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# Implied volatility dynamics in the foreign exchange markets

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**Abstract**

The purpose of this study is to examine the dynamics of implied volatilities derived from the major currency options on futures. Several studies have examined the properties of implied volatilities in the equity and interest markets. However, very little is known about the dynamics of implied volatilities derived from the currency options markets, which is the subject of this paper. The results show that participants in the currency market tend to expect higher future volatility when the currency market fluctuates in a large scale regardless of the direction, implying that uncertainty, as measured by implied volatility, would be higher when movements of exchange rates are large. We also provide evidence that in the foreign exchange markets, the traders' trading pattern, or the private information, in addition to the public information, also drive the intraweek implied volatility patterns. Finally, we document that it would be difficult to earn abnormal trading profits with portfolios based on the observed patterns of implied volatilities, and conclude that the foreign exchange options on futures market is efficient in this sense.


*Keywords:* Foreign exchange; Implied volatility; Options on futures; Macroeconomic announcements; Delta-neutral portfolio

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## 1. Introduction

The standard option pricing models do not evaluate the market's expectation of future volatility, but we can obtain the expectation by inverting the observed option price. This implied volatility is widely believed to be the market's best forecast regarding the future volatility over the remaining life of the option. A number of studies have focused on this predictive power of implied volatility. In the equity market, for example, Day and Lewis (1992) show that the implied volatility contains incremental information relative to the conditional volatility from GARCH models while Canina and Figlewski (1993) find that implied volatility has little predictive power for future volatility. More recent studies, such as Fleming et al. (1995); Christensen and Prabhala (1998); Fleming (1998), and Bates (2000), however, confirm that implied volatility outperforms other volatility measures in forecasting future volatility although there is some evidence that it is a biased forecast. Jorion (1995) also reports the similar findings in the currency options markets.

A group of other studies have examined the statistical dynamics of implied volatility to understand its behavior. Harvey and Whaley (1992) study the implied volatility of the S&P 100 index option and report that implied volatility changes are not unpredictable. They also document that implied volatilities tend to fall on Fridays and rise on Mondays. Fleming et al. (1995), however, find virtually no intraweek seasonality with the CBOE Market Volatility Index (VIX), an average of S&P 100 option implied volatilities. In addition, they show that VIX is inversely related to the contemporaneous S&P 100 index returns, and that both daily and weekly VIX changes are more sensitive to the negative than the positive stock market moves. In a study of Treasury bond option market Simon (1997) also reports similar implied volatility asymmetries. From a different perspective Ederington and Lee (1996) show that the implied volatilities in the Treasury bond and Eurodollar options on futures markets tend to decline on the days with scheduled macroeconomic announcements, which are also responsible for the intraweek patterns of implied volatilities.

However, very little is known about the properties of implied volatility derived from the currency options, which are the subject of this paper[1]. Specifically, we explore the temporal relationship between changes in implied volatility from the currency options on futures and the corresponding underlying future returns. We also study the impact of scheduled macroeconomic announcements on the changes in implied volatility, and intraweek patterns in the presence of announcement day effect. We finally test whether one can obtain abnormal trading profits with a trading strategy based on the observed implied volatility patterns. The results of this study have important implications for option traders who need to better understand the behavior

[1] There are some studies on the properties of implied volatility in the currency market. For example, Fung and Hsieh (1991) study whether the call(put) implied volatility in Deutsche mark is related to the levels of the DM futures with a data set covering from February 1985 till July 1989, and fail to find any noticeable relationship between them. Ederington and Lee (1996) examine the impact of macroeconomic announcements on the implied volatility derived from DM option on futures contract for the period from November, 1988 till September, 1992, and find little evidence of announcement day effect.