1. Introduction

Due to the rapid growth in electricity demand and rise in environmental awareness, China has looked to nuclear energy to help address those issues. The development of nuclear power began in the 1980s, but it took until 1991 for the help address those issues. The development of nuclear power environmental awareness, China has looked to nuclear energy to

This paper investigates the impact of China’s 2005–2020 nuclear expansion policy on the stock prices of nine major economic sectors in China, Japan and the US. Contagion tests based on changes in co-volatility and both forms of co-kurtosis are applied to identify how policy shocks impact markets and sectors. Monte Carlo experiments show that all of these tests perform well in power and that the co-kurtosis test performs better than the co-volatility test. Results for 2011 through 2016 show that China’s nuclear expansion policy has the most impact on sectors in China, with less significance in Japan, and with the least effect in the US. The most significant effects are coincident with major events that occurred in the post-announcement period when the 13th Five Year Plan was implemented. Sectors which are closely related to nuclear power are the most sensitive to policy announcements.

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The spillover effect of nuclear energy policy on market performance has been of great concern to academics and policy makers because of its important consequences on the national economy [5, 34, 39, 48, 69]. In the energy literature, most of researchers focus on studying the impacts of nuclear phase-out, relevant energy policies and unexpected nuclear events. Energy policies and unexpected events have significant impacts on market performance around the world.

A number of studies have explored the impacts of phasing out nuclear power on the housing market [7], power sector [51, 52], energy and environmental systems [28, 47, 55, 72] and the national economy [11]. Bauer et al. [7] used a difference-in-differences approach to analyze the effect of the Fukushima accident on the German housing market. They found that the closure of nuclear power plants has negative economic effects. Bretschger and Zhang [11] used a computable general equilibrium (CGE) model to analyze the economy-wide effects of phasing out nuclear power. They found that full phase-out can lead to welfare losses of 0.4% in the US. Li et al. [41] found that longer nuclear lifetimes had a negative impact on the housing market in China [76]. Germany [8], Sweden [2], Switzerland [9] and the US [20], as well as energy and power sector in China [73], Japan [15, 19, 29, 36] and around the world [17]. For example, Boes et al. [9] tested the influence of the Fukushima nuclear disaster on rental prices in Switzerland. They found a significant price discount for rental apartments near nuclear power plants after the accident. Fink and Stratmann [20] used a difference-in-differences approach to investigate the change in home prices in the US after the Fukushima event. They found that home prices close to nuclear reactor sites did not fall relative to home prices at other locations. The oil and energy shocks had a significant effect on energy sector in China [25, 35, 63] and Kenya [33]. Moreover, the global warming and weather conditions had a significant effect on the electricity market in Brazil [58], Hong Kong and Singapore [4], and the European countries [45], as well as energy markets in the Southeast Asian countries [56] and the US [18, 32]. Furthermore, the global financial crisis also had a negative impact on the energy sector in China [41, 70, 71], the European countries [3, 7], Lebanon [10] and the US [57, 59]. Li et al. [41] found that exports decreased in the energy-related and raw material sectors during the global economic crisis. Wang and Guo [62] found that the European debt crisis caused asymmetric spillover effect between two types of energy markets. Yuan [68] found that the global financial crisis led to a decrease of 7.33% in GDP and a reduction of 9.21% in energy consumption in China.

3. Constructing the mathematical models

Contagion tests and the announcement sensitivity index are used in this research to model the effects of China’s nuclear expansion on nine major sectors across three countries. Three types of contagion tests are used to determine how individual sectors were affected by nuclear expansion. This is followed by a description of how we calculate the announcement sensitivity index to evaluate each industry’s performance over the entire post-announcement period. Finally, a range of Monte Carlo experiments are conducted to evaluate the performance of three types of contagion tests in terms of power property.

3.1. Contagion tests

In the economic literature, “contagion” refers to the spread of market disturbances to neighboring markets, sectors or countries [21]. Several methods of testing for financial market contagion have been developed [6, 14, 24, 53]. In this study, contagion tests based on changes in co-kurtosis and co-volatility are developed to examine the impact of nuclear policy announcements. These tests capture
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