Preliminary Master Thesis Report

Study Program: MSc in Finance

Conditional Currency Hedging for International Equity Portfolio

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Abstract

This paper focuses on international equity portfolio and examines whether conditional currency hedging is a better-performing strategy than optimal and full currency hedging in terms of minimizing risk without compromising returns. Based on the interest rate differential as the forecasting indicator of future foreign exchange rate changes, conditional hedging is implemented over the period 1975 to 2015, out of sample, and is shown to improve the Sharpe ratio and outperform both optimal and full currency hedging.

Introduction

Holding foreign assets creates an exposure to currency exchange risks. Therefore, currency hedging is an important factor to consider for every asset manager and investor in international equity or bond markets.

Most of the previous studies focus on full and optimal hedging of currency risks for international investment portfolios. The objective of the given study is to investigate whether conditional currency hedging strategy can yield a better risk-return performance for a global equity investor as compared to full or optimal hedging. The novelty of our conditional hedging strategy is in timing the currency hedges only to the periods of expected foreign currency devaluation. Based on the study of Campbell, Serfaty-De Medeiros & Viceira (2010), we use seven major currencies: Australian dollar, Canadian dollar, euro, Japanese yen, Swiss franc, British pound, and the US dollar, and simulate the strategy where the hedge positions depend on one-month predictions of interest rate differential. Particularly, our objective is to investigate the out of sample performance of such hedge timing on our global equity portfolio performance.

This paper is structured as follows. Section I reviews the related literature and theory of currency hedging. Methodology is laid out in Section II. Section III describes our data and

presents preliminary statistical analysis of stock and currency returns. Section IV reports and analyzes the out of sample performance of conditional currency hedges for the global equity portfolio. Sections V and VI compare conditional hedging strategy performance (Sharpe ratio) with optimal and full hedging strategies. Section VII concludes.

Section I. Literature Review and Theory

Diversifying one's investments internationally is a common practice among investors and asset managers, regarded as the means to reduce the overall portfolio risk without necessarily compromising returns. However, international assets expose a portfolio to another source of risk – fluctuations of currency exchange rates – as the return of an international portfolio is comprised of the return on foreign assets plus the return on foreign currency. Hence, currency hedging becomes an important consideration.

Most currency hedging occurs through the use of forward contracts. For example, "to hedge the exchange exposure of a French franc investment, one can sell forward an amount in francs equal to the anticipated value of the investment and thereby lock in the exchange rate at the beginning of the investment period" (VanderLinden, Jiang & Hu, 2002, p. 72). Hence, a fully hedged portfolio results in a net zero position in foreign currency. On the other hand, an investor whose portfolio is unhedged receives the spot exchange rate prevailing at the end of the period, times the foreign currency value of the investment (VanderLinden et al., 2002). An unhedged position, therefore, corresponds to a long position in foreign currency equal to the value of an asset holding.

While there is some consensus in academic literature and empirical findings as to the benefit of hedging international portfolios against currency risk, there are different approaches to hedging and the ongoing search for the most effective one.

Perold and Shulman (1988) show that a U.S. investor can substantially reduce the volatility of his portfolio returns by employing a full hedge, with hedging ratios of one. The

study acknowledges that this strategy does not necessarily result in the highest possible risk reduction, but offers the simplest yet effective solution for a globally diversified investor.

In practice, however, a unitary hedge may be suboptimal as an investor may desire to have some foreign currency exposure for speculative reasons. In fact, "a unique feature of currencies is that investors in every country can simultaneously perceive positive expected excess returns on foreign currencies over their own domestic currencies" (Campbell et al., 2010, p. 90). Therefore, by adding some currency risk investors in different countries can all increase their expected returns. It is known as the "Siegel's paradox", which arises from Jensen's inequality (Siegel, 1972). Based on this paradox and additional assumptions, Black (1989) derives a universal hedging formula, suggesting that, regardless of their nationality, investors should use identical (universal) hedge ratios and should never hedge 100 percent of their foreign equity.

It is noted, however, that "a more important source of speculative currency demand arises from expected excess returns on particular currencies, as opposed to all currencies simultaneously" (Campbell et al., 2010, p. 91). The studies on forward premium anomaly (Fama, 1984, Engel, 1996) point out that currencies with high short-term interest rates tend to deliver high returns. This phenomenon is exploited by holding high-rate currencies and shorting low-rate currencies, which is known as currency carry trade.

Employing mean-variance optimization strategy to global stock and bond portfolios, Glen and Jorion (1993) report that optimal currency hedging significantly improves the performance of diversified bond portfolios. The study of Campbell et al. (2010) remarks that for countries like Canada, where full hedging is actually riskier than zero hedging, the benefits of optimal hedging are especially large.

The evidence on predictability of foreign exchange rates has opened the way for conditional hedging strategies. The hedge ratio is not the only factor improving the risk-

return characteristics of a portfolio. Unlike unconditional strategies, mentioned earlier, conditional ones incorporate hedge timings. An investor would track a particular variable that signals gains from entering into a forward contract. The expected result is better and more stable returns along with reduced transaction costs since the number of times a hedge is implemented is reduced.

A simple, well-known effective strategy involves the use of forward premium/discount – the difference between prevalent forward and spot exchange rates. An investor sells the foreign currency forward when it is trading at a forward premium and buys when the foreign currency is at a forward discount. Glen & Jorion (1993) empirically test the given strategy. The study finds that conditional currency hedging outperforms both full and universal strategies, and yields "substantially higher returns without additional risk" (Glen & Jorion, 1993, p. 1885).

The success of the conditional strategy rests on the forward discount bias. Under uncovered interest rate parity, in the risk-neutral market with rational expectations, the forward discount should be "an unbiased estimate of the subsequent exchange rate change" (Froot, 1990). The percentage change in the spot exchange rate should equal the interest rate differential between two countries, which by no arbitrage equals the forward exchange rate. Multiple studies on forward discount bias did not confirm the relationship, in fact, a reverse relationship is frequently discovered (Hansen & Hodrick, 1980; Fama, 1984). The finding calls for explanation and the two common interpretations are time-varying risk premium and expectational error (Froot, 1990). In the first interpretation interest rate differential incorporates both expected change in exchange rates and risk premium for holding a currency. An alternative view considers risk premium unrelated to interest rate movements and explains the bias with expectational errors. Tests of the two alternatives produce positive evidence for the expectational errors explanation and little to no evidence for risk premium.

Hedging conditioned on forward premium, therefore, is a strategy with potential for positive profit without additional risk.

Clarida, Davis & Pedersen (2009) study the forward discount bias and find that in high volatility environments the relationship between currency depreciation and forward premium is the opposite to that of low volatility environments. “In high volatility environments the low yielding currency tends to appreciate much more than implied by uncovered interest parity … causing large negative returns to the carry trade strategy as the short position in the low yielding currency result in losses” (Clarida, Davis & Pedersen, 2009).

Several studies attempted to explore other viable conditional hedging strategies. Hazuka and Huberts (1994) develop a strategy with a purpose to take advantage of differences in expected real interest rates. The given strategy, unlike the previous one, calls for hedging when the foreign real interest rate is less than the domestic rate.

VanderLinden et al. (2002) label the two aforementioned strategies as “Real-Interest-Rate Hedge Rule” (RIR) and “Forward Hedge Rule” (FHR). Their research focuses on testing the combination of the two strategies, named “The Real Forward Hedge Rule” (RFHR). RFHR requires the investor to hedge only when “(1) the foreign currency sells at a forward premium … and (2) the foreign real interest rate is less than the domestic rate…” (VanderLinden et al., 2002). The researchers test the new combined strategy not only against unconditional benchmarks, but also against FHR and RIR strategies. The conditional strategies have similar performance and show higher statistically significant Sharpe ratios than simple unconditional strategies. RFHR strategy achieved the highest Sharpe ratio and provided highest percentage of correct hedging decisions.

Our research will focus on testing the conditional strategy selling foreign currencies forward when they are trading at a premium. Our sample range is 1975 to 2015, and hence includes the financial crisis and the after-crisis period. Along with our main objective, we want to investigate how the positive relationship between interest rates and currency depreciation during crisis, as observed by Clarida, Davis & Pedersen (2009), will affect the performance of our strategy in terms of risk-return ratio during and after the financial turmoil.

Hypothesis to be tested: Conditional strategy allows to achieve higher Sharpe ratio than unconditional unitary and optimal hedging strategies.

Section II. Methodology

In this study we employ a framework similar to that of Glen and Jorion (1993) and Campbell et al. (2010). We use currencies of the seven developed economies: Australia, Canada, Euroland, Japan, Switzerland, the United Kingdom, and the United States, and assume that a global investor equally invests (14%) in each country stock market. The empirical analysis is based on monthly observations beginning July 1975, the earliest date for which there is data available for all variables and markets, and ending December 2015. As in Campbell et al. (2010), "Euroland" is defined "as a value-weighted stock basket that includes Germany, France, Italy, and the Netherlands" due to the longest record of stock returns, interest rates, and exchange rates of these euro zone countries (p. 92). "With regard to currencies, prior to 1999 we refer to a basket of currencies from those countries, with weights given by their relative stock market capitalization, as the «euro»" (p. 92).

Having constructed an equally-weighted global equity portfolio, we device our conditional hedging strategy. We use forward premium as a predicting variable of future FX rate changes and use one-month forward contracts as the hedging tool. By interest rate parity,

the forward premium is also the interest rate differential, therefore, we can use the following forecasting equation for the return on forward contracts:

$$\frac{\tilde{S}_{t+1} - F_t}{S_t} = \alpha + \beta(i_t^* - i_t) + \tilde{\epsilon}_{t+1};$$

where i_t is the domestic riskless interest rate, i_t^* is foreign riskless interest rate, and $i_t^* - i_t$ is the forward discount. We will use this regression to implement our conditional hedging strategy.

Our strategy lies in hedging currency exposure only in the event of expected currency depreciation. When a currency is expected to appreciate, we leave the portfolio unhedged to reap the benefit from the currency exposure. Therefore, our forward trading strategy sets the hedging coefficient equal to 1 when it is at a premium.

We aim to investigate the out of sample performance of such hedge timing on our international equity portfolio performance, and compare the Sharpe ratio achieved by the given conditional strategy with the Sharpe ratios of full and optimal hedging strategies.

References

Black, F. (July-August, 1989). Universal hedging: optimizing currency risk and reward in international equity portfolios. *Financial Analysts Journal, 45* (4), 16-22.

Campbell, J.Y., Serfaty-De Medeiros, K. & Viceira, L. M. (2010). Global currency hedging. *The Journal of Finance, 65* (1), 87-121.

Clarida, R., Davis, J. & Pedersen, N. (2009). Currency carry trade regimes: Beyond the Fama regression. *Journal of International Money and Finance, 28* (8), 1375-1389.

Engel, C. (1996). The forward discount anomaly and the risk premium: A survey of recent evidence, *Journal of Empirical Finance* 3, 123–192.

Fama, E. F. (1984). Forward and spot exchange rates, *Journal of Monetary Economics* 14, 319–338.

Froot, K. A. & Thaler, R. H. (1990). Anomalies, Foreign Exchange. *Journal of Economic Perspectives, 4* (3), 179–192.

Glen, J. & Jorion, P. (1993). Currency hedging for international portfolios. *Journal of Finance, 48* (5), 1865-1886.

Hansen, L. P. & Hodrick, R. J. (October, 1980). Forward exchange rates as optimal predictors of future spot rates: en econometric analysis. *The Journal of Political Economy, 88* (5), 829-853.

Hazuka, T. B. & Huberts, L. C. (March/April, 1994). A valuation approach to currency hedging. *Financial Analysts Journal, 50* (2), 55-59.

Perold, A. F. & Schulman, E. C. (May-June, 1988). The free lunch in currency hedging: implications for investment policy and performance standards. *Financial Analysts Journal, 44* (3), 45-50.

Siegel, J. J. (May, 1972). Risk, Interest Rates, and the Forward Exchange. *Quarterly Journal of Economics, 86* (2), 303-309.

VanderLinden, D., Jiang, C. X. & Hu, M. (2002). Conditional hedging and portfolio performance. *Financial Analysts Journal, 58* (4), 72-82.