Derivatives Trading

Information embedded in the trading volume of currency options

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Abstract

This paper expands on the existing literature about the predictive power of the trading volume of options for the future spot price of assets. It presents an empirical examination of the relationship between the trading volume of options for the Canadian dollar, the Swiss franc and the British pound and their exchange rates against the US dollar, 17 h after regular trading hours in Chicago. Except for the Canadian dollar, an additional day of trade distorts these relationships. At the same time, the exchange rate of the Japanese yen was less related to the options' volume of trade. It is seen that different currencies, which are traded in their homeland during different regular trading hours, are accordingly related to the options trading volume in Chicago.

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INTRODUCTION

This paper attempts to investigate the relationship between the trading volume of options on foreign currencies and the future spot exchange rate. Estimation of this relationship is done both one and two days after the trade-in options. The trading volume in options was measured for four currencies on the Chicago Mercantile Exchange over a period of five years, while the spot exchange rate was measured one and two days later. The ratio of put to call volume also serves as an explanatory variable of the changes occurring in the future spot exchange rate.

In the next section, the author discusses the relevant literature about the volume of trade in options and its relationship with the spot price. The model is described in the penultimate section and the results of the empirical estimations are presented in the final section.

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THE LITERATURE

Several papers have focused on the role of options trading-volume in the markets. After Anthony¹ showed the interrelation of stock and option market trading-volume, Easley *et al.*² rejected the hypothesis that option volume contains no information about future spot prices. In their empirical study, the latter authors show that past option volumes have information content. Their main result is that negative and positive option volumes contain information about future stock prices. Hagelin³ looked for the information contained in the volume of options traded in Sweden and investigated the relationship between option market activity and cash market volatility on the OMX index. Chan *et al.*⁴ studied the intra-day interdependence between New York Stock Exchange stocks and their Chicago Board Options Exchange (CBOE) traded options. Lamont and Stein⁵ mentioned the relationship between the ratio of put-to-call volume and market valuation, while Chakravarty *et al.*⁶ found informed trading in stock and option markets. As for the foreign currencies markets, Sarwar⁷ found interrelation of price volatility and trading volume of currencies options.

THE MODEL

The model predicts changes in foreign currencies' spot exchange rate as a function of past trade volume in put and call currencies options. Traders who expect an increase in the price of a foreign currency will demand call options, while those who expect a decrease in the price of a currency will demand put options. Although buying a call is similar to selling a put, markets show that the volume of call options and the volume of put options traded in stock

exchanges are different. Put-to-call ratio (PCR) is a very popular index viewed by many reporters as a proxy for the stock market sentiment or trading pressure (see eg Tan⁸). PCR is published continuously online by many internet websites that report financial news. Some sites add figures, which summarise historical data. Traders who want to hedge against risk are not indifferent to buying a call and writing a put. Buying a call protects them against uncertain future exchange rates while writing a put presents an additional risk. The sold options can be supplied by a financial institution that holds positive or negative assets of the foreign currency.

Measuring the exchange rate is easy, but measuring trade volume is impossible. The market for currencies and their derivatives is active around the world and around the clock. Nevertheless, the reported volume of trade in currencies options during the regular trading hours (RTH) on the Chicago Mercantile Exchange (CME) can serve as a proxy for the magnitude of the general volume of trade due to its significant part in world options trade. Unfortunately, activity in CME does not represent all option traders. Those who trade in CME are probably traders who do not have sufficient credit to transact in the over the counter market.

Data were observed over a five-year period, from January 1988 to October 2002. Statistical estimations of regressions were performed in order to examine the relationship between the trading volumes of put and call options for four currencies in CME during regular trading hours (RTH: 7:20 am–2:00 pm Central USA time) and the spot dollar-based exchange rates on the next day at 7:00 am (this takes place 17 h after 2:00 pm, just before the start of the next RTH).

The spot exchange rates are observed again after two days (41 h after RTH). Weekends and holidays were omitted from our data. The selected exchange rates against the US dollar are the Canadian dollar (CD), the Swiss franc (SF), the British pound (BP) and the Japanese yen (JY). The establishment of the Euro cancelled the possibility of following the currencies of the Euro block countries.

The following notation is used: i is the currency (CD, SF, BP, JY); R_{it} the exchange rate of currency i on day t at 7 am Central USA time (CT); V_{cit} the total volume of calls on currency i traded in CME during the RTH of day t ; V_{pit} the total volume of puts on currency i traded in CME during the RTH of day t ; $PCR_{it} = V_{pit}/V_{cit}$ of currency i traded in CME during RTH of day t .

The prices of options are missing from the model and it is thus impossible to know whether traders in options benefited from this trade or lost money.

The two following logarithmic equations for the four currencies at two points in time are estimated:

$$\ln\left(\frac{R_{i(t+\Delta t)}}{R_{it}}\right) = \beta_0 + \beta_1 \ln(V_{cit}) + \beta_2 \ln(V_{pit}) + \varepsilon_t \quad (1)$$

$$\ln\left(\frac{R_{i(t+\Delta t)}}{R_{it}}\right) = \lambda_0 + \lambda_1 \ln(V_{cit} + V_{pit}) + \lambda_2 \ln(PCR_{it}) + \varepsilon_t \quad (2)$$

Δt denotes either 17 or 41 h after the RTH.

The two explanatory variables of Equation (2), the sum of options and the PCR, give the specific volume of put and call options as they appear in Equation (1). Thus, Equation (2) does not add much to Equation (1) and is estimated in accordance with previous studies. Since Easley

*et al.*² found a significant effect of the total volume of trade (puts and calls together) on the price of stocks, it was chosen as an explanatory variable in Equation (2). An econometric analysis performed by Simon and Wiggins⁹ tried to examine the predictive power of PCR together with other sentiment indicators. Their analysis shows contrary signs for the regression coefficients, which should explain S&P futures returns. These impressive and varied reports have generated curiosity to discover more about the statistical relationship between the published PCR index and the future spot exchange rate.

The null hypothesis of the statistical test is that the four regression coefficients of the logarithmic regressions denoted by β_1 , β_2 , λ_1 , λ_2 , are zero.

RESULTS

For each currency, four regression equations were estimated and the results are presented in Tables 1 and 2. Cochrane–Orcutt estimates were done in order to overcome the possibility of autocorrelation. The estimators of the eight constants (β_0 and λ_0) were not statistically significant and have been omitted from the tables. In all calculations, there is one iteration, as the serial correlation is low.

Table 1 shows that for the three currencies: CD, SF and BP the volume of calls is positively correlated with the change of the spot currency price after 17 h, while the volume of puts is negatively correlated with this price. The coefficients and the level of significance of the first three regressions presented in Table 1 are very similar. For the CD, the most significant coefficients and largest R squared were found. The difference in the value of our predictive information about the future spot exchange rate

Table 1: Exchange rate as a function of trading volume of currency options 17 h after RTH in CME: Cochrane–Orcutt estimates of logarithmic transformation

<i>Explanatory variable</i>	<i>Canadian Dollar</i>	<i>Swiss Franc</i>	<i>British Pound</i>	<i>Japanese Yen</i>
Calls volume	3.56 (3.24)	5.33 (2.78)	4.32 (2.23)	4.90 (1.22)
Puts volume	−4.24 (−3.57)	−4.89 (−2.33)	−4.12 (−2.10)	−3.864 (−1.00)
<i>R</i> squared	0.017	0.013	0.007	0.007
<i>n</i>	810	809	810	809
Durbin–Watson	2.015	1.999	2.01	1.998
Calls+puts volume	−0.59 (−2.41)	3.80 (0.89)	0.17 (0.65)	0.93 (2.33)
Put/call ratio	−3.94 (−3.45)	−956.9 (−2.52)	−4.22 (−2.17)	−4.43 (−1.12)
<i>R</i> squared	0.017	0.013	0.007	0.007
<i>N</i>	810	809	810	809
Durbin–Watson	2.015	1.999	2.01	1.998

Regression coefficients multiplied by 10^4 .

Numbers in parentheses are *t*-values.

Table 2: Exchange rate as a function of trading volume of currency options: 41 h after RHT in CME: Cochrane–Orcutt estimates of logarithmic transformation

<i>Explanatory variable</i>	<i>Canadian Dollar</i>	<i>Swiss Franc</i>	<i>British Pound</i>	<i>Japanese Yen</i>
Calls volume	3.091 (2.42)	−0.644 (−0.28)	−0.888 (0.39)	−0.272 (−0.55)
Puts volume	−3.541 (2.57)	1.886 (0.45)	1.520 (0.65)	3.94 (0.83)
<i>R</i> squared	0.011	0.007	0.005	0.011
<i>n</i>	605	605	605	597
Durbin–Watson	2.003	1.996	1.979	1.984
Calls+puts volume	−0.371 (1.33)	1.08 (2.09)	0.554 (1.78)	1.111 (2.13)
Put/call ratio	−3.314 (2.50)	1.42 (0.55)	1.192 (0.52)	3.216 (0.67)
<i>R</i> squared	0.011	0.007	0.005	0.011
<i>N</i>	605	605	605	597
Durbin–Watson	2.003	1.996	1.979	1.984

Regression coefficients multiplied by 10^4 .

Numbers in parentheses are *t*-values.

between the JY and the three other currencies can be explained by the difference in the financial activity around the globe during the 17 h that passed after the end of the RTH in the CME. While in Canada, the trading hours are the same as in Chicago, in Japan they start earlier than in Europe and end before they open in Switzerland and London. The concentration of trade during regular trading hours is natural. Trade is usually conducted by people who are active during regular trading hours in their home market. The home bias of London traders, who wait with a bulk of their orders until the London market opens, was observed by Tse.¹⁰

The second regression in Table 1 shows that for the three currencies CD, SF and BP, the PCR index is negatively correlated with the price change. The total volume of options traded is negatively correlated with the future spot price of the CD and positively correlated with the JY, so, in fact, it is a predictor of the volatility of future spot price as shown by Sarwar.⁷ As shown in Table 2, after 41 h the relationship between option trading volume and the future spot exchange rate was much weaker. Only the future spot price of the CD was significantly correlated with the volume of puts and calls and the PCR. Only one day of RTH occurs in Canada during these 41 h and thus the relationship with the volume of trade in options on the CD is still observed. In fact, the relationship between option trading volume of the JY and the spot exchange rate after 17 h of trade in JY was very similar to the relationship of option trading volume of the SF and the spot exchange rate of the SF after 41 h (these two regressions appear highlighted in grey in the tables). It was found that the significant relationships observed after 17 h of trade, almost vanished after an additional day of trade in Europe.

The relatively small R squared estimated for the regressions is common in studies that look for relationships between financial variables. It is explained by the crude volumes data, which include the sum of all options independent of their price and exercise date. Volumes were recorded in CME, while options were traded in many markets so the sample was not random. If density forecasting for exchange rates is adopted as suggested by Sarno and Valente,¹¹ then the trading volume of options will appear to have an influence among other factors used for forecasting. Xu¹² shows that although estimations with small R squared may mean little to econometricians, they still have economic significance for traders.

CONCLUSION

The trading volume of call and put options and the put-to-call volume ratio are significantly correlated with the magnitude of future spot exchange rates. As time differences increase, these relationships become weaker. The empirical results of this study are in agreement with the general feelings of traders and with several previous studies, which point to the role of options trade volume in forecasting the future spot price of currencies.

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