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# Global terrorism and adaptive expectations in financial markets: Evidence from Japanese equity market

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### ABSTRACT

The adaptive expectations model posits that economic agents' expectations adjust by constant proportion of previous discrepancy and the forecast for the following period is the same for all the subsequent future periods, if the expectation is a permanent. We apply this hypothesis and event study methodology to examine the impact of five terrorist attacks (New York World Trade Centre, Bali, Madrid, London, and Mumbai) on Japanese industries. Being a watershed event, the negative impact of the attacks in the U.S. was apparent. Our evidence suggests an initial step-change in risk incorporated into expectations after the U.S., Bali and Madrid bombings. The two subsequent attacks had no effect on the market implying no the forecast error in risk expectation in Japan after the initial terrorist attacks.

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## 1. Introduction

Terrorism, a significant geopolitical risk that affects global financial markets, is not a recent phenomenon. The terrorist attack on the World Trade Centre twin towers in New York on September

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11, 2001 (9/11) has, however, proven to be a watershed event in global terrorism and fundamentally changed business operations and risk perception. Rosendorff and Sandler (2005) accentuate this point when they suggest that the event aptly underscored the susceptibility of modern societies to terrorist attacks as an everyday object could be utilised to wreck havoc on a gigantic scale. They also note that the magnitude of the attack and the resulting bloodshed were unprecedented in terms of terrorist attacks and that the financial losses resulting from the event (about USD 90 billion) were far greater than those associated with the terrorist attacks to date. Furthermore, they propose 9/11 set the standard for future attacks as terrorists try to exceed the scale of past attacks to capture and maintain media attention. This epochal event has intensified interest in the threat posed by modern-day terrorism and a new development on how terrorist risk is perceived. Combined with the globalisation trend in business, the post-9/11 environment has made a panoramic view of risk both essential and inevitable.

Karolyi (2006) provide a review of the literature on terrorism and the financial markets and indicate that there is an additional psychological fear of terrorism on economic behaviour that may turn out to be a permanent. This fear implies economic agents may form expectations based on recently observed events. The adaptive expectations hypothesis suggests economic agents' expectations adjust by constant proportion of previous discrepancy. The model suggests the expected target level is an exponentially weighted moving average of past observed averages, with recent values weighted more heavily (see Muth, 1960). Furthermore the forecast for the following period is the same for all the subsequent future periods, if the expectation is permanent and not transitory. However, if investors learn *ex post* that there is an error in their long term expectations of risk-return trade-off following new information in subsequent attacks, an adjustment in the permanent long term expectations would be made. Implicitly, being a turning point in global terrorism, if investors re-adjusted their risk-return expectation based on 9/11 terrorist event, then financial markets should not experience any significant abnormal returns and change in risk following subsequent terrorist events as these would have already been incorporated into investors' permanent expectations.

This paper examines the simple case of adaptive expectations hypothesis in financial markets following terrorist events and investigates the effect of dreadful attacks on the World Trade Centre in New York and four subsequent terrorist attacks (Bali, Madrid, London, and Mumbai) on all relevant Japanese industries. In a recent study, Broun and Derwall (2010) investigate the impact of 31 terrorist attacks on various stock markets and industries, including Japan. However, their analysis is limited to six industries (Airlines, Defense, Food, Hotels, Insurance, and Oil & Gas). We contribute to the literature by providing comprehensive analyses of all relevant industries in Japan. In addition, there is a non-negligible time difference between Japan and the U.S., and the European markets which we take into consideration in our empirical analysis. That is, in our estimated models we explore asynchronicity between these markets by including a feedback effect from the U.S. and the European markets to the Japanese market.

The deep economic ties as well as the flow of people between Japan on the one hand, and the Europe, Asia, and the U.S., on the other hand, suggests that terrorism poses a potent threat to the economic interests of Japan (Narayana and Narayan, 2010; Guzel and Ozdemir, 2011). This is evident from the speed with which Japan acted to push through counter-terrorism measures in their legislature following 9/11. Of financial markets, Japan was the first market to open following the initial September 11 and the subsequent four terrorist attacks (Bali, Madrid, London, and Mumbai). For example, unlike the U.S. market that opened six days after the attack, the Japanese market opened the day after the attack. Therefore, Japan offers a unique insight into the immediate reactions of domestic equity investors to international terrorism.

Following the adaptive expectations model, we initially hypothesise that those subsequent terrorist events after the September 11, 2001 bombings in the U.S. would not have significant impact on abnormal returns and risk in Japanese equity markets as investors have already incorporated geopolitical risks resulting from terrorism in their expectations around the 9/11 attacks. Nikkinen et al. (2008) show that market response to terrorist attacks in the U.S. differs across regions. We extend this pattern of thought and examine the micro content of the Japanese market, industry portfolios, and further hypothesise differential industry effects of terrorist attacks. We recognise that

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