HOW MUCH INTERNATIONAL EXPOSURE IS ADVANTAGEOUS IN A DOMESTIC PORTFOLIO FROM A CANADIAN PERSPECTIVE?

By

Jeffry Ghilardi
B.A. (Economics), University of Lima

&

John S. Currie
P. Eng. Dal-Tech University

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Examining Committee:

Peter Klein
Senior Supervisor
Endowed University Professor

John Heaney
Supervisor
Associate Professor

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Abstract

The concept of asset allocation is not a new idea: *"Let every man divide his money into three parts, and invest one third in land, a third in business, and a third let him keep in reserve"* is a Talmut quote and is approximately 2000 years old. Today asset allocation is more than simply determining an appropriate mix of cash, bonds and equities. In a wave of globalization that has overtaken the world in the last decade; many investors are now adding international exposure to their domestic portfolios. The question naturally arises: How much International exposure is advantageous in a Domestic Portfolio? Extensive academic and industry research has been completed on this question. While most, if not all papers have tackled this problem from a U.S. domestic perspective, the focus in this paper is on how much international exposure is advantageous for a Canadian domestic investor. Drawing upon the work of Roger G. Clarke and R. Matthew Tullis - How Much International Exposure is Advantageous in a (U.S.) Domestic Portfolio?, we adopt their set-up and variable definitions to develop optimal investment policy for varying levels of investor risk aversion. We found that using either historical data or reasonable forward looking assumptions about risk and return, Canadian investors have a good opportunity to increase their returns, while minimizing the overall risk of the portfolio.

Dedication

To our respective families for all their love and support through the years and especially during the completion of this program.

Acknowledgements

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1 Introduction

Beginning a few decades ago, U.S. institutions began allocating part of their pension plans to international equities, largely due to European money mangers looking to diversify and build upon their mature domestic client base. These money managers supported their arguments for international diversification with convincing academic credentials. Given that international markets' correlations were low throughout the 1980's and subsequently continued throughout the 1990's, diversification into international markets could reduce the overall risk level and also improve return, citing Markowitz's Modern Portfolio Theory (MPT).

In the early 1980's, the major problem confronting international investing at the time was to overcome the U.S. institutions' scepticism of any marketplace other than their own: unfamiliar stocks, irregular settlement practices, over regulation, radically different accounting methods and domination by local brokers and investors. That *"fear factor"* has largely disappeared in the wave of globalization that has overtaken the world in the last decade. The rise of multinational firms that derive a significant component of their revenue from economies other than its own has been aided by the relaxation of trade and political regulation. Some of the more prominent international companies have infiltrated the U.S. market so successfully that the majority of U.S. consumers may believe them to be U.S. in origin - Michelin Tire and Nestle are two examples that come to mind.

Professional money managers began to reflect the changing global landscape years ago, when analysts began to cover stocks on a global sector basis rather than splitting up their coverage by geography or market. As the world's major economies became steadily more intertwined, and following the lead of U.S. institutions, many U.S. investors in the 1990's have added international exposure to their domestic portfolios. The question naturally arises: **How much International exposure is advantageous in a Domestic Portfolio?** The answer to this question depends on part on how the Investor defines advantageous. In this analysis, we frame the answer in the context of the impact that international asset exposure has on the portfolio's expected risk and return.

Drawing upon the work of Tullis and Clarke[1] – How Much International Exposure is Advantageous in a Domestic Portfolio. We replicate their analysis, and test their key expected returns and risk assumptions using a more expanded data range from January 1980 to November 2006. Tullis and Clarke, use a rather small data range from 1990 – 1997 which was an extended market rally leading up to the height of the market in the 2000 tech-bubble. We will then shift the entire analysis and discussion into the framework of a Canadian Domestic Investor (CDI) – again asking the question of: **How much international exposure is advantageous in a domestic portfolio from a Canadian perspective?**

This paper is organized as follows: In Section 3, we replicate the set-up and optimal allocations to international assets, domestic assets and currency exposures as

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[1] The Journal of Portfolio Management, winter of 1999.

outlined by Tullis and Clarke. We expand the scope and data collection period to include EAFE, the S&P500, and the TSX, ranging from 1980 to 2005. We also expanded and updated the market correlation data, which is important to note as correlations have been steadily increasing over the past several years due to forces of globalization. We then compare and contrast the expected return and risk assumptions used by Tullis and Clarke with historical data collected over the expanded data range.

Section 4 continues with the framework developed by Tullis and Clarke, but now we are taking a Canadian perspective in terms of how much international investing is appropriate. Using the TSX as our proxy for the domestic equity market, and the S&P 500 to the proxy on the international market, we develop optimal policy for varying levels of risk aversion.

While the Canadian CPI basket is closely correlated with the U.S. CPI basket, there are striking differences in industry composition between the TSX and the S&P 500. This is problematic from the perspective of aligning one's investment portfolio with current consumption and future liabilities. To address this, we then deflate both the TSX and S&P 500 returns to develop and analyze the optimal policy using real returns. We then describe some other influences that domestic investors should take under consideration before finalizing their optimal policy and asset allocation.

Finally, Section 5 contains our summary and conclusions.

2 Literature Review

An old adage told us to *"Not put all of our eggs in one basket"*; the benefits of diversification has shown more powerful than this adage suggests. Brandhorst (2002)[2] pointed out in his research that despite rising correlations among developed markets and despite several years of underperformance relative to the U.S. equity market, international diversification, in the long-term, has delivered on the risk-reduction promises of diversification. His study analyzed data from 1970 to 2001 and compared a portfolio of 100% U.S. equity and a portfolio 80/20 U.S./Intl Allocation. Brandhorst concluded that while correlations among developed market returns have increased in the past several years, these levels are more associated with recent negative market environments and the technology/telecom/internet bubble and that adding non-U.S. assets to a U.S. portfolio improves the risk/return trade-off of the portfolio across different levels of correlation, the lower the correlation between assets, the bigger the improvement in the portfolio Sharpe ratio.

In his study, Brandhorst also divided the return associated with markets into two pieces: fundamental cash-flow growth in countries and changes in the way markets price underlying fundamental cash-flow (changes in P/E ratios); what he found is that while changes in P/E ratios across markets have become more correlated in recent years , the same cannot be said for the correlation between cash-flow growth rates across countries,

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[2] State Street Global Advisors – SSGA, July 15, 2002

suggesting that the recent increase in the correlation of returns is a more temporary reflection of changing views of global risk rather than a higher level of economic integration.

Sarkar and Li (2002)[3] demonstrated how international diversification benefited U.S. investors. The two researchers analyzed the monthly total return on stock indexes from 1976 to 1999 for the G7 group of developed countries and eight emerging market countries (four Latin American markets and four Asian markets). In their study they included scenarios with investment constraints, in this case short selling in emerging and developed markets. What they found is that international diversification in emerging markets remained beneficial to U.S. investors even when a ban on short selling was in place; U.S. investors saw an increase in expected returns and a reduction in risk on their portfolios. In contrast, the benefits of investing in developed country stocks disappeared when short selling was prohibited.

The researchers also compared their findings for the first and second halves of the sample period to determine whether the integration of global markets during the 90's might have reduced the benefits of international investing; they found that while market integration decreased the benefits of international investing, it did not eliminate them.

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[3] Current Issues in Economic and Finance, Volume 8 Number 3, March 2002

Gibson (2004)[4] examined the impact of internationally diversifying a domestic U.S. bond portfolio and common stock portfolio. In the first case, he compared the performance over a rolling 20-year period ending 1992 through 1997 of a 100% U.S. corporate bond portfolio versus portfolios with 10%, 20% and 30% international bond allocations; he found that volatility decreased and return increased as the international bond allocation grew from 10% to 30%. On the second case, Gibson examined the same type of impact for a domestic common stock portfolio over a rolling 20-year period ending 1989 through 1997. In all but one 20-year period, the international diversification improved the portfolio returns as the allocation grew from 0% to 30%.

Gibson (2004)[5] analyzed multiple-asset-class dynamics by studying 15 equity portfolios over the period of 1972 through 1997. Of these 15 portfolios, four were single-asset-class portfolios: S&P 500, EAFE Index (Europe, Australia and Far East), NAREIT Index (National Association of Real Estate Investment Trust), and the GSCI (Goldman Sachs Commodity Index futures contract); six portfolios represented every possible two-asset-class equally weighted portfolio that investors can construct using the four single-asset classes; four portfolios represented every possible three-asset-class equally weighted portfolio that investors can construct using the four single-asset classes; and the last portfolio represented an equally weighted combination of the four single-asset classes.

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[4] Journal of Financial Planning; July 2004

[5] Journal of Financial Planning, July 2004

When comparing the results he found that single-asset class portfolios generated the three lowest returns whereas the higher returns where achieved by multiple-asset class portfolios. In comparing the volatility levels of the portfolios, he found that four out of the five most volatile portfolios were single-asset-class portfolios while the multiple-asset class portfolios all demonstrated lower volatility. Specifically, he found that the four-asset-class portfolio has a compound rate of return 1.2% higher than the average compound returns of its components; it also had 47% less volatility than the average volatility levels of its components, and its Sharpe ratio had generated over twice as much risk-adjusted return as the average of its components. Therefore, as investors move towards broader diversification, rates of returns increase, volatility levels decrease, and the Sharpe ratio of their portfolios improve.

Should domestic investors also look at Emerging Markets as part of their international diversification? The interest in emerging markets has been growing in the financial community over the past few decades. A big portion of research in this field has highlighted the benefits of international portfolio diversification into emerging markets. The reality is that emerging market stocks make up a small share of investors' equity holdings. Data on U.S. holdings of international equities show that the emerging market share in U.S. investors' portfolios is close to 1%.

Fernandes (2005)[6] examined emerging market equity data from 1988 to 2001 to study the level of dis-aggregation advisable in emerging market investment from a global

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[6] The Journal of Portfolio Management; winter 2005

perspective. What he found is that in the post-liberalization period there are few benefits of including an aggregate fund of emerging markets in a portfolio; his results suggests that aggregate emerging market investment did not provide significant incremental diversification benefits; the aggregate index of emerging market equities (EMF) no longer offers investors performance beyond that achievable using only developed market securities.

Evidence on the increased integration of emerging markets shows how this has affected portfolios in different time periods. Emerging markets are today much more integrated with world stock markets and tend to behave like other developed markets; the premium they enjoyed in the 1980s has been eroded, and in the post-integration period, passive indexing strategies are no longer enough to create value.

Returns on emerging markets in the 1990s were very different from those in the past. Until the early 1990s, emerging markets were quite segmented, and seemed to provide substantial benefits. After the advent of country funds, cross-listed securities, and other forms of financial liberalization, these markets became more integrated with world capital markets.

What Fernandes' study suggests is that after liberalization and higher integration occurred in emerging markets, their role in global portfolios has changed. While investing in emerging market equities can still be very valuable to global investors, buying an index of all emerging markets countries is not enough. This type of investment

in emerging markets may still provide return potential, but investors will have to be more selective and country and stock selection strategies are imperative if a global portfolio manager wants to achieve enhanced performance.

3 Portfolio Risk and Return

In this section, we replicate the relevant set-up and testing framework as devised by Tullis and Clarke[7] – How Much International Exposure is Advantageous in a Domestic Portfolio? – We use their optimal weight and variance formulae to obtain allocations to international assets, domestic assets and currency exposures. We expand the scope and data collection period to include EAFE, the S&P 500, Emerging Markets, and the TSX, ranging from 1980 to 2005. We also expanded and updated the market correlation data, which is very important, as correlations have been steadily increasing over the past several years due to forces of globalization. We then comment on our findings and contrast the historical data with the expected return and risk assumptions used by Tullis and Clarke.

The addition of international asset exposure affects both the return and risk of the portfolio. The **return** of a simple portfolio, including both domestic and international asset positions, can be written as:

$$R = W_d R_d + w_i (R_i + f) + H(R_c - f) \tag{1}$$

Where:

W_d = portfolio proportion in domestic assets;
R_d = return on domestic assets;
w_i = portfolio proportion in international assets;
R_i = local return on international assets;
f = currency forward premium or discount;

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[7] The Journal of Portfolio Management, winter of 1999

H   = proportion of foreign currency exposure in the portfolio; and

R_c = currency return

The **variance** of the portfolio return can be written as:

$$\sigma^2_R = w_d^2\sigma_d^2 + w_i^2\sigma_i^2 + H^2\sigma_c^2 + 2\,[w_i\,HC_{ic} + w_d\,w_i C_{di} + w_d\,HC_{dc}] \tag{2}$$

Where:

w   = the weights;

σ_d = variance of domestic asset returns;

σ_i = variance of local international asset returns;

σ_c = variance of currency returns;

C_{ic} = Covariance between local international asset and currency returns;

C_{di} = Covariance between domestic and local international asset returns; and

C_{dc} = Covariance between domestic asset and currency returns.

The framework for analyzing how much international asset exposure is advantageous can be structured in two ways. The first is to consider the impact on both risk and return of adding international asset exposure. The second considers only the impact on risk. Within this framework, the investor can either jointly optimize the asset and currency positions, or allocate the portfolio given a currency policy of maintaining currency exposure at a predetermined proportion of international asset exposure. The two extremes of this policy would be to fully hedge or fully unhedge currency position.

To illustrate the effects of international assets we begin with a simple portfolio allocated to domestic and international assets. If the investor chooses the proportions of asset and currency exposure in order to jointly optimize the portfolio's risk-adjusted expected return:

$$E(R) - \lambda\sigma_R^2$$

The optimal allocations to international assets, domestic assets, and currency exposures are:

$$w_i = \frac{E(R_i) + f - E(R_d) - [E(R_c) - f]}{2\lambda\left\{\sigma_d^2 + \sigma_i^2 - 2C_{di} - \left[\frac{(C_{dc} - C_{ic})^2}{\sigma_c^2}\right]\right\}} \left(\frac{(C_{ic} - C_{dc})}{\sigma_c^2}\right) \tag{3}$$

$$- 2\lambda \frac{\left(C_{di} - \sigma_d^2 - (C_{ic} - C_{dc})\left(\frac{C_{dc}}{\sigma_c^2}\right)\right)}{2\lambda\left\{\sigma_d^2 + \sigma_i^2 - 2C_{di} - \left[\frac{(C_{dc} - C_{ic})^2}{\sigma_c^2}\right]\right\}}$$

$$w_d = 1 - w_i \tag{4}$$

$$H = \frac{E(R_c) - f - 2\lambda(w_d C_{dc} + w_i C_{ic})}{2\lambda \sigma_c^2} \tag{5}$$

Equation (3) clearly demonstrates that the optimal allocation to international assets is a complex expression. The trade-off between expected return and risk is determined by the investors risk aversion (λ). Investors with extreme risk aversion will have large values of λ. In our extreme case, we use $\lambda = 1000$. Investors with low aversion to risk will have small values of λ.

If the investor wants only to **minimize the variance** of the portfolio return without regard to the impact on return; Equations (3) and (4) reduce to:

$$w_i = \frac{\sigma_d^2 - C_{di} + \left[\dfrac{(C_{ic} - C_{dc})\, C_{dc}}{\sigma_c^2} \right]}{\sigma_d^2 + \sigma_i^2 - 2C_{di} - \left[\dfrac{(C_{dc} - C_{ic})^2}{\sigma_c^2} \right]} \tag{6}$$

$$H = \frac{-(w_d C_{dc} + w_i C_{ic})}{\sigma_c^2} \tag{7}$$

In the case of minimizing variance, expected returns disappear in Equations (6) and (7) leaving only risk-related terms. The minimum variance perspective is often an interesting starting point for a number of reasons: (1) measures of risk are usually more stable over time, (2) measures of risk are easier to estimate than expected returns, and (3) the minimum-variance allocation can be looked at as a core allocation to international equity given that any deviance from the minimum-variance portfolio would also add additional risk.

When forming optimal allocations using a pre-determined currency strategy, the optimal asset allocation when currency is fully hedged is:

$$w_i = \frac{E(R_i) + f - E(R_d) - 2\lambda(C_{di} - \sigma_d^2)}{-2\lambda(\sigma_d^2 + \sigma_i^2 - 2C_{di})} \tag{8}$$

In Equation (8) above, the Currency return is eliminated because the currency position is fully hedge and the forward premium captures the cost of the hedge. When currency exposure is unhedged, the optimal international weight becomes:

$$w_i \quad = \frac{E(R_i) + E(R_c) - E(R_d) - 2\lambda(C_{di} + C_{dc} - \sigma_d^2)}{2\lambda[\sigma_d^2 + \sigma_i^2 + \sigma_c^2 - 2(C_{di} + C_{dc} + C_{ic})]} \quad (9)$$

In Equation (9) above, when currency exposure in unhedged, the expected currency return becomes important while the forward premium disappears. Now let's look at the minimum variance solutions to the two extreme cases:

The minimum variance allocation to international assets when **currency exposure is fully hedged** is:

$$w_i \quad = \frac{\sigma_d^2 - C_{di}}{\sigma_d^2 + \sigma_i^2 - 2C_{di}} \quad (10)$$

The minimum variance allocation to international assets when **currency exposure is unhedged** is:

$$w_i \quad = \frac{\sigma_d^2 - C_{di} - C_{dc}}{\sigma_d^2 + \sigma_i^2 + \sigma_c^2 - 2(C_{di} + C_{dc} + C_{ic})} \quad (11)$$

Historical Market Experience

In order to use the allocation framework outlined above, the investor must supply estimates of expected returns and risk. Historical data may provide insights as to selecting reasonable forward looking estimates; however, it is important to look at long term averages over a number of decades. Tullis and Clarke analyzed a number of risk and return parameters from data ranging from 1990 – 1997. Over this period; however,

the return on the U.S. equity market has far outstripped the foreign equity markets as captured by the EAFE index. Not only did U.S. stocks outperform European stocks in the 1990s, but Japanese stocks collapsed, pulling down the EAFE average return with it. The simple lesson here is that for international investors, past performance is almost no guide to future performance. What was true for stock markets in different regions of the world in one decade was inevitably untrue in the next decade as Table 1 illustrates.

Table 1: Annual Total Real Stock Market Returns: 1920 - 1990

Decade	U.S.	Europe	EAFE
1920s	16.0%	11.0%	7.8%
1930s	1.4%	3.9%	4.6%
1940s	3.2%	-10.5%	-9.6%
1950s	16.7%	18.5%	18.2%
1960s	5.1%	2.1%	2.5%
1970s	-1.4%	1.1%	2.5%
1980s	11.8%	12.7%	16.8%
1990s	14.8%	11.2%	4.3%

Source: Bloomberg, Elaboration: Ghilardi & Currie

Restricting their analysis to equities, Tullis and Clarke selected the S&P 500 as the proxy for U.S. equities, and the Morgan Stanley Europe, Australia, and Far East (EAFE) index as a broad and commonly used proxy for international equities. Later, we will make the TSX the domestic proxy for a Canadian investor with the S&P 500 being the proxy for international equities.

Table 2 captures the historical return experience of the S&P 500, EAFE, and the TSX for the extended data range from 1981 - 2005.

Table 2: Annual Returns (1981 - 2005)
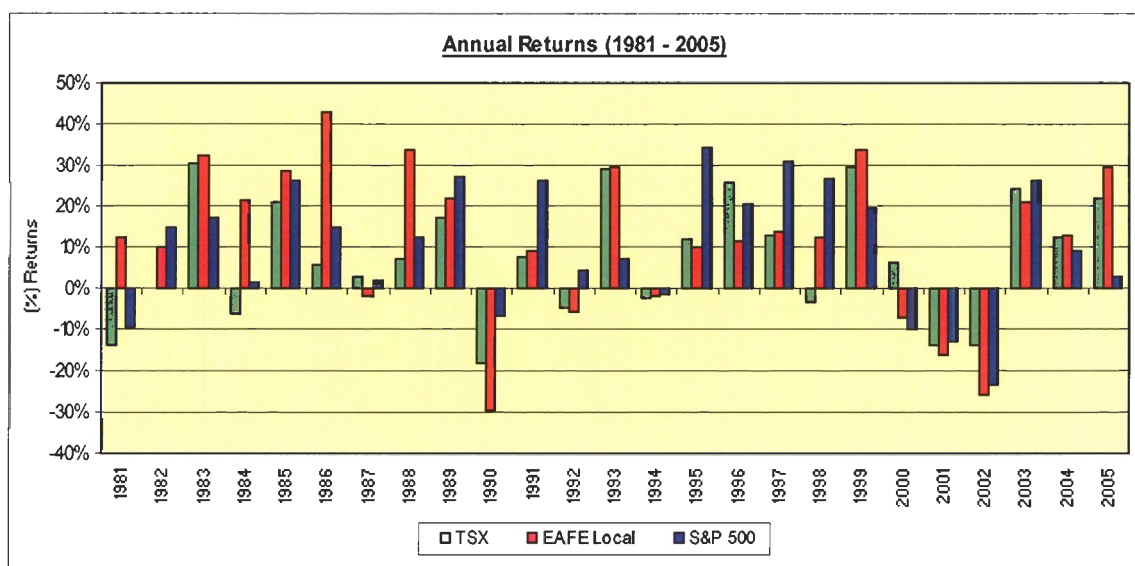
Source: Bloomberg, Elaboration: Ghilardi & Currie

A number of forces are at work in mapping these relative returns. The impact of currency is a major one. As we can see, Table 3 captures the historical experience of the EAFE (local) total return index and overlay's the FX contribution from a U.S. investor's perspective. In this case we define the following formula:

$$\text{Currency Contribution} \quad = \quad \text{MSCI EAFE (U.S.)} \quad - \quad \text{MSCI EAFE (Local)}$$

Where:

MSCI EAFE (U.S.)   = MSCI Europe, Asia and Far East, Equity Index Total Return expressed in U.S.

MSCI EAFE (Local) = MSCI Europe, Asia and Far East, Equity Index Total Return expressed in local currency.

Table 3: Currency Contribution (1981 - 2005)
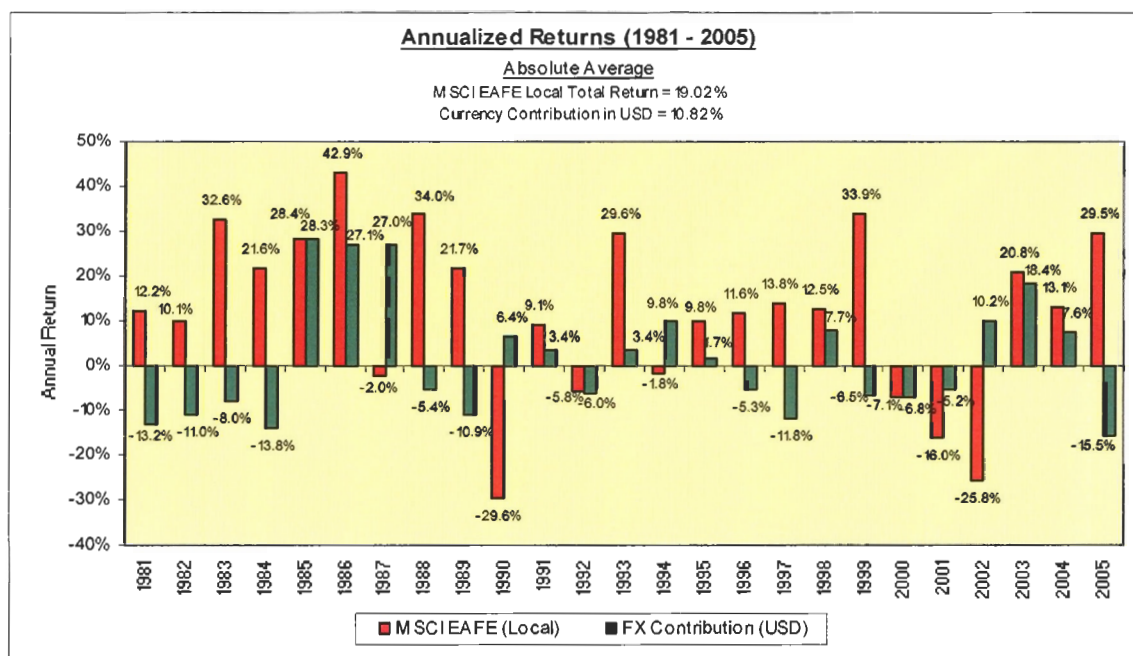
Source: Bloomberg, Elaboration: Ghilardi & Currie

To capture the historical experience of the risk of the respective equity indexes, the standard deviations are calculated using data ranging from 1980 to 2005. The underlying equity market volatility during this period for the S&P 500, EAFE Local, and the TSX, has averaged 15.50% and 18.85 % and 14.85% respectively. As with most markets, the historical data over the period suggests that there is usually more stability in the relative risk between markets than there is between the relative returns.

It is important to note that adding currency exposure increases the volatility of the underlying international equity markets. Some have suggested that currency exposure provides a natural diversification benefit in an international portfolio. Also of interest are the correlations between domestic and international equity market returns.

Table 4 shows the positive correlation between equity markets; this correlation fluctuated around 0.50 throughout the 1980's and much of the 1990's. It is interesting to see how these correlations have been rising during the last years.

Table 4: 10-year Monthly Correlations: 1990.01 - 2006.11
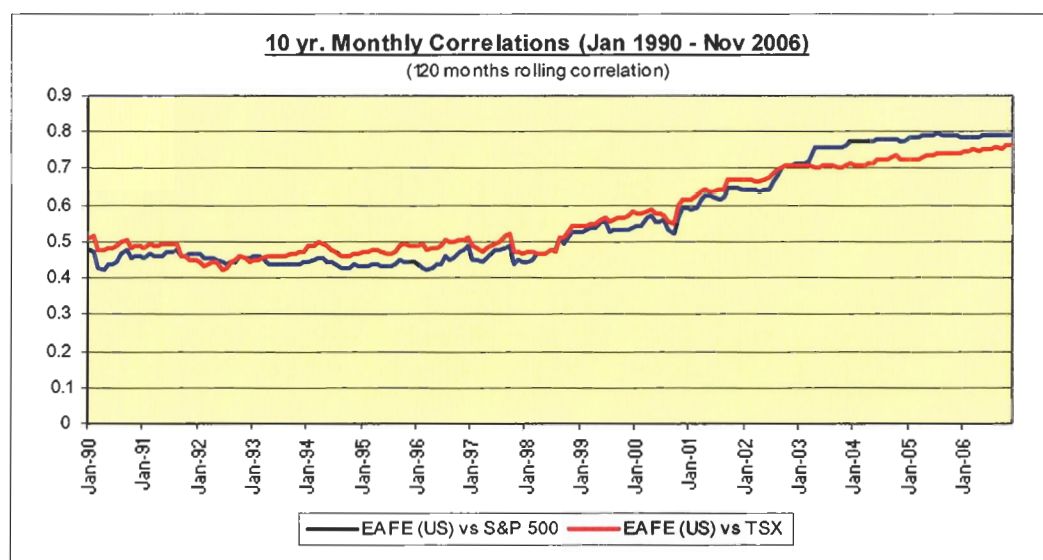
Source: Bloomberg, Elaboration: Ghilardi & Currie

One explanation of heightened correlations in the last several years may be the common effect of the valuation bubble across the global telecommunications and tech industries at the height of the market in 2000. The culmination of the late 1990's rally — and conversely, the extreme bear markets that followed for 3 years, might have contributed to markets behaving in similar ways. Greater convergence in terms of monetary policy by the world's central banks since then is another. It is ironic to note that, just when an investor prudently diversified into international equity markets expecting the forces of diversification to work to his benefit, the bear market of 2000 -

2003 has provided little or no respite as global markets all fell in unfortunate synchronization.

Long-run Risk/Return trade-offs

Investors are often enticed away from the minimum-variance allocation by expectations of increased return from one equity market or another, or because of expected views on currency movements. To illustrate how an investor might be enticed away, Tullis and Clarke assumed that because of the higher perceived risk of foreign equity, the expected return on foreign equity is 2 percentage points more than that for domestic equity. They further assumed that international markets would have 20% greater volatility than the domestic market.

Table 5 below compares Tullis and Clarke estimates to historic data obtained from January 1980 to December 2005. While their assumptions surrounding a 2% increase in International return and 20% greater volatility (σ) appear to be sound in comparison to historic data; the historic standard deviations are considerably higher – by approximately 40+%. This can be explained by both the longer time frame, and the added volatility introduced by both the tech bubble phenomena and the 3-year bear market that followed.

Table 5: Tullis and Clarke Estimates vs. Expanded Historical Data: 1980.01 - 2005.12

	Return	σ
S&P 500*	10.38%	15.50%
T&C assumptions	11.00%	10.00%
EAFE Local*	11.96%	18.85%
T&C assumptions	13.00%	12.00%

Furthermore, if the expected return on currencies is equal to the forward premium in the long run [E(R) = f], we can show the impact on portfolio allocations for various levels of investor risk aversion.

Exhibit 6 shows the recommended portfolio allocations and the impact on expected return and risk for the simple cases we have outlined.

Table 6: Long-run International and Currency Allocations (%)

Investor Risk Aversion λ	Joint Asset / FX Allocations				FX Exposure Completely Hedged				FX Exposure Unhedged			
	w_1	H	E(R)	σ_R	w_1	H	E(R)	σ_R	w_1	H	E(R)	σ_R
1	88.1	0	0.1289	0.2100	88.1	0	0.1289	0.2100	88.4	88.4	0.1178	0.1775
2	51.5	0	0.1184	0.1685	51.5	0	0.1184	0.1685	58.3	58.3	0.1130	0.1560
5	29.5	0	0.1122	0.1550	29.5	0	0.1122	0.1550	40.2	40.2	0.1102	0.1494
10	22.1	0	0.1101	0.1529	22.1	0	0.1101	0.1529	34.2	34.2	0.1092	0.1485
100	15.5	0	0.1082	0.1523	15.5	0	0.1082	0.1523	28.7	28.7	0.1083	0.1482
1000	14.9	0	0.1080	0.1523	14.9	0	0.1080	0.1523	28.2	28.2	0.1083	0.1482

Assumptions:

ρ_{di}	=	0.50	$\rho_{dc} = \rho_{ic}$ =	0.0	f =	0.0	
σ_d	=	15.5%	σ_i =	22.7%	σ_c =	8.0%	
$E(R_d)$	=	10.4%	$E(R_i)$ =	13.2%	$E(R_c)$ =	0.0%	

d: Domestic   i: International   c: Currency

Historical Data: 1980 - 2005

Annual	Return	σ	σ^*	ρ	Variance	Covariance
S&P 500	10.38%	15.50%	2.40%	0.593	0.0240	0.0166
EAFE Local	11.96%	18.85%	3.55%		0.0355	0.0166
S&P 500	10.38%	15.50%	2.40%	0.542	0.0240	0.0183
EAFE (US)	13.23%	22.67%	5.14%		0.0514	0.0183

Source: Bloomberg, Elaboration: Ghilardi & Currie

As Table 6 illustrates, the unhedged portfolio is preferred for a highly risk averse investor (e.g. for λ= 1000: w_1 = 28.2% in the Unhedged, vs. 14.9% for the Hedged portfolio). This is most likely due to the fact that over the time frame of 1980 – 2005, there was a positive currency contribution as one can clearly see from the long term return data comparing EAFE (US) with EAFE (Local); the former produced a long-term mean return of 13.23% while later produced a long-term mean return of 11.97%.

Moreover, EAFE (Local) had much less volatility than EAFE (US), 18.85% vs. 22.67%. In contrast, Tullis and Clarke used parameter estimates originating from 1988 – 1997 data, in which case there was a negative currency contribution associated with that time frame, and as such, the researchers had a slightly higher preference for EAFE Hedged. This is logical given that the main objective of entering into a hedge position is to eliminate the currency effect which can be either positive or negative.

Currency exposure and how to manage it is thus a critical element of investing internationally. It is also sometimes overlooked, or minimized, by equity managers focused on their core competency. Some believe that currency moves are a *"zero-sum game"* that equals out over time. i.e. $E(R_c) = 0$. This argument is used to support the idea of leaving currency unmanaged over time. Academic battles rage as to whether currency markets are the most inefficient in the world or whether conversely they are the most efficient, constantly self-correcting with the addition of each new piece of information.

What is the best solution for an investor looking to move into the international markets? The answer lies in the details of what investor's overall allocation and, as ever, his tolerance for risk may be. On the one hand, some of the larger institutional plans prefer to use a currency overlay manager who will oversee the different exposures of many specialist managers to ensure that the currency exposure agreed in advance by the plan is adhered to. On the other hand, some professional money managers actively manage the currency element of the portfolio, hedging (eliminating non-dollar exposure) through forward foreign exchange contracts or futures contracts.

The extent to which currency can be manipulated in this way is infinite. A manager can decide to leave all currency exposures open, or to hedge to some proportion, say, 50% or 100% of the portfolio. As always, there is no free meal, and the benefits of this exercise can sometimes be outweighed by the costs involved.

4 The Canadian Domestic Investor

We now shift the entire analysis and discussion into the framework of a Canadian Domestic Investor – again asking the question of: **How much International exposure is advantageous in a domestic portfolio from a Canadian perspective?** To begin, we first determine what would be the most appropriate proxy to represent International Equities. One strong reason for selecting the S&P 500 is the fact that the U.S. now represents around 50% of the total global market capitalization as per Exhibit 7 below:

Table 7: MSCI World Regional Make-up as of June 2006
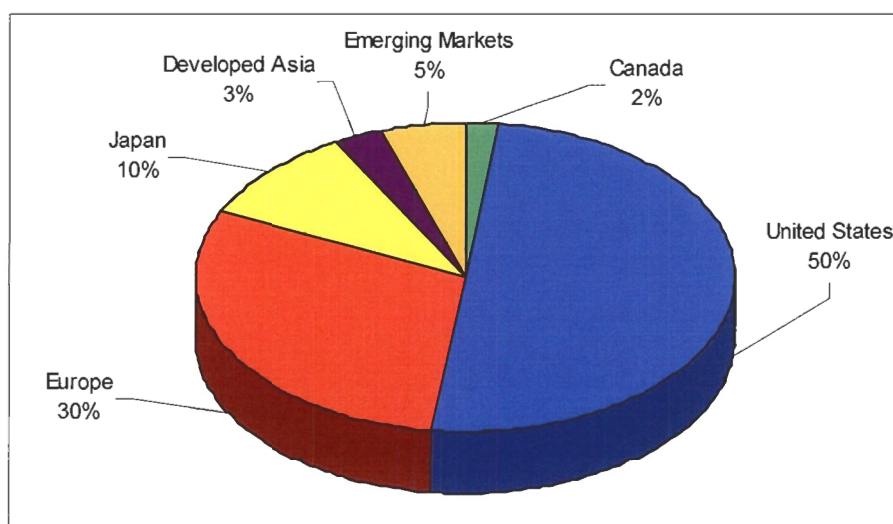
Source: Bloomberg, Elaboration: Ghilardi & Currie

Another strong reason for selecting the S&P 500 as the international proxy from a Canadian perspective relates to consumption. Table 8 shows how the TSX index is highly skewed towards energy and financial services with little to know representation of critical consumption industries such as health care. Health care spending in Canada in

2005 was over \$148 Billion, which represented over 11% of Canadian GDP[8] in 2005. Interestingly, health care represents only 1% of the TSX composition as compared to 12% for the S&P 500. Demographics, characterized by an aging baby-boomer population, suggest health care spending will increase dramatically going forward.

Table 8: TSX and S&P 500 Composition by Industry Sectors as of November

TSX Composition by Sector

- Utilities 1%
- Cons. Disc. 6%
- Cons. Staples 4%
- Telecom. 4%
- Materials 15%
- Energy 30%
- Inf. Tech. 4%
- Industrials 5%
- Health Care 1%
- Financials 30%

S&P 500 Composition by Sector

- Utilities 4%
- Cons. Disc. 11%
- Cons. Staples 10%
- Telecom. 4%
- Energy 10%
- Materials 3%
- Inf. Tech. 14%
- Financials 21%
- Industrials 11%
- Health Care 12%
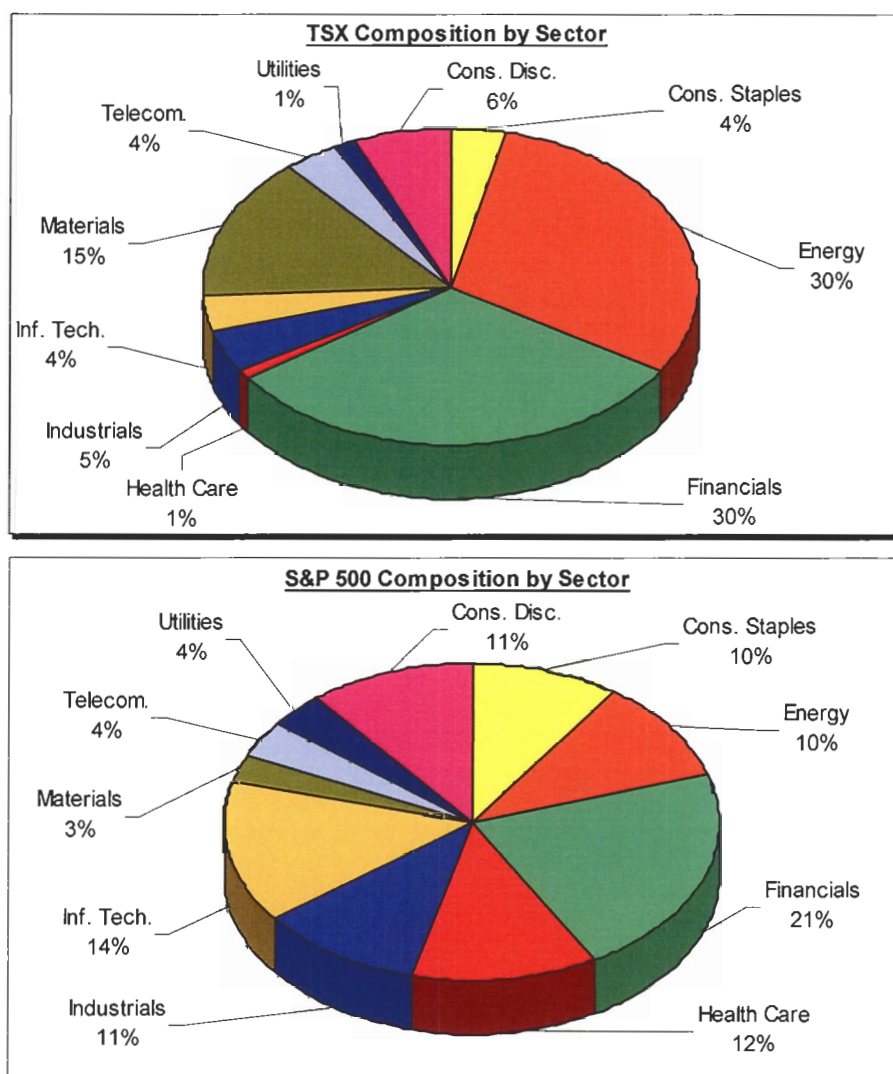
Source: Bloomberg, Elaboration: Ghilardi & Currie

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[8] Total Canadian GDP for 2005 was C\$ 1.37 trillion. Source: Statistics Canada

Other supporting arguments for selecting the S&P 500 as the international proxy for a Canadian investor would include our highly integrated trade and economy; Table 9 shows the historical correlations between U.S. and Canadian CPI and Inflation.

Table 9: U.S. and Canadian CPI's and Inflation Correlations: 1980 - 2005
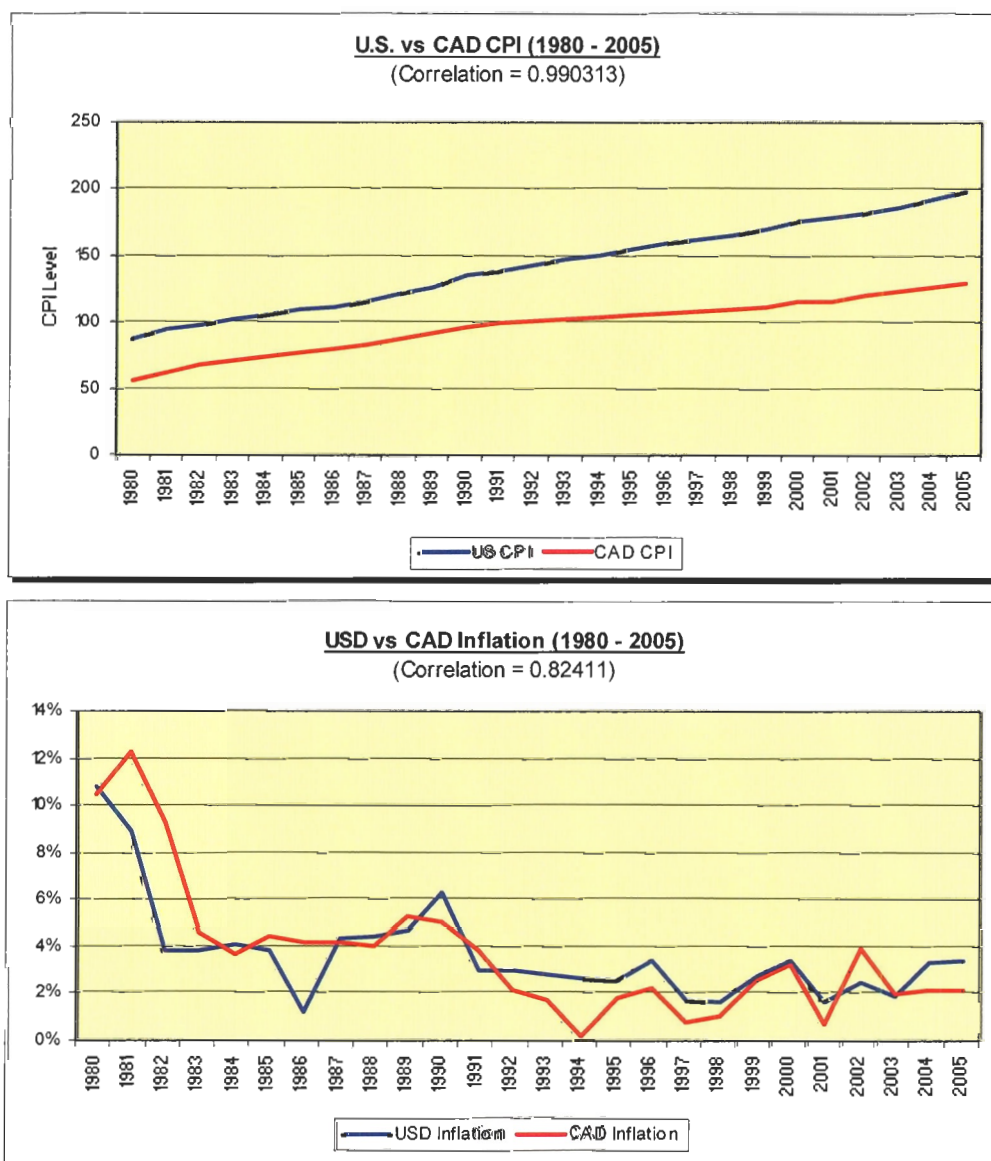
Source: Bloomberg, Elaboration: Ghilardi & Currie

Over the long term, both Canada and the U.S. are growing at very comparable rates. As of January 1, 2006, the 10-year GDP[9] growth rate for Canada was 3.4% vs. 3.3% for the U.S. Another important factor relates to the so-called home bias. There is a more natural reluctance to move overseas if your domestic bias lies in North America – with its deeply and liquid U.S. market.

Another reason is the fact that U.S. and Canadian consumption baskets are very similar. Table 10 compares the composition of the U.S. and Canadian CPIs.

Table 10: Canadian and U.S. CPI components
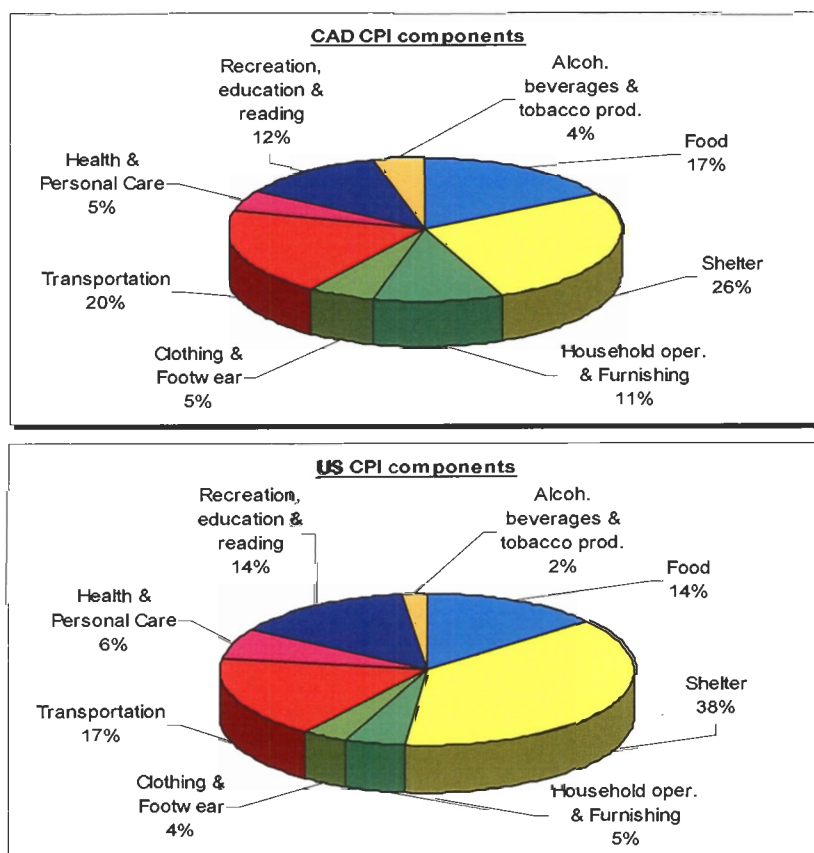
Source: Bloomberg, Elaboration: Ghilardi & Currie

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[9] World Fact Book

While there are close similarities between U.S. and Canadian CPIs, striking differences exist between the TSX and the S&P 500 industry compositions. This would be problematic for a Canadian domestic investor investing solely in the TSX, from the perspective of aligning their investment portfolio with both current consumption and future liabilities. Additionally, given the fact that the S&P 500 is comprised of a number of international companies that derives a significant amount of their earnings from abroad, the S&P 500 is a logical choice as a proxy for international equities.

In order to make meaningful comparisons between both indices, we also deflate both the TSX and S&P 500 nominal returns by the CAD ΔCPI to analyze the optimal policy using real returns from a Canadian perspective. We tried to develop a stock index representative of the Canadian and U.S. consumption patterns, but these efforts turned out to be futile. i.e. Aligning S&P 500 and TSX index sectors with their respective CPI's proved challenging, if not impossible. For example, some major categories such as food and clothing include big sub-components items such as restaurants, women's shoes and apparel, etc.

Table 11 shows the optimal policy of TSX and S&P 500 for both nominal and real returns.

Table 11: Optimal Allocation for TSX and S&P 500 in Nominal and Real Returns

Investor Risk Aversion λ	Domestic & International Exposure Nominal Returns				Domestic & International Exposure Real Returns (Deflated by CAD ΔCPI)			
	w_1	H	E(R)	σ_R	w_1	H	E(R)	σ_R
1	100.0	0	0.10379	0.15502	100.0	0	0.06908	0.16200
2	94.7	0	0.10234	0.15171	95.7	0	0.06790	0.15945
5	74.7	0	0.09681	0.14166	75.9	0	0.06243	0.15002
10	59.6	0	0.09266	0.13719	61.0	0	0.05832	0.14586
100	46.1	0	0.08893	0.13569	47.6	0	0.05463	0.14446
1000	44.7	0	0.08855	0.13567	46.2	0	0.05426	0.14445

ρ_{di}	=	0.62868	$\rho_{dc} = \rho_{lc}$ =	0.0	f =	0.0
σ_d	=	14.84%	σ_i =	15.50%	σ_c =	8.0%
$E(R_d)$	=	7.62%	$E(R_i)$ =	10.38%	$E(R_c)$ =	0.0%

d: Domestic i: International

NOMINAL - Historical Data: 1980 - 2005

Annual	Return	σ	σ^2	ρ	Variance	Covariance
TSX	7.6241%	14.8449%	2.2037%	0.62868	0.022037	0.013889
S&P 500	10.3787%	15.5021%	2.4032%		0.024032	0.013889

DEFLATED - Historical Data: 1980 - 2005

Annual	Return	σ	σ^2	ρ	Variance	Covariance
TSX	4.1531%	15.7443%	2.4788%	0.66454	0.024788	0.0162716
S&P 500	6.9077%	16.2001%	2.6244%		0.026244	0.0162716

Source: Bloomberg, Elaboration: Ghilardi & Currie

As one can see, the weightings of optimal policy are very similar using both nominal and real returns. In both cases the amount allocated to the international equity portfolio (S&P 500) rapidly approaches 45% and 47% in nominal and real terms respectively. Consequently, even the most risk-averse Canadian investor seeking equity exposure should allocate between 45% and 46% of their equities to the S&P 500.

Up until this point, our discussion surrounding international equities has been curtailed to the S&P 500, but what about the rest of the world? In order to study and answer this question we need to select another proxy for international exposure, ideally one that does not include U.S. equities. The best candidate is arguably the MSCI EAFE equity return index (Europe, Australia and Far East) which provides a good representation of emerging developed markets outside of North America. Using the MSCI EAFE index as our international proxy, we then followed the same framework of analysis as outlined in the previous cases.

Table 12 shows the optimal policy for domestic and international equity exposure, from a Canadian perspective, using both the TSX and MSCI EAFE index in both nominal and real returns.

In this case, the optimal weight of international allocation for a Canadian investor seeking equity exposure is much lower as compared to when the S&P 500 was the international proxy. As per Table 12, the weightings rapidly decrease to levels around 16% and 23% for nominal and real returns respectively. Thus, the most risk-averse Canadian investor seeking equity exposure should allocate at least 15% to 22% of their equities to MSCI EAFE index in nominal and real returns respectively. One explanation for the lower weights is due to increased correlation and covariance between the TSX and MSCI EAFE indexes, which allocate more weight on the domestic side.

Table 12: Optimal Allocation for TSX and MSCI EAFE in Nominal and Real Returns

Investor Risk Aversion λ	Domestic & International Exposure Nominal Returns				Domestic & International Exposure Real Returns (Deflated by CAD ΔCPI)			
	w_1	H	E(R)	σ_R	w_1	H	E(R)	σ_R
1	100.0	0	0.11965	0.18853	100.0	0	0.08494	0.18916
2	89.8	0	0.11521	0.17994	96.0	0	0.08318	0.18596
5	59.9	0	0.10226	0.15961	66.3	0	0.07032	0.16649
10	37.6	0	0.09255	0.15020	44.1	0	0.06066	0.15755
100	17.4	0	0.08381	0.14697	24.1	0	0.05198	0.15449
1000	15.4	0	0.08293	0.14693	22.1	0	0.05111	0.15446

ρ_{di} = 0.710518

σ_d = 14.84% σ_i = 18.85%

$E(R_d)$ = 7.62% $E(R_i)$ = 11.96%

d: Domestic i: International

NOMINAL - Historical Data: 1980 - 2005

Annual	Return	σ	σ^2	ρ	Variance	Covariance
TSX	7.6241%	14.8449%	2.2037%	0.710518	0.022037	0.0190897
EAFE Local	11.9646%	18.8528%	3.5543%		0.035543	0.0190897

DEFLATED - Historical Data: 1980 - 2005

Annual	Return	σ	σ^2	ρ	Variance	Covariance
TSX	4.1531%	15.7443%	2.4788%	0.717883	0.024788	0.0205245
EAFE Local	8.4936%	18.9158%	3.5781%		0.035781	0.0205245

Source: Bloomberg, Elaboration: Ghilardi & Currie

Finally, we want to optimize the TSX with both international equity indices (S&P 500 and MSCI EAFE) to see the aggregate effect on the international allocation for a Canadian investor. We take all three indices as three different asset classes and we do not allow for short-selling.

Table 13: Optimal Allocation for TSX, S&P 500 and MSCI EAFE in Nominal and Real Returns

Investor Risk Aversion	Domestic & International Exposure Nominal Returns				Domestic & International Exposure Real Returns (Deflated by CAD ΔCPI)			
λ	w_1	w_2	E(R)	σ_R	w_1	w_2	E(R)	σ_R
1	11.6	88.4	0.11781	0.17750	8.0	92.0	0.08367	0.18185
2	41.7	58.3	0.11303	0.15601	38.0	62.0	0.07891	0.16103
5	59.8	40.2	0.11016	0.14944	56.0	44.0	0.07605	0.15469
10	52.7	22.1	0.10036	0.13965	52.0	28.6	0.06828	0.14770
100	44.7	4.3	0.09043	0.13568	44.1	11.0	0.05844	0.14399
1000	43.9	2.5	0.08944	0.13564	43.3	9.2	0.05746	0.14395

σ_d	=	14.8%		σ_1	=	15.5%	σ_c	=	18.9%
$E(R_d)$	=	7.62%		$E(R_1)$	=	10.38%	$E(R_2)$	=	11.96%

d: Domestic   1: S&P 500   2: EAFE Local

NOMINAL - Historical Data: 1980 - 2005

Annual	Return	σ	σ^2	TSX	S&P 500	EAFE Local
TSX	7.6241%	14.8449%	2.2037%	0.0220371	0.0138888	0.0190897
S&P 500	10.3787%	15.5021%	2.4032%	0.0138888	0.0240315	0.0166299
EAFE Local	11.9646%	18.8528%	3.5543%	0.0190897	0.0166299	0.0355428

DEFLATED - Historical Data: 1980 - 2005

Annual	Return	σ	σ^2	TSX	S&P 500	EAFE Local
TSX	4.1531%	15.7443%	2.4788%	0.0247883	0.0162716	0.0205245
S&P 500	6.9077%	16.2001%	2.6244%	0.0162716	0.0262443	0.0178063
EAFE Local	8.4936%	18.9158%	3.5781%	0.0205245	0.0178063	0.0357807

Source: Bloomberg, Elaboration: Ghilardi & Currie

Table 13 shows the results of the optimization in nominal and real returns. In the case of nominal returns, we observe that the S&P 500 weight for the most risk-averse investor is still around 44% with just a small weighting on the MSCI EAFE (2.5%). Thus, the most risk-averse Canadian investor seeking equity exposure should allocate a minimum of 46% of their equities internationally, with the S&P 500 being of foremost importance. It is interesting to see how the weights for the MSCI EAFE plunge rapidly to levels at around 3% for the majority of the risk profiles.

In the case of real returns, we deflate both the S&P 500 and MSCI EAFE by the change in CAD CPI (ΔCPI or CAD inflation). While the results of the optimization show a similar allocation (43%) to S&P 500 for the most risk-averse Canadian investor, the weight to MSCI EAFE is noticeably different at 9%. Thus, the most risk-averse Canadian investor seeking equity exposure should allocate a minimum of 53% of their equities internationally and ideally in a ratio of 5:1 (S&P 500 / MSCI EAFE).

It is important to note that whenever the S&P 500 is included as an asset choice to be considered in optimal policy, the allocation to the S&P 500 remains very similar. When looking at the TSX and S&P 500, and then the TSX, S&P 500 and MSCI EAFE, the optimal allocations were close to 45% and 44% respectively.

5 Conclusion

These empirical findings show that international diversification can benefit investors by improving return potential, and at the same time, reducing volatility. The degree of how much is appropriate to invest internationally remains quite subjective. It ultimately depends on the trade-off of risk and return an individual investor is willing to take based on long-term investment objectives.

In our analysis, we assumed that the long-term historical data (Jan 1980 to Nov 2006) on the TSX and S&P 500 provided reasonable forward-looking estimates of risk and return. Based on our findings, even the most risk-averse Canadian investor seeking equity exposure in their long-term portfolio, should allocate a minimum of 45% of their equity exposure to the S&P 500. For less risk adverse investors, allocating more weight to the S&P 500 will help to enhance long-term return potential, but at the price of higher volatility.

Looking at both the S&P 500 and MSCI EAFE, the most risk-averse Canadian investors may consider adding 2% (9%) of their portfolio into MSCI EAFE in the case of nominal (real) returns. For less risk adverse investors, allocating more weight to MSCI EAFE will help to enhance long-term return potential, but similar to the case above, at the price of higher volatility.

Over the past several years, correlations amongst domestic and international markets have been steadily rising and are now close to 0.80 (recall Table 4). International economies have become more closely linked over time and it is no surprise that the correlations of major developed international markets have also been raising. Given the continuing forces of globalization, it seems unsafe to argue that markets will diverge rather than converge over time.

For Canadian investors seeking equity exposure, not only would diversifying equities to include some S&P 500 provide a more optimal risk and return trade-off, but it would also provide a more optimal reflection of their Canadian consumption patterns. This is particularly important for Canadian investors who will be retiring in Canada. In this case, they should be more inclined to better align their investment portfolio to their underlying patterns of consumption and future liabilities.

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