Ever since the global stockmarket crash of October 1987 participants in financial markets have been sensitive to international linkages. It is now clear that a movement caused by local factors in one market will be transmitted to related markets around the world in a process described as contagion.

The international relationship of asset prices arises from the tendency of the returns on different assets to be equalised within a single market. Equalisation will occur within a national market which is free of segmenting regulation and this force also came into play internationally when deregulation occurred on a global scale. A first step in exploring the global relationship of asset prices is an explanation of this equalisation process.

Equalisation of asset returns

The anticipated after-tax return on any asset over a given period is shown in Expression 1.

<table>
<thead>
<tr>
<th>Expression 1</th>
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<tbody>
<tr>
<td>Expected Asset return = Expected Income + Expected Capital Gain - Holding Costs - Taxes + Risk Premium</td>
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</tbody>
</table>

This is the anticipated return because it depends on expected income and expected capital gains which can arise from changes in the price of an asset or from movements in the exchange rate. The actual values of both of these forms of return will usually differ from their anticipated values. There could also be some uncertainty about the actual size of holding costs.

The risk premium is compensation for the risk involved in holding the asset. Risk arises from the possibilities of default or deviations of actual returns and costs from their anticipated values. The premium will vary over time, depending on the changing attitudes of investors and the degree of uncertainty prevailing in asset markets.

Investors will direct their funds into those investments which appear to offer the highest return. If there are no impediments to this process, it should create a situation in which anticipated asset returns tend towards equality. If a particular form of investment offers a higher return than others, funds will flow into that area, ultimately driving the return on it down to the values available elsewhere. This process underlies the equalisation principle which indicates that the returns on alternative forms of investment tend towards equality.

A special case of the equalisation of returns occurs when there is no uncertainty about the returns on the assets concerned. In such a situation, arbitrage will make the returns equal without any risk premium. If there is a difference in returns, an arbitrageur will buy the higher-yielding asset and sell the lower-yielding asset, locking in a certain profit.

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The recognition that in a free market asset prices tend to equality has many implications. One is that expected returns to different time-patterns of investment for the same period will be equalised. This means that the shape of the yield curve will be determined by interest rate expectations (Valentine 1991, pp. 65-9). This application of the equalisation principle produces the “expectations theory” of the yield curve.

Another implication of the equalisation principle is that if investment in a particular form of asset is given favourable taxation treatment, anticipated returns move to offset this advantage. That is, pre-tax returns fall. This means that while the introduction of a tax advantage for a specific type of asset provides a windfall gain for the current holders of the asset, it will not in general make future investment in this class of asset more attractive than investment in assets which have not been sofavoured.

There are a number of possible impediments to the equalisation of asset returns. The major source of such impediments is regulations which segment financial markets. Regulations which force investors to hold particular classes of assets will have this effect. An example is the prudential requirements often imposed on financial institutions, forcing them to hold prime assets such as government securities.

A second impediment to the equalisation of returns is high transaction costs which often slow down the process of equalisation. If equalisation is not immediate, opportunities are created for some investors to make higher-than-average profits. Property is one class of asset which is subject to high transaction costs. There is also considerable uncertainty about returns and, related to this uncertainty, high information costs. The uncertainty will lead to a large risk premium. Property is therefore an area in which the equalisation of returns will occur slowly and there will be opportunities for investors who have benefited access to information or who are more willing to take risks than the average market participant.

Global fixed-interest investments
Financial deregulation involved the removal of restrictions on capital flows between countries (exchange controls). Funds are now free to move from one national market to another and an environment which favours the international equalisation of asset returns has been created. Equalisation is likely to occur rapidly for fixed-interest investments. Interest income is predictable, capital gains and losses do not occur on securities with a term equal to the holding period, and transaction costs are low. The major uncertainty is the possibility of exchange losses or gains on overseas fixed-interest investments or borrowings.

Indeed, the following equalisation relationship shown in Expression 2 will be established.

<table>
<thead>
<tr>
<th>Expression 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Australian Interest Rate</strong> = <strong>Overseas Interest Rate</strong> + <strong>Expected Depreciation</strong> + <strong>Risk Premium</strong></td>
</tr>
</tbody>
</table>

The interest rates and anticipated exchange losses or gains apply to the same time period. The risk premium arises from the currency risk. This relationship will apply for the currency of any country which, like Australia, puts no restrictions on inflows or outflows of funds.

The relationship is known as uncovered interest rate parity. It will be established by speculation. For example, if an overseas investment appears to offer a higher return (including both the interest yield and the likely exchange gain) than is available on equivalent local fixed-interest investments, funds will flow into offshore investments. This flow will result in the equalisation of returns. The process by which this equalisation occurs will be examined in more detail below.

Relationship (2) suggests that the interest rate differential reflects exchange-rate expectations. This is true, but two reservations should be kept in mind in interpreting this relationship. First, the interest-rate differential differs from the expected depreciation of the currency by a risk premium which can be large and which varies over time. Second, historically these market expectations have been poor guides to what actually happens to the exchange rate over the relevant period. The interest in this relationship is not as a forecasting device but rather as the basis of adjustments in the foreign-exchange market.

If the expected depreciation of the Australian dollar is equal to the difference between the Australian inflation rate and the overseas inflation rate, exchange exposure arising from an offshore investment by selling foreign currency forward. This possibility gives rise to a second equalisation relationship, called covered interest parity.

<table>
<thead>
<tr>
<th>Expression 3</th>
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<tbody>
<tr>
<td><strong>Australian Interest Rate</strong> = <strong>Overseas Interest Rate</strong> + <strong>Cost of Forward Cover</strong></td>
</tr>
</tbody>
</table>

The cost of forward cover is the percentage difference between the spot and forward exchange rates. Relationship (3) will be established by arbitrage. If, for example, the covered return on an overseas investment is greater than the Australian interest rate, a riskless profit can be earned by borrowing in Australia and investing the proceeds of the loan in a covered overseas fixed-interest investment. The flow of funds out of the country will re-establish relationship (3). Indeed, deviations are usually small and short-lived.

The discussion up to this point illuminates the relationship between Australian long-term interest rates and those overseas, particularly in the US. In the first half of 1994 we saw Australian bond rates rise sharply in concert with US rates on a number of occasions. Since the US rates were moved by local events (mainly changes or predicted changes in the Fed’s monetary policy stance), there was some puzzlement over the Australian rates tracking them.
The equalisation principle can be used in two ways to explain this relationship. First, as noted earlier, the principle underlies the expectations explanation of the shape of yield curves. Under this view, long-term interest rates will increase when the market develops new expectations of future interest-rate increases. It appears that the increases in US interest rates caused participants to revise upward their expectations of future Australian interest rates.

The second explanation relies on the international equalisation of returns. Relationship (2) applies for fixed-interest securities of any term. It indicates that there will be a gap between Australian and US long-term bond rates which consists of the anticipated annual depreciation of the Australian dollar against the US dollar over the term of the bonds plus a risk premium.

When US long rates increase, there is no reason for the factors making up the gap to change. Australian long rates must therefore increase to maintain the equality of returns. An important implication of this explanation is that so long as the deregulated environment is maintained, Australian long interest rates will continue to depend on US long rates.

Relationship (2) is sometimes used by commentators to estimate the risk premium which overseas investors demand of Australian bonds. Assume that the anticipated depreciation of the Australian dollar against the US dollar is equal to the expected inflation differential (ie, purchasing power parity is expected to hold). Relationship (2) then allows us to calculate the risk premium as the real interest rate differential. Such calculations reveal an increase in the risk premium in recent years. It must be noted, however, that the calculation rests on two unlikely assumptions. They are:

- Inflationary expectations are based on current rates of inflation. This assumption enters the calculation because real interest rates are obtained by deducting current rates of inflation from nominal interest rates.
- Exchange rate expectations are determined solely by inflationary expectations.

In fact, expectations are determined by a wide range of factors including such elements as likely central bank policy or political developments.

Integration of global sharemarkets
In a world free from segmenting restrictions on capital flows, expected returns on investment in shares will also be equalised. The equalisation relationship is shown in Expression 4. It is stated in terms of US shares, but it could apply for shares in any country which has no controls on inward or outward flows of investment funds.

In this case the risk premium arises from uncertainty about the actual return on the shares and the actual exchange rate movement. It also reflects any sovereign risk involved in investment in the overseas country in question.

The dynamics of the adjustments necessary to establish equalisation relationship (4) will be discussed below, but a simple example will be helpful. Assume that the expected capital gain on US shares increases because, for example, economic activity in the US turns out to be stronger than expected.

**Expression 4**

<table>
<thead>
<tr>
<th>Expected</th>
<th>Expected</th>
<th>Expected</th>
<th>Expected</th>
<th>Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dividend</td>
<td>Capital</td>
<td>Dividend</td>
<td>Capital</td>
<td>Risk</td>
</tr>
<tr>
<td>Yield on</td>
<td>Gain on</td>
<td>Yield on</td>
<td>Gain on</td>
<td>of the</td>
</tr>
<tr>
<td>Australian</td>
<td>Australian</td>
<td>US Shares</td>
<td>Australian</td>
<td>Australian</td>
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<tr>
<td>Shares</td>
<td>Shares</td>
<td>US Shares</td>
<td>Shares</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>US $</td>
</tr>
</tbody>
</table>

Something must adjust to re-establish relationship (4).

One possibility is that US share prices rise, reducing both the expected dividend yield and the expected capital gain. Another possibility is that Australian shares increase in value, the rise creating expectations of a further increase. This outcome depends on the assumption that market participants form their expectations by extrapolating recent share price movements.

Indeed, it is clear from this example that the adjustment process depends crucially on the way in which market participants form their expectations.

Relationship (4) might appear to suggest that offshore investment is pointless, since its return to Australian investors will be equalised with the return to domestic investment. It must be noted, however, that the relation-
events" which affect all countries and which cannot be diversified away by adopting an international portfolio. Such global events include oil price shocks and wars. National economies are more highly integrated now, so that business cycles in most countries are closer to coincident. One factor contributing to this integration is the growth of multinational corporations with operations in many countries.

Third, derivatives markets have become more integrated, with contracts on some major stock exchanges being traded on futures and options exchanges in other countries. The existence of fungible contracts (ie, contracts which are interchangeable with contracts traded on other exchanges) also contributes to the integration.

International diversification of share and fixed-interest investments has been a popular risk reduction technique for investors for some time. The extent to which risk can be reduced by diversifying a portfolio over local shares is limited. A portfolio of, say, twelve shares generally provides most of the reduction in risk which can be obtained from diversification with local shares. Such a portfolio would track the market index closely and the addition of further shares could not reduce the variability of its return. An additional reduction can be obtained by diversifying globally because this process averages out "country events" such as a recession in one country.

The increasing correlation of international share prices has reduced the potential benefits from diversification, at least with respect to major markets. This development is the major motivation for the recent strong interest in "emerging markets". These sharemarkets are more subject to "country effects" than more mature markets which means that their share prices are less correlated than those in such markets.

Adjustment dynamics: the foreign-exchange market

The process whereby the international equalisation of asset returns, as indicated in (2) and (4), is accomplished can also be discussed in terms of the way in which causation flows through these relationships.

Relationship (2) appears to determine Australian interest rates, but this is not the case in the present environment of a floating exchange-rate regime. In such an environment cash interest rates can be determined by the Reserve Bank and longer-term rates are based on these short rates and market interest-rate expectations. Since the floating of the Australian dollar in December 1983, the bank has used the cash interest rate as its instrument of monetary policy, changing it in response to changes in the economy.

Assume that the Reserve Bank raises Australian cash rates and other short-term interest rates follow suit. What

The increasing correlation of international share prices has reduced the potential benefits from diversification.

Adjusts to maintain relationship (2)? The answer is the spot exchange rate. It must adjust so that the anticipated depreciation of the Australian dollar increases to equal the now larger interest-rate differential. In general, the dollar will appreciate so that its expected future depreciation will be larger. This process is not simple or easily predictable because a number of factors will disturb the adjustment process. They include:

1. spot exchange rate could alter exchange-rate expectations, necessitating further adjustments;
2. it could also lead a change in the risk premium; and
3. other influences on exchange-rate expectations could change during the adjustment process.

This view of the adjustment process also leads to a model of the determination of exchange rates. Consider relationship (3). The cost of forward cover is the percentage difference between the spot and forward exchange rate. A comparison of relationships (2) and (3) indicates that, apart from a risk premium, the forward exchange rate is equal to the expected future spot rate. These considerations indicate that relationship (3) can be rewritten so that it represents the spot exchange rate as a function of the interest-rate differential and the expected future spot rate.

This rewritten relationship implies that the current value of the spot rate depends on interest rate differentials and market exchange-rate expectations. Exchange rate expectations are the most volatile of these two determinants and so changes in the spot rate are dominated by swings in market expectations.

Even though this formulation appears to ignore the influence of fundamentals (economic variables such as relative rates of inflation, commodity prices and current account deficits), this is not the case. Fundamentals will influence the spot rate when they are reflected in market expectations.

FIGURE 1

![Diagram](image-url)
Ultimately market participants will recognise deviations of exchange rates from the levels indicated by economic fundamentals and exchange rate expectations, and, therefore, the spot rate will adjust to take account of the fundamentals. In the long term fundamentals determine the exchange rate but the timing of this reaction is unpredictable.

Exchange-rate expectations are determined in the foreign-exchange market according to equalisation relationship (2). Share prices are then determined through this relationship and direct influences on share prices here and overseas.

An increase in the Australian interest rate will cause an increase in the value of the Australian dollar. This appreciation leads to the creation of an expectation of a greater depreciation which, all other things being equal, causes a fall in the value of Australian shares. The fall will increase the basic expected return on the shares which offsets the higher expected exchange loss. The changes in the interest rate and the exchange rate will also have a direct effect on the expected return to investment in Australian shares. These linkages are shown in Figure 1.

To hedge or not to hedge
An important question arising out of international investment is whether the foreign-exchange exposure should be hedged, for example, by selling the currency in which the investment is denominated forward. Relationship (3) suggests that covering a fixed-interest investment wipes out the benefits of offshore investment. A holder of a hedged fixed-interest investment might, however, hope to gain from falls in overseas interest rates.

The question of whether or not to hedge international share portfolios can be elucidated in terms of the following simple formulation. Assume that we are considering domestic and overseas index portfolios (see Jorion and Roisenberg 1993 for a discussion of the advantages of investing offshore via stock index futures). We hold a proportion $a$ of the former and a proportion $(1-a)$ of the latter and the returns on these portfolios are, respectively, $r$ and $R$. Then the return on the portfolio $(P)$ is

**Expression 5**

$$P = ar + (1-a)(R+e)$$

where $e$ is the depreciation of the local currency against the foreign currency.

The volatility of this return is given by its variance which is

**Expression 6**

$$\text{variance } (P) = a^2 \text{ variance } r + (1-a)^2 \text{ variance } R + a(1-a)(\text{ covariance } (r,e) + 2(1-a)^2 \text{ covariance } (R,e))$$

Relationship (6), as expected, indicates that international diversification is more effective in reducing risk the lower the covariance between domestic and overseas returns. It also shows that leaving the portfolio unhedged will reduce the volatility of the return when the returns on the shares have a negative covariance with the depreciation of the Australian dollar against other currencies. In a study of international diversification by US and Japanese investors, Eun and Resnick (1991) conclude that hedging helped US investors but not Japanese investors.

The decision about whether or not to hedge an offshore portfolio will not be determined purely by the considerations outlined in the previous paragraph. First, the benchmark against which the portfolio manager is judged will influence the decision. If the benchmark is hedged, there will be pressure for portfolio managers to hedge to ensure that their performance does not fall below the benchmark.

Second, some investors might prefer an unhedged fund because they are seeking a foreign-exchange exposure which fits into their overall investment

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