Unconditional and conditional exchange rate exposure

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A B S T R A C T

We re-examine the relationship between exchange rate movements and firm value. We estimate the exchange rate exposure of U.S. firms to two currency indices. Firms are clustered into eleven industries. The sample includes exporters and non-exporters. Using a panel approach, we uncover statistically significant and sizable unconditional exposure. We also examine the dynamics of exchange rate exposure modeled as a function of business cycle indicators and firm characteristics. We find that exposure varies over time with macroeconomic and financial variables and increases during economic contractions. Deviations from the unconditional measure of exposure driven by the macroeconomic variables are economically meaningful.

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1. Introduction

Adler and Dumas (1984) define foreign exchange (FX) economic exposure as the sensitivity of the firm's returns to unexpected changes in real exchange rates. The extant literature finds a puzzling weak relationship between exchange rates and returns.[2] There are several reasons that render identifying and estimating the FX exposure difficult. First, methodology matters in how exposure is measured.[3]

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  [1] Tel.: +41 (0) 22 379 8568; fax: +41 (0) 22 379 8104.
  [2] Jorion (1990), Amihud (1994), Bartov and Bodnar (1994), Choi and Prasad (1995), and Griffin and Stulz (2001) among others, find a weak link between exchange-rate fluctuations and stock returns of US firms with international activity. Doidge et al. (2006) find evidence for economically sizeable exposure. Jorion (1990), He and Ng (1998), and Dominguez and Tesar (2006), among others, uncover cross-sectional variation in exposure. Exposure is correlated with firm size, the degree of hedging motive, foreign sales, and competitiveness at the industry level.
  [3] Bartov and Bodnar (1994), Bodnar and Wong (2003), Dominguez and Tesar (2001, 2006), and Priestley and Ødegaard (2007) among others, examine implications of differences in research designs, such as sample selection, return measurement horizon, model specification, and choice of the exchange rate, on the measure of exposure.

Second, exposure is temporally unstable.[4] Third, exposure is measured net of operational and financial hedging.[5] Ignoring any of these issues could understate the statistical significance or the economic importance of exposure.

Our contribution is twofold. First, using a panel approach in an unconditional setup, we find evidence of statistically significant and economically important exposure for U.S. firms. Second, in a conditional setup, we show that currency exposure varies over time with financial business cycle indicators and macroeconomic variables and increases in periods of contractions.

We measure industry level exposure and its dynamics using firm level data as opposed to industry indices. We cluster individual firms into industry panels and explicitly allow for heterogeneous exposure of firms within the same industry. Our approach is meaningful economically and statistically. Economically, an unexpected change in the exchange rate should affect industry's competitiveness but not equally affect each firm within the same industry.[6] Statistically, the use of a panel model takes advantage of expanded observations to yield greater testing power and higher precision in estimation. It also overcomes the potential loss of information and bias induced by grouping firms. The results of the methodology augment the traditional firm-by-firm approach. They provide a manager with industry exposure benchmarks useful to better manage operations and possibly design more effective hedging strategies.

We study the universe of US firms from COMPUSTAT over the period 1973–2005 using quarterly data. The sample includes firms with international involvement and purely domestic firms.[7] The latter could be indirectly exposed through for instance import-competing. We measure exposure to two trade-weighted real currency indexes: the major index (MJ) and the other important trading partners (EM) index.

In a static framework, we find that exposure is statistically significant and economically important. We first replicate the well known puzzling finding of a low proportion of firms significantly exposed as in Jorion (1990).[8] However, panel regressions show that the results from the individual firms regressions do not imply that exposure is unimportant or insignificant. Taking into account the joint evidence from the cross-section of firms we find statistically significant and sizable unconditional exposure in most industries. We also provide a detailed statistical analysis of the exposures by introducing additional controls, examining exporters and non-exporters, and by looking at two sub-periods. We then relate our findings to some stylized facts and statistics about the industry trade balance of US industries by region. We uncover significant changes of the exposure over time. These results motivate the analysis of the dynamics of exposure that we discuss next. Importantly, the changes in exposures are overall consistent with the changes in the trade balance for some industries. In addition, we analyze the cross sectional determinants of exposure. Exporters and non-exporters show noticeable qualitative similarities both in their level of exposure and the determinants of the exposures. Our findings show that firms with higher international involvement, that are smaller, that are more levered, or that have lower growth opportunities, are also more exposed.

Our second contribution is to relate the dynamics of exposure to the business cycle. Several studies examine time variation in exposure using subperiod dummies (see e.g. Williamson, 2001; Parsley and

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[4] Levi (1994) argues that many factors could change over time introducing variability in the regression coefficients measuring exposure: The elasticity of demand might not be constant, the profitability of operations could change substantially over the business cycle, and the firm's hedging position could be influenced by financial market changes and other factors.

[5] Pantzalis et al. (2001) document the importance of financial and operational hedges for managing the exchange rate risk of US multinationals. Bartram et al. (2010) show that for a typical firm pass-through and operational hedging each reduce exposure by 10 percent to 15 percent and financial hedging reduces exposure by 45 percent to 50 percent. Other studies, such as Allayannis and Ofek (2001) and Simkins and Laux (1997), document significant negative relationships between exposures and the use of financial derivatives.

[6] Both theoretical and empirical works have shown that industrial structure affects exposure. See for example, Marston (2001), Bodnar et al. (2002) and Allayannis and Ihrig (2001).

[7] Previous work primarily focused on multinationals. Some studies, such as Dominguez and Tesar (2001, 2006), Starks and Wei (2006), and Doukas et al. (1999), measure exposure of all firms regardless of their degree of international activity. Aggarwal and Harper (2010) examine domestic firms that have no identifiable direct exposure to foreign exchange risk.

[8] Jorion (1990) finds that it is difficult to measure exposure coefficients precisely to distinguish them individually from zero. However, he rejects the hypothesis that they are jointly zero at standard significance levels.