Research in International Business and Finance 25 (2011) 329–334

Contents lists available at ScienceDirect

Research in International Business and Finance

journal homepage: www.elsevier.com/locate/ribaf

The dynamic interaction between volatility and returns in the US stock market using leveraged bootstrap simulations

Abdulnasser Hatemi-J*, Manuchehr Irandoust

Department of Economics and Finance, UAE University, P.O. Box 17555, Al Ain, United Arab Emirates

ARTICLE INFO

Article history:
Received 28 November 2010
Received in revised form 3 March 2011
Accepted 15 March 2011
Available online 25 March 2011

JEL classification:
G10
C30

Keywords:
Volatility
Returns
Causality
Leveraged bootstrapping

ABSTRACT

One of the most important stylized facts in finance is that stock index returns are inversely related to volatility. The theoretical rationale behind the proposition is still controversial. The causal relationship between returns and volatility is investigated in the US stock market over the period 2004–2009 using daily data. We apply a bootstrap test with leveraged adjustments that is robust to non-normality and ARCH. We find that the volatility causes returns negatively and returns cause volatility positively. The policy implications of our findings are discussed in the main text.

1. Introduction

The underlying link between the return on a financial asset and its variance or volatility as a proxy for risk is of fundamental importance for valuing financial assets, for identifying optimal hedging strategies and for evaluating regulatory proposals on monitoring the impact of international capital flows. Therefore, the theoretical asset pricing models (e.g., Sharpe, 1964; Merton, 1973) are based on the interaction between returns and risk. However, it is still controversial whether such a relationship is positive or negative, i.e., a fully acceptable economic clarification for the effect has not yet been offered (Bouchaud et al., 2001; Bollerslev and Zhou, 2006). Although most asset pricing models highlight a positive link between stock portfolio's expected returns and volatility (Baillie and

* Corresponding author.
E-mail addresses: AHatemi@uaeu.ac.ae (A. Hatemi-J), MEirandoust@uaeu.ac.ae (M. Irandoust).

0275-5319/$ – see front matter © 2011 Elsevier B.V. All rights reserved.
doi:10.1016/j.ribaf.2011.03.001

DeGennarro, 1990) under the assumption of investor risk aversion, it is a long tradition in empirical finance to model stock return volatility as negatively correlated with stock returns (Cox and Ross, 1976; Whitelaw, 2000).

The first effort to provide an economic justification for the negative return correlation relies on a corporate finance argument. Black (1976) and Christie (1982) argue that a positive stock return enhances the market value of the firm's equity, which in turn reduces its financial leverage ratio.[1] The diminished leverage gear will result in a lower volatility of stock returns. The empirical observations do not support this leverage hypothesis, however, for the two reasons that follow: (i) it is inconsistent with the observed asymmetry of the effects of volatility on stock returns in bull and bear markets (Figlewski and Wang, 2000) and (ii) it predicts a significant relationship of the volatility-return nexus on individual stock rather than on stock market indices, although Bouchaud et al. (2001) do not provide empirical evidence to support this prediction. However, the leverage effect implies that the causality runs from stock return to volatility. That is, the leverage effect is only one possibility to explain a return-driven negative correlation.

Another potential explanation for a negative correlation between returns and volatility is that bad news might have different consequences for future uncertainty than good news (Glosten et al., 1993; Chen and Ghysels, 2007). For example, a decrease in price could result in more extensive portfolio adjustment of risk-averse agents than price increases. Bouchaud et al. (2001) claim that the return-driven relationship originates from a retarded effect, i.e., the scale for price updates is not a function of the current price level but of a moving average of previous prices which implies that present returns lead subsequent volatility returns.

On the other hand, the hypothesis of a volatility-driven negative correlation (known as feedback effect in the literature) relies on the assumption that volatility is related to systematic risk and is therefore relevant for pricing (French et al., 1987; Campbell and Hentschel, 1992). If new information causes an unanticipated increase in volatility, this will also lead to an increase in risk-adjusted discount rates and stock prices will decrease under the condition that cash flow expectations are not affected.

The return-driven and volatility-driven effects might have interactions. That is, an initial price change could create a volatility movement which in turn amplifies the price change with yet another impulse on volatility (Bekaert and Wu, 2000). In efficient financial markets, the actors will anticipate these reactions, therefore, the steps will occur almost simultaneously and this makes it difficult to identify the different stages of the process.

Generally speaking, most empirical finance literature found an insignificant and unstable relationship between returns and conditional variance in international stock markets (Turner et al., 1989; Glosten et al., 1993). Some studies report a positive relationship between stock market returns and conditional variance of these returns (French et al., 1987; Campbell and Hentschel, 1992; Scruggs, 1998; Ghysels et al., 2005; Brailsford et al., 2006), others a negative relationship (Campbell, 1987; Nelson, 1991). In the case of return-driven as well as volatility-driven effects, the results of most empirical studies also are mixed. Bollerslev et al. (1988), Giot (2005), Dufour et al. (2006), and Masset and Wallmeier (2008) support a return-driven relationship while Bekaert and Wu (2000) and Dennis et al. (2006) reveal evidence of volatility-driven effect.

Our main contribution is to go beyond a correlation analysis by studying causality directions. To the best of our knowledge, this is the first study which applies bootstrap causality tests to the interaction of index returns and volatility. The method we apply is robust to non-normality and ARCH effects. These properties are frequently common elements of financial data in which standard methods perform poorly.

The rest of the paper is organized as follows. Section 2 presents data and the underlying model. Section 3 presents the estimated empirical results. The last section provides conclusions and policy implications.

[1] It should be mentioned that leverage is used in econometrics as a weight to adjust for heteroskedasticity.