Lesson XI: Overview

1. Portfolio Investment
2. To sum up (Exercises, Q&A…)

Portfolio Investment

Spreading risk: Diversification I

Assuming **risk aversion**, investors demand higher returns for taking on higher risk

If we select our portfolio based on E[r], $\sigma^2[r]$ and $\sigma[r_m; r_n]$, we will be able to achieve min risk for a given expected return (or, equivalently, max return for a given level of risk)

Spreading risk: Diversification II

Ceteris paribus, the lower are the $\sigma[r_m; r_n]$, the greater are the benefits of portfolio diversification.

$$E[r_p] = \sum_{i=1}^{n} x_i E[r_i]$$

$$\sigma_p^2 = \sum_{i=1}^{n} x_i^2 \sigma_i^2 + \sum_{i=1}^{n} \sum_{j \neq i=1}^{n} x_i x_j \sigma_{ij}$$

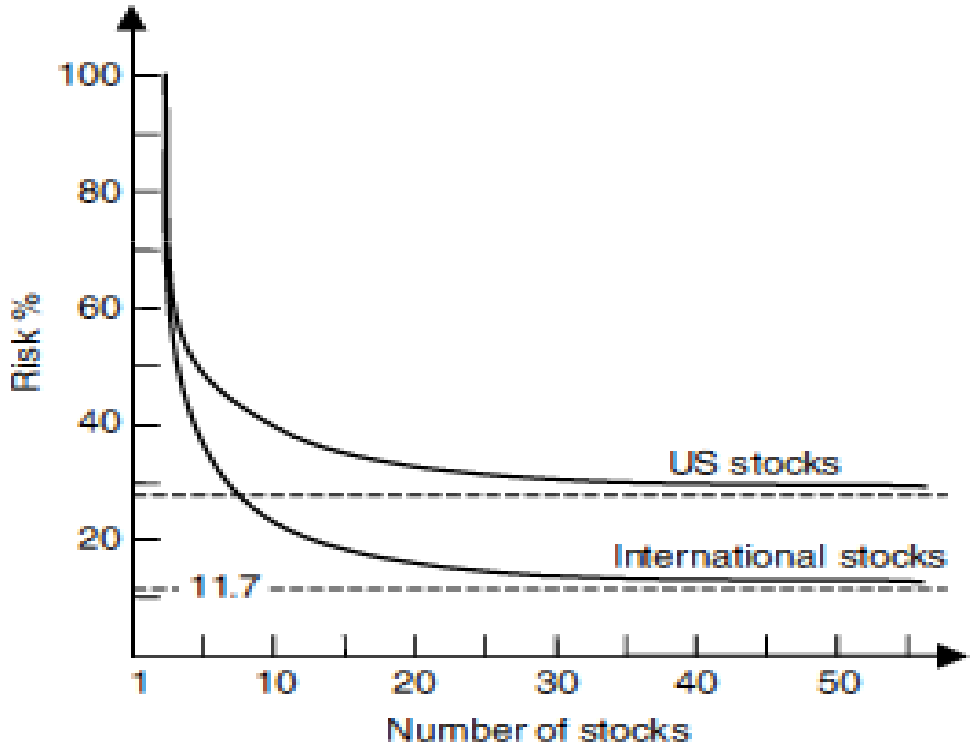
"International" correlations

Correlation coefficients computed on monthly USD returns (1994-2002)

	Correlation coefficient										
	Aus	Can	Fr	Ger	Ind	Ital	Jap	Holl	Sing	Swed	UK
Australia											
Canada	0.66										
France	0.46	0.59									
Germany	0.50	0.62	0.85								
India	0.43	0.41	0.21	0.21							
Italy	0.37	0.47	0.70	0.68	0.31						
Japan	0.57	0.44	0.37	0.32	0.25	0.28					
Holland	0.54	0.60	0.87	0.88	0.27	0.67	0.37				
Singapore	0.63	0.53	0.40	0.41	0.36	0.28	0.41	0.44			
Sweden	0.59	0.71	0.80	0.83	0.38	0.68	0.39	0.76	0.45		
UK	0.55	0.64	0.75	0.74	0.13	0.50	0.34	0.76	0.49	0.70	
USA	0.57	0.76	0.67	0.74	0.25	0.49	0.43	0.72	0.54	0.71	0.82

Source: IMF, *International Financial Statistics*, December 2003

The benefits of worldwide diversification



Source: B.H. Solnik, "Why not diversify internationally rather than domestically?", *Financial Analysts Journal*, 1974

Watch out

International diversification

Rewards

Lower σ_p^2

Risks

Unanticipated changes in FX rates

The Exchange Rate Risk I

The risk arising from unexpected changes in FX rates depends **both** on:

1. The **σ^2 of exchange rates**;
2. On the existing **relationship between exchange rates and security prices**

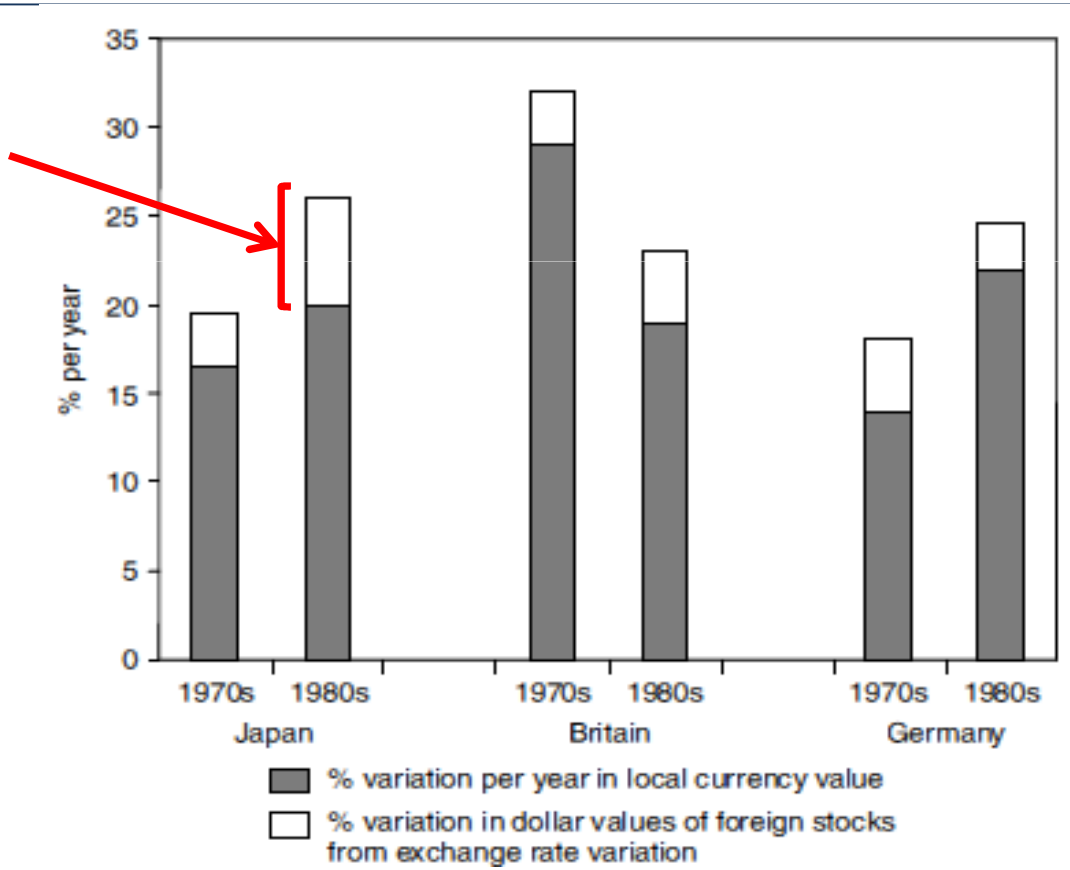
The exchange rates contribute a fraction of the total portfolio returns' volatility via the **direct effect** of the exchange rate volatility and via the **indirect effect** of positive covariance between exhange rates and (local) stock mkt returns

The Exchange Rate Risk II

The potential risk deriving from exchange rates fluctuations can be judged by comparing the σ^2 of stocks values measured in local currencies to the σ^2 of stocks prices expressed in domestic currency terms (assume the USD is our home currency)

The Exchange Rate Risk III

The difference between the two σ^2 can be conceived as the σ^2 contributed to the $ value by variations in FX rates→**relatively SMALL contribution**



Source: *International finance*, M. D. Levi, 2009

The Exchange Rate Risk IV

Expected $ return on a foreign stock:

$$E[r] = r_F + \Delta S \frac{F}{\$}$$

Variance of the $ return on a foreign stock:

$$\sigma^2 = \sigma^2 \Delta S \frac{F}{\$} + \sigma^2 r + 2\rho(r; \Delta S \frac{F}{\$})$$

The Var of the USD rate of return on the foreign stock depends on…

…the Var of the FX rate…

…the Var of the returns on the foreign stock…

…and the Cov between the FX rate and r.

The Exchange Rate Risk V

Composition of US dollar weekly returns on individual foreign stock markets, 1980–85

Country	Percentage of variance in US dollar returns from		
	Exchange rate	Local return	2 x Covariance
Canada	4.26	84.91	10.83
France	29.66	61.79	8.55
Germany	38.92	41.51	19.57
Japan	31.85	47.65	20.50
Switzerland	55.17	30.01	14.81
UK	32.35	51.23	16.52

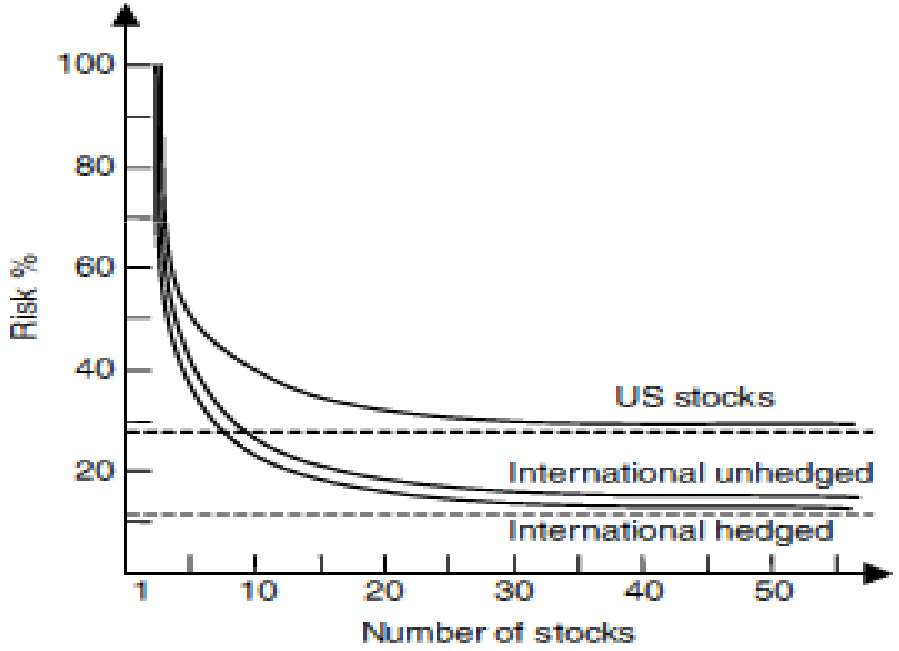
Source: Cheol S. Eun and Bruce G. Resnick, "Exchange Rate Uncertainty, Forward Contracts, and International Portfolio Selection," *Journal of Finance*, March 1988, pp. 197–215.

Given some Exchange Rate Risk…I

Does it completely nullify the benefits arising from international diversification? NO!

1. It is always possible to hedge against FX risk;
2. Even without hedging, the σ^2 of an internationally diversified portfolio < the variance of a domestically diversified portfolio

Given some Exchange Rate Risk…II



Source: B.H. Solnik, "Why not diversify internationally rather than domestically?", *Financial Analysts Journal*, 1974

International K Asset Pricing

The pricing (and, consequently, the returns) of assets depends on whether prices are determined in an **integrated** or in a **segmented** international K mkt

- *Integrated*: the connection between countries' capital markets is seamless
- *Segmented*: different countries' capital markets are not integrated because of implicit or explicit factors inhibiting the free movement of capital between the countries.

Integration vs Segmentation

- Whenever international K mkts are **integrated**, the **returns** on a given stock will be **appropriate for the risk of that security** in an internationally diversified portfolio;
- Conversely, if assets are priced in **segmented** K mkts, their **returns** will also depend on the **systematic risk of their domestic mkt**

If we were able to circumvent the causes of mkt segmentations, we would be able to enjoy higher benefits deriving from international diversification

Terminology

Systematic risk: risk that cannot be diversified away

Systemic risk: risk of collapse of an entire financial system or entire market

CAPM I

$$r_j = r_f + \beta(r_m - r_f)$$

$$\beta = \frac{\rho(r_j, r_m)}{\sigma^2_{r_m}}$$

- r_j: E[r] on the j^{th} security/portfolio
- r_f: risk-free rate of interest
- r_m: E[r] on the mkt portfolio
- $\rho(r_j; r_m)$: cov between the j^{th} security/portfolio and the mkt portfolio
- σ^2_{rm}: variance of the mkt portfolio

CAPM II

$$r_j - r_f = \beta(r_m - r_f)$$

$$\beta = \frac{\rho(r_j, r_m)}{\sigma^2_{rm}}$$

The risk premium is linearly related to…

…the risk that the single asset/portfolio contributes to the mkt as a whole→ **SYSTEMATIC RISK**

ICAPM

$$r_j = r_f + \beta(r_w - r_f)$$

$$\beta = \frac{\rho(r_j, r_w)}{\sigma^2_{r_w}}$$

- r_j: E[r] on the j^{th} security/portfolio
- r_f: risk-free rate of interest
- r_w: E[r] on the world portfolio
- $\rho(r_j; r_w)$: cov between the j^{th} security/portfolio and the world portfolio
- σ^2_{rw}: variance of the world portfolio

Very appealing→ no possibility of further diversification (no further returns to be enjoyed), yet **difficult to implement** (what is a "world portfolio"?)

K mkts integration I

By holding the internationally diversified portfolio in a integrated K mkt, an investor could enjoy the best possibile risk-return profile

Are K mkts really integrated?

K mkts integration II

The available empirical evidence tends to support the view that international K mkts are still quite segmented

The most obvious example of segmentation is in the form of a bias towards domestic investments (so called "**Home-equity Bias**")→ the global holdings of foreign securities is largely sub-optimal

Reasons behind the HEB

- Legal barriers to foreign investments;
- Higher transaction costs on foreign equities;
- Indirect barriers to foreign investments→ e.g. the difficulty in finding (and interpreting) information about foreign securities;
- Additional risks to be hedged (FX risk, country risk…)