The Analysis of Price-Volatility Feedback rate and Leverage effect using High-Frequency Data

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Extended Abstract

1 Introduction.

Modelling financial market volatility is at the heart of financial engineering since it is the basic measure of risk that investors face. Until recently, there were not many proxies of volatility to measure this risk. But the advent of high-frequency data lead to the concept of realized volatility which allows for detailed investigation of the relation between the volatility, price and return of a financial asset.

Two of the most important concepts that exploits these relationships are the volatility feedback effect and the leverage effect. For a company with a fixed amount of debt, its financial leverage increases when the market price of its stock declines. Black first proposes this leverage effect to explain the negative correlation between equity returns and return volatilities\textsuperscript{[1]}\textsuperscript{.} The main difference between these concepts lies in the causality: the leverage effect explains why a negative return leads to a higher subsequent volatility, whereas the volatility feedback effect justifies how an increase in volatility may result in negative returns\textsuperscript{[2]}\textsuperscript{.} The justification behind the volatility feedback effect is as follows: If volatility is priced, an anticipated increase in volatility would raise the required rate of return, in turn necessitating an immediate stock-price decline to allow for higher future returns, with fixed future cash flow projections, a forecasted increase in business risk increases the discount rate and reduces the present value of the business, generating the volatility feedback effect\textsuperscript{[2]}\textsuperscript{.} This volatility feedback effect can also show up as a negative correlation between equity return and volatility, irrespective of the level of financial leverage. Although these effects were anticipated in the literature for a while, it is very difficult to distinguish between them by use of lower-frequency data. Using the absolute high-frequency returns as a simple volatility proxy, Bollerslev et. al. found negative correlation between the volatility and the current and lagged returns, which lasts for several days. This result supports the notion of prolonged leverage effect at the intradaily level, and also an instantaneous volatility
feedback effect has been found.

On the other hand, Malliavin defines the instantaneous price-volatility feedback effect rate as a proxy of the instantaneous market liquidity rate as an indicator of the market stability [4]. Their proposed method is a model free Fourier transform method to compute both the volatility and the feedback effect rate.

In this work, we investigate the relation between the price-volatility feedback effect rate, leverage effect and the volatility feedback effect during different periods of the market; during large declines, before crisis and after crisis periods. Also, the relation between the long-memory characteristics of the leverage effect and the long-memory characteristics of the feedback effect rate is investigated to obtain a proper tool for forecasting financial crisis caused by the instantaneous feedback effect between the volatility and the liquidity of the market that represents the investors’ behavior against increasing risk.

References


