Highlights

- Optimal hedge ratios depend on the state of the business cycle
- Traditional safe haven currencies (US dollar and Swiss franc) maintain their state
- Risk managers should adjust currency hedge ratios according to the business cycle
Business cycle variations in exchange rate correlations: Revisiting global currency hedging

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Abstract

We revisit the main findings of Campbell et al. (2010) and Schmittmann (2010) covering an extended period from 1975 to 2016 and add a business cycle split. While we can confirm most of the results in the extended sample period, the role of the euro as a reserve currency vanishes during the financial crisis. The business cycle split shows there are differences in optimal hedge ratios between expansions and recessions for the euro and the other currencies investigated. These unstable correlations between asset returns and exchange rates should be considered carefully when aiming at volatility-minimizing hedge ratios of international investments.

JEL-codes: F31, G11, G15

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1 Introduction

International diversified portfolios can generate positive foreign asset returns and, hence, decrease the systematic risk due to the nonsynchronous movements of economies. However, this risk minimization is accompanied by currency risk stemming from fluctuations in the underlying currencies of international positions. Thus, investment performance depends on the exchange rate between foreign and domestic currency. This can be beneficial for the investor if the domestic currency depreciates when closing the position, but potential returns may also be diminished by exchange rate losses if the domestic currency appreciates.

There are discrepancies in the academic literature with respect to the implications of currency hedging. While earlier studies debate the free lunch regarding returns from simple currency hedging, i.e., returns are not reduced when applying simple hedge ratios (e.g., Eun & Resnick (1988), Perold & Schulman (1988), Black (1989), Glen & Jorion (1993)), more recent studies point out that the correlation between exchange rates and foreign asset returns is an important factor to consider in forming optimal hedge ratios (Campbell et al. (2010), Schmittmann (2010)). Optimal hedge ratios based on the correlation between exchange rates and asset returns can minimize the volatility of international portfolios. Furthermore, while correlations between equity returns and exchange rates are unstable over the sample period and, thus, hedge ratios are currency-specific, full hedging of international portfolios is optimal in almost every case. Comparing the results of Campbell et al. (2010) and Schmittmann (2010) in regard to certain currencies, we find that their findings differ to some extent. Campbell et al. (2010) show that the hedging property of the US dollar declines for risk-minimizing stock investors over time, while active exposure in the euro becomes better since it moves anti-cyclically to global stock markets and this effect becomes even stronger in the latter part of the sample lasting until 2005. However, Schmittmann (2010) points out that this relationship no longer existed after the start of the financial crisis in 2007 and the euro became pro-cyclical. These time-dependent correlations between exchange rates and asset prices must be considered in more detail, as they concern every corporation facing currency risk.

Thus, we reassess and combine the empirical analyses of Campbell et al. (2010) and Schmittmann (2010) with an extended data set ranging from January 1975 to December 2016. We can confirm the majority of their results except for a clear pattern in the optimal hedge ratios of euro investments. Subject to an investor’s origin and the subperiod, the hedge ratio can be positive or negative. To account for the inconsistency in the results of the base studies and to further benefit from our long sample period, we split its subject into NBER business cycles and find only limited evidence for the euro being a safe haven currency during recessions. In line with the authors, both the US dollar and the Swiss franc have negative hedge ratios, implying active currency exposure, and, therefore, seem to be a better natural hedge in economic downturns. This suggests that underhedged foreign positions in the euro might lead to significant return losses, since the currency loses value at the same time as global asset markets do in recessions.

Therefore, our study shows that when developing strategies to cope with currency risk, it is necessary to take into account the current state of the business cycle. This cycle-dependency in optimal hedge ratios is of great importance for all financial and nonfinancial institutions facing...
currency risk in their operations. For any of those companies hedging against unfavorable exchange rate developments, this may be value creating. In determining risk management strategies, our results imply that periodically adjusting hedge ratios based on the business cycle may be a sensible strategy.

2 Data and Methodology

We use a similar set of data also utilized in the base studies and extend the sample period to cover monthly data on spot exchange rates, equity and bond returns as well as 3-month bank deposit rates from January 1975 to December 2016. We consider seven developed countries as investment perspectives and destinations: Australia, Canada, Germany, Japan, Switzerland, the United Kingdom and the United States. For equity returns, we apply the MSCI Standard Total Return Index for every country taken into account in the analysis, and for bond returns, we use 10-year government bonds. Following Campbell et al. (2010), before 1999 the German mark is a good proxy for the euro, thus replacing the euro in the case of German exchange rates. The forward premiums of hedged returns are based on 3-month deposit rates, since they are close to the true exchange-rate-based forward premiums (Schmittmann (2010)).

In terms of the analyses, we follow Campbell et al. (2010) and Schmittmann (2010), calculating rolling returns of overlapping monthly observations with one-quarter investment horizons and computing simple, optimal and conditional hedge ratios for single and multicountry equity and bond portfolios.

Additionally, aiming at providing further insights into the reversal of correlations of the euro during the recent financial crisis, we split the sample period into recessions and expansions defined by NBER business cycles, which are representative of global business cycles. In doing so, a period from a peak to a trough is defined as a recession, while expansions last from a trough to a peak. This results in five business cycles, where the first date is the peak month, and the second date the trough month: 01/1980–07/1980, 07/1981–11/1982, 07/1990–03/1991, 03/2001–11/2001, 12/2007–06/2009. The global multicountry portfolios include equal weights of stock and bond market indices. Optimal hedge ratios are derived with an OLS regression of the quarterly unhedged returns of the equally weighted global portfolio on the exchange rate returns minus the forward premium. This way, we can fully exploit natural hedges based on the correlation between exchange rate movements and asset returns. We correct the standard errors for autocorrelation due to overlapping intervals using the Newey-West procedure.

3 Empirical Reassessment and Extension for Business Cycles

Starting with general results on the value of hedging, our findings are broadly in line with those of Campbell et al. (2010) and Schmittmann (2010). Outlining the most important but unreported results, from a risk-minimizing point of view, full hedging, even if it has no effect on returns, significantly lowers the volatility. This is more pronounced for bond investments than for equity investments due to the dominance of exchange rate risk in the variance of unhedged bond returns.

Hedge ratios conditional on interest rate differentials for equity and bond investments are usually positive, implying active hedging of open positions. However, hardly any coefficient is statistically
significantly different from zero. This minor effect of conditional currency hedging is in line with Campbell et al. (2010).

When taking into account the correlation between equity returns and exchange rates, optimal hedge ratios are significantly positive for equity positions in the Australian dollar, Canadian dollar, Japanese yen and British pound, while active exposure in the Deutsche mark/euro, Swiss franc and US dollar is optimal, irrespective of investment origin. Moreover, multicountry bond portfolios should be fully hedged to reduce exchange rate volatility. When splitting the sample period into two subperiods based on the level of inflation and interest rates (01/1975 – 12/1995 and 01/1996 – 12/2016), we find some developments over time. In line with Campbell et al. (2010), we show that the optimal hedge ratios of Deutsche mark and Swiss franc equity positions become more negative, since these currencies become more competitive with the US dollar regarding their risk-minimizing ability. In addition, the mathematical sign of the hedge ratio for the Australian dollar, Canadian dollar, British pound and US dollar remains constant, and only the magnitude becomes larger in the second subperiod for equity investments. Further, full hedging of international bond portfolios is optimal during both subperiods.

However, while Campbell et al. (2010) do not include the financial crisis of 2007–2009 in their sample, Schmittmann (2010) finds a positive correlation of the euro and stock market returns between 2007 and 2009. This demonstrates a shift in the attractiveness of the euro as a reserve currency from before to after the start of the financial crisis, considering that the full sample period underestimates the impact of unusual market conditions during recessions, when exchange rate volatility and correlations of currencies with stock markets are high. This result leads us to investigate not only this particular crisis but also to split the sample period into business cycles. Table 1 shows the results.

Table 1: Optimal Hedge Ratios of Multi-Country Portfolios in Recessions and Expansions

<table>
<thead>
<tr>
<th>Country</th>
<th>Germany</th>
<th>Japan</th>
<th>Switzerland</th>
<th>United Kingdom</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>E</td>
<td>R</td>
<td>E</td>
<td>R</td>
<td>E</td>
</tr>
<tr>
<td><strong>Equity portfolio</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>German investor</td>
<td>-</td>
<td>-</td>
<td>3.03</td>
<td>2.43***</td>
<td>-0.50</td>
</tr>
<tr>
<td>Bond portfolio</td>
<td>-</td>
<td>-</td>
<td>(0.48)</td>
<td>(0.10)</td>
<td>(0.25)</td>
</tr>
<tr>
<td><strong>Bond portfolio</strong></td>
<td></td>
<td></td>
<td>2.39**</td>
<td>0.49</td>
<td>1.42</td>
</tr>
<tr>
<td>Japanese investor</td>
<td></td>
<td></td>
<td>(0.14)</td>
<td>(0.09)</td>
<td>(1.07)</td>
</tr>
<tr>
<td><strong>Equity portfolio</strong></td>
<td></td>
<td></td>
<td>3.70</td>
<td>1.28**</td>
<td>3.18**</td>
</tr>
<tr>
<td>Bond portfolio</td>
<td></td>
<td></td>
<td>-0.47</td>
<td>-0.08</td>
<td>-0.29</td>
</tr>
<tr>
<td>Swiss investor</td>
<td></td>
<td></td>
<td>-13.00**</td>
<td>-0.28</td>
<td>5.11</td>
</tr>
<tr>
<td>Equity portfolio</td>
<td></td>
<td></td>
<td>-0.67</td>
<td>-0.15</td>
<td>(-0.55)</td>
</tr>
<tr>
<td>Bond portfolio</td>
<td></td>
<td></td>
<td>-11.01**</td>
<td>0.45</td>
<td>0.69</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(-0.65)</td>
<td>(-0.3)</td>
<td>(-0.09)</td>
</tr>
</tbody>
</table>
The monthly data cover the full sample period from 01/1975 to 12/2016. The table shows the risk-minimizing hedge ratios of multicountry portfolios depending on business cycles. The standard errors are corrected for autocorrelation due to overlapping intervals using the Newey-West procedure. The table differentiates between recessions (R) and expansions (E), where months between the recessions are expansions. The asterisks mark the coefficients for which the null hypothesis of one can be rejected at the 1%, 5%, and 10% significance levels.

For the sake of brevity, we leave out the Canadian dollar and Australian dollar in terms of investment origin and destination in this table, even though they were part of the analysis. In general, from almost all investment perspectives, optimal hedge ratios for currency exposures in Australian, Canadian, Japanese and UK stocks are higher in recessions than in expansions. In contrast, optimal hedge ratios for currency exposures in Swiss and US stocks are mostly lower and even more negative in recessions. Thus, in line with findings on general hedge ratios without the business-cycle split, the risk-minimizing strategy of underhedging the safe haven currencies Swiss franc and US dollar and overhedging the pro-cyclical currencies Australian dollar, Canadian dollar, Japanese yen and British pound enhances during recessions. However, hedge ratios of investments in German stocks decrease during recessions compared with expansions but are not significantly smaller than one for the majority of investors. We compute unreported correlation coefficients that reveal a positive relationship between German stock market returns and exchange rates with all other currencies during and after the financial crisis. Consequently, even though hedge ratios for German equity investments are smaller in recessions than in expansions, the value of the euro in terms of a natural hedge is only limited. In contrast to Campbell et al. (2010), we cannot prove that the euro displaces the US dollar as a safe haven currency during recessions since we show an increasing attractiveness of the US dollar.

The optimal hedge ratios of global bond portfolios are on average lower than they are for stock portfolios. In expansions, hedge ratios are close to zero while being more pronounced in recessions. However, changes in optimal hedge ratios between expansions and recessions are not consistent and estimates are only occasionally significant.
4 Conclusion

There are two main results from this paper. First, the trends already indicated in Schmittmann (2010) are persistent in our study. Whereas in Campbell et al. (2010), the demand for the euro as a reserve currency has increased in the second part of the sample period, the effect is reversed with the beginning of the financial crisis. This trend persists even to the end of our sample period. This might be caused by a loss of trust subject to the sovereign debt crisis following the financial crisis.

Second, the business cycle split shows there are differences in terms of the hedge ratios between expansions and recessions not only for the euro but also for the other currencies investigated. These unstable correlations between asset returns and exchange rates must be considered carefully when aiming at volatility-minimizing hedge ratios of international investments. Thus, we would strongly recommend that every financial institution facing currency risk reconsider their currency hedging strategies according to the state of the business cycle to benefit optimally from natural hedges.

Bibliography


