THE UNIVERSITY OF QUEENSLAND
AUSTRALIA
CREATE CHANGE

Lecture 10: International Diversification

Reading: Eun & Resnick Ch. 10 (10th ed.)

Why Invest Overseas?

- Security returns are much ***less*** correlated across countries than within a country.
  - This is so because economic, political, institutional, and even psychological factors affecting security returns tend to vary across countries, resulting in low correlations among international securities.
  - Business cycles are often highly asynchronous across countries.

Effects of exchange rates

- The **realized** dollar return for an Australian resident investing in a foreign market will depend not only on the return in the foreign market but also on the change in the exchange rate between the dollar and the foreign currency.

Foreign Exchange Returns

- **An illustration with an American stock**
  - An Australian investor takes AUD1,000,000 on 1/1/2016 and invests in Microsoft (MSFT) which trades on the NASDAQ
    - On 1/1/2016, the spot exchange rate was AUD 1.3765/USD
  - The investor purchases 13,094 shares valued at $55.48 for a total investment of USD 726,460
  - At the end of the 2022, the investor sells the shares at a price of $232.13 per share yielding AUD 4,753,339.59
    - On 29/12/2022, the spot exchange rate was AUD 1.5638/USD
  - The investor receives a 375% return on investment

    (AUD 4,753,339.59/AUD1,000,000) -1 = 375%

Foreign Exchange Returns

- An illustration with Australian stock returns
  - The total return reflects not only the appreciation in the USD stock price but also the change in the USD (appreciation in this case)
  - The formula for the total return is:

$$R_{AUD}^{MSFT} = \left[\left(1 + R_{USD}^{MSFT}\right)(1 + \Delta S_{USD})\right] - 1$$

where $R_{USD}^{MSFT} = \frac{232.13-55.48}{55.48} = 3.18$ and $\Delta S_{USD} = \frac{1.5625-1.3765}{1.3765} = 0.1351$;

$$R_{AUD}^{MSFT} = [(1 + 3.18)(1 + 0.1351)] - 1 = 3.7493 \text{ (or } 375\%)$$

Foreign Exchange Returns (2)

- General Formula
  - The total return of the foreign investment reflects not only the appreciation of the foreign asset, but also the appreciation (or depreciation) of the foreign currency relative to the home currency.
  - The formula for the total return is:

$$R_{HC}^{Asset(FC)} = \left[\left(1 + R^{Asset(FC)}\right)\left(1 + R_{FC}\right)\right] - 1$$

where HC = home currency; FC = foreign currency relative to home currency (FC is in the denominator). **Asset (FC) means the asset value is in FC.**

Stock Returns in Practice

- Volkswagen AG (VOW) trades in Frankfurt on the Xetra exchange.
- On 29/01/2016, VOW shares sold for €120.70 in Frankfurt.
- On 31/12/2021, these shares traded at €259.
- What return did a German investor earn in VOW over the period?

a. 193%

b. 115%

c. 51%

d. −48%

Stock Returns in Practice (2)

- Volkswagen AG (VOW) trades in Frankfurt on the Xetra exchange.
- On 29/01/2016, VOW shares sold for €120.70 in Frankfurt.
- On 31/12/2021, these shares traded at €259.
- What return did a German investor earn in VOW over the period?

$$P_{01/2016}^{VOW,€} = €120.70 \qquad P_{12/2021}^{VOW,€} = €259$$

$$R_{€}^{VOW} = \frac{€259}{€120.70} - 1 = \mathbf{114.59\%}$$

Stock Returns in Practice (3)

$$P_{01/2016}^{VOW,€} = €120.70 \qquad P_{12/2021}^{VOW,€} = €259$$

$$S_{01/2016}^{\$/€} = \$1.0821/€ \qquad S_{12/2021}^{\$/€} = \$1.1372/€$$

- What $ return did an American investor earn in VOW over that period?
  a. She lost 37%.
  b. She earned 126%.
  c. She earned 158%.
  d. She earned 61%.

Stock Returns in Practice (4)

$$P_{01/2016}^{VOW,€} = €120.70 \qquad P_{12/2021}^{VOW,€} = €259$$

$$S_{01/2016}^{\$/€} = \$1.0821/€ \qquad S_{12/2021}^{\$/€} = \$1.1372/€$$

$$P_{\$}^{VOW,2016} = (€120.70) \cdot (\$1.0821/€) = \$130.61$$

$$P_{\$}^{VOW,2021} = (€259) \cdot (\$1.1372/€) = \$294.53$$

- What **$** return did an American investor earn in VOW?

a. She lost 37%.
b. She earned 126%.
c. She earned 158%.
d. She earned 61%.

$$R_{\$}^{VOW} = \frac{\$294.53}{\$130.61} - 1 \approx 126\%$$

Stock Returns in Practice (5)

- Why did the American earn a higher return than the German investor?
  - Her investment in VOW earned a **115%** return, BUT she also invested in the euro, which gained 5.09%

$$P_{1/2016}^{VOW,€} = €120.70 \qquad P_{12/2021}^{VOW,€} = €259$$

$$S_{1/2016}^{\$/€} = \$1.0821/€ \qquad S_{12/2021}^{\$/€} = \$1.1372/€$$

$$R_{€}^{VOW} = \frac{€259}{€120.61} - 1 = 1.147 \qquad \Delta S_{€} = \frac{\$1.1372/€}{\$1.0821/€} - 1 = 0.0509$$

$$R_{\$}^{VOW} = (1 + 1.147) \times (1 + 0.0509) - 1 \approx 126\%$$

Stock Returns in Practice (6)

- How would the American investor have fared had she bought VOW in 2021 and exited the investment in 2023?
  - Using the following information, estimate this in your own time

$$P_{12/2021}^{VOW,€} = €259 \qquad P_{12/2023}^{VOW,€} = €117.3$$

$$S_{12/2021}^{\$/€} = \$1.1372/€ \qquad S_{12/2023}^{\$/€} = \$1.10465/€$$

$$R_{\$}^{VOW} = ?$$

Foreign Returns and Risk

	Means			Volatilities			Sharpe Ratio
	Market Return	Currency Return	USD Return	Market Return	Currency Return	USD Return	
AUSTRALIA	8.54%	-0.02%	9.15%	13.59%	11.90%	21.09%	0.20
CHINA	4.15%	0.98%	5.29%	31.37%	2.48%	31.93%	0.01
GERMANY	7.21%	-0.05%	7.13%	21.06%	9.43%	22.89%	0.09
HONG KONG	7.42%	-0.01%	7.41%	23.73%	0.48%	23.71%	0.10
INDIA	10.75%	-3.25%	8.24%	24.84%	6.91%	28.49%	0.11
JAPAN	2.24%	-0.13%	1.45%	17.96%	10.44%	17.42%	-0.20
NETHERLANDS	8.82%	-0.05%	8.69%	18.22%	9.43%	20.03%	0.18
USA	10.14%	0.00%	10.14%	15.34%	0.00%	15.34%	0.34

Source: Monthly MSCI Indices (Jan 1995 – Dec 2020). Annualized means $[(1+\text{Average Monthly Returns})^{12}-1]$ and volatilities [standard deviation ($\times\sqrt{12}$)] are presented in this table. Market return is in foreign currency terms; the currency return is the change in USD/FC. For Sharpe Ratio, risk-free return is assumed to be 5%.

Adding up Volatilities

- As shown in the previous slide, the volatility of currency returns affects the volatility of USD return on a foreign equity (last column).

  But volatilities of FC market returns & currency returns are **not** additive. Why?

$$(1)\ Var\left(r_{t+1,\$}\right) = Var\left(r_{t+1,FC}\right) + Var\left(s_{t+1}\right) + 2\ \mathrm{Cov}\left[\left(r_{t+1,FC}\right), \left(s_{t+1}\right)\right]$$

$$(2)\ Var\left(r_{t+1,\$}\right) = Var\left(r_{t+1,FC}\right) + Var\left(s_{t+1}\right) + 2\ \boldsymbol{\rho} Vol\left(r_{t+1,FC}\right) Vol\left(s_{t+1}\right)$$

If correlation ($\boldsymbol{\rho}$) = 1, the *volatility of the dollar return* is the sum of the foreign equity volatility *and* currency return volatility.

	Correlation $[r_{(t+1,FC)}, s_{t+1}]$
AUSTRALIA	0.39
CHINA	0.19
GERMANY	-0.01
HONG KONG	0.00
INDIA	0.45
JAPAN	-0.35
NETHERLANDS	-0.04

Key results of portfolio theory

- The extent to which risk is reduced by portfolio diversification depends on the correlation of assets in the portfolio.
- As the number of assets increases, portfolio variance becomes more dependent on the covariances (or correlations) and less dependent on variances.
- The risk of an asset when held in a large portfolio depends on its return covariance (or correlation) with other assets in the portfolio.

International Correlations & Risk Diversification

	AU	HK	JP	DE	UK	IN	CN	NL	SG	KO
HONG KONG (HK)	0.66									
JAPAN (JP)	0.62	0.51								
GERMANY (DE)	0.73	0.59	0.53							
UNITED KINGDOM (UK)	0.78	0.64	0.59	0.82						
INDIA (IN)	0.58	0.51	0.45	0.53	0.48					
CHINA (CN)	0.55	0.70	0.39	0.46	0.49	0.44				
NETHERLANDS (NL)	0.72	0.60	0.58	0.89	0.85	0.53	0.47			
SINGAPORE (SG)	0.70	0.81	0.53	0.62	0.66	0.55	0.66	0.63		
KOREA (KO)	0.60	0.51	0.59	0.50	0.50	0.44	0.43	0.50	0.53	
USA	0.74	0.62	0.58	0.81	0.81	0.48	0.52	0.80	0.66	0.53

Source: MSCI Indices (Jan 1995 – Dec 2020). Monthly USD returns.

$$R^2 = \rho^2 = 0.74 \times 0.74 = 0.5476\ (54.76\%)$$

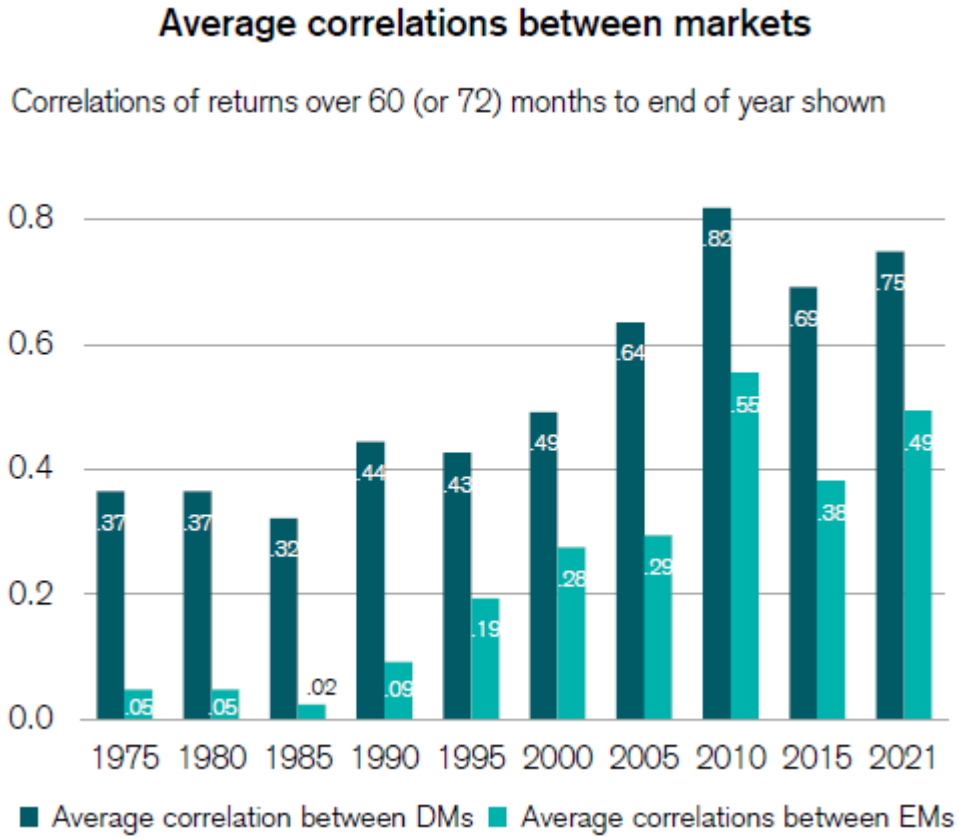
- As seen here, securities in different countries don't move in sync.
  - This means that if we diversify our investments, we can reduce our risk.
  - Remember, as you invest in more stocks, you reduce your portfolio risk (i.e., getting rid of idiosyncratic risk).
  - The takeaway? You can possibly get an even bigger "bang for your buck" by investing internationally…

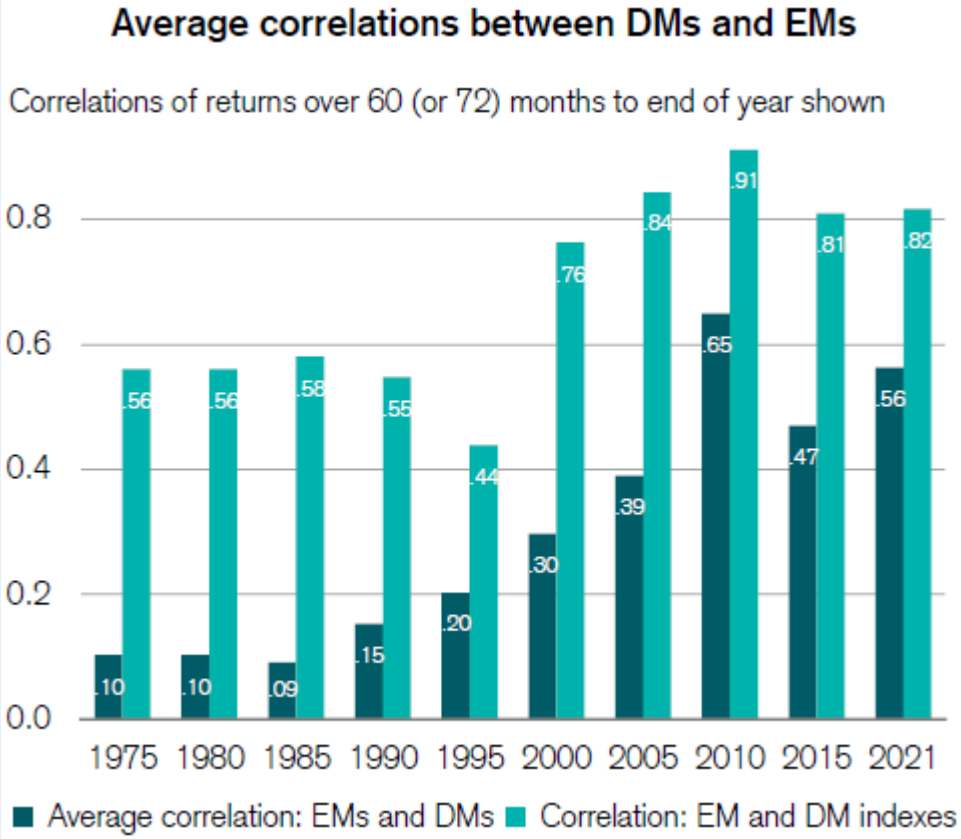
International Correlations

- Why do we expect return correlations across markets to be lower than within markets?

1. different regulation, tax laws
2. different industrial structure
3. different cultures
4. affected by different shocks
5. affected differently by same shocks

Correlations over Time

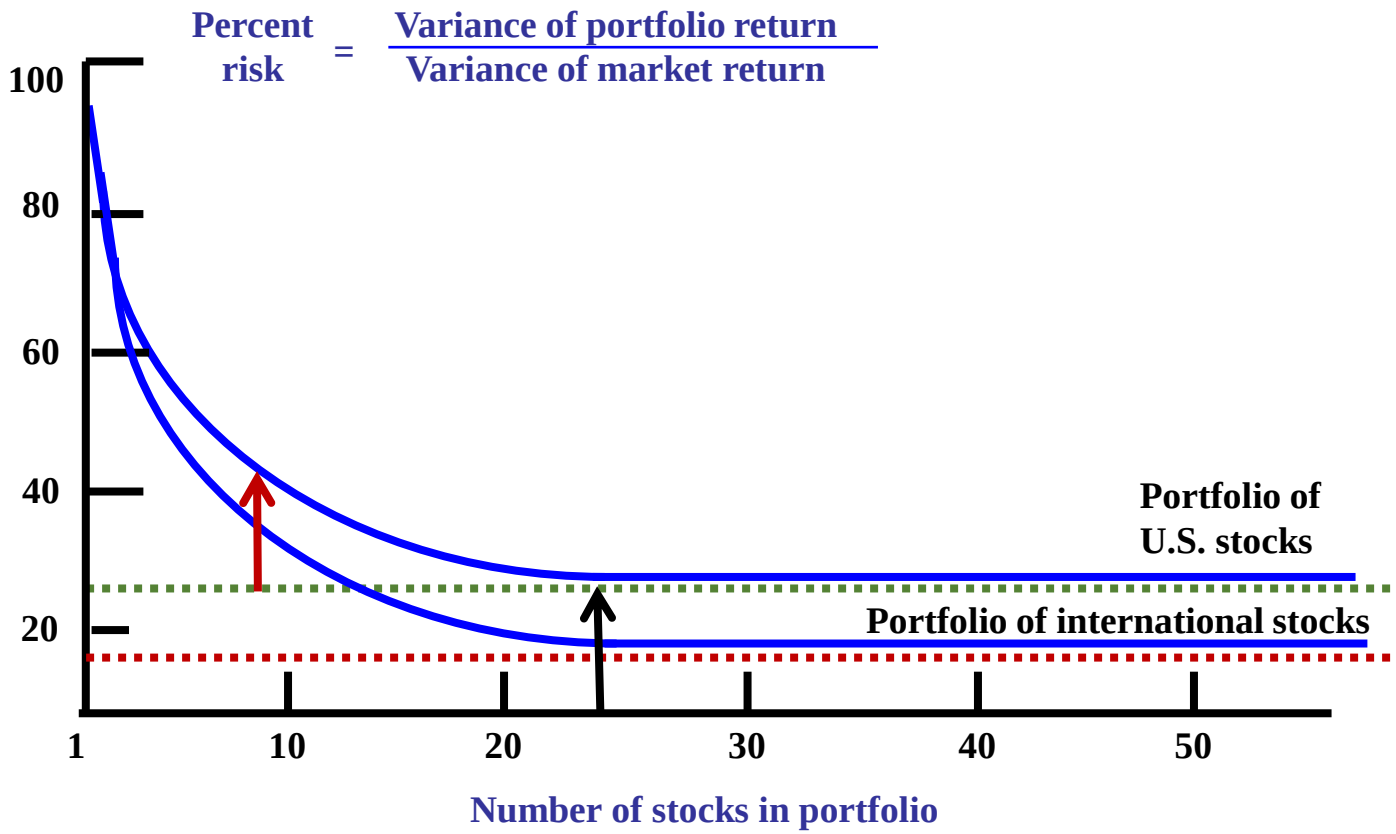




- Correlations between developed markets (DM) increased substantially post 2000
- Correlations between emerging markets (EM) approx. half that of developed markets

- Correlations between developed & emerging markets lower than those between DMs
- Correlations between EM and DM MSCI indexes (light green bars) a lot higher, but still less than 1.

The Case for International Diversification



By diversifying the portfolio, the variance of the portfolio's return relative to the variance of the market's return (beta) is reduced to the level of systematic risk -- the risk of the market itself.

Risk and Return

			Correlation			Covariance		
	Mean	Std. Dev	AUSTRALIA	CHINA	UK	AUSTRALIA	CHINA	UK
AUSTRALIA	9.15%	21.09%	1			0.0037	0.0031	0.0022
CHINA	5.29%	31.93%	0.55			0.0031	0.008	0.0021
UK	5.56%	16.17%	0.78	0.49	1	0.0022	0.0021	0.0022

- We can form a portfolio of these stock portfolios rather than invest in only one country.

				Correlation			Covariance		
	$E(R_i)$	Std. Dev	ω_i	AUSTRALIA	CHINA	UK	AUSTRALIA	CHINA	UK
AUSTRALIA	9.15%	21.09%	0.4	1			0.0037	0.0031	0.0022
CHINA	5.29%	31.93%	0.3	0.55			0.0031	0.008	0.0021
UK	5.56%	16.17%	0.3	0.78	0.49	1	0.0022	0.0021	0.0022

- Expected Return of the portfolio

$$E(r_P) = \sum_{i=1}^{N} \omega_i E(r_i)$$

$$= 0.4 \times 9.15\% + 0.3 \times 5.29\% + 0.3 \times 5.56\%$$

$$= 0.0692 \text{ (or } 6.92\%)$$

- Variance of the portfolio

$$Var(r_P) = \sum_{i=1}^{N} (\omega_i)^2 Var(r_i) + 2 \sum_{i=1}^{N} \sum_{j=i+1}^{N} \omega_i \omega_j Cov(r_i, r_j)$$

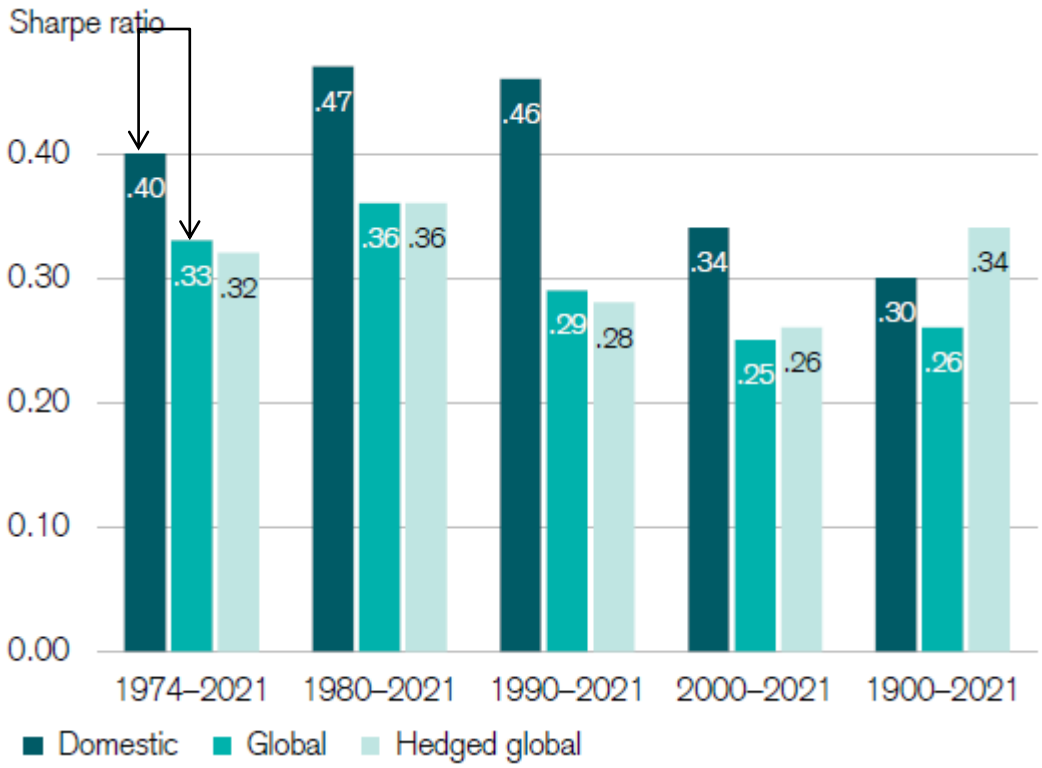
$$= (0.4)^2 \times (0.2109)^2 + (0.3)^2 \times (0.3193)^2 + (0.3)^2 \times (0.1617)^2 + 2 \times 0.4 \times 0.3 \times 0.0031 + 2 \times 0.4 \times 0.3 \times 0.0022 + 2 \times 0.3 \times 0.3 \times 0.0021$$

$$= 0.0203$$

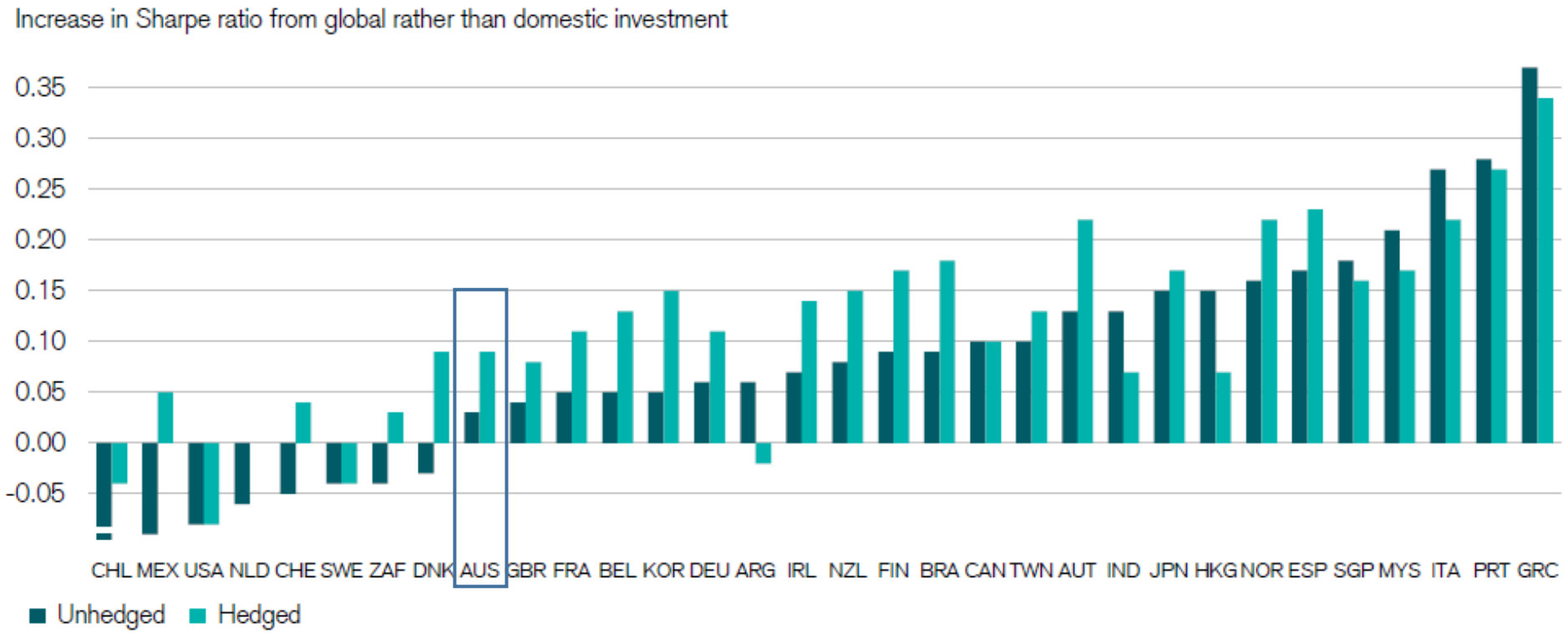
$$\boldsymbol{\sigma_p} = (0.0203)^{0.5} = 14.25\%$$

Global Diversification for a US Investor

- How would US investors fare from investing globally?
  - Compare Sharpe ratios for various strategies – local vs global.
  - For full-sample: 0.40 – 0.33 = -0.07
  - Can address currency risk via hedging. Does it improve performance?



Does diversification work elsewhere?

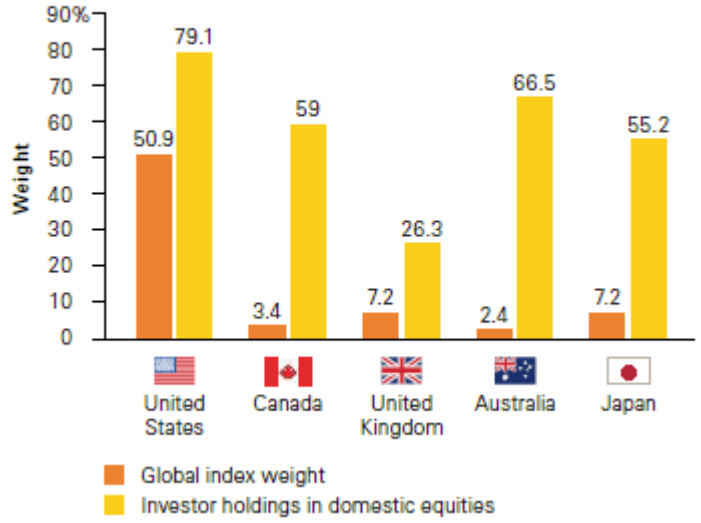


- Comparing Sharpe ratios for domestic versus global investment for 32 countries
  - Compare Sharpe ratios for various strategies – local vs global.
  - Bars below zero (8 countries) – better off investing in the domestic market. Mostly had high local returns combined with below average risk.
  - Positive values – gains from global diversification.
  - Across all countries, the SD of unhedged global portfolio below SD of domestic portfolio.

Does practice match the theory?

- Do investors appear to take advantage of optimal diversification?
  - Research shows that there is a “Home bias” – the tendency to overweight domestic securities relative to what portfolio theory would suggest is optimal.

Figure 5. Equity market home bias by country



Source: Vanguard Group (2017).

Why Home Bias in Portfolio Holdings

- Some explanations come to mind:
  1. Domestic equities may provide a superior inflation hedge.
  2. Home bias may reflect institutional and legal restrictions on foreign investment.
  3. Extra taxes and transactions/information costs for foreign securities may give rise to home bias.
  4. Investors have a natural tendency to invest in the familiar and avoid the unknown.

Table 3
Descriptive statistics of home bias

	mean	*t*-stat.	sd	10%	25%	median	75%	90%
	Panel A: Time series of cross-sectional means							
All	14.91	**(117.47)**	0.92	13.89	14.36	14.73	15.45	16.14
	Panel B: Cross section of fund-specific time-series averages							
All	15.67	**(17.89)**	17.47	0.49	2.90	10.18	22.79	36.44
Domicile								
Austria	3.04	**(5.79)**	3.31	0.07	0.98	1.86	4.21	10.23
Belgium	8.36	**(2.65)**	17.79	-0.02	1.74	3.44	5.26	36.86
Denmark	4.89	**(5.33)**	6.54	0.01	2.12	3.66	5.28	11.47
Finland	4.49	**(3.81)**	5.50	-0.02	1.07	2.81	6.16	13.36
France	29.70	**(27.18)**	16.57	12.01	18.23	26.00	35.40	68.23
Germany	21.35	**(11.90)**	16.80	10.14	13.23	16.66	21.43	60.80
Ireland	1.64	**(10.27)**	1.73	-0.01	0.26	1.17	2.73	4.77
Italy	10.37	**(9.22)**	8.08	3.60	5.67	8.15	12.22	21.50
Netherlands	12.97	**(4.34)**	18.50	3.10	4.81	7.61	11.16	41.58
Norway	8.37	**(2.22)**	13.12	1.56	2.52	3.43	7.18	28.87
Portugal	5.20	**(3.18)**	8.69	0.38	1.33	2.87	4.69	11.68
Spain	13.74	**(4.67)**	13.00	4.97	7.38	9.39	12.08	46.36
Sweden	17.13	**(2.37)**	26.73	3.80	4.45	5.94	10.08	67.25
Switzerland	3.57	**(2.49)**	5.93	-0.10	-0.10	-0.07	4.24	14.91
United Kingdom	24.01	**(9.44)**	16.71	0.25	12.06	24.28	31.00	47.47

Source: Maier and Scholz (2019) use data on mutual fund holdings from 2003-2016.

Home bias (in the red box) is defined as difference between the allocation towards domestic stocks relative to that in a benchmark (world market) index.

International Investment Vehicles (1)

- Direct Purchase of Foreign Shares
  - Buy shares of non-Australian firms directly from the exchange they trade on. Trading platforms such as COMMSEC, Interactive Brokers, eToro etc. make this feasible.
- Cross-Listings and American Depository Receipts (**ADRs**)
  - 260+ foreign firms are listed on ASX such as Xero Ltd, Block Inc

Source: ASX (March 2023).

Why List (or Cross-List) on Foreign Exchanges?

- Reasons to List (i.e. a solo listing) or Cross-List
  - Lowering of cost of capital
    - Improve liquidity
    - “Bond” to a better regulatory environment
    - Broaden shareholder base
  - Access to capital (obtain better valuations)
  - Enables the use of stock to (a) compensate employees not in country of domicile; (b) pay for acquisitions
  - Raise visibility of company

Source: ASX (May 2023).

American Depository Receipts

- ADRs represent a specific number of shares in the home market that are held in custody by a US depository bank. These can be with Sponsored or Unsponsored.

Type	Description	Trading Location	GAAP
Level I	Unlisted	OTC pink sheets	No GAAP reconciliation required
Level II	Listed on exchange	NYSE, NASDAQ, AMEX	Partial reconciliation
Level III	Capital raised and listed on exchange	NYSE, NASDAQ, AMEX	Full SEC compliance & full GAAP reconciliation
Rule 144A	Private placement to QIBs	PORTAL	No GAAP reconciliation required

- How strong is the case for legal 'bonding'? Morrison vs National Australia Bank (2010)

Australian Listings (Exchange & OTC)

Company Name	Ticker	Exchange	Ratio DR:ORD	Industry
Advanced Health Intelligence Ltd	AHI	NASDAQ	1:7	Tech.Hardware&Equip.
Alterity Therapeutics Limited	ATHE	NASDAQ	1:60	Pharma. & Biotech.
BHP Billiton	BHP	NYSE	1:2	Mining
Genetic Technologies	GENE	NASDAQ	1:600	Pharma. & Biotech.
Immuron	IMRN	NASDAQ	1:40	Pharma. & Biotech.
Immutep Limited	IMMP	NASDAQ	1:10	Pharma. & Biotech.
ioneer Ltd	IONR	NASDAQ	1:40	Mining
IperionX Limited	IPX	NASDAQ	1:10	Mining
James Hardie Industries	JHX	NYSE	1:1	Construct.&Materials
Kazia Therapeutics	KZIA	NASDAQ	1:10	Pharma. & Biotech.
Mesoblast	MESO	NASDAQ	1:5	Pharma. & Biotech.
Mobilicom	MOB	NASDAQ	1:275	Software&ComputerSvc
Novonix Limited	NVX	NASDAQ	1:4	Tech.Hardware&Equip.
Opthea Limited	OPT	NASDAQ	1:8	Pharma. & Biotech.

Exchange Listings, 2023

Company Name	Ticker	Ratio DR:ORD	Industry
A2B Australia Limited	CGAAY	1:2	Automobiles & Parts
ADBRI Limited	ADLDY	1:4	Construct.&Materials
AGL Energy	AGLXY	1:1	Electricity
ALS	ALSYY	1:4	General Industrials
Alumina	AWCMY	1:4	Indust.Metals&Mining
Amcor	AMCRY	1:4	General Industrials
AMP	AMLYY	1:4	Life Insurance
Ampol Limited	CTXAY	1:2	Oil & Gas Producers
Ansell	ANSLY	1:4	HealthCareEquip.&Ser
Antisense Therapeutics	ATHJY	1:20	Pharma. & Biotech.
Appen Ltd.	APXYY	2:1	Tech.Hardware&Equip.
ASX	ASXFY	1:1	Financial Services
Audio Pixels	ADPXY	1:1	Electron.&ElectricEq
Aurizon	AZKHY	1:4	IndustrialTransport.
Australia and New Zealand Banking	ANZBY	1:1	Banks
Australian Agricultural Co.	AAYYY	1:10	Food Producers
Bank of Queensland	BKQNY	1:2	Banks
Beach Energy	BCHEY	1:20	Oil & Gas Producers
Bega Cheese	BGCHY	1:4	Food Producers
Bluescope Steel	BLSFY	1:5	Indust.Metals&Mining
Boral	BOALY	1:4	Construct.&Materials
Brainchip Holdings	BCHPY	1:40	Software&ComputerSvc
Brambles	BXBLY	1:2	General Industrials
Breville Group	BVILY	1:2	General Retailers
Carsales.com	CSXXY	1:2	Automobiles & Parts

OTC Listings, 2023. Total number: 123

International Investment Vehicles (2)

- Mutual funds that invest in foreign stocks can be grouped into several categories from an Australian perspective:
  - ① Global - Investing in Australian and non-Australian shares.
  - ② International - Investing in non-Australian shares only.
  - ③ Regional - Investing in a geographic area (e.g., Latin America; Asia).
  - ④ Country - Investing in a single country.
- Stock Index Futures: These are futures contracts on stock indices. Cash settled as the underlying (stock index) does not exist physically
  - ① Cash delivery avoids the transaction costs of buying and selling large number of stocks. Highly liquid and relatively inexpensive to get a similar position to that of a well-diversified portfolio.
  - ② Speculate on/Hedge stocks with only a small cash investment. Invest in the entire market without bearing the risk of individual stocks.
  - ③ Speculate on/Hedge stocks with only a small cash investment.
  - ④ Foreign investors can reduce cash movements between countries and manage currency risk exposure better.

International Investment Vehicles (3)

- An *open-end* fund stands ready to issue and redeem shares at prices reflecting the net-asset-value of the underlying foreign shares.

- A *listed-investment company* *(also known as closed-end fund)* issues a fixed number of shares against an initial capital offering. The shares then trade in a secondary market at prices reflecting a premium or discount relative to the net-asset-value of the underlying foreign shares.

Summing up

1. **Low correlations across international markets may increase the risk-return trade off.**
2. **Investors might not be taking full advantage of the benefits of international diversification. This is known as the ‘home bias’ puzzle.**
3. **Perhaps this is due to some additional risks associated with international investing.**