行政院國家科學委員會專題研究計畫成果報告

外匯買賣差價之理論模型及實證研究
Foreign Exchange Spreads:
Theory and Econometric Estimation

一、中文摘要

　　本文探討在外匯市場中買賣差價的決定，買賣差價是投資過程中最重要的交易成本，也是對仲介商提供變現服務的報酬，通常必須包含營業成本、存貨成本和資訊不對稱性成本。

　　所以本研究的目的就是要進一步了解市場的細部微結構，並且讓外匯交易者作出最適的價格決定。其結果包含兩部分：模型推導與實證部分。

　　在模型建立部分，根據 Stoll (1978)和 Shen (1993) 的推導，假設外匯仲介商在兩期的情況下追求利潤極大，外匯本身的價格特性，如價格水準、利率、波動性等，將會如何影響最適買賣差價的決定。

　　至於在實證研究方面，本研究採用 Bessembinder and Segium (1992, 1993)和 Garch 的方法對世界各主要貨幣作時間數列風險分析，發現外匯買賣差價會受到本身的價格特性的改變而有所變化，另外我也發現外匯買賣差價間有週期性的現象。

關鍵詞：買賣差價、市場微結構

Abstract

This study investigates the most important transaction costs in the currency market, the bid-ask spreads, by using spot exchange rate data of six currencies against the U.S. dollar. The evidence shows that transaction costs in foreign exchange markets vary over different currencies and currency spreads cluster endogenously even without any mandated regulations. As for the currency return and volatility patterns, we find that the latter is more predictable than the former. Moreover, the returns on Fridays are generally lower than the returns on the rest of the days in our sample period. Our empirical evidence also generates some encouraging findings that are consistent with our theoretical predictions.

First, we find that spreads are positively associated with the estimated price volatility, which is a proxy for exchange rate uncertainty. Second, in equilibrium, we predict that there should be a negative relationship between the spread and the domestic (U.S.) interest rate and a positive relationship between the spread and the foreign interest rate. The results show that a majority of the data series has the expected sign between the spread and the domestic and foreign interest rates. Third, there is evidence that the currency dealers do not maintain a fixed absolute spread for their dealing services even though we anticipate that the percentage spreads should decrease as the U.S. Dollar value of the foreign currency increases.

Keywords: bid-ask spread, market microstructure

二、**Motives and Objectives**

Although the micro-approach in finance has received a lot of attention, most of the studies on how microeconomic factors influence asset prices still focus on the security market. In the New York Stock

Exchange (NYSE), dealers stand ready to buy or sell securities for their own account in order to maintain a liquid and continuous market. By providing this kind of market-making service, dealers inevitably incur costs and bear some degree of risks for which they must be compensated. Therefore, profit-maximizing dealers are forced to buy low and sell high to cover their costs and the undiversifiable risks. The difference between the bid and ask prices is sometimes called the "spread" or "margin". The spread represents an important element of transaction costs that a trader seeking immediacy in the execution of buy or sell orders cannot avoid.

However, the foreign exchange market, which is similar in nature to a continuous-auction market, shares some similar characteristics with the equity market. Dealers in the foreign exchange market also adjust their two-way quotes to help control unbalanced currency positions. If the dealer has a sub-optimal long (short) position, then she can lower (increase) the asking (bidding) price to increase the chance the next customers will buy (sell), which help alter the long (short) position. In this way, order flow can affect exchange rates. These order flow patterns may be completely unrelated to fundamental economic factors and they can alter prevailing exchange rates. Therefore, variation in the dealers' inventory management objectives should also be reflected in short-term spread behaviors.

What determines the size and placement of spreads and how it affects the market-making mechanism is thus an interesting and important problem in microstructure study and can help us understand the price generating process. Lyons (1999), therefore, considers bid-ask spreads as one of the two most important

hallmarks defining microstructure. The earliest research of this problem go back to Niederhoffer and Osborne (1966) who show that the non-uniform distribution of the bid-ask spread in the equity market produces a general tendency for stock price reversal and this property is by no means peculiar to the NYSE. Fisher (1966) demonstrates that bid-ask spreads in the equity market can trigger an upward bias in computed returns.

More recently, Glosten (1987) decomposes the spread into two components: inventory/ordering cost and information cost. He shows that the former cost produces biases in mean return, variance and serial covariance while the latter attenuates the biases. Blume and Stambaugh (1983) argue that the existence of a spread implies that average simple returns measured from transaction prices overstate true mean returns. These authors indicate that knowledge of the magnitude of the spread as well as the composition of it is needed to correct the biases it induces.

Following Bagehot (1971), Copeland and Galiai (1983) develop a one-period model of the market maker's pricing problem given that some fractions of the traders have superior information. A market maker is assumed to optimize her position by setting a bid-ask spread maximizing the difference between expected revenues received from liquidity traders and expected losses to information traders. The notion of information efficiency provides a new way to interpret market bid-ask spread patterns without depending on exogenous technological specifications of transaction costs and risks.

Thus, dealers, motivated by inventory costs and by fear of information asymmetry, must adjust their quotes in a complex response to the evolution of observed

transaction prices. Lyons (1995) finds that both inventory control and information asymmetry can explain bid-ask spreads in foreign exchange markets. Also, Stoll (1978) hypothesizes that the bid-ask spread must cover three types of cost components incurred by providing immediacy. These costs are order-processing costs, inventory carrying costs, and asymmetric-information costs.

None of the above researchers have developed an explicit model based on price variability and volume in foreign exchange markets. Following Allen (1977) and Booth (1984), Black (1991) also establishes a model determining the bid-ask spread, which is the main component of transaction costs in the interbank market for foreign exchange. His bid-ask spread model depends on the ratio of price volatility to volume as:

$$\text{spread} = \frac{(a+b)\sigma_p^2}{\overline{Q}},$$

where a and b are fixed coefficients, σ_p^2 is the variance of prices, and $\overline{Q}$ is the mean volume between bid and ask orders from liquidity traders. The implication of Black's work is that spreads in the interbank market will vary directly with risks measured by the variability of the exchange rate in the short run and inversely with the expected volume of transactions in the market. Spreads may vary inversely with volume because of economies of scale leading to more efficient processing of trades and because of higher competition among market-makers. On the other hand, when volatility increases, dealers may increase the spreads to offset the increased possibility of changing currency values and the losses to information asymmetry.

Therefore, the theoretical bid-ask model usually predicts that price risk, volume

volatility, and the opportunity cost of trading will influence the optimal spread (see Allen (1977) and Booth (1984), Black (1991)). Moreover, currency price level as well as interest differential can affect spread in equilibrium. The higher the expected price level of the currency, the smaller the associated percentage spreads. The interest rate differential, an opportunity cost measure in international finance, also plays a critical role in the spread determination. A higher domestic interest rate means that the dealer can earn more interest revenues for the same spread, given a surplus of domestic currency. In equilibrium, the dealer can only expect to earn a normal level of profits; therefore a lower spread is associated with a higher domestic interest rate. A higher foreig0n rate means that the dealer has to pay higher interest payment for a foreign currency loan, so the higher foreign interest rate, the higher the demanded spread. Even if the dealer has foreign currency balances, those balances are subject to foreign exchange risk and hence any foreign currency position is associated with higher spreads.

To sum up, the objective of this paper is to investigate the factors affecting the bid-ask spread of the foreign exchange market.

二、Empirical Results and Discussion

In this paper we evaluate the characteristics of foreign currency bid-ask spreads by empirically testing several theoretical hypotheses. Moreover, the methodology that we adopt to proxy the price risk also allows us to investigate the currency return and volatility patterns. The empirical spread analysis provides us with a number of insights concerning the bid-ask dynamics.

To some extent, movements of currency

volatility are much easier to predict than movements of currency return. Currency volatility persists for some time but the currency return does not. Most important of all, we can still document the week-of-the day return anomalies for some currencies in the 25-year sample period. Particularly, point estimates indicate that there is a general tendency that the U.S. Dollar is the safer short-term store of value, resulting a lower return for foreign currency before the weekend nontrading interval. Nevertheless, the calendar anomaly should be interpreted with caution. First, inspection of a particular sub-period shows that it is possible that the patterns observed would change from time to time, so it may not be unique. Second, it is also likely that the pattern results are sensitive to the methodology, currency, and sample period employed.

Finally, an empirical evaluation of the relation between the percentage spread and the hypothesized explanatory factors examines if there is a relationship predicted by our model. The results overwhelmingly indicate that volatility of the currency causes the spread to widen. There is also evidence that the spreads tend to be wider on Fridays.

The results from the U.S. and foreign interest rate variables do not perfectly meet our predictions. However, a majority of the data series portray the expected sign and significance. Most of them show that the percentage spreads are negatively related to the U.S. interest rate but positively related to the foreign interest rate. The most perplexing variable is the currency price level variable. Five out of six currencies show results that are contrary to the implications of our model. Only the British Pound obtains a negative relationship between the percentage spread and the price level. There

is evidence that the currency dealers do not maintain a fixed spread measured by the U.S. Dollar per unit of foreign currency traded.

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