Chapter 8

VOLATILITY FORECASTS AND THE PROFITABILITY OF AUTOMATED TRADING STRATEGIES

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Abstract Traditional approaches to forecast option prices and implement trading strategies make use of implied volatilities. Noh, Engle, and Kane (1994) propose a different approach. Based on conditional variance models of the GARCH type they forecast volatility and use these forecasts to predict future option prices. In combination with simple trading rules Noh et al. evaluate the profitability of these forecasts for the S&P 500 index. In this paper we take up their approach and apply it to Bund future options. We show that volatility forecasts together with simple option trading strategies create value. The profits can be significant even when transaction costs are taken into account.

1. Introduction

Traditional models of option price forecasts use implied volatilities to predict future prices. The theoretical basis for this approach is rooted in option pricing theory. In efficient capital markets volatility must be reflected in option prices. While there is a large body of literature to test this proposition empirically (see e.g. Schmalensee and Trippi (1978)) Noh, Engle, and Kane (1994) take a different approach to forecast option prices. They make use of a GARCH model to predict the volatility of

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asset returns and use the forecasts to predict option prices. ARCH and GARCH models as proposed by Engle (1982) and Bollerslev (1986) are asset return models which capture the dynamic behavior of conditional volatility without presupposing any option price formula. ARCH and GARCH volatilities can, however, be used to predict future option prices. This is done by taking a GARCH volatility forecast together with an option pricing formula to calculate future option prices.[1] Applying a GARCH model in such a way is equivalent to an efficiency test of the option market.

Noh, Engle, and Kane (1994) analyze the efficiency of the market for the S&P 500 index option. Their analysis is set up as follows. First, historical asset returns of the S&P 500 are used to estimate a GARCH(1,1) model which in turn is used to predict daily volatilities. Second, the Black and Scholes (1973) option price formula is used together with the volatility forecasts to predict future option prices. The option price forecasts, and hence the efficiency of the option market, are analyzed on the basis of simple trading rules. Noh, Engle, and Kane (1994) take *at-the-money straddles* to benefit from the accuracy of the volatility forecasts. Since a straddle is a delta-neutral strategy, mainly changes in volatility cause a shift in the straddle price and therefore they make use of the following strategy. If the forecast of the future straddle price is above today's closing price, the straddle is bought (long position) and if it is below, it is sold (short position). Rates of returns for this strategy are calculated on a daily basis. It turns out that GARCH volatility forecasts and corresponding price forecasts for *near-the-money straddles* can result in significant profits even after transaction costs are taken into account. As a consequence the market for the S&P 500 index option is inefficient in such a way that historical information as exploited in a GARCH model generates value.

In this paper we take up the approach proposed by Noh, Engle, and Kane (1994) and apply it to Bund future options as traded at LIFFE.[2] Hence, our objective is twofold. Firstly, we need to analyze whether or not GARCH models are appropriate to capture the dynamics of conditional variances for interest rate futures markets. Secondly, we are interested in the efficiency of the option market on the Bund future. The trading rules applied in this paper are the same as proposed by Noh, Engle, and Kane (1994). We use *near-the-money straddles* and

[1] It should be noted, however, that it is not theoretically sound to use any possible option pricing model together with GARCH volatilities. A theoretically sound approach must guarantee that the option pricing formula is consistent with the returns generating process.

[2] For a similar analysis with DAX data see Schmitt and Kaehler (1996).