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Stock market asymmetric volatility and macroeconomic dynamics in Central and Eastern Europe

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Abstract

The risk on financial markets drives the performance of stock market investments in a national capital market, hence its interpretation in the minds of investors has a large influence on the dynamics of asset prices. The academic inclusion of fear on the financial markets is realized by the use of the concept of utility in a field that became mostly empirical in the development of modern finance. The creation of models on financial markets takes into account the so-called *downside* volatility reaction, as a stylized fact defined as the negative correlation between the return of a financial asset and the volatility of that asset. Our paper aims to measure this asymmetric volatility effect on the dynamics of Eastern European stock markets by using a wide set of GARCH models with coefficients for the effect of asymmetry and to detect its connection with the development of the macroeconomic environment. The objective is to reflect the differences between this connection and similar ones specific to developed economies.

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1. Introduction

The link between stock prices or stock returns and their volatility represents a key element in financial applications. Several studies demonstrated empirically that there is a negative correlation between returns and conditional variance.

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In other words, it has been observed that volatility is higher in market downswings that in market upturns. This phenomenon is called asymmetric volatility and has been strongly investigated in contributions like: Bekaert and Wu (2000), Wu 2001 or Jackwerth and Vilkov (2014).

Dennis et al (2006) observe that asymmetric volatility can also be defined as a negative correlation between the returns and innovations in expected volatility. In addition to this, the authors state that the scientific literature is discussing whether this phenomenon is firm-specific or on the contrary market-wide.

Econometric modeling initiatives targeting the analysis of the asymmetric volatility phenomenon (henceforth AVP) date back to Black (1976) and Christie (1982) which offer a leverage-based formulation of the concept. Black (1976) employs daily data ranging from 1964 to 1975 for a series of 30 stocks in order to observe the dynamics of volatility changes and returns. The returns are grouped into 21 day summed values and the volatility is estimated statistically. The main conclusion of the study is that for every decline in returns, the volatility increase is higher.

On the basis of data representing a series of 379 stocks observed during the 1962-1928 period, Christie (1982) derives the following equation in order to model the relation between volatility and returns:

$$n\left(\frac{\sigma_t}{\sigma_{t-1}}\right) = \beta_0 + \theta_s r_{t-1} + u_t$$

Where σ_{t-1} and r_{t-1} represent the estimations for volatility and returns over a given quarter. The results indicate a positive link between volatility and leverage.

Schwert (1989) extends the leverage hypothesis without obtaining a clear causality relation between leverage and the dynamics of volatility.

Bekaert and Wu (2000) review the AVP literature consulting 15 different approaches and report several conflicting empirical results. French, Schewert and Stambaugh (1986) and Campbell and Hentschel (1992) observe that the relation between volatility and the expected return has a positive nature. On the other hand, Glosten, Jagannathan and Runkle (1993) and Nelson (1991) report that this relation is negative. Besides this lack of consensus, a further division exists in the way in which the models are constructed. One approach considers AVP at the market level, while the other focuses on the firm or portfolio. The first approach is based on the time-varying risk premium assumption and it is generally studied through the use of the GARCH family of models whichcompute the link between return innovations and the conditional volatility of returns. The second approach incorporates the leverage hypothesis and is in general a regression analysis that generates as output the causal relation between the level of volatility specific to a time frame and the level of returns specific to the previous one. Bekaert and Wu (2000) try to incorporate both these perspectives in a model that also considers covariance asymmetry as firstly documented by Kroner and Ng (1998). These approaches have been extended since is what became a strong stream of scientific literature.

Cheung and Ng (1992) study the relation between future volatility and current market prices using a series of daily returns from 1962 to 1989. Using an EGARCH model, they show that over a time span the conditional variances tend to became less reactive to price variations.

An original explanation of the negative relation that characterizes stock returns and fluctuations in future volatility is put forward by Duffee (1995). He bases his argumentation on the *contemporaneous* link between the two parameters and proposes the following regression functions:

$$ln(\sigma_t) = \alpha_1 + \lambda_1 r_t + u_{t,1}$$
$$ln(\sigma_{t+1}) = \alpha_2 + \lambda_2 r_t + u_{t+1,2}$$

Koutmos (1998) sets out to investigate whether the conditional mean and the conditional variance of stock returns can be expressed as asymmetric functions of the past data. Using a Threshold GARCH model and a series of data specific to nine national stock markets, the author reports that both parameters react asymmetrically to previous existing information, demonstrating the leverage effect.

Blair Poon and Taylor (2002) analyze the volatility of the S&P 100 index adapting the asymmetric volatility model of Glosten et al. (1993). They conclude that the index has a higher volatility reaction to negative returns than to the positive ones.

Chuhsiung and Chen (2003) examine the asymmetric volatility of all the individual stocks in the Taiwan stock market between 1993 and 2001. The authors find that 15% of the companies displayed asymmetric return volatility before the Asian financial crisis and 25% after.

The study of the asymmetric properties of volatility remains a current research topic. Hasanhodzic and Lo (2011) contradict the general leverage theory as proposed by Black (1976). Building on a sample of all-equity-financed firms,