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Global Finance Journal 16 (2005) 48–68

Global Finance Journal

Contagion and impulse response of international stock markets around the 9–11 terrorist attacks

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Received 4 March 2005; received in revised form 9 April 2005; accepted 10 April 2005
Available online 14 June 2005

Abstract

This study investigates both return and volatility contagion effects of the 9–11 terrorist attacks across the major markets, and examines the extent to which international stock markets can be destabilized by shocks that arise in the US. Evidence presented in this paper suggests that to the extent that higher correlations with the US market can enhance contagion effects from the US, the attacks brought about volatility contagion (rather than return contagion) from the US to UK and German markets. In contrast, the Japanese market had return contagion (rather than volatility contagion) from the US market. After the attacks, a US shock had a strongly positive effect on the US/Japan return correlation but had little or no effect in response functions of the return correlation for the US/UK and US/German markets. Impulse responses of the volatility correlation to a US shock notably increased after the attacks for the US/UK and US/German markets. An overall analysis of the post-attack period reveals that international market correlations were strengthened through volatility for the US/UK and US/German markets and through return for the US/Japanese market.
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JEL classification: F21
Keywords: 9–11 terrorist attacks; Contagion; Impulse response

1. Introduction

The tragic events of September 11, 2001 exacerbated an already very difficult situation in the US and world stock markets. The shock in the US market driven by the terrorist attacks

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doi:10.1016/j.gfj.2005.05.002

Table 1
Summary statistics of two-day stock returns

Country	Period	Mean of returns (%)	Standard deviation (%)
US	I	−0.1796	1.6550
	0	−5.0468	3.0513*
	II	−0.1396	1.5350
UK	I	−0.1784	1.4101
	0	−4.9366	4.0872*
	II	−0.1615	1.5199
Germany	I	−0.2645	1.7621
	0	−7.1447	5.3320*
	II	−0.2006	2.4053
Japan	I	−0.2195	1.8844
	0	−5.8326	2.7433*
	II	−0.0548	1.8437

Period I is the time period before the terrorist attacks; period 0 is the date immediately following the attacks; and period II is the time period after the attacks.
*Indicates the values of conditional volatility obtained from the standard deviation of residuals for which each index return is regressed on constant within a univariate GARCH (1,1) process.

gave rise to a synchronous downturn across nearly all major regions of the world. As seen from Table 1, two-day mean returns immediately following the attacks fell by 5.05% for the S & P 500, 4.94% for the FTSE 100 of the UK, 7.14% for the DAX of Germany, and 5.83% for the TOPIX of Japan. At the same time, the market volatility as measured by standard deviation rose drastically across the markets. Apparently, increased international financial linkages have played an important role in the synchronicity of global market downturns.

Many people have spoken or written about September 11 and its economic consequences. Enough perspectives exist to assess the impact of the attacks on the global economic situation, i.e., weakened consumer and business confidence, worsening financing conditions for emerging market economies, and rising transactions costs, etc.

The attacks, however, have potentially far-reaching implications for stock market behavior and deserve special attention in the finance literature for at least four reasons. First, although there were many incidents that severely affected US stock markets in the past, the 9–11 attacks appeared to be unique in the pattern of US stock market behavior after market crashes.[1] As seen from Fig. 1, while there was a gradual market resilience shortly after the crash for other incidents, the 9–11 attacks caused stock markets to plunge to a prolonged bear market after the attacks due to a long-term decline in consumer and investor confidence.[2]

[1] The US stock market crashes for the last three decades as measured by more-than-3% drop in daily S&P 500 market indexes include the Hunt silver crisis of 1980, the Black Monday of 1987, the Iraqi invasion of Kuwait of 1990, the Asian financial crisis of 1997, and the 9–11 terrorist attacks of 2001.

[2] One can claim that the prolonged bear market after the 9–11 attacks may be attributable to the business cycle rather than the 9–11 attacks. As reported by the NBER's Business Cycle Dating Committee (2003; http://www.nber.org/cycles), a recession began in March 2001 and the economy reached its trough (a turning point) in November 2001, entering a recovery. This observation in the business cycle that the aggregate economic activity has been rising since November 2001 does not seem to be compatible with overall stock market conditions that continued to be bearish for a long period of time even after November 2001. This suggests that a bear market after the 9–11 attacks may not be well explained by the business cycle.

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