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Trading Strategies in Currency Markets

Angie Abdel Zaher[a], Dipasri Ghosh[b], Dilip K. Ghosh[c]

[a] American University in Cairo
aabde003@fiu.edu
[b] California State University, Fullerton
dghosh@fullerton.edu
[c] The Institute of Policy Analysis, Rutgers University
editordghosh4@tijof.com

ABSTRACT

This work presents profit making strategies a trader can take in the currency markets under different scenarios. Arbitrages with forward and option contracts are highlighted to give the profit measures under hedging. Finally, speculation without cover and then with cover are exposited in this paper and possible profit situations are examined.

JEL Classifications: C, G

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I. INTRODUCTION

Trading in any markets is done with three strategies: arbitrage, hedging, and speculation. Markets are not always perfectly aligned. In that situation of misaligned condition, if the investor can find an opportunity, he or she can enter into arbitrage activity. Arbitrage is buying an asset in lower price and selling it higher price (if such reality exists), and thus making profit in twin-head strategy of buy and sell. In stock market, an investor buys an equity instrument when he or she thinks the price is low and expects the price rise of the same asset in the future. It is the normal behavior of a rational investor always. This act is essentially a speculation, in which there is an assumption of risk. If the price does not rise within his/her time horizon, he/she cannot make any profit. The investor can incur loss if the future price of the acquired asset goes down. Hedging is a device by which investor can contain his/her loss or completely/partially eliminate it. Speculation is basically the assumption of risk by choice with the intent of making larger profits out of invested amount.

Covered trading is basically the investment position with hedging, - investment with safety net. In this work, however, we plan to bring out covered trading only in currency markets alone, although the intertwining of currency markets, equity markets, and commodity markets are in the existing literature. Covered trading here refers to covered arbitrage and covered speculation. Formally, covered arbitrage has its most formal inception in the works of Frenkel and Levich (1975, 1977), followed by Deardorff (1979), although these works can be traced back to Aliber (1973) and Keynes (1923). A few other works appeared in the literature in 1980's, but the major work came into being in the work Rhee and Chang (1992) where intra-day arbitrage opportunities were examined. Ghosh (1997) extended arbitrage with forward hedging. Here, in this work, we first enunciate covered arbitrage with continuous iterations by forward rate and by put/call options.

Speculation is the more sophisticated operation when it is covered with options and futures. Uncovered speculation is simpler with simple calculation of future spot rate of exchange. In this paper, we plan to present uncovered speculative designs for a rational investor, and then covered speculation with a view to maximize profits. Before we do that, let us bring out the existing literature to give the proper perspectives on the issue. It should be noted that in 1950's and early 1960's, a series of serious works, e.g., Friedman (1953), Baumol (1957), Telser (1959), Tsiang (1959), Spraos (1959), Kemp (1963). Kenen (1965), Grubel (1966), and Feldstein (1968) began various aspects of speculation, and colored the literature. Tsiang (1973), Dalal (1979), Sweeny (1986, and Surajaras and Sweeny (1992) forwarded the literature to its frontier. In this paper, we plan to extend it further with uncovered and covered condition with derivative securities.

II. ARBITRAGE

A. Arbitrage with Hedging by Forward Contract

First, assume that there is no transaction cost, and so ask and bid quotes are not considered for analytical convenience[1]. Consider a rational investor who sees an opportunity (because of a misalignment of market quotes) and trades in the following way: he/she borrows US dollars ($) (to the tune of ($Y ≡ $100 million), converts ($Y ≡ $100 million) at the spot rate of exchange (Q_s - 2, which means \$2 = £!), and then deposits $\frac{Y}{Q_S} = \frac{100,000,000}{2} = £50,000,000$ (converted amount) in the foreign bank or foreign market[2], and makes it grow. At the end of 3 months (terminal date: 3 months, for simplicity), the amount is re-converted into home currency by forward exchange rate $(Q_F = 2.10)$. Finally, he/she must subtract the original borrowed dollar (home currency) amount with accrued interest at the domestic market for the usage of $(\$Y \equiv \$100 \text{ million})$, and get the net profit out of covered arbitrage[3]. To proceed further, let us employ the following notations: Q_S, Q_F = (*known*) current spot rate and forward rate of exchange, respectively; r_H, r_F = 3-month (*known*) home and foreign interest rates, and hence; $1 + r_H \equiv R_H, 1 + r_F \equiv R_F$ are the (*known)* home and foreign interest factors; and ρ = total profit made out of covered arbitrage.

With these notations on hand, the investor who starts off with $(\$Y \equiv \$100 \text{ million})$, earns positive amount of total net profit (ρ) where:

$$\rho = Y\{R_F \frac{Q_F}{Q_S} - R_H\} \tag{1}$$

$$\text{if } \{R_F \frac{Q_F}{Q_S} - R_H\} > 0 \text{ or } \{R_F > \frac{Q_S}{Q_F} R_H\} \tag{1A}$$

$$\text{If } \{R_F \frac{Q_F}{Q_S} - R_H\} = 0 \text{ or } \{R_F = \frac{Q_S}{Q_F} R_H\} \text{ (case of no profit),} \tag{1B}$$

it is the situation of *interest rate parity*.

$$\text{If } \{R_F \frac{Q_F}{Q_S} - R_H\} < 0 \text{ or } \{R_F < \frac{Q_S}{Q_F} R_H\} \tag{1C}$$

investor incurs loss by starting off with U.S dollars, converting the dollar amount into British pound, and so on, as outlined.

Consider an example where $Q_S = 2.00$, and $Q_F = 2.10$, $r_H = 0.10$, $r_F = 0.095$. $R_F \frac{Q_F}{Q_S} - R_H = 0.04543379 \; > 0, \quad \rho = \$4,543.379 \; > 0.$

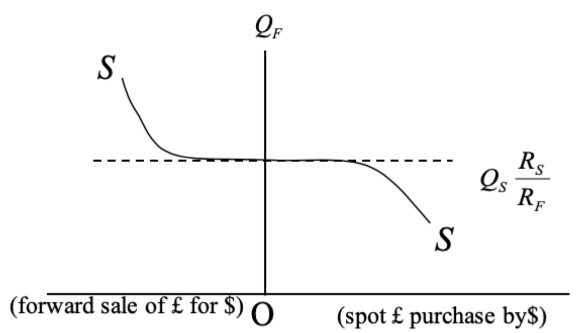
Consider an alternative scenario where $Q_S = 2.00$, and $Q_F = 2.001$, $r_H = 0.10$, $r_F = 0.095$. Here, $R_F \frac{Q_F}{Q_S} - R_H = -0.0044533 \; < 0, \quad \rho = -\$445,250 \; < 0.$

The investor, following the sequence of conversion, deposits and re-conversion, as noted earlier, incurs the total loss of \$445,250, as noted earlier. Here a *caveat* is in order. If the investor starts off with U.S dollars, and converts it into foreign currency (here, in this scenario, British pound sterling), and follows the afore-said procedure, profit level is indeed negative (that is, it is a case of loss). However, if the investor starts off with the equivalent amount of foreign currency $(£\frac{Y}{Q_S})$, (that is, he/she converts the pound sterling into U.S dollars), deposits the dollar in the American bank at the interest rate of r_H ,and follows the reverse process, profit level will be positive. With market data set $Q_S = 2.00$, and $Q_F = 2.10$, $r_H = 0.10$, $r_F = 0.095$. $R_F \frac{Q_F}{Q_S} - R_H = 0.04543379 > 0$, , $\rho = \$4{,}543.379 > 0$, with market data $Q_S = 2.00$, and $Q_F = 2.001$, $r_H = 0.10$, $r_F = 0.095$. starting off with foreign currency investment, $R_F \frac{Q_F}{Q_S} - R_H = 0.0044533 > 0$, $\rho = \$505{,}000 > 0$.

Note that at the end of 3 months, starting with home currency (U.S. dollars), investor's net profit in the *first* round of arbitrage act, as noted in expression 1, is: $\rho = Y\{R_F \frac{Q_F}{Q_S} - R_H\}$.

Figure 1 below exhibits what has been delineated above. The solid SS-curve shows that if forward rate is above $Q_S \frac{R_S}{R_F}$, the investor has the case of $\rho = Y\{R_F \frac{Q_F}{Q_S} - R_H\} > 0$, and when the forward rate is below $Q_S \frac{R_S}{R_F}$, $\rho = Y\{R_F \frac{Q_F}{Q_S} - R_H\} < 0$. When forward rate coincides with $Q_S \frac{R_S}{R_F}$, it is case of no profit possibility.

Figure 1



We can now note expression 1 as the first-round arbitrage, and it is noted now as follows:

$$\rho_1 = Y\{R_F \frac{Q_F}{Q_S} - R_H\} \tag{1}$$

Its present value is

$$\rho_{1(0)} \equiv \frac{Y}{r_H}\{R_F \frac{Q_F}{Q_S} - R_H\} = Y\lambda \tag{2}$$

where $\lambda \equiv \frac{1}{r_H}\{R_F \frac{Q_F}{Q_S} - R_H\}$

In this day and age when multiple calculations are made in a millisecond, the investor can put $Y + \rho_{1(0)}$ as the second round of investment in arbitrage and can earn the amount, $\rho_{2(0)}$, which is:

$$\rho_{2(0)} = Y\lambda(1+\lambda)^{2-1} \tag{3}$$

The present value of the k[th] round (net) arbitrage profit is by iterations:

$$\rho_{k(0)} = Y\lambda\sum_{i=1}^{k}\lambda^{i-1} \tag{4}$$

The sum total of iterative arbitrage profit of all k rounds is then:

$$S_{\rho(0)} = \sum_{j=1}^{k}\rho_{j(0)} = Y\lambda\sum_{m=1}^{k}(1+k-m)\lambda^{m-1} \tag{5}$$

Total net profit is magnified, and the investor moves on.

B. Arbitrage with Hedging by Options Contract

Covered position is not only just taken by forward contract. Option contracts (European variety) offer the same scope of hedging. Put options are sell options and call options are buy options at a pre-determined future date (here at the end of 3 months) at the exercise price[4]. For 3-month forward contract, no money is paid today, but for a put or call you buy the option today at put or call premium, and so at the end of 3 months, its cost is option's price *times* the interest factor. Let us use a few more notations as follows: P= price of a put option (premium); C= price of a call option (premium); P_X= exercise price of a put option (pre-determined like forward rate of exchange); and C_X= exercise price of a call option (pre-determined forward rate of exchange)

So, the costs of a put or a call at the end the terminal date are PR_H and CR_H, respectively. With these notations, one can find the first-round arbitrage net profit $(\hat{\rho}_1)$ as follows:

$$\hat{\rho}_1 = Y\left(\frac{P_X}{Q_S}R_F - \frac{P}{Q_S}(R_F+1)R_H\right), \tag{6}$$

and

$$\hat{\rho}_{1(0)} = \frac{Y}{R_H}\left(\frac{P_X}{Q_S}R_F - \frac{P}{Q_S}(R_F+1)R_H\right) \tag{7}$$

Obviously then, the i[th] round yields the following measure of profit:

$$\hat{\rho}_{i(0)} = \frac{Y}{R_H}\left(\frac{P_X}{Q_S}R_F - \frac{P}{Q_S}(R_F+1)R_H\right)\left\{\frac{1}{R_H}\left(\frac{P_X}{Q_S}R_F - \frac{P}{Q_S}(R_F+1)R_H\right)\right\}^{i-1} \tag{8}$$

Sum total of all *k* rounds of iterative arbitrage profit is then:

$$S_{\hat{\rho}_{(0)}} = \sum_{i=1}^{k}\hat{\rho}_{i(0)} = \frac{Y}{R_H}\left(\frac{P_X}{Q_S}R_F - \frac{P}{Q_S}(R_F+1)R_H\right)\sum_{i=1}^{k}\left\{\frac{1}{R_H}\left(\frac{P_X}{Q_S}R_F - \frac{P}{Q_S}(R_F+1)R_H\right)\right\}^{i-1} \tag{9}$$

III. SPECULATION

A. Speculative Design without Covered Position

To set the stage, consider simple speculation where trading in the currency market occurs when the investor assumes risk with or without calculation. Here, however, we postulate that the investor takes some calculated risk when he/she buys or sells a currency on the basis of current market data and expected future spot rate of exchange. Let $E(Q_S)$ be the expected spot rate of exchange (*unknown* but only known probabilistically). Here then,

$$E(Q_S) = \sum_{h=1}^{L} p_h Q_{S(h)}, \quad \sum_{h=1}^{L} p_h = 1 \tag{10}$$

where $p_h . 1 \leq h \leq L$ are different probabilities and $Q_{S(h)}$ is the future spot rate with probability p_h. One can consider probability distribution in continuous situation, and can ascertain $E(Q_S)$. Here the decision rules are simple. One can easily see that:

If $E(Q_S) > Q_F$, buy foreign currency (£) at forward rate, and make a profit of $(E(Q_S) - Q_F)/Q_F$ per each dollar of forward contract purchase. Note at the end of 3 months in this case, Q_F is instantly swapped for $E(Q_S)$.

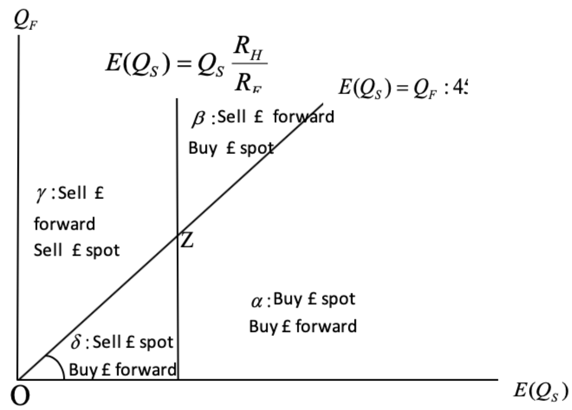
If $E(Q_S) = Q_F$, no amount of profit is made, no matter what decision is taken.

If $E(Q_S) < Q_F$, sell foreign currency forward, and the profit is $(Q_F - E(Q_S))/Q_F$ per each dollar.

Note we have discussed so far the forward rare *vis-à-vis* expected future spot rate, and current rate has been out of the purview. Now, let us bring out the current spot rate and ignore the forward rate, and examine if spot speculation (as opposed to previous forward speculated noted earlier) is a feasible trading strategy. We must begin by asking the question: how much is the dollar cost today to buy one unit of foreign currency (here, £1), 3 months from today when the expected spot rate is $E(Q_S)$? To answer this question, note that the dollar cost today of £1 (that is needed 3 months from today) is the present value of £1, and it is $\$Q_S \frac{1}{R_F}$. This amount in 3 months will grow to be $\$Q_S \frac{R_H}{R_F}$. So, the dollar cost of £1 in 3 months is $\$\frac{R_H}{R_F}$. Now, the decision rules are clear-cut as following:

If $E(Q_S) > \$\frac{R_H}{R_F}$, buy foreign currency spot, (D) and the profit per £1 is ($E(Q_S)$ - $\$\frac{R_H}{R_F}$). If $E(Q_S) = \$\frac{R_H}{R_F}$, buy or sell foreign currency, (E) no profit can be made by spot speculation. If $E(Q_S) < \$\frac{R_H}{R_F}$, sell foreign currency spot, (F) and profit will be ($\$\frac{R_H}{R_F}$ - $\$\frac{R_H}{R_F}$).

Figure 2



Expressions (A) through (F) are depicted by Figure 2 above, and the zones of strategic choices are delineated. Here 45^0-degree line defines the equality between the expected future spot rate and currently-exercisable forward rate of exchange (that is, $E(Q_S) = Q_F$). Along the vertical line here expected spot rate of exchange equals the parity rate (that is, $E(Q_S) = \$\frac{R_H}{R_F}$).

The right side (or below) 45^0 - degree line is the zone where $E(Q_S)$ *exceeds* Q_F : zones of α and δ . In these zones, as expression (A) has already indicated, buying pound sterling forward is the profitable strategy. The left-hand (or above) 45^0 - degree line is the zone where $E(Q_S)$ *is lower than* Q_F : zones of β α and γ . In these zones, as expression (C) has already indicated, selling pound sterling forward is the profitable strategy. The 45^0 - degree line is the dividing line, and any co-ordinates of $E(Q_S)$ and Q_F on this line is a no-profit situation for forward speculation.

Next, focus on the vertical line in the diagram where $E(Q_S)$ *equals* $Q_S \frac{R_H}{R_F}$. Here on the right-side of the line $E(Q_S)$ *exceeds* $Q_S \frac{R_H}{R_F}$, and that means, as spelled out by expression (D), buying foreign currency in the current spot rate the profitable choice. The zones α and β are these zones. Conversely, γ and δ are the areas to the left of the vertical line where $E(Q_S)$ is lower than $Q_S \frac{R_H}{R_F}$. That signifies the speculative strategy that the investor must be selling foreign currency spot. The dividing vertical line is where, as already mentioned, $E(Q_S)$ is equal to $Q_S \frac{R_H}{R_F}$. Spot speculation here yields no profit out of spot speculation. At the intersection of the 45^0 - degree line and the vertical line Z, speculation is futile, spot or forward.

B. Speculative Design with Covered Position

For a long time, speculation has been construed as a risk-taking venture without any safely net. But with the advent of derivative securities, many attempts have been made to take speculative positions with options and futures. In this work, we bring out forward, put and call options to provide the hedging to speculative acts of trading. We first illustrate a few scenarios with some assumed data for the foregoing analysis. Consider the following: $P = \$0.04$, $P_X = \$2.40$ = 0.04, and $Q_F = \$2.10$, $E(Q_S) = \$2.25$.

In this case, if the investor buys a put option for the price of \$0.04, he/she can sell it for \$2.40, he/she pays the net price of the put option upon exercise, $P_X^* \equiv \$2.36$ (= $P_X - P$). . If $E(Q_S) = \$2.30$, he/she must exercise his/her put option, and net (\$236 - \$2.30 = \$0.06), and sell the forward and net (\$2.30 - \$2.10 = \$0.20). So, as long as $P_X^* > E(Q_S)$, and $E(Q_S) > Q_F$, he/she is a net gainer by taking the covered speculative position with a purchase of a put and a forward contract. However, when $(E(Q_S) < Q_F)$, profitability still exists if $P_X^* > E(Q_S)$, and $(P_X^* > E(Q_S)) > |E(Q_S) - Q_F|$; when $(P_X^* > E(Q_S)) = |E(Q_S) - Q_F|$, it is the cut-off point for forward speculation. It is a situation of being on the 45^0- line of Figure 2. However, spot speculation is still feasible with the exception of the cross-point of the 45^0- line and the vertical line. If $P_X^* > E(Q_S)$, and $E(Q_S) > Q_S \frac{R_H}{R_F}$, the investor must speculate with a put option and a purchase of a spot contract. As before, $E(Q_S) < Q_S \frac{R_H}{R_F}$, $(P_X^* > E(Q_S)) = \left|E(Q_S) - Q_S \frac{R_H}{R_F}\right|$, it must be the cut-off condition for spot speculation.

Next, let us examine call option with forward and spot contracts. Consider C = 0.03, C_X = 2.35, and other data remain, as before. If the investor exercises the call option, he/she gets $C_X^* \equiv C_X - C = \$2.35 - 0.03 = 2.32$ (in this illustrative case). Speculator will exercise call when $E(Q_S) \leq C_X^*$; otherwise non-exercise is the superior choice. As in our case so far, $E(Q_S) = 2.30$, investor loses by exercises his/her call option. But with the purchase of a forward and call, his net profit is ($(Q_F - E(Q_S)) +$ $((C_X^* - E(Q_S))$, which is still profitable. But absence of option in this case is more profitable. Now, if we focus once again Figure 2, we can offer better speculative strategies. Look at zone α. If the investor buys a call, his/her profit increases more as he/she buys pound sterling at a lower cost and sells the foreign currency at higher dollar value. Zones β, λ, and δ can yield higher profits by appropriate purchase or sale of options contracts. Several scenarios can be drawn to enunciate covered speculation. Synthetic options with forward contract can further extend our analysis, but we stop here at this point.

IV. CONCLUDING REMARKS

The paper has brought the literature from a long past to date. Second half of the past century marked the major works in currency market arbitrage, hedging, and speculation and stability issue of the currency markets, and there has been a lull in the literature. Not much discussion has been made to bring trading strategies in the foreign exchange environment. Here that discourse is brought to limelight under covered and uncovered position in the arena of speculation. The transaction costs are conspicuous but footnote 1 shows that the results derived here can still be valid with lower measures of profits. We plant to bring out currency market transaction costs and the recognition of the difference between lending rates and borrowing rates. Synthetic options structures such as straddle, strangle, butterfly spread, and so on can increase the profitability further, and these structures should also be incorporated instead of simple singular put and call options. One more point to note here is that the work here is built with European options. A more analytical study on American options should be a further and forward step to sharpen the edges of this paper.

ENDNOTES

1. Bid and ask quotes can easily be brought in, and that will make the profit level lower. See Frenkel and Levich (1977) on that issue.
2. The converted amount does not necessarily have to be deposited at a bank at the fixed rate of interest. Investor can put the amount at an immunized portfolio with guaranteed fixed rate of return.
3. Even if the investor uses his/her own money, he or she must subtract the amount being invested with opportunity cost to arrive at the pure arbitrage profit,
4. 3-month is taken as a terminal date for option and contract maturing at the same time. Instead of 3 months, it can be a year or so.

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