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Can hedging tell the full story? Reconciling differences in United States aggregate- and industry-level exchange rate risk premium ☆

Bill B. Francis [a], Iftekhar Hasan [a b], Delroy M. Hunter [c]

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Abstract

While the importance of currency movements to industry competitiveness is theoretically well established, there is little evidence that currency risk impacts US industries. Applying a conditional asset pricing model to 36 US industries, we find that all industries have a significant currency premium that adds about 2.47 percentage points to the cost of equity and accounts for approximately 11.7% of total risk premium in absolute value. Cross-industry variation in the currency premium is explained by foreign income, industry competitiveness, leverage, liquidity, and other industry characteristics, while its time variation is explained by US aggregate foreign trade, monetary policy, growth opportunities, and other macro variables. The results indicate that methodological weakness, not hedging, explains the insignificant industry currency risk premium found in previous work, thus resolving the puzzle that currency risk premium is important at the aggregate stock market level, but not at the industry level.

Introduction

The dismantling of the fixed exchange rate system in the early 1970s led to a tremendous increase in the volatility of exchange rates (Bartov, Bodnar, and Kaul, 1996). Since then, purchasing power parity has been overwhelmingly rejected (see Frankel and Rose, 1995), implying that corporations and industries should be affected by currency risk (Frenkel, 1981; Froot and Klemperer, 1989; Rogoff, 1996). Empirical research on whether corporations or industries or both are affected by currency risk has taken a two-pronged approach. The first approach, which is the focus of the majority of papers, tests the effect of exchange rate changes on ex post stock returns. These papers assume that ex post returns proxy for cash flows and regard evidence of an exchange rate effect as a cash flow effect on firm value. This line of research generally concludes that

exchange rate movements do not statistically or economically significantly affect the cash flows of either individual firms or industries.[1]

The second approach focuses on ex ante expected returns. It is motivated by the fact that currency risk could be a priced factor in ex ante expected returns and currency risk premium could be a large component of the cost of equity (Solnik, 1974; Adler and Dumas, 1983), even if exchange rate changes have no effect on ex post returns. Surprisingly, even in light of the weak results from the first approach, few studies attempt to examine this alternative channel of exchange rate risk on firms and industries. Moreover, those that do, find that currency risk is not significantly priced and that currency premium is not materially different from zero (see Jorion, 1991).

Both sets of results are puzzling. If, in fact, ex post returns proxy for cash flows, then the results from the first approach are inconsistent with evidence from practitioners that exchange rates significantly affect firm and industry profitability. For instance, Hung (1992) estimates that due to exchange rate movements US manufacturing firms lost about $23 billion, or 10% of gross profits, per year during the 1980s. Similarly, financial journalists regularly link firm performance to the value of the dollar.[2]

The results from the second approach is even more puzzling because, while they fail to show that exchange rate risk is priced at the industry level, Dumas and Solnik (1995), De Santis and Gerard (1998), and Carrieri, Errunza, and Majerbi (2006) find that currency risk is priced at the more aggregated stock market level and that currency risk premium accounts for about 20% of total risk premium in the US stock market (Carrieri, Errunza, and Majerbi, 2006).

In this paper, we examine if both developing and industrialized countries' currency risks are priced and whether they give rise to an economically significant currency risk premium in the ex ante expected returns of US industries. Following the long-established tradition of empirical research examining exchange rate effects (see Jorion, 1991; Bodnar and Gentry, 1993; Allayannis, 1997; Griffin and Stulz, 2001; Williamson, 2001; Allayannis and Ihrig, 2001), the industry is the unit of analysis. This is because, despite the evidence of aggregate-level exchange rate effects, these papers do not reveal if and how this carries over to the more disaggregated industry level. Understanding how and if the aggregate results can be generalized to the industry level is important for the following reasons. First, countries compete vigorously in international trade and currency movements affect their ability to compete (Griffin and Stulz, 2001). A large component of the literature on Michael Porter's model of competitive strategy is based on the premise that industry-level analysis is more important than country-level analysis.[3] Further, if exchange rate exposure differs systematically between industries, but less so across countries, then examining industry-level exposure is more relevant to policymakers because, as argued by Westphal (1990) and Murtha (1991), it is optimal to target specific industries in response to competitive challenges from foreign trading partners. This industry focus is also consistent with the view that currency exposure is largely determined at the industry level (Marston, 2001).

Second, examining industry-level currency risk enhances an understanding of international integration beyond that which is possible with an analysis at the aggregate market level. This is because sensitivity to exchange rate movements is correlated with the level of international integration and Carrieri, Errunza, and Sarkissian (2004) show that industries, even within countries regarded as highly integrated internationally, vary widely in their level of integration and that integration (segmentation) at the country level does not preclude industry-level segmentation (integration).

Third, examining industry-level currency risk adds to the discussion that US investors can obtain international diversification benefits at home (Errunza, Hogan, and Hung, 1999). If, as is widely held,

international integration at the market level has increased in recent years, then cross-industry diversification on the basis of the level of industry currency exposure could improve the portfolio performance of US investors. To this end, this study not only explicitly identifies the industries with the largest currency risk premiums, but it also identifies if this risk premium is positive or negative.

Our analysis is comprehensive and proceeds as follows. First, using an approach that addresses a weakness of most of the existing research, we examine if currency risk is priced in the conditionally expected returns of industries and if the associated currency risk exposure and risk premium are time-varying.[4] Second, we estimate the magnitude of the currency risk premium and ascertain its economic importance in industry cost of equity. Third, we assess if industry characteristics, such as foreign income as a proportion of sales, industry competitiveness, leverage, and liquidity, explain the cross-sectional differences of industry currency risk premiums. Fourth, we examine the extent to which US foreign trade, aggregate growth opportunities, business cycle, tight monetary policy, and emerging market currency crises affect the time variation in industry currency risk premium.

Our approach allows us to distinguish between the two most likely explanations for the failure to find that industry returns contain a statistically and economically important exchange rate premium: weakness in the methodology used to address this issue and effective hedging of currency risk.[5] Previous empirical work that examines if industry expected returns contain a currency risk premium imposes constant parameters on the model (e.g., Jorion, 1991), although financial theory (Adler and Dumas, 1983) and economic intuition indicate that the effects of exchange rate risk change over time. Furthermore, it is now well established over a wide range of applications that constant-parameter models understate the importance of the estimated parameters relative to (conditional) models with time-varying parameters.[6] Thus, our methodological hypothesis contends that the lack of significant exchange rate premium arises from the use of fixed-parameter (unconditional) models that understate the importance of currency risk.

In contrast, the hedging hypothesis states that effective hedging eliminates currency risk premium in industry returns. If currency risk is priced at the stock market level and currency and stock markets are imperfectly integrated, then currency hedging can reduce industry cost of capital by eliminating the currency risk premium (Jorion, 1991). Though hedging could explain the insignificant currency premium in industry returns in previous papers, no attempt has been made to determine if in fact it does. This is despite the fact that currency risk is a systematic risk (Eun and Resnick, 1988) and well-established theories predict that hedging reduces risk (see Hentschel and Kothari, 2001, for references). More specifically, several theoretical and empirical papers show that currency hedging reduces currency risk (e.g., Eun and Resnick, 1988; Black, 1990; Glen and Jorion, 1993).

Bodnar, Hayt, and Marston (1998) and Allayannis and Weston (2001) provide evidence that firms hedge currency risk and suggest that this is the reason for the weak evidence of cash flow exposure. However, Guay and Kothari (2003) find that cash flows from hedging are small relative to firm size and operating or investing cash flows, and Hentschel and Kothari (2001) find no difference in risk between firms that hedge with derivatives and those that do not. It is therefore unclear if the finding of lack of exposure shown in the extant literature can be attributed to the hedging of currency risk.

To distinguish between these hypotheses we use changes in the trade-weighted exchange rate indices of the currencies of the industrialized and developing economies as our measure of currency risk. Trade with the industrialized countries constitutes the bulk of US foreign trade. However, trade with the developing economies has become increasingly important, growing from 31% of total trade in 1980 to about 42% in 1999 and 48% in 2006 (Federal Reserve, 2007). While it has been easy for US firms to hedge the exchange rate risk

of the currencies of the industrialized countries for a long time, it is only in the mid- to late 1990s that hedging instruments (futures and options) for the currencies of developing economies became available, and even currently they are still not readily available for the currencies of some of the larger developing economies. Furthermore, US firms have fewer natural hedges (e.g., local currency liabilities or assets or both) in the emerging markets compared with the industrialized countries. Hence, if hedging were the reason for the insignificant currency risk premium, then, despite the methodology, we should find that the currency risk premium associated with the currencies of the industrialized countries is not significantly different from zero, while the risk premium associated with the currencies of the developing economies is significantly different from zero.

Conversely, if the methodological hypothesis explains the previous weak results, then we should find significant currency risk premium associated with both currency indices. To ensure that we have estimated the model over a period in which hedging instruments were highly unlikely to be available for emerging market currencies, we present results for two subperiods, 1980–1989 and 1990–1999. If the exposures and premiums for both currency indices are significant and economically large in the first subperiod, then it is clearly not due to hedging that previous results find that currency risk is not priced.

We use a multivariate generalized autoregressive conditional heteroskedasticity (GARCH) framework to estimate a five-factor asset pricing model in which the factors are the market return, the return on the small minus big (SMB) and high minus low book-to-market value (HML) portfolios, and the changes in an index of real exchange rates from the industrialized economies and from the developing economies, respectively. The first exchange rate factor is a trade-weighted index of the 16 major currencies that trade freely outside of their country of issue (MAJOR), and the second is a trade-weighted index of the currencies of the other important trading partners (OITP) of the US (19 developing economies). The model is applied to 36 US industries (31 manufacturing industries and five nontraded goods industries).

We find that all 36 industries have statistically significant and economically large time-varying currency risk premium. On average, the currency risk premium adds 2.47 percentage points (in absolute value, annualized) to the cost of equity. The mean absolute currency risk premium is never less than 1 percentage point for any industry and reaches a maximum of 7.78 percentage points. When averaged across all industries, currency risk premium accounts for 11.7% of total risk premium, with a minimum of 5.7% and a maximum of 32.9%. For 18 of the 36 industries, currency risk premium constitutes more than 10% of the total risk premium. Both sets of currencies contribute to the currency risk premium, implying that hedging cannot explain the insignificant currency risk premium in US industry returns found in previous empirical work. In addition, over the subperiods of the 1980s and 1990s, no material difference emerges in our results. This provides further evidence in support of the methodological, not the hedging, hypothesis.

To summarize, in contrast to Jorion (1991) and others, we find strong evidence that exchange rate risk is priced and constitutes an economically large part of US industry expected returns. In addition, we resolve the puzzle in which De Santis and Gerard (1998) and others find that currency risk premium is a significant component of the total risk premium at the aggregate US stock market level yet researchers have failed to show the same at the industry level.

In other analyses, we find that industry characteristics, such as foreign income as a proportion of sales, industry competitiveness, leverage, and liquidity explain up to 30% of the cross-industry variation in currency premiums. Similarly, US foreign trade, growth opportunities, recessions, tight monetary policy, and the Mexican and Asian currency crises jointly explain anywhere from 0% to 78% of the time variation in currency risk premium, depending on the industry. These results have important implications for the global

competitiveness of US industries, and for how time variation in cash flow exposure is estimated, and they serve as an important model specification check not contemplated by previous work (De Santis and Gerard, 1998; Carrieri, Errunza, and Majerbi, 2006).

The studies closest to ours are De Santis and Gerard (1998) and Carrieri, Errunza, and Majerbi (2006). De Santis and Gerard find that the exchange rate risk of a few developed market currencies is priced at the aggregate stock market level for developed countries. Carrieri, Errunza, and Majerbi extend the work of De Santis and Gerard and show that emerging market currency risk is also priced at the aggregate level. Our work differs from these studies in the following ways. First, we estimate the effects of both industrialized and developing countries' currency risks on industry instead of on aggregate stock market returns. Our results simultaneously resolve the puzzle that their work raises (evidence of exposure at the aggregate but apparently not at the industry level) and distinguish between the most likely causes of this puzzle (hedging versus a bad model problem). Second, we explain the variation of the estimated currency risk premiums across industries and over time. These tests strengthen our understanding of how factors in the control of corporate managers or policymakers or both influence the level of the currency premium in industry returns. These tests also represent the first implementation of an alternative specification test to a modeling approach that is new to the currency premium literature (having first been used by De Santis and Gerard, 1998) because if the model is misspecified then we would not expect the variables of interest to have much explanatory power for the estimated currency premiums. Third, because we focus on industries instead of the aggregate stock market, our results provide new insights into aspects of the international competitiveness of US industries beyond that possible from an analysis at the aggregate level. For instance, open-economy macroeconomics suggests that the performance and competitiveness of open economies are sensitive to the terms of international trade. By estimating industry-level currency premiums, we can gauge the level of openness of the economy by the dispersion of industry-level exchange rate effects because more open economies should have greater inter-industry dispersion (Bodnar and Gentry, 1993). Finally, given the literature that shows that exchange rate uncertainty affects industry investment (e.g., Campa and Goldberg, 1995), our results compliment work in this area by identifying a possible cost-of-equity channel of exchange rate effects on domestic investment.

There are five remaining sections to the paper. In Section 2 we discuss the methodology, and in Section 3 we describe the data and preliminary analyses. The empirical results are in 4 Empirical results for currency risk premium, 5 Further analyses of the currency risk premiums. A summary of the paper's main findings and conclusions are in Section 6.

Section snippets

The conditional asset pricing model

In this section, we describe the five-factor asset pricing model that we estimate. The first three risk factors are the returns on the Fama and French (1993) factors: the value-weighted US market portfolio in excess of the risk-free rate (VWM), the returns on the size factor (SMB), and the returns on the book-to-market factor (HML). Given that SMB and HML have received widespread, though not uncontroversial, empirical support as priced factors in the asset pricing literature (see Fama and…

Data

In this section, we describe the data used in the empirical analyses. In Section 3.1, we describe the industry portfolios. In Section 3.2, we describe the risk factors and in Section 3.3, we describe the instrumental variables used to predict the returns on the risk factors.…

Empirical results for currency risk premium

We present the main empirical results in this section. In Section 4.1, we briefly examine the industry betas relative to the equity-related factors. In Section 4.2, we focus on the exchange rate betas, and in Section 4.3 we discuss the currency risk premiums. In Section 4.4, we address the issue of whether or not hedging can explain the previously weak results. In Section 4.5, we discuss various diagnostic and robustness tests.…

Further analyses of the currency risk premiums

Currency risk premium has an economically large effect on the cost of equity of US industries. In this section, we investigate if the magnitude of the currency risk premium varies systematically across industries and over time.…

Summary and conclusions

In this paper, we investigate whether or not exchange rate movements are important to US industry expected returns. We hypothesize that the failure of previous studies to find that currency risk is priced and plays an important role in US industry returns is due to methodological shortcomings or the use of currencies or currency indices that are easily hedged, but which does not represent the broad cross section of trading partners of US firms. The methodological shortcomings arise from the…

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☆ This paper, under the title "The Role of Currency Risk in Industry Cost of Capital," is the winner of the Goldman Sachs Quant award for the best paper in investments at the 2005 Western Finance Association meetings. We thank workshop participants at the University of South Florida and participants and discussants at the 2004 Financial Management Association European meeting, the 2004 Financial Management Association (US) meetings, the 2005 Southern Finance Association meeting, and the 2005 Western Finance Association meetings for their comments. We thank Zenu Sharma for valuable research assistance. Finally, we are grateful to the referee for many insightful comments that significantly improved the paper.

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