CHAPTER 14

International Portfolio and the Diversification of Risk

14.1 Introduction

This chapter continues our study from Chap. 9 and Chaps. 12-13. We want to explore the particular question: to what extent one can diversify risk through an international portfolio of assets. There are two types of risks. The first type of risk is exchange rate risk. The second type of risk is asset specific risk in different countries. There are earlier studies on an international CAPM. Important mile-stones include work by Grubel (1966) who pursued studies on international equity markets in order to explore potential gains for U.S. investors from an international portfolio due to low correlations between equity indices of national markets. Here dividends are not included in the returns and only small samples were explored. Grubel’s work indicated a significant reduction in risk through international diversification. The work was pursued on the basis of the mean-variance framework as introduced in Chap. 9. Furthermore, Solnik (1973, 2000) extensively computed international portfolios and compared them to national portfolios. He also computed efficient frontiers of international portfolios. In recent times in particular Levich’s (2001) work has been concerned with international equity as well as bond portfolios. Here, as above mentioned, one of the major issues is the volatility of exchange rates. We thus first explore exchange rate risk arising from volatility of exchange rates.

14.2 Risk from Exchange Rate Volatility

We first present the standard theory of exchange rate determination which is based on uncovered interest rate parity (UIP). Since we are interested in the short run movements of exchange rates, we do not discuss the purchasing power parity (PPP) theory of exchange rate determination, which pertains more to the long run. We first discuss spot rate, forward rate and interest parity from the point of view of a home country, e.g., U.S. The exchange rate of, for example, the US dollar and the euro is

\[ e = \frac{\text{dollar}}{\text{euro}} \]

The spot rate may be 1.5325 dollar per euro. The forward rate (to avoid exchange rate risk through a forward contract) is 1.5308 dollar to purchase one euro, for example, 90 days in the future.\(^\text{148}\) Next we define interest parity. Let the spot rate be

\(^{148}\) We are neglecting discounting here.
$S = \frac{\text{dollar}}{\text{euro}}$ or $\frac{1}{S} = \frac{\text{euro}}{\text{dollar}}$ and let the forward rate be $F_t$. In the U.S. one dollar investment from $t$ to $t+1$ delivers $(1 + R_t)$ as return. For the same time period there is an alternative investment in euro, which delivers $\frac{1}{S_t}(1 + R_t^*)$ with $R_t^*$ the return in Europe.

Thus, for the time period $t$ to $t+1$ one can obtain $\frac{1}{S_t}(1 + R_t^*)$ due to arbitrage (except transaction cost).

With riskless gain the arbitrage condition reads

$$1 + R_t = \frac{1}{S_t}F_t(1 + R_t^*)$$

(14.1)

Use from (14.1), $\frac{F_t}{S_t} = \left(\frac{1 + R_t}{1 + R_t^*}\right)$, and then take logs,

$$\log F_t - \log S_t = \log(1 + R_t) - \log(1 + R_t^*)$$

(14.2)

or $\approx R_t - R_t^*$

The covered interest parity theory with $f_t = \log F_t$ and $s_t = \log S_t$ gives us

$$f_t - s_t = R_t - R_t^*$$

(14.3)

A forward premium on the foreign currency is $(F_t - S_t)/S_t$, $S_{t+1}$ is the spot rate at $t+1$.

Take

$$E_t(S_{t+1}) = S_{t+1} + \varepsilon_{t+1}$$

and

$$\frac{E_t(S_{t+1})}{S_t} = \left(1 + \frac{R_t}{1 + R_t^*}\right)$$

Take logs, then the Uncovered Interest Parity (UIP), can be written as

$$s_{t+1}^e - s_t = R_t - R_t^*$$

(14.4)

or as

$$R_t = R_t^* + \frac{(s_{t+1}^e - s_t)}{\dot{\varepsilon}_t}$$

with $\dot{\varepsilon}$ the corresponding time continuous change of the exchange rate. This means, the domestic interest rate is equal to the foreign rate plus the expected change of the exchange rate.

Thus, one could postulate

$$s_{t+1}^e - s_t = \alpha + \beta(f_t - s_t)$$