

EG, Ch. 12: International Diversification

I. Overview. International Diversification:

- A. Reduces Risk.
- B. Increases or Decreases Expected Return?
- C. Performance is affected by Exchange Rates.
- D. How to go about investing internationally.
- E. Benefits versus Costs.

II. International Diversification Reduces Risk.**A. Statistics Review.**

1. $\{R_1, R_2, \dots, R_N\}$ are random variables with:
 - $\{E(R_1), E(R_2), \dots, E(R_N)\},$
 - $\{\sigma_1^2, \sigma_2^2, \dots, \sigma_N^2\}.$
2. Let w_i be fraction of wealth in stock i .
 - a. Ex post portfolio return:
 $R_p = \sum w_i R_i$ (where $\sum w_i = 1$).
 - b. Ex ante portfolio return:
 $E(R_p) = \sum w_i E(R_i).$
 - c. Ex ante uncertainty:
 $\sigma^2(R_p) = \sum w_i^2 \sigma_i^2 + \sum_{i \neq j} \sum w_i w_j \sigma_{ij}.$

B. Diversification within a country reduces risk.

1. Consider naïve diversification ($w_i = 1/N$):

$$\begin{aligned}\sigma^2(R_p) &= \sum (1/N)^2 \sigma_i^2 + \sum_{i \neq j} \sum (1/N)^2 \sigma_{ij} . \\ &= (1/N) \sum \sigma_i^2 / N + (N-1)/N \sum_{i \neq j} \sum \sigma_{ij} / N(N-1). \\ &= (1/N) \bar{\sigma}_i^2 + (N-1)/N \bar{\sigma}_{ij} .\end{aligned}$$

- a. As we diversify (increase N), $\sigma^2(R_p) \rightarrow \bar{\sigma}_{ij}$.

Individual stock's σ_i^2 can be diversified away,
but covariance (systematic) risk cannot.

C. Same benefits extend to international diversification.

1. Let w_i = fraction of wealth in country i ...
2. Individual country's risk, σ_i^2 , can be diversified away,
but covariance (systematic) risk across countries can't.

D. Comparing Alternative International Investments.

1. Measures of expected return for U.S. and country N must be *adjusted for relative risks*, σ_{US} and σ_N :

$$\text{Sharpe Measure for U.S.} = \{[E(R_{US})] - R_f\} / \sigma_{US}$$

$$\text{Sharpe Measure for Country N} = \{[E(R_N)] - R_f\} / \sigma_N$$

2. These offer 'comparable' *risk-adjusted* return measures.

Thus, might want to invest in country N if:

$$\{[E(R_N)] - R_f\} / \sigma_N > \{[E(R_{US})] - R_f\} / \sigma_{US}.$$

3. However, this comparison *ignores* the benefits of risk reduction provided by investing in country N ($\rho_{N,US}$).

Must combine Sharpe Measure with Correlation:

RULE: Hold non-U.S. securities as long as

$$\frac{E(R_N) - R_f}{\sigma_N} > \frac{E(R_{US}) - R_f}{\sigma_{US}} \cdot \rho_{N,US}.$$

4. If $\rho_{N,US} = 1$, no risk reduction from investing in N;
invest in N only if larger Sharpe Measure.
If $\rho_{N,US} < 1$, risk reduction makes N more attractive;
→ invest in N even if $E(R_N) < E(R_{US})$
and/or $\sigma_N > \sigma_{US}$.

III. International Diversification may \uparrow or \downarrow $E(R_p)$.

A. Return experience has varied over time.

1. Over some periods the U.S. market out-performs.
Over other periods the U.S. market under-performs.
2. Thus, looking forward, *cannot* say that
int'l diversification \uparrow risk-adjusted expected returns.
 - a. $E(R_i)$ versus $E(R_j)$ depends on many factors,
at any point in time.

IV. Performance is affected by Exchange Rates.

A. The **Dollar Rate of Return** on an investment in country i stocks.

$$1. (1 + R_{i\$}) = (1 + R_i)(1 + e_i)$$

where R_i = return on stock in foreign currency i ;
 e_i = appreciation/depreciation in currency i .

2. Ignoring the cross-product term,

$$R_{i\$} = R_i + e_i.$$

3. Example.

a. U.S. & U.K. stocks both increase 10%;

U.S. \$ depreciates 10% against the £;

Today: 1\$ = 0.50£ ($e_0 = 2.00$ \$/£).

1 year: 1\$ = 0.45£ ($e_1 = 2.20$ \$/£).

b. U.S. investor:

Today: \$1 buys 0.5£ worth of U.K. stock;

1 year: U.K. stock worth 0.55£;

Exchange for \$ -- 0.55£ x (2.20\$/£) = \$1.21

(U.K. stock ↑ 10%, £ ↑ 10%).

c. U.K. investor:

Today: 0.50£ buys \$1 worth of U.S. stock;

1 year: U.S. stock worth \$1.10;

Exchange for £ -- \$1.10 ÷ (2.20\$/£) = 0.50£

(U.S. stock ↑ 10%, \$ ↓ 10%).

B. Exchange Rate Uncertainty.

1. For investment in i^{th} foreign market:
 - a. $R_{i\$} = R_i + e_i$.
 - b. $\sigma^2(R_{i\$}) = \sigma^2(R_i) + \sigma^2(e_i) + 2 \text{Cov}(R_i, e_i)$.

2. Now the international portfolio behaves as follows:
 - a. $R_{p\$} = \sum w_i (R_{i\$}) = \sum w_i (R_i + e_i)$.
 - b. $E(R_{p\$}) = \sum w_i E(R_{i\$}) = \sum w_i E(R_i) + \sum w_i E(e_i)$.
 - c.
$$\begin{aligned} \sigma^2(R_{p\$}) = & \sum w_i^2 \sigma^2(R_i) + \sum_{i \neq j} \sum w_i w_j \text{Cov}(R_i, R_j) + \\ & \sum w_i^2 \sigma^2(e_i) + \sum_{i \neq j} \sum w_i w_j \text{Cov}(e_i, e_j) + \\ & \sum_{i \neq j} \sum w_i w_j \text{Cov}(R_i, e_j) \end{aligned}$$

3. Notes:
 - a. $\sigma^2(R_i)$ & $\sigma^2(e_i)$ can be diversified away.
 - b. If covariances = 0, don't contribute to risk.
 - c. If covariances < 0, they can reduce (hedge) risk.
 - d. If covariances > 0, they are sources of risk that cannot be diversified away.
 - i. $\text{Cov}(R_i, R_j) = \sigma_{ij}$; discussed earlier.
 - ii. $\text{Cov}(e_i, e_j)$ represents covariation across e_i & e_j .
If \$ strengthens against all currencies, then all foreign investments do poorly.
 - iii. $\text{Cov}(R_i, e_j)$ represents covariance between stocks in country i & currency in country j .
For $i \neq j$, $\text{Cov}(R_i, e_j)$ probably ≈ 0 ;
For $i = j$, $\text{Cov}(R_i, e_j)$ probably > 0 .
-- when a country's economy is strong, both its stocks & currency tend to \uparrow .

V. How to go about investing internationally.

- A. Buy foreign stocks directly.
 - 1. High transactions costs.
 - 2. Subject to foreign regulations & taxes.

- B. Cross-listed stocks.

- C. ADR's (American Depository Receipts).
 - 1. Negotiable certificates issued by U.S. bank;
 - 2. Represent shares of stock held in trust at a custodian foreign bank.
 - 3. Dividends paid in \$ -- bank converts.
 - 4. Transfer of ownership done in U.S.; according to U.S. laws, not foreign court system.

- D. International Mutual Funds.
 - 1. Good way to capture diversification benefits.
 - 2. Low transactions costs & information costs.
 - 3. Three kinds:
 - a. Country funds: invest in 1 country;
 - b. Global funds: > 25% in foreign markets;
 - c. International: > 50% in foreign markets.
 - 4. Look at prospectus!
 - a. Performance depends on time period, and whether \$ was increasing or decreasing.
 - 5. See ads in Wall Street Journal.

- E. U.S. Multinational Companies.
 - 1. Let firm diversify for you.
 - 2. Performance:
 - a. U.S. Multinationals act like U.S. firms; beta with U.S. $R_m \approx 1$; with foreign $R_m \approx 0$.
 - b. Multinationals are large, limited growth pot.

VI. Benefits must be weighed against costs.

- A. International Capital Market Imperfections:
 - 1. High information & transactions costs.
 - 2. Barriers in some foreign markets.
 - a. withholding taxes, legal restrictions, ...).
 - 3. Double taxation of foreign investment income.
 - 4. Political Risk.
 - a. unexpected changes in regulations or taxes.
 - b. possible nationalization of firm's assets.
- B. Exchange Rate Uncertainty.
 - 1. $\text{Cov}(R_i, R_j)$, $\text{Cov}(e_i, e_j)$, & $\text{Cov}(R_i, e_j)$.
- C. Trend toward greater world market integration may make markets tend to move together more.
 - 1. Covariances (& thus risk) increasing over time?
 - 2. Before cross-listing, low correlations with U.S.
after cross-listing, high correlations.
 - 3. Recent experience:
Markets have low correlations when rising,
but have higher correlations when falling!
(international market crashes, ...).