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The impact of currency movements on asset value correlations



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ABSTRACT

This paper looks at the asset correlation bias resulting from firms' assets and liabilities being denominated in different currencies. It focuses on the time-variation in the bias and on the dependency of the bias on currency movements. Overall, we find that the asset correlation bias for the average pair of firms in the Dow Jones Industrial Average index is significant. The bias fluctuates widely, however, and it has turned negative for shorter periods. The policy implication of the paper is that by ignoring the exchange rate component when computing portfolio credit risk one may materially underestimate the actual risk.

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1. Introduction

For the average bank, the risk category that is the most important to manage accurately is credit risk. In order to monitor this risk the typical bank puts much effort into assessing the likelihood that its counterparties will not honor their future contractual obligations. For corporate counterparties (firms) this risk is often estimated using quantitative models, such as the Merton (1974) model. In

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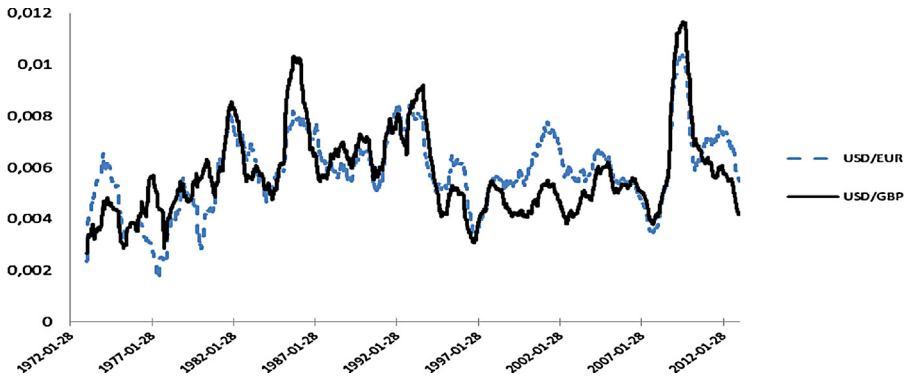


Fig. 1. The volatility of the two USD exchange rates USD/EUR and USD/GBP from 1973 to 2013.

these models the main focus is on the firm's assets and on the likelihood that the market value of these assets falls below the value of the firm's debt at some point in the future. Since banks rarely, or never, lend to one single firm but to a large number of firms, the banks spend much time and money on estimating how the credit risk of one borrower affects the credit risk of other borrowers. This "portfolio perspective" to credit risk modeling requires quantitative estimates of credit risk dependencies and the most commonly used proxy for this dependency is the, so-called, asset correlation.

The asset correlation is simply the correlation between two borrowing firms' asset values and the higher this correlation is the larger the credit risk is when lending to both firms simultaneously. One complication that arises when focusing on correlations between asset values is that asset values are not observable. While the value of a firm's equity is instantaneously available to everyone through the stock market, the asset value is not. Instead, asset values have to be estimated using models, for instance the above-mentioned [Merton \(1974\)](#) model.

In this paper we focus on another important issue when assessing firms' credit risk; namely the risk that currency movements affect the value of the firms' assets. This risk appears when firms have some, or all, of its assets denominated in another currency than its debt. Not only does this currency mismatch affect the likelihood that the firm will default, due to the additional layer of exchange rate risk put on top of the original credit risk, but it also affects the default dependency, i.e. the asset correlation, amongst firms. If the firms have significant portions of their assets denominated in a foreign currency, these firms' asset correlation will typically be biased upwards. As will be shown below, the bias increases not only with the amount of assets held abroad but also with the volatility of the exchange rate as well as with the correlation between the assets and the exchange rate. Now, the volatility of many of the major exchange rates has increased over time and two examples are shown in [Fig. 1](#). This, plus the widespread "risk-on, risk-off" mentality among investors as of lately, with an associated hike in most financial correlations, is likely to have increased the economic significance of the bias.

The first study to acknowledge the issue of currency risk in credit risk modeling is [Tasche \(2007\)](#). While [Tasche \(2007\)](#) derives an analytical relationship that has to hold between asset correlations with and without currency risk he presents no empirical results and does not estimate the actual real-life size of the currency-risk-induced asset correlation bias. To assess the economic importance of the bias, [Byström \(2013\)](#) builds on the theoretical findings in [Tasche \(2007\)](#) and empirically estimates the asset correlation bias for a sample of US firms in different industrial sectors. [Byström \(2013\)](#) finds the bias to be positive and large enough to potentially result in a significant underestimation of actual portfolio credit risk.

In this article we focus on the exchange rate and on how the time-series behavior of the exchange rate affects the asset correlation bias. Particular emphasis is put on the time-variation of the bias, and the fluctuations of the empirically estimated asset correlation bias are compared to the theoretically predicted relationship between the bias and the exchange rate movements. The main finding is that

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