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Asset pricing and foreign exchange risk

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ABSTRACT

According to the International Capital Asset Pricing Model (ICAPM), the covariance of assets with foreign exchange currency returns should be a risk factor that must be priced when the purchasing power parity is violated. The goal of this study is to re-examine the relationship between stock returns and foreign exchange risk. The novelties of this work are: (a) a data set that makes use of daily observations for the measurement of the foreign exchange exposure and volatility of the sample firms and (b) data from a Eurozone country.

The methodology we make use in reference to the estimation of the sensitivity of each stock to exchange rate movements is that it allows regressing stock returns against factors controlling for market risk, size, value, momentum, foreign exchange exposure and foreign exchange volatility. Stocks are then classified according to their foreign exchange sensitivity portfolios and the return of a hedge (zero-investment) portfolio is calculated. Next, the abnormal returns of the hedge portfolio are regressed against the return of the factors. Finally, we construct a foreign exchange risk factor in such manner as to obtain a monotonic relation between foreign exchange risk and expected returns.

The empirical findings show that the foreign exchange risk is priced in the cross section of the German stock returns over the period 2000–2008. Furthermore, they show that the relationship between returns and foreign exchange sensitivity is nonlinear, but it takes an inverse U-shape and that foreign exchange sensitivity is larger for small size firms and value stocks.

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1. Introduction

The research area around asset pricing has undoubtedly been one of the most important and at the same time challenging fields within financial economics. Since the second half of the last century, more and more academics across the world have been dealing with the detection of risk factors which capture the cross-section of average stock returns. The objectives of these attempts focus on the identification of the variables which proxy for common risk factors, the theoretical foundation of the relation between potential risk factors and stock returns, and the modeling of the systematic risk using econometric methods.

Over the past decade a new asset pricing model, namely the Three Factor Model (3FM), proposed by Fama and French (1993), has attracted the attention of the academic community because of its ability to best capture the stock return variation as compared to the CAPM. The empirically motivated 3FM predicts that the expected excess return on a portfolio of securities is explained by its sensitivity to three factors: (i) the excess returns on the market portfolio (the market factor), (ii) the difference between the returns on a portfolio of small capitalization stocks and the return on a portfolio of big capitalization stocks (SMB or the size factor) and (iii) the difference between the returns on a portfolio of high book-to-market equity ratio (BE/ME) stocks and the return on a portfolio of low book-to-market stocks (HML or the value factor). Carhart (1997) proposes a fourth factor that controls for momentum (WML), resulting in the extended four factor (4FM) version of the model.

Both models are in the center of numerous empirical studies, which aim to test their statistical significance, their theoretical background and their validity. In general, most studies have been supportive of the models (Hawawini and Keim, 1995; Heston et al., 1995; Fama and French, 1998; Halliwell et al., 1999; Davis et al., 2000; Berk, 2000; Pastor and Stambaugh, 2000; Connor and Sehgal, 2001; Gaunt, 2004; Bilinski and Lyssimachou, 2004; Bauer, 2007). However, there are studies which challenge the ability of the 3FM or 4FM to describe the average stock returns, rejecting the presence of size, value or momentum effects (Black, 1993; Lakonishok et al., 1994; MacKinley, 1995; Daniel and Titman, 1997).

The 4FM focuses only on the value, size and momentum premium, ignoring other risk factors that might have a significant contribution in the cross section of stock returns, such as the foreign exchange risk.

The main objective of this paper is to provide evidence of whether the foreign exchange risk is an asset pricing factor by exploring the effect that a foreign exchange mimicking factor portfolio has in explaining the cross sectional variation of stock returns. The methodology we use is based on the work by Fama and French (1993), Carhart (1997) and Kolari et al. (2008), forming the size, value, momentum and foreign exchange mimicking factor portfolios as to explain the returns of the sample stocks.

The novelties of this work are the extension of the asset pricing tests by the use of: (a) a data set from the Eurozone, contributing in this way the necessary accumulation of non-US research and (b) daily observations for the measurement of the foreign exchange exposure of the sample firms and the size, value, momentum and foreign exchange, mimicking factor portfolios as opposed to the majority of the literature that use monthly observations.

Specifically, the present study focuses on the Eurozone and by doing so it uses data from Germany which is the most important country in terms of economic significance. The rationale for choosing Germany is twofold. First, Germany was the largest economy in the Eurozone in terms of gross domestic product (GDP), the largest importer and exporter during all years of the research (OECD Statistical Extracts). Second, the German stock exchange (Deutsche Börse) was the largest in terms of number of firms listed and total market capitalization for the whole time period of the research, according to the World Federation of Exchanges database (www.world-exchanges.org).

The present study uses the time-series regression approach of Black et al. (1972). However, instead of using monthly excess returns, daily excess returns, of the sample stocks regressed to a market portfolio and mimicking portfolios for size, BE/ME, momentum and foreign exchange risk factors are used. According to Fama and French (1993), the time-series regression coefficients are factor loadings that have a clear interpretation as risk-factor sensitivities for stocks. The time-series regressions approach, in contrast to cross-section regressions, gives us the chance to answer two important asset pricing questions: (i) whether the mimicking portfolio related to the foreign exchange risk captures shared variation in stock returns, not explained by other factors and (ii) whether the research model is a

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