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Linear and nonlinear foreign exchange rate exposures of German nonfinancial corporations

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Abstract

This paper investigates whether the low significance of the impact of foreign exchange rate risk on firm value reported in previous studies can be explained by the fact that only the linear exposure component has been estimated or that exchange rate indices were used. For a comprehensive sample of German firms, empirical evidence is presented for the existence of significant linear and nonlinear exposures, which can be identified for bilateral as well as multilateral foreign exchange rates. The percentage of foreign sales, measures of firm liquidity and industry sectors are significant determinants of the exposure.

JEL classification: G3; F4; F3

Keywords: Foreign exchange rates; Exposure; Corporate finance; Risk management; Derivatives

1. Introduction

The foreign exchange rate exposure of nonfinancial firms is a contentious issue. Financial theory predicts an impact of foreign exchange rate risk on firm value due to corporate foreign currency cash flows originating, for example, from export and import transactions, foreign debt, cash flows of foreign subsidiaries and foreign portfolio investments. Moreover, more complicated exposures may result from the effect unexpected foreign exchange rate changes have on sales prices and quantities, production costs, market share and, thus, the competitive position of a firm

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(e.g. Levi, 1994). Contrary to expectations, a significant impact of foreign exchange rate risk on firm value can be found for only a small number of corporations (e.g. Bartov and Bodnar, 1994; Chow et al., 1997; Griffin and Stulz, 2001; He and Ng, 1998; Jorion, 1990), a finding which has been perceived as the "exposure puzzle."

While many studies look at the exposure of U.S. corporations, firms in other countries (e.g. Japan, Europe, Australia) have become subject to investigation more recently. This paper presents a comprehensive study of the foreign exchange rate exposure of a large sample of German nonfinancial corporations. While German firms have not been subject to a broad empirical analysis, they lend themselves particularly well to the study of the exposure phenomenon since Germany is a very open economy that depends more than other countries, including the United States and Japan, on international business (as measured by exports or imports relative to Gross Domestic Product (GDP)).

Several potential explanations exist for the low significance of the results of previous studies. Most importantly, existing studies investigate almost exclusively linear foreign exchange rate exposures. While the assessment of linear exposures has been motivated for hedging with forwards and futures, i.e. instruments with a linear payoff structure (Adler and Dumas, 1984), there exist also risk management instruments with nonlinear payoff profiles, such as options or portfolios of options. Since financial theory predicts that the exposure of firms may have a nonlinear component due to nonlinear relationships between corporate cash flows and exchange rates (e.g. Giddy and Dufey, 1995; Kanas, 1996a; Kanas, 1996b; Sercu and Uppal, 1995; Stulz, 2003; Ware and Winter, 1988), the assessment of nonlinear exposures has important implications for corporate risk management. Another reason for insignificant foreign exchange rate exposures might exist in the use of foreign exchange rate indices for exposure estimation because the weighting of different foreign exchange rates in the indices is not representative for the individual firm. Additionally, the aggregation of several currencies may lead to diversification effects, which reduce the statistical significance of the exposures since changes in individual currencies may partially offset each other.

Motivated by these potential shortcomings in the empirical exposure literature, this paper offers a re-investigation of the foreign exchange rate exposure phenomenon using a new data set and improved methodologies. The study analyzes the exposure of 447 publicly traded nonfinancial corporations in Germany during the period 1981–95. The results show some significance for linear exposures of German corporations with regard to the currencies of Germany's most important trading partners. In addition, nonlinear exposures are substantially more statistically significant for all foreign exchange rates. These results persist even when excluding the largest exchange rate movements. Sign/size bias tests and partially nonparametric regressions yield supporting evidence to corroborate the nonlinear feature of the exposure. Interestingly, multilateral foreign exchange rates do not cause excessive diversification effects precluding the identification of significant exposures for German firms. The ratio of foreign sales to total sales, firm liquidity and industry sectors constitute empirically significant determinants of the foreign exchange rate exposure.