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ASSET MANAGEMENT

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CURRENCY-HEDGED
INTERNATIONAL FIXED INCOME INVESTMENT

SUMMARY

In recent years, the management of risk in internationally diversified bond portfolios held by U.S. investors has been guided by the following principles:

Since foreign exchange movements are so volatile and return implications are not clear, it is best to hedge foreign currency exposures fully into US$. Therefore, a hedged international benchmark portfolio is the appropriate reference point for assessing performance.

Currency exposure has a role only as a tactical decision, when a manager believes it possible to outperform the forward market.

This paper demonstrates that the case for full hedging as a strategic decision for a plan sponsor is far from clear-cut:

While full hedging of currency exposure has reduced total portfolio risk without sacrificing return for U.S. investors in the 1980s, from the viewpoint of bond investors based in Yen, Deutschemarks, and Sterling, this has not been the case. Unhedged international diversification, at all realistic levels of international allocation, turned in the lowest total risk as well as higher return for investors based in Deutschemarks and Sterling, and lowest total risk for Yen based investors.

The appropriate hedging strategy from a risk standpoint is governed by the way in which currency returns interact with local currency asset returns. These interactions have been observed to change over time, highlighting the need for timely estimates that drive the hedging decision.

Several simple principles for international portfolio management follow:

The hedging decision should reflect the effect of hedging on the total risk of the portfolio, rather than a desire to avoid currency volatility.

Currency exposure in principle could be maintained because currency movements are expected to offset asset return movements, not simply because it is believed that the direction of the exchange rate can be predicted systematically. As such it pays to view currencies as possessing some "strategic" features, rather than as purely "tactical" assets.

Investors based in Yen, Deutschemarks and Sterling should consider an unhedged benchmark as the appropriate neutral strategy.

Since the appropriate benchmark depends on the nature of the interactions between asset and currency returns, which have been observed to change over time, the benchmark used should be reviewed periodically. This highlights the need for timely estimates of the parameters that drive the hedging decision.

Hedging currency exposure can be less effective in managing portfolio risk than judicious choice of the division of the portfolio between domestic and foreign assets and across foreign assets.

Significant reductions in total portfolio risk can be obtained by cross-hedging currency exposure.

The value added of tactical currency management is not dependent on the choice of strategic currency position.

INTRODUCTION

The almost unanimous conclusion of a number of recent studies of internationally diversified portfolios has been that investors can lower their risks by completely hedging their exposure to exchange rate movements.[1] Because this reduction in risk is held to come about with little change in average returns, currency hedging has come to be regarded as presenting investors with a "free lunch." Therefore exposure to foreign currency movements has come to be regarded as a "tactical" decision, based on one's views on the direction of future currency movements, rather than a "strategic" element of the attempt to minimize portfolio risks. Along similar lines, some investors believe that the superiority of complete hedging permits the separation of the roles of the fund manager and the currency specialist: the former need only decide on a position in hedged assets, while that latter need only be concerned with the extent of currency exposure.

Proponents of full currency hedging typically offer two observations. One is that hedged foreign securities have less volatile returns than unhedged foreign securities. The other is that, from the viewpoint of U.S. investors, portfolios of U.S. and foreign securities would have experienced lower risk in the past had foreign currency exposures been hedged rather than left unhedged. The connection between these two observations is not made explicit, although one is left with the sense that the first is responsible for the second. In fact, while both are correct for the historical periods considered, the two observations are logically unrelated. As this paper will show, there are important, and by no means exceptional cases for which remaining unhedged minimizes risks, in spite of the higher volatility of unhedged international bond returns than their hedged

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[1] See, for example Lee R. Thomas, "The Performance of Currency Hedged Foreign Bonds, " Goldman Sachs, February 1989; Adrian F. Lee, Optimal Currency Hedging Strategies: in The Handbook of International Investing, ed. Carl Beidelman (1987); and Andre Perold and Evan Schulmann, "The Free Lunch in Currency Hedging: Implications for Investment Policy" Financial Analysts Journal, May/June 1988, pp. 45-50. Articles that bear similarities to certain points made below are: Phillipe Jorion, "International Asset Allocation" Investment Management Review (1987), pp. 44-49; Michael Rosenberg, "How Strong is the Case for Currency-Hedged Foreign Bond Funds?" Merrill Lynch, August 18, 1988, and Jack D. Glen, "Exchange Rate Uncertainty, Forward Contracts and the Performance of Global Equity Portfolios" Rodney L. White Center for Financial Research, 37-89.

counterparts. Indeed, for investors based in currencies othat than U.S. dollars, in many cases remaining unhedged would have yielded lower risk and higher returns than completely hedging over the last ten years or so. Evidently, the conditions that makes (not) hedging the optimal strategy for (non-) U.S. investors have not been analyzed adequately in the published literature.[2] This creates cause for concern, since these unidentified conditions may change over time, motivating different strategic hedging positions. Without an understanding of what these conditions are, and how they have influenced the performance of hedging strategies in the past, recommendations on how much to hedge future foreign currency exposures stand on shaky ground.

This paper reexamines the case for currency-hedging by developing an explicit model of the allocation problem faced by an investor wishing to minimize risks by diversifying internationally. The model makes it possible to pinpoint the factors that are important in determining the optimal hedging strategy. The central result of the paper is that the optimal degree of currency hedging is determined by the covariances between exchange rate movements on the one hand, and domestic and foreign asset returns on the other. If these covariances are zero or positive, it will be optimal to be fully or over hedged. If they are negative, it will be optimal to remain partially unhedged.

It is important to realize that it is the base currency of the investor that determines the sign of these covariances. If, for example, movements in the $/¥ exchange rate are positively correlated with U.S. and Japanese asset returns denominated in their local currencies, then movements in the ¥/$ exchange rate will be *negatively* correlated with the same asset returns. Hence, the same underlying phenomena that make it optimal from a risk standpoint for investors based in one currency to hedge foreign exposures make it optimal for investors based in the foreign currencies not to do so. The paper thus shows that complete hedging does not guarantee a free lunch, and that complete hedging cannot be appropriate for all investors. Investors based in several currencies other than dollars would have been "stuck with the tab" had they hedged their foreign currency exposure during the last decade. For them, currency hedging typically incurred substantially greater volatility of bond portfolio returns that using the volatility-minimizing hedge ratio. The result is consistent with the lukewarm support for currency hedging among marketing participants in Europe.

Two points bear stressing that concern the relationship of these results to the existing currency hedging literature. First, the hedging decision has nothing to do with the observation that hedged foreign returns are less volatile than unhedged returns. During the 1980s, all investors would have agreed with this observation, irrespective of their base currencies. However, given the configuration of bond asset return-currency covariances, it was optimal for some to hedge, and for others to remain unhedged, depending on their base currencies. Second, deciding to remain unhedged on the basis of the considerations outlined here has nothing to do with investors' confidence that they can predict exchange

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[2] An unpublished paper that represents a rigorous theoretical analysis to precisely determine when a hedged international portfolio product may indeed offer institutional client superior return-risk trade-offs is:
Michael Adler, Michael R. Granito, and Adrian Lee, "Should International Portfolios Be Permanently Hedged?" J.P. Morgan Investment Management Inc., November 1988.

rates better than the forward market. Currencies are used as instruments of diversification. As such, they figure as strategic as well as tactical assets.

An important aspect of the approach of this paper is to consider explicitly the role played by the share of the domestic asset in the portfolio. It turns out that the volatility of portfolio returns is typically more sensitive to changes in the distribution of the portfolio among foreign and domestic assets than it is to changes in the hedged ratio, particularly when the share of domestic assets exceeds 75%. This suggests that hedging is not necessarily the most effective way of controlling risks in global portfolios.

The theoretical framework of the paper provides a perspective on international investment markedly different from the existing published literature. Significant benefits from hedging can typically only be reaped when the hedge ratio and the division of the portfolio between domestic and foreign assets are decided simultaneously. Consequently, the bond portfolio manager should be kept informed of, and take into account, decisions concerning currency exposure. Hence, while it is obviously sensible to manage actively the currency exposure that comes with international bonds, it is not necessarily optimal to make bond allocation and currency exposure decisions independently. Indeed, judging the performance of international bond mangers relative to a hedged benchmark may result in investments that are detrimental to overall portfolio risk. Even though the analysis focuses on bonds exclusively, the conclusions for fixed income investments are not altered when equities are included in the model. Also, the results do not comment on the case for hedged vs. unhedged equities.

Estimates on the correlations between bond returns and foreign currency movements based on the entire 1980-89 sample period have been positive for U.S. investors, implying that they would have minimized risks during the last decade by hedging more than one hundred percent. However, estimates based on subsamples of the decade do vary, and exhibit certain long-term trends. In particular, "rolling sample" estimates of the correlation between U.S. asset returns and currency changes have fallen over time, and turned negative over the last several years. Should this trend continue, risks for U.S. investors may be minimized in the future by less-than-complete hedging. It follows that correct implementation of strategies to control risk requires timely estimates of the changing inputs to the portfolio problem

The portfolio model

Historically, the correlation of returns on the assets of different countries has been low, offering investors the opportunity to reduce risks by diversifying internationally. However, since total return performance is measured in an investor's domestic currency, holding foreign assets also exposes the portfolio to exchange rate risks. The historical volatility of exchange rate movements have been quite large, while return implications are not clear. Consequently, some investors have been advised to sell all foreign currency proceeds forward, which immunizes them against currency risks, at the cost of the forward premium, without necessarily sacrificing expected return.

The problem with this justification for complete hedging is that, while the declared objective is to minimize portfolio risks without sacrificing return, the superiority of complete hedging is inferred solely form the lower volatility of hedged than unhedged assets. The correct approach would derive the hedging decision as part of an overall strategy of risk minimization.[3] One can think of the problem in the following way. The investor chooses the proportions in which he or she will hold three assets: domestic, hedged foreign, and unhedged foreign. Returns on unhedged foreign assets are more volatile than those on hedged foreign assets. Does this mean that the unhedged asset should be assigned a weight of zero? Not necessarily. Its returns may covary with the other returns in such a way that holding it is advantageous for overall portfolio risk.

It is possible to capture what is at issue here with a simple model, which casts both currency hedging and international asset allocation in the same framework. For this it is useful to introduce some notation, which is summarized in Table 1. The model is framed in terms of the most elementary case, involving a choice between one domestic and one foreign asset. This permits the solution to the optimization problem to be characterized explicitly, and the factors determining the hedge ratio to be identified.

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[3] See Adrian Lee, "Hedging Decisions Within the Overall Asset Allocation Strategy," Managing Currency Risk, The Institute of Chartered Financial Analysts, 1989 for a similar model.

	Table 1

Definition of terms

D   Percentage return on domestic asset over the horizon of the investment

L   Percentage return of foreign asset over the horizon, when returns are valued in the foreign currency

C   Percentage change in the domestic currency/foreign currency exchange rate over the horizon

F   Current foreign exchange forward premium for the horizon date, expressed as a percentage of the spot exchange rate at the time the assets are purchased

R   Percentage return on portfolio

w_i Portfolio share of asset i

o_i Variance of returns of asset i

o_{jj} Covariance of returns on assets i and j.

The return on the foreign asset valued in the domestic currency will be L + C. Hedging currency risk essentially involves swapping the (unknown) currency movement (C) for the known forward premium (F). Hence, the return on the composite hedged foreign asset will be L + F. The return on the overall portfolio is then:

1. $R = w_d\, D + w_{L+C}\,(L+C) + w_{L+C}\,(L+F)$

where the weights of the three assets must sum to one.[4] The hedge ratio, h, is defined as the proportion of hedged foreign assets to total foreign assets:

$$(2)\ \ h = \frac{w_{L+F}}{w_{L+C} + w_{L+F}}$$

The problem considered is that an investor wishing to minimize risk by selecting appropriate values of w_D, w_{L+C} and w_{L+F}. The optimal shares of the three assets will be determined by the variances and covariances of their returns, while the optimal hedge ratio will be one only if w_{L+F} the share of the unhedged foreign asset, is zero. From an asset allocation perspective, it is not a foregone conclusion that this will be so!!

To investigate further the determinants of the optimal hedge ratio, it is useful to employ the following equivalent formulation of the portfolio return, in which the hedge ratio appears explicitly:

$$(3)\ \ R = w_D\, D + (1 - w_D)\,(L + (1 - h)\,C + hF)$$

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[4] Equation 2 shows that a negative hedge ratio can arise if, for example, the investor is short hedged foreign assets ($w_{L+F} < 0$) but long foreign assets ($w_{L+C} + w_{L+F} > 0$). A hedge ratio in excess of one arises, for example, from a longer position in hedged foreign assets than in foreign assets overall ($w_{L+F} > 0$, $w_{L+F} < 0$, and $w_{L+F} < 0$, and $w_{L+C} + w_{L+F} > 0$).

Equation (3) has the advantage of breaking down returns into the individual contributions of the basic sources of uncertainty, D, C, and L.[5] The advantage of hedging completely is that it removes o^2 , the variance of currency returns, from the variance of the portfolio. However, simultaneously, this also removes the interactions of currency returns with asset returns, that is the covariance δ_{DC} and δ_{LC} . **If these covariances are sufficiently negative, the benefit of immunizing against currency volatility will be outweighted by the loss of the diversification benefits of currency exposure.**

The literature on currency hedging has typically examined the risk of completely hedged and unhedged positions (h = 1 and h = 0, respectively).[6] For purposes of comparison, the optimal hedge ratio will be constrained to lie between zero and one in the current discussion as well, which effectively rules out short sales.[7] This constrained optimal hedge ratio, h*, is then described by:

$$(4) \quad h^* = \begin{cases} 0 & \text{if } h < 0 \\ h & \text{if } 0 < h < 1 \\ 1 & \text{if } h > 1. \end{cases}$$

The dependence of the optimal hedge ratio on the distribution of the portfolio among the assets of different countries suggests that bond and currency managers should be apprised of each other's decisions. Gains form using specialists may be mitigated if information is not shared between them. The optimal hedge ratio can vary substantially in response to small changes in the composition of the portfolio. The model also suggests that there may be drawbacks associated with judging an international bond manager's performance according to some simple standard, such as the performance of a fully hedged international bond index.[8] For the portfolio of foreign assets which is the optimal solution to the narrower problem of outperforming the index may increase the sponsor's overall portfolio risk, even though it minimizes the risk of the international part of the portfolio. For example, this will happen whenever currencies figure as strategic assets but their role as instruments of diversification are removed by the fully hedged benchmark.

In practice, because their performance is assessed frequently and the costs of underperforming a fixed income benchmark are higher than the gains from outperforming, many bond managers tend to keep the expected risk of their portfolios reasonably close to the expected risk of the benchmark they are judged against. They deviate significantly, in terms of residual risk and return, only when they think it is possible to produce sufficient excess returns to compensate for the added risk. Therefore, if currency exposure is removed from the benchmark, currency exposure will not bulk as large in the investor's portfolio as it would if the benchmark were left unhedged. Ideally, the rewards of the international manager should be based on his or her contribution to the plan sponsor's total portfolio performance. However, it may be more practical

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[5] To conform with the literature on currency hedging, we do not treat the forward premium as a random variable. This is the correct thing to do when considering a one period hedge with the same termination date as the forward contract. However, for "rolling hedge" strategies it is not appropriate, since forward contracts after the first will be struck at values of the forward premium that are uncertain at the time the assets are purchased. In practice, the contribution to volatility of the forward premium is insignificant in comparison to that of exchange rate and asset returns.

[6] See footnote 1 for references.

[7] See footnote 4.

[8] See Perold and Shulman, op.cit.

to judge performance according to a simple benchmark such as the hedged or unhedged international index.[9] In view of these considerations, the benchmark should be selected with care by the plan sponsor, since it will be a crucial determinant of the international investment's contribution to overall portfolio performance.

For example, consider the case of a Sterling-based bond investor, diversifying into U.S. assets. The standard deviations of returns of hedged and unhedged U.S. assets are 3.05% and 4.21% per month, respectively. Consequently, in order to beat the hedged benchmark, the international manager will likely take positions in unhedged U.S. bonds only when it will result in returns sufficiently in excess of those of hedged U.S. bonds, to compensate for the sizeable residual (extra) currency risk involved. Since it is considered difficult systematically to outperform the forward exchange rate, it is likely that the international manager will typically choose to hedge more than if the benchmark were an unhedged one. In the case under consideration, this has an adverse effect on overall portfolio risk since δ_{DC} and δ_{LC} are both negative. If 75% of the portfolio were committed to U.K. assets, then the overall risk resulting form a completely hedged U.S. position would be 2.59% per month. However, if contrary to the incentives provided by the hedged benchmark, the international manager were induced not to hedge in order to minimize residual risk relative to an unhedged benchmark, overall portfolio risk would fall to 2.47% per month. Historically, remaining unhedged would have also resulted in a higher overall portfolio return.

Some authors have concluded from the superior performance of hedged portfolios over unhedged portfolios (from the standpoint of U.S. dollar-based investors) that currencies should not be present in the investor's normal portfolio: they are instead viewed as tactical assets, in which one takes a position only if one believes it possible to outperform the forward market.[10] The model presented here shows that this can be bad advice. Currencies can have a strategic role to play, a role governed by the correlation of their returns with those of other assets, which can cause the long-term strategy to involve some exposure to fluctuations in currency returns.

In summary, the analysis of this rudimentary model motivates the following observations on the determinants of the optimal hedge ratio:

1. The optimal hedge ratio depends on the expected interactions of asset returns and currency returns, as well as the expected volatility of currency returns.

2. The optimal hedge ratio will be one (actually greater than one) if the correlations of currency returns with both foreign and domestic returns are both positive. It will be less than one if these correlations are both negative.

3. Positive correlations valued in domestic currency are negative correlations valued in foreign currency. Hence, the optimal hedge ratio for the foreign investor will often turn out to be the mirror image of that of the domestic investor: if it is optimal for one hedge completely, it may be optimal for the latter to remain unhedged.

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[9] Of course, the optimal benchmark form the plan sponsor's perspective is the one that induces the international manger to make decisions replicating those that would be made by someone marking all asset allocation decisions and hedging decisions simultaneously, with the combined skill of all individual managers.

[10] See Thomas, op.cit.

4. The optimal hedge ratio from a risk minimization standpoint depends critically on the weighted assigned to the domestic asset, while the optimal allocation of the portfolio among domestic and foreign assets is sensitive to the choice of hedge ratio. Hence, it is not advisable, from the standpoint of risk management, to make strategic asset allocation decisions and currency exposure decisions independently: benchmarks should be chosen to reflect the goals of the overall portfolio management strategy.

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Emad is the Managing Partner and Chief Executive Officer of Vanderbilt Avenue Asset Management LLC. Vanderbilt's client base includes Multi-national Corporations, Public Funds, Foundations/Endowments, and Taft Hartley accounts.

Previously, Emad was Chairman of Institutional Business at Pioneer Investments. Pioneer investments has more than $300 Billion in assets under management. The parent of Pioneer, UniCredit S.p.A., is the largest bank in Italy and the second largest bank in Europe. Pioneer had purchased Vanderbilt Capital Advisors, of which Emad was the founder and Chief Executive Officer.

Emad has had numerous articles published in professional and academic journals such as *The Journal of Forecasting*, *The American Economist* and *The Journal of Fixed Income*. He is a Board member of The National Investment Company. Emad was a member of the Board of Advisors of the Pacific Institute, The Advisory Committee of Fulcrum Global Partners, The Chief Executive Officers Club and formerly a board member of The Foreign Policy Association. He also served on the Board of Directors of the University of Albany Foundation, NextGen Healthcare Inc., The Park Avenue Bank, AA Bank and The New Providence Fund and Associates LP.

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