Economic Systems xxx (2015) xxx–xxx

Contents lists available at ScienceDirect

Economic Systems

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

Unravelling the asymmetric volatility puzzle: A novel explanation of volatility through anchoring

Mihály Ormos*, Dusan Timotity**

Department of Finance, Budapest University of Technology and Economics, Magyar tudosok krt. 2., 1117 Budapest, Hungary

ARTICLE INFO

Article history:
Received 4 November 2014
Received in revised form 28 September 2015
Accepted 30 September 2015

JEL classification:
G02
G14
C53
C58

Keywords:
Anchoring
Implied volatility
Realized volatility
Asymmetric volatility
VIX
VXST

ABSTRACT

This paper discusses a novel explanation for asymmetric volatility based on the anchoring behavioral pattern. Anchoring as a heuristic bias causes investors to focus on recent price changes and price levels, which leads to a belief in continuing trend and mean-reversion, respectively. The empirical results support our theoretical explanation through an analysis of large price fluctuations in the S&P 500 and the resulting effects on implied and realized volatility. These results indicate that asymmetry (a negative relationship) between shocks and volatility in the subsequent period indeed exist. Moreover, contrary to previous research, our empirical tests also suggest that implied volatility is not simply an upward biased predictor of future deviation compensating for the variance of the volatility but rather, due to investors' systematic anchoring to losses and gains in their volatility forecasts, a co-integrated yet asymmetric over-/under-estimated financial instrument. We also provide results indicating that the medium-term implied volatility (measured by the VIX Index) is an unbiased though inefficient estimation of realized volatility, while in contrast short-term volatility (measured by the recently introduced VXST Index representing the 9-day implied volatility) is also unbiased and yet efficient.

1. Introduction

Despite volatility forecasting models having undergone a long evolution, the novel regressions still have difficulty estimating the deviation of future returns. Currently, the most common techniques, including ARCH-type models (Lamoureux and Lastrapes, 1993; Blair et al., 2001) and model-free volatility forecasts (Carr and Madan, 1998; Demeterfi et al., 1999; Britten-Jones and Neuberger, 2000; Carr and Wu, 2009), fail to explain the effects of jumps and non-continuities in the price of the underlying asset. However, Taylor et al. (2010) argue that methods based on implied volatility ("IV") are likely to outperform the aforementioned methods if the prediction horizon extends until the expiry date of the options. Becker et al. (2009) also conclude that IV itself contains more information than individual model-based forecasts. For short-term volatility, our paper supports the ideas of Taylor et al. (2010) and Becker et al. (2009), as we measure that IV subsumes the information contained in historical realized volatility ("RV"). Notwithstanding, in the long run we do find that, although co-integrated with RV, IV is an unbiased yet inefficient estimation of the future deviation of returns.

* Corresponding author.
** Corresponding author.
E-mail addresses: ormos@finance.bme.hu (M. Ormos), timotity@finance.bme.hu (D. Timotity).

http://dx.doi.org/10.1016/j.ecosys.2015.09.008
0939-3625/

Standard volatility autoregression models imply that massive changes in the price of the underlying asset should result in increased RV over the next period; however, our findings show that volatility increases only in case of losses. This phenomenon is known as asymmetric volatility. Despite the large amount of literature devoted to asymmetric volatility (Black, 1976; Christie, 1982; Schwert, 1989), which we discuss below in detail, no adequate explanation for this has been given yet. In this paper, we propose a novel explanation for this phenomenon based on the anchoring heuristic (Kahneman and Tversky, 1974, 1979).

According to Fleming (1998) and Andersen et al. (2003), by applying a model that corrects the IV's upward biased forecast, implied volatility has a greater predictive power. In contrast, we find that analyzing the relationship in the context of asymmetric volatility, their results only hold in the case of price declines in the underlying asset. Since white noise effects are canceled out, on average, these two types of volatility reflect the same level of standard deviation (as measured by our co-integration tests and by the fractional co-integration results of Bandi and Perron, 2006). Moreover, the IV of a given period is conditional to the filtration at the beginning of the interval (*ex ante*), whereas the RV is measured at the end (*ex post*). Therefore, through an analysis of the relation between the two, effects having a different influence at the beginning of and during a given period can be separated. Furthermore, in our proposed reasoning for this asymmetric volatility, the anchoring exactly follows this type of effect, thereby fading out over time. Hence, we may bolster our theory with empirical support by describing the relation of RV and IV through regressions and event studies.

We also provide robustness tests in two ways: first, we test whether anchoring is also present in short-term analysis, and second, we examine alternative intervals of the return distribution. In other words, we test whether the asymmetry is present only in case of extreme circumstances or generally throughout.

This paper is organized as follows: Section 2 discusses our anchoring-based explanation for the asymmetric effect. Section 3 provides a review of the data and methodology used. In Section 4, our empirical results are presented in detail and, lastly, in Section 5 we offer a brief conclusion of the main contribution of our research.

2. Anchoring and asymmetric volatility

A debate has raged over the last few decades as to which factor is responsible for the asymmetric volatility effect (i.e. are stock returns negatively correlated with the volatility of the next period?). Bae et al. (2007) argue that there are currently two main explanations for the asymmetric volatility puzzle. The first is the leverage effect noted by Black (1976),Christie (1982) and Schwert (1989). These authors find, if rather simply, that if the value of an equity drops, the firm becomes more leveraged, thereby causing the volatility of equity returns to rise. All three authors conclude that, although volatility is indeed an increasing function of financial leverage, the effect by itself is not sufficient to account for the observed negative correlation. The second explanation is the volatility feedback hypothesis, which states that in cases of unexpected increases in volatility, future expected volatility rises and thus the required return of the stock also increases, resulting in an immediate negative impact on the current stock price. Although numerous studies have found evidence in support of both explanations (Pindyck, 1984; Kim et al., 2004), recent studies still provide results that frequently contradict each other. Bollerslev et al. (2006) find that the analysis of high-frequency data indicates no significant volatility feedback, while Bekaert and Wu (2000) conclude that the leverage effect is insignificant. We aim to introduce an alternative explanation for this conundrum.

Since the milestone paper of Kahneman and Tversky (1974), much research has provided support for the existence of anchoring (Ariely et al., 2003; De Bondt, 1993; Shefrin, 2002). De Bondt (1993) suggests that anchoring consists of two separate effects. On the one hand, price anchoring leads people to rely heavily on average past price levels, and therefore an unexpected exogenous shock in the price could imply a belief in mean-reversion and, in the short term, lead to under/overpricing without any significant effect on the fundamental value (see also De Bondt and Thaler, 1985; Daniel et al., 1998; Barberis et al., 1998; Chopra et al., 1992). On the other hand, De Bondt (1993) underlines that, in addition to recent price levels, past returns (i.e. previous trends) are also used as anchors in investors' expectations. Therefore, linear extrapolations of bullish and bearish trends are also present in estimations of future prices. The latter might be attributed either to the representativeness heuristic, which would imply that investors interpret the recent trend as a representative pattern for the whole time-series, or to the availability heuristic, implying that investors pay much more attention to recent information. However, as in De Bondt (1993), we argue that, instead of the alternative heuristics, both of the anchors (i.e. the price level and its recent change) are in focus and therefore form the future expectations together. According to his results, in contrast to alternative explanations implying that the recent trend is believed to continue (e.g. the representativeness heuristic), the subjective probability given to the continuing trend is much higher than that of a mean-reverting process following bull markets, whereas in the case of bear markets the difference is insignificant. Therefore, due to the asymmetric distribution of trend followers and contrarians, previous gains yield more identical expectations of the future price, resulting in lower anticipated volatility than losses that equally include estimates of both mean-reverting and trend continuing predictions. In other words, in the case of bull markets, the effect of the price change anchor (i.e. continuing trend) dominates over the price level effect (i.e. mean-reversion), whereas in the case of bear markets both anchors contribute equally to the prediction of future prices, hence increasing uncertainty, which in turn leads to a higher uncertainty of estimated future price

Having formed the expected (i.e. implied) volatility, the last step in the effect of previous anchors on future risk consists of the relationship between the estimated and realized volatility. According to the law of one price, forward and option prices should converge to current spot prices, and vice versa (Cox et al., 1981; Fama, 1984). Therefore, through the convergence of prices, IV affects RV and results in a positive linear relationship. Hence, there is a respective increase or decrease in IV and RV

Please cite this article in press as: M. Ormos, D. Timotity, Unravelling the asymmetric volatility puzzle: A novel explanation of volatility through anchoring, Econ. Syst. (2016), http://dx.doi.org/10.1016/j.ecosys.2015.09.008