

Does an Optimal Static Policy Foreign Currency Hedge Ratio Exist?

FQ Perspective



DORI LEVANI

Partner, Investments

Investing in foreign assets comes with the additional question of what to do with the foreign currency (FX) exposures that can come along. Focusing on developed market equities, we show that the starting point of the discussion is to fully hedge for intuitive reasons. Hence, leaving any exposures unhedged is equivalent to leveraging the portfolio. The end point of the discussion, however, can be quite different based on “special views” one may have about the prospect of foreign currencies and the role foreign currency exposures can play in improving the portfolio’s risk-return profile.

Introduction

Institutional investors have been told of the benefits of investing internationally for many years. However, less has been said about what to do with the FX exposures that can come along with such investments. The important thing to realize is that those currency exposures can be studied in exactly the same way one studies any other exposure in a portfolio. That makes the starting point for the discussion easy to identify, since no prudent investor would choose to hold exposures in their portfolio without good reason.

We will review the academic work in this area, then move on to present some relatively simple empirical studies with the focus on developed market equities. Other asset classes and more complex studies will follow in subsequent papers.

One of the questions we will have to answer as part of those empirical studies is how to tell when an outcome is better or worse, since it may not always be clear. We will also show that the FX exposures should not just be ignored. Lastly, we will look at some basic recommendations, both in terms of what to do and how much to hedge.

Background

Grubel (1968) contains an early version of the advice to invest in international stocks, extending the work of Markowitz (1959) and Tobin (1958) from domestic to international equities. Solnik (1974) moves beyond the basic analysis in Grubel’s paper discussing how much diversification foreign equities can offer above and beyond what is available in a domestic-only portfolio. Similar to most early studies on international equity investing, he explicitly ignores exchange rates, which is the same as looking at fully hedged returns.

Similarly, Perold and Schulman (1988) make it clear that the starting point of any international investing discussion should be from the fully hedged perspective:

“OUR PRESCRIPTION DOES NOT SAY THE PRESCIENT INVESTOR SHOULD NOT SELECTIVELY LIFT A HEDGE, JUST THAT HEDGING SHOULD BE THE POLICY, AND LIFTING THE HEDGE AN ACTIVE INVESTMENT DECISION.”

Past and simulated performance is no guarantee of future results. Potential for profit is accompanied by possibility of loss.



Intuitively, the decision to invest in developed market equities is, inherently, an equity-based decision based on the attractiveness of local (i.e. foreign) returns. Japanese investors do not buy shares of IBM listed in New York because they like the US dollar but instead because they like IBM. Hedged returns are the “next best thing” to those local currency returns and hence match that same intuition.

In making the active decision to lift the hedge, then, as Perold and Shulman (1988) intimate, we argue that the investor must pose the following question:

“WHAT IS THE BENEFIT OF HOLDING FOREIGN CURRENCY IN INVESTMENT PORTFOLIOS?”

Note that we could just as easily replace “foreign currency” in the above sentence with any other asset or exposure. The rules by which we answer that question remain the same as if we looked at standard measures of risk and return used to evaluate other asset classes.

Can Foreign Currency be Beneficial to Investment Portfolios?

As with other assets and exposures, foreign currency may be beneficial to investment portfolios. But how much of this exposure should be hedged to optimize this benefit?

Froot (1993) points out that:

“...HEDGE RATIOS MUST STRIKE A BALANCE – FOR INVESTORS PRIMARILY CONCERNED WITH LONG HORIZON MOMENTS, HEDGE RATIOS SHOULD PRIMARILY REFLECT EXPOSURE TO RELATIVE INFLATION AND INTEREST RATE SURPRISES, WHILE FOR THOSE CONCERNED WITH SHORT-HORIZON MOMENTS, HEDGE RATIOS SHOULD PRIMARILY REFLECT REAL-EXCHANGE-RATE EXPOSURE.”

That perspective is based both on the existence of Purchasing Power Parity (PPP)¹ and the assumption that equities are real and not nominal assets. Such assertions make that view hard to consider as a starting point for the FX hedging discussion².

Black (1989) takes a view driven by fewer assumptions. His optimal hedge ratio study led to a recommendation of a universal hedge ratio for foreign equities of 77%³.

Black did leave the door open for evolution and a more flexible approach to FX hedging than the one outlined above:

“THE FORMULA’S RESULTS MAY BE THOUGHT OF AS A BASE CASE. WHEN YOU HAVE **SPECIAL VIEWS ON THE PROSPECTS FOR A CERTAIN CURRENCY**, OR WHEN A CURRENCY’S FORWARD MARKET IS ILLIQUID, YOU CAN ADJUST THE HEDGING POSITIONS THAT THE FORMULA SUGGESTS.”

Do Currency Returns Wash Out?

Most discussions about optimal FX hedging policies raise the point that FX returns wash out and that the FX hedging decision is meaningless until foreign exposures rise to some significant level. Effectively, they claim that currency exposure does not matter in the end.

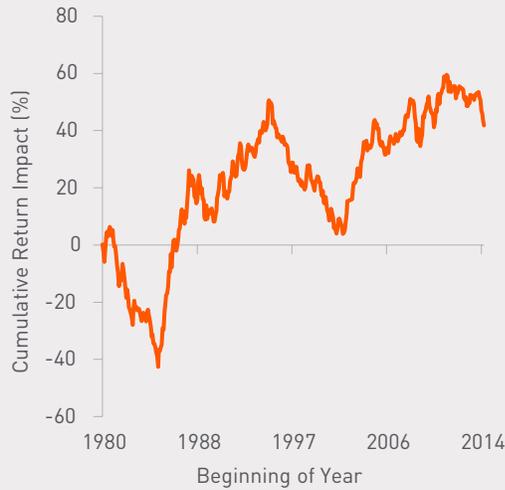
But do FX returns really wash out? Not even close! Exhibit 01 (next page) shows the cumulative return difference between an unhedged and fully hedged portfolio for a US dollar-based developed market equity investor.

We can easily observe that there are four extended periods and one brief period of time when the impact of currencies certainly does NOT wash out:

- US dollar appreciation from September 1980 through Feb 1985 (54 months)
- US dollar depreciation from March 1985 through April 1995 (122 months)



EXHIBIT 01 - CUMULATIVE RETURN IMPACT OF FOREIGN CURRENCY CONTENT OF US DOLLAR-BASED MSCI WORLD EX-US INDEX (JANUARY 1980 - DECEMBER 2014)



Sources: First Quadrant, LP, Datastream, MSCI

- US dollar appreciation from May 1995 through January 2002 (81 months)
- US dollar depreciation from February 2002 through August 2011 (115 months)
- US dollar appreciation from September 2011 to present (40 months)

If we stepped even further back, one could argue that there's only one observation, as the US dollar has been in a period of depreciation since 1985, interrupted only briefly (81 months) by a period of strength. That, however, is quite a long time to wait – and indeed, much longer than the horizon of most investors.

What Do We Need to Know to Go Beyond Basic FX Hedging?

How do we study the choices beyond the base case, which, as discussed above, is to fully hedge currency exposure? What do we need to know that will aid us in our attempts to be a “prescient” investor⁴?

We must decide on how to tell if one choice is better than another. If we compare two portfolios

or return series, is “better” measured by: 1) lower risk (and which measure of risk); or 2) higher return and/or higher risk-adjusted return (e.g., Sharpe Ratio)?

Variance/Standard Deviation as a Measure of Risk

Studying the risk and drawing conclusions from the impact on the risk (as measured by standard deviation of returns) of the hedging decision is complicated by the fact that lowering the hedge ratio (i.e. moving the portfolio from being fully hedged to unhedged) is effectively ADDING (and not REPLACING) an asset in the program. Put differently, buying unhedged foreign equities results in a leveraged position, as for each unit of base currency invested in the portfolio one holds one unit of foreign equities AND one unit of foreign currency.

By definition, adding an asset to a portfolio can only lower risk if the correlation between the added asset and the original portfolio is sufficiently negative to overcome the impact of adding in a risky asset with the same weight as the original portfolio.

More formally, the variance (Var) of the combined portfolio, where i represents foreign equities and j represents foreign currencies, is:

$$\text{Var}_{(i+j)} = \text{Var}_{(i)} + \text{Var}_{(j)} + 2\text{Std}_{(i)} * \text{Std}_{(j)} * \text{Corr}_{(i,j)}$$

The requirement then to be met for correlation (Corr) such that adding in asset j to the portfolio i lowers variance is:

$$\text{Corr}_{(i,j)} < -0.5 * \text{Std}_{(j)} / \text{Std}_{(i)}, \text{ where Std is standard deviation}$$

Using a simulated Developed Market Equity Model Portfolio⁵ from January 1980⁶ to December 2014, the average ratio of the standard deviation of returns of the two “assets” is 0.57⁷. So, unless correlations are less than approximately -0.30⁸, variance of the combined portfolio increases when you lower the hedge ratio. It turns out the average correlation between developed market



equities and their respective currencies is -0.12 for the period under analysis⁹.

As a result, the default answer when investors know “just a little bit” (we already established that when investors know “nothing” the answer is to hedge) and they define “better” as lower variance/standard deviation, is again to hedge. The results of our study bear this out:

TABLE 01 - RISK AS MEASURED BY STANDARD DEVIATION OF DEVELOPED MARKET EQUITY MODEL PORTFOLIO (UNHEDGED AND FULLY HEDGED) (JANUARY 1980 - DECEMBER 2014)

	Unhedged	Fully Hedged
Standard Deviation	15.49%	14.20%

Sources: First Quadrant, LP (see Endnotes 5-9), Datastream, MSCI

Risk Measures Beyond Variance

However, we are also interested in risk measures beyond just variance/standard deviation. How does the hedging decision affect the maximum drawdowns (i.e. the worst peak to valley loss) and negative tails (i.e. the worst month)? Although we covered this topic in some detail in a previous paper in 2004¹⁰, we offer here the results of an additional period of 10 years of data “out of sample”.

First, we will look at the average maximum drawdown.

TABLE 02 - RISK AS MEASURED BY MAXIMUM DRAWDOWN AND WORST MONTH OF DEVELOPED MARKET EQUITY MODEL PORTFOLIO (UNHEDGED AND FULLY HEDGED) (JANUARY 1980 - DECEMBER 2014)

	Unhedged	Fully Hedged
Max Drawdown	-71.34%	-66.70%
Worst Month	-18.16%	-18.53%

Sources: First Quadrant, LP (see Endnotes 5-9), Datastream, MSCI

As demonstrated, the hedged model portfolio incurred lower drawdowns, so we should still hedge. On the other hand, if we used the negative tails as a criterion, we would not hedge, although it is a relatively close call as shown in Table 02.

How About Return?

Next, we look at both the return and risk-adjusted return defined as the annualized return divided by the annualized standard deviation.

TABLE 03 - RETURN AND RISK-ADJUSTED RETURN OF DEVELOPED MARKET EQUITY MODEL PORTFOLIO (UNHEDGED AND FULLY HEDGED) (JANUARY 1980 - DECEMBER 2014)

	Unhedged	Fully Hedged
Return	11.02%	11.17%
Risk-Adjusted Return	0.71	0.79

Sources: First Quadrant, LP (see Endnotes 5-9), Datastream, MSCI

In this case, we would still hedge although, once again, it is pretty close.

Making the FX Hedging Call

So where does that leave us in our hedging decision? Should we or should we not hedge looking at the combination of risk and return measures for a diversified developed market equity portfolio?

TABLE 04 - RISK AND RETURN MEASURES OF DEVELOPED MARKET EQUITY MODEL PORTFOLIO (UNHEDGED AND FULLY HEDGED) (JANUARY 1980 - DECEMBER 2014)

	Unhedged	Fully Hedged	Should You Hedge?
Standard Deviation	15.49%	14.20%	Yes
Max Drawdown	-71.34%	-66.70%	Yes
Worst Month	-18.16%	-18.53%	No
Return	11.02%	11.17%	Yes
Risk-Adjusted Return	0.71	0.79	Yes

Sources: First Quadrant, LP (see Endnotes 5-9), Datastream, MSCI

All the risk and return measures used in the analysis except for the worst month indicate that developed market equity portfolios should be hedged. It potentially improves both your risk and drawdowns. It costs you very little in the worst month scenario, and might even make you some return!

We would concede that if you looked at each measure individually, none of them would prove to be statistically significant. However, in combination, the conclusion to hedge is somewhat significant¹¹.

No Regret!

That, in fact, puts the investor in a very good position...because **you can't choose incorrectly!**

Statistically, if neither answer is correct, then neither answer is wrong. That means investors have the flexibility to choose their hedge ratio that most matter to them and their portfolios, without fear that they will have chosen the wrong answer.

The idea of "avoiding regret" by selecting the mid-point 50% as your hedge ratio is, then, not necessary!

Can We Go a Bit "Deeper"?

If we are willing to pick the "optimal" hedge ratio (from 0-100%) for each measure, how does it look for the different criteria we have chosen? It does range from 38% to 74% depending on the measure.

Even in the case of worst month where hedging was a slightly less appealing case than not hedging, the "optimal" answer is still slightly above 50% (56%). It turns out Fischer Black's "example" of 77% would not look out of place in the table below.

Conclusion

In the end, we would urge investors to remember to invest in developed market equities, but manage the currency exposures that "come along for the ride" as an entirely separate decision. When currency exposures are left in a portfolio without an explicit view, it is effectively equivalent to leveraging the portfolio.

At the same time, foreign currency may benefit investment portfolios, but investors do need to make sure they know what benefit they seek. And if they are willing to think about currency in this way, we would ask an important question, namely:

WHY SHOULD EQUITY MARKET CAPITALIZATION WEIGHTS FOR CURRENCY PORTFOLIOS BE THE RIGHT WAY TO GET THE BENEFIT INVESTORS SEEK?

And that question is quite possibly more important than the one we started with.

In our next papers on FX hedging, we will move beyond the basic universal hedging ratio, which implicitly assumes that using equity market capitalization rule is the right way to invest. We will examine if the strategic FX hedge ratio should vary by country and through time, and also if currency weights that are not connected to the underlying equity market capitalizations are the right exposures. We will also introduce the concept of active currency management for investors who might have "special views" on currencies and treat hedging as a starting point.



TABLE 05 - OPTIMAL HEDGE RATIO OF DEVELOPED MARKET EQUITY MODEL PORTFOLIO (UNHEDGED AND FULLY HEDGED) USING DIFFERENT RISK AND RETURN MEASURE (JANUARY 1980-DECEMBER 2014)

	Unhedged	Fully Hedged	Should You Hedge?	Optimal Rule	Optimal Hedge Ratio
Variance	15.49%	14.20%	Yes	Smallest	74%
Max Drawdown	-71.34%	-66.70%	Yes	Smallest	38%
Worst Month	-18.16%	-18.53%	No	Smallest	56%
Return	11.02%	11.17%	Yes	Largest	49%
Risk-Adjusted Return	0.71	0.79	Yes	Largest	71%

Sources: First Quadrant, LP (see Endnotes 5-9), Datastream, MSCI



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Endnotes

- ¹Purchasing Power Parity (PPP) is an economic theory that estimates the amount of adjustment needed on the exchange rate between countries in order for the exchange to be equivalent to each currency's purchasing power. We do believe in the existence of PPP in the long term.
- ²Though it may very well be near the "ending point."
- ³We would point out that the 77% figure in Black (1989) was used almost as an example rather than a recommendation.
- ⁴To use Perold & Schulman (1988)'s phrasing.
- ⁵The Developed Market Equity Model Portfolio includes simulated returns for Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, the United Kingdom and the United States. The unhedged returns for each country is a simulation of the MSCI World ex-base country measured (not hedged) in the base country's currency, where the country weights are rebalanced on a monthly basis. The hedged returns for each country is a simulation of MSCI World ex-base country hedged back to the base country's currency, where the country weights are rebalanced on a monthly basis. The hedges are established with currency forward contracts on each respective currency and adjusted monthly on a per currency basis. In this paper, we assume investors are country-agnostic. In other words, we take a simple average of the analysis from every country's perspective, because that would be the best answer if investors did not care which country we applied the analysis to. Our next paper will take that question on.
- ⁶Due to available index and hedging data, start dates of data for Finland and New Zealand is January 1988, for Norway is March 1984 and for Switzerland is February 1980.
- ⁷Before 1999, we used the average of all the "legacy" EMU countries as a synthetic EMU country in the dataset.
- ⁸ $-0.5 * 0.57 = -0.285$
- ⁹Before 1999, we used the average of all the "legacy" EMU countries as a synthetic EMU country in the dataset. Going forward, we will only note this approach if it makes a material difference to the conclusions. Otherwise, we will continue using the simple average across all countries in the dataset.
- ¹⁰Optimal Currency Hedge Ratios – Redux by Dori Levanoni, First Quadrant, LP, May, 2004
- ¹¹Our analysis indicates that, from the statistical perspective, the conclusion to hedge is significant at the 95% confidence level.



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Model, backtested or simulated performance presented in this paper and further described in Endnote #5-9 are for illustrative purposes and are not a representation of strategies currently managed by First Quadrant, L.P. and are provided solely for conceptual discussion only; therefore no fees are discussed or illustrated within this paper. Results from any live implementation of strategies discussed would in actuality be reduced by fees charged against an account deploying the strategy. Model, backtested, or simulated performance is no guarantee of the future results in a live portfolio using the strategy. Potential for profit is accompanied by possibility of loss. Hypothetical or simulated performance results have certain inherent limitations. Unlike an actual performance record, simulated results do not represent actual trading. Simulated trading programs in general are also subject to the fact that they are designed with the benefit of hindsight. Further, backtesting allows the security selection methodology to be adjusted until past returns are maximized. No representation is being made that any account will or is likely to achieve profits or losses similar to those shown. Unless otherwise noted, performance returns for one year or longer are annualized. Performance returns for periods of less than one year are for the period reported. Reinvestment of earnings was assumed. The simulated performance used in this presentation may differ from live performance experienced using the same strategies for a variety of reasons such as: The simulation assumes that the strategy guidelines are constant through the life of the portfolio, whereas, the guidelines for live portfolios may change over the life of each portfolio; the simulation assumes zero transaction cost whereas live portfolio transaction costs will be variable; dependent on market conditions such as liquidity and portfolio size, the types of instruments traded within the simulation may not have been permissible in a live portfolio; etc.

The MSCI World Index Ex-US is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed markets. The MSCI World Index Ex-US consists of the following 23 developed market country indices: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, and the United Kingdom.

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FIRST QUADRANT, L.P. | 800 E. COLORADO BLVD. SUITE 900, PASADENA, CALIFORNIA 91101
MARKETING SERVICES INFO@FIRSTQUADRANT.COM | OFFICE 626 683 4223 | WEB FIRSTQUADRANT.COM
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