

## Accepted Manuscript

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PII: S0927-538X(17)30351-7  
DOI: [doi:10.1016/j.pacfin.2017.12.004](https://doi.org/10.1016/j.pacfin.2017.12.004)  
Reference: PACFIN 982  
To appear in: *Pacific-Basin Finance Journal*  
Received date: 1 August 2017  
Revised date: 20 November 2017  
Accepted date: 5 December 2017

Please cite this article as: Sungjae F. Kim, Don M. Chance , An empirical analysis of corporate currency risk management policies and practices. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Pacfin(2017), doi:[10.1016/j.pacfin.2017.12.004](https://doi.org/10.1016/j.pacfin.2017.12.004)

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**An Empirical Analysis of  
Corporate Currency Risk Management  
Policies and Practices**

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R&R Version: November 20, 2017

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Conflicts of interest: none

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**Abstract**

Using a unique and extremely granular data set of complete currency spot and derivatives positions for 101 large non-financial corporations, we compare the stated currency risk management policies with the actual strategies executed by these companies. Our integrative analysis draws from the three principal sources of information that exist about firms: market prices, financial statements, and what firms say about themselves. We first identify a notable discord between the policies and their practices of firms. We next find that these companies engage in a high degree of currency speculation that seems to be driven by market movements with the results strongest for the heaviest derivatives users. Finally, we show that these companies attempt to time the market even when they are engaged in hedging. We find that the actions of companies differ from their words more often when they have a greater amount of debt, particularly foreign currency debt, and a lower level of managerial ownership. In general, we find that corporate risk management is highly speculative and more often than not disagrees with stated company policies.

Keywords: currency risk management, derivatives, hedging, corporate risk management, financial risk management

JEL Codes: F30, F31, G15, G32

# **An Empirical Analysis of Corporate Currency Risk Management Policies and Practices**

## **1. Introduction**

This study provides a detailed examination of the currency risk management practices of a sample of non-financial firms that have relatively high foreign sales. It investigates whether these companies are hedging and whether any apparent hedging is actually hedge timing, a form of selective hedging driven by movements in the currency market. We conduct a series of tests that examine their hedging with currency assets and liabilities, hedging with derivatives, and their overall or composite hedging.

Our sample of global corporations publicly claim that they practice risk management to control exchange rate risks. As non-financial corporations, they specialize in providing products and non-financial services for which they believe they have competitive advantages. For example, a global manufacturer such as Hyundai produces automobiles that have an established reputation. Hyundai can justify the risks it takes in launching new automobiles and introducing new features to its existing line of automobiles. These actions are consistent with the exploitation of its manufacturing and marketing expertise. The theory of corporate finance has long held that firms with specialized capabilities can generate economic rents, or in corporate finance parlance, positive net present values, through their capital investment activities, but, of course, not from their financing transactions.

Global corporations are exposed to currency risk that arises in the course of purchasing raw materials and selling their products in multiple countries. Currencies trade in large, highly competitive, and arguably quite efficient financial markets. In April 2016, the Bank for International Settlements estimates that the global currency spot market has average daily turnover of more than \$1.6 trillion, and derivatives turnover is about \$2.6 trillion. Manufacturing corporations would not be expected to possess a comparative advantage in trading currencies. It would seem to follow that manufacturing corporations should endeavor to eliminate their currency net exposure by hedging and focus their energies on their core

businesses. Canonical hedging models in the literature show that firms can increase their values by hedging these types of non-competitive risks and by taking risks in their areas of expertise.

Clearly, we would not expect that all manufacturers are hedged at all times, but we should expect that if they are hedging, their currency positions will reflect the dynamic adjustments of their ex ante exposure toward zero. Given sufficiently detailed information, we would expect to observe changes in their net overall currency positions of spot plus derivatives instruments that move them toward an overall hedged position. If they move away from a hedged position, we can reasonably conclude that they are not hedging, whether consciously or unconsciously. And if they change their positions in response to changes in market variables, they would appear to be attempting to time the market. In so doing, they may be ostensibly hedging, but in reality, they are trying to time their hedges, which is a form of speculation.

Naturally financial firms would be expected to actively engage in currency trading that may from time to time be speculative. Our interest, however, is not in financial institutions but in non-financial corporations that hold currency positions in support of their business activities. We use a unique data set of the 101 largest exporting companies in South Korea that contains firm-level information on currency spot and derivatives positions. As such, there is much more granular information about the currency spot and derivatives positions of Korean firms than firms in other countries. From this data, we are able to construct a complete set of end-of-year currency spot positions, currency derivatives positions, and composite currency positions for approximately 1,000 firm-years from 2000 – 2010.

The data we use are unique to this study. Most previous studies focus on the use of currency betas to capture currency exposure. Currency betas provide information on the historical sensitivities of equity returns to exchange-rate returns but are subject to many of the weaknesses and criticisms of betas in general. Moreover, currency betas reflect past relationships and not expected future relationships. Because of the unique characteristics of our data, we can examine the actual currency positions of firms. Positions in spot assets, liabilities, and derivatives clearly are more reflective of the expectations of the firms' decision makers and, thus, are more conducive to identifying what firms believe will happen in the future

in currency markets than are their currency betas, which reflect simply what has happened in the past.

With the unique data set we have available, we are able to better clarify the relationship between a firm's currency exposure as measured by its currency beta and its currency spot, derivatives, and composite positions, and as such, we more clearly delineate the hedging and speculative positions of a multinational firm. Our results reveal a number of important findings and make unique contributions to establishing a framework for understanding a positive, in contrast to a normative, model of corporate currency risk management. We show that what companies publicly say they do and what they actually do are not in agreement. In fact, they agree less than a third of the time. The primary objective of this study is to pursue the reason behind this great divide, which appears to be motivated by the practice of timing their hedges and in many cases, pure speculation. We also find that these effects are strongest for the heaviest users of derivatives and are directly related to managerial holdings of stock options.

To our knowledge, this is the first study that reports a tremendous divide between the stated hedging policies of firms and their actual activities as well as providing evidence of significant speculation and efforts to time corporate hedges. It is the first and only study that examines risk management policies on an ex ante basis, as inferred from the positions taken in currency spot assets and liabilities and derivatives instruments, rather than focusing exclusively on the results of past risk management activities. Moreover, our analysis and findings not only take advantage of the information in the equity market prices of these firms, they also delve into the financial statements and public proclamations made by these firms.

The remainder of the paper is organized as follows. Section 2 briefly reviews the previous risk management studies. In Section 3, we develop a conceptual foundation for understanding currency hedging strategies for non-financial firms. Section 4 provides a brief description of the data and the empirical methodology. We provide empirical findings in Section 5, followed by conclusions in Section 6.

## **2. Overview of Previous Studies on Corporate Risk Management**

Research on the risk management activities of corporations has looked at the rationale for

hedging, how firms determine which risks to take and which risks to hedge, whether firms are attempting to time the market, and whether the compensation contracts of managers influence hedging. In this section, we provide a brief review of that literature.

## 2.1 Should firms hedge?

Modigliani and Miler (1958) demonstrate that in a frictionless world with no transaction costs, taxes, and bankruptcy costs, financing decisions are irrelevant. If, however, corporations face and attempt to reduce these costs, there may be an economically sound rationale for hedging. The extant literature provides models that support corporate hedging to mitigate costs and thus increase the value of the firm. For example, Smith and Stulz (1985) show that if marginal tax rates are an increasing function of the firm's pre-tax value, hedging can reduce expected tax liabilities. They also argue that hedging can reduce the cost of bankruptcy and financial distress and can increase debt capacity. Froot, Sharfstein, and Stein (1993) show that hedging can increase the value of the firm by ensuring that the firm has sufficient internal funds for value-maximizing investment opportunities.

Empirical studies find evidence that firms hedge to reduce variability and thus increase value. For example, Nance, Smith, and Smithson (1993) document that the benefit of hedging is greater for the firms that have higher leverage and more growth options and hedging can reduce conflicts between debtholders and stockholders and thereby lower agency costs. Geczy, Minton, and Schrand (1997) find that firms with greater growth opportunities and tighter financial constraints are more likely to hedge their currency exposures, reducing the probability of forgoing valuable growth opportunities. Allayannis and Weston (2001) find a positive relation between firm value and the use of currency derivatives. Carter, Rogers, and Simkins (2006) find that jet fuel hedging is positively related to the values of airlines. Graham and Rogers (2002) document that the tax benefits resulting from hedging increase firm value. In short, there is substantial theoretical and empirical evidence of the benefit of hedging, and in particular, currency hedging.

## 2.2 Which risks should firms take?

Schrand and Unal (1998) show that firms can use risk management to allocate different exposures to multiple sources of risks rather than to simply reduce total risk. They argue that firms can earn economic profits for bearing risk related to activities in which they have a comparative advantage, i.e., their core business risk, which is the point illustrated earlier with the Hyundai example. By contrast, firms earn zero economic rents in efficient markets for bearing financial risks such as unexpected changes in interest rates, or exchange rates. By implementing this coordinated risk management strategy, firms optimize by choosing the appropriate level of their core business risk while decreasing the risks over which they have no competitive advantage.

Likewise, Stulz (1996) argues that if firms have a comparative advantage, risk-taking may be a value-increasing strategy. He finds that many firms use risk management to pursue goals other than simply reducing the variance of cash flows, that is, by engaging in selective, as opposed to full-cover, hedging. If a firm decides that it has a comparative advantage in taking certain financial risks, it must then determine the role of risk management in exploiting such advantage. Stulz (2013) also argues that companies having a comparative advantage in bearing and in managing risks should retain and focus on managing those risks, while seeking to transfer other risks to investors or other companies.

We take the Schrand-Unal and Stulz implications as the principal framework for this study. Firms should exploit those risks in which they have a comparative advantage and eliminate those risks in which they do not. The firms we study are manufacturers and, hence, would not be expected to have a comparative advantage in currency markets.

## 2.3 Do hedgers time the market?

Firms that ostensibly hedge may not, however, do so on a consistent basis. They may be hedged at some times and not hedged at others. Are they hedgers or not? What motivates them to put a hedge on or off? We propose that firms may engage in a hybrid form of hedging, which we call hedge timing whereby a firm puts a hedge on when it thinks the market will make an adverse move and takes a hedge



off or remains unhedged when it believes the market will move favorably. This form of hedging is clearly of a speculative nature.

There is considerable empirical evidence that firms may speculate in executing their general corporate financial policies (Baker and Wurgler (2002), Allayannis, Brown, and Klapper (2003), Faulkender (2005), Manchiraju, Pierce, and Sridharan (2014), Cheng and Xiong (2014)). In the area of currency risk management, Brown (2001) suggests that a number of dynamic factors including market volatility and recent hedge results affect the company's risk management strategy. Beber and Fabbri (2012) argue that holdings of currency derivatives are affected by past exchange rate returns. Unlike our research, however, these studies do not directly show that firms are timing the market when they try to hedge their currency risks.

Most companies engage in the manufacturing of products and provision of services that are largely unhedgeable. Hence, they willingly accept their core business risks on a continuous basis. For some companies, however, their core business risks are hedgeable. In that case, one might expect to see efforts to time hedges that are justified in the Schrand-Unal and Stulz framework. For example, Tufano (1996), Adam and Fernando (2006), and Brown, Crabb, and Haushalter (2006) show that gold mining companies may engage in hedge timing as they exploit their expertise in their core business, the gold market. Our empirical sample, however, consists of manufacturers and we focus only on currency hedging. Hence, hedging is consistent with the Schrand-Unal and Stulz framework and hedge timing is not.

#### **2.4 Does managerial compensation influence hedging?**

Smith and Stulz (1985) argue that if the manager's wealth is a concave function of firm value, the optimal strategy is to hedge the firm completely, whereas if the manager's wealth is a convex function of the firm value, the manager may behave like a risk-seeker. If managerial compensation packages, such as stock options and bonuses, make the manager's wealth a convex function of the firm value, managers with greater stock options would hedge less. Hence, firms with more managerial option holdings are less

likely to hedge. They also argue that firms whose managers own a significant fraction of the firm's shares are expected to hedge more. Empirically, Tufano (1996) finds that firms whose managers hold more shares of stock options do less hedging, and those whose managers have more wealth invested in the firm's stock do more.

### 3. A Framework for Examining How Non-Financial Firms Hedge Currency Risks?

In this section, we provide a conceptual foundation for understanding the process of currency risk management in a non-financial company with significant foreign cash flows. We provide a link between the empirical hypotheses and the tests we conduct. We also report our findings of what companies say about their risk management policies and what they actually do.

#### 3.1 Defining currency exposure from spot and derivatives positions

Suppose that a company that operates globally generates a significant portion of its sales in foreign currencies and chooses not to bear currency risk. The primary objective of its currency risk management program would be to hedge the exposure created by its foreign sales. To support its operations, however, the company holds some foreign-currency denominated assets and liabilities. If the foreign currency appreciates, the values of both its currency assets and liabilities increases. Therefore, the change in the value of foreign currency cash flows is directly linked with its currency spot net position, which is defined as the difference in total currency assets and total currency liabilities. Hence, its exposure arises not only from its foreign sales but also from its currency spot net position. That exposure would be measured and used as the primary target of its risk management program.

Assume that the company's currency assets and liabilities are denominated in  $N$  currencies and that it does not use currency derivatives. Let  $\mathbf{A}_t$  be the vector of the company's holdings of foreign currency denominated assets and  $\mathbf{L}_t$  be the vector of its holdings of foreign currency-denominated liabilities at time  $t$ , with both values stated in terms of units of the foreign currencies held by the company. Then the vector of the company's currency spot net positions,  $\boldsymbol{\phi}_t$ , is defined by  $\mathbf{A}_t - \mathbf{L}_t$ . Let  $e_{i,t}$  be the value of the  $i^{\text{th}}$  currency in terms of the local currency where  $i = 1, 2, \dots, N$ . Define the  $i^{\text{th}}$  currency's

holding period exchange rate return during a time horizon  $[t, t + 1]$  by  $r_{i,t+1} = e_{i,t+1}/e_{i,t} - 1$ .<sup>1</sup> A change in an exchange rate directly affects the company's cash flow in the local currency at time  $t + 1$ . If the  $i^{\text{th}}$  exchange rate changes from  $e_{i,t}$  to  $e_{i,t+1}$ , the cash flow changes by  $(e_{i,t+1} - e_{i,t})\varphi_{i,t} = r_{i,t+1}e_{i,t}\varphi_{i,t}$  where  $\varphi_{i,t}$  is the  $i^{\text{th}}$  currency spot net position. The company's currency spot net position can either be positive, negative, or zero. It can increase its spot net position by increasing its currency assets, decreasing its currency liabilities, or a combination of the two, or decrease its net position accordingly. We assume that it consciously chooses its net position, whether positive, negative, or zero. That is, we assume that it monitors and manages its currency position and does not allow that position to change in a haphazard manner.

Now, we extend our analysis to a company that also uses currency derivatives. Define the  $i^{\text{th}}$  currency's composite net position as the sum of the  $i^{\text{th}}$  currency's net spot and derivatives positions, where a derivatives net position is the derivatives long position minus the derivatives short position.<sup>2</sup> Denote the  $i^{\text{th}}$  currency's composite net position at time  $t$  by  $z_{i,t}$  and the derivatives net position by  $\delta_{i,t}$ . By definition, we have

$$z_{i,t} = \varphi_{i,t} + \delta_{i,t}$$

Then the company's cash flow is affected by its currency spot net position ( $\varphi_{i,t}$ ) plus its currency derivatives net position ( $\delta_{i,t}$ ). Therefore, the company's currency composite net position ( $z_{i,t}$ ) combines with its currency cash flow from sales to determine its overall net currency cash flow and represents its currency exposure.

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<sup>1</sup>The currency holding period return derives strictly from exchange rate movements. The value of a net position in a currency could grow as a result of a change in the number of units, such as through interest accruing on a foreign-currency denominated bond. Such a change is not reflected in the holding period exchange rate return.

<sup>2</sup>In our empirical work, we recognize that all long derivatives except puts have positive deltas. We reflect the use of puts in a consistent manner by grouping short puts with long calls, forwards, futures, and swaps.

### 3.2 Two-step currency risk management

Previous studies often associate hedgers as companies that use currency derivatives. This classification is misleading, however, since in practice many firms state that they hedge currency risks as a two-part process. First, they attempt to reduce the currency spot net position by matching currency assets such as accounts receivable with currency liabilities such as accounts payable. This approach is often referred to as internal risk management, which is sometimes described as a natural hedging strategy in that hedging is conducted through the firm's on-balance-sheet activities. If, however, after implementing their internal hedging strategy, firms still hold a non-zero currency spot net position, they may use derivatives to further reduce their overall exposure. This second method is referred to as external risk management since hedging at this stage requires derivatives transactions with counterparties outside of the firm. It should be noted that firms must reduce the absolute value of the currency *spot* net position if they hedge by conducting internal risk management. Likewise, firms must also reduce the absolute value of the currency *composite* net position if they hedge through external risk management. If a company hedges using derivatives, its currency composite net position is

$$z_{i,t} = \varphi_{i,t} + \delta_{i,t}; \quad \varphi_{i,t} \delta_{i,t} < 0$$

Therefore, derivatives hedging should reduce the variability in the currency cash flows. Overall, if firms hedge by conducting internal and/or external risk management, they must reduce their currency composite net position so that they can also reduce the variability in cash flows as canonical hedging models predict. Of course, firms may also use derivatives for speculative purposes. In that case, the currency derivatives net position does not necessarily reduce the currency composite net position, possibly increasing the variability in cash flows.

Naturally, some firms may manage their currency exposures strictly using derivatives, but they would also have currency spot assets and liabilities. As such, we will still have to look at their overall currency exposure.

### **3.3 Do firms actually reduce their currency composite net position when they claim they are hedging?**

The risk management policies of companies can be measured in three ways. One is through public statements, such as a company proclaiming that it hedges all foreign sales. Another is what a company is actually doing, as indicated by the changes in its currency spot and derivatives net positions. A third way is how changes in a company's currency positions are related to macroeconomic and financial variables, which can suggest that they are engaged in a form of timing. We will do all three. We start by looking at what companies say they are doing.

In this study, we use a unique data set that includes information on complete firm-level currency spot and derivatives positions in 101 large exporting companies in South Korea. Following deregulations after the 1998 financial crisis, in 2001 the Korean government began requiring firms to describe their currency risk management strategies in their annual reports, starting with the annual reports of the year 2000. As such, this information gives us a means of comparing what firms say they are doing in managing their currency risk with what they are actually doing. Companies state whether they engage in internal currency risk management strategies by referring to the use of natural hedging activities. They express whether they engage in external currency risk management strategies by referring to the use of derivatives for hedging purposes. We identify their actions by comparing their currency spot and derivatives net positions from one year to the next.

Further details of the data set are provided in Section 4.1 as a prelude to the primary empirical work, Section 5, where we report on the multivariate analyses that examine the risk management policies of these firms in more depth. In this section, we take a preliminary look at what the companies say they are doing about currency risk management and compare their words with the changes observed in their balance sheet and derivatives positions to determine if what they say and what they do are in general agreement.

We review every annual report over our sample period from 2000 to 2010 to classify the firms'

statements regarding their currency risk management strategies into four categories: internal only, internal and external, external only, and neither internal nor external.<sup>3</sup> We also examine whether firms are actually following their stated hedging policies. Investigating the changes in a firm's currency spot, derivatives, and composite net position enables us to examine if firms indeed hedge in the manner they say in their annual reports.

For instance, suppose that a firm says that it engages in internal risk management only. The firm's currency spot net position can change either through conscious attempts to balance currency assets and liabilities or merely through changes in the level of its foreign business activity. In the latter case, however, if a company's foreign business activity increases or decreases, a company that considers itself an internal hedger should respond by changing its foreign currency assets and liabilities accordingly.<sup>4</sup>

Therefore, we first determine the stated risk management policy for year  $t$  as identified by the language used in the annual report of year  $t$ . We then compare the absolute value of the company's currency spot net position at year-end  $t$  with that in the previous year, year-end  $t - 1$ . The changes that occur from year  $t - 1$  to year  $t$ , thus, reflect the actions taken during year  $t$ , the period described by its annual report. If the firm indeed conducts natural hedging in such a way as to practice internal risk

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<sup>3</sup>If a firm states that it uses internal and external risk management, we classify it as "Internal and External Risk Management." We do not interpret a firm's statement as meaning that it must simultaneously engage in internal and external risk management. Thus, the conjunction *and* is interpreted to mean that the firm's policy allows the use of either method at any time or both simultaneously. We also do not require mention of the specific words "internal" or "external." Internal risk management can be indicated by expressions such as "balance sheet matching" or "natural hedging." External risk management can be referenced by mention of the words "derivatives," "swaps", "options," etc. We also do not require that companies explicitly disavow the use of one form of hedging. Thus, failing to mention a form of hedging is sufficient to interpret that the company does not engage in that form of hedging.

<sup>4</sup>A firm that is not a hedger (or one that is) could briefly have its position be inconsistent with a policy of hedging (or not hedging), but we would expect that to occur only transitorily and be quickly rectified. Because we will observe year-end publicly reported information, companies should be particularly attentive to how the balances in their assets and liabilities appear and would ensure that these balances give an accurate impression of what they say they are doing.

management in year  $t$ , we should not see an increase in the absolute value of its currency spot net position from year  $t - 1$  to year  $t$ . Thus, if the position decreases or, in the very unlikely case, stays the same, we would consider the firm to be following a policy of internal hedging.<sup>5</sup>

Suppose that a firm states in its annual report that it engages in external risk management only. In that case, we investigate if it uses derivatives for hedging purposes. If the firm indeed conducts derivatives hedging, it should hold a currency derivatives net position in the opposite direction to its spot net position.

If the firm states that it engages in both internal and external risk management, we examine the change in its currency composite net position in year  $t$  relative to year  $t - 1$ . If the firm indeed practices internal and external risk management in year  $t$  using natural hedging and/or derivatives hedging, the absolute value of its currency composite net position should not increase from year  $t - 1$ .

Finally, suppose that a firm states that it engages in neither internal nor external risk management in year  $t$ . In this case, we examine whether the firm does not reduce the absolute value of its currency composite net position from year  $t - 1$ .

These classifications are collectively exhaustive. They encompass all of the possible ways in which a company can classify its risk management strategy with respect to whether it is practicing risk management and whether it uses spot transactions, derivatives transactions, or both. Table 1 provides a summary of the sample firms' currency risk management strategies stated in their annual reports as well as a tabulation of their actual hedging activities in the year corresponding to the annual report. Panel A summarizes the risk management strategies of these firms classified into the four categories previously described. As shown in the second column, on about five percent of the observations, firms state that they engage in internal risk management only. On about 44, 26, and 25 percent of the observations, firms state

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<sup>5</sup>Note, however, that the firm's currency exposures can be naturally hedged without any active effort to balance currency assets and liabilities so that the absolute value of its currency spot net position can decrease. In such a case, however, since the firm should be proactive in measuring and managing the level of its net exposures, we consider it as engaging in internal risk management.

that they engage in internal and external risk management, external risk management only, and neither internal nor external risk management, respectively. Thus, in about 49 and 70 percent of the observations, they state that they practice internal risk management and external risk management, respectively. In about 75 percent of the observations, firms state that they practice either external or internal risk management. Thus, on about three-fourths of the observations, they state that they are practicing some form of risk management. Recall that these observations are firm-years. In the last two columns, we attempt to measure the number of firms themselves engaged in these practices by examining their most recent annual reports, in most cases the year 2010. About 53 and 86 percent of the firms state that they engage in internal risk and external risk management, respectively. Overall about 90 percent of the firms state that they engage in either internal or external risk management. Comparing the firm-year results with the last-year firm results, it appears that an increasing number of companies use derivatives and there is a slight tendency for more firms to state that they adopt internal hedging over this period.

Panel B of Table 1 presents the number of firm-year observations in which companies actually engage in currency risk management in the manner stated in their annual reports. The diagonal totals and percentages reflect the use of strategies that are consistent with stated policies. Note that only about 38% of the time do firms state that they do internal only and actually do internal only, only about 20% of the time firms that state internal and external and actually do internal and external, only 31% of the time they state that they do external only and actually do external only, and about 42% of the time they state neither internal nor external and do neither internal nor external.

Thus, of the 880 firm-year observations, only 257, which is the sum of the diagonals and amounts to 29%, do what they say. More than half of the firm-year observations stating internal only do neither internal nor external, while more than half stating they do neither internal nor external do internal but only internal. Nonetheless, we find that about 58% of the firm-year observations stating that they do neither internal nor external actually do engage in some form of risk management. Panel B also provides a tally of the observations in which firms state that they do some form of risk management. As we see in the



right-most column, close to 30% do not practice any form of risk management in spite of saying that they do.

The contrast between what firms say they do and what they do is startling. To our best knowledge, this is the first study that reports a great divide between actual hedging activities and stated hedging strategies. It raises substantial questions about whether investors can believe what companies say about their risk management policies. Given the growing importance of disclosure in risk management, this finding is quite troubling. We continue to explore the reason behind this divide in the remainder of this paper.

### **3.4 Are firms actually engaged in hedge timing?**

If firms hedge to reduce the variability of cash flows stemming from exchange rate changes, they must also reduce their currency composite net positions without consideration of future market movements. In other words, management must not take a view on the market price when it manages currency positions. Therefore, if firms hedge, their currency spot, derivatives, or composite net position should not be significantly associated with variables that capture market activity.

If managers believe that they have comparative advantage in the currency markets, however, they will take risks as suggested by Stulz (1996). Firms can increase currency risks by using spot or derivatives positions. If a manager takes a view of the market and seeks to increase the risk using spot positions, the firm's currency spot net position must be significantly associated with market variables. If the manager attempts to take more risks and expects a significant increase (decrease) in an exchange rate, the company would hold a more positive (negative) currency spot net position. If the manager attempts to time the market using derivatives, its currency derivatives net position would be significantly correlated with market variables. A manager forecasting currency appreciation (depreciation) will increase holdings of long (short) derivative positions. If the manager attempts to time the market using spot and/or derivatives position, the firm's currency composite net position will be significantly associated with the market movements.

As we showed in Section 3.3, it is extremely common for firms to claim to hedge while increasing their currency composite net positions. In doing so, they may be engaged in what we call hedge timing. The manager will adjust the firm's currency composite net position based on an opinion on the direction of the market. Thus, if it is engaged in hedge timing, the firm's hedging activities will be significantly associated with measures of market activity. We will test a firm's hedging and hedge timing and report the empirical results in Sections 5.4 – 5.6.

If managers face option-like compensation packages, they may increase the risk to make their wealth a convex function of the firm value as suggested by Smith and Stulz (1985). Thus, firms with managers holding greater stock options will hedge less or engage in hedge timing if they do hedge. Conversely, firms with managers holding greater shares of stock will hedge more. We will test these hypotheses and report the results in Sections 5.4 and 5.5. Of course, the results of testing these hypotheses are contingent on the assumption that the manager's compensation schedule provides an incentive to operate its treasury activities as a profit center. Such incentives and a corporate culture of the treasury as a profit center are difficult to identify. We can, however, observe currency spot and derivatives positions to determine if firms are engaging in speculative trading. That is, are a firm's actions consistent with this incentive?

#### **4. Data Description and Empirical Methodology**

Examining the derivatives positions taken by firms is ordinarily difficult given the relatively coarse disclosure requirements in many countries. In the U.S., publicly-traded firms must disclose their risk management policies and provide numeric measures of their risks in the form of sensitivity analysis, simulations, or metrics such as Value-at-Risk. They are not, however, required to disclose their derivatives positions with much granularity. They can, for example, net out their derivatives assets and liabilities and disclose the overall total, and they are not required to disclose positions in currency assets and liabilities with any detail. Reporting rules in South Korea, however, require considerably more detail and, thus, provide an opportunity to examine the actual spot and derivatives positions taken by firms.

#### 4.1 Data Descriptions

We use a unique data set that includes firm-level currency balance sheet and income statement items, as well as data on derivatives positions. Our data set contains foreign currency cash, receivables, payables, borrowings, other assets and liabilities, and also foreign sales and currency-related profits and losses. From this information, we can construct the complete currency spot net position for each company. The data are also unique in that they include information on firms' derivatives positions broken down into currency forwards, swaps, and option. Using this derivatives data, we construct both the complete firm-level currency derivatives net position and the currency composite net position, reflecting both currency spot and derivatives exposure. To the best of our knowledge, this is the first study that uses complete firm-level currency spot, derivatives, and composite net positions. Although one might argue that it is only the overall position of spot plus derivatives that matters, we analyze the positions separately as well, inasmuch as derivatives require special expertise and typically specific authorized corporate policies. Hence, the results we obtain when companies hedge using derivatives could differ from those when they hedge using spot currencies.

Because small domestic companies do not have sufficient holdings of currency assets and liabilities to conduct a meaningful analysis, we use data only from large exporting companies. Large firms are also more likely to be derivatives users as suggested by Nance, Smith, and Smithson (1993), Hentschel and Kothari (2001), Graham and Rogers (2002), Adam and Fernando (2006), and Rampini, Sufi, and Viswanathan (2014). We collect this data for the 101 non-financial largest exporting companies in Korea that have foreign sales greater than five percent of total sales and asset sizes greater than one trillion Korean won, approximately US\$1 billion. These companies are also required to be listed on the Korea Exchange, and they generally have strong banking relationships and the ability to borrow in international debt markets. They also have the resources and expertise to engage in formal risk management programs using derivatives as well as through the management of their currency spot positions. We collect the currency asset, liability and derivatives data from the companies' audit reports

and their annual reports. Under these constraints, we obtain approximately 1,000 firm-year observations from 2000 to 2010.

We collect fiscal year-end accounting and daily stock price data from the Compustat Global database and various other data items from the Financial Supervisory Service's DART (Data analysis, retrieval and transfer system) website in Korea (<http://dart.fss.or.kr>). We collect macroeconomic data from the Bank of Korea's Economic Statistics System (ECOS) website (<http://ecos.bok.or.kr>), the Federal Reserve Board website (<http://www.federalreserve.gov>), and the U.S. Bureau of Labor Statistics website (<http://www.bls.gov>). We obtain LIBOR (London Interbank Offer Rate) data from the British Bankers' Association (BBA) website (<http://bbalibor.com>) and the Federal Reserve Bank of St. Louis website (<https://research.stlouisfed.org>).

To save space, we provide only a summary of the financial characteristics of the sample firms that are not reported. We find that these companies are naturally quite large, averaging \$6.6 billion in total assets and a similar amount in sales, with foreign sales about 40% of total sales. The average currency-related profit is a net loss of about \$3.8 billion. Currency assets are about 4.4% of total assets, and currency liabilities about 13.5% of total liabilities. The average currency derivatives net position is negative and in absolute value a little under 5% of total assets. As expected, the dollar is the dominant currency, with about 88% of total currency assets and a similar percentage of currency liabilities. Dollar-denominated derivatives represent virtually all derivatives. Forward contracts are the dominant derivative with swaps second and options third. The total of dollar-denominated derivatives is about 8.5% of total assets. The dollar values of the call, put, and swap positions account for only 2.1%, 1.5%, and 4.1% of total dollar-denominated currency derivatives positions, respectively. The average currency composite net position is negative and a little under 9% of total assets. Thus, on average, these firms do not cover their currency spot net positions with currency derivatives, though some derivatives can be used for anticipated cash flows, a point we will address in the tests.

## 4.2 Empirical Methodology

A critical element in examining currency risk management is in measuring exchange rate exposure and the extent of risk management. Jorion (1990) and Allayannis and Ofek (1998) estimate the exchange rate exposure using a regression model that includes market returns and exchange rate returns similarly to Adler and Dumas (1985). This measure is referred to as the currency beta. We draw from this approach but extend it by using a four-factor model based on Fama and French (1993) as suggested by Aggarwal and Harper (2010),

$$R_{i,t} - R_{rf,t} = \alpha_i + \beta_{m,i} (R_{mkt,t} - R_{rf,t}) + \beta_{fx,i} R_{fx,t} + \beta_{smb,i} SMB_{i,t} + \beta_{hml,i} HML_{i,t} + \varepsilon_{i,t} \quad (10)$$

where  $R_{i,t}$ ,  $R_{rf,t}$ ,  $R_{mkt,t}$ ,  $R_{fx,t}$  are the rates of return on the  $i^{th}$  company's stock, the risk-free asset, the market portfolio, and the exchange rate at time  $t$ . SMB is the Fama-French small minus big factor reflecting the small cap vs. large cap return differential, and HML is the Fama-French high minus low factor reflecting the value vs. growth return differential, both estimated using Korean stock data. We use the Korea Treasury yield, the return on the KOSPI index, and the rate of change in the won/dollar exchange rate for  $R_{rf,t}$ ,  $R_{mkt,t}$  and  $R_{fx,t}$ . The coefficients are estimated with Fama-MacBeth regressions using 60 previous monthly data points. The  $\beta_{fx,i}$  coefficients are proxies for the  $i^{th}$  firm's stock return sensitivity to the rate of change in the exchange rate, and thus are the currency betas. We run this regression for each month during the sample period, using the current and previous four years of monthly data. These regressions then provide currency beta estimates for each firm for each month. We assume that managers of large multinational companies are implicitly aware of their companies' currency betas even if they do not directly calculate their betas. By being cognizant of the response of their stock prices to movements of exchange rate, managers understand the direction and sensitivity of market values of their firms to exchange rate changes.

While the currency beta might be considered a reasonable measure of a firm's economic exposure to currency risks, it may not be the optimal measure. The currency beta is an ex post measure subject to

the criticism that it reflects the past and not the future. In addition, as a beta, it carries the well-known concerns about stability that exist with all beta estimates over historical time periods for non-diversified portfolios. By necessity, however, previous studies of firms' currency risk management activities use variables that look backward, such as the currency beta. The absence of detailed firm-level data has prohibited a granular examination that considers the actual positions taken by firms. The data set of the currency holdings of companies will provide a better indicator of expectations than are currency betas. Some studies measure the extent of firms' hedging using the ratio of the notional amount of currency derivatives to foreign sales (Lel (2012)) or the ratio of the change in the annual cash flow resulting from derivatives in the portfolio for a given change in the price of underlying asset to the operating cash flow (Guay and Kothari (2003)). These methodologies do not appear to classify the use of currency derivatives for hedging or speculating. The data set in this study contains detailed information on the currency spot and derivatives positions of the sample firms. As such we do not need to rely on ex post measures. Current holdings reflect strategies that position firms to take advantage of expectations.

We examine the factors that determine currency positions with the following random-effects panel regression model:

$$y_{i,t} = \alpha_1 + \beta_1 \hat{\beta}_{fx,i,t} + \sum_{j=2}^J \beta_j MV_{j,t} + \sum_{k=J+1}^K \beta_k CV_{k,t} + \varepsilon_{i,t}, \quad (11)$$

where the dependent variable  $y_{i,t}$  is either a firm's currency spot net position (currency assets minus currency liabilities), its currency derivatives net position (delta positive derivatives net of delta negative derivatives), or its currency composite position (spot plus derivatives), each scaled by total assets and measured at the end of each fiscal year. The  $\hat{\beta}_{fx,i,t}$  is the currency beta as measured by the average of the currency betas estimated with the model (10) for the twelve months before time  $t$ , the MVs are market variables that capture external shocks, and the CVs are control variables that account for firm-specific effects.

The role of the currency beta in this regression is to investigate the manager's response to changes in the company's stock price sensitivity to the exchange rate. We use the average of the currency betas during the year to better capture the manager's perception of the firm's market value sensitivity to changes in exchange rates at year-end. If a firm with a relatively high currency beta is hedging, it would either decrease its spot position by a somewhat larger amount or take on a derivatives position in the opposite direction. Similarly, if a firm with a relatively large negative currency beta is hedging, it should undertake a somewhat greater increase in its spot position or assume a derivatives position in the opposite direction. Recall that the currency beta is estimated over the previous five years. We assume that at a given time, firms are aware at least implicitly of their recent currency betas and consequently hedgers will position their currency assets, liabilities or derivatives to lower their sensitivity to exchange rate changes. Thus, for hedging firms the changes in their currency net positions should be negatively related to their currency betas. In short, at the beginning of a time period, a firm that is presumably a hedger should be taking actions that move its currency beta closer to zero.

If firms are not hedging but timing the market, however, they will take active positions based on their expectations of exchange rate movements. If firms expect the exchange rate to increase, they will increase a positive spot net position or take a positive derivatives net position. While firms with relatively higher currency betas may be more likely to be speculators, their holdings of currency net positions should primarily depend on exchange rate expectations. If firms are speculating and expect a positive exchange rate return, those firms with positive currency betas as well as those with negative currency betas will increase their currency net positions in a positive direction. Therefore, if the change in a currency net position is regressed on the currency beta, the effects of positive currency betas and those of negative currency betas will have a canceling effect. Thus, we expect that the currency beta will not be significantly related to the aggregate currency net position of speculators.<sup>6</sup> One concern might be that

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<sup>6</sup>It would appear that this argument requires a balance between positive and negative currency beta firms, but it does not. Consider an expected exchange rate increase. All speculators would tend to increase their currency net positions

currency betas do not vary sufficiently for the sample period. In our sample, however, the currency beta is not time invariant.<sup>7</sup> Large multinational firms can change their currency betas if they actively manage their currency positions by watching the betas closely and taking appropriate spot or derivatives positions. By using a random effects model instead of a fixed effects model, however, we adjust for this heterogeneity resulting from time invariance.

Therefore, if managers take a view of the currency market to increase the risks, exchange rate movements can influence their currency positions through those market views. Also, if managers actively attempt to time the market, their views on domestic and foreign interest rates will be associated with their firms' currency positions, as suggested by the International Fisher Effect. For the market variables, we use the rate of change in the exchange rate at year-end time  $t$  and the Korea-U.S. interest rate differential at year-end time  $t$ .<sup>8</sup> During the sample period, the exchange rate and the interest rate differential show a strong positive relationship as suggested by the international Fisher effect with a correlation of 0.64.

Firms that attempt to hedge their exposures may also engage in hedge timing by trying to purchase currencies at lower exchange rates and sell at higher rates. To examine whether firms are doing hedge timing, we create a dummy variable that captures internal natural hedging and external derivatives hedging. If firms are hedging and not attempting to time the market, the hedging dummy should not be significantly affected by market variables and is more likely to be associated with the currency beta. If,

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in a positive direction. If there are more positive beta firms than negative beta firms, there would appear to be an imbalance. But that imbalance works the opposite way for an expected exchange rate decrease. Thus, in the aggregate, the currency beta should be uncorrelated with the currency net position.

<sup>7</sup>The average of the sample estimated currency betas for the entire sample year by year is 0.58, 0.02, -0.12, 0.32, 0.47, 0.28, 0.25, 0.42, -0.03, -0.15, and -0.07. As an example for an individual firm, the currency beta of Samsung Electronics, which has the largest market capitalization, was year-by-year -0.65, -0.59, -0.61, 0.57, -0.27, 1.37, -0.20, -0.30, 0.34, -1.13, and -1.31. It is apparent that there is considerable variation in currency betas.

<sup>8</sup>For some robustness tests, we also use the rate of change in the average exchange rate for the twelve months before time  $t$  and the average Korea-U.S. interest rate differential for the twelve months before time  $t$  to proxy for the expected rate of change in the exchange rate and the expected interest rate differential at time  $t$ , respectively.



however, firms are trying to time the market while hedging, the hedging dummy should be significantly influenced by market shocks rather than by their currency betas. From these regressions, we can examine whether the sample firms are indeed hedging their exchange rate risks or whether they are engaging in hedge timing.

To examine whether firms are hedging or not, we also use the model in (11) and conduct a three-stage tests of hedging. For the first stage, we investigate whether firms are engaging in internal hedging. Using the dependent variable of the currency spot net change, we test whether firms are hedging or increasing the variability and report the empirical results in Table 2. For the second stage, we examine whether firms are engaging in external hedging. Including the currency derivatives net position, we test whether firms are hedging with derivatives and report the results in Table 3. The results of testing whether firms are overall hedging by engaging in internal and/or external risk management are reported in Table 4. Finally, we examine whether firms are conducting hedge timing and report the empirical results in Table 5 with robustness tests in Table 6.

We employ nine firm-specific controls. Foreign sales (over total sales) and size (log of total assets) are used to capture the effects of a firm's size on its risk management activities. Leverage (long-term debt over total assets) and capital expenditures (over total sales) are employed to proxy for the motivations for risk management to reduce the expected costs of financial distress, bankruptcy, and underinvestment. Tobin's Q is used to capture relative valuation.

To incorporate the effects of managerial compensation and wealth on a firm's risk management, we include a variable to measure the ratio of number of stock options granted to managers relative to the total number of common shares issued in the company. We also include a dummy variable that captures whether executives own shares, and measures of the shares owned by controlling blockholders. The effective tax rate for each firm-year is employed to capture the motivations for risk management to reduce

expected taxes<sup>9</sup>. In addition, we incorporate a dummy variable corresponding to the company's currency risk management policy stated in its annual report. The dummy variable takes on a value of 1 if the company states that it engages in some form of risk management and zero otherwise.

Finally, we incorporate an additional dummy variable that plays an important role in controlling for a critical factor that can affect the firm's currency positions. Hedges can be typically classified into two types: market value hedges and cash flow hedges. Market value hedges are hedges of assets held by a company. If a company is long that asset and wishes to hedge its market value, it would typically take a position that benefits from a decrease in the value of that asset. By contrast, cash flow hedges are anticipatory. If a company expects to receive or make a cash flow in the future, it can engage in a hedge transaction today that is classified as a cash flow hedge. For example, if the company expects to receive a foreign currency-denominated asset in the future, it is effectively long that currency. Thus, it might engage in a negative delta derivative transaction or it might borrow in the foreign currency spot market and later use the cash it receives to repay the loan. To adjust for this effect, we create a cash flow hedging dummy set to 1 if firms clearly state in their annual reports that they designate currency assets and liabilities for cash flow hedging of future revenues and identify the assets and debts used, or if firms state in their annual reports that they engage cash flow hedging with derivatives and they have OCI amounts in their balance sheets.<sup>10</sup> The Appendix provides formal definitions and abbreviations of all the variables in the analyses.

Of course, if the exchange rate changes, the value of a currency asset or liability that is evaluated in the local currency can change automatically, that is, without any conscious activity on the part of the firms. In order to prevent exchange rate changes from appearing to affect the holdings of currency assets

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<sup>9</sup>The marginal tax rate for the sample firms is 25 percent for the more profitable firms and 13 percent for the least profitable firms.

<sup>10</sup>Other Comprehensive Income can include entries unrelated to cash flow hedging, but we checked the notes in the annual reports to verify that the firms did record cash flow hedges into their OCI accounts.

and liabilities, we convert the values of all currency assets and liabilities denominated in local currency back to their values in foreign currencies. In essence, what this means is that we observe the dollar holdings of Korean firms. Therefore, the exchange rate change itself does not automatically lead to changes in firms' holdings of currency assets or liabilities. The exchange rate change should affect the values of the holdings, but not the holdings themselves, unless of course, the firm is actively managing its holdings in response to exchange rate changes, which is the principal issue that we examine.

## 5. Empirical Findings

To recall, we will examine if firms reduce the variability in cash flows (i.e., they hedge) when they determine the currency spot net position, the currency derivatives net position, and the currency composite net position. We then investigate the question of whether firms that may appear to be hedging are in fact timing their transactions based on events occurring in the market (i.e., they engage in hedge timing). Because the U.S. dollar comprises about 87 percent of all currency assets and liabilities, we analyze only U. S. dollar positions.

### 5.1 First Stage: Do firms engage in internal hedging?

First, we wish to determine if companies are hedging by reducing the variability of cash flows or timing the market when they manage their currency spot positions. As such, we restrict the sample to derivatives non-hedgers, which are firms that do not use currency derivatives and those that use derivatives but not to hedge their spot positions.<sup>11</sup>

Table 2 reports the results of the random effects panel regressions of the response variables on the specified explanatory variables for derivatives non-hedgers. Because of potential multicollinearity, we use either the exchange rate return or the interest rate differential but not both in the same regression. The

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<sup>11</sup>We exclude the sample from firms using derivatives for hedging purposes since derivatives hedging activities can influence the management of their currency spot net positions.

observations are positioned at year-end  $t$ , and the exchange rate return and interest rate differential are also measured at year-end  $t$ . The currency spot net positions are scaled by total assets.

The results in model (1) imply that exchange rate shocks have a positive effect on a firm's currency cash holdings, with significance at better than 1%. This positive association between cash holdings and the exchange rate return appears to be driven by speculative activity. When exchange rates increase, these firms increase their currency cash holdings. If firms were hedging, however, their currency cash holdings should not be significantly influenced by exchange rate movements.

Furthermore, the results in models (2) and (4) imply that currency cash holdings and total currency assets are also significantly positively affected by the interest rate differential. Currency borrowings appear to be also significantly positively affected by the interest rate differential, as shown in model (6). In netting currency liabilities out of currency assets, leaving the currency spot net position, models (7) and (8) show no strong effect of the exchange rate return or the interest rate differential on the overall currency spot net position. This result is likely driven by the significant effects on both currency assets and liabilities, which somewhat offset.

If firms are hedging by managing their currency spot positions, their currency betas should be significantly negatively associated with their currency spot net positions as discussed in Section 4. The currency beta, however, does not seem to be significantly negatively related to the currency spot net position. Interestingly, the currency cash positions and currency assets are significantly positively associated with the currency beta in models (1) – (4). Thus, the managers appear to take greater risks as the company's value sensitivity increases. Moreover, the internal risk management dummy does not appear to be significantly associated with firms' currency spot net positions. Thus, again, what companies say they do seems to bear no relationship to what they do. In addition, the control variables to capture cash flow hedging, managerial stock options, managerial ownership, and blockholder ownership are not significant in most of the models.

The results using the monthly average exchange rate return and the interest rate differential as opposed to the year-end exchange rate return and interest rate differential, which we do not report here, are consistent with those of Table 2. Thus, the evidence shows that these non-financial firms appear to be timing the market instead of hedging when they manage their currency spot positions. This speculation appears, quite logically, to manifest in their currency cash holdings rather than in their borrowings.

Thus, these results support the hypothesis that when firms manage their currency spot positions, they appear to be timing the market instead of hedging. As we have seen in Section 4, even though about 53 percent of sample firms claim in their annual reports that they conduct internal currency risk management using natural hedging, the findings in Table 2 suggest that they actually manage their currency spot positions in such a manner that it appears they are speculating.

## **5.2 Second Stage: Do firms engage in external hedging?**

Since our data provide information on firms' currency derivatives positions, we can also investigate whether firms indeed use derivatives to hedge their exchange rate risks. Specifically, we examine whether derivatives net positions scaled by total currency assets are determined by hedging or by market timing.<sup>12</sup> Table 3 reports the results of the regressions of the derivatives net positions of all derivatives users on the explanatory variables.

The results in model (8) imply that the derivatives net position is positively related to the interest rate differential, a result significant at the 1% level. Model (2) shows that the interest rate differential is positively related to currency forward holdings, which is significant at the 5% level. A firm's currency beta, however, is not significantly related to its currency derivatives net position or to its positions in forwards, options, or swaps. Also, the external risk management dummy is not significantly associated with firms' currency derivatives net positions. Interestingly, the cash flow hedging dummy is negative and significant in models (1) and (2), and positive and significant in models (5) and (6), meaning that cash

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<sup>12</sup>As in our examination of currency spot positions, we convert derivatives positions to their respective foreign currencies.

flow hedging is associated with the use of currency forward and swaps, an effect for which we wish to control. Firms using cash flow hedging are more likely to take a negative derivatives net position as described in models (7) and (8). Similar conclusions are drawn from the estimation results based on monthly average market shock variables, which we do not report here. The managerial stock option holdings variable is significantly negatively associated with a firm's currency forward net position in models (1) – (2) in Table 3. A possible interpretation would be that if currency forwards are a multinational corporation's primary tool for hedging their currency exposures increased by foreign sales, a negative association between currency forwards and stock option holdings may imply that firms with more managerial stock option holdings are less likely to hedge. Based on the results of Table 3, our findings suggest that when firms use currency derivatives, they are apparently attempting to time the market.

### **5.3 Do firms reduce variability when managing overall currency composite net position?**

We now examine whether firms seek to reduce the variability in cash flows when they manage the currency composite net positions scaled by total assets, which combine their spot and derivatives currency positions. We are interested in whether their composite net positions are significantly affected by market shocks or whether they are driven by attempts to truly hedge. Models (1) and (2) in Table 4 present the results of the random effects panel regressions of firms' currency composite net positions on the explanatory variables.

The results in model (2) imply that a firm's composite net position is significantly positively related to the interest rate differential. The currency beta, however, is not significant. The cash flow hedging variable is significant and negative in models (1) – (2). This may be interpreted that firms decrease cash flow hedging as they increase their currency composite net position. Interestingly, a firm's currency composite net position is significantly negatively related with its foreign sales. A possible interpretation would be that as their foreign sales increase, firms either decrease their currency spot net position or take more derivatives positions opposite foreign sales. A firm's capital expenditures and

managerial option holdings are significantly positively associated with the currency composite net position while managerial ownership and blockholder ownership holdings are significantly negatively related with the currency composite position.<sup>13</sup>

A significantly positive relationship between composite net positions and the interest rate differential implies that firms may change their currency positions by attempting to time the market based on expectations inferred from the interest rate differential.

Models (3) and (4) in Table 4 reports the results of the logit regressions of the probability of increasing a firm's currency composite net position on the explanatory variables. The results in model (3) imply that a firm's currency composite net position is significantly positively associated with exchange rate return. In addition, the currency beta, cash flow hedging dummy, and the internal/external risk management dummy are not significant.

These results support the hypothesis that overall currency positions are associated with external market shocks. Thus, these firms would appear to be timing the market instead of hedging.

#### **5.4 Third Stage: Do firms engage in hedge timing?**

Based on the results of Table 4, we have reason to suspect that firms may be attempting to time the market even when they are hedging. Their positions are changing in accordance with certain market variables. We refer to this activity as hedge timing.

We investigate whether firms are engaging in hedge timing by conducting logit regressions of a firm's hedging dummy on the explanatory variables. The hedging dummy is 1 if the absolute value of its composite net position decreases from the previous year and 0 otherwise. Thus, if a company has a net positive or net negative position and moves that position away from zero, its hedging dummy will be zero and if it moves the position closer to zero, the hedging dummy will be one. Hedge timing is suggested if the hedging dummy is related to the market variables. These results are presented in Table 5.

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<sup>13</sup>These relationships, however, do not necessarily imply that the variables are associated with a firm's hedging. Increases (decreases) in a firm's currency composite net position do not directly indicate hedging or speculating.

The results in model (2) imply that the likelihood that the firm is engaged in hedging increases if the interest rate differential increases. In addition, the results in model (3) imply that an increase in the exchange rate return is significantly associated with an increase in the likelihood that the firm is engaged in hedge timing. The results in Table 5, however, show that the currency beta, the internal/external risk management dummy, and the cash flow hedging dummy are not significantly related to the likelihood of hedging. These results indicate that a firm's active currency hedging is associated with movements in market variables.

### **5.5 Robustness tests for firms' hedge timing**

To conduct robustness tests for whether firms are conducting hedge timing, we divide the sample firms into four paired groupings that are based on time period, manufacturing orientation, and the degree of derivatives usage. The two time periods are 2001–2005 and 2006–2010. Manufacturing orientation is based on two-digit SIC codes with codes 20 to 39 being manufacturers and all other being non-manufacturers except for wholesale trades and financial services. The third classification is based on the extent to which they use derivatives. We divide the observations into two groups based on derivatives notional divided by total assets. Firms in the upper half of this measure are classified as heavy derivatives users, while those in the lower half are referred to as light derivatives users. Each classification is based on a firm-year observation basis.

Panel A of Table 6 reports the results of the logit regressions of the currency hedging dummy on the explanatory variables in the two estimation periods, 2001–2005 and 2006–2010. The results imply that currency hedging is not significantly associated with the currency beta and the internal/external risk management dummy over both estimation periods. During 2001–2005, however, the likelihood of currency hedging is significantly positively associated with the exchange rate return. During 2006–2010, which includes the Financial Crisis, the currency hedging dummy is significantly positively associated with the interest rate differential. These results imply that over both estimation periods, firms are apparently attempting to time the market even when they are hedging. The cash flow hedging dummy and



the managerial option holdings are significantly negatively associated with the likelihood of currency hedging during 2001–2005, and leverage is significantly positively related with the likelihood of currency hedging.

Panel B of Table 6 reports the results of the logit regressions of the currency hedging dummy on the explanatory variables for manufacturers and non-manufacturers. For manufacturers, the exchange rate return is significantly positively related to the likelihood of hedging. The currency beta and the internal/external risk management dummy, however, do not appear to be significantly related to the likelihood of currency hedging. The managerial option holdings is significantly negatively associated with the likelihood of currency hedging of manufacturers. Also, the cash flow hedging and Tobin's Q are significantly negatively associated with the likelihood of currency hedging of non-manufacturers. Interestingly, the leverage is significant and positive for the likelihood of currency hedging of manufacturers but significant and negative for the likelihood of currency hedging of non-manufacturers.

Panel C presents the results in which the sample firms are broken down into the two groups defined as heavy and light derivatives users. It is perhaps not surprising to see that the market variables are positive and statistically significant for heavy derivatives users. For light derivatives users, the market variables are negative but not statistically significant. The currency beta, the internal/external risk management dummy, and the cash flow hedging dummy are not statistically significant. Leverage, however, is significantly positively associated with the likelihood of currency hedging of light derivatives users.

Overall, our robustness tests in Table 6 provide additional evidence supporting the argument that firms appear to be endeavoring to time the market even when they are seemingly engaged in hedging. In other words, though they may be hedging, that hedging shows a pattern of attempting to time the market. The results are strongest for the heaviest derivatives users.

## 5.6 Factors that reinforce hedge timing

In the Korean currency market, dollar/won trading has grown considerably on a worldwide basis, with daily turnover from 2004 to 2010 doubling to \$4.4 billion. The combination of a large number of global market participants and exploding trading volume reduces if not virtually eliminates any comparative advantage sample firms might have in the currency market in Korea. As Schrand and Unal (1998) argue, firms of this type can earn almost zero economic rents from bearing homogeneous financial risk, of which FX risk is an obvious one.

Our empirical results confirm, however, that firms appear to take risks by hedge timing in the currency market where they do not appear to have comparative advantage. These large exporters have been the most influential suppliers of foreign currencies in the local FX market. This unique status might cause these managers to develop a misbelief that they have comparative informational advantages, thereby leading them to conduct hedge timing. Ko and Moon (2012) also suggest that Korean exporters' optimistic bias might lead them to engage in hedge timing with knock-in knock-out options that have been attributed to destroy firm value.

As consistent with Smith and Stulz (1985) who argue that managerial option holdings significantly reduce hedging, our empirical results in Table 5 imply that firms with more managerial stock options are less likely to hedge. This finding is particularly true in 2001-2005 rather than in 2006-2010 (Table 6, Panel A), and for manufacturers (Table 6, Panel B). Our result is an interesting finding in that unlike the gold mining companies, our sample firms do not have a comparative advantage in the FX market. This suggests that managerial overconfidence about comparative advantage as well as their holdings of option-like compensation packages cause firms to engage in hedge timing even though it is not clear that their risk-taking activities increase shareholder value.

## 5.7 Why Firms are Truthful, or Not

In this final section, we undertake an investigation of what factors explain why firms are truthful in the sense of their actions agreeing with their stated policies. Recall that in Table 1, Panel B, the

diagonal terms are the cases in which the stated policies of the companies are in agreement with the actions they undertake, and the off-diagonal elements are when there is disagreement. These firm-year observations allow for the possibility that a logit regression can distinguish firm-year agreement observations from firm-year disagreement observations and thereby provide insights into why firms might state one thing and do another. For discussion purposes, we shall refer to cases of agreement as truthful statements.

We conduct five logit regressions where a dependent variable of 1 means that the stated policy associated with the firm-year observation agrees with the action taken by that firm in that year. The results are presented in Table 7. Due to multicollinearity, we enter certain variables separately to capture currency exposure. Specifically, we use foreign currency assets, foreign currency liabilities, spot net position, derivatives net position, and composite net position. In addition, we use a number of control variables as in the previous regressions.

The results show that foreign currency liabilities and leverage in general are negatively related to the likelihood of making truthful statements. Thus, firms that are more in debt and more in foreign debt are less likely to be truthful. In addition, we see that the spot net position (SNP) and composite net position (CNP) are positively related to making truthful statements. These results may occur, however, because of the foreign currency liabilities effect. Specifically, SNP, which is foreign currency assets minus foreign currency liabilities, can be positively related to being truthful, given that we find that foreign currency assets is unrelated. In addition, CNP, which is SNP plus the derivatives net position, DNP, can be positively related since DNP is shown to have no effect in Regression (4), and SNP has a positive effect, which is apparently driven by foreign currency liabilities. Table 7 also shows that the managerial ownership dummy has a positive effect. This result suggests that when managers have greater ownership, the firm is more likely to be honest.

Thus, debt, particularly foreign currency debt, makes a firm more likely to take actions that diverge from its stated policy. An explanation is that their policy statements could be attempts to disguise

their speculation so as to garner more favorable terms from creditors. Moreover, this outcome is more likely to occur if there is a lower level of managerial ownership. Hence, firms in which managers have more skin in the game are more likely to be truthful.

## 6. Conclusions

This study makes a number of contributions to our understanding of corporate financial risk management. It is the first study that has been able to compare what companies say about their risk management policies with what they do. Our analysis not only uses the information in market prices and rates, but it also draws from financial statements, as well as public statements made by the companies. Thus, it provides an integrative analysis of the three primary sources of information we have about firms: market prices, accounting statements, and what the firms themselves say.

We find a substantial difference between words and actions. We pursue the reason behind this contradiction and find that firms are actually engaged in pure speculation as well as hedge timing. Our results on the latter are a particularly unique contribution to the literature. We show that instead of a consistent pattern of hedging exchange rate risks, companies put hedges on and off based on market movements.

Perhaps this active form of hedging occurs because managers believe they have an informational advantage in the local currency markets. We also find that these effects are stronger for the heaviest derivatives users and when managers have more stock options. Interestingly, we find that firms are less likely to be truthful if they have more leverage, and in particular more foreign currency liabilities, and firms are more truthful when there is a higher degree of managerial ownership.

The formal practice of corporate risk management is a young and evolving field. Corporations are certainly talking more and more about risk management. Our evidence suggests, however, that they are doing far less than their words suggest.

**Appendix: Variable Definitions**

<i>Exchange rate Exposure Measures</i>	
Currency Beta	<p>We estimate this measure using the following four factor regression model:</p> $R_{i,t} - R_{rf,t} = \alpha_i + \beta_{m,i} (R_{mkt,t} - R_{rf,t}) + \beta_{fx,i} R_{fx,t} + \beta_{smb,i} SMB_{i,t} + \beta_{hml,i} HML_{i,t} + \varepsilon_{i,t}$ <p>where <math>R_{rf,t}</math>, <math>R_{mkt,t}</math>, <math>R_{fx,t}</math> are the KOSPI return, the Korea Treasury yield, the change in the won/dollar exchange rate. The SMB and HML are estimated in the Korean stock market. The coefficients are estimated by running the Fama-MacBeth regressions on 60 monthly stock returns and changes in the exchange rate.</p>
<i>Market Shocks Measures</i>	
Exchange Rate Return	<p>The rate of change in the year-end won/dollar exchange rate.</p> <p><math>(\Delta \text{Exchange Rate})_t = e_t/e_{t-1} - 1</math> where <math>e_t</math> is the Korean won exchange rate against one U.S. dollar.</p>
Interest Rate Differential	<p>The difference in rates between the year-end 3-month Korean CD and the year-end 3-month dollar LIBOR.</p> <p><math>(\text{Interest Rate Differential})_t = (\text{Korean CD rate})_t - (\text{Dollar LIBOR})_t</math>.</p>
Inflation Rate Differential	<p>The difference between the rate of change in CPI in Korea and the rate of change in the U.S. at the end of the year.</p> <p><math>(\text{Inflation Rate Differential})_t = (\text{Korean CPI growth rate})_t - (\text{U.S. CPI growth rate})_t</math>.</p>
<i>Currency Position Measures</i>	
FCA	<p>The total currency assets: the sum of the year-end firm level dollar denominated cash holdings, accounts receivable, accrued revenues, investments and other assets</p>
FCL	<p>The total currency liabilities: the sum of the year-end firm level dollar denominated accounts payable, accrued expenses, borrowings, bonds, and other liabilities.</p>
SNP	<p>The currency spot net position: the difference between the total currency assets (FCA) and the total currency liabilities (FCL). <math>SNP_t = FCA_t - FCL_t</math>.</p>
Currency Forward Net Position	<p>The currency forward long position minus the currency forward short position</p>
Currency Option Net Position	<p>The currency call option net position minus the currency put option net position.</p> <p>The currency call option net position is the currency call long position minus the</p>

	currency call short position, and the currency put option net position is the currency put long position minus the currency put short position.
Currency Swap Net Position	The currency swap long position minus the currency swap short position
DNP	The currency derivatives net position: the sum of the currency forward net position, the currency option net position, and the currency swap net position.
CNP	The currency composite net position: the sum of the currency spot net position (SNP) and the currency derivatives net position (DNP).
<i>Dummy Variables to Capture Firm's Currency Risk Management Policy as Stated in its Annual Report</i>	
Stated Internal RM	Dummy variable set to 1 if a firm stated in its annual report that it engages in internal natural hedging and 0 otherwise.
Stated External RM	Dummy variable set to 1 if a firm stated in its annual report that it engages in external derivatives hedging and 0 otherwise.
Stated Internal/External RM	Dummy variable set to 1 if a firm stated in its annual report that it engages in either internal natural hedging or external derivatives hedging and 0 otherwise.
CF Hedging Dummy	The cash flow hedging dummy is set equal to 1 if a firm states in its annual report that it engages in forecasted cash flow hedges and 0 otherwise.
<i>Firm Characteristics</i>	
Foreign Sales	Sales in foreign countries scaled by total sales.
Size	The natural log of total assets in thousands of the dollars at the end of the year.
Leverage	Total long-term debts scaled by total assets
CapEx	Capital expenditure scaled by total sales
Tobin's Q	Measures the natural log of firm value: $[\text{Market value of stock} + \text{Book value of debt} + \text{Book value of preferred stock}] / \text{Book value of total assets}$ .
Mgr Stock Option Holdings	The total number of common shares that can be purchased by exercising managerial stock options divided by total number of common shares outstanding.
Mgr Ownership Dummy	Dummy variable equal to 1 if a firm's executive managers own common stocks in the company and 0 otherwise.
Blockholders	The percentage of common shares owned by the largest stakeholder who holds a controlling interest, their family, executives, and companies.
Effective tax rate	The percentage of income taxes over pretax income during the end.

Advertising	Advertising expenses scaled by total sales during the fiscal year
R&D	Research and development expenses scaled by total sales during the fiscal year.

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**Table 1. Summary of Currency Risk Management Strategies of Sample Firms**

<b>Panel A. Statements of Risk Management Policy</b>					
RM Strategies	No. of Obs.	% of Total	No of Firms	% of Total	
Internal RM only	47	5.34%	4	3.96%	
Internal and External RM	384	43.64%	50	49.50%	
External RM only	232	26.36%	37	36.63%	
Neither Internal nor External RM	217	24.66%	10	9.90%	
Total	880	100.00%	101	100.00%	
Internal RM	431	48.98%	54	53.47%	
External RM	616	70.00%	87	86.14%	
Either Internal or External RM	663	75.34%	91	90.10%	

  

Stated RM Strategies	Number of Observations in which Firms Actually Engage in							
	Internal RM		Internal & External RM		External RM		Neither Internal nor External RM	
	Only		Only		Only		Only	
Internal RM only	18	(38.3%)	1	(2.1%)	2	(4.3%)	26	(55.3%)
Internal and External RM	100	(26.0%)	76	(19.8%)	91	(23.7%)	117	(30.5%)
External RM only	56	(24.1%)	46	(19.8%)	72	(31.0%)	58	(25.0%)
Neither Internal nor External RM	116	(53.5%)	5	(2.3%)	5	(2.3%)	91	(41.9%)
Total	290	(33.0%)	128	(14.5%)	170	(19.3%)	292	(33.2%)
Internal RM	118	(27.4%)	77	(17.9%)	93	(21.6%)	143	(33.2%)
External RM	156	(25.3%)	122	(19.8%)	163	(26.5%)	175	(28.4%)
Either Internal or External RM	174	(26.2%)	123	(18.6%)	165	(24.9%)	201	(30.3%)

Note: This table provides a tabulation of currency risk management strategies that sample firms state in their annual reports with a comparison to their currency hedging activities actually taken. Currency risk management strategies are identified in 101 sample firms' annual reports from 2001 to 2010, with a total of 880 firm-year observations. Panel A presents the numbers of firm-year observations in which firms state that they engage in internal risk management, external risk management, both forms of risk management, or neither form of risk management. Panel B presents the number of firm-year observations



in which sample firms actually engage in hedging activities in the manner in which they state in their annual reports.

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**Table 2. Determinants of Currency Spot Net Position**

Dependent variables:	Currency Cash		Total Currency Assets		Currency Borrowings		Currency Spot Net Position	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Currency beta	0.001 *	0.001 *	0.001 **	0.002 **	0.000	0.000	0.000	0.000
	(1.66)	(1.94)	(2.22)	(2.14)	(0.20)	(0.14)	(0.15)	(0.13)
Exchange rate return	0.009 ***		0.009 *		0.006		0.033	
	(3.03)		(1.65)		(1.06)		(1.56)	
Interest rate differential		0.137 ***		0.361 ***		0.117 **		0.278
		(2.84)		(4.66)		(2.27)		(1.51)
Stated Internal RM	0.001	0.000	0.003	0.000	0.003	0.002	-0.004	-0.007
	(0.86)	(0.18)	(0.89)	(0.02)	(0.96)	(0.55)	(0.59)	(0.94)
CF hedging dummy	0.000	-0.001	-0.002	-0.005	0.007	0.006	-0.008	-0.008
	(0.17)	(0.45)	(0.32)	(0.78)	(1.20)	(1.05)	(0.75)	(0.82)
Foreign sales	0.029 ***	0.028 ***	0.023 ***	0.021 ***	0.026 ***	0.026 ***	-0.060 ***	-0.062 ***
	(3.42)	(3.45)	(10.19)	(9.10)	(9.38)	(8.88)	(9.92)	(10.37)
Size	-0.003	-0.003	-0.009 ***	-0.009 ***	0.001	0.001	-0.002	-0.001
	(1.64)	(1.52)	(3.07)	(3.20)	(0.36)	(0.49)	(0.37)	(0.09)
Leverage	-0.005	-0.008	-0.012	-0.022	0.092 ***	0.089 ***	-0.033	-0.041
	(0.90)	(1.41)	(0.83)	(1.52)	(5.89)	(5.67)	(0.90)	(1.15)
CapEx	-0.027 ***	-0.019 **	-0.017	0.003	-0.018	-0.012	0.163 **	0.179 ***
	(3.32)	(2.42)	(0.70)	(0.11)	(0.61)	(0.38)	(2.44)	(2.74)
Tobin's Q	0.002	0.003	0.003	0.006	0.004	0.005	-0.003	-0.001
	(0.80)	(1.27)	(0.40)	(1.04)	(1.02)	(1.32)	(0.28)	(0.07)
Mgr stock option holdings	-0.000	0.002	-0.005 **	0.001	-0.004	-0.002	0.003	0.006
	(0.15)	(0.64)	(1.98)	(0.38)	(1.46)	(0.68)	(0.42)	(0.75)
Mgr ownership dummy	0.001	0.002	-0.004	-0.003	0.002	0.003	-0.010	-0.008
	(0.47)	(0.78)	(0.73)	(0.51)	(0.69)	(0.83)	(1.27)	(1.01)
Blockholders	-0.001	-0.002	-0.006	-0.011	0.0025	0.001	-0.053 **	-0.054 **
	(0.20)	(0.24)	(0.42)	(0.78)	(0.30)	(0.12)	(1.96)	(1.96)
Effective tax rate	0.001	0.001	0.001	0.001	-0.002	-0.002	0.007 **	0.007 **
	(1.26)	(1.53)	(0.56)	(0.68)	(1.61)	(1.59)	(2.42)	(2.39)
Observations	487	487	508	508	504	504	508	508
R <sup>2</sup>	0.204	0.202	0.748	0.748	0.890	0.890	0.726	0.726

Note: This table presents random effects panel regressions of firms' currency cash, assets, borrowings, and spot net positions scaled by total assets on the currency beta, market shock variables, and control variables as described in Appendix A. Samples come from derivatives non-hedgers. Standard errors are heteroskedasticity robust. t-statistics are in parentheses. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

**Table 3. Determinants of Currency Derivatives Net Position**

Dependent variables:	Currency Forward		Currency Option		Currency Swap		Derivatives Net Position	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Currency beta	-0.001 (0.13)	-0.001 (0.11)	-0.006 (1.23)	-0.006 (1.24)	0.000 (0.77)	0.000 (0.69)	-0.006 (1.01)	-0.006 (1.02)
Exchange rate return	0.034 (0.89)		0.001 (0.24)		0.006 * (1.87)		0.041 (1.08)	
Interest rate differential		1.046 ** (2.17)		0.182 (1.07)		0.030 (0.87)		1.273 *** (2.60)
Stated External RM	-0.023 (1.44)	-0.018 (1.04)	-0.007 (1.25)	-0.005 (1.18)	0.000 (0.05)	0.0002 (0.04)	-0.028 (1.65)	-0.022 (1.19)
CF hedging dummy	-0.097 *** (3.63)	-0.099 *** (3.67)	-0.007 (1.43)	-0.007 (1.41)	0.004 ** (2.35)	0.004 ** (2.51)	-0.094 *** (3.54)	-0.097 *** (3.61)
Foreign sales	-0.008 (0.81)	-0.012 (1.15)	0.001 (0.61)	0.001 (0.43)	-0.001 (1.16)	-0.002 (1.52)	-0.011 (1.24)	-0.016 * (1.66)
Size	-0.005 (0.31)	-0.009 (0.51)	0.006 (1.31)	0.006 (1.33)	0.000 (0.49)	0.000 (0.27)	0.001 (0.07)	-0.004 (0.19)
Leverage	0.161 * (1.66)	0.151 (1.52)	0.000 (0.01)	0.000 (0.03)	0.008 (1.19)	0.006 (0.93)	0.130 (1.34)	0.118 (1.19)
CapEx	0.060 (0.57)	0.099 (0.88)	-0.008 (0.57)	-0.005 (0.41)	0.013 (1.18)	0.018 (1.52)	0.100 (1.01)	0.148 (1.40)
Tobin's Q	-0.077 ** (2.14)	-0.070 * (1.93)	0.000 (0.06)	0.001 (0.23)	0.000 (0.04)	-0.001 (0.37)	-0.076 ** (2.09)	-0.067 * (1.84)
Mgr stock option holdings	-0.001 ** (2.50)	-0.001 *** (2.84)	0.000 ** (2.10)	0.000 ** (2.21)	0.000 (0.10)	0.000 (0.18)	0.000 (1.71) *	-0.0005 ** (2.19)
Mgr ownership dummy	-0.024 (0.99)	-0.021 (0.89)	-0.004 (1.17)	-0.004 (1.13)	-0.002 (0.76)	-0.001 (0.64)	-0.031 (1.31)	-0.028 (1.19)
Blockholders	0.005 (0.11)	-0.010 (0.23)	0.008 (1.08)	0.007 (1.05)	0.017 ** (2.40)	0.016 ** (2.20)	0.029 (0.64)	0.010 (0.22)
Effective tax rate	0.001 (0.35)	0.001 (0.40)	0.001 (0.94)	0.001 (1.01)	0.000 (0.51)	0.000 (0.40)	0.001 (0.49)	0.001 (0.57)
Observations	400	400	400	400	400	400	400	400
R <sup>2</sup>	0.227	0.233	0.159	0.162	0.025	0.019	0.240	0.248

Note: This table presents random effects panel regressions of firms' currency forward, option, swap, and derivatives net positions scaled by total assets on the currency beta, market shock variables, and control variables as described in Appendix A. Samples come from derivatives users. Standard errors are heteroskedasticity robust. t-statistics are in parentheses. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

**Table 4. Determinants of Currency Composite Net Position**

Dependent Variable:	Panel Regression		Logit Regression	
	Currency Composite Net Position		Currency Composite Net Position Dummy	
	(1)	(2)	(3)	(4)
Currency beta	-0.004 (0.81)	-0.003 (0.75)	0.005 (0.69)	0.005 (0.69)
Exchange rate return	0.035 (1.39)		0.302 *** (2.69)	
Interest rate differential		0.750 *** (2.94)		1.808 (1.39)
Stated Internal/External RM	-0.018 (1.56)	-0.020 * (1.67)	-0.047 (1.04)	-0.051 (1.11)
CF hedging dummy	-0.105 *** (4.35)	-0.106 *** (4.38)	-0.054 (0.96)	-0.047 (0.84)
Foreign sales	-0.065 *** (9.59)	-0.068 *** (9.77)	0.045 (1.62)	0.038 (1.37)
Size	-0.002 (0.24)	-0.002 (0.18)	0.009 (0.48)	0.012 (0.63)
Leverage	0.056 (1.11)	0.039 (0.78)	0.147 (0.78)	0.111 (0.60)
CapEx	0.185 ** (2.50)	0.216 *** (2.84)	-0.636 ** (2.16)	-0.561 ** (1.91)
Tobin's Q	-0.041 ** (2.29)	-0.034 * (1.87)	-0.022 (0.43)	-0.0159 (0.30)
Mgr stock option holdings	0.000 ** (2.47)	0.000 *** (2.82)	-0.011 (0.33)	-0.009 (0.74)
Mgr ownership dummy	-0.031 ** (2.06)	-0.029 * (1.94)	-0.062 (1.02)	-0.052 (0.85)
Blockholders	-0.063 ** (2.07)	-0.069 ** (2.27)	-0.255 ** (2.16)	-0.238 ** (2.02)
Effective tax rate	0.00 (0.93)	0.00 (1.13)	-0.006 (0.37)	-0.005 (0.31)
Observations	773	773	775	775
R <sup>2</sup>	0.466	0.470		

Note: This table presents regressions of firms' currency composite net positions on market shock variables and control variables. Models (1) and (2) employ random effects panel regressions in which the dependent variable is the currency composite net position scaled by total assets. Models (3) and (4) employ logit regressions in which the dependent variable is the currency composite net position dummy variable and takes the value 1 if a firm's currency composite net position increases from the previous year and 0 otherwise. Definitions of the independent variables are provided in the Appendix A. For panel regressions, standard errors are heteroskedasticity robust t-statistics are reported in parentheses. For logit regressions, the marginal effects of explanatory variables evaluated at the mean on the probabilities of increasing the currency composite net position along with z-values are reported. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

**Table 5. Determinants of Currency Hedging: Do Firms Engage in Hedge Timing?**

Dependent Variable:	Currency Hedging Dummy			
	(1)	(2)	(3)	(4)
Currency beta	-0.001 (0.07)	0.000 (0.03)	0.000 (0.00)	-0.001 (0.09)
Exchange rate return	0.196 * (1.90)		0.372 ** (2.18)	
Interest rate differential		3.023 ** (2.38)		1.831 (1.33)
Stated Internal/External RM	-0.040 (0.88)	-0.044 (0.96)	-0.043 (0.94)	-0.042 (0.93)
CF hedging dummy	-0.003 (0.06)	-0.003 (0.06)	-0.007 (0.13)	0.002 (0.04)
Foreign sales	-0.005 (0.18)	-0.013 (0.49)	-0.006 (0.23)	-0.010 (0.39)
Size	-0.001 (0.08)	0.000 (0.03)	-0.001 (0.05)	0.001 (0.06)
Leverage	0.555 *** (3.07)	0.512 *** (2.84)	0.535 *** (2.97)	0.534 *** (2.99)
CapEx	-0.023 (0.08)	0.061 (0.22)	-0.018 (0.06)	0.035 (0.12)
Tobin's Q	-0.046 (0.88)	-0.0300 (0.58)	-0.041 (0.80)	-0.037 (0.70)
Mgr stock option holdings	-0.006 ** (2.50)	-0.006 *** (2.84)	-0.006 *** (2.59)	-0.006 *** (2.67)
Mgr ownership dummy	-0.061 (1.02)	-0.050 (0.84)	-0.059 (0.99)	-0.054 (0.90)
Blockholders	-0.101 (0.87)	-0.092 (0.79)	-0.095 (0.81)	-0.086 (0.74)
Effective tax rate	-0.014 (0.88)	-0.012 (0.80)	-0.013 (0.82)	-0.012 (0.84)
Observations	775	775	775	775

Note: These tables present logit regressions of a sample firm's currency hedging dummy on its currency beta, market variables, and firm-specific control variables. The dependent variable takes the value 1 if the absolute value of the currency composite net position decreases from the previous year and zero otherwise. For models (1) and (2), market variables are measured at year end, whereas they are measured as monthly average during the year for models (3) and (4). The marginal effects of explanatory variables evaluated at the mean on the probabilities of increasing the currency hedging along with z-values are reported. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

**Table 6. Robustness Tests: Determinants of Currency Hedging and Firms' Market Timing Efforts When Hedging**

Dependent variable:	2001–2005				2006–2010			
	Currency Hedging Dummy				Currency Hedging Dummy			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Currency beta	0.014 (1.36)	0.012 (1.22)	0.014 (1.32)	0.012 (1.22)	-0.023 (1.01)	-0.021 (0.89)	-0.023 (0.99)	-0.021 (0.89)
Exchange rate return	1.768 *** (3.78)		1.192 *** (3.36)		0.170 (1.63)		0.182 (0.89)	
Interest rate differential		1.825 (1.00)		1.825 (1.00)		3.740 * (1.95)		3.611 ** (1.96)
Stated Internal/External RM	-0.034 (0.53)	-0.044 (0.70)	-0.037 (0.57)	-0.044 (0.70)	0.014 (0.20)	-0.002 (0.04)	0.007 (0.10)	-0.001 (0.02)
CF hedging dummy	-0.234 *** (2.76)	-0.215 ** (2.38)	-0.223 ** (2.51)	-0.215 ** (2.38)	0.098 (1.43)	0.095 (1.40)	0.098 (1.43)	0.095 (1.39)
Foreign sales	0.050 (0.46)	0.053 (0.51)	0.042 (0.39)	0.053 (0.51)	0.002 (0.08)	-0.004 (0.13)	0.001 (0.02)	-0.003 (0.11)
Size	0.027 (0.93)	0.026 (0.91)	0.028 (1.03)	0.026 (0.91)	-0.014 (0.50)	-0.019 (0.72)	-0.013 (0.48)	-0.019 (0.72)
Leverage	0.475 * (1.70)	0.549 ** (2.09)	0.452 * (1.66)	0.549 ** (2.09)	0.441 * (1.72)	0.423 * (1.68)	0.425 * (1.68)	0.427 * (1.69)
CapEx	0.479 (0.95)	0.553 (1.14)	0.507 (1.04)	0.553 (1.14)	-0.118 (0.35)	-0.055 (0.16)	-0.104 (0.31)	-0.062 (0.18)
Tobin's Q	-0.102 (1.12)	-0.0909 (0.95)	-0.055 (0.59)	-0.0909 (0.95)	0.047 (0.68)	0.0377 (0.56)	0.040 (0.59)	0.040 (0.59)
Mgr stock option holdings	-0.006 *** (3.41)	-0.007 ** (3.49)	-0.006 *** (3.38)	-0.007 *** (3.49)	0.014 (0.07)	0.042 (0.20)	0.013 (0.06)	0.045 (0.22)
Mgr ownership dummy	-0.101 (1.17)	-0.096 (1.15)	-0.099 (1.17)	-0.096 (1.15)	0.049 (0.57)	0.056 (0.67)	0.053 (0.63)	0.057 (0.68)
Blockholders	-0.319 * (1.91)	-0.283 * (1.76)	-0.276 * (1.68)	-0.283 * (1.76)	0.267 (1.46)	0.239 (1.29)	0.273 (1.49)	0.239 (1.29)
Effective tax rate	-0.026 (0.70)	-0.023 (0.63)	-0.021 (0.57)	-0.023 (0.63)	-0.008 (0.36)	-0.008 (0.38)	-0.007 (0.32)	-0.009 (0.41)
Observations	374	374	374	374	401	401	401	401

Note: These tables present logit regressions of a firm's currency hedging dummy on its currency beta, market variables, and control variables. The marginal effects of explanatory variables evaluated at the mean along with z-values are reported. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

## Panel B: Logit Regressions for Manufacturers vs. Non-manufacturers

Dependent variable:	Manufacturers				Non-manufacturers			
	Currency Hedging Dummy				Currency Hedging Dummy			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Currency beta	0.002 (0.28)	0.003 (0.34)	0.004 (0.45)	0.002 (0.23)	-0.059 * (1.88)	-0.054 (1.63)	-0.062 * (1.91)	-0.054 (1.59)
Exchange rate return (year-end)	0.138 (1.16)		0.518 *** (2.64)		0.378 (1.27)		0.067 (0.15)	
Interest rate differential (year-end)		2.458 * (1.70)		0.302 (0.19)		3.778 (1.10)		5.003 (1.31)
Stated Internal/External RM	-0.032 (0.62)	-0.037 (0.72)	-0.035 (0.68)	-0.033 (0.65)	-0.115 (0.81)	-0.088 (0.61)	-0.125 (0.90)	-0.089 (0.63)
CF hedging dummy	-0.008 (0.12)	-0.008 (0.12)	-0.018 (0.28)	-0.003 (0.05)	-0.338 ** (2.90)	-0.330 ** (2.15)	-0.339 ** (2.25)	-0.320 ** (2.07)
Foreign sales	0.029 (0.31)	0.023 (0.25)	0.032 (0.34)	0.027 (0.29)	0.041 (0.55)	0.027 (0.34)	0.041 (0.53)	0.018 (0.23)
Size	0.004 (0.21)	0.006 (0.29)	0.003 (0.17)	0.006 (0.29)	0.166 * (1.73)	0.159 * (1.66)	0.182 * (1.93)	0.153 (1.61)
Leverage	0.898 *** (4.13)	0.862 ** (3.96)	0.890 *** (4.05)	0.890 *** (4.12)	-1.482 ** (2.16)	-1.525 ** (2.27)	-1.591 ** (2.37)	-1.471 ** (2.18)
CapEx	0.027 (0.08)	0.105 (0.32)	0.021 (0.06)	0.057 (0.17)	-0.550 (0.66)	-0.400 (0.47)	-0.547 (0.65)	-0.305 (0.35)
Tobin's Q	0.011 (0.19)	0.0219 (0.37)	0.020 (0.35)	0.010 (0.17)	-0.348 ** (2.03)	-0.3258 * (1.87)	-0.350 ** (2.05)	-0.292 (1.63)
Mgr stock option holdings	-0.006 *** (2.58)	-0.006 ** (2.85)	-0.005 *** (2.68)	-0.006 *** (2.61)	-7.849 (1.03)	-8.783 (1.17)	-9.047 (1.19)	-9.338 (1.26)
Mgr ownership dummy	-0.066 (0.94)	-0.055 (0.78)	-0.068 (0.96)	-0.060 (0.85)	0.177 (1.15)	0.174 (1.18)	0.178 (1.20)	0.158 (1.07)
Blockholders	-0.051 (0.38)	-0.040 (0.30)	-0.054 (0.40)	-0.039 (0.29)	0.763 (1.47)	0.712 (1.35)	0.773 (1.49)	0.637 (1.21)
Effective tax rate	-0.014 (0.96)	-0.013 (0.89)	-0.013 (0.84)	-0.014 (0.97)	-0.012 (0.11)	0.001 (0.01)	0.003 (0.03)	0.014 (0.12)
Observations	598	598	598	598	131	131	131	131

## Panel C: Logit Regressions by the Degree of Currency Derivatives Uses

Dependent variable:	Heavy Derivatives Users				Light Derivatives Users			
	Currency Hedging Dummy				Currency Hedging Dummy			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Currency beta	0.003 (0.39)	0.004 (0.49)	0.003 (0.40)	0.003 (0.35)	-0.028 (1.38)	-0.026 (1.31)	-0.025 (1.27)	-0.028 (1.40)
Exchange rate return (year-end)	0.312 ** (2.45)		0.426 * (1.87)		-0.036 (0.21)		0.243 (0.94)	
Interest rate differential (year-end)		5.091 ** (2.75)		4.429 ** (2.26)		1.009 (0.55)		-0.935 (0.46)
Stated Internal/External RM	-0.208 (1.57)	-0.181 (1.30)	-0.210 (1.61)	-0.192 (1.41)	-0.022 (0.39)	-0.024 (0.43)	-0.021 (0.38)	-0.018 (0.33)
CF hedging dummy	-0.010 (0.15)	-0.012 (0.19)	-0.012 (0.19)	-0.007 (0.10)	0.006 (0.02)	0.004 (0.02)	0.006 (0.03)	0.000 (0.00)
Foreign sales	0.015 (0.40)	-0.002 (0.05)	0.010 (0.28)	-0.003 (0.08)	0.201 * (1.90)	0.197 * (1.87)	0.195 * (1.85)	0.201 * (1.89)
Size	0.013 (0.44)	0.009 (0.31)	0.012 (0.41)	0.012 (0.40)	-0.006 (0.23)	-0.006 (0.23)	-0.007 (0.30)	-0.007 (0.28)
Leverage	0.203 (0.72)	0.144 (0.51)	0.195 (0.69)	0.140 (0.50)	0.772 ** (3.04)	0.757 ** (2.95)	0.751 ** (2.92)	0.775 *** (3.05)
CapEx	-0.300 (0.72)	-0.123 (0.31)	-0.258 (0.64)	-0.116 (0.29)	0.432 (0.91)	0.463 (0.98)	0.440 (0.94)	0.410 (0.86)
Tobin's Q	-0.138 (1.62)	-0.134 (1.57)	-0.139 (1.62)	-0.136 (1.58)	0.053 (0.75)	0.0594 (0.83)	0.053 (0.76)	0.045 (0.62)
Mgr stock option holdings	-0.025 (0.13)	-0.008 (1.29)	-0.016 (0.09)	-0.008 (1.22)	0.261 (1.48)	0.272 (1.53)	0.284 (1.59)	0.261 (1.46)
Mgr ownership dummy	-0.111 (1.09)	-0.102 (1.03)	-0.109 (1.09)	-0.098 (1.00)	-0.023 (0.29)	-0.020 (0.26)	-0.023 (0.29)	-0.025 (0.32)
Blockholders	-0.011 (0.06)	-0.020 (0.11)	-0.007 (0.04)	-0.013 (0.07)	-0.015 (0.10)	-0.021 (0.13)	-0.028 (0.17)	-0.020 (0.12)
Effective tax rate	-0.001 (0.05)	-0.003 (0.20)	-0.002 (0.08)	-0.003 (0.18)	-0.025 (0.68)	-0.025 (0.69)	-0.028 (0.75)	-0.026 (0.72)
Observations	388	388	388	388	387	387	387	387



**Table 7. Logit Regressions with Trustfulness Dependent Variable**

Dependent variable:	Risk Management Statement Trustfulness Dummy				
	(1)	(2)	(3)	(4)	(5)
FCA/TA	-0.021 (0.12)				
FCL/TA		-0.487 *** (3.18)			
SNP/TA			0.652 *** (3.66)		
DNP/TA				0.090 (1.04)	
CNP/TA					0.281 *** (2.75)
Currency Beta	0.001 (0.35)	0.000 (0.01)	0.000 (0.14)	0.001 (0.50)	0.001 (0.57)
Exchange Rate Return	-0.050 (0.33)	-0.038 (0.25)	-0.053 (0.35)	-0.060 (0.40)	-0.064 (0.43)
Size	-0.001 (0.06)	-0.001 (0.10)	-0.001 (0.06)	0.003 (0.21)	0.006 (0.44)
Leverage	-0.332 ** (1.95)	-0.280 * (1.63)	-0.227 (1.31)	-0.372 ** (2.14)	-0.384 ** (2.18)
R&D	-0.525 (0.71)	-1.031 (1.24)	-1.020 (1.24)	-0.511 (0.70)	-0.836 (1.07)
Tobin's Q	0.007 (0.16)	0.009 (0.20)	-0.002 (0.04)	0.012 (0.26)	0.016 (0.35)
Mgr stock option holdings	-0.005 * (1.80)	-0.005 (1.44)	-0.005 (1.60)	-0.005 * (1.81)	-0.005 * (1.82)
Mgr ownership dummy	0.088 * (1.87)	0.084 * (1.79)	0.101 ** (2.24)	0.094 ** (2.02)	0.101 ** (2.23)
Blockholders	0.086 (0.83)	0.099 (0.96)	0.128 (1.25)	0.094 (0.90)	0.110 (1.07)
Effective tax rate	-0.014 (1.21)	-0.016 (1.34)	-0.016 (1.34)	-0.016 (1.53)	-0.027 ** (2.41)
Observations	874	874	874	875	875

Note: This table presents logit regressions of a firm's risk management trustfulness dummy on its currency assets (FCA), currency liabilities (FCL), spot position (SNP), derivatives position (DNP), composite position (CNP), and control variables. The dependent variable takes 1 if a firm's risk management statements confirm to the manner in which they actually engage in hedging and zero otherwise. The marginal effects of explanatory variables evaluated at the mean along with z-values are reported. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10%, respectively.

**Acknowledgements:** This paper was presented at seminars at the Hong Kong Polytechnic University, the University at Albany, and Macquarie University and at the Korean American Finance Association, Eastern Finance Association and Academy of Financial Services meetings. The authors thank participants at those presentations and Jess Cornaggia, James Ohlson, Baeho Kim, David Smith, Na Dai, Ying Wang, Xue Han, Hany Shawky, and Shane Magee.

**Funding Sources:** This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Conflicts of Interest:** None.

ACCEPTED MANUSCRIPT

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**An Empirical Analysis of  
Corporate Currency Risk Management  
Policies and Practices**

November 10, 2017 version

**Highlights**

- Unique data set of complete currency positions for 101 non-financial corporations
- Analysis of risk management policies in comparison to the actions taken
- Analysis of whether companies are truly hedging and if they are timing the market
- We find a difference between what their stated policies and actions
- We find a high degree of speculation and market timing even when they are hedging