Non-reversed trades: 
Further implications for currency trading

Lloyd P. Blenman*

Department of Finance, Belk College of Business, University of North Carolina-Charlotte, Charlotte, NC 28223-0001, USA

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Abstract

In markets populated by speculators, arbitrageurs and hedgers, it is shown that the conditions for non-reversed trading, which potentially combine investing (borrowing) with hedging must exist. Hence, forward exchange rates always contain an implicit risk premium. Non-reversed trading activity is necessary but not sufficient for all the other classes of trades to exist. If non-reversed traders are active and set arbitrage boundaries, no other type of riskless and profitable one-way arbitrage activity can exist. However, the activities of non-reversed traders cannot preclude rational pure forward speculative activity in the foreign exchange markets.

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1. Introduction

In analyzing foreign exchange markets, the usual practice has been to either (1) analyze the payoff to speculative activity or (2) test for the presence of interest rate parity in its covered or uncovered form. However, what has not been made clear is that all of these strategies have as boundary conditions, restrictions imposed by rational synthetic currency trading. An integrated treatment of the relations among pure speculators, hedgers, synthetic traders and covered interest rate arbitrageurs also does not exist.

* Corresponding author. Tel.: 704-547-2063; fax: 704-510-6987.
E-mail address: LBlenman@email.UNCC.edu (L.P. Blenman)

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In a recent article, Levi (1992) introduced the concept of a non-reversed trade, which is a special type of synthetic trade. He showed that no departures from interest parity can result from transactions costs if there are non-trivial equilibria in foreign exchange markets. However, his line of investigation was more focused on the conditions for viable trades in all markets.¹

His article and that of Blenman (1996) exhaustively analyze all 16 possible trades that are feasible intertemporally and across currencies, in a riskless bilateral setting. Traders are assumed to face no execution or basis risk on trades, and there are no delivery lags, default or liquidity risks.² That framework obviously eliminates the possibility of speculative trades, which are key elements in the analysis of foreign exchange market structures.

The focus of this article is to show that the concept introduced by Levi (1992) has more far-reaching implications than those he envisaged. In a setting where bid-ask spreads on interest rates and on foreign exchange rates are the only outright costs, and speculative trades are permitted, I show precisely, the sense in which non-reversed trades are fundamental.³

I show that if non-reversed traders set the arbitrage boundaries, there can be no other form of profitable one-way arbitrage, but rational pure forward speculators who act to maximize expected terminal wealth, are not precluded from the markets. If an initial asset position is held, the payoff from any trade, speculative or otherwise, must be bounded by a condition induced by a non-reversed trade. Hence, if other classes of traders are active in foreign exchange markets, non-reversed traders always have the potential to trade profitably. Pure forward speculators represent the only class of traders that can have binding restrictions that are independent of the ones induced by non-reversed traders.

This article is organized as follows. Section 2 introduces the model and its assumptions. Section 3 derives rational pricing bounds that are necessary for non-reversed traders, pure speculators and hedgers. Section 4 shows the precise sense in which the boundaries induced by non-reversed trading must exist in rationally priced foreign exchange markets. Section 5 concludes the discussion.

2. The model and its assumptions

I assume that there are no credit constraints in either the domestic or foreign markets and that all participants are treated uniformly. The only market frictions are the spreads on credit and foreign exchange transactions. As such the impact of taxation is not treated. Traders are assumed to face rational forward foreign exchange quotes so that no pure arbitrage profits are possible.⁴

I use the following notation. Current domestic (foreign) asset holdings are designated $₀ (£₀) and future asset holdings are designated $₁ (£₁). $F_t^{a,b}$ ($F_t^{b,a}$) represents the forward ask (bid) rate on a contract that matures at period $t + T$. $S_t$ ($S_t^f$) is the current spot ask (bid) rate, $r_a$ ($r_b$) is the current domestic lending (borrowing) rates, and $r_a^*$ ($r_b^*$) is the foreign lending (borrowing) rate. Ask rates (prices) in all markets exceed

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³ The focus here is on the role of non-reversed traders in setting arbitrage boundaries.
⁴ The assumption of rational forward quotes implies no pure arbitrage profits are possible.
the relevant bid rates (prices). Spreads in the spot currency markets are also assumed to be less than those in the forward markets.  

The markets are populated by marketmakers who set foreign exchange quotes such that no pure arbitrage opportunities are available. The speculators, hedgers, covered interest arbitrageurs and synthetic traders, of whom non-reversed traders are a special case, trade at the prices set by the marketmakers. All of these traders are assumed to act in a rational fashion in the market. They will only execute trades if the sure payoff from the trade is positive or if the expected payoff is positive. As such they are assumed to act to maximize expected terminal wealth.  

The synthetic traders that are the focus of this analysis are traders with an underlying asset position in either a domestic or foreign currency. These traders are faced with the necessity of either liquidating future foreign currency obligations or converting foreign currency receivables into the domestic currency on the most favorable terms. These traders are, in a sense, liquidity traders engaged in maximizing expected terminal wealth. Their actions may be characterized as either hedging or speculating depending on whether they use forward or future spot markets to determine the future values of receivables or liabilities.  

Pure hedgers are assumed to have only future receivables or liabilities in the foreign currency. Pure speculators are assumed to have no underlying asset position, prior to initiating the speculative trades. These traders are typically analyzed via their actions in the forward markets, since forward speculation is less costly than spot speculation. Here I impose no such restriction and analyze the necessary conditions for both forward and spot speculation.  

3. Rational pricing bounds on forward quotes  

In this section I derive the necessary condition for synthetic trading in a modified Levi/Deardorff type framework, in which trading costs are manifested by the inclusion of bid-ask spreads. However, the analysis expands their basic framework to consider the actions of speculators and the relations among their trades and those of other classes of traders. I also present in Appendix A the complete set of restrictions for all possible trades that can be executed in a riskless bilateral framework. This then provides an easy point of reference and comparison with the conditions for the speculative trades.  

3.1. Pure speculation: No underlying asset position  

3.1.1. Spot speculation  

Since these speculators have no initial asset positions, they must borrow to fund their speculative bets. In the case of the spot speculator, if a spot position in the foreign currency is established, the domestic costs of funding the position must be less than the expected payoff from liquidating the position in the future spot markets. This implies that [Eq. (1)]
\[ S_t (1 + r_s)/(1 + r^*_b) < E_t(S_{t+T}^b) \]  

(1)

for purchases in the spot market and [Eq. (2)]

\[ \frac{(1 + r^*_b)}{S^b_t (1 + r_s)} < E_t \left( \frac{1}{S_{t+T}^b} \right) \]  

(2)

for foreign exchange sales in the spot market.

Since we know from Jensen’s inequality that [Eq. (3)]

\[ E_t \left( \frac{1}{S_{t+T}^b} \right) > \frac{1}{E_t(S_{t+T}^b)} \]  

(3)

it raises the possibility that the costs of funding the position may be more than the expected payoff. However, no rational speculator will undertake the position unless funding costs are less than the proceeds calculated on the basis of the expected future spot exchange rate. Therefore, for sellers the appropriate restriction is [Eq. (4)]

\[ \frac{(1 + r^*_b)}{S^b_t (1 + r_s)} < \frac{1}{E_t(S_{t+T}^b)} < E_t \left( \frac{1}{S_{t+T}^b} \right) \]  

(4)

This implies that [Eq. (5)]

\[ E_t(S_t^b) < S_t^b \frac{1 + r_b}{(1 + r^*_b)} \]  

(5)

must hold if rational speculation on spot foreign exchange sales is to occur. It is the case that a pure speculative spot trade has no synthetic trading options. There is only one way to fund the position and execute the trades.

### 3.1.2. Forward speculation

If there is complete synchronization between receipt of sale proceeds and payment on purchases and no margin requirements are enforced, the forward market speculator need not borrow any funds to establish a speculative position. The pure forward market speculator has no rational synthetic trading option. Any attempt to borrow funds to execute the trade must be profit-reducing in nature.

For the pure speculator the necessary condition for speculation is that the future payoff exceeds the future payment on the forward position. Since no cashflows are assumed to occur until contract expiration the following relations must hold as shown in Eqs. (6) and (7)

\[ F_{t,T}^s < E_t(S_{t+T}^b) \]  

(6)

\[ F_{t,T}^b > E_t(S_{t+T}^b) \]  

(7)

for purchases and sales respectively.
3.2. Speculation with an underlying asset position

These trades are characterized by (a) asset flows from current dollars to future dollars and (b) current pounds to future pounds. However, instead of following a direct investment route in the securities markets, speculators can transform their assets at the spot foreign exchange rate, invest the proceeds and speculate on the future spot value of foreign exchange. For these speculators in (a) and (b) the following restrictions must apply for rational trading,

$$E_t(S^b_{t+T}) > S_t^f \frac{(1 + r_b)}{(1 + r_e^f)}$$ (8)

and

$$S_t^b \frac{(1 + r_b)}{(1 + r_e^f)} > E_t(S^b_{t+T})$$ (9)

A necessary requirement for Eqs. (8) and (9) to hold is that the expected payoff from the unhedged foreign investment must exceed the opportunity costs of the domestic investment. If they hold with equality they are simply representations of the uncovered interest parity relation, when bid-ask spreads are not ignored.

3.3. Non-reversed trades

The non-reversed trades that Levi (1992) describes involve the following asset transformations, (a) $0 \rightarrow \£1$; (b) $1 \rightarrow \£0$; (c) £1 \rightarrow $10; (d) £0 \rightarrow $1. As characterized by Levi the trades in (a–d) are essentially riskless trades that involve investing (borrowing) with hedging in the forward market.10

Trade (a) involves domestic investment plus forward purchase of foreign currency versus the alternative trade of spot market currency of foreign exchange and foreign investment. Trade (b) involves forward purchase of foreign exchange combined with discounting in the foreign credit market against the alternative of domestic borrowing plus a spot sale in the currency market. Trade (c) involves the forward sale of foreign exchange plus domestic discounting versus the alternative of foreign discounting and spot sale of currency. Trade (d) involves foreign investment plus a forward sale versus the alternative of spot foreign currency sale and domestic investment.

Following Levi’s lead, and applying the convention that a synthetic trade occurs whenever the route other than the direct route is used, these trades give rise to the following restrictions

$$S_t^f \frac{(1 + r_s)}{(1 + r_e^f)} < F_{t,T}$$ (10)

$$S_t^e \frac{(1 + r_s)}{(1 + r_e^f)} < F_{t,T}$$ (11)

$$F_{t,T} < S_t^f \frac{(1 + r_s)}{(1 + r_e^f)}$$ (12)
Results [Eqs. (10–13)] are fundamental conditions that must hold in a riskless setting if traders are confronted with rational quotes from marketmakers. I will show later in the article that if these four conditions are violated, profitable riskless synthetic trades are sure to occur. Moreover, the types of trade that are certain are pure covered interest rate arbitrage strategies. As discussed previously, all the available empirical evidence shows that these types of trading events are extremely rare, notwithstanding Ghosh’s (1997) article. Moreover, if Eqs. (10–13) are violated, I show that marketmakers must subsidize forward trades. As a consequence, under either scenario, prices cannot be rationally set in the market.

3.4. Pure hedgers

Pure hedgers are market participants who want to avoid foreign exchange risk. They have only a future position in the market. The first assessment to be made is whether conditional upon current market quotes and their expectations of future spot exchange movement, the decision to hedge is a rational one. If hedging is a rational option, then what is the best hedging strategy becomes the next decision to be considered. These traders can also possibly synthesize the outright forward trades, and hence they have a synthetic trading option. Necessary conditions for making the decision to hedge foreign currency purchases and sales respectively, by direct forward market trades, are [Eqs. (14) and (15)]

\[
F_{t,T}^b < S_t^b \frac{(1 + r_b)}{(1 + r_b^b)}
\]  

(13)

The alternative to the direct market trade is to route asset flows through the spot currency market and either the domestic or foreign credit market, depending on whether a foreign-currency denominated receivable or payable is to be hedged. Necessary conditions for the synthesized pure forward hedges are [Eqs. (16) and (17)]

\[
S_t^e \frac{(1 + r_a)}{(1 + r_a^e)} < F_{t,T}^e < E_r(S_{t+T}^e)
\]  

(14)

\[
F_{t,T}^e > E_r(S_{t+T}^e)
\]  

(15)

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\[
S_t^e \frac{(1 + r_a)}{(1 + r_a^e)} < F_{t,T}^e < E_r(S_{t+T}^e)
\]  

(16)

and

\[
S_t^e \frac{(1 + r_b)}{(1 + r_b^e)} > F_{t,T}^e > E_r(S_{t+T}^e)
\]  

(17)

These synthesized hedges are commonly termed “money-market hedges.”

3.5. Pure covered rate arbitrageurs

Pure covered interest rate arbitrage is a trading strategy with an initial portfolio that is zero or negative-valued, and which generates a positive-valued payoff surely at maturity. These trades are identified in Table A1 as trades (4), (8), (12) and (16).
It is a simple exercise to show that trades (9–13) must hold if the conditions for the pure covered interest rate strategies hold.

4. Rational foreign exchange quotes and non-reversed trades

In this section, I utilize the assumptions of the model and the relations derived in section 3 to show that some non-reversed trading boundaries must hold in any foreign exchange market where the traders are faced with rational foreign exchange quotes. This result is stated in the following proposition.

Proposition 1. In a completely riskless setting, some or all of the non-reversed induced trading conditions must hold, if marketmakers are posting rational foreign exchange quotes such that forward spreads exceed spot spreads. These conditions integrate the spot and forward foreign exchange markets and are consistent with the necessary conditions for speculative trading.

The proof of Proposition 2 is provided in detail in Appendix B. What Proposition 2 does is to establish that if marketmakers post rational foreign exchange quotes, this very fact establishes the preconditions for some profitable non-reversed trade to hold surely. Since these trades are possible whenever any type of synthetic trade or direct trade is profitable, the rational actions of marketmakers ensures that viable trades can always occur. These trades add to the vibrancy of the currency and credit markets, since the non-reversed trades integrate both credit and currency markets. Therefore, it is actually in the best interests of all market participants that rational foreign exchange quotes be set.

In fact from Eq. (28), it is clear that the differential between spot spreads and forward spreads depends on the level of spot exchange rates and a factor depending on the difference of scaled credit spreads between the domestic and foreign credit markets. Analysis of non-reversed trades thus helps to shed additional light on the precise nature of the relations among spot and forward spreads, and the contribution of credit spreads to size of the forward spread.

Proposition 2. Any type of profitable synthetic trading, that has either a speculative or hedging element, induces the non-reversed trading boundaries to hold. If the trade has a speculative component then the trade is deemed to be ex-ante profitable and the bounds on the future spot rate must be consistent with the bounds specified in Eqs. (18) and (19).

In view of the proof of Proposition 1, non-reversed trading boundaries must exist. This result is therefore a corollary result and can also be verified by an inspection of the boundary conditions in Table A1, for trades with a hedging component.

For the pure spot speculative trades and speculation with an initial position, it is a simple exercise to show that 1 and 5, 8 and 9 imply that the bounds specified in 10–13 must hold. For pure forward speculative trades, in which the trader has no underlying initial position, the only consideration is the relation of the applicable forward price to the expected future spot price of the currency. Such traders are driven solely by their...
expectations and those expectations may not have any relation to the observed market fundamentals or the necessary conditions I have outlined. In summary, the conditions imposed by non-reversed trading strategies will hold for all possible types of simple fundamental speculative or riskless trades in foreign exchange and credit markets.

5. Conclusions

The properties of trades termed non-reversed trades are analyzed and shown to be vital to the existence of rational trading in foreign exchange markets. The properties of these trades are utilized to derive limiting conditions that must hold in an arbitrage setting regardless of whether one considers riskless trades or risky arbitrage (speculative) trades. However, I show that the activities of non-reversed traders while potentially inhibiting to other classes of hedgers, cannot preclude pure speculative activity in the foreign exchange markets. The analysis shows the precise relation that must exist between spot and forward spreads in markets with rational foreign exchange quotes. The difference between the spot and forward spread is intimately connected to the level of the prevailing spot currency and credit spreads in the domestic and foreign markets.
Appendix A

Necessary conditions for riskless synthetic trading

<table>
<thead>
<tr>
<th>Type of trade</th>
<th>Implied restrictions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $0 \to S_0$</td>
<td>$F_{st}^b &gt; S_b^t \frac{(1 + r_a)}{(1 + r_b^s)}$</td>
<td>Synthetic spot FX trade</td>
</tr>
<tr>
<td>2. $0 \to S_1$</td>
<td>$F_{st}^b &lt; S_b^t \frac{(1 + r_a)}{(1 + r_b^s)}$</td>
<td>Non-reversed trade</td>
</tr>
<tr>
<td>3. $0 \to L_1$</td>
<td>$S_b^t \frac{(1 + r_a)}{(1 + r_b^s)} &gt; F_{st}^b$</td>
<td>Synthetic rate swap</td>
</tr>
<tr>
<td>4. $0 \to L_0$</td>
<td>$S_b^t \frac{(1 + r_a)}{(1 + r_b^s)} &gt; F_{st}^b$</td>
<td>Covered interest arbitrage</td>
</tr>
<tr>
<td>5. $0 \to S_0$</td>
<td>$S_b^t \frac{(1 + r_a)}{(1 + r_b^s)} &gt; F_{st}^b$</td>
<td>Synthetic spot FX trade</td>
</tr>
<tr>
<td>6. $0 \to L_1$</td>
<td>$S_b^t \frac{(1 + r_a)}{(1 + r_b^s)} &lt; F_{st}^b$</td>
<td>Non-reversed trade</td>
</tr>
<tr>
<td>7. $0 \to S_1$</td>
<td>$F_{st}^b &gt; S_b^t \frac{(1 + r_a)}{(1 + r_b^s)}$</td>
<td>Synthetic rate swap</td>
</tr>
<tr>
<td>8. $0 \to S_0$</td>
<td>$F_{st}^b &gt; S_b^t \frac{(1 + r_a)}{(1 + r_b^s)}$</td>
<td>Covered interest arbitrage</td>
</tr>
<tr>
<td>9. $1 \to S_0$</td>
<td>$F_{st}^b &lt; S_b^t \frac{(1 + r_a)}{(1 + r_b^s)}$</td>
<td>Non-reversed trade</td>
</tr>
<tr>
<td>10. $1 \to S_1$</td>
<td>$F_{st}^b &lt; S_b^t \frac{(1 + r_a)}{(1 + r_b^s)}$</td>
<td>Money market hedge</td>
</tr>
<tr>
<td>11. $1 \to L_0$</td>
<td>$F_{st}^b &gt; S_b^t \frac{(1 + r_a)}{(1 + r_b^s)}$</td>
<td>Synthetic loan</td>
</tr>
<tr>
<td>12. $1 \to L_1$</td>
<td>$S_b^t \frac{(1 + r_a)}{(1 + r_b^s)} &gt; F_{st}^b$</td>
<td>Covered interest arbitrage</td>
</tr>
<tr>
<td>13. $1 \to S_0$</td>
<td>$S_b^t \frac{(1 + r_a)}{(1 + r_b^s)} &gt; F_{st}^b$</td>
<td>Synthetic loan</td>
</tr>
<tr>
<td>14. $1 \to L_0$</td>
<td>$S_b^t \frac{(1 + r_a)}{(1 + r_b^s)} &lt; F_{st}^b$</td>
<td>Non-reversed trade</td>
</tr>
<tr>
<td>15. $1 \to L_1$</td>
<td>$S_b^t \frac{(1 + r_a)}{(1 + r_b^s)} &lt; F_{st}^b$</td>
<td>Money market hedge</td>
</tr>
<tr>
<td>16. $1 \to S_1$</td>
<td>$F_{st}^b &gt; S_b^t \frac{(1 + r_a)}{(1 + r_b^s)}$</td>
<td>Covered interest arbitrage</td>
</tr>
</tbody>
</table>
Appendix B

Proof of Proposition 2

The proof of this proposition is essentially a proof by contradiction. For the non-reversed non-speculative trading boundaries to hold it must be the case that

\[ F^a_{t,T} > \max \left \{ S_i^b \frac{(1 + r_b)}{(1 + r^b_\$)} , S_i^a \frac{(1 + r_a)}{(1 + r^a_\$)} \right \} \quad (18) \]

and

\[ F^b_{t,T} < \min \left \{ S_i^b \frac{(1 + r_a)}{(1 + r^a_\$)} , S_i^b \frac{(1 + r_b)}{(1 + r^b_\$)} \right \} \quad (19) \]

If profitable non-reversed trades do not exist, and Eqs. (18) and (19) do not hold, it must be the case that

\[ F^a_{t,T} < \min \left \{ S_i^b \frac{(1 + r_b)}{(1 + r^b_\$)} , S_i^a \frac{(1 + r_a)}{(1 + r^a_\$)} \right \} = \Psi_a \quad (20) \]

and [Eq. (21)]

\[ F^b_{t,T} > \max \left \{ S_i^b \frac{(1 + r_a)}{(1 + r^a_\$)} , S_i^b \frac{(1 + r_b)}{(1 + r^b_\$)} \right \} = \Psi_b \quad (21) \]

obtain. Now suppose that [Eq. (22)]

\[ \Psi_a = S_i^b \frac{(1 + r_b)}{(1 + r^b_\$)} \]

is the minimum value of Eq. (20). This implies that [Eq. (23)]

\[ \frac{(1 + r_b)}{(1 + r^b_\$)} < \frac{(1 + r_a)}{(1 + r^a_\$)} \quad \text{and} \quad \Psi_b = S_i^b \frac{(1 + r_a)}{(1 + r^a_\$)} \quad (23) \]

This in turn implies that [Eq. (23a)]

\[ S_i^b \frac{(1 + r_b)}{(1 + r^b_\$)} > F^a_{t,T} ; \quad F^b_{t,T} > S_i^b \frac{(1 + r_a)}{(1 + r^a_\$)} \quad (23a) \]

must hold in this particular foreign exchange market. However, rationally priced foreign exchange quotes would imply that [Eq. (24)]

\[ S_i^b \frac{(1 + r_b)}{(1 + r^b_\$)} > F^a_{t,T} ; \quad F^b_{t,T} > S_i^b \frac{(1 + r_a)}{(1 + r^a_\$)} \quad (24) \]

and [Eq. (25)]

\[ F^a_{t,T} > F^b_{t,T} > S_i^b \frac{(1 + r_a)}{(1 + r^a_\$)} \]

(25)
must also obtain simultaneously. These restrictions bound the forward bid and ask rates as follows.

\[
\frac{S^b_t}{(1 + r^b)} < \frac{F^a_{t,T}}{1 + r^a} < \frac{S^a_t}{(1 + r^a)} \tag{26}
\]

\[
\frac{S^b_t}{(1 + r^b)} < \frac{F^b_{t,T}}{1 + r^b} < \frac{S^a_t}{(1 + r^a)} \tag{27}
\]

From Eqs. (26) and (27) we can infer the properties of the forward spread that would exist in a market where non-reversed trading boundaries do not hold. Let \( \alpha = F^a_{t,T} - F^b_{t,T} \) and \( \delta = S^a_t - S^b_t \) be the sizes of the actual forward and spot spreads respectively. Let \( \Delta = r^a - r^b \) and \( \Delta^* = r^a - r^b \) denote the domestic and foreign credit spreads.

Utilizing Eqs. (26) and (27), I show that for both conditions to be jointly satisfied it must be the case that,

\[
\alpha < S^b_t - S^a_t(1 + \mu)
\]

where \( \mu = \frac{\Delta}{1 + r^a} - \frac{\Delta^*}{1 + r^b} - \frac{\Delta^* \Delta}{(1 + r^a)(1 + r^b)} > 0 \tag{28}
\]

From Eq. (28) it is the case that \( \alpha < \delta - S^b_t \mu \), and \( \alpha < \delta \) since \( \mu \) is strictly positive in this case. Therefore, in any market where non-reversed trading boundaries are not in effect, the marketmakers must elect to receive lower commissions on forward trades than on spot trades.

Since forward contracts are deferred delivery contracts on which payment occurs at time \( t + T \), the spread commission on a round trip forward contract would be less than on a spot contract, on which payments are made immediately. Hence, forward contracts must be subsidized which is expressly disallowed in the model. Such behavior would be construed as irrational, since there is additional risk being borne for which no compensation is demanded. Hence, the market with spot spreads greater than forward spreads is not a market where traders face rationally-set foreign exchange quotes. Therefore, Eqs. (18) and (19) must hold in markets with rationally-set foreign exchange quotes. The alternative case where [Eq. (22b)]

\[
\Psi^a = S^a_t (1 + r^a) \tag{22b}
\]

can be analyzed to reach an equivalent conclusion. For the speculative trades it suffices to note that conditions 1, 5, 8 and 9 imply satisfaction of the non-reversed conditions 10–13.

Notes

1. A non-reversed trade is a trade that changes the currency and maturity composition of a trader’s holdings. No attempt is made to terminate the sequence of
elemental trades with holdings in the initial currency. As such these trades are but one of the trades termed “one-way arbitrage” trades by Deardorff (1979).

2. These 16 trades assume that there are two maturities, borrowing and lending is freely permitted in the domestic and foreign riskless asset, traders hold current or future assets and can freely trade in organized spot and forward markets in the currencies. Obviously, if the number of maturities is allowed to increase, the number of possible types of trades increases and their implied restrictions will increase almost exponentially.

3. Non-reversed trades can be shown to be fundamental, in the sense that if any synthetic trading opportunity exists, such trades surely must also exist. This then establishes the relation of synthetic spreads to outright spreads, implied bounds on spot foreign exchange market spread costs, the relation of synthetic spreads to spot costs several new conditions.

4. Most of the recent work on foreign exchange markets show that pure covered interest arbitrage opportunities are very rare in a setting where market participants do not face differential treatment. (e.g., see Blenman, Louis, & Thatcher, 1999; Rhee & Chang, 1992).

5. This assures a necessary condition that in setting their quotes, the dealers are not subsidizing any class of trades. Typically, one would expect that as a compensation for bearing additional risk, the forward spreads will increase with maturity. If marketmakers quote rational prices, which permit no pure arbitrage strategies, explicit forward spreads must exceed spot spreads.

6. The basic premise of the model is that conditions exist which would not generate pure profits for covered interest arbitrageurs. Empirical evidence suggests that this is a reasonable suggestion.

7. In reality, even the distinction between hedging and speculation in this simple case is not sharply defined. By making a decision to hedge now rather than waiting to see how the market further evolves, the trader is abandoning some implicit timing options, so the trader is implicitly making a determination that the current value of such options is zero. This can be nothing more than a guess since the future evolution of spot rates is not known a priori.

8. However, I do abstract from the institutional requirements that must be faced by speculators, namely the need to post margin collateral, and the payment of variation balances. These extensions are straightforward but are omitted to maintain ease of comparability of my results with those of Levi (1992), in particular.

9. Operators of hedge funds, which are known to make huge speculative bets on foreign exchange rates, use their investors’ funds to establish their market positions. Investors in these funds are rewarded only if gross returns to the fund exceed the costs and fees of the fund operator and any loan repayments. In many cases, the funds of the primary investors are further leveraged by the hedge fund operator.

10. However, there is no a priori reason why a synthetic trader could not combine the underlying trades with speculation in the future spot foreign exchange
market. Since the trades discussed here combine investing with hedging in the forward market, whenever the forward markets are not used, the alternative trades are considered to be synthetic trades. Blenman (1991) and Levi (1977) show that covered interest rate arbitrage occurs almost surely if traders have differential opportunity sets. Such differences may be triggered by differential taxation or differential transaction costs. In the absence of such conditions, Ghosh’s (1997) findings may also apply to thinly traded disequilibrium markets that are not very price sensitive.

References


