International Financial Management

Lecture Topic:

International Portfolio Investments
(國際投資組合決策)

Overview

- The Algebra of Portfolio Diversification
- International Correlation Structure and Risk Diversification
- Optimal International Portfolio Selection
- Effects of Changes in the Exchange Rate
- International Bond Investment
- International Mutual Funds: A Performance Evaluation
Overview

- International Diversification through Country Funds
- International Diversification with ADRs
- International Diversification with WEBS
- Why Home Bias in Portfolio Holdings?

Perfect Financial Markets: A Starting Point

- Frictionless markets
  - No government intervention or taxes
  - No transaction costs or other market frictions
- Rational investors with equal access to costless information and market prices
  - All investors rationally price financial securities
  - All investors have equal access to costless information
  - All investors have equal access to market prices, so that buyers and sellers are “price takers”
The Algebra of Portfolio Theory

Assumptions

- Nominal returns are normally distributed
- Investors want more return and less risk in their functional currency

Let $X_i =$ proportion of wealth devoted to asset i such that $\sum_i X_i = 1$

Expected return on a portfolio $E[R_p] = \sum_i X_i E[R_i]$

Portfolio variance $\text{Var}(R_p) = \sigma_p^2 = \sum_i \sum_j X_i X_j \sigma_{ij}$

where $\sigma_{ij} = \rho_{ij} \sigma_i \sigma_j$

Expected Return on A Portfolio

<table>
<thead>
<tr>
<th></th>
<th>$E[R_j]$</th>
<th>$\sigma_j$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A American</td>
<td>14.3%</td>
<td>16.4%</td>
</tr>
<tr>
<td>B British</td>
<td>17.6%</td>
<td>29.9%</td>
</tr>
<tr>
<td>J Japanese</td>
<td>17.7%</td>
<td>35.7%</td>
</tr>
</tbody>
</table>

Example: Equal weights of A and J

$E[R_p] = X_A E[R_A] + X_J E[R_J]$

$= \left(\frac{1}{2}\right)(0.143) + \left(\frac{1}{2}\right)(0.177)$

$= 0.160$, or 16.0 percent
Portfolio Variance

<table>
<thead>
<tr>
<th></th>
<th>$E[R_i]$</th>
<th>$\sigma_i$</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>A American</td>
<td>14.3%</td>
<td>16.4%</td>
<td>1.000</td>
<td>0.557</td>
<td>0.325</td>
</tr>
<tr>
<td>B British</td>
<td>17.6%</td>
<td>29.9%</td>
<td>0.557</td>
<td>1.000</td>
<td>0.317</td>
</tr>
<tr>
<td>J Japanese</td>
<td>17.7%</td>
<td>35.7%</td>
<td>0.325</td>
<td>0.317</td>
<td>1.000</td>
</tr>
</tbody>
</table>

**Example:** Equal weights of A and J

$$\sigma_p^2 = X_A^2 \sigma_A^2 + X_J^2 \sigma_J^2 + 2 X_A X_J \rho_{AJ} \sigma_A \sigma_J$$

$$= \left(\frac{1}{2}\right)^2 (0.164)^2 + \left(\frac{1}{2}\right)^2 (0.357)^2$$

$$+ 2 \left(\frac{1}{2}\right) \left(\frac{1}{2}\right) (0.325)(0.164)(0.357) = 0.0481$$

$$\sigma_p = (0.0481)^{1/2} = 0.2190$$, or 21.9 percent

**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.
Diversification

Mean annual return

![Chart showing diversification with mean annual return and standard deviation of annual return](chart)

- \( \rho = -1 \)
- \( \rho = +0.325 \)
- \( \rho = +1 \)

Mean-Variance Efficiency

Mean annual return

![Chart showing mean-variance efficiency with mean annual return and standard deviation of annual return](chart)
International Portfolio Diversification

- Potential for higher returns
- Potential for lower portfolio risk

Expected return

Standard deviation of return

Domestic vs. International Diversification

Portfolio risk relative to the risk of a single asset ($\sigma_P^2/\sigma_i^2$)

- U.S. diversification only
- International diversification

Number of stocks in portfolio
International Correlation Structure and Risk Diversification

- 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 high asynchronous across countries.
International Correlation Structure
(in US Dollars from 1973-1982 using weekly returns)

<table>
<thead>
<tr>
<th>Stock Market</th>
<th>AU</th>
<th>FR</th>
<th>GM</th>
<th>JP</th>
<th>NL</th>
<th>SW</th>
<th>UK</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia (AU)</td>
<td>.586</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France (FR)</td>
<td>.286</td>
<td>.576</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany (GM)</td>
<td>.183</td>
<td>.312</td>
<td>.653</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan (JP)</td>
<td>.152</td>
<td>.238</td>
<td>.300</td>
<td>.416</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands (NL)</td>
<td>.241</td>
<td>.344</td>
<td>.509</td>
<td>.282</td>
<td>.624</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switzerland (SW)</td>
<td>.358</td>
<td>.368</td>
<td>.475</td>
<td>.281</td>
<td>.517</td>
<td>.664</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom (UK)</td>
<td>.315</td>
<td>.378</td>
<td>.299</td>
<td>.209</td>
<td>.393</td>
<td>.431</td>
<td>.698</td>
<td></td>
</tr>
<tr>
<td>United States (US)</td>
<td>.304</td>
<td>.225</td>
<td>.170</td>
<td>.137</td>
<td>.271</td>
<td>.272</td>
<td>.279</td>
<td>.439</td>
</tr>
</tbody>
</table>

Relatively low international correlations imply that investors should be able to reduce portfolio risk more if they diversify internationally rather than domestically.

Gains from International Portfolio Diversification
Domestic vs. International Diversification
(Systematic vs. Diversifiable Risk)

When fully diversified, an international portfolio only
12 percent as risky as holding a single security

Optimal International Portfolio Selection

- The correlation of the U.S. stock market with the returns on the stock markets in other nations varies
- The correlation of the U.S. stock market with the Canadian stock market is 70%
- The correlation of the U.S. stock market with the Japanese stock market is 24%
- A U.S. investor would get more diversification from investments in Japan than Canada

<table>
<thead>
<tr>
<th>Stock Market</th>
<th>Correlation Coefficient</th>
<th>Mean (%)</th>
<th>SD (%)</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada (CN)</td>
<td>.79</td>
<td>5.83</td>
<td>0.90</td>
<td></td>
</tr>
<tr>
<td>France (FR)</td>
<td>0.38</td>
<td>1.42</td>
<td>7.01</td>
<td>1.02</td>
</tr>
<tr>
<td>Germany (GM)</td>
<td>0.33</td>
<td>1.23</td>
<td>6.74</td>
<td>0.87</td>
</tr>
<tr>
<td>Japan (JP)</td>
<td>0.26</td>
<td>1.52</td>
<td>5.41</td>
<td>0.90</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.58</td>
<td>1.33</td>
<td>4.56</td>
<td>0.80</td>
</tr>
<tr>
<td>United States</td>
<td>0.70</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*β measures the sensitivity of the market to the world market.*

Clearly the Japanese market is more sensitive to the world market than is the U.S.

.79% monthly return = 9.48% per year
The Optimal International Portfolio

The choice of the optimal international portfolio (OIP): can be solved

Composition of the OIP for a U.S. Investor

<table>
<thead>
<tr>
<th>Market Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgian market</td>
<td>14.66%</td>
</tr>
<tr>
<td>Italian market</td>
<td>0.37%</td>
</tr>
<tr>
<td>Japanese market</td>
<td>9.25%</td>
</tr>
<tr>
<td>Dutch market</td>
<td>14.15%</td>
</tr>
<tr>
<td>Swedish market</td>
<td>20.26%</td>
</tr>
<tr>
<td>U.S. market</td>
<td>41.31%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>
Gains from International Diversification

For a U.S. investor, the risk-return tradeoff for the optimal international portfolio and optimal domestic portfolio are shown below and at right.

<table>
<thead>
<tr>
<th></th>
<th>OIP</th>
<th>ODP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Return</td>
<td>1.53%</td>
<td>1.33%</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>4.27%</td>
<td>4.56%</td>
</tr>
</tbody>
</table>

Effects of Changes in the Exchange Rate

The realized dollar return for a U.S. 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 U.S. dollar and the foreign currency.
The realized dollar return for a U.S. resident investing in a foreign market is given by

\[ R_{IS} = (1 + R_i)(1 + e_i) - 1 \]

\[ = R_i + e_i + R_ie_i \]

Where

- \( R_i \) is the local currency return in the \( i^{th} \) market
- \( e_i \) is the rate of change in the exchange rate between the local currency and the dollar

For example, if a U.S. resident just sold shares in a British firm that had a 15% return (in pounds) during a period when the pound depreciated 5%, his dollar return is 9.25%:

\[ R_{IS} = (1 + .15)(1 + -.05) - 1 = .0925 \]

\[ R_{IS} = .15 + -.05 + (.15)(-.05) = .0925 \]
The risk for a U.S. resident investing in a foreign market will depend not only on the risk in the foreign market but also on the risk in the exchange rate between the U.S. dollar and the foreign currency.

\[ \text{Var}(R_s) = \text{Var}(R_i) + \text{Var}(\epsilon_i) + 2\text{Cov}(R_i, \epsilon_i) + \Delta \text{Var} \]

The \( \Delta \text{Var} \) term represents the contribution of the cross-product term, \( R_i \epsilon_i \), to the risk of foreign investment.

This equation demonstrates that exchange rate fluctuations contribute to the risk of foreign investment through three channels:

1. Its own volatility, \( \text{Var}(\epsilon_i) \)
2. Its covariance with the local market returns \( \text{Cov}(R_i, \epsilon_i) \)
3. The contribution of the cross-product term, \( \Delta \text{Var} \)
International Bond Investment

- There is substantial exchange rate risk in foreign bond investment; this suggests that investors may be able to increase their gains if they can control this risk, for example with currency forward contracts or swaps.

- The advent of the euro is likely to alter the risk-return characteristics of the euro-zone bond markets enhancing the importance of non-euro currency bonds (in terms of bond diversification).

International Mutual Funds: A Performance Evaluation

- A U.S. investor can easily achieve international diversification by investing in a U.S.-based international mutual fund.

- The advantages include:
  1. Savings on transaction and information costs
  2. Circumvention of legal and institutional barriers to direct portfolio investments abroad
  3. Professional management and record keeping
International Mutual Funds: A Performance Evaluation

As can be seen below, a sample of U.S. based international mutual funds has outperformed the S&P 500 during the period 1977-1986, with a higher standard deviation.

<table>
<thead>
<tr>
<th></th>
<th>Mean Annual Return</th>
<th>Standard Deviation</th>
<th>$\beta_{US}$</th>
<th>$R^2$</th>
</tr>
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<tbody>
<tr>
<td>U.S. Based International Mutual Funds</td>
<td>18.96%</td>
<td>5.78%</td>
<td>0.69</td>
<td>0.39</td>
</tr>
<tr>
<td>S&amp;P 500</td>
<td>14.04%</td>
<td>4.25%</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>U.S. MNC Index</td>
<td>16.08%</td>
<td>4.38%</td>
<td>.98</td>
<td>.90</td>
</tr>
</tbody>
</table>

International Mutual Funds: A Performance Evaluation

U.S. stock market movements account for less than 40% of the fluctuations of international mutual funds, but over 90% of the movements in U.S. MNC shares; this means that the shares of U.S. MNCs behave like those of domestic firms, without providing effective international diversification.

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</table>
Performance of International Mutual Funds (1977-1986)

International Diversification through Country Funds

- Recently, country funds have emerged as one of the most popular means of international investment (close-end funds)
- A country fund invests exclusively in the stocks of a single county; this allows investors to:
  1. Speculate in a single foreign market with minimum cost
  2. Construct their own personal international portfolios
  3. Diversify into emerging markets that are otherwise practically inaccessible
American Depository Receipts

- Foreign stocks often trade on U.S. exchanges as ADRs.
- It is a receipt that represents the number of foreign shares that are deposited at a U.S. bank.
- The bank serves as a transfer agent for the ADRs.

There are many advantages to trading ADRs as opposed to direct investment in the company’s shares:

- ADRs are denominated in U.S. dollars, trade on U.S. exchanges and can be bought through any broker.
- Dividends are paid in U.S. dollars.
- Most underlying stocks are bearer securities, the ADRs are registered.

International Diversification with ADRs:
Adding ADRs to domestic portfolios has a substantial risk reduction benefit.
World Equity Benchmark Shares

- World Equity Benchmark Shares (WEBS)
  - Country-specific baskets of stocks designed to replicate the country indexes of 14 countries
  - WEBS are subject to U.S. SEC and IRS diversification requirements
  - Low cost, convenient way for investors to hold diversified investments in several different countries

International Diversification with WEBS

- Recent research suggests that WEBs are an excellent tool for international risk diversification
- For investors who desire international exposure, WEBs may well serve as a major alternative to such traditional tools as international mutual funds, ADRs, and closed-end country funds
Why Home Bias in Portfolio Holdings?

Home bias refers to the extent to which portfolio investments are concentrated in domestic equities.

### The Home Bias in Equity Portfolios

<table>
<thead>
<tr>
<th>Country</th>
<th>Share in World Market Value</th>
<th>Proportion of Domestic Equities in Portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>2.6%</td>
<td>64.4%</td>
</tr>
<tr>
<td>Germany</td>
<td>3.2%</td>
<td>75.4%</td>
</tr>
<tr>
<td>Italy</td>
<td>1.9%</td>
<td>91.0%</td>
</tr>
<tr>
<td>Japan</td>
<td>43.7%</td>
<td>86.7%</td>
</tr>
<tr>
<td>Spain</td>
<td>1.1%</td>
<td>94.2%</td>
</tr>
<tr>
<td>Sweden</td>
<td>0.8%</td>
<td>100.0%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>10.3%</td>
<td>78.5%</td>
</tr>
<tr>
<td>United States</td>
<td>36.4%</td>
<td>98.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
<td></td>
</tr>
</tbody>
</table>
Why Home Bias in Portfolio Holdings?

Three 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