2011

Determinants of exchange rate hedging an empirical analysis of U.S. small-cap industrial firms

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DETERMINANTS OF EXCHANGE RATE HEDGING: AN EMPIRCAL ANALYSIS OF U.S. SMALL-CAP INDUSTRIAL FIRMS

by

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A thesis submitted in partial fulfillment of the requirements
for the Honors in the Major Program in Finance
in the College of Business Administration
and in The Burnett Honors College
at the University of Central Florida
Orlando, Florida

Spring Term 2011

Thesis Chair: Dr. James H. Gilkeson

ABSTRACT

Using a sample of 141 U.S. small-cap industrial firms, I examine the firm characteristics that influence its use of foreign exchange derivatives to hedge exchange rate risk. Companies in the industrial sector produce goods and services that are used for the production of another final product. The performance of this sector is closely correlated to the level of demand from the final consumer.

I find firm size, the amount of foreign sales, and firm liquidity influence the firm's decision to use foreign exchange derivatives to hedge exchange rate risk. For those firms that hedge exchange rate risk using derivatives, a second test examines the firm characteristics that influence the extent of its hedging activities. I find the extent of hedging is influenced by the amount of foreign sales, the amount of foreign assets, and the number of foreign subsidiaries the firm operates. A final test examines whether certain firm characteristics influence its decision to use options as part of its hedging operations. I find no evidence that the firm characteristics examined herein influence that decision.

ACKNOWLEDGEMENTS

I wish to thank my thesis chair Dr. James H. Gilkeson. I have learned so much from you during our work together and I wouldn't have been able to accomplish this without you. I would also like to thank my committee members, Dr. Pradipkumar Ramanlal and Dr. Richard Hofler, for their invaluable contributions throughout my research. I wish to thank the Burnett Honors College, particularly Denise Crisafi, for assisting me and providing countless resources throughout my research. Lastly, I wish to thank my father Allen for always encouraging me to try my hardest and for sparking my interest in business at a young age.

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INTRODUCTION

U.S. multi-national corporations face many risks in their normal course of business. One of the important risks they are concerned about is exchange rate risk. An exchange rate, also known as an FX rate, forex rate, or foreign-exchange rate, is the value of one currency in terms of another. For example an exchange rate of two Euros (EUR, €) to the United States dollar (USD, $) means that for two Euros you can purchase one U.S. dollar. The spot exchange rate is the price of one currency in terms of another for a transaction made immediately. Forward exchange rates for transactions at later dates are also available. Exchange rate risk, also known as currency risk, foreign-exchange risk, F/X risk, or foreign currency risk, is the risk that a company's operations may be affected by fluctuating exchange rates. For example, if a U.S. based company has a sale in Canada and the value of the Canadian dollar (CAD, $C) increases relative to the U.S. dollar, the company will experience a gain on the value of the transaction when converting the sale proceeds to U.S. dollars. On the other hand, if the value of the Canadian dollar decreases relative to the U.S. dollar, then the company will experience a decrease on the value of the transaction. The International Business Survey found this risk is becoming more prevalent, as 56% of U.S. senior executives say their overseas sales are growing faster than their domestic sales (HSBC, 2010).

One of the strategies for managing exchange rate risk is hedging through the use of complex financial derivatives. A hedge is a tactic for reducing the unwanted risk of a certain position by entering into an offsetting position in a related security. An example of a hedge that

limits downside risk is simultaneously purchasing a stock and buying a put option on the same stock, which is the right to sell a security. There are many different types of currency derivatives such as currency forwards, foreign exchange swaps, currency swaps, currency options/warrants, and currency swaptions. See the appendix for an explanation of each type of currency derivative. The most commonly used are currency forward and futures contracts, currency swaps, and currency options (BIS, 2010). According to the Bank for International Settlements (BIS), the gross market value of foreign exchange contracts has doubled in the past three years from $1.6 trillion to $3.2 trillion (BIS, 2010). The gross market value is the cost of replacing all of the open contracts at spot prices. During the same time, the notional value has increased roughly 9% from $57.6 trillion to $62.9 trillion (BIS, 2010). The notional value represents the size of the contract, but is not equal to the dollars at risk. The gross market value as a percentage of the notional value of foreign exchange contracts was only 5% (BIS, 2010).

Tables 1 and 2, from the BIS' triennial central bank survey on global foreign exchange market activity, illustrate the value and the global daily turnover of outstanding foreign exchange derivatives, respectively. Table 1 is broken down by the type of contract used and the corresponding notional value and gross market value. The total notional value is below its peak of $63 trillion in June 2008; however, it has steadily increased since 2009. Non-financial customers represented roughly 18% of the foreign exchange derivatives traded, while reporting dealers and financial institutions accounted for the remaining transactions. Currency forwards and foreign exchange swaps represented roughly 48% of the total notional value of foreign exchange derivatives, followed by currency swaps with 31%, and options with 21%.

Table 2 illustrates the sharp increase of daily foreign exchange derivative transactions every three years, starting in 1998. The global daily average turnover increased 160% from $1.5 trillion in 1998 to $3.9 trillion in 2010. Since 2007, when the survey was last conducted by BIS, the daily average turnover increased 20%. Spot transactions represented only 37% of the average daily turnover of foreign exchange contracts. Since 2004, the amount of exchange-traded derivatives has increased almost 550% from 26 to 168 products.

There are two major types of exchange rate risk: transaction exposure and translation exposure. A transaction exposure exists when a change in an exchange rate would cause a change in the value, as measured in a firm's home currency, of its current and expected future foreign currency cash flows. For example, if a U.S. company agrees to purchase goods from a Mexican company in Pesos (MXN,$N), it faces the risk of the Peso appreciating relative to the U.S. dollar, thus causing the U.S. company to pay more in U.S. dollars than was originally anticipated to close the transaction.

A translation exposure exists when a firm holds foreign assets or liabilities that must be reported in terms of its home currency on the firm's accounting statement of financial position (balance sheet.) A change in the exchange rate could cause the reported value of those assets to decline, resulting in a decline in the firm's reported equity. For example, if a U.S. company has assets in Australia and the value of the Australian dollar (AUD, $AU) decreases relative to the U.S. dollar, then a decline in the assets' value will be reflected on the company's balance sheet.

The value of a company's stock is the present value of all future dividends and other cash flows an investor expects to receive discounted at the investor's required return. Since an investor's required return is positively related to the uncertainty or risk surrounding those future

cash flows, hedging against these fluctuations may lead to reduced volatility in the company's earnings and therefore a higher stock price. As business becomes more global and more firms face exchange rate risk, an increasing number of corporations are hedging this exposure through the use of foreign currency derivatives (Allayannis and Ofek, 2001). In a survey of firms in the Fortune Global 500 conducted by the International Swaps and Derivatives Association (2009), the most commonly hedged risk was exchange rate risk, which was hedged by 88% of firms. By hedging against exchange rate fluctuations, firms are attempting to limit their losses related to their financial positions in foreign currencies and to reduce the volatility of foreign earnings and firm value. Guay (1999) examines a decrease in firm risk once they began hedging with derivatives, stressing the relationship between risk reduction and derivative use.

Some firms attempt to naturally offset cash flows using natural hedges instead of using derivatives. A natural hedge reduces exchange rate risk by matching the size of a company's cash inflows and outflows (i.e., revenues and expenses) in a particular foreign currency. For example, if a company has revenues in a foreign country, it may open a distribution facility which would allow it to match the future expected costs with the future expected revenues, thus creating a natural hedge. This strategy is attractive because it allows companies to hedge without having to spend the money to purchase foreign exchange derivatives. However, natural hedging is difficult to achieve and not every company can successfully implement a natural hedge strategy.

The Financial Accounting Standards Board (FASB) issued Statement No. 133, *Accounting for Derivative Instruments and Hedging Activities*, also known as FAS 133, in June 1998. FAS 133, was introduced to provide consistency in financial reporting and to provide more

oversight of companies derivative usage. FAS 133 requires companies to classify derivatives as either assets or liabilities on their balance sheets and measure them at fair value. Fair value is the value that a security, in this case the derivative, could be sold for on the open market. Under FAS 133, a company may bundle together an asset or liability and a derivative position and report only the net loss of the combined position. This is referred to as hedge accounting treatment and can only be used if changes in the values of the asset or liability and the derivative position have a correlation ratio between 80% and 125% and the company documents that relationship. Hedge accounting is beneficial for firms who experience volatility in earnings from the underlying volatility of operations which they seek to hedge. This avoids the "lower of cost or market" problem inherent in separate reporting of the asset or liability and the derivative position.

Because the use and complexity of derivative instruments and hedging activities has increased, FASB issued Statement No. 161, *Disclosures about Derivative Instruments and Hedging Activities - an amendment of FASB Statement No. 133*, also known as FAS 161, in March 2008. FAS 161 is intended to further improve the transparency of financial reporting by changing the disclosure requirements for derivative instruments and hedging activities. FAS 161 requires enhanced disclosures about how and why an entity uses derivative instruments, how derivatives instruments and related hedged items are accounted for under FAS 133 and its related interpretations, and how derivative instruments and related hedged items affect an entity's financial position, financial performance, and cash flows. The amendment requires disclosure of the fair value of derivative instruments in the statement of financial position and their gains and losses in the statement of operations. It requires cross-referencing within footnotes to allow users to locate information regarding the entities' use of derivatives. FAS 161 became effective for

financial statements issued after November 15, 2008. The increased transparency in financial reporting that resulted from FAS 133 and FAS 161 has enabled me to determine which corporations are actively hedging their foreign currency exposure.

In this paper, I examine whether certain firm characteristics are related to management's decisions regarding the hedging of exchange rate risk. The first purpose of my research is to examine whether certain firm characteristics influence its decision to hedge its foreign currency exposure using derivatives. The second purpose of my research is to examine, for those firms that do hedge their foreign currency exposure using derivatives, whether certain characteristics influence the extent or amount of hedging relative to overall currency exposure. Finally, for those firms that use derivatives to hedge currency risk, I examine whether certain characteristics are related to its decision of whether to use options.

LITERATURE REVIEW

Existing research on corporate derivative usage frequently discusses the theory of Modigliani and Miller (1958), which argues the risk management decisions of management are irrelevant to individual shareholder's wealth because shareholders have access to the same risk management tools as the firm. In the Modigliani and Miller framework, which assumes among other things no taxes and no costs to bankruptcy, there is no direct relationship between hedging and firm value. However, more recent research has challenged this theory. Allayannis and Weston (2001) find a strong relationship between firm value and the use of derivatives in a sample of 720 large nonfinancial firms between 1990 and 1995. Their results suggest companies who manage foreign currency risk using derivatives have a 4.87% higher value than firms that do not use derivatives. Carter *et al*. (2006) produce results consistent with Allayannis and Weston (2001) while studying a sample of firms in the airline industry. Their results show that firms who use derivatives to hedge jet fuel trade at a premium over those who do not.

Prior research also argues that size is one of the most important factors related to derivatives usage. Nance *et al*. (1993), Mian (1996), Tufano (1996), Geczy *et al.* (1997), and Allayannis and Ofek (2001) argue that economies of scale exist in acquiring information on hedging techniques and instruments for larger firms, which reduces the costs of trading financial derivatives. The costs of maintaining a derivatives portfolio may be too high for smaller firms who don't have the capital to manage their risks in this way. A similar hypothesis is introduced

by Bodnar and Wong (2000), who find that large firms are more exposed to exchange rate movement than small firms, based on an assumption that large firms are likely to have more foreign operations than small firms. However, this is contrary to the research of Froot *et al*. (1993), who find that hedging is more likely for small firms with higher expected growth. Also supporting the argument that small firms benefit more than large firms is McGahan (1999) who suggests firms in a focused industry are more affected by external shocks than larger corporations who may operate in more diverse business areas. The disagreement on the relationship between firm size and derivatives usage motivates me to include this factor in my research.

In order for a firm to hedge against exchange rate risk using derivatives, it must have exposure to foreign currencies. Much of the prior research on exchange rate hedging including Jorion (1990), Bodnar and Wong (2000), among others has measured the extent of the foreign exposure as a percentage of foreign sales to total sales. If a company's foreign operations are mostly manufacturing and not the source of sales, it may measure its foreign exposure as the ratio of international assets to total assets, which is consistent with Bartram, Brown, and Fehle (2009). Choi and Prasad (1995) found a positive relationship between foreign assets and foreign sales and foreign exposure. If a firm has a higher proportion of its assets overseas, they may be more inclined to protect the value of the assets by using derivatives to lock in future exchange rates.

If a company is hedging its exchange rate exposure using derivatives for each country in which it has subsidiaries, then a company with more foreign subsidiaries should have a larger amount of derivatives. As Butler (1997) found, the costs of hedging for smaller, less diversified

firms are higher than for large multinational corporations who are likely to have established operations in each location. These results complement the results of Nance *et al*. (1993), Mian (1996), and Allayannis and Ofek (2001) who argue that larger multinationals are able to obtain economies of scale which reduces the cost of trading financial derivatives. It is important to determine if the amount of foreign subsidiaries the company has is related to the extent of its hedging.

Bartram, Brown, and Fehle (2009) find that derivatives users have higher leverage and lower liquidity. He and Ng (1998) and Chow and Chen (1998) suggest that firms with high leverage and low liquidity have more of an incentive to hedge, but are nevertheless more sensitive to currency fluctuations. These results are supported by Froot et al. (1993) who suggest more liquid firms have less of an incentive to hedge compared to firms with low liquidity, who are averse to cash flow volatility. Other than hedging, Nance et al. (1993) argued that firms can reduce the probability of financial distress by maintaining more liquid assets or lower dividend yields. They use the current ratio as a measure of liquidity.

Smith and Stulz (1985) conclude that the expected utility of managers is affected by volatile profits, thus motivating them to hedge risks. Profits are an important measure of how investors value a stock. If a company has volatile profits each quarter, then it is likely the stock price will also be volatile. Pantzalis, Simkins, and Laux (2001) support this by finding that firms with higher stock price volatility have more exposure to foreign exchange risk. Measuring risk as the natural log of the ratio of the high and low stock prices for the year, they argue their results are consistent with the notion that foreign exchange exposure constitutes a large portion of total

firm risk. Another popular measure of firm risk is a stock's beta, which was used in tests by Adler and Dumas (1984) and Bodnar and Wong (2000).

Earlier research has studied the relationship between managerial ownership of the firm and the decision to hedge exchange rate risk. Previous findings vary, such as Tufano (1996) and Schrand and Unal (1998) who find evidence that hedging increases as managerial ownership increases. Tufano (1996) studied risk management practices in the gold mining industry and concluded that managers who hold more options manage less risk, but managers who hold more stock manage more risk. This is consistent with Smith and Stulz (1985) who predict that managers with greater proportions of their wealth invested in the firm's shares would prefer to hedge, while those with options holdings would prefer no hedging. On the contrary, Geczy et al. (1997) and Graham and Rogers (2002) find managerial ownership and risk aversion have no effect on hedging. Overall the relationship between managerial ownership and derivatives usage are mixed, which has motivated me to study this in my research.

HYPOTHESIS

Earlier research studied the hedging activities of specific industries such as oil and gas producers (Jin and Jorion, 2006), natural gas companies (Geczy *et al*., 1997), airlines (Carter *et al*., 2006), and gold mining (Tufano, 1996). I intend to focus on the industrials sector. The companies represented in the industrials sector provide goods and services that are widely used throughout the world. The industrials sector is composed of the following industry groups:

- Capital Goods
- Commercial & Professional Services
- Transportation

In contrast with the previously mentioned examples, which focus on commodity hedging, this research focuses on exchange rate hedging. This research differs from prior research that focuses on Fortune 500 firms (Geczy *et al*., 1997) and S&P 500 firms (Allayannis and Ofek, 2001) by examining small-cap firms. Considering how vital the industrials sector is, I will use prior research as a basis to conduct research that will focus on the industrials sector.

The first purpose of my research is to examine whether certain firm characteristics influence its decision to hedge its foreign currency exposure using derivatives. Bodnar and Wong (2000) find a positive relationship between firm size and its exposure to exchange rate risk.

Geczy *et al.* (1997) and Allayannis and Ofek (2001) discover that economies of scale exist which reduces the costs of trading financial derivatives. They conclude that the larger firms are more likely to capitalize on these economies of scale. Consistent with these studies, I include a measure of firm size and hypothesize a positive relationship with the firm's decision to hedge using derivatives.

Previous research such as Jorion (1990) and Bartram, Brown, and Fehle (2009) has studied the relationship between a firm's foreign exposures and the extent of its hedging activity. Based on their findings, which suggest a positive relationship between foreign exposure and a firm's hedging activities, I predict a positive relationship between the magnitude of a firm's foreign exposure and its decision to hedge using derivatives.

Froot et al. (1993) found a positive relationship between a firm's liquidity and its hedging activities. They suggest firms with low liquidity are more likely to hedge to prevent cash flow volatility. Further research by Chow and Chen (1998) supports their argument that less liquid firms are more inclined to hedge their exchange rate risk. Based on these results, I include a measure of a firm's liquidity and expect a positive relationship with the decision to hedge using derivatives.

Research by Pantzalis, Simkins, and Laux (2001) studies the relationship between a firm's stock price volatility and the extent of its hedging activities. They propose that foreign exchange risk represents a large portion of total firm risk. Management may wish to keep its cash flows from being volatile so they can prevent the stock price from swinging too much in either direction. Consistent with these findings, I include a firm's stock price volatility as a measure of

risk and propose a positive relationship between a firm's risk and the decision of whether to hedge using derivatives.

The second purpose of my research is to examine whether certain characteristics of those firms that do hedge their foreign currency exposure using derivatives are related to the extent or amount of hedging relative to overall currency exposure. Graham and Rogers (2002) and Allayannis and Ofek (2001) analyzed whether the characteristics affecting the decision to hedge and the extent of hedging exchange rate risk are different.

Larger firms are more likely to have more foreign operations, thus increasing their exposure to exchange rate risk. Geczy *et al.* (1997) and Allayannis and Ofek (2001) found that economies of scale exist for corporations who hedge exchange rate risk using derivatives. If the larger firms are able to achieve a cost advantage then it is possible they will be purchase more contracts. Mian (1996) observed a similar relationship. Based on this, I include firm size and predict a positive relationship with the extent of its hedging.

Alyannis and Ofek (2001) find that foreign sales and trade are positively related to both the decision to hedge and the extent of hedging. Choi and Prasad (1995) found a positive relationship between foreign assets and foreign sales and foreign exposure. If a company has a large amount of foreign sales in a certain location, it is likely that they will have assets located there also. Based on this, I include foreign sales as a ratio to total sales, and foreign assets to total assets, and anticipate a positive relationship for both with the extent of its hedging.

Graham and Rogers (2002) find that hedging increases the debt ratio by 3%. They also found that the market value of assets increased by 1.1% by capitalizing on the incremental tax

shield. They conclude that the level of debt affects the extent of hedging but not the decision to hedge. Bartram, Brown, and Fehle (2009) find the level of derivatives use is related to a firm's debt levels and maturity and holdings of liquid assets. Based on this I include a firm's liquidity and anticipate a positive relationship with the extent of its hedging activity.

Butler (1997) finds small firms that don't have as many foreign operations as their larger counterparts are not able to bear the costs of hedging for each location. He suggests the larger firms are more likely to have established operations in many countries. This supports the results of Geczy *et al.* (1997) and Allayannis and Ofek (2001), among others, who argue the economies of scale are more favorable for large firms which have the appropriate resources, such as capital and more foreign subsidiaries. Based on their findings, I include a count of a firm's foreign subsidiaries and anticipate a positive relationship with the extent of its derivatives use.

The level of a firm's profitability may also influence the extent of the firm's hedging activity. Altman (1983) finds that firms with a higher probability of bankruptcy, measured by Z-scores, are more likely to hedge. With lower profits, firms risk missing payment obligations and becoming insolvent. By hedging exchange rates, firms lower the risk of missing future payments because unanticipated changes in exchange rates. Brown (2001) finds hedging is related to earnings management. However, Bartram, Brown, and Fehle (2009) find a negative relationship between gross profit margin and derivatives use. Based on these results, I include a firm's profitability and hypothesize a negative relationship with the extent to its hedging activity.

The range of a firm's stock price and its beta are similar measures of risk. The difference is the stock price range only takes into account the firm being discussed. Beta, however, includes

the covariance of returns between the stock and some portfolio, usually a broad market portfolio of risky assets. Pantzalis, Simkins, and Laux (2001) measure firm risk as the range of a firm's stock price for the year, and find a positive relationship between stock price volatility and exchange rate risk. Based on this, I predict a positive relationship between the range of a firm's stock price and the extent of its hedging activity.

Bodnar and Wong (2000) produce similar results while finding that the average beta of the sample firms was greater than one. This suggests that more volatile firms are likely to hedge exchange rate risks. I include the beta as an alternate measure of risk and anticipate a positive relationship with the extent to hedging.

Prior research on the relationship between inside ownership and derivatives usage has been mixed. Stulz (1990) suggests managers who have a financial position in a company may be more likely to use the company's resources to hedge diversifiable risk, thus creating a conflict of interest between managers and shareholders. Tufano (1996) finds that managers who hold more options manage less risk, but managers who hold more stock manage more risk. Research by Geczy et al. (1997) and Graham and Rogers (2002) contradict the results of Tufano and Stulz, finding that managerial ownership and risk aversion are unrelated to the presence of hedging. Based on this, I include inside ownership and predict a positive relationship with the extent of hedging.

The third purpose of my research is to examine whether, for those firms that use derivatives to hedge currency risk, certain characteristics are related to its decision of whether to use options. Firms can use different types of derivatives such as currency forward contracts,

currency futures, currency swaps, and currency options to hedge their exchange rate risk. Options differ substantially from forwards, futures, and swaps in two fundamental ways. First, options can be used to protect against a loss from adverse exchange rate movements without giving gains from beneficial movements, whereas forwards, futures, and swaps work to lock in the firm's current position against either gains or losses in the future. Second, options have substantial costs (premiums) that must be paid upfront and are lost if adverse exchange rate movements do not occur. In contrast, forwards, futures, and swaps are typically entered into at the current market price with minimal transactions costs. Options act more like traditional insurance policies (premium paid up front, losses covered if they occur) whereas futures, forwards, and swaps freeze the firm's current position in place. Options represented approximately 20% of the foreign exchange derivatives traded in 2010 (BIS). The market for currency options is the most liquid and largest market for options in the world.

I have not found prior research that examines whether certain firm characteristics influence its decision to use options as part of its hedging operations. Given the lack of prior research on this relationship, I have decided to add this question to my research. I do not have particular hypotheses regarding the outcome of this test.

Table 3 summarizes the hypotheses. The independent variables are shown with their corresponding definitions. The prediction of each hypothesis is shown as either positively related, negatively related, or no hypothesis.

DATA

In this paper, I examine cross-sectional data to analyze the use of derivatives to hedge exchange rate risk by publicly traded small-cap industrial corporations headquartered in the U.S. Small-cap is defined as any firm included in the Russell 2000 Index, which includes the bottom 2,000 stocks in the Russell 3000 Index, which consists of the largest 3,000 publicly traded firms in the U.S. The Russell 2000 Index includes approximately 8 to 9 percent of the total market value of all publicly held companies in the U.S. A corporation is included in the industrial sector if it has Global Industry Classification Standard (GICS) code 20. The GICS was created by Standard & Poor's (S&P) and MSCI Barra in 1999 to segregate sectors and is used by S&P and the Russell 2000 Index. The GICS is composed of 10 sectors, 24 industry groups, 68 industries, and 154 sub-industries.

I began my data collection with the 2,000 firms included in the Russell 2000 Index as of June 28, 2010. From those, a filter was applied to select the firms in the industrials sector, identified by GICS code 20. There are 141 such firms. I referred to the most recent 10-K report as of October 26, 2010 to obtain firm-specific information. For the 141 industrial firms, I collected and/or calculated the following data, which represents the independent variables used in the first test:

SIZE – natural log of the book value of total assets reported at the end of the reporting year

FOREIGN EXPOSURE A - foreign sales/total sales

FOREIGN EXPOSURE B – foreign assets/total assets

LIQUIDITY – current assets/current liabilities (current ratio)

STOCK PRICE RANGE - the ratio of the high stock price for the reporting year divided by the low stock price for the period

The natural log of the book value of total assets has been frequently used in other research papers as a proxy for size. Consistent with Jorion (1990), Bodnar and Wong (2000), among others, I use foreign sales as a percentage of overall sales to model foreign exposure. As a second measure of foreign exposure, I use the ratio of foreign assets to total assets. The current ratio has frequently been used as a measure of liquidity. Prior research, such as Bartram, Brown, and Behle (2009), argues that firms with a lower liquidity will be more likely to use derivatives. I use the ratio of high stock price to low stock price as a measure of total risk, which is consistent with Pantzalis, Simkins, and Laux (2001), who found a positive relationship between total firm risk, measured as the natural log of the ratio of the firm's high and low stock prices for the year, and derivative usage.

I was interested in determining if each of the 141 firms was engaged in exchange rate hedging through the use of any type of foreign currency derivative. This information was found by scanning through the annual report to see if there was any mention of an exchange rate hedging strategy and analyzing the notional amount of derivatives for the reporting year to determine if any were foreign currency derivatives. This information can be found in different

sections of a firm's annual report, but is most commonly found in the Notes to the Consolidated Financial Statements.

Once I determined which firms were actively hedging their exchange rate exposure through foreign currency derivatives, I obtained the following data, which in addition to the independent variables from the first test, represents the independent variables used in the second test:

BREADTH OF MULTINATIONAL NETWORK - the number of foreign countries in which the firm has subsidiaries

PROFITABILITY – the firm's return on assets over the trailing twelve months

INSIDE OWNERSHIP – the percentage of stock held by company insiders

BETA – the beta of the firm's common stock

The number of foreign countries in which the firm has subsidiaries was obtained in the firm's 10-K report. Each firm's return on assets (ROA) and beta were gathered from the Yahoo! Finance website, as was the percentage of stock held by insiders (which is provided to Yahoo by Computershare). The sum of the notional value of foreign currency derivatives for each firm will be used as a dependent variable in the second model and was found in the 10-K, most commonly in the Notes to Consolidated Financial Statements.

The type of derivative each firm uses to hedge exchange rate risk is documented in their 10-K. I separated those firms that use options from those that use any other type of derivative such as forwards, futures, or swaps. A company is designated as using options if their 10-K made

any mention of options as part of their hedging policy. There are seven such firms. Since there is a lack of prior research analyzing the decision to use options or other types of derivatives, the same independent variables from second test are used for the third test.

Table 4 contains summary statistics for the independent variables. The table consists of summary statistics for the 141 firms included in the first test and the 30 firms included in the second and third tests. The corresponding mean, median, standard deviation, maximum value, and minimum value of each independent variable are shown. The min is zero for both measures of foreign exposure in the first test. This is because some firms in the sample do not have foreign operations. However, for the firms that do use derivatives to hedge, the average percentage of foreign sales to total sales is approximately 44%. The mean of *LIQUIDITY* and *STOCK PRICE RANGE* both decrease for firms that use derivatives. The mean number of foreign subsidiaries for firms that use derivatives is approximately nine. Consistent with the notion that small-cap firms are riskier, the average beta of the 30 firms that use derivatives to hedge is approximately 1.58.

Table 5 contains correlation coefficients between the independent variables used in test 1. The independent variables *FOREIGN EXPOSURE A* and *FOREIGN EXPOSURE B* have a correlation coefficient of 0.754. Table 6 contains correlation coefficients between the independent variables used in tests 2 and 3. The independent variables *FOREIGN EXPOSURE A* and *FOREIGN EXPOSURE B* have a correlation coefficient of 0.843. The independent variables *BETA* and *STOCK PRICE RANGE* have a correlation coefficient of 0.795. Although these

independent variables have “strong” positive correlations, these independent variables were included in the tests unaltered.

METHODOLOGY

Independent regressions were estimated as tests of each of my research questions using Minitab. The first and third research questions were examined through binary logistic regressions, while the second was examined using a multiple linear regression.

A firm's decision to use derivatives to manage currency risk was examined using a binary logistic regression, where the dependent variable is 0 if the firm does not hedge using foreign currency derivatives and 1 if the firm uses any type of foreign currency derivative for hedging purposes. If the value is zero, this does not imply that the firm has not hedged using derivatives in prior years or won't hedge using derivatives in the future. The first model estimates the impact of the following independent variables (firm characteristics) on the probability that the firm decides to hedge: *SIZE, FOREIGN EXPOSURE A, FOREIGN EXPOSURE B, LIQUIDITY,* and *STOCK PRICE RANGE*.

The second issue examined is why firms that use foreign currency derivatives to manage exchange rate risk use different amounts. One question is how to measure the extent of derivatives use. Two multiple linear regressions using different dependent variables were estimated to examine whether certain firm characteristics influence the extent to which the firm hedges. The first, the model I denote "model 2-A", measures derivatives use as the ratio of the notional value of foreign currency derivatives to total assets. This takes a balance sheet approach to foreign currency exposure. The second, the model I denote "model 2-B", measures derivatives

use as the ratio of the notional value of foreign currency derivatives to total sales. This takes an income statement approach to foreign currency exposure. Each version of the second model estimates the impact of the following independent variables (firm characteristics) on the extent of derivatives use: *SIZE, FOREIGN EXPOSURE A, FOREIGN EXPOSURE B, LIQUIDITY, STOCK PRICE RANGE, BREADTH OF MULTINATIONAL NETWORK, PROFITABILITY, INSIDE OWNERSHIP,* and *BETA.*

The third issue examined is why some firms use foreign exchange options as all or part of their exchange rate hedging, while others use only futures, forwards and swaps. A binary logistic regression is estimated to examine whether certain firm characteristics influence the probability that a firm decides to use options to hedge its foreign currency exposure. The dependent variable is 0 if the firm does not use any options to hedge its foreign currency exposure and 1 if the firm uses options. The third model employs the same independent variables (firm characteristics) as the second model: *SIZE, FOREIGN EXPOSURE A, FOREIGN EXPOSURE B, LIQUIDITY, STOCK PRICE RANGE, BREADTH OF MULTINATIONAL NETWORK, PROFITABILITY, INSIDE OWNERSHIP,* and *BETA.*

RESULTS & DISCUSSION

Test 1: The Decision to Hedge

The first test, which models the decision of whether to hedge exchange rate risk using derivatives, suggests that three of the independent variables influence the decision to hedge. Approximately 21% of the firms in the sample used derivatives in the past year. As Table 7 summarizes, SIZE, FOREIGN EXPOSURE A, AND LIQUIDITY are each statistically significant at at least the 10% level as measured by the p-value of the estimate. Note that the sample size for the first test was reduced to 140. One company was omitted from the sample because it was purchased and subsequently delisted.

The coefficient estimate for the variable *SIZE*, the natural log of the total assets of the firm, suggests that the decision to hedge exchange rate risk through the use of foreign currency derivatives is positively related to firm size. This is consistent with Jorion (1990), Bodnar and Wong (2000), and Pantzalis, Simkins, and Laux (2001). As noted earlier, Nance et al. (1993), Mian (1996), Tufano (1996), Geczy et al. (1997), and Allyannis and Ofek (2001) argue that economies of scale exist in acquiring information on hedging techniques and instruments for larger firms, which reduces the transaction costs of trading financial derivatives. The precise reason why size is related to the decision to hedge may vary among firms. However, the Russell 2000 is composed of small-cap companies that often do not have operations outside of the United States. These companies will likely have no exposure to exchange rate risk.

The coefficient estimate for *FOREIGN EXPOSURE A*, which is the ratio of foreign sales to total sales, is positively and significantly related to the decision to hedge using foreign currency derivatives. These results are consistent with those in Jorion (1990) and Bodnar and Wong (2000). Firms with greater reliance on foreign revenues are more likely to manage the currency risk imbedded in these revenues. It is interesting to note, however, the second measure of foreign exposure, which is the ratio of foreign assets to total assets, does not have a significant impact on the decision to use foreign currency derivatives.

Finally, the coefficient estimate for *LIQUIDITY*, which is equal to the current ratio, is statistically significant but negative. This result is consistent with Bartram, Brown, and Behle (2003, 2009). Firms with a higher current ratio, meaning they can meet short term liabilities more easily, are less likely to initiate an exchange rate hedging program. It may be that these firms achieve higher current ratios by not having to pay the immediate costs that are associated with maintaining an active hedging strategy using foreign currency derivatives.

Test 2: The Extent of Hedging

The extent of hedging was measured in two ways: the ratio of the notional value of foreign currency derivatives to total assets and the ratio of the notional value of foreign currency derivatives to total sales. The two versions of test two regress these measures against the same set of explanatory variables. Both versions of the second test had qualitatively similar results. Tables 8 summarize the results of the second test. The table presents the independent variables' corresponding coefficient estimate and p-value. Each panel presents three different models,

which represent the different versions of the second test. The first model in both versions includes the five independent variables originally tested. The second model in both versions omits *STOCK PRICE RANGE* and *SIZE* because the p-values were so high in the first model. The third model in both versions adds three additional firm characteristics, *PROFITABILITY*, *INSIDE OWNERSHIP*, and *BETA*.

For both tests in model 1, the coefficient estimates for both measures of exposure, *FOREIGN EXPOSURE A* and *FOREIGN EXPOSURE B,* were statistically significant. Similar to the results of the first test, *FOREIGN EXPOSURE A*, which measures foreign sales relative to total sales, is positively related to the extent to which a firm hedges. This is consistent with Bartram, Brown, and Fehle (2009) who find the ratio of foreign sales to total sales is positively correlated to the extent of hedging. *FOREIGN EXPOSURE B,* which measures foreign assets relative to total assets, is negatively related to the extent to which the firm hedges exchange rate risk. This result contradicts Choi and Prasad (1995), who found that a higher ratio of foreign assets to total assets is positively related to translation risk. Perhaps firms that have more operations overseas are less worried about repatriating revenues (converting them to U.S. dollars) as they have needs to increase or replace facilities overseas.

The proxy for global reach, *BREADTH OF MULTINATIONAL NETWORK*, which measures the number of foreign countries in which the firm has subsidiaries, is positive and statistically significant in both versions of model 1. This is contrary to Pantzalis, Simkins, and Laux (2001), who argue that firms with a broader multinational network are less exposed to currency risk.

Because the p-values for SIZE and *STOCK PRICE RANGE* were so high in versions A and B of model 1, a second version of each test was estimated, denoted model 2, which excludes these two independent variables. The results for model 2, which are presented in table 8, are consistent with those of model 1, although the r-squared of model 2 is slightly higher than that of model 1 for each version.

A third variation of test 2, denoted model 3, was also estimated. This version added three explanatory variables to the reduced model 2: *PROFITABILITY, INSIDE OWNERSHIP*, and *BETA*. These variables were added to measure the significance of earnings and firm risk when determining the extent to which a firm hedges. Rather than examining whether larger firms are more likely to use more derivatives, *PROFITABILITY*, which is the return on assets, is introduced as an alternative measure. None of the additional three variables are statistically significant. *BREADTH OF MULTINATIONAL NETWORK* is the only independent variable that is positively related to the extent to which a firm hedges in model 3.

The results indicate that neither proxy used for risk in test 2, *STOCK PRICE RANGE* and *BETA*, is related to the decision to hedge and the extent of hedging. This is interesting because hedging exchange rate risk by using derivatives is intended to be a risk management strategy. Further, when the model is expanded with the three additional independent variables, the extent of foreign exposure, measured by sales or assets, is no longer found to be related to the extent of hedging.

Test 3: Using Options to Hedge

Test 3 attempts to explain the decision of some firms to use options as a part of their foreign currency hedging. The same independent variables used in test 2 are employed in test 3. The three versions of this test are summarized in Table 9. The results of these binary logistic regressions suggest that none of the firm characteristics examined is related to this decision. As noted earlier, prior research does not appear to have examined this issue. The lack of prior research into the factors that influence the decision to use options leads me to believe that there is no concrete method of determining what influences the use of options. Since the number of firms that use options is less than a quarter of the thirty firms in the "use derivatives" subsample, the benefits of using options rather than other derivatives may not outweigh the costs. This is especially true because options require upfront costs, whereas forwards, futures, and swaps do not. This may explain the reason why forward contracts represented nearly half of all the foreign exchange derivatives traded in 2010 (BIS).

CONCLUSION

This paper examines whether certain firm characteristics influence its decision to hedge its exchange rate exposure using foreign currency derivatives. Using a sample of 141 industrials sector, small-cap firms in the Russell 2000 index, I examine the determinants of the decision to implement a derivative-based hedging strategy, the extent to which the sample firms hedge, and the decision to hedge with options, rather than relying solely on futures, forwards, and swaps..

I found significant, positive associations between the decision to hedge and a firm's size, and its ratio of foreign sales to total sales, and a significant, negative association with firm liquidity. Hedging firms are larger, generate more of their sales overseas, and have lower cash assets relative to short-term debts.

I also found that firms with more foreign sales hedge a greater proportion of their foreign currency exposure, while firms with more foreign assets relative to total assets hedge a lesser proportion of that exposure. In addition, firms that operate in more foreign markets hedge more of their foreign exposure, which contradicts the notion that operations in many countries create natural currency hedges. Oddly, firm risk does not appear to be related to the decision to hedge or the extent of hedging.

Although this paper attempts to model the factors that influence management's decision to use options for hedging, none of the firm characteristics studied was significantly related to

this decision. This presents the opportunity for further research to be conducted to determine what influences management to choose different styles of hedging.

In conclusion, some of the results in this paper are consistent with prior research on the use of derivatives. Firm size is consistently found as being positively related to the decision to hedge in numerous research papers on the usage of derivatives. It is interesting to note that firm size is only significant when determining whether or not the firm hedges; size is not related to the extent of hedging or the use of options in hedging. The results of this research should be of interest to risk managers who wish to understand the factors that influence a firm's decision to hedge and the extent of its hedging using foreign exchange derivatives.

Table 1 Foreign Exchange Derivatives by Instrument and Counterparty (BIS 2010)

Amounts outstanding of OTC foreign exchange derivatives

By instrument and counterparty

In billions of US dollars

	Notional amounts outstanding					Gross market values				
Instrument / counterparty	Jun 2008	Dec 2008	Jun 2009	Dec 2009	Jun 2010	Jun 2008	Dec 2008	Jun 2009	Dec 2009	Jun 2010
Total contracts	**62,983**	**50,042**	**48,732**	**49,181**	**53,125**	**2,262**	**4,084**	**2,470**	**2,070**	**2,524**
reporting dealers	24,845	19,665	18,849	18,896	19,920	782	1,520	892	732	898
other financial institutions	26,775	21,300	21,441	21,445	23,475	995	1,768	1,066	888	1,084
non-financial customers	11,362	9,077	8,442	8,840	9,731	484	796	512	449	541
Outright forwards and foreign exchange swaps	**31,966**	**24,494**	**23,105**	**23,129**	**25,625**	**802**	**1,830**	**870**	**683**	**925**
reporting dealers	10,897	8,472	7,701	7,683	8,370	281	662	301	235	314
other financial institutions	14,444	10,906	10,653	10,497	11,872	348	780	374	300	398
non-financial customers	6,624	5,116	4,751	4,949	5,383	172	388	195	148	213
Currency swaps	**16,307**	**14,941**	**15,072**	**16,509**	**16,347**	**1,071**	**1,633**	**1,211**	**1,043**	**1,187**
reporting dealers	6,599	6,009	6,330	7,112	7,006	315	568	402	332	397
other financial institutions	7,367	6,858	6,717	7,282	7,279	520	783	568	478	548
non-financial customers	2,341	2,074	2,025	2,115	2,062	237	282	241	233	243
Options	**14,710**	**10,608**	**10,555**	**9,543**	**11,153**	**388**	**621**	**389**	**344**	**411**
reporting dealers	7,349	5,184	4,818	4,101	4,544	186	290	190	166	187
other financial institutions	4,964	3,537	4,071	3,666	4,323	127	205	125	111	138
non-financial customers	2,397	1,887	1,666	1,775	2,286	75	126	75	68	86

Table 2 Global Daily Turnover of Foreign Exchange Derivatives (BIS 2010)

Global foreign exchange market turnover[1]

Daily averages in April, in billions of US dollars

Instrument/maturity	1998	2001	2004	2007	2010
Foreign exchange instruments	**1,527**	**1,239**	**1,934**	**3,324**	**3,981**
Spot transactions[2]	568	386	631	1,005	1,490
Outright forwards[2]	128	130	209	362	475
Up to 7 days	65	51	92	154	219
Over 7 days	62	80	116	208	256
Foreign exchange swaps[2]	734	656	954	1,714	1,765
Up to 7 days	528	451	700	1,329	1,304
Over 7 days	202	204	252	382	459
Currency swaps	10	7	21	31	43
Options and other products[3]	87	60	119	212	207
Memo:					
Turnover at April 2010 exchange rates[4]	*1,705*	*1,505*	*2,040*	*3,370*	*3,981*
Estimated gaps in reporting	*49*	*30*	*116*	*152*	*144*
Exchange-traded derivatives[5]	*11*	*12*	*26*	*80*	*168*

[1] Adjusted for local and cross-border inter-dealer double-counting (ie "net-net" basis). [2] Previously classified as part of the so-called "Traditional FX market". [3] The category "other FX products" covers highly leveraged transactions and/or trades whose notional amount is variable and where a decomposition into individual plain vanilla components was impractical or impossible. [4] Non-US dollar legs of foreign currency transactions were converted into original currency amounts at average exchange rates for April of each survey year and then reconverted into US dollar amounts at average April 2010 exchange rates. [5] Sources: FOW TRADEdata; Futures Industry Association; various futures and options exchanges. Reported monthly data were converted into daily averages of 20.5 days in 1998, 19..5 days in 2001, 20.5 in 2004, 20 in 2007 and 20 in 2010.

Table 3 Summary of Hypotheses

Summary of Hypotheses		
Panel A Determinants of Decision to Hedge Using Derivatives		
Variable	**Prediction**	**Definition**
Size	+	Natural log of the book value of total assets reported at the end of the reporting year
Foreign Exposure A	+	Foreign sales/total sales
Foreign Exposure B	+	Foreign assets/total assets
Liquidity	-	Current assets/current liabilities (current ratio)
Stock Price	+	Ratio of the high stock price for the reporting year divided by the low stock price for the period
Panel B Determinants of the Extent of Hedging		
Variable	**Prediction**	**Definition**
Size	+	Natural log of the book value of total assets reported at the end of the reporting year
Foreign Exposure A	+	Foreign sales/total sales
Foreign Exposure B	+	Foreign assets/total assets
Liquidity	-	Current assets/current liabilities (current ratio)
Stock Price	+	Ratio of the high stock price for the reporting year divided by the low stock price for the period
Breadth of Multinational Network	+	Number of foreign countries in which the firm has subsidiaries
Profitability	-	Firm's return on assets over the trailing twelve months
Inside Ownership	+	Percentage of stock held by company insiders
Beta	+	Beta of the firm's common stock
Panel C Determinants of Whether to Use Options		
Variable	**Prediction**	**Definition**
Size	?	Natural log of the book value of total assets reported at the end of the reporting year
Foreign Exposure A	?	Foreign sales/total sales
Foreign Exposure B	?	Foreign assets/total assets
Liquidity	?	Current assets/current liabilities (current ratio)
Stock Price	?	Ratio of the high stock price for the reporting year divided by the low stock price for the period
Breadth of Multinational Network	?	Number of foreign countries in which the firm has subsidiaries
Profitability	?	Firm's return on assets over the trailing twelve months
Inside Ownership	?	Percentage of stock held by company insiders
Beta	?	Beta of the firm's common stock

Table 4 Summary Statistics of Independent Variables

Independent Variable	N	Mean	Median	Std. Dev.	Max.	Min.
Test 1						
SIZE	141	20.12	20.22	0.94	21.82	17.20
FOREIGN EXPOSURE A	141	0.27	0.22	0.24	0.94	0.00
FOREIGN EXPOSURE B	141	0.21	0.09	0.25	0.84	0.00
LIQUIDITY	141	3.09	2.58	2.15	17.04	0.72
STOCK PRICE RANGE	141	3.22	2.50	2.82	28.88	1.30
Tests 2 & 3						
SIZE	30	20.60	20.61	0.62	21.69	19.65
FOREIGN EXPOSURE A	30	0.44	0.44	0.20	0.82	0.05
FOREIGN EXPOSURE B	30	0.41	0.40	0.24	0.82	0.03
LIQUIDITY	30	2.32	2.25	0.72	3.58	1.05
STOCK PRICE RANGE	30	2.94	2.50	1.23	6.16	1.62
BREADTH OF MULTINATIONAL NETWORK	30	9.17	9.00	5.36	21.00	2.00
PROFITABILITY	30	0.06	0.05	0.03	0.16	0.01
INSIDE OWNERSHIP	30	0.16	0.04	0.24	0.92	0.00
BETA	30	1.58	1.52	0.51	2.68	0.75

Table 5 Correlations between Independent Variables Used for Test 1

Correlations that are greater than 0.70 are in bold.

Test 1	*SIZE*	*FOREIGN EXPOSURE A*	*FOREIGN EXPOSURE B*	*LIQUIDITY*
FOREIGN EXPOSURE A	0.079			
FOREIGN EXPOSURE B	0.227	**0.754**		
LIQUIDITY	-0.282	-0.106	-0.049	
STOCK PRICE RANGE	0.176	-0.083	-0.050	-0.094

Table 6 Correlations between Independent Variables Used for Tests 2 & 3

Correlations that are greater than 0.70 are in bold.

Tests 2 & 3	*SIZE*	*FOREIGN EXPOSURE A*	*FOREIGN EXPOSURE B*	*LIQUIDITY*
FOREIGN EXPOSURE A	-0.084			
FOREIGN EXPOSURE B	-0.057	**0.843**		
LIQUIDITY	-0.211	0.027	0.000	
STOCK PRICE RANGE	0.061	0.070	0.034	0.007
BREADTH OF MULTINATIONAL NETWORK	0.081	0.200	0.142	-0.028
PROFITABILITY	-0.191	0.494	0.258	0.009
INSIDE OWNERSHIP	0.070	-0.104	0.016	-0.211
BETA	0.062	0.188	0.204	0.208
	STOCK PRICE RANGE	*BREADTH OF MULTINATIONAL NETWORK*	*PROFITABILITY*	*INSIDE OWNERSHIP*
BREADTH OF MULTINATIONAL NETWORK	-0.296			
PROFITABILITY	-0.072	-0.013		
INSIDE OWNERSHIP	0.093	0.096	0.106	
BETA	**0.795**	-0.053	-0.116	-0.020

Table 7 Logistic Regression of the Decision to Hedge

The dependent variable is 0 if the firm does not hedge using foreign currency derivatives and 1 if the firm uses any type of foreign currency derivative for hedging purposes. T-statistics are shown in parenthesis. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

Dependent Variable	**Value**	**Count**
Dummy Variable	1	30
	0	110
Total		140
Independent Variable	**Coefficient**	
SIZE	0.75	
	(0.027)**	
FOREIGN EXPOSURE A	3.20	
	(0.054)*	
FOREIGN EXPOSURE B	1.54	
	(0.29)	
LIQUIDITY	-0.44	
	(0.092)*	
STOCK PRICE RANGE	-0.15	
	(0.36)	
Log-Likelihood: -53.02		
Test that all slopes are zero: G = 39.440, DF = 5, P-Value = 0.000		
No. of Observations: 140		
Concordant: 85.0%		

Table 8 Multiple Linear Regression of the Extent of Hedging

T-statistics are shown in parenthesis. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

Panel A Multiple Linear Regression of the Extent of Hedging			
Dependent Variable	**Model 1 Coeff.**	**Model 2 Coeff.**	**Model 3 Coeff.**
Constant	0.623 (0.45)	0.085 (0.37)	0.154 (0.21)
Independent Variables			
SIZE	-0.02 (0.54)		
FOREIGN EXPOSURE A	0.43 (0.062)*	0.43 (0.053)*	0.36 (0.22)
FOREIGN EXPOSURE B	-0.36 (0.055)*	-0.36 (0.049)**	-0.30 (0.15)
LIQUIDITY	-0.05 (0.11)	-0.05 (0.12)	-0.05 (0.15)
STOCK PRICE RANGE	-0.01 (0.67)		
BREADTH OF MULTINATIONAL NETWORK	0.01 (0.088)*	0.01 (0.052)*	0.01 (0.059)*
PROFITABILITY			0.15 (0.87)
INSIDE OWNERSHIP			-0.10 (0.37)
BETA			-0.04 (0.48)
No. of Observations	30	30	30
R^2	17.9%	22.3%	17.5%

Panel B Multiple Linear Regression of the Extent of Hedging			
Dependent Variable	**Model 1 Coeff.**	**Model 2 Coeff.**	**Model 3 Coeff.**
Constant	0.036 (0.96)	0.029 (0.72)	0.071 (0.47)
Independent Variables			
SIZE	0.00 (0.96)		
FOREIGN EXPOSURE A	0.38 (0.049)**	0.36 (0.049)**	0.29 (0.23)
FOREIGN EXPOSURE B	-0.30 (0.06)*	-0.29 (0.057)*	-0.24 (0.17)
LIQUIDITY	-0.03 (0.36)	-0.03 (0.34)	-0.03 (0.39)
STOCK PRICE RANGE	-0.01 (0.50)		
BREADTH OF MULTINATIONAL NETWORK	0.01 (0.078)*	0.01 (0.032)**	0.01 (0.04)**
PROFITABILITY			0.28 (0.72)
INSIDE OWNERSHIP			-0.06 (0.52)
BETA			-0.03 (0.52)
No. of Observations	30	30	30
R^2	16.6%	21.7%	15.2%

Table 9 Binary Logistic Regression of the Use of Options

The dependent variable is 0 if the firm does not use any options to hedge its foreign currency exposure and 1 if the firm uses options. T-statistics are shown in parenthesis. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

Dependent Variable	**Value**	**Count**	
Dummy Variable	1	7	
	0	23	
Total		30	
Independent Variables	**Model 1 Coeff.**	**Model 2 Coeff.**	**Model 3 Coeff.**
SIZE	-0.05		
	(0.96)		
FOREIGN EXPOSURE A	1.55	-0.95	-10.31
	(0.75)	(0.83)	(0.19)
FOREIGN EXPOSURE B	-1.13	-0.28	4.60
	(0.78)	(0.94)	(0.34)
LIQUIDITY	-0.89	-0.70	-0.89
	(0.28)	(0.29)	(0.29)
STOCK PRICE RANGE	-1.34		
	(0.14)		
BREADTH OF MULTINATIONAL NETWORK	-0.10	-0.04	0.04
	(0.32)	(0.69)	(0.76)
PROFITABILITY			43.32
			(0.13)
INSIDE OWNERSHIP			-3.46
			(0.27)
BETA			-0.47
			(0.70)
No. of Observations	30	30	30
Concordant	81.4%	62.7%	79.5%

APPENDIX: TERMS DEFINED

APPENDIX: TERMS DEFINED

Currency forward– A contract that locks in the price a currency will be bought or sold for on a future date.

Currency future – A contract to exchange one currency for another on a future date at an agreed upon exchange rate.

Currency option– A contract granting the right but not the obligation to exchange one currency for another on a specific date for a specific exchange rate.

Currency swap – A contract where two parties exchange principal and interest payments in one currency for principal and interest payment in another currency.

Currency swaption – An option contract to enter into one side of a currency swap at a predetermined exchange rate.

Exchange rate – The price at which one currency can be purchased in terms of another currency.

Exchange rate risk – The risk an investment's value will be affected by changing exchange rates.

Foreign exchange swap – A contract among two parties to exchange two different currencies for a predetermined exchange rate on a predetermined future date.

Hedge – A security position taken so that the gains it experiences when certain risk factors (such as exchange rates) change will offset the losses experienced in a firm's underlying value or cash flows.

Natural hedge – A situation in which changes in the cash flows from (or values of) two different assets or businesses that are due to changes in an underlying risk factor (such as exchange rates) cancel each other out; a natural hedge doesn't require complex financial instruments such as derivatives.

Transaction exposure – The risk that exchange rates will change the home currency value of a future foreign cash inflow or outflow.

Translation exposure – The risk that the home currency value of a company's foreign assets or liabilities will change due to a change in the exchange rate.

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