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Asymmetries in stock markets

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ABSTRACT

This paper analyzes three major asymmetries in stock markets, namely, asymmetry in return reversals, asymmetry in return persistency and asymmetry in return volatilities. It argues for a case of return persistency as stock returns do not always reverse, in theory and in practice. Patterns in return-volatility asymmetries are conjectured and investigated jointly, under different stock market conditions. Results from modeling the world's major stock return indexes render support to the propositions of the paper. Return reversal asymmetry is illusionary arising from ambiguous parameter estimations and deluding interpretations of parameter signs. Asymmetry in return persistency, still weak though, is more prevalent.

1. Introduction

While asymmetric time-varying volatility on the stock market has been widely documented in the empirical literature, the other major asymmetric phenomenon, asymmetry in returns, has yet to be scrutinized. Although the former has been publicized with the news argument, the leverage notion and even an econometric model of EGARCH (Exponential General Autoregressive Conditional Heteroskedasticity, cf. Nelson 1991), the latter is more direct in shaping returns to investors. Further, interactions between return and volatility asymmetries need to be probed into, to identify the right source of asymmetry and to avoid the delusion of one kind of asymmetry in the name of the other. Critically, most empirical studies have overlooked the difference between a shock to stock returns and the return itself, thereby the terminology of asymmetry in return reversals has emerged, which is at most half of the veracities. During stock market upturns, both slope and intercept parameters in the mean (return) equation are likely to be positive, so positive returns persist and negative returns may tend to reverse, regardless of a positive or negative past return shock. The present study proposes hypothetically and tests empirically this new strand of asymmetry, i.e., return persistency asymmetry, alongside return reversal asymmetry and their interactions.

The rest of the paper progresses as follows. The next section provides a brief review and discussion of recent research on asymmetries in stock return reversals and volatilities. Section 3 specifies the models and develops the corresponding hypotheses. It elaborates on the behavioral patterns in return reversal/persistency asymmetry and volatility asymmetry, vis-à-vis the restrictions imposed on the return reversal/persistency asymmetry parameters and the volatility asymmetry parameters. Section 4 presents the empirical results and findings of this study, with further deliberation on the implications of the present study. Finally, Section 5 summarizes this study.

2. Asymmetries in stock return reversals and volatilities

It has been widely documented that a negative shock to stock returns, or an unexpected fall in the stock price, tends to increase volatility of the stock to a greater extent than a positive shock to stock returns, or an unexpected rise in the stock price of the same magnitude. This kind of volatility asymmetry exhibits asymmetric responses to good news vis-à-vis bad news, and is reasonably attributed to, and explained by, the leverage effect in the literature. It is not the intention of the present paper to review this kind of asymmetry in volatilities, which is abundant in the literature ready to be referred to. Studies on return reversals, or stock market overreactions and asymmetries in stock market returns, include De Bondt and Thaler (1985) in early days, which continues to progress and one of the recent examples is Kedar-Levy, Yu, Kamesaka, and Ben-Zion (2010). De Bondt and Thaler (1985) have found that investors overreact on the stock market, using monthly returns on the stocks listed on the New York Stock Exchange for the period between January 1926 and December 1982. Their results and findings are confirmed or supported by later studies by Zarowin (1989,1990), Dissanaike (1996), Kim and Nelson (1998), Malliaropulos and Priestley (1999), Atkins and Dyl (1990) and Bremer and Sweeney (1991), Iihara, Kato, and Tokunaga (2004), and

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Table 1
Persistency and reversal patterns: $R_t = \mu_0 + \mu_1 R_{t-1} + \varepsilon_t$.

μ_0	0	+	−	+	−	+	−	0
μ_1	+	+	+	0	0	−	−	−
$R_{t-1} > 0$	Persist	Persist	Mixed	Persist	Reverse	Mixed	Revers	Reverse
$R_{t-1} < 0$	Persist	Mixed	Persist	Reverse	Persist	Reverse	Mixed	Reverse

Nam, Pyun, and Avard (2001). Recently, Hwang and Rubesam (2013) provide an explanation to overreactions and asymmetries in stock returns based on behavioral biases. Two conditions that increase return reversals are proposed. Return reversals increase when investors respond to public signals asymmetrically or when public signals become noisy.

Most empirical studies, however, have overlooked the difference between a positive (negative) shock to stock returns and a positive (negative) return itself. Their results and findings may look sound with return data in stock market downturns or stagnation, but are questionable otherwise. Failing to differentiate shocks to returns and returns themselves would mingle persistence with reversion. These can be demonstrated with a basic model for capturing reversion, $R_t = \mu_0 + \mu_1 R_{t-1} + \varepsilon_t$. During booming times or stock market upturns, both slope and intercept parameters in the mean (return) equation are likely to be positive, so a positive past return tends to persist, regardless of a positive or negative past return shock. Whereas negative past return could either persist or reverse, depending on the relative size of the intercept and slope parameters. Table 1 summarizes the return persistency/reversal patterns of positive and negative past returns, given assorted combinations of the intercept and slope parameters. The table is arranged with return persistency decreasing/return reversals increasing from left to right, starting with the highest return persistency tendency case and ending with the highest return reversal tendency case. It can be observed that no clear patterns of persistency/reversals exist in many cases, even less unlikely for asymmetry in return persistency/reversals. Return reversals may apply to stock market downturns, during which the slope parameter is likely to be negative. When stock prices stagnate, the slope parameter can be negative with a positive intercept, or be positive with a negative intercept, and the former case could exhibit mean reversion tendencies. As returns do not always reverse, we study whether stock returns would persist with a higher compounding rate following a positive return shock as against a negative return shock.

There are a few real and behavioral factors that may possibly induce asymmetry in return persistency and reversals. In booming times, the stock price is on average rising around an up sloping trend. A positive past return shock coupled with a positive past return means that, while the expectation was on the rise, it was not higher enough in the previous round. Whereas a negative past return shock coupled with a positive past return indicates that investors were over optimistic. Positive stock returns are therefore more likely to persist and to persist to a higher degree in the former than in the latter. The catchphrase "a good round deserves another" probably best explains this asymmetry pattern. Then it comes to the case of a negative past return. Stock returns would reverse to a larger degree with a positive past return shock, vis-à-vis a negative past return shock, under our framework. i.e., stock returns would become positive or lesser negative following a positive return shock, but remain negative or deeper negative following a negative return shock. The conventional propositions and analysis in return reversals in the existing literature would work appropriately in stock market downturns, nevertheless. With a negative slope parameter under the circumstances, stock returns almost always reverse. With the expectations that stock performance improves more or deteriorates less following a positive return shock than a negative return shock, there would be the following patterns in return reversal asymmetry. Experiencing a positive past return shock, stock returns would reverse to a lesser extent when the past return was positive, and would reverse to a larger extent when the past return was negative, both being an indication of improving performance or recovery. Whereas given a negative past return shock, stock returns reverse to a larger extent with a positive past stock return and to a lesser extent with a negative past stock return, both being the indication of deteriorating performance or relapse.

Few studies have included both asymmetric return reversals and asymmetric time-varying volatilities in empirical investigations, nonetheless. Adopting an ANST-GARCH modeling approach, Nam, Pyun, and Avard (2002) study asymmetric mean reversion and contrarian profits, so both asymmetries in mean reversion and time-varying volatilities can be examined. Koutmos (1998) tests the hypothesis for nine national stock markets that both the conditional mean and the conditional variance of stock index returns are asymmetric functions of past information. The empirical evidence suggests that both the conditional mean and the conditional variance respond asymmetrically to past information. He alleges that asymmetry in the conditional mean is linked to asymmetry in the conditional variance, because the faster adjustment of prices to bad news causes higher volatilities during down markets, which suggest that volatility asymmetry increases with mean reversion asymmetry. Park (2011) suggests that asymmetric herding is a source of asymmetric return volatility. His work is based on exchange rate data though and involves no asymmetries in return reversals. Charles (2010) has found that asymmetry influences the day-of-the-week effect on volatility. Hua and Zhang (2008) deal with asymmetry in conditional distribution and volatility asymmetry. It is claimed that empirical results of one-step-ahead density forecasts on the weekly S&P500 returns suggest that forecast quality can be significantly improved by modeling these asymmetric features.

Recently, Wang and Wang (2011) have scrutinized the interactions between return reversal asymmetry and volatility asymmetry. They suggest that mean reversion asymmetry and volatility asymmetry may originate from similar sources and causes but the two asymmetries do not reinforce each other. Volatility asymmetry can be a measure of ambiguity in mean reversion asymmetry. There would be no or weak volatility asymmetry, instead of strong, definite volatility asymmetry, when there is a strong, clear pattern of mean reversion asymmetry. They argue that asymmetric return reversals can be better explained by risk aversion functions where relative risk aversion is a decreasing function of wealth levels, or conditional on the direction of changes in wealth levels. This asymmetry in risk premium requirements could be the source of asymmetry in return reversals that would otherwise have been symmetric. They propose that asymmetry in variances is the residual effect of mean reversion asymmetry in the interaction between the mean and the variance, in terms of the trade-off between asymmetry in return reversals and asymmetry in time-varying volatilities. Their empirical results contradict those in Koutmos (1998).

Different from all the previous research, the present study scrutinizes return persistency asymmetry in exploiting the mystery in return behavior and patterns. It is in contrast to Wang and Wang (2011) and Koutmos (1998) who have associated the two asymmetries in return reversals and in volatilities to a certain extent. The present study makes inquiries into whether and how asymmetry in return reversals and persistency surfaces. The study examines return reversal/persistency asymmetry and volatility asymmetry jointly and in a balanced way, imposing no prior conditions on the likely patterns