



DIVERSIFICATION THROUGH INTERNATIONAL MONEY MARKETS

Adrian F. Lee

The world's fixed-income markets totaled \$9,400 billion publicly issued securities at the end of 1987. Table 1 shows a breakdown by country and issuer. These large, liquid markets generally comprise government or government agency bonds. Fixed-income markets have offered, and should continue to offer, opportunities to U.S. investors for returns and diversification outside the U.S. domestic market.

The case for diversification into these markets by a U.S. investor is significantly enhanced by considering the benefits of diversification on a currency-hedged basis. The purchase of a foreign security represents an investment in the asset purchased and also in the currency in which this asset is denominated. This currency exposure can be reduced by separately selling the currency exposure forward for the base currency. When the full exposure is sold forward, a fully hedged foreign asset is created. Fully hedged foreign returns are made up of the local market returns plus the forward premiums.

Hedged international fixed income overcomes some of the traditional drawbacks associated with international fixed-income investment, such as currency risk and duplication with international equity investment. In doing so, it provides the investor with the following benefits:

- Return opportunities beyond domestic fixed income
- Volatility reduction in overall fixed-income portfolios
- Diversification versus all domestic assets as well as international equities

Adrian F. Lee is Vice-President in charge of International Capital Markets Research and New Product Development at J.P. Morgan Investment Management, Inc., New York.

TABLE 1. Breakdown of World Bond Markets

Bond Market	Total Publicly Issued	As % of Issues in All Markets	Central Gov't	Central Gov't Agency and Gov't Guarantee	State and Local Gov't	Corp.	Other Domestic Publicly Issued	International Bonds		Private Placement and Unclassified
								Foreign Bonds	Euro Bonds	
U.S. dollar	\$4,165.7	44.3%	\$1,335.2	\$945.1	\$778.3	\$658.5	\$ 16.0	\$ 55.1	\$379.5	\$364.8
Japanese yen	2,120.6	22.6	1,236.2	153.5	54.0	157.3	412.7	41.0	65.9	346.9
deutschemerk	811.5	8.6	191.7	34.6	23.6	1.6	458.0	104.0		328.4
Italian lira	540.1	5.7	415.5	24.6	—	5.4	91.3	1.8	1.5	—
French franc	336.8	3.6	98.9	160.5	3.6	62.8	—	3.1	7.9	—
U.K. sterling	332.7	3.5	258.6	—	0.2	19.4	—	6.6	47.9	—
Belgian franc	196.8	2.1	97.0	60.4	—	7.6	27.0	4.4	0.4	—
Canadian dollar	192.9	2.1	78.4	0.1	63.4	31.3	0.7	0.8	18.2	—
Swiss franc	171.7	1.8	9.1	—	10.5	35.2	38.4	80.5	—	58.1
Danish krone	171.2	1.8	49.8	—	—	—	117.9	—	3.5	—
Swedish krona	160.6	1.7	68.7	—	2.4	12.8	76.8	—	0.1	—
Dutch guilder	128.4	1.4	77.3	—	3.9	29.8	—	12.1	5.3	92.2
Australian dollar	73.6	0.8	28.5	13.8	—	12.9	—	—	18.4	25.9
Total	\$9,402.6		\$3,944.9	\$1,392.6	\$937.9	\$1,034.6	\$1,234.6		\$858.0	\$1,216.3
Sector as a percent of public issues in all markets		100.0%	42.0%	14.8%	10.0%	11.0%	13.1%		9.1%	

Note: Size of major bond markets at year-end 1987 (nominal value outstanding in billions of U.S. dollars equivalent).
Source: How Big Is the World Bond Market?—1988 Update, Salomon Brothers, Inc.

Hedged international fixed income is an attractive diversifying asset class, providing long asset returns with a risk level that has historically been only marginally greater than that of U.S. Treasury bills. Fundamentally, hedged international fixed income diversifies the exposure of fixed-income assets to changes in fiscal and monetary policies across many different governments and economies.

This discussion of the benefits of hedged international fixed income refers to the long run, or strategic benefits, of such a hedging policy. This point of view in no way reduces the role or need for active currency management on a tactical basis. Hedged investment simply suggests that the neutral currency exposure for tactical purposes should be considered as zero or 100 percent in the base currency. This approach can be contrasted with the more traditional one, which used the market capitalization of the foreign markets as the neutral currency exposure. In many ways, the role of tactical currency management is even more crucial in an environment in which international investment is defined on a fully hedged basis.

HISTORICAL BENEFITS OF HEDGED INTERNATIONAL FIXED INCOME

Opportunity for Return

The return to a U.S. investor from a fully hedged foreign bond investment is equal to the local market return plus the forward premium. The forward premium is equal to the interest rate differential between deposits in each market, with maturity equal to the length of the hedge contract.

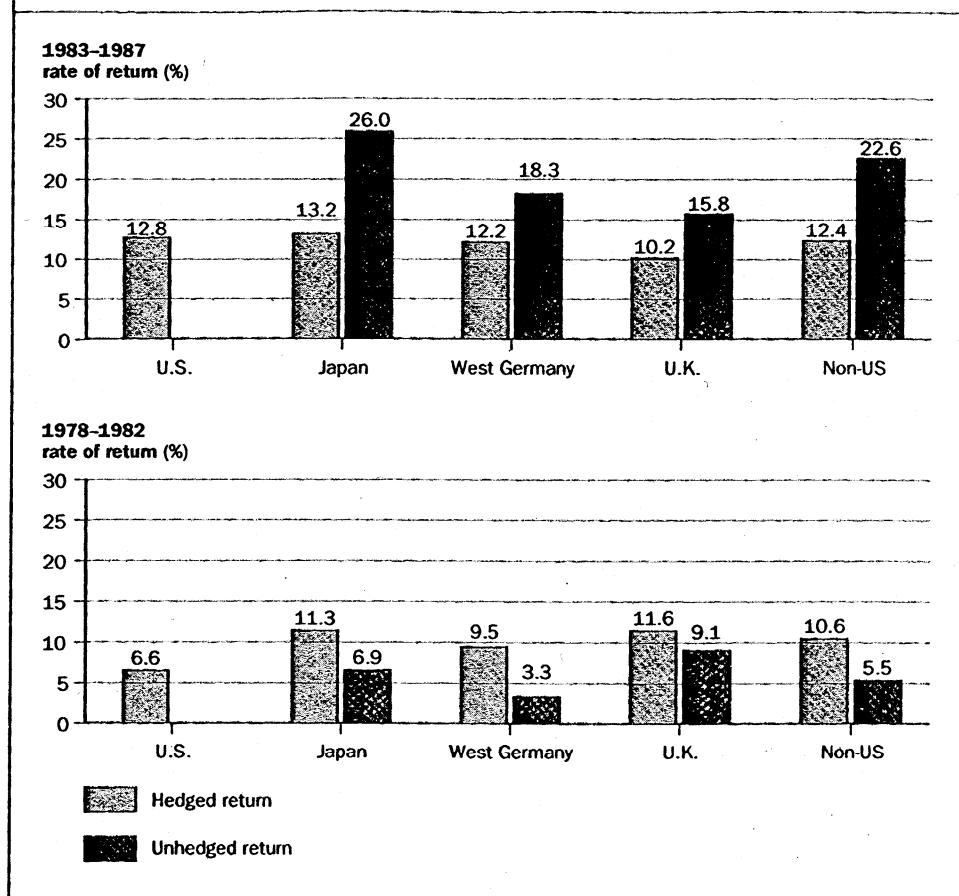
Using monthly hedges rolled over, Figure 1 shows the returns to hedged and unhedged fixed-income investments (ten-year government bonds) in the major markets over the last ten years. It is assumed that any market appreciation during the month was known and hedged at the beginning of the month. This residual, which in practice cannot be hedged, was and can be expected to be insignificant over extended periods.

The unhedged non-U.S. fixed-income market significantly outperformed the U.S. market over the last five years, but underperformed it over the previous five years. The hedged non-U.S. markets slightly underperformed the U.S. market over the last five years, but significantly outperformed it over the previous five. Figure 1 shows the opportunity for outperformance versus the U.S. markets in individual markets and in the aggregate, but also shows the possibility of underperformance for extended periods.

Volatility Reduction in Fixed-Income Portfolios

Figure 2 shows the historical volatility, or risk, of hedged investment in each of the major fixed-income markets. Each individual foreign market has been less risky than the U.S. alone; in the aggregate, non-U.S. markets had a risk of 5 percent over the last five years and 5.4 percent over the previous 5 years. This situation can be contrasted with the higher risk levels on an unhedged basis.

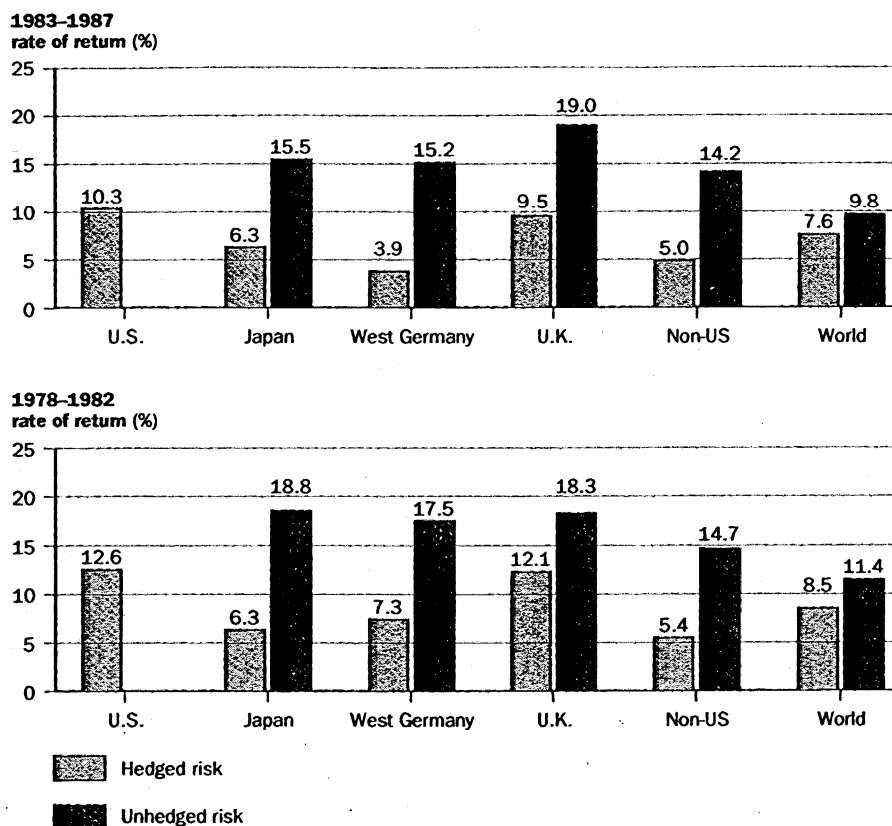
However, the key benefit of non-U.S. fixed-income investment is the risk reduction or diversification it provides a U.S. fixed-income portfolio. A world portfolio of U.S. and hedged non-U.S. bonds was consistently less risky than the U.S. market over the period 1978 to 1987. A world portfolio was weighted approximately 50 percent U.S. and 50 percent non-U.S.

FIGURE 1. International Fixed-Income Markets—Compound Returns

The fixed-income diversification benefits over various combinations of U.S. and non-U.S. markets on a hedged and unhedged basis are plotted in Figure 3. It can be observed that any size allocation to non-U.S. bonds reduced total fixed-income risk consistently over the period 1978 to 1987. For example, for the period 1983-1987, a 25 percent allocation to non-U.S. bonds (hedged) reduced the total portfolio risk from approximately 10 percent to 8 percent per year.

Historically, this risk reduction has been due in part to the fact that the non-U.S. markets have in themselves been less risky individually; more significantly, they are the result of the diversification effect across many markets. While it may not be reasonable to expect each individual non-U.S. market to be less risky than the U.S. market, it is reasonable to expect that any diversified portfolio of markets will be less risky than any individual one.

The risk benefits of hedged international fixed income can be contrasted with those available from unhedged international fixed income, the latter providing some diversification benefits for allocations of up to approximately 30 percent.

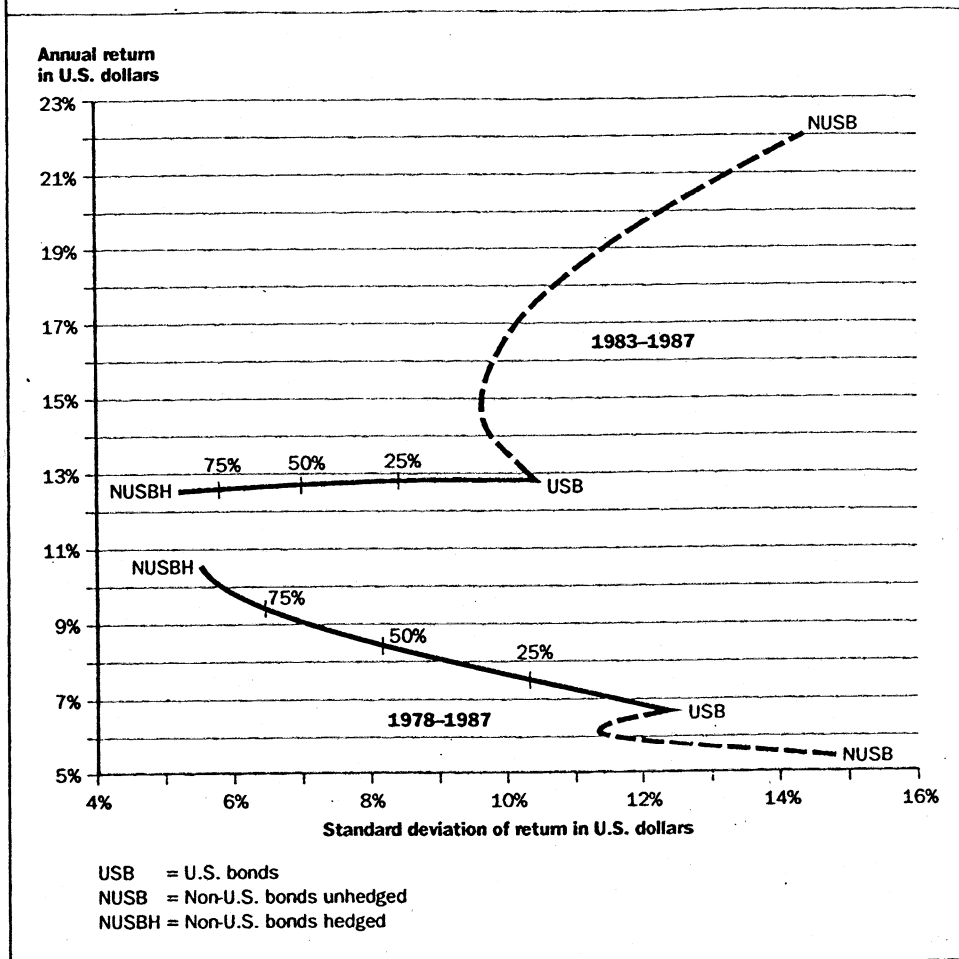
FIGURE 2. International Fixed-Income Markets—Standard Deviation of Return

Total Portfolio Diversification

Hedged international fixed income offers diversification in the context of the total portfolio. Diversification benefits in general are measured by the correlation or, more precisely, lack of correlation between different asset categories.

These correlations over the last ten years are highlighted in Figure 4. These data indicate that historically hedged international fixed income has had low correlations with U.S. stocks (.12), U.S. bonds (.54), and, more important, non-U.S. stocks (.39). This correlation of .39 between non-U.S. stocks and non-U.S. bonds (hedged) can be contrasted with the equivalent correlation with non-U.S. bonds (unhedged), which was .66. This relatively high correlation is due in part to the duplicated currency exposure of international stocks and bonds. Hedging reduces this duplication and thereby improves diversification.

The shaded area in Figure 4 represents the historical improvement in terms of total portfolio risk and returns to a U.S. investor who, already invested in U.S. stocks, U.S. bonds, and non-U.S. stocks, considers the inclusion of hedged international fixed income.

FIGURE 3. Fixed-Income Diversification Benefits, 1978-1987 (U.S. dollars)

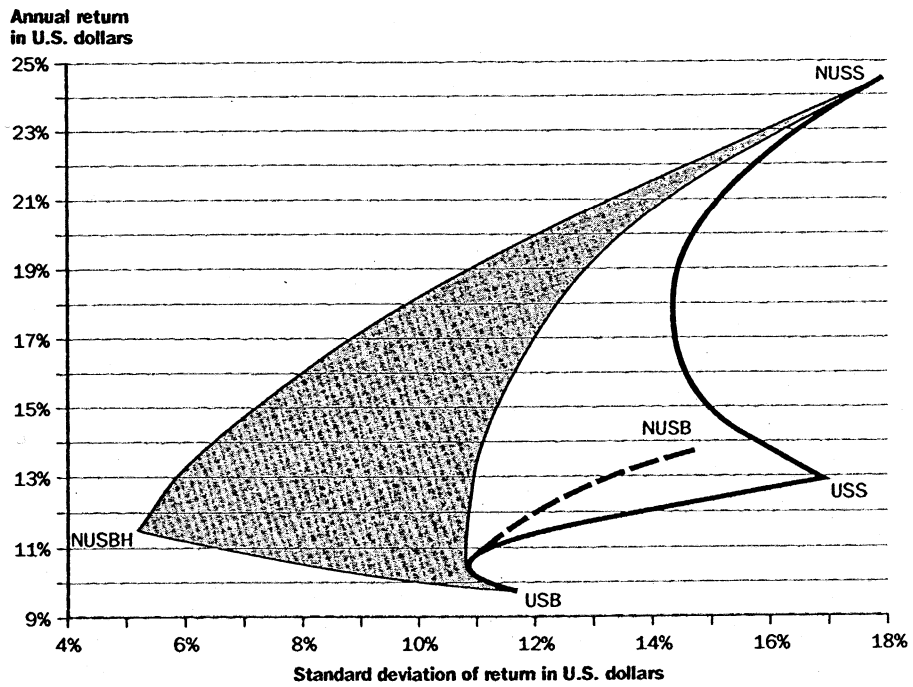
OPTIMAL ASSET ALLOCATION

This section provides a framework within which investors can identify appropriate asset allocation strategies for the future. Asset allocation is appropriately based on the investor's expectations for returns, risk, and covariance. These expectations should reflect relationships that are anticipated to hold over an extended period of time. An illustration of one such set of equilibrium expectations is shown in Table 2. The table shows the expected benefits or value added from the inclusion of each separate asset class in an unconstrained and then in a constrained environment. It also examines the sensitivity of these benefits to changes in expectations for returns.

The equilibrium assumptions in Table 2 imply a number of expectations:

- U.S. stocks will outperform U.S. bonds, but with higher risk.
- International stocks will slightly outperform U.S. stocks with a marginally higher risk.

FIGURE 4. Total Portfolio Diversification Benefits, 1978-1987 (U.S. dollars)



Correlations

U.S. stocks (USS)	1				
U.S. bonds (USB)	.28	1			
Non-U.S. stocks (NUSS)	.39	.25	1		
Non-U.S. bonds (NUSB)	.02	.41	.66	1	
Non-U.S. bonds hedged (NUSBH)	.12	.54	.39	.68	1

TABLE 2. Illustrative Equilibrium Assumptions—U.S. Investor

	Annual Return	Annual Standard Deviation	Correlation of Return			
U.S. equities	10.5%	18.0%	1.00			
U.S. bonds	7.5	9.0	.30	1.00		
Non-U.S. equities	11.0	20.0	.40	.25	1.00	
Non-U.S. bonds	7.5	11.0	.00	.40	.65	1.00
Non-U.S. bonds—hedged	7.5	4.5	.10	.55	.40	.65 1.00

- Non-U.S. bonds will perform in line with U.S. bonds but with a higher risk due to currency exposure.
- Hedged non-U.S. bonds will perform in line with unhedged non-U.S. bonds but with less risk.
- The approximate interrelationships of the past between these asset classes will hold into the future.

There is considerable historical and theoretical evidence to support expectations that broadly reflect these relationships. In particular, there are four justifications for hedged and unhedged expected returns being equal over the long run.

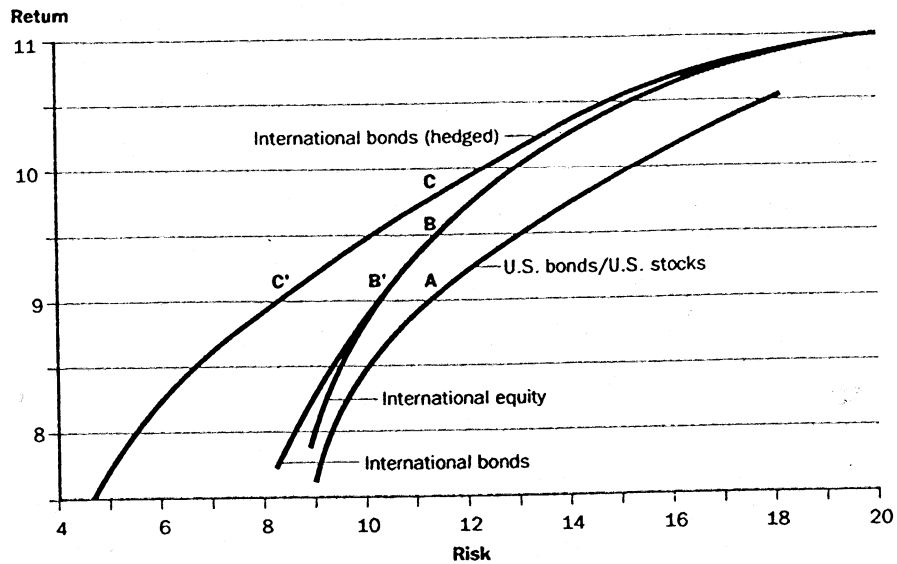
1. The rational expectation that forward exchange markets cannot be surprised continuously in one direction
2. The expectation that purchasing power parity should hold in the long run and that short-term real rates are expected to be equal across markets, again in the long run
3. The lack of significant theoretical or empirical evidence that there is a systematic reward associated with bearing currency risk
4. The theoretical contradiction associated with simultaneously rewarding a U.S. investor for bearing currency risk and a foreign investor for bearing U.S. dollar risk (theory suggests that currency should be expected to be a zero sum game)

It is worth stressing that equilibrium assumptions, by definition, are highly likely not to be realized over short or even extended periods. For example, hedged and unhedged returns differed by more than 10 percent per year over the five years ending December 1987. Ultimately, investors must identify, explicitly or implicitly, expectations with which they feel comfortable. These assumptions are presented for illustrative purposes only.

On the basis of these expectations and quadratic optimization techniques that minimize risk and maximize returns, the marginal benefits of the inclusion of each asset class separately into the investor's opportunity set can be examined. Figure 5 illustrates the results of this analysis.

The line "U.S. bonds/U.S. stocks" represents the return and risk opportunity range available to the investor who considers U.S. bonds and stocks only. For example, Portfolio A on this line is 45 percent U.S. bonds and 55 percent U.S. stocks. If the investor is also allowed to include international equities in his portfolio, then the available opportunity set is shifted to the line marked "International Equity." Here, Portfolio B has the same risk as Portfolio A, but higher expected return. Portfolio B is made up of 30 percent U.S. bonds, 35 percent U.S. stocks, and 35 percent international equity.

The added inclusion of international bonds, as represented by the shift to the line "International Bonds," has an insignificant impact on return and risk opportunities, because of the relatively high correlation between international bonds and international equities and the significant allocations to international equities. This result suggests that in the presence of existing international equity allocations, the international fixed-income diversification has limited impact except at the lowest levels of risk.

FIGURE 5. Return/Risk Opportunity Set Under No Constraints

Assets	Portfolio composition (%)				
	A	B	B'	C	C'
U.S. bonds	45	30	50	—	—
U.S. stocks	55	35	25	40	30
International equity	—	35	25	35	25
International bonds	—	—	—	—	—
International bonds (hedged)	—	—	—	25	45

If, however, international bonds (hedged) are included in the universe of available assets, then the return/risk opportunity set is significantly enhanced, as represented by the shift to the line "International Bonds (hedged)." Here, Portfolio C, which is comprised of 40 percent U.S. stocks, 35 percent international equities, and 25 percent international bonds (hedged), has the same risk as Portfolio A., but significantly higher return.

It appears that the value added from hedged international fixed income is significant, particularly at moderate to lower levels of risk.

Figure 6 presents the results of these optimizations in a constrained environment, where international assets in total must not exceed 30 percent of the portfolio. In this environment, the allocation to international fixed income (hedged) appears to be inversely related to the overall risk level of the portfolio, but is still desirable in portfolios in which the domestic stock/bond ratio is as high as 2:1 (Risk Level III).

FIGURE 6. International Assets Constrained to 30 percent Maximum

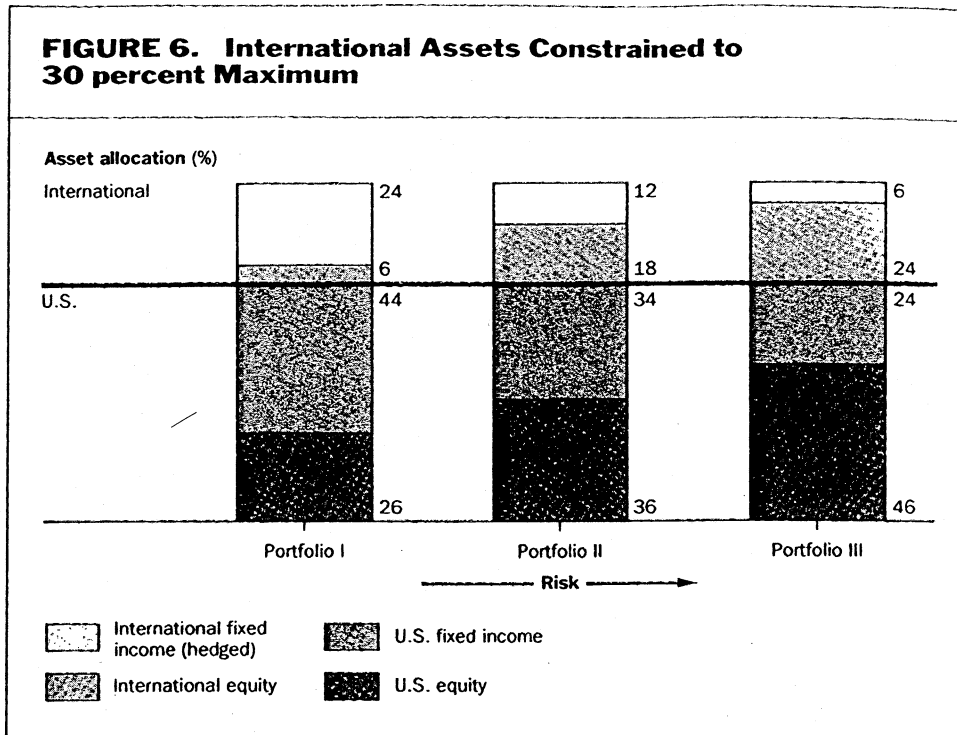
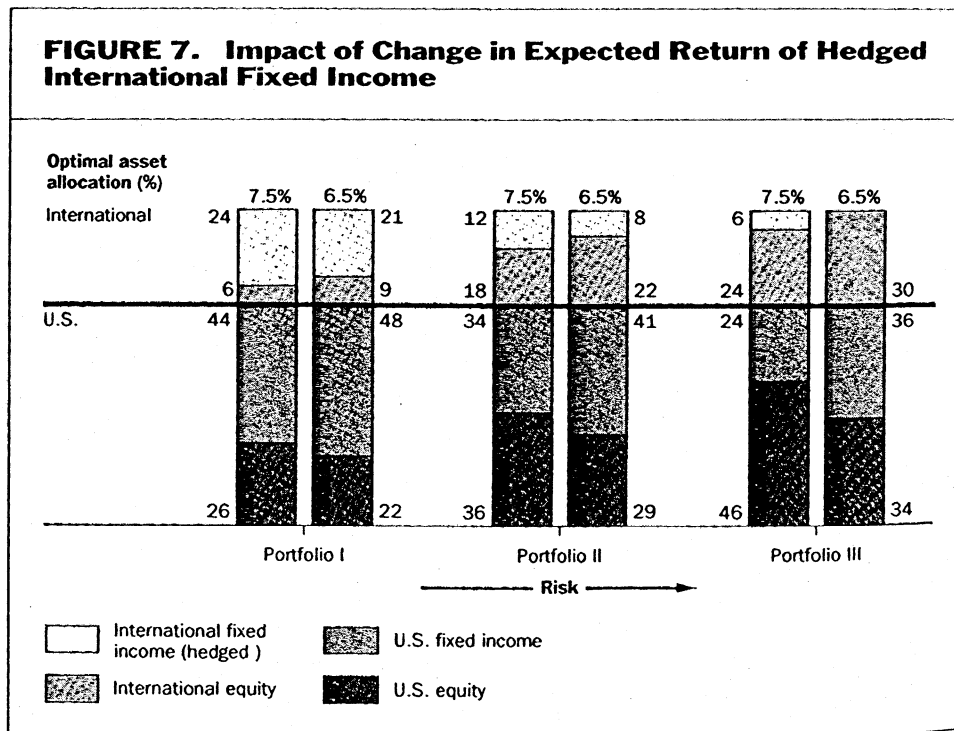


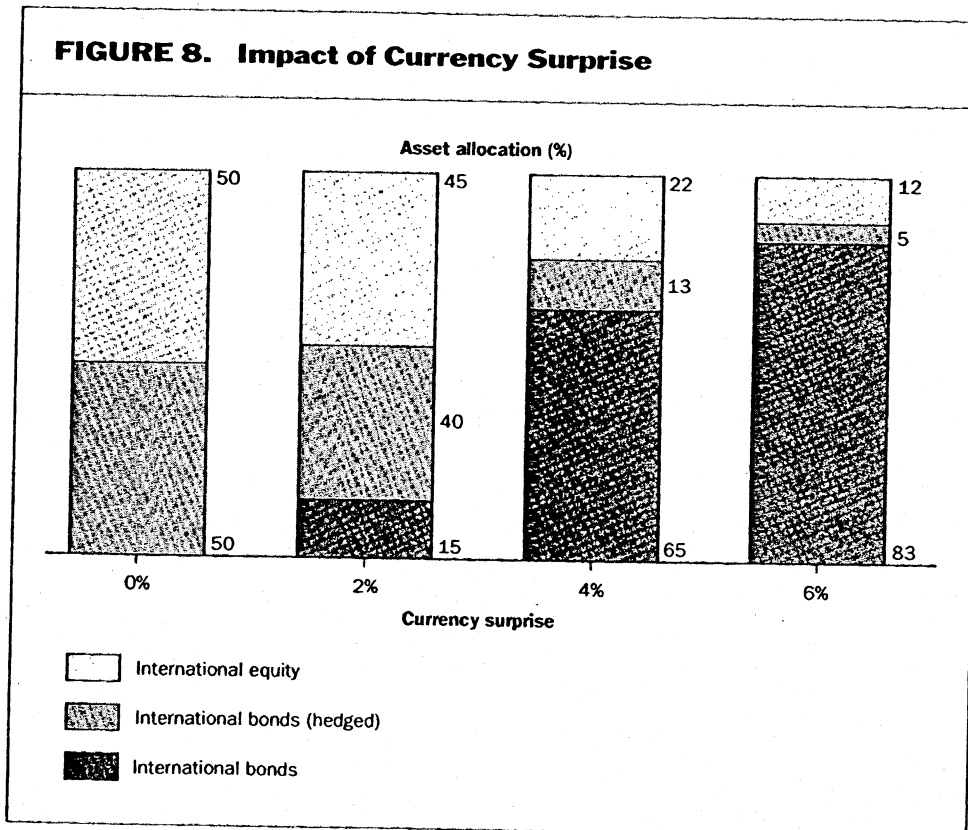
FIGURE 7. Impact of Change in Expected Return of Hedged International Fixed Income



Sensitivity Analysis

It is important to be aware of the sensitivity of the role of hedged international fixed income to a reduction in the long-run expected return from international fixed income and the impact of a positive long-run return to currency exposure. Figure 7 shows how the optimal long-run allocations to the various asset classes alter, if the expected return to hedged international fixed income is reduced by one percent. The results vary by risk level. At risk level I, the optimal allocation to hedged international fixed income is reduced from 24 percent to 21 percent. At risk level III, international fixed income is replaced by international equity. Figure 7 suggests that the case for hedged international fixed income is more sensitive to changes in expected return for high-risk investors than for low-risk investors.

If currencies are expected to appreciate over the long run in excess of what is implied by the forward premium, then the expected currency surprise is defined as being greater than zero. Figure 8 shows the role of hedged versus unhedged international fixed income for varying levels of currency surprise, for a given level of risk. For example, if the currency surprise is expected to be 2 percent per year, then the international portfolio should be structured as 45 percent equity, 40 percent hedged international fixed income, and 15 percent international fixed income (unhedged). It is not until the currency surprise is as high as 6 percent per year that hedged international fixed income appears to be dominated by unhedged international fixed income. These results are dependent to some extent on the



risk level chosen as well as the fact that international equity is unhedged; but overall, they appear to indicate that one requires quite optimistic expectations for foreign currencies to justify a fully unhedged international fixed-income investment.

SUMMARY

On the basis of past evidence and equilibrium expectations, hedged international fixed income offers an investor several benefits, including the opportunity for enhanced return, reduced volatility in the fixed income portfolio, and diversification. Hedged international fixed income can be an attractive diversifying separate asset class.
