

Direct Foreign Investment (DFI)

DFI

Definition: A DFI is a controlling ownership in a business enterprise in one country by an entity based in another country.

DFI is different from portfolio investing abroad, a more passive tool.

The Bank/OECD defines controlling ownership as 10%+ of voting stock.

DFIs can be done through mergers & acquisitions, setting up a subsidiary, a joint venture, etc.

According to the World Bank, total DFI in 2013 was USD 1.65 trillion.
- China biggest recipient of DFI (USD 347.8 B), followed by the U.S. (USD 235.9 B), Brazil (USD 80.8 B) and HK (USD 70.7 B).

This chapter motivates DFI through a firm's evaluation of two alternatives:

- A domestic firm can produce at home and export production.
- A domestic firm can also invest to produce abroad (& do a DFI).

• **Q: Why DFI instead of exports?**

A: Avoid tariffs and quotas

Access to cheap inputs

Reduce transportation costs

Local management

Take advantage of government subsidies

Reduce economic exposure

Diversification

Access to local expertise (including: contacts, red tape, etc.)

Real option (investment today to make investments elsewhere later).

• **Diversification through DFI**

Companies have many DFI projects. They will select the project that will improve the company's risk-reward profile (think of a company as a portfolio of projects).

Note:

- No debate about measuring returns: Excess Return = $E[r_t - r_f]$

- But, there are different measures for risk.

• Popular risk-adjusted performance measures (RAPM):

Reward to variability (Sharpe ratio): $RVAR = E[r_t - r_f]/SD$.

Reward to volatility (Treyner ratio): $RVOL = E[r_t - r_f]/Beta$.

Risk-adjusted ROC (BT): $RAROC = Return/Capital-at-risk$.

Jensen's alpha measure: Estimated constant (α) on a CAPM-like regression

RAPM: Pros and Cons

- RVOL and Jensen's alpha:

Pros: They take systematic risk into account

⇒ Appropriate to evaluate diversified portfolios.

Comparisons are fair if portfolios have the same systematic risk, which is not true in general.

Cons: They use the CAPM => Usual CAPM's problems apply.

- RVAR

Pros: It takes unsystematic risk into account. Thus, it can be used to compare undiversified portfolios. Free of CAPM's problems.

Cons: Not appropriate when portfolios are well diversified.

SD is sensible to upward movements, something irrelevant to Risk Management.

- RAROC

Pros: It takes into account only left-tail risk.

Cons: Calculation of VaR is more of an art than a science.

• RVAR and RVOL

Measures: $RVAR_i = (r_i - r_f) / \sigma_i$.

$RVOL_i = (r_i - r_f) / \beta_i$.

Example: A U.S. investor considers foreign stock markets:

Market	$(r_i - r_f)$	σ_i	β_{WLD}	RVAR	RVOL
Brazil	0.2693	0.52	1.462	0.5170	0.1842
HK	0.1237	0.36	0.972	0.3461	0.1273
Switzerl	0.0548	0.19	0.759	0.2884	0.0722
Norway	0.0715	0.29	1.094	0.2466	0.0654
USA	0.0231	0.16	0.769	0.1444	0.0300
France	0.0322	0.22	1.073	0.1464	0.0300
Italy	0.0014	0.26	0.921	0.0054	0.0015
World	0.0483	0.155	1.0	0.3116	0.0483

Example: RVAR and RVOL (continuation)

Using RVAR and RVOL, we can rank the foreign markets as follows:

Rank	RVAR	RVOL
1	Brazil	Brazil
2	Hong Kong	Hong Kong
3	Switzerland	Switzerland
4	Norway	Norway
5	France	USA
6	USA	France

Note: RVAR and RVOL can produce different rankings. ¶

- **Diversification through DFI: RVAR and RVOL**

- We need to know how to calculate $E[r]$ and $\text{Var}[r]$ for a portfolio:

If X and Y, then:

$$E[r_{x+y}] = w_x * E[r_x] + (1 - w_x) * E[r_y]$$

$$\text{Var}[r_{x+y}] = \sigma_{x+y}^2 = w_x^2 (\sigma_x^2) + w_y^2 (\sigma_y^2) + 2 w_x w_y \rho_{x,y} \sigma_x \sigma_y$$

$$\text{RVAR}_p = \text{SR} = (r_p - r_f) / \sigma_p.$$

- Calculate the β of the X+Y portfolio: The beta of a portfolio is the weighted sum of the betas of the individual assets:

$$\beta_{x+y} = w_x * \beta_x + (1 - w_x) * \beta_y$$

$$\text{RVOL}_p = \text{TR} = (r_p - r_f) / \beta_p.$$

Note: SR uses total risk (σ); appropriate when total risk matters –i.e., when most of an investor's wealth is invested in asset i . When asset i is a small part of a diversified portfolio; σ is inappropriate. TR emphasizes systematic risk, the appropriate measure of risk, according to the CAPM.

Example: A US firm with $E[r] = 13\%$; $SD[r] = 12\%$ ($SD = \sigma$), $\beta = .90$

Considers two potential DFIs: Colombia and Brazil

(1) Colombia: $E[r_c] = 18\%$; $SD[r_c] = 25\%$, $\beta_c = .60$

(2) Brazil: $E[r_b] = 23\%$; $SD[r_b] = 30\%$, $\beta_b = .30$

$r_f = 3\%$

$\rho_{\text{ExistPort, Col}} = 0.40$

$\rho_{\text{EP, Brazil}} = 0.05$

$w_{\text{Col}} = .30, \Rightarrow (1 - w_{\text{col}}) = w_{\text{EP}} = .70$

$w_{\text{Brazil}} = .35, \Rightarrow (1 - w_{\text{Brazil}}) = w_{\text{EP}} = .65$

Q: Which project is better? Calculate a RAPM for each project:

- $SR = E[r_i - r_f] / \sigma_i = RVAR$

- $TR = E[r_i - r_f] / \beta_i = RVOL$

Example (continuation):

• Colombia

$$E[r_{\text{EP+Col}} - r_f] = w_{\text{EP}} * E[r_{\text{EP}} - r_f] + (1 - w_{\text{EP}}) * E[r_{\text{col}} - r_f]$$

$$= .70 * .10 + .30 * .15 = 0.115$$

$$\sigma_{\text{EP+Col}} = (\sigma_{\text{EP+Col}}^2)^{1/2} = (0.017721)^{1/2} = 0.1331$$

$$\sigma_{\text{EP+Col}}^2 = w_{\text{EP}}^2 (\sigma_{\text{EP}}^2) + w_{\text{Col}}^2 (\sigma_{\text{Col}}^2) + 2 w_{\text{EP}} w_{\text{Col}} \rho_{\text{EP, Col}} \sigma_{\text{EP}} \sigma_{\text{Col}}$$

$$= (.70)^2 * (.12)^2 + (.30)^2 * (.25)^2 + 2 * .70 * .30 * 0.40 * .12 * .25 = 0.017721$$

$$\beta_{\text{EP+Col}} = w_{\text{EP}} * \beta_{\text{EP}} + w_{\text{Col}} * \beta_{\text{Col}}$$

$$= .70 * .90 + .30 * .60 = 0.81$$

$$SR_{\text{EP+Col}} = E[r_{\text{EP+Col}} - r_f] / \sigma_{\text{EP+Col}} = .115 / .1331 = 0.8640$$

$$TR_{\text{EP+Col}} = E[r_{\text{EP+Col}} - r_f] / \beta_{\text{EP+Col}} = .115 / .81 = 0.14198$$

Interpretation of SR: An additional unit of total risk (1%) increases returns by .864%

Interpretation of TR: An additional unit of systematic risk increases returns by .142%

Example (continuation):

• Brazil

$$E[r_{EP+Brazil} - r_f] = 0.135$$

$$\sigma_{EP+Brazil} = 0.1339$$

$$\beta_{EP+Brazil} = 0.69$$

$$SR_{EP+Brazil} = 0.135/0.1339 = 1.0082 > SR_{EP+Col} = 0.8640$$

$$TR_{EP+Brazil} = .135/.69 = 0.19565 > TR_{EP+Col} = 0.14198$$

⇒ Under both measures, Brazilian project is superior.

• Existing portfolio of the firm (to compare to Brazilian project):

$$SR_{EP} = (.13 - .03)/.12 = .833$$

$$TR_{EP} = (.13 - .03)/.90 = .111$$

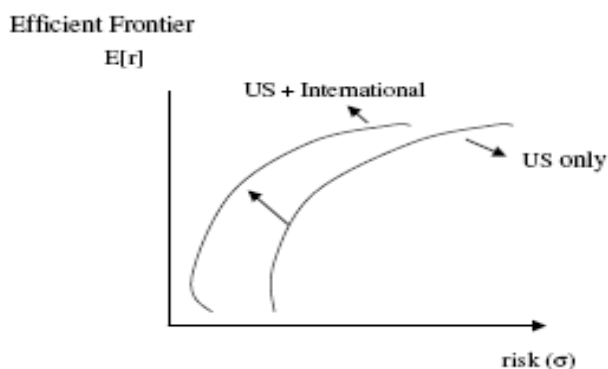
⇒ Under both measures, the firm should diversify internationally!

Q: Why? Because it improves the risk-reward profile for the firm.

Why Go International?

• Diversification

If it is good to diversify in domestic markets, it is even better to diversify internationally.



Q: Why does the frontier move in the NW direction?

A: Low Correlations! Low correlations are the key to achieve lower risk.

• Empirical Fact #1: Low Correlations

The correlations across national markets are lower than the correlations across securities in most domestic markets.

- Return correlations are moderate.
 - Average for developed markets: 0.42.
- Common economic policies matter:
 - Average intra-European correlation: .57
 - Average intra-Asian correlation: .42
- There is a regional (neighborhood) effect:
 - Correlations between the US and Canada is .76.
 - Correlations between the US and Japan is .35.

TABLE 13.1 -MSCI Indexes: Correlation Matrix (1970-2015)

A. European Markets

MARKET	Bel	Den	France	Germ	Italy	Neth	Spain	Swed	Switz	U.K.	Wrld
Belgium	1.00	0.59	0.72	0.70	0.54	0.75	0.56	0.55	0.68	0.59	0.69
Denmark		1.00	0.53	0.59	0.48	0.62	0.51	0.54	0.55	0.49	0.61
France			1.00	0.73	0.59	0.73	0.59	0.57	0.68	0.63	0.73
Germany				1.00	0.56	0.78	0.58	0.64	0.71	0.54	0.71
Italy					1.00	0.55	0.57	0.50	0.50	0.57	0.57
Netherlands						1.00	0.59	0.63	0.75	0.69	0.81
Spain							1.00	0.57	0.50	0.47	0.62
Sweden								1.00	0.57	0.52	0.69
Switzerland									1.00	0.62	0.72
U.K.										1.00	0.73
World											1.00

International returns correlations tend to be moderate, with an average of 0.45 (Table 13.1). Neighboring countries show higher numbers.

- Emerging Markets tend to have lower correlations.

- Average correlation with Canada: 0.507

- Average correlation with Brazil: 0.375

- Average correlation with Russia: 0.426

- Average correlation with India: 0.431

- Average correlation with China: 0.414

TABLE XI.2
Correlation of Developed and Emerging Markets (Jan. 1987- Sep. 2011)

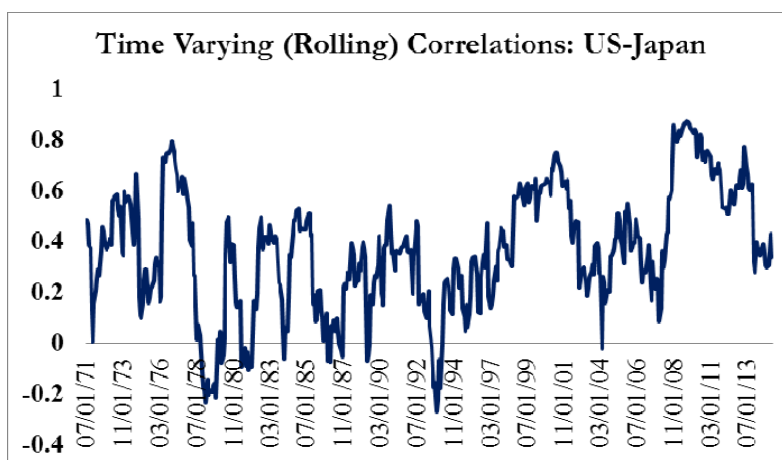
MARKET	Brazil	Russia*	India*	China*	EM-Lat Am	EM-Global	EAFE
U.S.	0.41	0.47	0.42	0.49	0.57	0.60	0.56
U.K.	0.37	0.37	0.43	0.43	0.45	0.52	0.64
Japan	0.28	0.29	0.34	0.25	0.36	0.40	0.75
World	0.44	0.50	0.50	0.46	0.59	0.63	0.92

- *Empirical fact 2: Correlations are time-varying*

International correlations change over time. They can have wild swings.

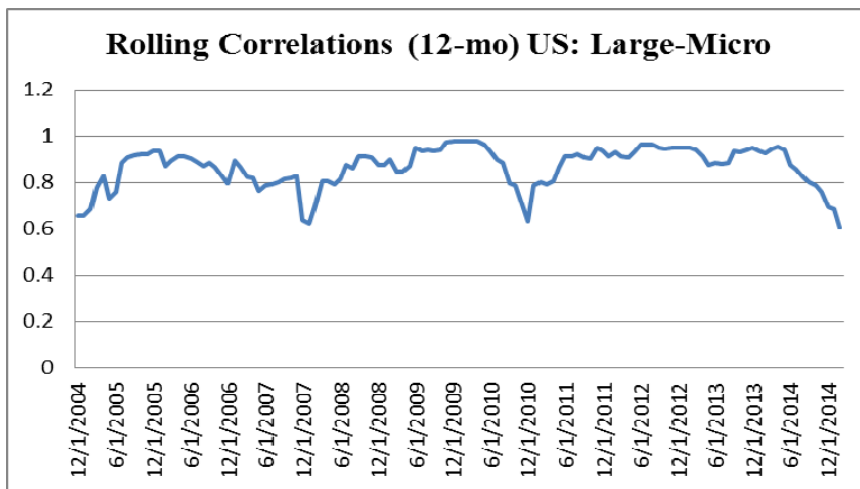
General finding: During bad global times, correlations go up

=> when you need diversification, you tend not to have it!



• Empirical fact 2: Correlations are time-varying

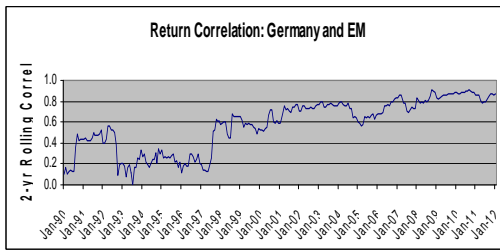
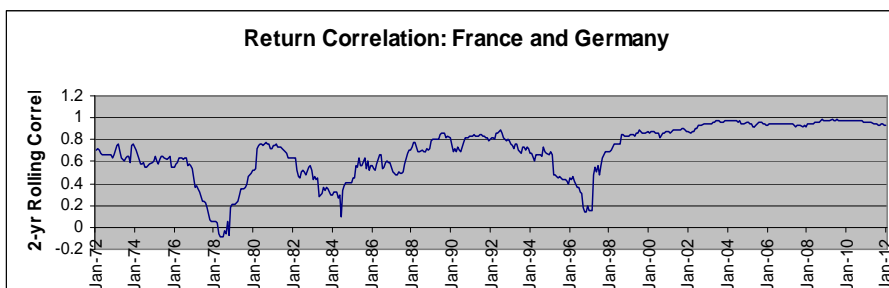
Correlations change over time: Also between U.S. stocks, but not as much as international correlation. Note also they are higher!



• Empirical fact 2-A: Correlations seem to be increasing

Correlations have increased over the last 10 years.

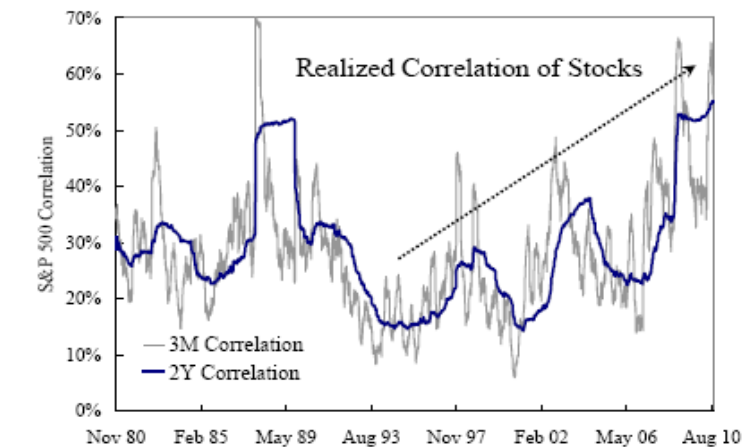
- Germany and France have become the *same* asset!



• Empirical fact 2-A: Correlations seem to be increasing

It also true at the domestic level. JPMorgan: “Correlation Bubble”

Figure 1: Realized Correlation of S&P 500 Stocks



Source: J.P. Morgan Equity Derivatives Strategy.

• Empirical fact 2: Correlations are time-varying

A “correlation bubble” is bad news for international (and domestic) investors: High correlations \Rightarrow more volatile portfolios.

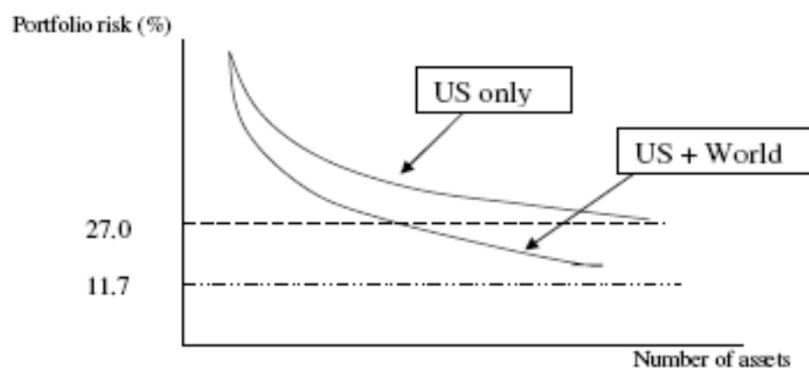
- In addition, higher volatility \Rightarrow higher option premiums (higher insurance cost!).
- Investors like diversification. They look for low correlated assets: *treasury bonds, commodities (gold, oil, etc.), real estate.*
- But, diversification can work with highly correlated assets.

Example: The correlation between the U.S. and Canadian markets is .75. The RVAR of the U.S. market from 1970-2011 is .15, while the RVAR of a 50-50 portfolio with Canada is .18.

• Empirical Fact 3: Risk Reduction

Past 12 stocks, the risk in a portfolio levels off, around 27%. For international stocks, the risk levels off at 12%

Figure 13.1: Effect of International Investment on Risk



• Empirical Fact 4: Returns Increase

Portfolios with international stocks have outperformed domestic portfolios in the past years. About 1% difference (1978-1993).

Q: Free lunch?

A: In the equity markets: Yes! Higher return (1% more), lower risks (2% less).

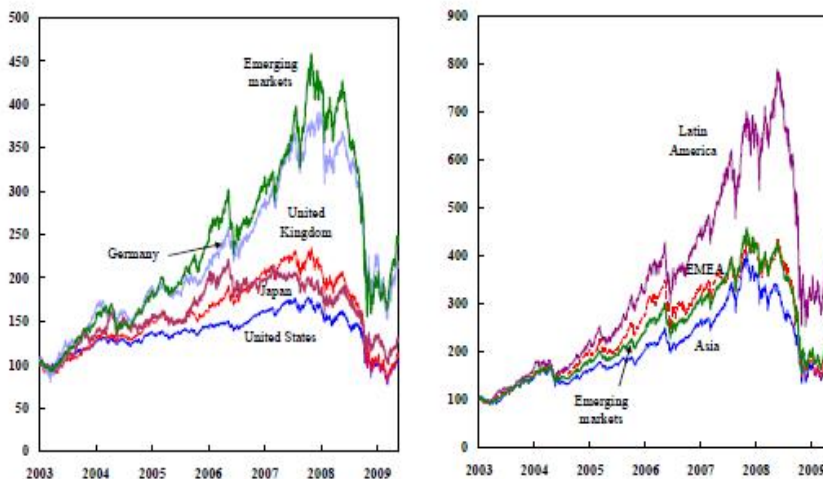
Example: The U.S. market return and volatility from 1970-2011 were 7.71% and 15.62%, respectively (RVAR=.15). A portfolio with a 25% weight with Japan would have produced a market return and volatility of 8.32% and 14.53%, respectively. (RVAR=.23).

• Q: How to take advantage of facts 2 and 3?

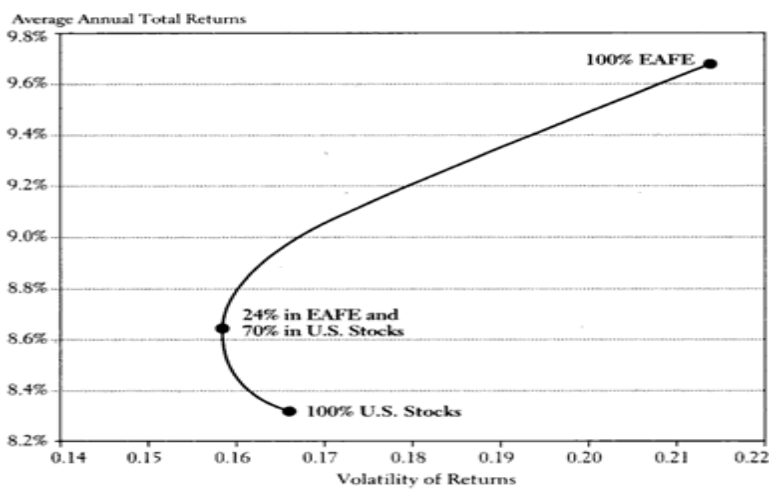
A: True diversification: invest internationally.

Example: Higher Returns - The Case of Emerging Markets (EM)

Figure 1. Selected Equity Market Indices
(January 1, 2003=100; in U.S. dollars)



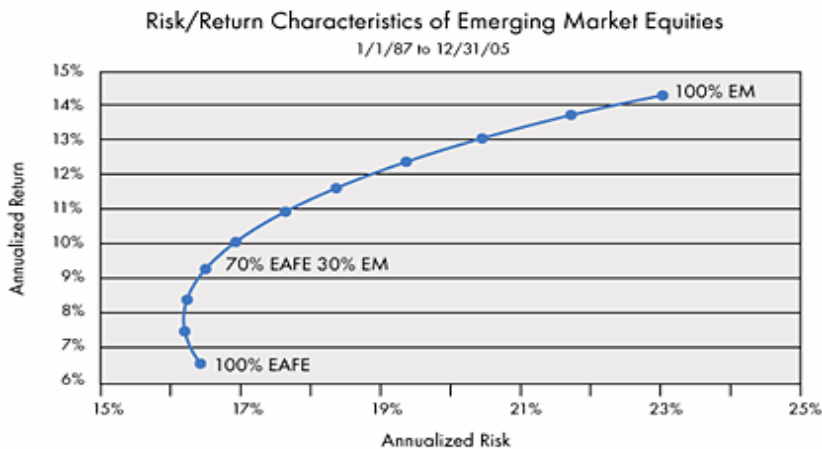
Example: Lower Risk/Higher Returns!
Taken from H. Markowitz's "A Random Walk Down Wall Street."



Example: Lower Risk/Higher Returns II -The Case of EM

More Emerging Market, More Return

At each point on the curve (going upward), the hypothetical investor owned 10% more of the MSCI Emerging Markets Index and 10% less of the MSCI EAFE Index, which represents non-U.S. developed assets. At 30% EM ownership, returns have increased to more than 9% with no increased risk.



• *Empirical Fact 5: Investors do not diversify enough*

Many studies show that domestic investors tend to invest at home. In a 2002 UBS survey, the most internationally diversified investors are Netherlands (62%), Japan (27%) and the U.K. (25%).

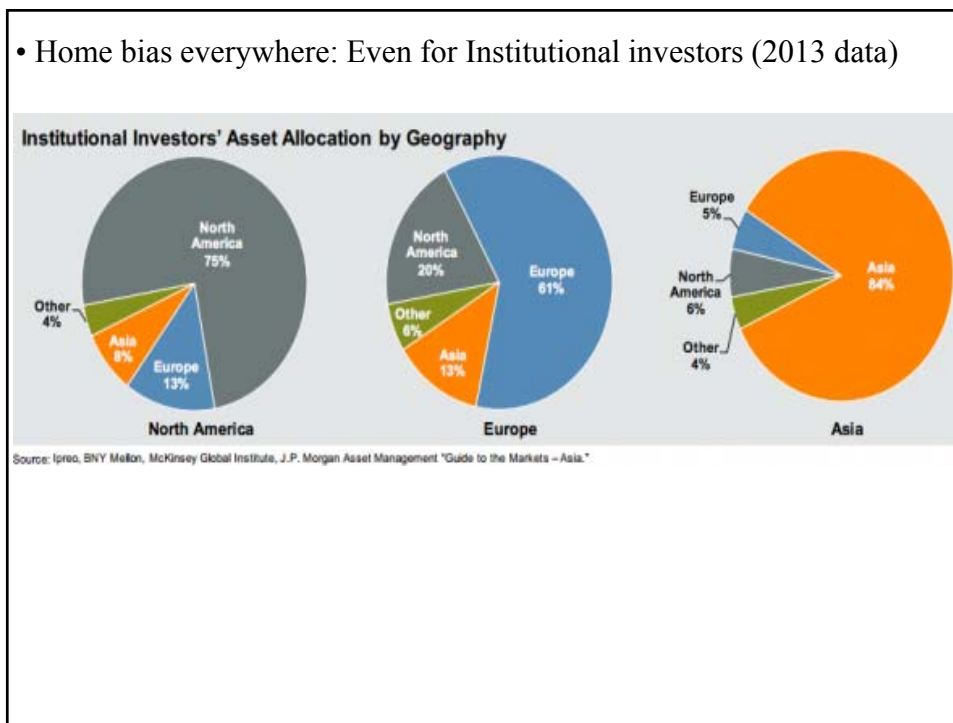
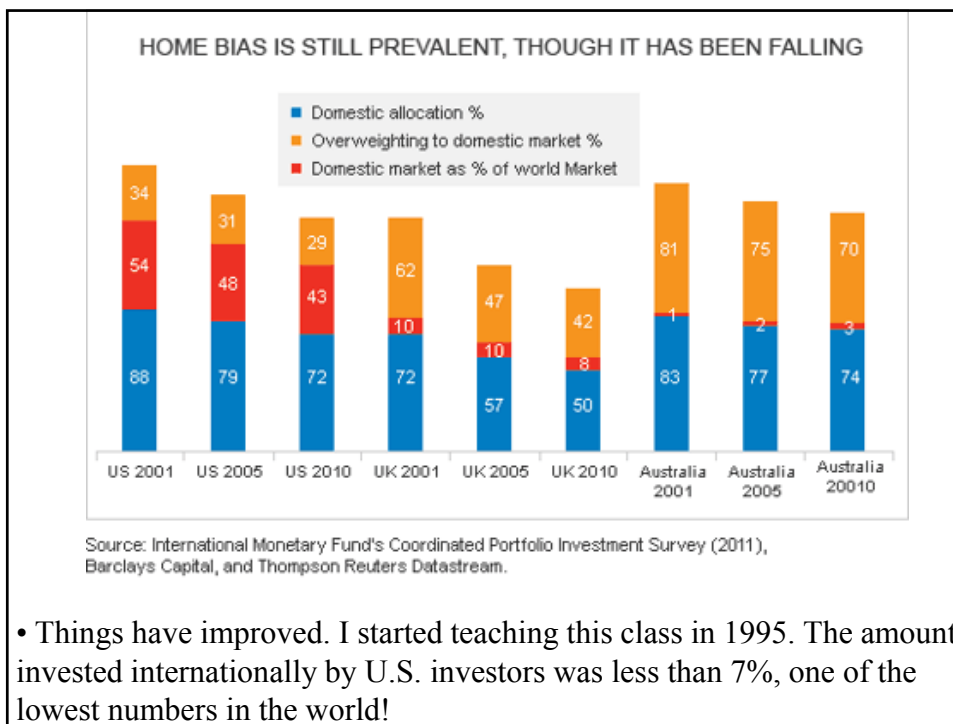
⇒ The U.S. ranks at the bottom of list: only 11%.

More recent data (2010) shows better proportions. For example, the U.K. and the U.S. international allocations are 50% and 28%, respectively.

This empirical fact is called the *Home Bias*.

Proposed explanations for home bias and low correlations:

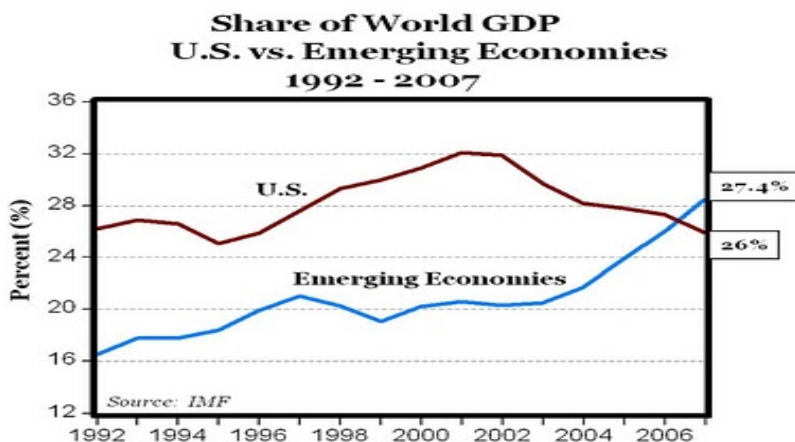
- (1) Currency risk.
- (2) Information costs.
- (3) Controls to the free flow of capital.
- (4) Country or political risk.
- (5) Cognitive bias.



- Why do we have a separate market segment: Emerging Markets?
 - Information problem problem is big. It involves financial, product, and labor markets.
 - Distortionary regulation and/or inefficient regulation
 - Judicial system not reliable (contracts enforcement a question mark)
- Labor markets
 - Problems
 - Lack of educational institutions to train people
 - No certification and screening
 - Labor regulation that limits layoffs
 - Solutions
 - Groups provide training programs (group specific)
 - Internal labor markets

- Why do we have a separate market segment: Emerging Markets?
- Regulation
 - Problems
 - Too many regulations or unequal enforcement
 - Solution
 - Intermediation between government and individual companies. Lobbying & educating politicians.
- Judicial system
 - Problems
 - Contracts not enforceable
 - Solution
 - International arbitration clauses
 - Reputation for honest dealings

Related Question: What should be your international exposure?
 - GDP weighted?



Related Question: What should be your international exposure?
 - GDP weighted?
 - Market capitalization weighted?

