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Does oil product pricing reform increase returns and uncertainty in the Chinese stock market?

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ABSTRACT

This paper examines whether and to what extent the oil product pricing reform in 2013 has affected uncertainty in the Chinese stock market at both the aggregate and sectoral levels. Based on daily data from 17 March 2011 to 27 March 2015 and univariate GARCH-based modelling augmented with interaction terms, the main empirical results can be summarized as follows: first, the 2013 reform has improved the risk-return pattern of the Chinese aggregate stock market. Second, since the reform, Chinese sectoral stocks have become more sensitive to the price adjustments of oil products. In particular, upward price adjustments impose larger effects on stock market volatility than downward price adjustments, primarily leading to a significant reduction in stock market volatility. Counter-intuitively, the main conclusions show that China's 2013 oil product pricing reform has significantly reduced the risks of stock investments and financing, implying that a market-oriented pricing mechanism can actually decrease the financial market uncertainty surrounding domestic oil product price adjustments.

1. Introduction

It is indisputable that energy continues to serve China's dizzying pace of economic growth, as it has for decades. However, Chinese policymakers are at a crossroads, confronting crucial decisions due to the acute intersections among energy scarcity, economic growth, and environmental deterioration (Fan, Luo, & Zhang, 2016). Jiang and Tan (2013) suggest that one means to address those interactions is by implementing further energy price reforms and removing energy subsidies. In recent decades, the refined oil pricing mechanism in China has gradually changed from being set independently by the local government to becoming more linked to changes in international crude oil prices. In 2009, the launch of the domestic product pricing mechanism led refined oil prices to be adjusted when the moving average of international crude oil prices fluctuated outside a 4% range around the established price within 22 consecutive working days.

Interestingly, a more market-oriented reform was launched on 27 March 2013, which has shortened the time frame of price adjustments from 22 days to 10 days and has eliminated the 4% crude price band. As shown in Fig. 1, there has been a much closer relationship between China's oil (gasoline) price and the international oil price in the period since 27 March 2013. In fact, we observe 33 changes in China's refined oil (gasoline) price during the 2005–2012 period, whereas approximately 47 changes are observed from 27 March 2013, to 30 December 2015. Li and Lin (2015) suggest that the 2013 oil product pricing reform has potentially affected the stability and development of oil-related industries in China. A more market-oriented oil product pricing mechanism is generally expected to decrease consumer spending and increase the cost of production, leading to a potential reduction in corporate profits. For oil-related companies, an increase in the price of oil products usually boosts corporate profits. However, given that most Chinese oil-related companies are state owned and are well protected by the government, they lack motives to adopt new technology to reduce the cost of production. This condition suggests that tracking international crude oil prices more closely may not necessarily benefit those companies. Because the stock price is a suitable indicator of a company's financial performance and because the stock market represents a major channel for investment and financing for Chinese companies, the above suggestion made by Li and Lin (2015) indicates that the implementation of the new pricing reform in 2013 may potentially have affected the uncertainty of the Chinese stock market, particularly in relation to energy-intensive sectors.

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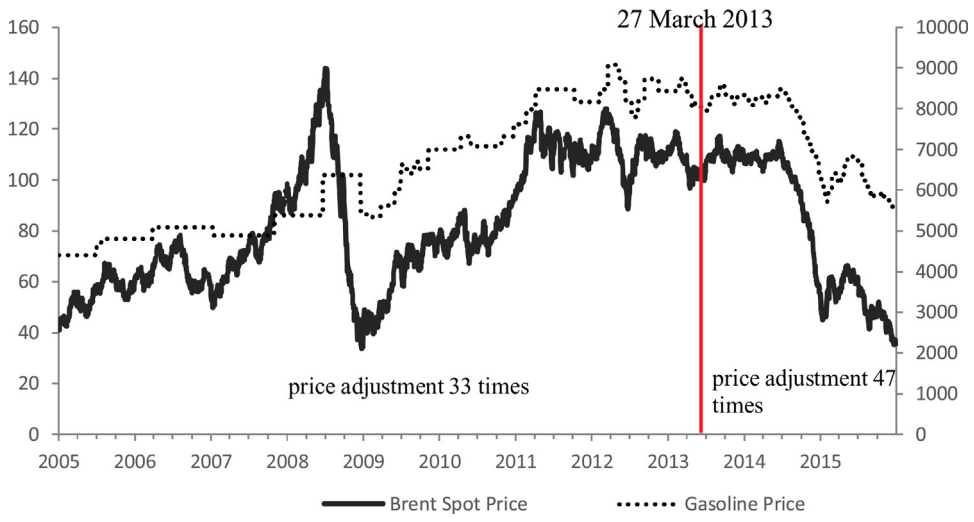

Fig. 1. Number of price adjustments of gasoline in China and the international oil price.

In fact, more than three years after the launch of the new oil product pricing mechanism in 2013, it remains unclear whether and to what extent this reform has affected return and uncertainty in the Chinese stock market at the aggregate and sectoral levels. Interestingly, the 2013 reform may have reduced the uncertainty surrounding China's oil price adjustments to changes in international oil prices. After the reform of 2013, the adjustment time became much shorter, making the prediction of the adjustment in China's domestic oil price easier once we observe the trend of international oil prices. This paper seeks to address this research gap. Such a consideration is very important for both corporations and policymakers in their strategies to manage energy price returns and risks. For investors, understanding the effects of the oil reform on the stock price return and volatility plays an important role in risk management and derivative pricing and helps link hedging decisions to the potential risk of the oil reform. In particular, focusing on the sectoral level of stock market data is expected to make our analysis more informative to economic actors. Given that the existing literature provides evidence that different stock sectors may respond differently to the same change in oil prices (see, among others, Moya-Martínez, Ferrer-Lapeña, & Escribano-Sotos, 2014), it is important to uncover heterogeneity across sectors that might be masked by analysing only aggregate data. A further motivation of this research paper is that stock investors usually rotate between sectors to maximise return and minimise risk, and policymakers can develop policies across the different equity sectors.

In this paper, we examine how the domestic oil product price adjustments (upward and downward adjustments) affected the stock price return and volatility before and after the 2013 reform. In accordance with Reboredo and Wen (2015), we use a GARCH-based modelling technique augmented by several interactions terms. However, our modelling technique differs in several ways. First, we model more properly the conditional mean of returns by capturing many of the salient features of the data, such as day-of-the-week effects, monetary conditions, and movements in world stock prices. The result is an autoregressive (AR) moving average (MA) with external inputs (X), an ARMAX process (Bouri, 2015). Second, we apply different univariate specifications for the GARCH-type modelling. According to Javed and Mantalos (2011), misspecification in fitting a GARCH-type model, together with an imprecise assumption of the error-term distribution, may substantially lead to unbiased estimates, and an incorrect assessment of periodic changes in volatility can eventually produce invalid inputs into the decision-making process. In this regard, for all the return series, the most optimal univariate symmetric/asymmetric GARCH model is selected based on Schwarz Bayesian Information Criterion (SIC), which is known to lead to a parsimonious specification (Beine & Laurent, 2003). The two abovementioned methodological extensions adopted in this paper are very important to avoid biased estimates of volatility coefficients. We also conduct several robustness checks to ensure the reliability of the empirical results.

The main results show that the upward adjustments of the oil product price, particularly after the reform in 2013, have significantly improved the risk-return pattern in the Chinese aggregate stock market. At the sectoral level, the 2013 reform has had no significant effect on stock returns, whereas it has significantly diminished the level of volatility in most cases. Additional analyses support the findings.

2. Related studies

In recent years, a growing body of literature has empirically studied the effect of energy pricing reform on the overall economy. Numerous studies have considered the case of China, since this country is believed to be playing a leading role in global sustainable development. As energy subsidies are considered an important determinant of energy price, those studies primarily focus on how the reform of energy subsidies has affected energy demand, energy consumption, general price level, and environmental degradation. For example, Lin and Jiang (2011) applied the price-gap approach to estimate energy subsidies in China and further used a computable general equilibrium (CGE) model to analyse the economic impacts of energy subsidies reform. The researchers' analyses show that removing the energy subsidies will result in a significant decrease in energy demand and emissions, but removing subsidies will also have negative impacts on macroeconomic variables such as GDP and employment. Liu and Li (2011) conducted a similar study and found that the energy consumption structure could be improved to different extents by removing coal or oil subsidies, and the effects of reducing coal subsidies are larger than the effect of reducing subsidies overall. Furthermore, Hong, Liang, and Di (2013) employed a co-thinking approach, focusing on how energy subsidy reform could mitigate the rebound effect in China and help to achieve "economic and environmental gains". Their results suggest that removing energy subsidies would increase the ultimate demands of different economic sectors and reduce the cumulative physical consumption of coal, oil, natural gas, and electricity. Jiang and Tan (2013) used an input–output model to analyse the impacts of

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