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Intertemporal risk-return trade-off in foreign exchange rates[☆]

Charlotte Christiansen

CREATES, School of Economics and Management, Aarhus University, Bartholins Alle 10, 8000 Aarhus C, Denmark

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ABSTRACT

We investigate the intertemporal risk-return trade-off of foreign exchange (FX) rates for ten currencies quoted against the USD. For each currency, we use three risk measures simultaneously that pertain to that currency; its realized volatility, its realized skewness, and its value-at-risk. We apply monthly FX excess returns and risk measures calculated from daily observations. We find that there is a significant contemporaneous risk-return trade-off for the currencies under investigation. There is no evidence of noncontemporaneous risk-return trade-off. We pay special attention to the risk-return trade-off during the recent financial crisis.

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1. Introduction

Since Merton (1973) there has been a focus on the risk-return trade-off at the stock market: a positive risk-return relationship implies that the higher the risk is, the higher is the expected return. Recently, the risk-return relationship on the stock market has seen a renewed investigation relying on cross sectional studies, cf. e.g. Ang et al. (2006, 2009) as well as on intertemporal studies, cf. e.g. Bali (2008) and Bali et al. (2009).

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E-mail address: CChristiansen@creates.au.dk

In contrast to the stock market, the intertemporal risk-return relationship for the FX market is yet largely unexplored. We set out to fill this gap. In particular, we rely on time series analysis to study the intertemporal risk-return relationship on the FX market. It is not a matter of course that the risk-return relationship is similar for the FX and stock market. In fact, [Park and Irwin \(2004\)](#) review many studies that show that the FX market differs from the stock market in its profitability in technical trading rules, which are especially profitable for the FX market. This indicates that the FX market is less efficient than the stock market. Moreover, the FX market differs from the stock market in that FX returns are subject to central bank interventions that increase the systematic risks, cf. [Sweeney \(2007\)](#).

The current paper is related to [Guo and Savickas \(2008\)](#) who forecast future FX returns using a linear model where the explanatory variables are various financial variables, including idiosyncratic stock market volatility. [Guo and Savickas \(2008\)](#) apply quarterly data for six foreign exchange rates against the USD. They find a strong relationship between the FX returns and stock market volatility. [Lustig and Verdelhan \(2007\)](#) consider the risk-return trade-off on currencies using portfolios sorted on interest rates. They find a cross sectional risk-return relationship where the risk is measured by consumption growth risk. In contrast to these papers, we investigate the FX risk-return relationship using FX own risk measures. Using own risk measures enable us to compare more directly with the risk-return findings that apply to the stock market, but still remembering the differences between the stock and FX markets, cf. [Park and Irwin \(2004\)](#) and [Sweeney \(2007\)](#).

A recent strand of the international finance literature analyzes FX carry trade strategies; that is self-financing portfolios consisting of long positions in currencies with high interest rates and short positions in currencies with low interest rates. The carry trade literature provides us with some useful risk measures to apply in the risk-return analysis. [Christiansen et al. \(forthcoming\)](#) use a smooth transition model to show that typical FX carry trade strategies have much higher exposure to the stock market and are mean reverting when FX volatility is high. Their findings suggest that FX excess returns are related to the FX volatility (their state variable). [Brunnermeier et al. \(2009\)](#) find evidence that sudden changes in exchange rates are related to unwinding of carry trade strategies due to funding constraints by the investors. They forecast future realized FX skewness (interpreted as crash risk) by interest rate differentials (foreign minus US interest rate) and FX excess returns. So, their findings suggest that it is of interest to use the FX skewness as another risk measure. [Burnside et al. \(2008\)](#) propose that carry trade strategies give high average payoffs due to peso problems, namely extreme and rare events. Their findings imply that value-at-risk is a promising risk measure.

We consider ten currencies of developed countries (all measured against the USD). The sample covers the period January 1987–July 2009. We use daily exchange rates to calculate three monthly risk measures for each currency; the realized volatility, the realized skewness, and the value-at-risk. We investigate if the three risk measures are jointly able to explain the excess FX return using linear time series models. We find a strong contemporaneous risk-return relationship for all currencies under investigation. We find only limited evidence of noncontemporaneous risk-return relationships. It is important to consider all three risk measures simultaneously. Finally, we investigate if the current financial crisis has an effect upon the FX risk-return relationship. We confirm this conjecture.

The remaining part of the paper is structured as follows. In Section 2 we introduce the data. The econometric specification is laid out in Section 3 and the empirical results are discussed in Section 4. Finally, Section 5 concludes.

2. Data

2.1. Construction of risk and return measures

The analysis is done on a monthly frequency, yet we use daily data to calculate monthly risk measures. The sample covers the period January 1987–July 2009, thus we have 269 monthly observations. We consider the following currencies all measured as number of foreign currency units per US dollar (USD): Australian dollar (AUD), Swiss franc (CHF), Canadian dollar (CAD), Danish krone (DKK), euro, UK pound (GBP), Japanese yen (JPY), Norwegian krone (NOK), New Zealand dollar (NZD), and Swedish krona (SEK). The exchange rates are available from DataStream. Before 1999 we use the German mark (DEM) in place of the euro.

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