An Analysis of Currency Overlays for U.S. Pension Plans

Hedging costs and asset allocation policies must be considered.

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Should U.S. pension plan sponsors strategically hedge some or all of their currency exposure through currency overlay strategies? Increasingly, this is a question that institutional investors must address in light of current and expected global investment trends. This article uses findings derived from a series of mean-variance analyses to help assess the proper role of such strategies.

BACKGROUND ON CURRENCY RISK MANAGEMENT

Instruments such as futures, options, and forward contracts may be used as hedges to reduce the volatility of international (or global) portfolio returns resulting from fluctuating exchange rates. Hedging, however, like all forms of insurance, is not free. Costs associated with hedging include transaction costs, management fees, and opportunity costs. The hedger must evaluate the cost of entering into and maintaining a hedge against the hedge's potential risk reduction benefits.

Although a plan sponsor could authorize international securities managers to engage in hedging activities, some portfolio managers may not be comfortable making active currency decisions and should not be expected to assume the responsibility. Some international stock managers, for example, focus almost exclusively on making country allocation and security selection decisions, independent of currency trends, and may not explicitly address the management of cur-

rency risk. Use of a currency overlay manager as a "currency expert" is appropriate in this circumstance.

SUGGESTED FRAMEWORK FOR DECISION-MAKING

Should a U.S. pension plan's currency hedging be accomplished through use of an overlay manager? To answer this question, we can conduct a mean-variance analysis on an entire pension fund investment portfolio to determine the plan sponsor's normal currency hedge position.

The position could range anywhere between 0% (fully unhedged) and 100% (fully hedged) of the total non-U.S. dollar exposure. If a normal hedge position in an efficient portfolio is greater than 0%, an overlay manager can play a meaningful role; if the normal hedge position is close to or at 0%, an overlay manager would be superfluous in terms of risk reduction.

Estimates of the total costs associated with overlay strategies range between 25 and 100 basis points (see Proffer [1989]). An informal survey conducted by a major consulting firm suggests that management fees for a currency overlay program can range between 10 and 50 basis points annually, depending upon the size of the program and the nature of the assignment. Trading and custody costs associated with currency hedging can total approximately 25 basis points annually (see Lee [1989]). Thus, it is reasonable to assume that total annual costs of an overlay program might be in the area of 55 basis points.

In this analysis, we use a set of hypothetical expected returns and risks (using standard deviation of returns as a measure of risk) for six asset classes. Allocation constraints are placed on the six asset classes to reflect a practical operating range. Failure to use such constraints would otherwise prompt a portfolio optimizer to select a dramatic overweighting to highly illiquid asset classes, such as venture capital, alternative investments, and real estate. While these types of illiquid investments have a role to play within the context of a total pension fund, it is presumed that most plan sponsors prefer to have the critical mass of their investment assets invested in the more liquid public market areas such as stocks and fixed-income.

The assumed long-term returns, risks, and allocation constraints for the asset classes are listed in Exhibit 1. Note that the 20% allocation constraints placed on international stocks and international fixed-

EXHIBIT 1
Assumed Risk and Return Expectations and
Allocation Constraints (%)

Asset Class	Expected Return	Expected Risk	Minimum Allocation	Maximum Allocation
Domestic Stocks	9.5	17	30	100
International Stocks (unhedged)	9.5	18	5	20
Domestic Fixed-Income	7.0	7	20	50
International Fixed-Income (unhedged)	7.0	9	0	20
Real Estate	8.5	12	5	10
Venture Capital and Alternative Investments	14.0	30	0	5

income permit the plan sponsor to have a maximum of 40% of the total fund's assets invested internationally.

While the allocation constraints used are arbitrary, they are nevertheless reasonable for purposes of this simulation, and may actually reflect the long-term operating ranges of some U.S. plan sponsors.

Historical Approach

To generate the first set of efficient frontiers, we use a historical correlation matrix derived from return data from 1980 through 1993, using six indexes as proxies for the six asset classes; these are identified in Exhibit 2. The associated correlation matrix for these indexes appears in Exhibit 3.

Note in Exhibit 2 that the two non-U.S. indexes are included on an unhedged basis. To allow the optimizer to consider the possibility of currency hedging at a macro level, 1980-1993 correlation data based upon total returns (in U.S. dollars) of 1) the Japanese yen and 2) a European currency basket (composed of British pounds, French francs, and German deutschemarks) are also entered into this matrix.

The level of currency hedging is constrained at a maximum of 20% each for the yen and the European basket, or 40% combined. This is consistent with the

EXHIBIT 2
Proxies for Major Asset Class Correlations, 1980-1993

Asset Class	Index Proxy
Domestic Stocks	Wilshire 5000 Stock Index
International Stocks	FT World ex-U.S. Index Stock Index (unhedged)
Domestic Fixed-Income	Lehman Brothers Aggregate Bond Index
International Fixed-Income	Salomon Brothers Non-U.S. Dollar Bond Index (unhedged)
Real Estate	Wilshire Real Estate REIT Index
Venture Capital and Alternative Investments	OTC Stock Index

EXHIBIT 3
Historical Correlation Matrix, 1980-1993

	U.S. Stocks	Int'l Stocks	U.S. Bonds	Int'l Bonds	Real Estate	OTC Stocks	Euro Curr.	Japanese Yen
U.S. Stocks	1.000	0.460	0.370	0.050	0.680	0.930	−0.030	−0.030
Int'l Stocks	0.460	1.000	0.210	0.600	0.340	0.380	0.450	0.580
U.S. Bonds	0.370	0.210	1.000	0.370	0.330	0.200	0.190	0.150
Int'l Bonds	0.050	0.600	0.370	1.000	0.020	−0.080	0.820	0.840
Real Estate	0.680	0.340	0.330	0.020	1.000	0.720	−0.150	−0.050
OTC Stocks	0.930	0.380	0.200	−0.080	0.720	1.000	−0.150	−0.150
Euro Currencies	−0.030	0.450	0.190	0.820	−0.150	−0.150	1.000	0.640
Japanese Yen	−0.030	0.580	0.150	0.840	−0.050	−0.150	0.640	1.000

Historical correlations for OTC stocks are used as a proxy for both the venture capital and alternative investments areas.

maximum non-U.S. exposure of 40% that this hypothetical plan sponsor agreed to when the minimum and maximum allocation ranges for each asset class were selected.

SCENARIO A. Scenario A uses this historical matrix, and assumes no costs for hedging. Six sample portfolios along this efficient frontier (labeled A-1 through A-6) are given in Exhibit 4.

In a no-cost environment, significant use of strategic currency hedging is preferred in all of the sample portfolios. For example, Portfolio A-5 would maintain a currency hedge of 80% of the total non-U.S.

EXHIBIT 4
Scenario A: Six Sample Portfolio Percentages Using Historical Correlations; Annual Currency Hedging Costs = 0

	Portfolio A-1	Portfolio A-2	Portfolio A-3	Portfolio A-4	Portfolio A-5	Portfolio A-6
Domestic Stocks	30	30	30	30	40	50
International Stocks	5	15	20	20	20	20
Domestic Fixed-Income	40	30	23	20	20	20
International Fixed-Income	20	20	20	20	10	0
Real Estate	5	5	5	5	5	5
Venture/Alternatives	0	0	2	5	5	5
European Currencies	−10	−11	−13	−11	−6	−3
Japanese Yen	−12	−19	−20	−20	−18	−13
Currency Hedge as a % of Total International Allocation	88	86	83	78	80	80
Expected Return	7.92	8.16	8.41	8.66	8.90	9.15
Expected Risk (std. dev.)	7.77	8.26	8.98	9.80	11.28	12.80

EXHIBIT 5
Scenario B: Six Sample Portfolio Percentages Using Historical Correlations; Annual Currency Hedging Costs = 55 Basis Points

	Portfolio B-1	Portfolio B-2	Portfolio B-3	Portfolio B-4	Portfolio B-5	Portfolio B-6
Domestic Stocks	30	30	30	30	40	50
International Stocks	5	13	13	20	20	20
Domestic Fixed-Income	40	32	28	20	20	20
International Fixed-Income	20	20	20	20	10	0
Real Estate	5	5	5	5	5	5
Venture/Alternatives	0	0	4	5	5	5
European Currencies	−10	−5	−3	0	0	0
Japanese Yen	−12	−12	−10	−9	0	0
Currency Hedge as a % of Total International Allocation	88	52	39	23	0	0
Expected Return	7.80	8.07	8.34	8.61	8.88	9.15
Expected Risk (std. dev.)	7.77	8.36	9.16	10.11	11.46	12.93

exposure. This could be accomplished using an overlay manager who would manage the plan sponsor's overall currency exposure versus this goal.

SCENARIO B. Scenario B uses this same matrix, but assumes total annual hedging costs of 55 basis points. Six sample portfolios along this efficient frontier (labeled B-1 through B-6) appear in Exhibit 5.

When costs are factored into the equation, the optimizer's strong preference for strategic currency hedging is radically altered. Because of the costs, the optimizer finds more efficient methods of constructing optimal portfolios.

Portfolio B-5, which is similar to Portfolio A-5, is an example of a more aggressive portfolio that might be considered by a long-term investor, such as a pension fund. In this portfolio, no amount of strategic currency hedging is desired.

The return on Portfolio B-5 is 8.88%, virtually identical to the return on Portfolio A-5, although B-5's standard deviation is slightly higher (11.46%) than A-5's (11.28%) because the cost of "insurance" (or risk reduction) through currency hedging makes it more feasible to bear currency risk by avoiding a strategic currency hedge. In essence, the correlations among the asset classes and the currencies are low enough to provide adequate diversification without incurring the added costs associated with currency hedging.

Forward-Looking Approach

A set of expected (or projected) correlations are also used to generate two additional efficient frontiers.

The projected correlation matrix is similar to one used by a major pension fund and its investment consultant in a recently completed asset allocation study. To these projections for the major asset classes, we add the historical correlation data for both the Japanese yen and the European currency basket. This correlation matrix is found in Exhibit 6.

SCENARIO C. Scenario C uses this projected correlation matrix, and assumes no costs for hedging. Six sample portfolios along this efficient frontier (labeled C-1 through C-6) are shown in Exhibit 7.

In a no-cost environment, significant use of strategic currency hedging is preferred once again in all of the sample portfolios. This could be accomplished using an overlay manager who would manage the plan sponsor's overall currency exposure versus this goal.

SCENARIO D. Scenario D uses this same matrix, but assumes total annual hedging costs of 55 basis points. Six sample portfolios along this efficient frontier (labeled D-1 through D-6) are shown in Exhibit 8.

Much as in Scenario B, the optimizer's strong preference for strategic currency hedging is radically altered when costs are factored into the equation. Because of such costs, the optimizer has found more efficient methods of constructing optimal portfolios.

Portfolio D-5 serves as another example of a more aggressive portfolio that might be considered by a long-term investor, such as a pension fund. In this portfolio, no amount of strategic currency hedging is desired. The return on Portfolio D-5 is 8.88%, virtually identical to the return on Portfolio C-5, but D-5's

EXHIBIT 6
Projected Correlation Matrix (with currency correlations from 1980-1993)

	U.S. Stocks	Int'l Stocks	U.S. Bonds	Int'l Bonds	Real Estate	OTC Stocks	Euro Curr.	Japanese Yen
U.S. Stocks	1.000	0.750	0.450	0.150	0.200	0.750	−0.030	−0.030
Int'l Stocks	0.750	1.000	0.250	0.460	0.200	0.300	0.450	0.580
U.S. Bonds	0.450	0.250	1.000	0.430	0.200	0.200	0.190	0.150
Int'l Bonds	0.150	0.460	0.430	1.000	0.200	0.400	0.820	0.840
Real Estate	0.200	0.200	0.200	0.200	1.000	0.200	−0.150	−0.050
OTC Stocks	0.750	0.300	0.200	0.400	0.200	1.000	−0.150	−0.150
Euro Currencies	−0.030	0.450	0.190	0.820	−0.150	−0.150	1.000	0.640
Japanese Yen	−0.030	0.580	0.150	0.840	−0.050	−0.150	0.640	1.000

Projected correlations for OTC stocks are used as a proxy for both the venture capital and alternative investments areas. Historical correlations for the European currencies and Japanese yen employed earlier are also used here.

standard deviation is slightly higher (11.58%) than C-5's (11.46%). Once again, the cost of "insurance" (or risk reduction) through currency hedging makes it more feasible to bear currency risk by avoiding a strategic currency hedge.

LIMITATIONS OF THIS ANALYSIS

The expectational inputs (i.e., returns, risks, and correlations) and asset allocation constraints employed in this report are matters of judgment. A "one-size-fits-all" approach is inappropriate for all plan sponsors, and customization of inputs and constraints is necessary. Moreover, the combination of forward-looking correlation data for asset classes together with backward-

looking currency correlation data in the same matrix (as in Scenarios C and D) is also a weakness. Finally, estimates of actual costs related to currency hedging vary widely.

Plan sponsors are strongly encouraged to do their own research and properly evaluate operating ranges for various asset classes *before* using mean-variance analysis to evaluate the impact of a currency overlay strategy.

CONCLUSION

The decision to use a currency overlay strategy will depend upon the investor's profile. Relevant factors are the size of the international allocation, the costs

EXHIBIT 7
Scenario C: Six Sample Portfolios Using Projected Correlations; Annual Currency Hedging Costs = 0

	Portfolio C-1	Portfolio C-2	Portfolio C-3	Portfolio C-4	Portfolio C-5	Portfolio C-6
Domestic Stocks	30	30	30	30	39	50
International Stocks	5	5	9	19	20	20
Domestic Fixed-Income	37	32	26	20	20	20
International Fixed-Income	20	20	20	16	7	0
Real Estate	8	10	10	10	10	5
Venture/Alternatives	0	3	5	5	5	5
European Currencies	−9	−8	−7	−8	−4	−2
Japanese Yen	−13	−12	−14	−20	−17	−13
Currency Hedge as a % of Total International Allocation	88	80	72	80	78	75
Expected Return	7.96	8.19	8.43	8.67	8.91	9.15
Expected Risk (std. dev.)	8.01	8.57	9.26	10.11	11.46	13.09

EXHIBIT 8
Scenario D: Six Sample Portfolios Using Projected Correlations; Annual Currency Hedging Costs = 55 Basis Points

	Portfolio D-1	Portfolio D-2	Portfolio D-3	Portfolio D-4	Portfolio D-5	Portfolio D-6
Domestic Stocks	30	30	30	30	37	50
International Stocks	5	5	7	18	20	20
Domestic Fixed-Income	37	33	28	23	21	20
International Fixed-Income	20	20	20	14	7	0
Real Estate	8	10	10	10	10	5
Venture/Alternatives	0	2	5	5	5	5
European Currencies	−9	−3	0	0	0	0
Japanese Yen	−13	−7	−5	−6	0	0
Currency Hedge as a % of Total International Allocation	88	40	19	19	0	0
Expected Return	7.84	8.09	8.36	8.62	8.88	9.15
Expected Risk (std. dev.)	8.01	8.53	9.27	10.31	11.58	13.21

associated with hedging, and the ability to identify and hire talented managers to implement such strategies (see "To Hedge or Not to Hedge" [1993]). Assuming total annual costs of approximately 55 basis points (or more), the benefits of such strategic currency hedging appear to be minimal for a long-term investor. If the plan sponsor's risk tolerance and/or expectational inputs change, however, or if the cost of currency hedging through an overlay strategy is materially lower than 55 basis points annually, the use of an overlay strategy would merit further consideration.

Although we do not address the use of partially hedged benchmarks, they are an option in an overall currency risk management program. An optimization analysis employing appropriate correlations for such partially hedged benchmarks, as well as the associated currency hedging transaction costs, would reveal whether this approach should be pursued.

Perhaps this article's most important point is the notion that strategic currency hedging must be evaluated within the context of an entire pension fund investment program, and that all of the associated hedging costs must be considered. To evaluate a currency over-

lay program merely within the context of either an international stock portfolio or an international fixed-income portfolio ignores the ability of a well-diversified total fund portfolio to absorb currency volatility.

Finally, plan sponsors must operate in the real world of transaction costs and management fees. The fund's attitude toward currency overlay programs will be affected by the magnitude of these costs.

ENDNOTE

REFERENCES

Lee, Adrian F. "Hedging Decisions Within the Overall Asset Allocation Strategy." In *Managing Currency Risk*. Charlottesville, VA: AIMR, 1989.

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