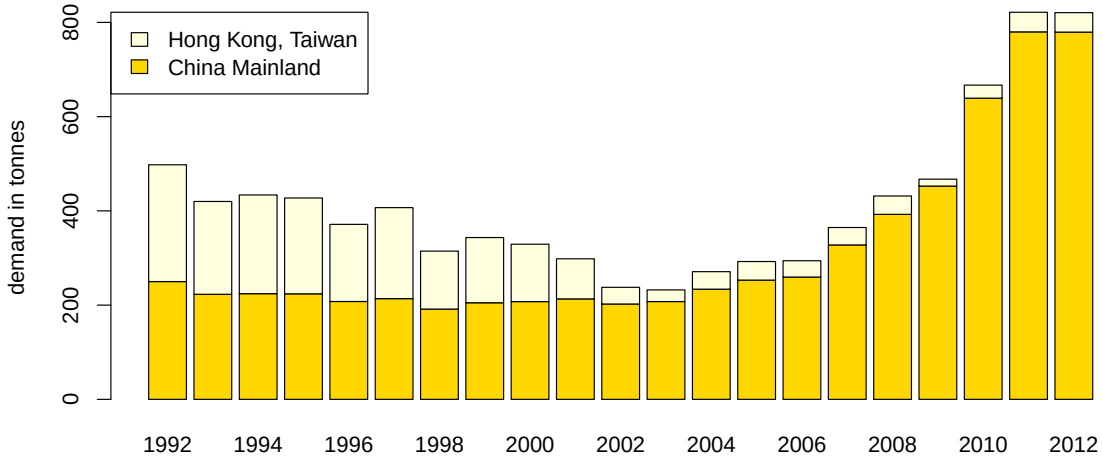



Figure 2: Chinese consumer demand: gold jewelry, bars and coins[6]

Yet prior to 2002, strict regulations had been imposed on the gold market in China. The People's Bank of China, and other central authorities, had established a tight allocation and purchase system, restraining prices and quotas from production through to retail distribution, of export and import; cf. a 2010 publication by the World Gold Council[5] on the outlook for gold demand and supply in China [15]. When the Shanghai Gold Exchange was opened in October 2002 to replace this system, China had ushered in a process of liberalisation, welcoming foreign investment and expertise to Chinese gold mining, and particularly encouraging domestic gold purchases. A boom in domestic gold consumption has been triggered, the majority of which is constituted by purchases of jewelry; Figure 2 gives an impression.

According to computations by the World Gold Council [15], China's per capita gold consumption had almost doubled from 2002 to 2009, while average annual gold prices in USD more than tripled. This strengthening of demand has been related to the country's booming economy and higher incomes per capita, but it appears to be particularly spurred by Chinese gold culture. "Today, gold is regarded as a sign of prosperity, an ornament, a currency and an integral part of Chinese religion," the World Gold Council [15] states in its 2010 report on China. Particularly, the demand for gold around Chinese Spring

[4]Data source: the World Gold Council, URL http://www.gold.org/, accessed May 9, 2013; 2012 data are provisional.

[5]The World Gold Council is a market development association of gold mining companies representing more than 60% of the global annual gold production. Website URL http://www.gold.org/.

[6]Data source: l.c.

Festival, the most important yearly holiday season in Chinese culture, marking the begin of the new luni-solar year, is said to impact the gold price globally, as the traditional gift of red envelopes with cash has, in recent years, increasingly been replaced by jewelry.[7] Traditionally, celebrations run from Chinese New Year's Eve to the 15th day of the first month. The date of Chinese New Year falls on different days each year, floating between January 21 and February 20.[8]

The main issues addressed in extant finance literature on gold are volatility transmission and hedging properties of gold, in both cash and derivative markets.

In order to ascertain macroeconomic determinants of volatility in the precious metal market, Batten et al. [1] employed a monthly VAR framework. Their findings suggest that precious metals should not be considered a single asset class as volatilities do not appear affected by the same set of key factors even. Particularly, both monetary and financial variables proved significant for gold, but neither of them for silver. This adds to findings in previous studies, e.g. on futures by Erb and Harvey [9].

The study of relations between precious metal and FX markets has received particular attention. Capie et al. [7] regressed weekly returns on gold prices in USD on the Sterling (Yen) to USD exchange rate, and fitted a GARCH model to the residuals. The authors find evidence that during the span of thirty years from the early 1970s onward, gold has served as a hedge against USD exchange rate movements, "to a degree that seems highly dependent on somewhat unpredictable political attitudes and events" though. Investigating copula models for the tail behavior of weekly returns from the recent decade, Reboredo [12] concludes that gold can be considered a "safe haven" against USD exchange rate fluctuations even in periods of extreme volatility. Fitting daily data from the past forty years to a CCGARCH model, Pukthuanthong and Roll [10] show that a higher price of gold can be associated with depreciation in every currency (USD, Euro, Pound, and Yen) over the same time period, refuting the hypothesis of a special relation between the USD price of gold and USD weakness that would allow to imply a positive impact from foreign currencies' appreciation. On a daily basis, using a VAR model, Sari et al. [14] analyzes co-movements and information spillovers among the precious metal, oil and FX markets. They found evidence of close linkage in the short run after shocks.

Gold as a hedge or a safe haven during worsening market conditions, as indicated by market indices, stocks or bonds, is discussed in several papers, e.g. by Baur and McDermott [2], Baur and Lucey [3], respectively. Among the authors' conclusions is that gold works as a safe haven in the short-run only. While for developed market investors gold may be a hedge against losses, emerging market investors may prefer developed market shares to investments in gold.

Recent articles contribute to a further field of research on gold prices. On the basis of three decades of monthly price changes, a forthcoming article by Baur [5] studies the "autumn effect" of gold which relates to the recurring observations of price surge in autumn. September and November proved significant seasonal determinants increasing both return expectation and volatility. The author makes an effort to explain this anomaly by several factors acting: "negative investor sentiment" due to crisis clustering in autumn, the "winter blues" accompanying reduced daylight, and the "Halloween effect", but also increased demand for gold jewelry during the Indian wedding season.

The idea that annual festivals may influence the distribution of daily gold price changes led us to a combined regression and GARCH specification with covariates that can differentiate between pre- and post-effects of the (first) festival day. In this approach the magnitude of effects on conditional return expectation can be measured in units of the current conditional standard deviation. In a previous research, cf. Rösch and Schmidbauer [13], among a selection of festivals which can be related to purchases of gold, Akshaya Tritiya, Dussehra, Ramadan Eid, and Christmas, prove to have a clear impact over the past two decades, but the impact's character may be quite different. For example, we observe a significant boost in volatility after Akshaya Tritiya, without a discernible rise in expectation. Increased volatility can also be found around Ramadan Eid and Christmas. While heightened expectation can be ascertained during

[7] Financial Times, 2012-01-24, "Chinese New Year: retailers cash in, and so do the pawnshops".

[8] See, e.g. URL http://www.history.com/topics/chinese-new-year.

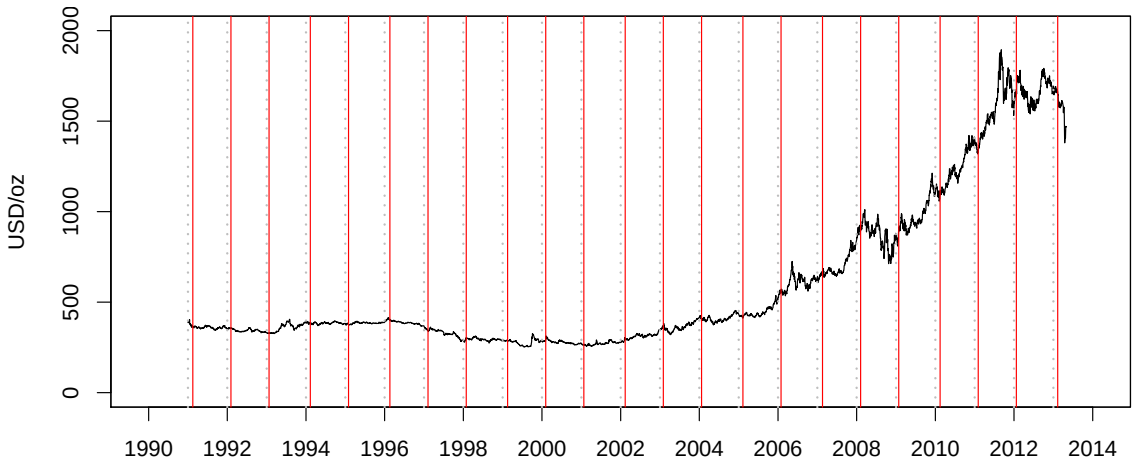



Figure 3: The gold price series and Chinese New Year dates

the impact period of Ramadan Eid, Christmas, however, features a peculiarity: impact on expectation appears positive right before the festival, and turns negative afterward. Effects of Chinese New Year festival appear least pronounced in this study, however results from sub-periods indicate the necessity of taking a closer look onto peculiarities of the Chinese gold market. The goal of our present study is to close this gap.

All computations were carried out in R [11]. — This paper is organized as follows. The data which we use in our study are introduced in Section 2. Section 3 provides our modeling approach. Empirical results are presented in Section 4. Finally, Section 5 concludes.

## 2 Data

The time series of daily p.m. gold fixings in USD per troy ounce, together with the dates of Chinese New Year festival, is displayed in Figure 3, starting from January 1991 and ending in April 2013 (5600 observations; festival dates are represented by the vertical lines in red). Gold price fixings are published at the website of The London Bullion Market Association[9], the dates of Chinese New Year festival were taken from the website of the Hong Kong Observatory[10]. For this study, we made no effort to convert gold prices into Chinese renminbi nor to adjust prices for inflation, because the renminbi was and still is not fully convertible, and because our analysis is based on daily price changes (returns) in percent — returns would be affected by inflation adjustment only marginally. The daily return series is shown in Figure 4.

Figure 5 displays, for the period considered in this paper, a calendar of festivals which may be tied to traditions of buying or making gifts of gold; see Rösch and Schmidbauer [13] with respect to Indian and Muslim festivals.

## 3 Methodology

To ascertain the effect of China's liberalisation policy on daily gold price changes, we split the whole time period considered into two (almost equally long) parts, the first part ending in 2002, the second starting from 2003. For modeling potential New Year festival impacts, we adopted a combined GARCH and regression approach from the study by Rösch and Schmidbauer [13]:

[9]The London Bullion Market Association, URL http://www.lbma.org.uk/pages/?page_id=53&title=gold_fixings

[10]Hong Kong Observatory, URL http://www.hko.gov.hk/gts/time/conversion.htm

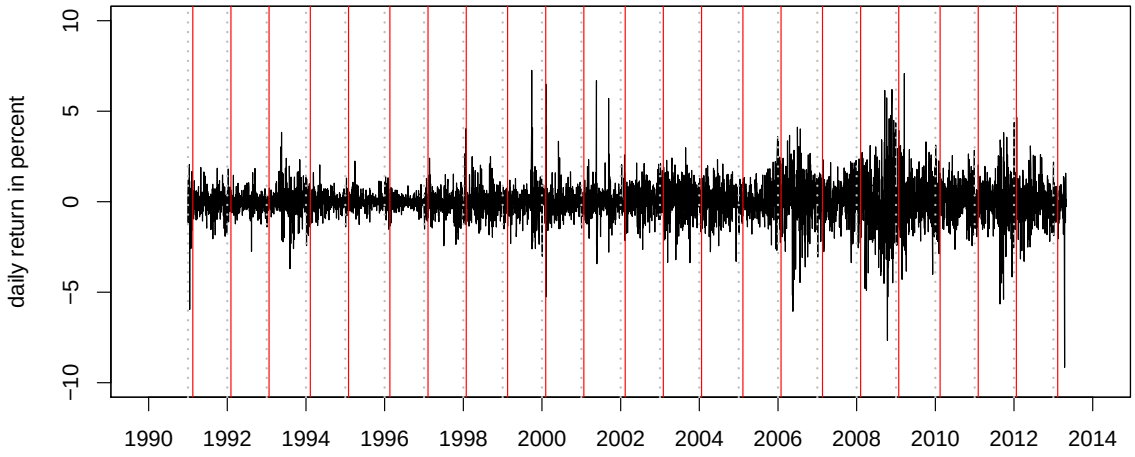



Figure 4: The gold return series and Chinese New Year dates

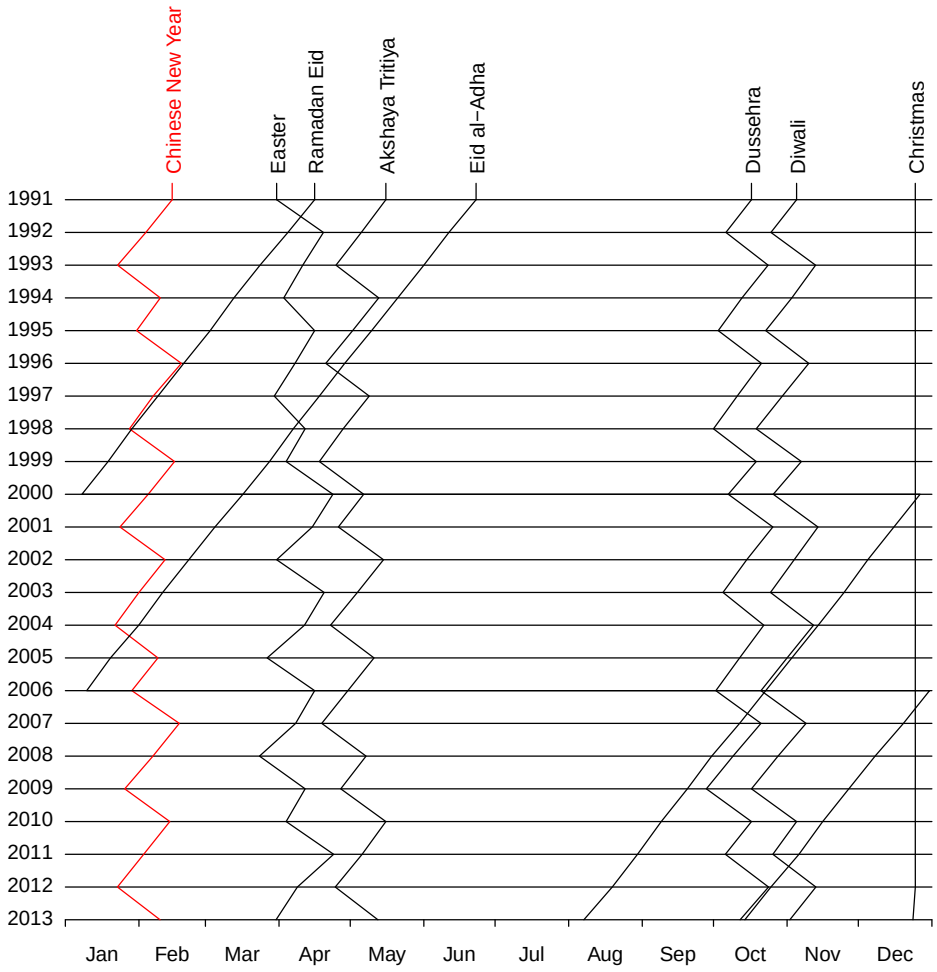
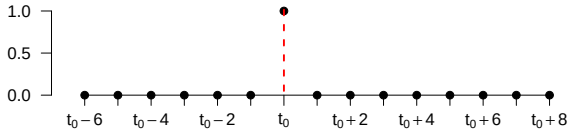



Figure 5: The festival calendar, 1991–2013

a) original:




b) extended, from 0 to +4:

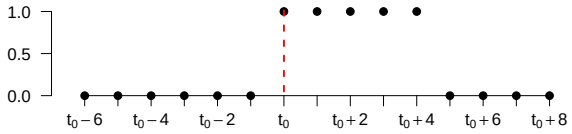



Figure 6: Dummy variables: original and extended

$$r_t = c + \epsilon_t = c + \nu_t \sqrt{h_t} \quad (1)$$

$$h_t = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \beta h_{t-1} + \gamma_{\text{cny}} d_{\text{cny},t} \quad (2)$$

$$\nu_t = \eta_t + b_{\text{cny}} d_{\text{cny},t} \quad (3)$$

No significant autocorrelation was found in the series of daily gold price returns, denoted by $(r_t)$, which then allows decomposition into a constant mean $c$ and a heteroscedastic series $(\epsilon_t)$ of mean-corrected returns, according to equation (1).

The approach, based on the conception that Chinese New Year festival may affect return volatility and expectation concurrently, suggests to measure the magnitude of the festival's impact on conditional expectation of $r_t$ in units of the current standard deviation, $\sqrt{h_t}$. To this end, a festival period indicator $d_{\text{cny},t}$ is designed to potentially affect each of the two components of mean-corrected returns $\epsilon_t$: conditional volatility $h_t$, and residual noise $\nu_t$. In equation (2), a festival dummy enters a GARCH(1,1) model (cf. Engle [8], Bollerslev [6]) to model potential impact on conditional volatility. In equation (3), Gaussian white noise $(\eta_t)$ with $\text{var}(\eta_t) = 1$ is augmented by a festival dummy to allow for impact on conditional expectation. A significant effect of the festival on return expectation in this sense would imply an increase by $b_{\text{scriptsizecny}}\sqrt{h_t}$ percentage points then. The process $(\eta_t)$ represents a "news" process, driving returns excluding information about the festival period.

The procedure of fitting the model to daily (mean-corrected) return data runs in two steps: a GARCH model is fitted first, according to equation (2). We obtain the residual series $(\nu_t)$, which is then regressed on a dummy variable according to equation (3).

The dummy variable $(d_{\text{cny},t})$ indicates Chinese New Year festival dates. In its original form, it is set 1 if the festival is celebrated on day $t$, or, in case of a non-trading day, if day $t$ is the last day *before* the festival on which the gold price is still available. Otherwise, it is set 0, yielding a sequence of isolated 1s, surrounded by 0s. However, this definition of dummy variable does not preclude that there is a single, random, day which proves significant. Further modifications are necessary in order to reflect anticipation and/or aftereffects: installing a sequence of at least two 1s on successive days if the festival day is covered, and of at least 3 days if the original indicator is shifted to another day (at a maximum distance of 2 days from the previous date), while maximum of 15 days before and after the festival date should not be exceeded. A comprehensive presentation of *admissible* modifications is given by Rösch and Schmidbauer [13]. Figure 6 shows an example, where $t_0$ is the festival date (or the last day prior to the festival on which the gold price was available).

The extended dummy variable is plugged into equations (2) and (3). Modifications need not be identical for both equations, as the festival can impact expectation and volatility in different ways. The model fit is then optimized with respect to AIC over a set of extensions for the dummy variable.

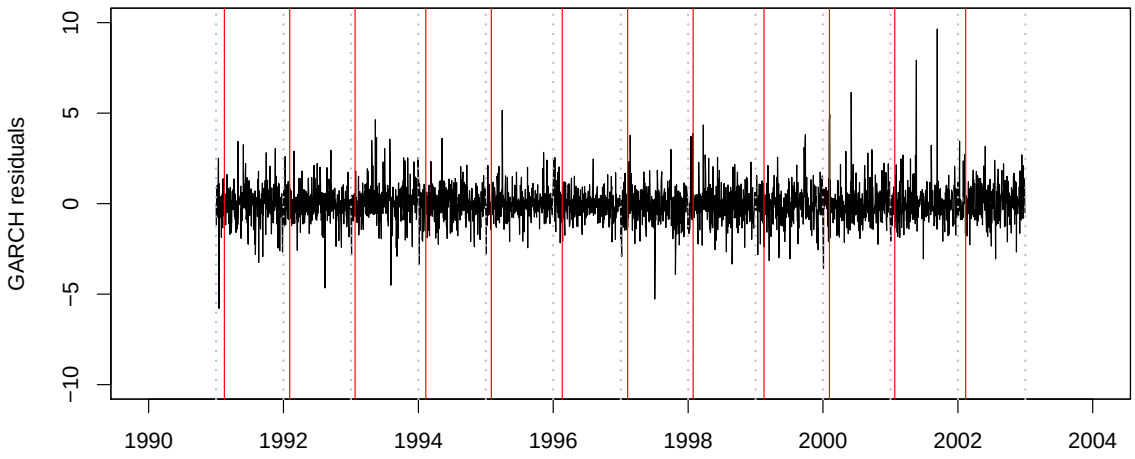



Figure 7: GARCH residuals and festival dates, 1991–2002

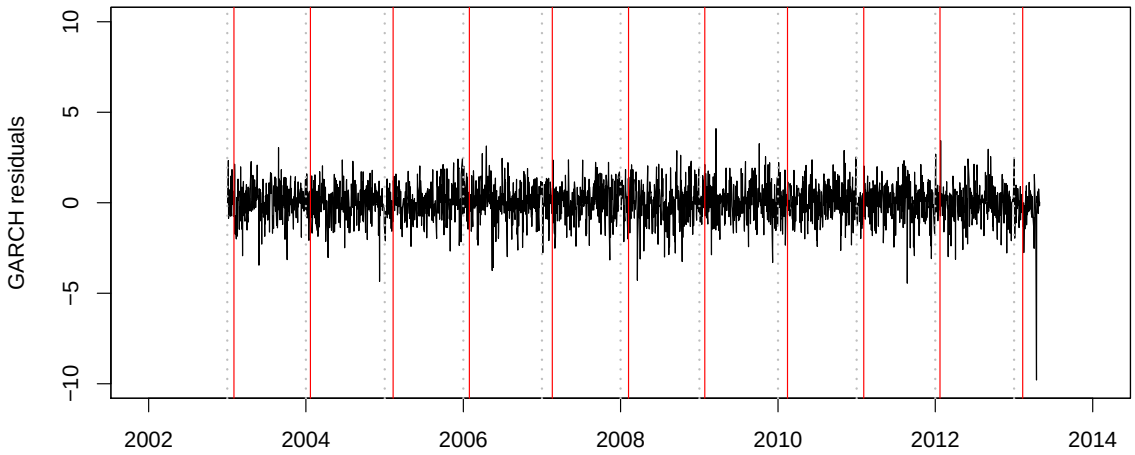



Figure 8: GARCH residuals and festival dates, 2003–2013

# 4 Empirical Results

No extension of the dummy variable was found to have a significant impact on return volatility (i.e., $H_0 : \gamma_{\text{cny}} = 0$ was not rejected in any case) in any of the time periods considered. Figures 7 and 8, show plots of the residual noise process $(\nu_t)$, to be regressed on a festival period indicator according to equation (3 in the next step.

For the period 1991 through 2002, return expectation was not found significantly affected either, though the largest ever absolute daily return close to the festival could be observed on Monday, 2000-02-07, right after Chinese New Year, which in that year was celebrated on Saturday, 2000-02-05, marking the beginning of the "Year of the Metal Dragon". This situation is shown in Figure 9.

Here, day $t_0$ designates the position of the Chinese New Year indicator (which, in 2000, according to our convention was shifted to the previous trading day, Friday, 2000-02-04), the solid black line shows returns in 2000. The yellow line in the plot marks the average returns across the period 1991 through 2002. In spite of the 2000 outlier, no significant impact of Chinese New Year was found in this period, providing a strong argument that outliers do not distort the overall picture.

The comparison of averages in Figure 10 at a first glance suggests that the situation might have become different since China ushered in a process of liberalisation a decade ago.

Indeed, Chinese New Year festival proved to have a substantial impact on return expectation when

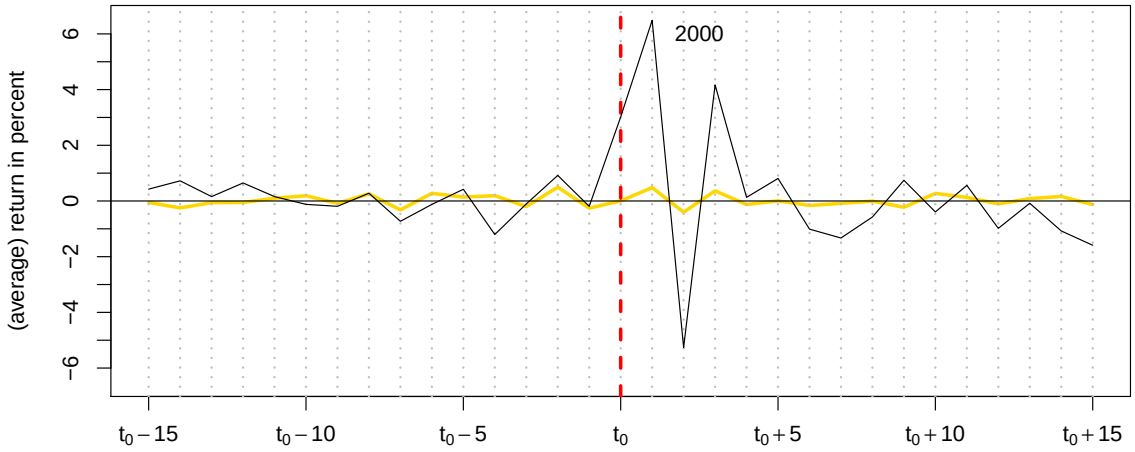



Figure 9: Gold price changes around Chinese New Year, 1991–2002

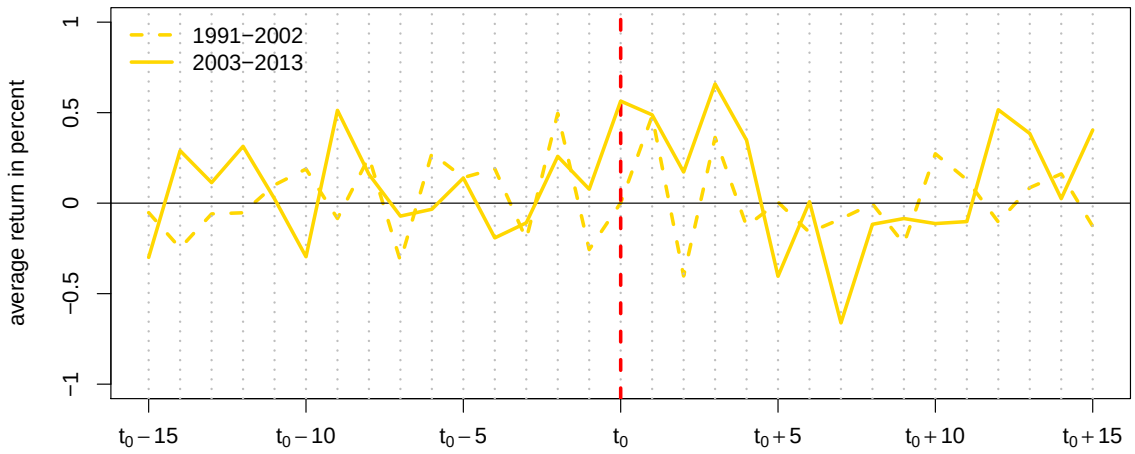



Figure 10: Averages of gold price changes around Chinese New Year, 1991–2002 and 2003–2013

| | estimate | std.err. | t value | p value |
|---|---|---|---|---|
| $\alpha_0$ | 0.0185 | 0.0048 | 3.886 | 0.000 |
| $\alpha_1$ | 0.0562 | 0.0080 | 6.983 | 0.000 |
| $\beta$ | 0.9329 | 0.0090 | 104.086 | 0.000 |
| $b_{\text{cny}}$ | 0.3100 | 0.1348 | 2.299 | 0.022 |

Table 1: Parameters of the fitted model, 2003–2013

analyzing data starting from 2003. The optimal extension for the regression model was found to reach from 0 to 4 then, that is, beginning on the day of Chinese New Year (or the latest trading day before it) and ending 4 days after it (an extension pattern which was illustrated earlier in plot (b) of Figure 6). The fitted model had the following estimated parameters:

The analysis of data starting from 2001 revealed that the festival impact has only gradually evolved over the two years after its abrupt popping up in year 2000, as it proved less pronounced and less significant for the extended time period.

## 5 Summary and Conclusions

The purpose of the present study was to ascertain the character of the impact of Chinese New Year festival on the expectation and volatility of daily price changes in the spot gold market over the past two decades. We applied a framework developed in an earlier study, cf. Rösch and Schmidbauer [13], which combines a regression and GARCH specification with covariates modeling anticipation and/or aftereffects of the festival. Specifically, it measures effects on conditional expectation in units of the current conditional standard deviation acting as a "news magnifier".

The gold market in China has been tightly regulated by central authorities until the first step has been made and Chinese liberalisation policy went into effect with China becoming a full member of the World Trade Organisation in December 2001 and with the opening of the Shanghai Gold Exchange in October 2002. Deregulation becomes visible not only from displays of annual Chinese domestic consumption of gold jewelry, bars and coins after 2002, but also when investigating daily gold price changes around Chinese New Year festival. While conditional volatility does not appear to be affected in either subperiod, our findings suggest a substantial increase in return expectation after 2002, stretching over a five-day-period beginning with the first day of the festival.

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