Canada UNBOUND

With the FPR gone, what might happen to Canadian institutional portfolios?

BY MARK KRITZMAN & SÉBASTIEN PAGE

TAX-exempt Canadian investors have long been subject to the "Canadian Foreign Content Restriction Rules," which limited investment outside of Canada to 30% of assets, up from 20% a few years ago. The motivation for this restriction was to promote investment in Canadian companies and, therefore, growth in the Canadian economy. We do not know to what extent this policy succeeded in fostering economic growth in Canada, but we do know the extent to which its abolition helps Canadian investors.

It is worth noting, though, that not all tax-exempt Canadian investors abided by this rule—at least in spirit. Many institutions used derivatives to gain access to foreign assets far beyond the 30% limitation. The improvements that we document pertain to those investors who chose not to circumvent the 30% rule with derivatives.

We approach the problem incrementally. First we calculate the optimal portfolio weights from a mean-variance perspective for a Canadian investor who wishes to diversify across global stocks and bonds, subject to the 30% rule. Then we recalculate the optimal weights based on the same assumptions but without the foreign content restriction. Next we consider an investor who wishes to invest in the global equity and bond markets, and simultaneously to hedge currency risk. Again, we compare the optimal results with and without the foreign content restriction. Finally, we introduce liabilities to the analysis as a fixed short position and evaluate the impact of the foreign content restrictions net of liabilities.

Methodology and Data

The theoretical foundation of our analysis is based on portfolio theory, which was introduced in 1952 by Harry Markowitz. His innovation, which is sometimes called

Global Betas and Equilibrium Returns TABLE 1

	Global Beta	Equilibrium Return
Canadian Equity	0.99	7.45%
Foreign Equity	1.42	9.16%
Canadian Fixed Income	0.08	3.82%
Foreign Fixed Income	0.38	5.00%
Cash	0.00	3.50%

Standard Deviations and Correlations TABLE 2

		Correlations			
	Standard Deviation	Canadian Equity	Foreign Equity	Canadian Fixed Income	Foreign Fixed Income
Canadian Equity	15.30%				
Foreign Equity	12.95%	68%			
Canadian Fixed Income	5.17%	28%	4%		
Foreign Fixed Income	7.76%	-25%	4%	10%	
Cash	0.62%	13%	1%	42%	-9%

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mean-variance analysis, requires estimates of expected returns, standard deviations, and correlations. With this information, we combine assets optimally so that for a particular level of expected return the optimally combined assets offer the lowest possible level of expected risk, usually measured as standard deviation or its squared value, variance. A continuum of these portfolios plotted in dimensions of expected return and standard deviation is called the efficient frontier. We identify portfolios along the efficient frontier by maximizing a measure of investor satisfaction defined by the following quantity:

Expected Return - Risk Aversion x Standard Deviation^2

In order to proceed we must estimate each asset class's expected return. We begin with the assumption that markets, on balance, are fairly priced, therefore expected returns represent fair compensation for the degree of risk each asset class contributes to a broad market portfolio. These returns are called equilibrium returns and we estimate them by first calculating the beta of each asset class with respect to the market portfolio of stocks and bonds, based on historical standard deviations and correlations from January 1992 through December 2004. We use a 60% allocation to MSCI World Equity Index and a 40% allocation to the Shearson/Lehman Global Bond Index as a proxy for the market portfolio. We assume its expected return equals 7.5% and that the riskless return is 3.5%. We estimate the expected return of each asset class as the riskless return plus its beta times the excess return of the market portfolio.

Our assumptions for the market's expected return and the riskless return are arbitrary, but it shouldn't matter much. If we choose different values, we will simply scale up or down each asset's return proportionately. The composition of the efficient frontier will not change, although portfolios associated with different degrees of risk aversion might vary. The resulting global betas and equilibrium returns are presented in Table 1.

We are also required to estimate the asset classes' standard deviations and correlations between each pair of asset classes. Table 2 shows these standard deviations and correlations.

Optimal allocations with and without foreign content restriction rules — TABLE 3

	PIAC Composite Mix	Optimal With 30% Restriction	Optimal Without 30% Restriction
Canadian Equity	27.38%	30.66%	0.69%
Foreign Equity	29.50%	30.00%	55.70%
Canadian Fixed Income	39.74%	7.61%	6.05%
Foreign Fixed Income	0.50%	0.00%	37.56%
Cash	2.88%	31.73%	0.00%
Return	6.39%	6.43%	7.27%
Risk	7.97%	7.97%	7.97%

Global Stocks and Bonds Unhedged

Based on these assumptions for expected returns, standard deviations, and correlations, we have derived two optimal mean-variance allocations that have the same risk as the average Canadian pension plan as of December 31, 2003, based on information provided by the Pension Investment Association of Canada (PIAC). The first allocation limits foreign investment to 30% of the fund's value, while the second allocation is unconstrained. The first thing to notice is that a 67% allocation to Canada (the PIAC average) is sub-optimal. Indeed, the optimal allocation to Canada is 7%, not 67%. It is also interesting to note, that if Canadians insist on allocating funds domestically, without taking into account liabilities, they should invest in Canadian cash rather than bonds. By removing the constraint, we substantially improve the return of the portfolio. For the same level of risk we improve the return from 6.43% to 7.27% (Table 3).

Global Stocks and Bonds Hedged

Next, we evaluate the impact of currency hedging on the constrained and unconstrained allocations. We estimate expected returns, standard deviations, and correlations of each currency forward contract from a Canadian dollar perspective. We assume that uncovered interest arbitrage holds, which means that spot rates are expected to decrease or increase to the forward discounts or premiums on average. It follows from this assumption that forward contracts have expected returns equal to 0.00%. Standard deviations for currencies are shown in Table 4. Correlations for assets and currencies are shown in Table 5.

We simultaneously optimize assets and currencies rather than solving first for the optimal asset portfolio and secondarily determining the optimal exposure to currencies. Again, we derive two optimal mean-variance allocations. The first allocation is constrained to hold no more than 30% in foreign assets, while the second allocation is unconstrained. Table 5 shows that Canadian assets tend to have a negative correlation with currencies. Therefore, Canadian investors benefit, on balance, from the diversification of currencies. The optimal allocation with foreign content restriction hedges only three currencies: the AUD, the JPY, and the NZD. These three currencies have the highest correlation with domestic assets.

Why is it that Canadian assets are negatively correlated with currencies? It might help to consider some other relationships. For example, European assets are highly correlated with currency returns, while Australian assets, like Canadian assets, are negatively correlated. We also find that Australia and Canada's financial markets are highly synchronized. From a U.S. dollar perspective, their equity markets are 70% correlated and their currencies are 76% correlated. These correlations are quite remarkable, given the geographic distance and lack of trade between these two countries. There must be a common factor that distinguishes Australia and Canada from other developed countries, and it probably

Volatilities of Currencies — TABLE 4

AUD	8.04%	JPY	12.87%
CHF	11.79%	NOK	10.22%
DKK	10.19%	NZD	8.63%
EUR	10.51%	SEK	10.70%
GBP	9.82%	SGD	6.67%
HKD	5.82%	USD	5.83%

Indices used — TABLE 6

Canadian Equity	S&P/TSX composite total return index
Non-Canadian Equity	MSCI x Canada total return index
Canadian Bonds	Scotia Capital Overall Universe total return index
Foreign Bonds	CGBI WGBI World x Canada all maturities total return index
Cash	JP Morgan Canada Cash 3M total return index
Liabilities	Blend of 55% Scotia Capital Long; 45% Scotia RRB Universe

Correlations of assets and currencies — TABLE 5

	(a)	(b)	(c)	(d)	(e)	AUD	CHF	DKK	EUR	GBP	HKD	JPY	NOK	NZD	SEK	SGD
Canadian Equity (a)																
Foreign Equity (b)	0.68															
Canadian Fixed Income (c)	0.28	0.04														
Foreign Fixed Income (d)	-0.25	0.04	0.10													
Cash (e)	0.13	0.01	0.42	-0.09												
AUD	0.21	0.33	-0.04	0.20	-0.13											
CHF	-0.30	-0.07	-0.07	0.81	-0.17	0.13										
DKK	-0.29	-0.06	-0.08	0.80	-0.13	0.18	0.94									
EUR	-0.27	-0.03	-0.07	0.81	-0.16	0.19	0.95	0.98								
GBP	-0.22	0.04	-0.06	0.64	-0.10	0.18	0.67	0.69	0.70							
HKD	-0.36	0.04	-0.26	0.58	-0.10	0.11	0.42	0.38	0.40	0.46						
JPY	-0.01	0.22	-0.09	0.69	-0.08	0.19	0.52	0.47	0.48	0.35	0.39					
NOK	-0.17	0.00	-0.03	0.69	-0.15	0.15	0.82	0.86	0.86	0.62	0.33	0.38				
NZD	0.07	0.26	-0.06	0.47	-0.13	0.69	0.41	0.44	0.45	0.33	0.25	0.38	0.37			
SEK	-0.07	0.08	0.03	0.57	-0.13	0.18	0.74	0.78	0.76	0.60	0.21	0.29	0.76	0.38		
SGD	-0.10	0.21	-0.17	0.65	-0.07	0.28	0.52	0.51	0.53	0.47	0.66	0.61	0.50	0.47	0.37	
USD	-0.36	0.04	-0.27	0.57	-0.10	0.10	0.40	0.36	0.38	0.45	1.00	0.38	0.32	0.24	0.19	0.65

moves inversely with currencies, in light of the negative correlation between currencies and the equity markets of Australia and Canada.

The likely candidate, in our view, is commodities. Both the Australian and Canadian economies are largely driven by agriculture and mining. Commodities typically perform well during periods of rising inflation, and they do poorly when inflation falls. The opposite is true for currencies. Rising inflation depreciates currencies, which leads them to move in the opposite direction of commodities and by extension, in the opposite direction of the Australian

Correlations of assets and liabilities TABLE 7

	Liabilities
Canadian Equity	29%
Foreign Equity	5%
Canadian Fixed Income	89%
Foreign Fixed Income	8%
Cash	23%

and Canadian domestic assets.

When we remove the foreign content restriction, we find that the optimal exposure to Canadian assets decreases to 0%, which raises expected return from 6.41% to 7.52% and lowers risk from 7.83% to 7.67%. This portfolio compares favourably not only to the foreign content-

Optimal unhedged asset-liability allocations with and without foreign content restriction rules TABLE 8

	PIAC Composite Mix	Optimal With 30% Restriction	Optimal Without 30% Restriction
Canadian Equity	27.38%	27.29%	5.18%
Foreign Equity	29.50%	30.00%	47.07%
Canadian Fixed Income	39.74%	42.71%	38.03%
Foreign Fixed Income	0.50%	0.00%	9.71%
Cash	2.88%	0.00%	0.00%
Liabilities	-100%	-100%	-100%
Surplus:			
Return	**2.44%**	**2.47%**	**2.69%**
Risk	**8.16%**	**8.16%**	**8.16%**

restricted portfolio but to the unrestricted, unhedged portfolio as well. Recall that its expected return and risk equal 7.27% and 7.93%, respectively.

Optimal asset-liability allocations and currency hedge ratios with and without foreign content restriction rules TABLE 9

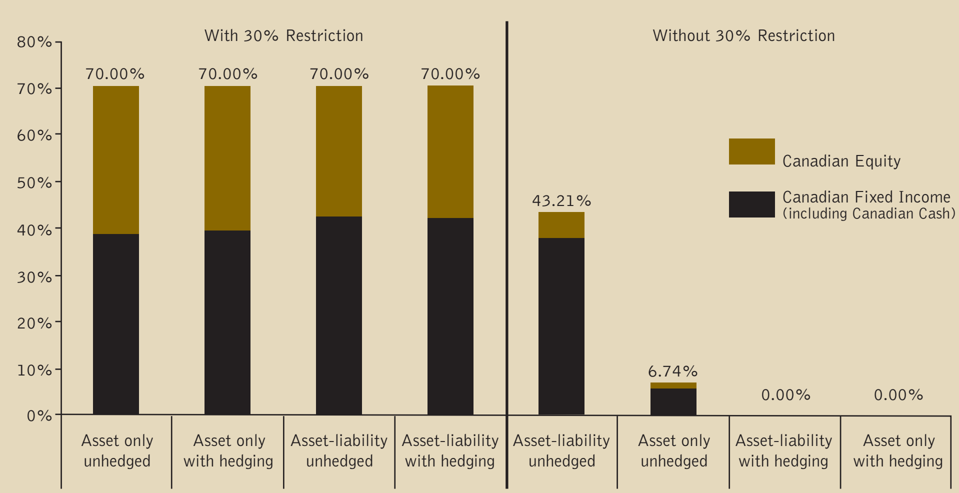
	PIAC Composite Mix	Optimal With 30% Restriction	Optimal Without 30% Restriction
Canadian Equity	27.38%	27.59%	0.00%
Foreign Equity	29.50%	30.00%	45.95%
Canadian Fixed Income	39.74%	42.41%	0.00%
Foreign Fixed Income	0.50%	0.00%	54.05%
Cash	2.88%	0.00%	0.00%
Liabilities	-100%	-100%	-100%
Optimal Hedge Ratios			
AUD	na	-100%	-100%
CHF	na	0%	0%
DKK	na	0%	-47%
EUR	na	0%	-100%
GBP	na	0%	-30%
HKD	na	0%	0%
JPY	na	-100%	-100%
NOK	na	0%	-100%
NZD	na	-100%	-100%
SEK	na	0%	-100%
SGD	na	-100%	-100%
USD	na	0%	-97%
Surplus:			
Return	2.44%	2.48%	2.97%
Risk	8.16%	8.12%	7.93%

When domestic assets are removed from the portfolio, the diversification benefits of currency exposure largely disappear; hence the optimal strategy calls for hedging most of the embedded currency exposure of foreign assets.

Global Stocks and Bonds Net of Liabilities

In our final analysis, we introduce liabilities to the analysis. We assume that the plan is fully funded; hence we proxy liabilities as a -100% fixed exposure to a long-term Canadian bond. Table 7 shows the correlations between assets and liabilities. Table 8 shows that the optimal exposure to Canadian assets increases to 43% when Canadian liabilities are included in the analysis. Table 9 shows that this result does not hold when Canadian investors are allowed to hedge currency risk. When currency hedging is allowed, the optimal allocation to Canadian content reverts back to 0%. Also, a comparison of Tables 3 and 9 shows that with liabilities included in the analysis, Canadian investors should invest in long-term fixed income securities as opposed to cash. The expected return and risk of these portfolios are expressed net of liabilities, so they are not comparable to the expected return and risk estimates reported in the preceding analyses. Nonetheless, the optimal allocations are comparable, since we assume the same level of risk as the PIAC benchmark in both analyses.

Optimal exposure to Canadian assets under different scenarios EXHIBIT 1



Summary

Our analysis reveals that Canadian investors are much better off without foreign content restrictions. Moreover, by increasing exposure to foreign assets Canadians do not benefit as much from the diversification currencies introduce to domestic assets; hence they should hedge most of the currency risk embedded in foreign asset exposure. Finally, the appeal of foreign asset exposure is mitigated somewhat when liabilities are included in the analysis, but a 70% exposure to Canadian assets is substantially suboptimal even in the presence of liabilities. Moreover, when currency hedging is allowed in the asset-liability optimization, the optimal allocation to Canadian assets decreases back to 0%. Exhibit 1 shows the optimal exposure to Canadian assets under these different scenarios.

Our analysis also raises important questions about constraints faced by other investors. Many public pension funds, for example, are required to invest a fraction of their funds locally. Participants in U. S. 401(k) plans are encouraged to allocate part of their savings to their companies' stock. And many investors constrain allocations in accordance with various social criteria. Policy-makers and investors, at the very least, should estimate the cost of these constraints and justify them in light of these costs. ■

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Endnotes

1. Many of the insights reported in this analysis were first reported in Economics and Portfolio Strategy. See, for example: Kritzman M. "Currency Hedging Around the World," Economics and Portfolio Strategy, January 15, 2005; and Kritzman M. "Canada Unbound," Economics and Portfolio Strategy, April 15, 2005.