Who *Times* the Foreign Exchange Market? Corporate Speculation and CEO Characteristics*

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Abstract

This paper shows that managers' personal beliefs and individual characteristics explain a large share of the substantial time-variation of derivatives use beyond firm, industry, and market fundamentals. We construct a panel data set of foreign currency derivatives holdings and currency exposures for U.S. non-financial firms. We use a novel approach to build a firm-specific foreign exchange return. We find that managers adjust derivatives notional amounts in response to past foreign exchange returns, as if they were forming views on future currency prices. We then construct an empirical measure of speculative behavior for each firm to investigate the profile of the speculator. Firms where the CEO holds an MBA degree, is younger, and has less previous working experience speculate more. These results are consistent with overconfident managers taking more risk.

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1 Introduction

Managers are acknowledged to have their own style when taking corporate decisions. Personal characteristics of CEOs are empirically important determinants of a large range of corporate variables, like the firm investment policy (Malmendier and Tate, 2005), acquisition or diversification decisions, dividend policy, interest coverage, cost-cutting policy (Bertrand and Schoar, 2003), and capital structure decisions (Malmendier, Tate, and Yan, 2005). The behavioral approaches to corporate finance offer a useful complement to the other paradigms in the field in explaining some corporate policies (see Baker, Ruback, and Wurgler, 2005, for a survey). However, there are still a number of unexplored research questions. One of these is to what extent the corporate risk management policies of non-financial firms departs from textbook hedging. More specifically, do managers select the amount of derivatives according to some optimal hedging policy, or are they just taking *active* views, which reflect their personal preferences, attitudes, or skills?

In this paper, we study to what extent CEO personal beliefs and individual characteristics explain the time-series variation of foreign currency derivatives beyond industry, firm, and market fundamentals. A growing theoretical literature in behavioral finance shows that several biases, like overconfidence, representativeness and narrow framing, could induce investors and managers to incorporate their views into their financial decision making. In the context of corporate risk management, some survey evidence indicates that indeed managers frequently incorporate their views when they determine the firm's derivatives holdings.[1] It is not feasible to measure behavioral biases directly, but we observe managers personal characteristics that the literature has linked in general to the attitude towards risk and specifically to overconfidence.

Three features of our data set are crucial for the goals of our analysis. First, we construct a panel of large U.S. non-financial firms for six years that includes information on currency derivatives holdings. For the firms in our sample, managing foreign currency risk is a crucial corporate activity since the majority of them exports abroad more than 35% of the total sales.[2] Second, we build a firm-specific foreign exchange return by using geographical information on the foreign sales of each firm. This variable is important to capture active views on the foreign exchange market, whenever managers predict currency returns using past information on the exchange rate. Finally, we merge

[1] The 1998 Wharton risk management survey (Bodnar, Hayt and Marston, 1998) indicated that 61% of responding firms state that views on the foreign exchange market alter the size of their hedges.

[2] There is evidence that corporate risk management has a significant impact on the value of the firm (e.g., Allayannis and Weston, 2001; Graham and Rogers, 2002). We can expect this effect to be potentially more relevant when foreign sales represent a substantial share of total sales, as in our sample.

the panel on firm variables with hand-collected data on personal CEO characteristics.

We document a substantial time-series variation in currency derivative holdings. The annual average change in notional amounts is 56%, and 63% of the firms in our sample change their derivative position at least by 30% every year. We find that currency derivative holdings respond to the past dynamics of the foreign exchange rate, after controlling for a set of alternative hedging measures, different currency exposure proxies, firm fixed effects, and other time-varying firm characteristics. In particular, firms reduce (increase) notional amounts of currency derivatives after observing a depreciation (appreciation) in the home currency. Moreover, the characteristics of the manager compensation scheme are also relevant. Managers with compensation strongly tied to firm's stock return volatility are more willing to reduce derivatives holdings than to increase them.

The sign and the significance level of the exchange rate in explaining derivatives holdings is hard to reconcile with derivatives being exclusively managed according to an optimal hedging policy. Rather, it is consistent with managers adjusting derivative holdings over time according to some active views formed using the information in past exchange rates, which is explained by the behavioral literature with the representativeness, narrow framing and overconfidence biases.

To investigate the role of CEO's beliefs and personal characteristics for corporate risk management, we construct an empirical measure of speculation obtained as the variation of derivatives holdings that is not explained by fundamentals. We then use our proxy of speculation to test the hypotheses that personal manager characteristics positively correlated with overconfidence, such as young age, short experience, and an MBA degree, lead to more speculation. After controlling for a host of variables that describe the riskiness of the business environment, we obtain the striking result that manager personal characteristics increase the explanatory power for our proxy of speculation by about 50% with respect to firm and industry variables. Specifically, firms where the CEO is younger, holds an MBA degree and has less working experience display a larger empirical measure of speculation. These findings hold when we control for proxies of operational hedging (Allayannis et al., 2001) and when we use alternative measures of currency exposures, or different normalization of derivatives use.

The most intriguing result of our paper is the positive and highly significant coefficient on managers holding an MBA degree. We investigate whether this finding is related to the overconfidence bias or to an information advantage using several empirical exercises. First, we look at non-MBA managers with a solid training in finance and find that they do not exhibit the

same behavior. This is an indication that MBAs are unlikely to speculate because of superior finance information. Second, we construct a proxy to measure whether the deviations from fundamental hedging are successful. While detailed information on derivatives profits and losses is not available and our measure is admittedly rough, we find consistent evidence that deviations are not profitable and MBA managers seem to be, if anything, even worse performers than the rest of the sample. Finally, we test some predictions of the Gervais and Odean (2001) model of overconfidence. We find that an MBA degree only matters for speculation when managers have less experience and are successful earlier, results that are clearly consistent with an overconfidence story. We also restrict our analysis to the sub-sample of MBA degree holders, assuming that these managers are a population of potentially overconfident agents (like the traders in Gervais and Odean, 2001). Accordingly, these MBA managers speculate more with shorter working experience and with early success. In summary, all the evidence points consistently to overconfidence as the explanation behind the tendency of MBA managers to speculate more.

Our paper contributes to the literature by answering three related questions: *whether* managers *time* the foreign exchange market, *how* they do it and, most importantly, *who* they are. Along the first dimension (*whether*), we show that managers of large corporations *time* the foreign exchange market in adjusting currency hedging, thus adding to the extant evidence on equity and debt market timing (e.g., Graham and Harvey, 2001; Baker and Wurgler, 2002; Baker, Greenwood, and Wurgler, 2003; Faulkender, 2005). To identify the *timing* behavior, it is crucial to use the time-series dimension. Our paper is, to our knowledge, the first in the corporate risk management literature to use a panel data of firms with information on currency derivatives notional amounts for a broad range of industries over six years.[3] The focus of our paper on a large sample of firms across industries implies data limitations that can only be avoided by concentrating on specific single industries, such as the gold-mining sector. However, our approach to all sectors has the potential to deliver more general results. Furthermore, managers of large non-financial firms are unlikely to have superior knowledge of currency price dynamics in the same way managers of gold-mining firms have of gold prices. In this sense, we contribute to the literature focusing on single industries, such as Brown, Crabb and Haushalter (2006).

On the second aspect of our contribution (*how*), we document that managers use the past information in foreign exchange returns when *timing* the currency market. So far, the data

[3]More generally, our panel methodology also improves over the traditional approach of using dichotomous variable for derivative users (e.g., Geczy, Minton and Schrand, 1997; Bartram, Brown and Fehle, 2003), as well as papers using only a cross-section of firms (e.g., Knopf, Nam and Thornton, 2002).

limitation of observing only the total notional amount of derivatives, rather than an amount broken down by currency, was preventing a compelling empirical analysis. Our novel approach of constructing a *firm-specific* foreign exchange rate allows us to overcome this limitation. Also in this case, studies focusing on single industries can rely on more detailed information (e.g., Brown, Crabb and Haushalter, 2006), but their conclusion are potentially less general.

On the third and most important aspect of our contribution (*who*): manager personal characteristics have strong explanatory power over firm and industry characteristics. This striking finding is consistent with a growing literature on the importance of individual manager features in corporate decision making (e.g., Bertrand and Schoar, 2003; Malmendier and Tate, 2005; Malmendier, Tate, and Yan 2005). Specifically, our results on age, educational background, working experience, are all going in the direction that other papers have related to overconfidence (e.g., Barber and Odean, 2001; Gervais and Odean, 2001), or more generally to a risk-taking attitude (e.g., Kumar, 2005). Our findings on executive compensation parallel the results of Geczy, Minton and Schrand (2007). Using survey data, they show differences in executive compensation between a group of 102 non-speculators and a group of 13 frequent speculators on interest rates and foreign exchange rates. Our contribution consists in examining *actual* decisions of multiple firms over time (as opposed to *self-reported* survey information), allowing us to characterize empirically the currency market timing and to relate it to changes in foreign exchange rates and changes in the compensation scheme. In a concurrent paper on interest rates timing, Chernenko and Faulkender (2006) use a similar empirical approach.

The remainder of the paper is organized as follows. Section 2 reviews the related theoretical literature and outlines a number of testable hypotheses. Section 3 describes the data set and documents the time-series variation of currency derivatives holdings. Section 4 presents the empirical results. We first investigate the determinants of the time-series variation of currency derivatives. We then construct a proxy of speculative behavior. Finally, we investigate whether and to what extent CEO personal characteristics explain the cross-section of speculative behavior and relate our findings to the testable predictions. Section 5 discusses a series of robustness checks and additional results. Section 6 concludes.

2 Why should personal characteristics matter for corporate risk management?

In the traditional view of the firm, corporate policies are completely determined by technology and product market conditions. The manager has no role. Two different sets of assumptions can deliver this prediction. The first is the neoclassical view that managers are homogeneous and thus perfect substitutes. A more extreme assumption implies that, while managers differ in their preferences, risk aversion and other characteristics, none of these matters since a single person cannot easily affect corporate policies.

Standard agency models represent a first departure from this paradigm. These models argue that managers are opportunistic and have some discretion inside the firm that they can use to alter corporate decisions in favor of their own objectives. However, these models do not predict any variation of corporate policies, since they do not consider idiosyncratic differences across managers. Rather, agency models might attribute the variation in corporate behavior to heterogeneity in the strength of governance mechanisms across firms, i.e., heterogeneity in firms ability to control for managers opportunism.

Heterogeneity in corporate policies arises in models that explicitly allow managers to differ in their beliefs, preferences, attitudes toward risk, skills. The psychological and economic literature have both extensively investigated people's preferences and the systematic biases that arise when people form their beliefs. Some of these beliefs and preferences have been recently incorporated in financial models. These models however have been mainly used to explain aggregate stock market anomalies or some specific corporate activities like investment decisions or corporate financial policies. A full-fledged theory linking personal characteristics to hedging policies is still missing in the literature. However, we can exploit the implications of the theoretical literature in two main domains. First, the process of forming expectations and taking decisions. This helps us understand how managers would implement hedging policies. Second, the relation between risk taking attitudes, which have a role in defining a risk management policy by definition, and personal characteristics. This helps us identify the profile of the manager, who takes specific hedging decisions.

Several papers in this literature focus on the representativeness bias in forming expectations, in particular the version known as the law of small numbers, whereby people expect even short samples to reflect the properties of the parent population. Barberis, Shleifer and Vishny (1998) show that this bias generates momentum and can explain the cross-section of average returns in the stock market. The same bias generates extrapolative expectations, where investors' expectations of future

returns are based on past returns. This type of expectations are the simplest way to rationalize the positive feed-back trading, where investors buy more of an assets that has recently gone up in value (De Long et al., 1990; Barberis and Shleifer, 2003). In the context of risk management of currency exposures, the representativeness hypothesis implies that corporate managers form expectations on future exchange rates using past returns and design hedging strategies accordingly. The representativeness bias is thus consistent with the widespread use of technical analysis trading rules in forecasting the foreign exchange market, although the evidence on the predictive ability of these trading rules is mixed (e.g., Cumby and Modest, 1987; Elliott and Ito, 1999). A large part of technical analysis indicators are variations on simple trend-following rules.[4]

Another behavioral bias that could explain managers' hedging policy is *mental accounting*, a term coined by Thaler (1980). Mental accounting implies that managers maintain separate mental accounts for different decision variables. Numerous experimental studies suggest that when doing their *mental accounting*, people often appear to pay attention to narrowly defined gains and losses (*narrow framing*). These biases have been documented also among managers. For example, Loughran and Ritter (2002) use mental accounting to explain IPO underpricing. In a risk management context, managers would assess profits and losses with one mental account related to derivatives and one account related to the underlying asset, a conjecture supported by survey evidence in Coleman (2007).

Mental accounting is often linked to another behavioral bias known as *loss aversion* (Kahneman and Tversky, 1979), which implies a larger sensitivity to losses than to profits of equal size. In the corporate risk management context, mental accounting coupled with loss aversion implies that managers view the hedging profits and losses in isolation with respect to the exposure in the underlying currency and ignore offsetting effects. Specifically, if derivatives generate a loss that offsets the profits on the underlying, the manager may feel a sense of regret over the decision on the extent of hedging, leading to a reduction of hedging in the following year.[5]

Another behavioral bias that has been analyzed theoretically and also widely documented among investors and managers is overconfidence. Daniel, Hirshleifer and Subrahmanyan (1998, 2001) investigate how overconfidence biases the interpretation of different types of information. They

[4] As an example of these rules in the corporate risk management literature, Brown (2001) uses the percentage change in the spot exchange rate over the previous three months to capture the trend-following behavior of currency risk managers at the firm HDG. Brown (2001) observes that currency risk managers at HDG use various technical indicators to form views about future foreign exchange rates. He finds that the recent trends in the exchange rate are significantly related to the characteristics of the hedging portfolio. Specifically, there is a positive relationship suggesting that if the foreign currency appreciates against the USD, then HDG will tend to hedge less.

[5] We thank Robin Greenwood for pointing out this possible explanation.

assume that investors are more likely to be overconfident about information they have worked hard to generate and link these phenomena to momentum. In Heaton (2002), overconfident managers systematically overestimate the probability of good outcomes resulting from their actions. The general implications for corporate decisions are that overconfident managers act more decisively and aggressively. Thus, overconfidence leads naturally to more risk-taking attitudes. The overconfidence bias has been used so far to explain some specific corporate decisions like investment decisions (Heaton, 2002 and Malmendier and Tate, 2005), capital structure decisions (Heaton, 2002), and takeover activity (Roll 1986).[6] Barber and Odean (2000) report similar evidence for overconfident individual investors. If we assume that managers are overconfident in the context of corporate risk management, we would expect managers to take active views on the foreign exchange market.

This discussion highlights that several managerial biases - representativeness, mental accounting, loss aversion and overconfidence - could rationalize selective hedging. Furthermore, the representativeness bias would also be consistent with selective hedging based on past information about exchange rates. Of course, all these biases could potentially be at work simultaneously. The first goal of our paper is thus to provide evidence on selective hedging using variation in derivatives positions unexplained by fundamentals. More specifically, the testable implication would be

H1a: Managers incorporate their market views into their hedging decisions and thus change derivatives holdings to a large extent for reasons unrelated to the firm's fundamentals.

The second goal of the paper is to show that selective hedging is implemented using information on past returns. Specifically, we can test the following hypothesis:

H1b: Managers hedge selectively using past currency return information to predict future foreign exchange rates.

It would be certainly interesting to distinguish between alternatives theories that would imply this behavior, but data limitations prevent us to carry out this analysis directly. However, we implicitly explore these issues when we analyze the profile of the speculator. Specifically, as explained above, we explore the implications of theories that link risk-taking attitudes to personal characteristics directly or through behavioral biases. One prominent bias that the theoretical literature has analyzed extensively is overconfidence. For example, Gervais and Odean (2001) build a model to explain when overconfidence arises and how it changes over a trader's life. Traders become overconfident when they improperly overweight the possibility that their success is due

[6] While Heaton (2002) and Malmendier and Tate (2004) show that optimistic managers overinvest, assuming other imperfections such as risk aversion, Gervais, Heaton and Odean (2003) and Goel and Thakor (2002) show that optimism moves investment away from an inefficiently low level towards the first best.

to superior ability. Overconfidence is the result of an attribution bias in learning. This bias reduces over time as long as they progressively develop a more realistic assessment of their abilities. The greatest overconfidence in a trader's life span comes early in his carrier and then gradually decreases with age. Overconfidence is higher when the trader is inexperienced and after several episodes of success. The insights of this model for our corporate risk management setting are that age, working experience and previous successful outcomes could matter for the speculative behavior of the managers through their impact on overconfidence.

The age, tenure and previous working experience of the manager can affect the incentives to speculate not only through overconfidence but also for reasons related to carrier and reputation concerns, skill, or risk aversion directly. For example, older executives have greater costs of failure because getting rehired is more difficult. Similarly, executives that have been with the firm for longer have less need to establish a reputation (e.g., Gibbons and Murphy, 1992). Stulz (1996) argues that some executives may take active views when taking risks can lead to managerial promotion. A related literature in economics has also shown that age and tenure are related to skill and risk aversion.

In summary, the literature above provides at least two important testable implications:

H2: Younger managers speculate more.

H3: Managers with shorter working experience (either within the firm or in other firms) speculate more.

The overconfidence model by Gervais and Odean (2001) could easily be extended to incorporate other manager personal characteristics, like gender and educational background. If the attribution bias in learning is more likely among men than women, male managers are more likely to be overconfident. This conjecture is supported by existing evidence in finance and economics. The overconfidence hypothesis would thus imply the following additional prediction:

H4: Male managers speculate more.

In a similar vein, we could envision that people with a specific educational background are more likely to improperly think that their success is due to their superior training. For example, we could expect that managers with an MBA degree are more likely to be overconfident and thus more risk tolerant, possibly because the MBA is simply perceived as the best degree in general management. Consistent with this idea, other papers document that managers holding an MBA degree follow more aggressive strategies (Bertrand and Schoar, 2003). But the educational background could matter for risk management simply because it provides the manager with better information, not

necessarily an overconfidence story. For example, MBA degree holders could have an information advantage relative to the market that allows them to forecast future exchange rate movements more accurately. Both an overconfidence and an information story would imply the following prediction:

H5: Managers holding an MBA degree speculate more.

In the empirical analysis, we explicitly test hypotheses H1 to H5. For H5, we also try to disentangle which of the two underlying explanations, overconfidence or information, is more likely to drive our findings.

3 Data and Preliminaries

Unlike much of the extant literature, we build a panel data set. It includes large U.S. non-financial corporations between 1996 and 2001. The time-series dimension is crucial in our analysis, since it allows us to investigate the determinants of changes in the firm's derivatives holdings and to calculate a firm-specific proxy for speculation. In the next subsections, we describe the sample and the data on currency derivatives, focusing on the time-series variation of derivatives use. We also illustrate the firm characteristics and the CEO characteristics that are relevant for our analysis.

3.1 Sample

We select firms that are part of the S&P500 Index as of December 2001. We exclude financial firms (85), because their motivation in using derivatives may be different from the motivation of non-financial firms, and public utilities (52), since they are heavily regulated. We also drop firms that were part of merger and acquisitions in any of the years of our sample, consistent with the extant literature (e.g., Geczy et al, 1997), because data in one period may not be comparable to data in another period.

Since our purpose is to explain the extent and time-series variation of derivative use, we focus on those firms with foreign-exchange rate exposure during our sample period and among these firms we select only the ones that are derivatives users. Conditioning our analysis on derivatives use is important, because it effectively holds constant the fixed costs of setting up the risk-management operations. We thus consider firms reporting either non-zero foreign sales, or foreign pre-tax income, or foreign income taxes, or foreign deferred taxes, as firms with a foreign exchange-rate exposure, along the lines of Geczy, Minton and Schrand (1997).

Among the firms with currency exposure, we restrict our sample to potential currency derivative users by conducting a keyword search on the 10-K reports filed for fiscal years between 1996 and

2001. We end up with a sample of 231 firms and a total of 1315 firm-year observations. For these firms, we read the footnotes of the annual reports and obtain data on year-end gross-notional value of foreign currency derivatives.

From our initial sample, we drop 19 firms (103 firm-year observations) that were never currency derivative users during our sample period, and 22 firms (122 firm-year observations) that never had foreign currency derivatives outstanding at the end of the year, although they were qualitatively reporting the use of currency derivatives. We retain, however, firms that did not use derivatives in the first years of the sample, considering them as new derivative users as in Guay (1999).[7]

3.2 Foreign Currency Derivatives

A crucial characteristic of our sample is that firms report not only the use of foreign currency derivatives, but also their magnitude. Beginning in fiscal years ending after June 15, 1990, SFAS 105 requires all firms to report information about financial instruments with off-balance sheet risk. SFAS 119 calls for increased disclosure of derivatives activity as of December 1994. In particular, firms must report amounts and nature of derivative financial instruments, along with information about credit risk, market risk, and accounting policies. The notional amount of foreign currency derivatives outstanding at the end of the year provides information that is ignored by a dichotomous variable indicating whether or not a firm is a foreign currency derivative user. The downside of our choice could be the sample size reduction, but this is not dramatic in our sample (from 1090 to 978 firm-year observations).

However, the disclosure of notional values limits the information that can be extracted from the data, since we do not know in general whether the net position of foreign currency derivatives was short or long, and in which currency. This drawback in the data should not, however, introduce systematic biases for a number of reasons. First, the focus of the analysis is on the absolute values of the derivative positions. Second, anecdotal evidence for the firms in our sample shows that single currency derivative positions are netted before being aggregated. Non-financial firms may hold offsetting positions, in general, if they have decentralized trading of foreign currency derivatives and individual managers are allowed to manage their exposures. However, there are not other obvious reasons, such as there are for financial firms. Finally, the notional measure is not sensitive to changes in the underlying foreign-exchange rate.

Table 1 presents summary statistics on derivatives use for our sample firms. In Panel A, we

[7]The inclusion of new derivatives users in our sample could mix the incentives on *how* to hedge with the incentives on whether to start an hedging program. We find that our empirical results hold also if we drop those observations.

break down notional amounts of derivatives by instrument. Firms manage foreign-exchange risk most frequently using forward contracts. Option contracts are less common, but contract values outstanding at year's end are similar. It is common in the literature on currency risk management of operating revenues to exclude foreign currency swaps (e.g., Allayannis and Ofek, 2001), because firms generally use swaps to translate foreign debt into domestic liabilities and not to hedge foreign sales. For the same reason, foreign debt is also typically excluded.[8] Furthermore, recent empirical evidence shows that the use of foreign debt is the result of a capital structure decision rather than a typical risk management device (Allayannis, Brown and Klapper, 2003) and responds to cross-currency differences in covered and uncovered interest yields, unrelated to foreign currency exposure (McBrady and Schill, 2007).

We find widespread evidence for the combination of swaps and foreign debt also in the annual report footnotes for the firms in our sample. For example, the 10-K derivatives disclosures of Johnson and Johnson, a typical company in a typical year of our sample, read "The Company enters currency swap contracts to manage the exposure to foreign currency denominated debt...". For all these reasons, we decide not consider swaps and foreign debt in our empirical analysis. Our approach is also consistent with the short term horizon that most firms adopt in hedging currency exposures. In fact, 82% of firms in the 1998 Wharton risk management survey state they use derivatives with a maturity of 90 days or less. Lastly, foreign currency futures are almost never used by the firms in our sample. These contracts are apparently undesirable because of the mark-to-market mechanism effect on earnings volatility and the inability to customize maturity dates.

3.2.1 The Time-Series Variability of Foreign Currency Derivatives

In Table 1, Panel B, we report the notional amount of foreign currency derivatives for each year in our sample as the sum of foreign exchange forward and option contracts. We observe a monotonic increase in notional amounts outstanding at year's end, except for 2001. We attribute this decline in notionals and number of observations to the release of SFAS 133. The increased disclosure about derivative instruments may have discouraged their use, as some theoretical models predict (e.g., DeMarzo and Duffie, 1995). However, it is more likely a reporting issue, since the required mark-to-market reporting rule implies firms disclosures on fair values, profits and losses, rather than on notional amounts. In any case, we repeat all our empirical analysis in a sample period

[8] Allayannis and Ofek (2001) find that exporters prefer the use of foreign currency derivatives over the use of foreign currency debt. They argue that this might be explained by the nature of exporting, which can require customized, short-term contracts that are better served by derivatives rather than by long-term foreign debt.

with constant disclosure rules and find that the results are not sensitive to the exclusion of 2001 observations.

Panel B concludes with an interesting statistic on the degree of time-series variability of foreign currency derivatives in our sample. The absolute value of the average yearly logarithmic change of the notional amounts is 56%, i.e. our sample firms increase or decrease the amount of currency derivatives by more than 50% every year on average.

Panel C further investigates the substantial time-series variability of derivatives holdings. For each firm, we compute the average logarithmic absolute change in the notional amounts over our sample period. We then compute the proportion of firms for which the average change is greater than a certain threshold. We find that almost all the firms in our sample, 96%, change their currency derivatives holdings more than 5% each year. We also find that almost two thirds of the firms in our sample change notional amounts by more than 30% on average each year. The remainder of Panel C repeats the analysis by industry. The substantial time-series variability of currency derivatives holdings does not seem to be sector-specific.

Finally, Panel D in Table 1 reports the notional amounts of currency derivatives held by a few firms in each year of our sample. We choose three firms with relatively low currency derivatives time-series variability, three firms with medium variability, and three firms with relatively high variability. In all cases, we observe that notional amounts change substantially from year to year and do not seem to follow a distinct pattern.

3.3 Firms' Characteristics

We obtain data on firms' characteristics from COMPUSTAT. Table 2, panel A, presents summary statistics. In particular, we obtain data from the geographical segment of the COMPUSTAT database on year's end foreign sales and identifiable foreign assets. Firms must report information for segments whose sales, assets, or profits exceed 10% of consolidated totals.[9]

One of the main characteristics of the firm activity we are interested in is the exposure to the exchange rate risk. We proxy the exposure by the amount of foreign sales over total sales. The use of this ratio is a good proxy of the percentage of net foreign income (out of total income), if foreign profit margins are similar to domestic margins. In that case, the ratio of foreign sales to total sales is equal to the ratio of foreign net income to total net income.[10]

[9] More than 90% of the firms in our sample report foreign sales in the geographical segment of the COMPUSTAT database.

[10] Let us use a simple example to clarify. Suppose profit margins are such that sales are 110% of expenses, foreign

For half of the firms in our sample, foreign sales represent at least 35% of the total sales. This evidence shows that the management of currency risk exposure is a crucial corporate activity for the firms in our sample. The mean (median) proportion of foreign sales that our sample firm supposedly hedges with foreign currency derivatives is 0.21 (0.13). This result is in line with previous findings (e.g., Allayannis and Ofek, 2001) and suggests that the firms overall risk-management program is likely to include other means of hedging (e.g., operational hedges through diversified manufacturing sites).[11]

Following previous studies (e.g., Geczy, Minton and Schrand, 1997), we control for a set of firm characteristics, like size, debt ratio, growth opportunities and liquidity. We provide a detailed description of these variables in Appendix A. Larger firms may be better able to manage risk, so firm size may affect the extent of currency hedging of firms due to a difference in the ability of firms to achieve a particular exposure. Firms with less debt should be less concerned about incurring financial distress and therefore may be less worried about the volatility of their foreign exchange payments (as similarly argued by Tufano, 1996, among others). We consider capital expenditures, research and development expenditures (each standardized by the sales of the firm), and the book-to-market ratio as measures of potential distress costs (following others, such as Graham and Rogers, 2002; Geczy et al., 1997; and Allayannis and Ofek, 2001). As these measures increase, firms may become more concerned about currency fluctuations that may force such investment expenditures to be cut in times of distress, and therefore impact the desired currency exposure. For similar reasons, firms holding more liquid assets are less exposed to cut investments with adverse fluctuations in cash flows. For example, Opler, Pinkowitz, Stulz, and Williamson (1999) show that cash holdings are related to the extent of derivatives usage.

Table 2, panel A, shows that our sample firms are large corporations. For example, the average firm size is more than seven times the average size of the currency derivatives users considered in Geczy, Minton and Schrand (1997) and the average total sales are more than twice with respect to the sample considered in Geczy, Minton and Schrand (2007).

We also control for the quality of corporate governance inside each firm, by using the Gomper, Ishii, Metrick (2003) index. This index captures the balance of power between managers

sales are $110 and total sales are $550. In this example, foreign income is 10, total income is 50, and the ratio of foreign to total sales is 20%, exactly like the ratio of foreign to total income.

[11] Accounting conventions imply that foreign sales are the sum of sales realized over the year, while foreign currency derivatives notionals are amounts outstanding at year's end. Since non-financial firms generally use derivatives contracts with maturities shorter than one year (see the 1998 Wharton risk management survey), the actual proportion of foreign currency derivatives on foreign sales prevailing during the year is certainly higher than the ratio we report.

and shareholders. A higher value of this index implies higher management power and weaker shareholders rights.

3.4 Firm-specific foreign exchange rate

An important innovation of our paper is the calculation of a firm-specific foreign exchange rate. Since we do not generally know in which currency the derivatives contracts are expressed, we could use as a first approximation a general foreign exchange rate of the U.S. dollar versus a panel of major trading partners, such as the broad index compiled by the Federal Reserve Board. However, this standard approach would assign the same foreign exchange rate to all firms within the same year and would thus miss the cross-sectional dimension of the analysis.

Therefore, we build a firm-specific foreign exchange return exploiting the breakdown of the total amount of foreign sales by geographic area for each firm and in each year of the sample. Specifically, the firm-specific foreign exchange rate return represents the appreciation of the relevant foreign currency basket versus the U.S. dollar. The relevant foreign currency basket is a weighted average of the currencies of the countries where the firm reported foreign sales, weighted by the amount of sales of the firm in each country. When foreign sales refer to a geographic area rather than to a specific country, we build a synthetic foreign exchange rate of the U.S. dollar versus the specific geographic area.[12] In particular, we use the currencies of the single countries part of the geographic area and the weights of these countries as U.S. trading partners compiled by the Federal Reserve Board.

3.5 CEO's Characteristics

3.5.1 CEO's Compensation

Stock price volatility increases option values and many models thus predict a positive relation between option-based compensation and incentives for managers to take risks (see, for example, Smith and Stulz, 1985, specifically with respect to derivatives). However, existing empirical evidence on derivatives use and compensation is mixed. In cross-sectional studies across broad samples of firms, there is little evidence that the use of derivatives for hedging or speculation is greater for managers with more equity-sensitive compensation (see Geczy, Minton, and Schrand, 1997, among others). In the gold-ming sector, Tufano (1996) finds evidence of a relation between derivatives and compensation, but, more recently, Brown, Crabb and Haushalter (2006) show that

[12]For some of the firms in our sample, the indication of the geographic area was too general to be related to a specific currency or panel of currencies. In these cases we could not obtain a measure of *firm-specific* foreign exchange rate.

actively managed changes in the hedge ratios are not connected to compensation proxies. Finally, Geczy, Minton and Schrand (2007) show that speculating firms, as defined by the Wharton survey, encourage managers to speculate through incentive-aligning compensation.

We thus analyze the features of the CEO's compensation scheme. We rely on the ExecuComp database for detailed disclosure of stock and stock option compensation for each of the firms CEO. Such detailed disclosure, in particular for the stock option holdings, also allows us a deeper investigation with respect to Tufano (1996), given that in that case only aggregate option holdings were disclosed for the management of gold-mining firms.

We construct a measure of the sensitivity of the CEO compensation to the firm's stock price - *delta* - and a measure of the sensitivity to the firm's stock price volatility - *vega* -. Specifically, we obtain detailed information from ExecuComp on new option grants, exercisable and unexercisable stock options, and managerial share ownership. We couple this information with estimates from CRSP of the firms average annual stock return volatility and dividend yield over the previous five years, the firms stock price at fiscal year-end, and prevailing Treasury yields for appropriate maturities. Following the procedure described in Core and Guay (1999), we infer the average exercise price and time to maturity of previously issued stock options. With these data, we obtain an estimate of *delta* and *vega* for the entire CEO stock and stock option portfolio. For completeness and for comparison of our results with Geczy, Minton and Schrand (2007), we also compute the *delta* and *vega* measures for the CFO of the firm, using the same procedure. To mitigate issues of endogeneity, we use executive compensation variables lagged one period in our empirical analysis. We provide further details on the construction of these compensation variables in Appendix B.

Table 3, Panel A, shows summary statistics for CEO's *delta* and *vega*. A one percent increase in the stock price determines an increase of about 620 thousand dollars in the compensation of the median firm's CEO, whereas a one percent increase in the volatility of stock price causes a 210 thousand dollars increase. The values for *delta* and *vega* in our sample are larger than those reported by previous studies (e.g, Core and Guay, 1999). We attribute the difference to the larger size of the firms in our sample and to the different timing. In particular, our sample (1996 to 2001) includes a substantial rise in the stock market and a general trend toward increasing compensation in U.S. corporations.

3.5.2 CEO's Personal Characteristics

To investigate the role of the personal characteristics of the CEO, we collect information about the career background, both with the present company and with previous firms, about the educational background, and about more strictly personal attributes like the age. We obtain data on these variables from Execucomp, by reading proxy statements, and by reading a variety of publications including different editions of the "Who's who in Finance and Industry". We provide a detailed description of all these variables in Appendix B. We do the same exercise for the company CFO, although in this case it is much harder to collect relevant information.

Table 3, panel A, shows that on average the CEO in our sample has been in charge for more than six years. The CEO is on average 55 years old, has been with the company for almost 18 years, and has worked for almost three different companies before joining the firm.

Table 3, panel B, shows information about the educational and career background. We report information about education based on both the official general labeling of the degree (e.g., Master of Science) and also allocating the degrees to two more meaningful categories, namely technical and finance education. We report information on career background by again allocating previous job experiences as technical jobs or finance jobs. Almost 43% of the CEOs in our sample hold a MBA degree, about one third have a technical education and about 20% have a finance education. As for the career background, 37% of the CEOs in our samples had technical jobs and about 45% had finance jobs.

3.6 Preliminaries

Table 1, 2 and 3 summarize the key features of our sample in terms of derivatives use, firm characteristics and CEO characteristics, respectively. We now analyze the relation between these different group of variables, augmenting the set with measures of riskiness of the business environment, such as the volatility of the firm-specific foreign exchange rate and the volatility of sales. Adding the characteristics of the business environment is important because they have a positive correlation with the variability of derivatives holdings. More specifically, the volatility of derivative positions has a correlation of 0.12 and 0.17 with the volatility of foreign exchange returns and with the extent of growth opportunities, respectively.

We start by showing the correlations between derivatives positions, firm variables, and the firm-specific foreign exchange return in Table 4, Panel A. As expected, we find a positive and significant correlation between derivatives and exposure proxied by the ratio of foreign to total

sales. Interestingly, we also find that the foreign exchange returns never has a significant correlation with the firm variables, suggesting that it does not seem to proxy for some fundamental factor.

In Table 4, Panel B, we tabulate the correlations among manager personal characteristics, including its compensation. We note that age has a significantly positive correlation with the manager's tenure, as expected. In contrast, the working experience (i.e., the number of companies) is uncorrelated with both age and tenure. Finally, the MBA degree holders tend to be younger and have a shorter tenure.

Finally, Table 4, Panel C, shows the correlations between firm characteristics, manager personal characteristics, and some additional measures such as the variability of derivatives holdings and the riskiness of the business environment measured by the volatility of firm-specific exchange rates and sales. Overall, managers characteristics and firm characteristics are weakly correlated, probably with the exception of age, suggesting that there is only little evidence of specific manager types self-selecting into specific firm types.

In contrast, the characteristic of the business environment are relatively more correlated with some CEO personal characteristics. For example, we find a negative correlation between managers previous working experience and both the volatility of foreign sales and the extent of growth opportunities. In contrast, older managers tend to work in firms with larger growth opportunities. Holding an MBA degree has generally a positive correlation with measures of business risk, such as volatility of the foreign exchange rate and growth-opportunities. For example, the number of CEOs with an MBA degree is 83 (39) among firms with volatility of the foreign exchange rate above (below) the median. Similarly, the number of CEOs with an MBA degree is 72 (50) among firms with growth-opportunities above (below) median. Finally, besides the correlations shown in the different panels of Table 4 and described above, there is also some evidence that the variability of derivative positions and the manager educational background are markedly different across sectors.[13]

This preliminary evidence is useful to guide our empirical strategy. It is important to control for industry fixed effects and for cross-sectional differences in business environments that can simultaneously affect the incentive to change derivatives positions and the likelihood that a manager with some specific characteristics joins the firm.

[13] Along these lines, we presented the variation across sector of derivative holdings in Table 1, Panel C.

4 Results

In this section, we first investigate the determinants of the documented time-series variation in currency derivatives holdings. We then exploit the panel dimension of our data to construct a measure of firm-specific speculation, obtained as the variability of derivatives holdings unexplained by fundamentals. Finally, we investigate whether and to what extent behavioral biases and manager personal characteristics explain the extent of speculation in corporate risk management.

4.1 Determinants of Time-Series Variation of Derivatives Holdings

4.1.1 Baseline Specification: the role of fundamentals

We start by regressing the notional amount of foreign currency derivatives scaled by the book value of total assets on a number of firm characteristics. Scaling the notional amount of derivatives by total assets is the most frequent choice in the corporate risk management literature (e.g., Graham and Rogers, 2002; Knopf, Nam and Thornton, 2002). Section 5 in the paper will show the robustness of our empirical results to the use of different scaling variables of the derivatives notional amounts. The firm characteristics that control for fundamentals are the ratio of foreign sales to total sales, the size, the debt ratio, the quick ratio, and a proxy for growth opportunities (ratio of capital expenditures to total sales).[14]

The first column of Table 5 shows the results of estimating this baseline specification with firm fixed-effects, year dummies, and robust standard errors. Interestingly, only the ratio of foreign to total sales is statistically significant. As explained in Section 3, this variable is a measure of currency exposure and is equivalent to net foreign income to total income when margins on foreign and domestic sales are similar. The small predictive power of firm fundamentals for variation in derivatives holdings does not change when we use different econometric specifications, such as a panel estimation with random effects and sector dummies or an ordered probit model where the dependent variable is the discrete decision to increase or decrease derivatives holdings (results not reported). The low explanatory power of firm fundamentals for changes in derivatives holdings is an indication that managers could be taking views and implement selective hedging, consistent with our hypothesis $H1$.

[14] We obtain very similar results when we use different control variables as proxies for size (total assets) and growth (book-to-market ratio). We also used additional control variables (e.g., a proxy for firm diversification) that were never significant and did not change the results.

4.1.2 Including past currency returns

We complement the set of fundamental explanatory variables with a novel regressor, the lagged *firm-specific* foreign exchange return, which has the purpose to capture the way managers take active views. As discussed in Section 2, in the context of risk management, behavioral biases like representativeness, narrow framing, and overconfidence can generate market timing based on the information in past currency returns.

Table 5, second column, shows a striking result. The $within - R^2$ increases by more than 40%, from 5% to 7%, and the coefficient of the lagged firm-specific foreign exchange return is statistically significant, lending empirical support to the hypothesis $H1$. Furthermore, the sign of the coefficient is negative, suggesting that the appreciation (depreciation) of the foreign currency versus the U.S. dollar in the previous year reduces (increases) derivatives holdings in the current year. This finding is consistent with the representativeness bias: foreign currency appreciation implies further appreciations and therefore suggests to reduce hedging of foreign sales in the following year. The negative coefficient on the foreign exchange return is also consistent with the mental accounting. In this case, hedging foreign sales generates offsetting losses that are likely to be seen in isolation from the underlying profits and, as a result, suggest to reduce hedging of foreign sales in the following year.

In our interpretation, we are implicitly assuming that the firms in our sample are using currency derivatives to hedge foreign sales. Unfortunately, data on foreign purchases are not available and therefore we cannot support this conjecture explicitly. However, we can still get some indirect indications using data on annual import and export shares for the main U.S. manufacturing industries compiled by the U.S. Department of Commerce (we will use these data more extensively in Section 5 to check the general robustness of our results). More specifically, we test whether our findings on the hedging effects of past exchange rates are stronger for firms belonging to the three sectors with the largest difference between sector exports and imports. These firms are more likely to be foreign-seller firms. The results (not tabulated) show that for this sub-sample of firms, the effect of past exchange rates on derivatives positions is economically and statistically stronger than in the general case, even if the number of observations is reduced by about a third.

The significant result on lagged foreign currency returns is hard to reconcile with optimal hedging policies, because they should act through firm variables we do not control for and that are correlated with lagged currency returns. We discuss two simple examples to better illustrate this idea. Suppose that past currency returns have an effect on the investment policy of the firm.

Since hedging is known to mitigate the underinvestment problem (e.g., Froot, Scharfstein and Stein, 1993), we could envision an indirect effect of past currency returns on optimal hedging strategies. However, we control for the growth opportunities available to a firm using three alternative proxy variables (capital expenditures, book-to-market ratio, and research and development expenditures). These proxies would capture a potential effect of currency returns on growth opportunities.

Now suppose currency returns have an effect on the competitiveness of the firm and thus alter the probability of financial distress. If the expected costs of financial distress affect the incentives to hedge (e.g., Smith and Stulz, 1985), then past currency returns have an impact on the optimal hedging policy. However, our proxy for expected financial distress costs, the debt ratio, would take this effect into account.

We obtain the same findings on the lagged currency returns also when we add to the regressors quadratic terms of firm variables to control for potential non-linear hedging strategies and when we estimate an ordered probit model with the discrete decision to change derivatives holdings as dependent variable (results not reported).

We compute the economic effect of a one-standard deviation shock to exchange rates on derivatives holdings. We find a strong impact of 11% on the median derivatives position. This statistically and economically significant dependence on the lagged currency return is a remarkable finding, because our measure of the foreign exchange return is based on two approximations. First, since we do not observe a breakdown of derivatives in different currencies but a net amount, we assume that the firm is holding derivatives in the same currency denomination of the foreign sales. Second, for the same reason, we build an average foreign exchange return that dampens down the variation of each single currency. Therefore, the effect of the lagged currency return that we find is likely to be a conservative estimate of the actual effect.

Of the fundamental variables, the ratio of foreign to total sales is still significant and the quick ratio is also statistically significant now. An increase in the firm quick ratio reduces derivative positions, suggesting that firms holding more liquid assets need smaller derivatives positions, because they are less exposed to cut investments with adverse fluctuations in cash flows (see Opler, Pinkowitz, Stulz, and Williamson, 1999).

4.1.3 Including manager's compensation

In line with related literature (e.g., Tufano, 1996), we now include the features of the executive compensation scheme. In particular, we isolate the incentive of the CEO to increase the stock price

(*delta*) and the incentive of the CEO to increase the volatility of the stock price (*vega*), similarly to Geczy, Minton and Schrand (2007).

In the third column of Table 5, we observe that an increase in *vega* leads to a reduction in currency hedging, whereas *delta* is not statistically significant. The result suggests that the CEO has the incentive to leave more currency exposure unhedged, and therefore to let the firm exposed to a higher currency risk, when her compensation is strongly tied to the volatility of the stock price.

In the remainder of Table 5, we let the executive compensation scheme influence derivatives holdings also indirectly through the interaction with the foreign exchange return. In the fourth column of Table 5, we thus interact *vega* by the depreciation ($Forex < 0$) and by the appreciation ($Forex > 0$) of the foreign currency. We construct two separate interaction terms, because we expect that the unconditional effect of *vega* to reduce derivatives holdings will reinforce consistent signals from past foreign currency returns, but at the same time will offset contrasting indications. The coefficient on the foreign currency return is still negative and statistically significant. The first vega interaction term is positive and significant (at the five percent level), while the second interaction term is negative. This evidence suggests that managers react to changes in the exchange rate in an asymmetric fashion. After a depreciation of the foreign currency, firms generally increase derivatives holdings, as in the baseline specifications, but this effect is slightly diminished when CEOs have compensation with higher *vega*.[15] In contrast, after an appreciation of the foreign currency, firms generally reduce derivatives holdings and CEOs with higher *vega* tend to do it more frequently, although this last effect is not statistically significant. These results imply that the incentive to take active views is affected by the characteristics, namely the *vega*, of the executive compensation scheme.

In the last column of Table 5, we interact the CEO's lagged *delta* with the lagged foreign exchange rate return ($Forex$). We confirm all the results of the basic specification. However, the interaction term is not statistically significant. The CEO does not seem to take active views more frequently when her compensation is more strongly tied to the stock price.

4.1.4 A proxy for speculation

Our results so far show that fundamental firm variables have low explanatory power for changes in derivatives holdings and a proxy for active views based on past currency returns is economically

[15]The coefficient on the first interaction term in the fourth column of Table 5 is positive and significant. Notice, however, that the first interaction term is always a negative quantity, because it is the product of a positive quantity - vega - and a negative quantity - foreign currency depreciation -. The total effect is thus negative.

and statistically significant in all specifications. This suggests that a firm's hedging policy could be affected by speculative motives. We thus construct an empirical measure of speculation intensity to understand the characteristics of the firm that deviates from textbook hedging.

We use the residuals of the baseline panel regression with firm characteristics, year and firm fixed-effects estimated in Table 5, column one, to exclude the effects of fundamental motives for hedging. We end up with a panel of estimated residuals for each firm, over time. We construct our measure of speculation as the firm-specific standard deviation of the estimated residuals ($\sigma_{RES_{fcd}}$) for the six years in our sample. Firms with a large standard deviation of $\sigma_{RES_{fcd}}$ are likely to be firms where the hedging strategy deviates the most from textbook hedging and are thus more likely to be speculators.

We only use the residuals for the years in which firms use derivatives. Since the variability of residuals is potentially larger for firms that use derivatives only for part of the sample period, we also carry out our empirical analysis with the exclusion of these firms.

As a reality check on this speculation measure, we recompute the correlations of Table 4, panel C, using $\sigma_{RES_{fcd}}$ instead of the variability of derivatives holdings. We find that all the correlations with manager characteristics are never significantly different from zero, suggesting that we were indeed able to exclude from this speculation measure fundamental factors that were still present in the variability of derivatives holdings.

4.2 The Profile of the Speculator

In this section, we describe the profile of the speculator. Specifically, we investigate what are the manager characteristics that have explanatory power for our empirical measure of speculation $\sigma_{RES_{fcd}}$, using a cross-sectional analysis. If managers are changing derivatives holdings simply as an outcome of some optimal hedging policy, we should not find any significant relation. In contrast, if managers speculate, we should find significant relations on the manager characteristics that the literature has linked to risk attitudes mainly through the effect of overconfidence and other behavioral biases.

Table 6 presents the results of this analysis. We first estimate a baseline cross-sectional specification with firm variables, industry dummies and robust standard errors. We find that firms with larger foreign currency exposures measured by the ratio of foreign to total sales exhibit a higher volatility of deviations from textbook hedging. This result could be the related to the stronger incentives to take active views when the currency risk is a more relevant determinant of

the firm's profits and is consistent with the survey evidence analyzed in Geczy, Minton and Schrand (2007). We also find that larger firms exhibit a lower variability of derivatives holdings.

In the second column of Table 6, we add the characteristics of the CEO's compensation scheme. When CEOs have stronger incentives based on the stock price (a larger *delta*), they take active views significantly more frequently. The relation with CEOs' *vega* is positive, but not significant. These two findings suggest that CEOs perceive speculation as a positive NPV activity, as opposed to an activity that merely increases volatility but is negative NPV.

In the third column of Table 6, we add a number of personal CEO's characteristics that the theoretical literature has identified as potentially relevant to explain executive attitude towards risk, as we extensively explained in Section 2. More specifically, we include the age of the CEO *(Age)*, the length of the previous working experience distinguishing between the length of tenure inside the firm *(Tenure)* and the number of companies where the CEO has worked before joining the company *(No. of Companies)*. Finally, we characterize the educational background, including a dummy variable that takes value of one if the CEO holds an MBA degree.

The results are intriguing. Older CEOs seem to be more conservative when taking active views on the currency market, lending empirical support to the hypothesis $H2$. This is consistent with the results of Bertrand and Schoar (2003) that older managers appear to follow less aggressive strategies in corporate investment decisions and financial policies. Likewise, Barber and Odean (2000) and Kumar (2005) both document a similar behavioral bias, in that excessive trading or investments in lottery-type stocks tend to decrease with the age of individual investors. Furthermore, we document, to our knowledge for the first time, that the previous working experience also matters. CEOs that have worked for a larger number of companies are less likely to take active views, lending empirical support to the hypothesis $H3$. A possible common explanation behind the negative sign of the age and the working experience of the CEO could be overconfidence, in line with the argument of Gervais and Odean (2001). When we compute the economic impact of changes in CEO's age and experience on the variability of the derivatives position, the results are striking. A one-standard deviation shock to the age of the CEO and to the number of companies the CEO has worked for, have an impact on the median FX derivatives variability of 28%, and 21%, respectively.

Interestingly, we find that the coefficient on the MBA dummy variable is positive and statistically significant, suggesting that managers with MBA degrees are more likely to take active views. This is consistent with hypothesis $H5$ in Section 2 and with the results of Bertrand and Schoar (2003) that managers who hold MBA degrees appear to follow more aggressive strategies

when deciding about capital expenditures. The economic effect is very strong: firms with MBA-CEOs have a 56% larger variability of FX derivatives positions.

We presented descriptive evidence in Table 4, panel C, that managers working experience and MBA degrees exhibit some correlation with the riskiness of the business environment, described by the volatility of firm-specific foreign-exchange rates and the volatility of foreign sales.[16] In the last column of Table 6, we thus add these two variables to the set of regressors to control for the conditions of the market environment. Both the volatility of firm-specific foreign-exchange rates and the volatility of foreign sales positively affect the variability of derivatives holdings, even if their effect is not statistically significant. However, the coefficients on the MBA degree, the working experience and the age of the CEO are, if anything, even stronger than in the previous specifications.

We estimate a number of other different specifications that we do not tabulate because they have either very similar or non-significant results. For example, the results do not change when we use the volatility of total rather than foreign sales. When we control for the gender of the CEO, we find that firms with male managers exhibit significantly larger $\sigma_{RES_{fcd}}$, lending empirical support to hypothesis $H4$ in Section 2. The number of female managers in our sample is extremely low and we are thus very cautious in the interpretation of this finding. Finally, we also add the Gompers, Ishii, Metrick (2003) corporate governance index. We do not find a significant effect of corporate governance quality and all the previous results hold virtually unchanged. The insignificant finding on corporate governance was somewhat expected, given that the speculative behavior we identify is likely to depend on behavioral biases of the CEO, rather than on a misalignment of incentives between managers and shareholders. Furthermore, it is not unreasonable to think that when managers are *timing* the market, they believe that this will benefit the firm and therefore also shareholder value. This interpretation is consistent with the positive sign estimated for the *delta* of the CEO compensation.

In summary, we find that educational background, age, and previous working experience of the CEO do matter. These characteristics represent a striking 50% increase in the explanatory power of our specification with respect to the baseline specification with only firm and industry characteristics – the adjusted-R^2 increases from 0.16 to 0.24.

[16] In contrast, the correlation between manager characteristics and variability of derivatives holdings virtually disappears once we use our empirical measure of speculation $\sigma_{RES_{fcd}}$ that excludes the effect of fundamentals.

4.3 Why does the MBA matter? Overconfidence versus information

One of the most intriguing results in the previous section is that managers with an MBA degree speculate more, consistent with hypothesis $H5$. This seems to suggest that getting an MBA degree increases a person's willingness to take risks. Why is this the case? Is it because MBA degree holders are more overconfident, in the spirit of the Gervais and Odean (2001) model reviewed in Section 2? Is it because MBA degree holders have an information advantage that allows them to accurately forecast future currency returns? Data limitations prevent a compelling empirical test, but we can nevertheless obtain important qualitative indications from a set of four empirical exercises that we carry out in the remainder of this Section.

4.3.1 The potential information advantage

The first approach is to identify specifically the potential information advantage. MBAs are likely to receive a solid training in finance that could indeed be useful to take hedging decisions. However, this training is likely to be similar to a non-MBA finance education at the graduate level. If information is an explanation for our findings on MBAs, we expect to find similar results when we focus on non-MBA finance degree holders.

In our sample, about 43% of the managers have an MBA degree and about 20% of them have a finance education (e.g., a M.Sc. in Accounting and Finance). In the first two columns of Table 7, we replace the MBA dummy with a finance education dummy *(Fineduc)*. The new finance dummy has the opposite sign and is never close to be statistically significant. In the last two columns of Table 7, we include both the MBA and the *Fineduc* dummy, and again we find that only the MBA dummy is statistically significant, as it was already in isolation. In summary, MBAs do not seem to have an information advantage based on their finance training.

4.3.2 Successful speculation

A second approach to distinguish overconfidence from information is to measure the economic performance of deviating from the hedging policy determined by fundamentals. An information advantage for MBA-degree holders would be consistent with a positive performance from hedging deviations. Unfortunately, detailed information on derivatives profits and losses is not available. However, we can still have some indication along these lines by relating over/under hedging to subsequent currency returns. More specifically, if a net foreign seller is under-hedging (over-hedging), she will only be successful if the foreign currency subsequently appreciates (depreciates).

The opposite scenario would characterize a net foreign buyer. We thus construct a proxy for successful speculation as the residual from regressing derivatives on fundamentals (measure of under/over hedging), multiplied by the subsequent firm-specific foreign-exchange return and using opposite signs for net foreign buyers and sellers.

Table 8 shows that the median success rate among all managers is negative and statistically indistinguishable from zero (Panel A, first column). We then split firms into net foreign sellers and buyers using data on annual import and export shares for the main US manufacturing industries compiled by the U.S. Department of Commerce and estimating firm-specific foreign purchases from sector imports using the share of *measurable* foreign sales to sector exports. We find that the median success rate is negative and statistically indistinguishable from zero also for the sub-sample of foreign sellers and foreign buyers (Panel A second and third column). When we further distinguish managers between MBA-degree holders (Table 8, Panel B) and non-MBA holders (Panel C), the former group has a negative success rate, while the latter group has a positive success rate. The MBA-degree holders seem to do worse, although the difference between the two groups is not statistically significant at conventional confidence levels. We get similar results when we compare the sub-samples of foreign sellers split in MBA-degree holders and non-holders (second column) and the sub-sample of foreign buyers (third column). In summary, we find no evidence that deviating from the hedging policy dictated by fundamentals is profitable and MBAs are, if anything, even worse at doing that. Again, this finding seems to be inconsistent with an information story.

4.3.3 Overconfidence over time

Our third approach exploits the empirical implications of the Gervais and Odean (2001) overconfidence model. As we explained in Section 2, the greatest overconfidence in a manager's life span comes early in his carrier and then gradually decreases with age. Moreover, overconfidence is higher when the manager is inexperienced and after several episodes of success. If holding an MBA is a proxy for overconfidence, we would expect that MBA degrees would matter more for speculation among young managers, managers with less working experience, and managers experiencing early success in speculation.

We take these three predictions to the data in Table 9, where we estimate our main empirical specification in six different sub-samples: companies where the CEOs is younger and older than the median age of our sample; companies with manager's working experience below/above median; companies where the CEOs had *early* success below and above the median, where *early* success

is measured as in the previous subsection as under- and over-hedging multiplied by the following currency return, but only in the first half of our sample.

We find that an MBA degree only matters for speculation when managers have less experience and early success. We also find that younger CEOs have a significantly larger coefficient on the MBA dummy variable than older CEOs. These results are clearly consistent with an overconfidence story.

4.3.4 Conditioning on MBA degree holders

Finally, as a last empirical test to disentangle the overconfidence versus information hypothesis, we restrict our analysis to the sub-sample of MBA degree holders. If these managers are a population of potentially overconfident agents (like the traders in Gervais and Odean, 2001), we would expect their speculative behavior to decrease with age and working experience, and to increase with early success.

In Table 10, first column, we estimate the usual empirical specification, but only for firms with MBA degree holder CEOs. In the second column, we add the *early* success, estimated as explained in the subsection above. We find that MBA managers with longer working experience and with previous unsuccessful performance speculate less. Older MBAs managers speculate less as well, but the coefficient is not statistically significant at conventional levels. This evidence supports again the overconfidence hypothesis and is inconsistent with an information advantage hypothesis.

5 Discussion and Robustness of the Results

The data limitations in the empirical risk management literature require exceptional care to make sure that the results are not an artifact of specific measurement choices. In this section, we first discuss the robustness of our empirical findings to alternative measures of foreign exposures and different scaling methods for the dependent variable. Second, we augment the set of regressors to include proxies for operational hedging. Third, we analyze the effects of changes in CEO to better identify the role of managerial personal characteristics. Finally, we extend our analysis to include CFO's personal characteristics.

5.1 Alternative Measures of Exposure

A general problem of the risk management literature is that academics do not know the direction of a firm's inherent FX exposures. Firms are only required to report foreign revenues and provide no

useful information about foreign expenses. This data limitation is common to all papers in our field, except for those focusing on some specific industries, such as hedging in the gold-mining sector. Notwithstanding this serious data disadvantage, the approach to all industries has the potential to deliver more general results and our findings could not be the outcome of the specific workings of a specific commodity derivatives market. Furthermore, while managers of gold-ming firms could have superior knowledge of gold price dynamics (in the spirit of Stulz, 1996), it is more difficult to argue that managers of large U.S. non-financial firms would have superior knowledge of currency market dynamics.

In any case, the empirical hedging literature uses notional amounts of derivatives (scaled) as a dependent variable and control for these imperfect proxies of exposure. This dominant approach has some merits. As discussed in Section 3, the ratio of foreign to total sales corresponds to the ratio of foreign to total income, when profit margins on foreign and domestic sales are similar. However, it is still reasonable to check whether our results are robust to alternative measures of exposure. We look at three different approaches.

First, we normalize derivatives by foreign sales. This approach allows us to keep the same number of observations as in the original version of the paper. The ratio of derivatives to foreign sales, however, delivers a misspecified hedging ratio, which can be problematic when firms have low levels of foreign sales (the ratio potentially diverges) or high levels of (unobserved) foreign expenses.

Second, we keep the original normalization of derivatives by assets or sales, but we add further controls besides foreign sales to try and improve the measurement of exposure, especially as concerns the unobserved foreign purchases of inputs. This information is not available at the firm level and we thus collect data on imports and exports from the U.S. Department of Commerce, which compiles annual import and export shares at the sector level for the main U.S. manufacturing industries. In our analysis, we match firms with their industry import (export) share at the four-digit SIC, where available. This fine disaggregation is likely to make imports a sensible proxy of the unobserved foreign purchases by firm. However, an important drawback is that import information is available for all our sample period but only for a subset of industries, 59 industries at the four-digit SIC. This limitation reduces our sample size by about 50%.

Finally, we normalize derivatives with a proxy of foreign income, such that the dependent variable becomes a proxy for the hedging ratio. This last approach requires a proxy for foreign income, which amounts to obtaining a proxy for foreign purchases. We map the data on imports at the 4-digit SIC level to a proxy for foreign expenses at the firm-level using the ratio of firm-

specific foreign sales to sector exports. The underlying assumption is that if a firm covers a certain proportion of the sector total exports, then it is sensible to expect that the same firm will have a similar share of the sector total import. This assumption is probably reasonable given that the 4-digits SIC are relatively narrow sector definition and our sample comprises large firms.

When we replicate the regression analysis of Tables 5 and 6 with the three alternative measures of exposure described above, all our previous findings are confirmed.[17] In particular, our result that the lagged firm-specific foreign exchange return has significant explanatory power for currency derivatives holdings is robust to all alternative specifications with different scaling of the dependent variable or different controls. The results on the characteristics of the executive compensation are preserved and seem to be somewhat weaker in only one specification. Finally, including CEO's personal characteristics increases substantially the explanatory power for the variability of the residual of derivatives holdings on firm fundamentals. More specifically, the MBA education, the age, and the number of companies the CEO has worked for, are still significant features of the profile of the speculator.

5.2 Operational Hedging

Firms can hedge foreign currency risk without using derivatives instruments, for example using operational (natural) hedges. However, these hedges are hard to measure. For example, data on production that is transferred to foreign countries is not available. As a result, the literature has traditionally constructed proxies to account for operational hedges, e.g., Allayannis et. al. (2001). The authors on that paper kindly agreed to share their data on operational hedging proxies with us. They use four proxies for a firm's operational hedging: (1) the number of countries that it operates in, (2) the number of broad regions it is located in, (3) the geographic dispersion of its subsidiaries across countries, and (4) the geographic dispersion of its subsidiaries across regions. Most of these measures of operational hedging strategies are significantly positively correlated. Their proxies are available for a cross-section of firms covering about 50% of the firms in our sample and for one year, 1998, which is in the middle of our sample period.

We thus replicate the cross-sectional analysis of Table 6 about the effect of firm and CEO characteristics on derivatives variability, augmenting the set of regressors to include a proxy for operational hedging.[18] We can thus be more confident that our managerial variables do not

[17] The six additional tables of robustness results are not tabulated in the paper, but are available on request from the authors.

[18] The results are not tabulated in the paper, but are available on request from the authors.

pick up spurious correlations with operational decisions. We confirm the substantial increase in explanatory power obtained by adding the CEO's compensation and personal characteristic with respect to a baseline specification that now also includes operational hedging. Some of the key CEO characteristics are not significant at the conventional levels anymore, but this was somewhat expected given that the sample size is basically reduced by a half.

5.3 Changes in the Firm CEO

An alternative empirical strategy is to examine the effects on currency derivatives holdings when there is a change in the CEO of the firm. This approach allows us to more convincingly argue that derivatives strategies are affected by managerial characteristics while ruling out the possibility that these characteristics are correlated with hedging fundamentals. In our data set, we have a total of 76 changes of CEOs in 64 companies during our sample period.[19] We use a difference in difference specification along the lines of the analysis presented in Table 5, where we regress the change in scaled derivative holdings on the changes in the usual firm and manager personal characteristics. We cluster the standard errors at the firm level to account for potential correlation of residuals when multiple CEO changes occur for the same firm.

The results (not tabulated) show that adding the manager personal characteristics to the set of firm-specific regressor, there is a ten percent increase in the explanatory power, with the adjusted R^2 increasing from 31% to 41%. This is an indication that manager characteristics are likely to have a role in setting the level of derivatives holdings, although the large drop in the number of observations prevents proper identification at conventional statistical levels in all but one case. Specifically, the change of the firm CEO with a manager holding an MBA degree leads to a significant reduction in derivatives holdings.

5.4 CFO Personal Characteristics

All the empirical corporate finance literature with the exception of Geczy, Minton and Schrand (2007) focuses on the CEO with the implicit assumption that even when the decision is taken at different hierarchy levels, there is a formal or informal CEO imprinting. This is certainly motivated also by the lack of information for other executives.

Given our focus on corporate risk management, which is likely to be run by the CFO, it might make sense to investigate whether her personal characteristics matter as well. It is relatively

[19] Two companies have three changes of the CEO, six companies have two changes and in the remaining 56 companies the CEO changes only once.

straightforward to find basic information about some of the characteristics of the CFO of large corporations, such as age and compensation. However, it is much harder to find information about educational background and previous working experience. For example, Geczy, Minton and Schrand (2007) only use information about the compensation of 186 CFOs.

In any case, using a variety of information sources, such as different editions of the *Whos who in finance* publication and a number of internet databases, we obtain information about the educational background for 109 CFOs and about the working experience for 83 CFOs. When we replicate the empirical analysis of Table 6 about the profile of the speculator using information about the CFO, the number of observations drops significantly to one third of the sample that was available for the CEO (results not tabulated). To partially address this problem and increase the number of observations, we remove the tenure of the CFO (which was never significant in the specifications using CEO characteristics) and the working experience. With a sample size that is now about two thirds of the original sample, we find that CFOs holding MBA degrees increase speculation much in the same way CEO did, even after controlling for cross-industry differences and for the volatility of foreign exchange rate and the volatility of foreign sales. All the other variables have a sign that is consistent with our results for the CEO, but they are not statistically significant at the conventional levels.

In summary, our empirical analysis of CFO personal characteristics is problematic because of the low number of observations. If it is the CFO to take risk management decisions, then our results suggest that these decisions are positively correlated with CEO beliefs and personal characteristics.

6 Conclusions

In this paper, we examine the use of foreign currency derivatives in a sample of large non-financial firms over a six-year horizon. We show a substantial time-series variability of derivatives holdings. We document that managers change the notional amount of currency derivatives in response to the past dynamics of the foreign exchange rate. Managers seem to be timing the foreign-exchange market and this behavior is consistent with several behavioral biases that the theoretical literature has formalized and previous empirical studies have documented in other finance settings.

For each firm in our sample, we construct an empirical proxy for speculation as the residual of derivatives holdings regressed on firm fundamentals and time effects. When we relate our empirical proxy for speculation to CEO personal characteristics, we find that firms speculate more when the CEO has an MBA degree, is younger, and has less working experience. The manager personal

characteristics increase the explanatory power for the cross-section of speculation by about 50% with respect to firm, industry and market variables.

Our empirical evidence strongly supports theories that have linked these personal characteristics to overconfidence and a more tolerant attitude towards risk. There are other related open questions left for future research. For instance, it would be interesting to better understand why the CEO personal characteristics affect currency derivatives holdings, when day-to-day hedging decisions for large corporations are done mostly at the Treasurer level. A possible explanation would be that CEOs are imprinting their personal marks on the companies they manage at all levels. This is certainly plausible for the compensation variables, which may be good proxies for the overall compensation policy of management.[20] As regards the other personal characteristics, our findings could be the outcome of how the hedging results are evaluated. For example, younger CEOs, CEOs with less working experience, or CEOs holding an MBA degree, could "prize" relatively more *absolute* results, rather than hedging results *relative* to the underlying exposure, giving an implicit incentive to the Treasurer to *time* the currency market. This last interpretation is consistent with the descriptive evidence reported in Geczy, Minton, and Schrand (2007), where the respondents of a survey indicate that results of derivatives use are much more frequently evaluated by a risk committee, rather than by the Treasurer alone.

[20]For example, Chernenko and Faulkender (2006) show that the activity of timing the yield curve in interest rate risk management is linked in practically the same way to the CEO or to the CFO compensation.

A Appendix: Firms' Characteristics

In this Appendix, we illustrate the construction of the variables describing firms' characteristics and their source. All data refer to the period 1996-2001.

Total assets: book value of total assets. Source: COMPUSTAT.

Notional/total assets: notional amount of total currency derivatives. Source: 10-K filings.

Foreign sales: ratio of foreign sales to total sales. Source: geographical segment of COMPUSTAT.

Size: sum of the market value of equity and the book value of debt. We also employ total sales and total assets as alternative measures as robustness checks. Source: COMPUSTAT.

Debt ratio: long-term debt over total assets. Source: COMPUSTAT.

Quick ratio: ratio of cash and marketable securities to current liabilities. Source: COMPUSTAT.

Growth: ratio of capital expenditures to total sales. We also use the book to market ratio and the ratio of R&D to total sales as alternative growth opportunities proxies to check the robustness of our results. Source: COMPUSTAT.

Governance (GIM): is the Gompers, Ishii, Metrick (2003) corporate governance index. Source: Gompers, Ishii, Metrick (2003).

Industry Dummies:
industries defined using the 10 Fama and French industry groups from Kenneth French's website (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/datalibrary.html). The results are typically robust to larger numbers of industry classifications.

Forex return: firm-specific foreign exchange rate return, expressing the appreciation of the relevant foreign currency unit versus the U.S. dollar. The relevant foreign currency unit for each year is a weighted average of the currencies of the countries where the firm reported foreign sales, weighted by the amount of sales of the firm in that country for that year. When foreign sales refer to a geographic area rather than to a specific country, we build a synthetic foreign exchange rate of the U.S. dollar versus the specific geographic area. In particular, we use the currencies of the single countries part of the geographic area and the weights of these countries as U.S. trading partners compiled by the Federal Reserve Board. Source: geographical segment of COMPUSTAT and Federal Reserve Board.

$\overline{DISP}$**:** standard deviation of all EPS forecasts across analysts issued for a specific year, standardized by the absolute value of the median forecast for the same year and averaged over the sample years. Source: IBES.

σ_{fcd}**:** the standard deviation of the foreign currency derivatives holdings, scaled by total assets, for the sample years. Source: 10-K filings.

N. of Analysts: the logarithm of the number of analyst comprising a given consensus earning estimate, averaged over the sample years. Source: IBES.

B Appendix: Executives' Characteristics

This Appendix explains how the measures describing executive compensation have been calculated and reports the definition of other executive characteristics.

B.1 CEO Compensation: Delta and Vega

We compute the delta - sensitivity of the option value to a one percent change in the stock price - and the vega - sensitivity of the option value to a one percent change in the stock return volatility - using the Black-Scholes option pricing model, as modified by Merton to account for dividend payouts:

$$Call = Se^{-dT}\mathrm{N}(Z) - Ke^{-rT}\mathrm{N}\left(Z - \sigma T^{0.5}\right) \quad \text{(B.1)}$$

$$Delta = 0.01e^{-dT}\mathrm{N}(Z)\,S \quad \text{(B.2)}$$

$$Vega = 0.01e^{-dT}\mathrm{N}'(Z)\,ST^{0.5} \quad \text{(B.3)}$$

where:

- $Z = \left(ln\left(S/K\right) + T\left(r - d + 0.5\sigma^2\right)\right) / \left(\sigma T^{0.5}\right)$.
- S = price of the underlying stock.
- K = exercise price of the option.
- T = time to maturity of the option (years).
- d = dividend yield on the underlying stock.
- r = risk-free interest rate.
- σ = expected stock return volatility over the life of the option.
- N( )= standard normal cumulative density function.
- N( )$'$ = standard normal probability density function.

We compute the delta and vega measures for four different items of the executive compensation:

new option grants: all the inputs to equations (2) and (3), except for r, are promptly obtained from the Execucomp data set. r is the Treasury bond yield to maturity, from CRSP as quoted at the firm's fiscal year end, matching T with the closest available bond maturity (i.e, one-year bond yield, if $T = 1$; two-year bond yield, if $2 <= T <= 3$; five-year bond yield, if $4 <= T <= 5$; seven-year bond yield, if $6 <= T <= 8$; ten-year bond yield, if $T >= 9$). We compute delta and vega for each option grant using equation (2) and (3) and then sum them up.

previous exercisable options: S, d, and σ are promptly obtained from the Execucomp data set. r is obtained by CRSP as explained above for the new option grants. We follow the methodology of Core and Guay (1999) to obtain K and T. More specifically, we compute K in two steps: first, we divide the realizable value of exercising vested options (Execucomp variable INMONEX) by the number of vested options held at year end (Execucomp variable UEXNUMEX), obtaining an average difference between the stock price and the strike price.

Then, we subtract this ratio from the stock price to get an average strike price. We set T to three years less than the average time to maturity of the new grants, or six years if no grant was made in the current year. We use these inputs in equation (2) and (3) to obtain delta and vega and then we multiply by the number of exercisable options.

previous unexercisable options: S, d, and σ are promptly obtained from the Execucomp data set. r is obtained by CRSP as explained above for the new option grants. We follow the methodology of Core and Guay (1999) to obtain K and T. More specifically, we compute K in two steps: first, we divide the potential realizable value of unvested options (Execucomp variable INMONEUN) by the number of unvested options held at year end (Execucomp variable UEXNUMUN), obtaining an average difference between the stock price and the strike price. Then, we subtract this ratio from the stock price to get an average strike price. We set T to one year less than the average time to maturity of the new grants, or nine years if no grant was made in the current year. We use these inputs in equation (2) and (3) to obtain delta and vega and then we multiply by the number of unexercisable options.

portfolio of stocks: we compute the delta of the executive shareholdings as the number of owned shares (Execucomp variable SHWOWN) multiplied by one percent of the stock price at the end of the fiscal year. The vega of the shareholdings is assumed immaterial.

We obtain the delta of the executive compensation as the sum of the delta of the new option grants, the delta of exercisable and unexercisable options, and the delta of the shareholdings. We obtain the vega of the executive compensation as the sum of the vega of the new option grants, and the vega of exercisable and unexercisable options.

We compute the delta and the vega for the compensation packages of the CEO.To alleviate the concerns about endogeneity issues, we lag the compensation variables by one period. For example, for the year 1997, we use the compensation scheme granted in 1996 to the executive officer happening to be the CEO in 1997.

B.2 CEO Personal Characteristics

We supplement the executive compensation variables with CEO characteristics. More specifically, we consider:

Tenure: number of years that the CEO has been the CEO. The number of days from the date the CEO became the CEO (Execucomp variable BECAMECEO, and proxy statements) to the end of the fiscal year, divided by 365.

Age: Age of the CEO in years (Execucomp variable P_AGE_2 and proxy statements).

Joined Company: number of years that the CEO has joined the company (Execucomp variable JOINED_{CEO}, and proxy statements).

No. of Companies: number of companies where the CEO has worked before joining the company (Who's Who in Finance and Industry, several editions, and a variety of other publications).

Bachelor Art: dummy variable equal to one if the CEO has a Bachelor degree in Art and equal to zero otherwise (mainly Who's Who in Finance and Industry, several editions and a variety of other publications).

Bachelor Science: dummy variable equal to one if the CEO has a Bachelor degree in Science and equal to zero otherwise (Who's Who in Finance and Industry, several editions and reading proxy statements).

Bachelor Bus.Adm.: dummy variable equal to one if the CEO has a Bachelor degree in Business Administration and equal to zero otherwise (Who's Who in Finance and Industry, several editions and reading proxy statements).

Master Art: dummy variable equal to one if the CEO has a Master degree in Art and equal to zero otherwise (Who's Who in Finance and Industry, several editions and reading proxy statements).

Master Science: dummy variable equal to one if the CEO has a Master degree in Science and equal to zero otherwise (Who's Who in Finance and Industry, several editions and reading proxy statements).

MBA: dummy variable equal to one if the CEO has a MBA degree and equal to zero otherwise (Who's Who in Finance and Industry, several editions and reading proxy statements).

Finance Education: dummy variable equal to one if the CEO has a Bachelor degree in Business Administration or in Accounting, or if he has a Master degree in Finance and Accounting, and no MBA degree and equal to zero otherwise (Who's Who in Finance and Industry, several editions).

Technical Education: dummy variable equal to one if the CEO has a Bachelor degree in Science, or in Industrial Management, or in Industrial Engineering, or in Mechanical Engineering, or in Electrical Engineering, or in Civil Engineering or in Chemistry, or in Chemical Engineering, or in Computer Science, or a Master degree in Science, or in Chemistry, or in Industrial management, or in Engineering, and no MBA degree and equal to zero otherwise (Who's Who in Finance and Industry, several editions).

Finance career: dummy variable equal to one if the CEO previously worked in a financial institution, or if previously worked as a CFO, Treasurer, Accountant, or finance-related professional and equal to zero otherwise (Who's Who in Finance and Industry, several editions).

Technical Career: dummy variable equal to one if the CEO previously worked as an engineer, or other technically oriented professional equal to zero otherwise (Who's Who in Finance and Industry, several editions).

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Table 1: Summary Statistics on Derivatives Use

This table presents summary statistics on currency derivatives holdings. Panel A breaks down the notional of currency derivatives by instrument held at year's end: forwards, options and swap contracts. Panel B shows notional amounts by year, where the notional variable represents the total amount of currency derivatives outstanding at year's end, excluding currency swaps. We report also the absolute value of the logarithm of the notional change from year to year for each firm i, i.e. $|\Delta|$ FCD $= |\text{Log}(Notional_{t,i}/Notional_{t-1,i})|$. Panel C presents the proportion of firms with a change in derivatives larger than 5%, 10%, 20%, and 30%, for the full sample and broken down by industry. Panel D illustrates the amount of derivatives holdings for nine companies selected among firms with low, medium, and high variability of derivatives holdings.

Panel A

	Notional (millions)			
	No. obs.	Mean	Median	Std. Dev.
Foreign Exchange Forwards	787	696	188	1491
Foreign Exchange Options	244	559	163	878
Foreign Exchange Swaps	157	821	227	1281

Panel B

	Notional (millions)					
	No. obs.	Mean	Median	Std. Dev.	Min	Max
1996	144	931	136	2908	0	9700
1997	178	953	174	2801	0	10900
1998	178	1099	175	3211	0	13630
1999	177	1078	190	3483	0	13700
2000	174	1248	199	4445	0	17100
2001	127	543	122	1020	0	5741
Full Sample	978	998	163	3223	0	17100
$\|\Delta\|$ FCD	771	0.56	0.33	0.63	0	5.49

Panel C

Proportion of sample firms	$\|\Delta\| > 0.05$	$\|\Delta\| > 0.10$	$\|\Delta\| > 0.20$	$\|\Delta\| > 0.30$
All Sample	96%	93%	77%	63%
Consumer NonDurables	100%	100%	100%	63%
Consumer Durables	100%	100%	89%	72%
Chemicals and Allied Products	100%	95%	76%	57%
Manufacturing	94%	92%	79%	66%
Telephones and Television	100%	100%	100%	100%
Wholesale, Retail, and Some Services	100%	87%	67%	60%
Everything Else	80%	80%	40%	20%

Panel D

Company	Notional of FCD (millions) 1997	1998	1999	2000	2001	$\|\Delta\|$
United Technologies Corp (UTX)	2809	2731	2569	2709	3033	0.06
General Electric Co (GE)	6656	7914	6764	6961		0.11
Pfizer Inc (PFE)	2534	3071	3797	3870	3627	0.12
Phelps Dodge Corp (PD)	158	44	34	16	13	0.52
Xerox (XRX)	1977	2817	3838	1788	3900	0.55
Philip Morris (MO)	2500	8100	3800	5800	3700	0.70
Advanced Micro Devices (AMD)	198	88	59	207	507	0.84
Cooper Industries Ltd (CBE)	209	626	21	41	20	1.46
Goodrich Corp (GR)	12	125	26	11	0	1.59

Table 2: Summary Statistics on Firm Characteristics

This table shows summary statistics on firm characteristics. We present summary statistics on: *foreign sales over total sales*; *size*, computed as the sum of the market value of equity, the book value of long term debt, and the book value of preferred stock; *debt ratio*, computed as long-term debt over total assets; *quick ratio* computed as the ratio of cash and marketable securities to current liabilities; *growth*, computed as the ratio of capital expenditures to total sales; *Governance (GIM)* is the Gompers, Ishii, Metrick (2003) corporate governance index. We report the ratio of total notional amount (see Table 1) to the book value of total assets, foreign assets and foreign sales, respectively. Finally, we report summary statistics on $Forex$, i.e. the firm-specific foreign exchange return expressing the appreciation of the relevant foreign currency unit versus the U.S. dollar. Appendix A provides a detailed description of the construction of all these variables.

	No. obs.	Mean	Median	Std. Dev.	Min	Max
Foreign sales/total sales	978	0.33	0.35	0.19	0	0.87
Size (millions)	978	29450	8393	61813	447.74	467096
Total assets (millions)	978	14628	4799	39117	68.94	304012
Total sales (millions)	978	12099	5067	23129	39.15	174694
Debt Ratio	978	0.17	0.12	0.17	0.01	0.84
Quick Ratio	978	0.57	0.18	1.04	0.01	5.16
Growth	978	0.53	0.44	0.43	0.03	2.79
Governance (GIM)	900	9.65	10	2.61	3	16
Notional/total assets	978	0.07	0.04	0.10	0	0.67
Notional/foreign assets	978	0.37	0.17	0.90	0	0.89
Notional/foreign sales	978	0.21	0.13	0.28	0	0.75
Forex	553	-0.03	-0.05	0.07	-0.21	0.10

Table 3: Summary Statistics on CEO Characteristics

This table shows summary statistics on CEO characteristics. Panel A presents summary statistics on CEO's characteristics: *Delta* is the sensitivity of the compensation to a one percent change in the stock price; *Vega* is the sensitivity of the compensation to a one percent change in the stock return volatility; *Tenure* is the number of years that the CEO has been the CEO; *Age* is the CEO's age in years; *Joined Company* is the number of years that the CEO has been with the company; *No. of Companies* is the number of companies the CEO has worked for before. Panel B shows the educational and career background of the CEOs in our sample. Appendix B provides a detailed description of the construction of all these variables.

Panel A

	No. of obs.	Mean	Median	Std. Dev.	Min	Max
Delta (thousands)	1062	4042	620	24949	0	208400
Vega (thousands)	1062	508	210	1251	0	8681
Tenure (years)	1039	6.23	4.00	6.84	0	38
Age (years)	953	55.28	56.00	7.17	29	81
Joined Company (years)	858	17.70	15.50	12.92	0	46
No. of Companies	857	2.75	3.00	1.57	0	8

Panel B: CEO background

	N. Obs.	proportion of all CEOs
Bachelor Art	791	29.20%
Bachelor Science	791	62.19%
Bachelor Bus.Adm.	791	5.68%
Master Art	794	5.54%
Master Science	794	18.89%
MBA	794	42.95%
Technical Education	1101	32.61%
Finance Education	817	19.58%
Technical Career	816	37.25%
Finance Career	816	44.61%

Table 4: Correlations

These tables show correlations between firm variables (Panel A), between CEO's characteristics (Panel B), and between firms variables, market variables, and CEO's characteristics (Panel C).

Panel A

	Notional Assets	Foreign sales Sales	Size	Debt	Quick	Growth	Forex	Governance (GIM)
Notional/Assets	1.00							
Foreign Sales/Sales	**0.27**	1.00						
Size	0.06	-0.02	1.00					
Debt	**-0.14**	**-0.14**	0.01	1.00				
Quick	0.03	**0.14**	-0.03	**-0.37**	1.00			
Growth	-0.06	0.01	-0.00	**0.24**	**-0.20**	1.00		
Forex	-0.01	-0.00	0.02	-0.08	0.02	0.01	1.00	
Governance (GIM)	0.06	0.01	**-0.16**	**0.15**	**-0.27**	**0.22**	-0.01	1

Panel B

	Delta	Vega	Tenure	Age	No. of Companies	Finance Education	MBA
Delta	1.00						
Vega	**0.12**	1.00					
Tenure	**0.12**	0.03	1.00				
Age	**-0.18**	-0.09	**0.33**	1.00			
No. of Companies	-0.04	**0.13**	-0.08	-0.04	1.00		
Finance education	0.02	**0.12**	-0.05	0.05	0.03	1.00	
MBA	-0.08	-0.06	**-0.10**	**-0.24**	0.08	**-0.44**	1.00

Panel C

	Delta	Vega	Tenure	Age	No. of Companies	Finance Education	MBA
Notional/Assets	0.04	0.04	-0.04	**-0.17**	**-0.15**	0.03	-0.04
Foreign Sales/Sales	-0.04	-0.02	-0.03	**-0.10**	-0.08	0.03	**-0.10**
Size	**0.32**	0.06	0.08	0.09	**-0.15**	**0.23**	-0.09
Debt	-0.09	-0.01	**-0.13**	**0.22**	-0.01	-0.04	0.03
Quick	**0.13**	0.08	**0.14**	**-0.24**	**0.15**	**-0.19**	0.04
Growth	-0.09	0.06	-0.03	**0.19**	-0.06	**-0.15**	0.04
Forex	0.01	-0.04	0.01	0.01	-0.01	0.03	0.01
Governance (GIM)	0.01	0.01	**-0.10**	**0.13**	-0.05	**0.14**	-0.09
$\text{Std}_{notional/assets}$	-0.03	0.05	-0.01	-0.06	-0.15	-0.12	0.13
Std_{forex}	-0.10	0.02	0.06	**-0.23**	-0.10	-0.01	0.12
$\text{Std}_{foreignsales}$	0.01	0.10	-0.01	0.06	**-0.16**	0.07	-0.05

Coefficients in bold are significant at the 5% level.

Table 5: Determinants of Time-Series Variation of Derivatives Holdings

This table shows the results of regressing the notional amount of foreign currency derivatives, scaled by total assets, on firm characteristics, the lagged *firm-specific* foreign exchange return (*Forex*) and the lagged CEO's compensation variables. The Appendix provides further details on the construction of firm's and CEO's variables. We estimate all the specification with firm fixed-effects panel estimation techniques, year dummies and robust standard errors (in parenthesis). In the fourth column, we include two interaction terms between CEO's lagged *vega* and the depreciation and appreciation of the foreign exchange, respectively. In the last column, we include the interaction term between the CEO's lagged *delta* and *Forex*.

Dependent variable: Notional/Assets	(1) fundamentals	(2) fundamentals + fx views	(3) fundamentals + fx views + compensation	(4) interacted vega	(5) interacted delta
Foreign/Total Sales	0.064*	0.087**	0.091**	0.090**	0.092 **
	(0.034)	(0.037)	(0.039)	(0.039)	(0.039)
Size	-8.17e-08	-5.27e-08	-4.28e-08	-3.87e-08	-3.12e-08
	(8.27e-08)	(6.90e-08)	(7.45e-08)	(7.59e-08)	(7.93e-08)
Debt Ratio	-0.056	-0.060	-0.068	-0.066	-0.068
	(0.0431)	(0.043)	(0.046)	(0.047)	(0.046)
Quick Ratio	-0.007	-0.011**	-0.008**	-0.008**	-0.008**
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
Growth	0.018	0.020	0.027	0.023	0.027
	(0.016)	(0.016)	(0.017)	(0.018)	(0.017)
Forex_{lagged}		-0.051**	-0.057**	-0.072**	-0.063**
		(0.025)	(0.026)	(0.031)	(0.027)
CEO's Vega_{lagged}			-6.71e-06*	-3.10e-07	-6.91e-06*
			(3.73e-06)	(5.43e-06)	(3.82e-06)
CEO's Delta_{lagged}			-1.12e-08	-2.53e-08	3.45e-08
			(8.83e-08)	(1.27e-07)	(1.23e-07)
(CEO's Vega)*(Forex<0)				0.842e-04	
				(0.721e-04)	
(CEO's Vega)*(Forex>0)				-0.655e-04	
				(1.134e-04)	
(CEO's Delta)*(Forex)					1.40e-06**
					(6.17e-07)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Robust Std. Err.	Yes	Yes	Yes	Yes	Yes
No. obs.	553	527	505	505	505
Within R-squared	0.05	0.07	0.09	0.09	0.09

***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively. Robust standard errors are reported in parenthesis.

Table 6: Profile of the Speculator

This table presents the results of regressing our proxy for speculation $\sigma_{RES_{fcd}}$ - standard deviation of residuals of derivatives holdings on fundamentals - for each firm on a set of average firm's and CEO's characteristics over our sample period, controlling for industry, in four specifications. First, we estimate a baseline model on firm characteristic: *foreign sales over total sales*, the firm *Size*, the *Debt Ratio*, the *Quick Ratio*, and the firm *Growth* opportunities. Second, we add the CEO compensation characteristics, *Delta* and *Vega*. Third, we add the personal characteristics and the educational background of the CEO: the *Age* of the CEO in years, the *Tenure* as the number of years that the CEO has been the CEO, the number of companies the CEO has worked for, and a dummy variable for MBA degree holders. Finally, we add market control variables, such as the volatility of foreign sales and the volatility of the firm-specific foreign-exchange rate. Further details on the variables construction are reported in the Appendix.

Dependent variable:	$\sigma_{RES_{fcd}}$ firm variables	$\sigma_{RES_{fcd}}$ firm + compensation	$\sigma_{RES_{fcd}}$ firm + compensation + personal	$\sigma_{RES_{fcd}}$ firm + compensation + personal + mkt
Foreign/Total Sales	0.029**	0.033**	0.033**	0.035**
	(0.014)	(0.016)	(0.017)	(0.016)
Size	-4.16e-08**	-4.80e-08*	-5.00e-08**	-8.64e-08*
	(2.06e-08)	(2.73e-08)	(2.52e-08)	(4.50e-08)
Debt Ratio	-0.009	-0.008	-0.003	-0.006
	(0.012)	(0.013)	(0.014)	(0.016)
Quick Ratio	0.22e-03	-0.157e-03	0.003	0.55e-03
	(0.003)	(0.003)	(0.004)	(0.004)
Growth	0.012	0.012	0.017	0.017
	(0.011)	(0.011)	(0.012)	(0.015)
Delta		1.15e-08*	2.52e-08	9.21e-08
		(7.14e-08)	(7.58e-08)	(1.11e-07)
Vega		7.22e-06	5.39e-06	5.38e-06
		(5.44e-06)	(6.29e-06)	(6.34e-06)
Age			-0.811e-03*	-0.459e-03*
			(0.481e-03)	(0.577e-03)
Tenure			-0.159e-03	-0.822e-04
			(0.482)	(0.493e-03)
No. of companies			-0.002*	-0.002*
			(0.001)	(0.001)
MBA			0.013**	0.014**
			(0.006)	(0.006)
Foreign Sales Volatility				5.65e-07
				(6.15e-07)
Forex Volatility				0.119
				(0.123)
Industry dummies	Yes	Yes	Yes	Yes
Robust Std. Err.	Yes	Yes	Yes	Yes
No. obs.	145	140	123	114
Adj-R^2	0.155	0.162	0.236	0.253

***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively. Standard errors are corrected for heteroskedasticity and reported in parenthesis.

Table 7: Profile of the Speculator and Finance Education

This table presents the results of regressing our proxy for speculation $\sigma_{RES_{fcd}}$ - standard deviation of residuals of derivatives holdings on fundamentals - for each firm on a set of average firm's and CEO's characteristics over our sample period, controlling for industry, in four specifications. The first and the second columns contain a dummy for non-MBA finance education (e.g., M.Sc. Accounting and Finance). In the third and fourth columns, we also add an MBA dummy variable. The firm characteristics are: *foreign sales over total sales*, the firm *Size*, the *Debt Ratio*, the *Quick Ratio*, and the firm *Growth* opportunities. The CEO compensation characteristics are *Delta* and *Vega*. The personal manager characteristics are the *Age* of the CEO in years, the *Tenure* as the number of years that the CEO has been the CEO, the number of companies the CEO has worked for. The market control variables are the volatility of foreign sales and the volatility of the firm-specific foreign-exchange rate. Further details on the variables construction are reported in the Appendix.

Dependent variable:	$\sigma_{RES_{fcd}}$	$\sigma_{RES_{fcd}}$	$\sigma_{RES_{fcd}}$	$\sigma_{RES_{fcd}}$
Regressors:	firm + compensation + personal	firm + compensation + personal + market	firm + compensation + personal	firm + compensation + personal + market
Foreign/Total Sales	0.028	0.028	0.033**	0.034**
	(0.018)	(0.017)	(0.017)	(0.016)
Size	-3.60e-08	-6.51e-08	-4.67e-08*	-7.94e-08*
	(2.50e-08)	(4.67e-08)	(2.55e-08)	(4.63e-08)
Debt Ratio	0.14e-03	-0.008	0.02	0.006
	(0.014)	(0.016)	(0.014)	(0.016)
Quick Ratio	0.68e-03	0.003	0.001	0.002
	(0.004)	(0.005)	(0.004)	(0.004)
Growth	0.017	0.018	0.015	0.016
	(0.012)	(0.015)	(0.012)	(0.014)
Delta	-8.17e-08	2.10e-08	-3.15e-08	7.80e-08
	6.86e-08	(1.10e-07)	(7.69e-08)	(1.12e-07)
Vega	4.75e-06	4.39e-06	6.13e-06	6.04e-06
	5.60e-06	(5.78e-06)	(6.41e-06)	(6.5e-06)
Age	-1.05e-03**	-0.71e-03	-0.877e-03*	-0.529e-03
	(0.52e-03)	(0.59e-03)	(0.52e-03)	(0.592e-03)
Tenure	-0.18e-03	-0.12e-03	-0.14e-03	-0.671e-04
	(0.492e-03)	(0.51e-03)	(0.48e-03)	(0.497e-03)
No. of companies	-0.002*	-1.37e-03*	-0.002*	-0.002*
	(0.001)	(0.86e-03)	(0.001)	(0.001)
Finance Educ.	-0.007	-0.007	-0.007	-0.006
	(0.005)	(0.006)	(0.005)	(0.006)
MBA			0.013**	0.014**
			(0.006)	(0.006)
Foreign Sales Volatility		4.11e-07		5.02e-07
		(6.06e-07)		(6.22e-07)
Forex Volatility		0.135		0.121
		(0.130)		(0.123)
Industry dummies	Yes	Yes	Yes	Yes
Robust Std. Err.	Yes	Yes	Yes	Yes
No. obs.	124	114	123	114
Adj-R^2	0.21	0.22	0.26	0.26

***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively. Standard errors are corrected for heteroskedasticity and reported in parenthesis.

Table 8: Performance of Deviating from the Optimal Hedging Policy

This table shows summary statistics for the performance of deviating from the optimal hedging policy. Specifically, for each firm and each year, we take the residual of the regression of derivatives holdings on firm variables, firm fixed-effects, and year dummies, which represents whether a firm is under-hedging or over-hedging. We then obtain a measure of performance as the product of the deviation and the currency return in the following year. In Panel A, we present performance summary statistics for the full sample of firms that we split into net foreign sellers and buyers using foreign purchases estimated from sector imports shares compiled by the U.S. Department of Commerce. In Panel B, we focus on the sub-sample of firms where the CEO holds an MBA degree. In Panel C, we focus on the sub-sample of firms where the CEO does not hold an MBA degree.

	All	Foreign Seller	Foreign Buyer
Panel A: All Firms			
Median	-1.64e-06	-0.23e-04	-0.34e-03
Std. Dev.	(2.44e-03)	(0.34e-02)	(2.14e-03)
No. obs.	527	159	127
Panel B: Firms with MBA CEOs			
Median	-0.36e-03	-0.54e-03	-0.47e-03
Std. Dev.	(2.81e-03)	(3.60e-03)	(0.25e-02)
No. obs.	145	87	49
Panel C: Firms with non-MBA CEOs			
Median	0.17e-03	0.81e-03	-0.18e-03
Std. Dev.	(2.45e-03)	(3.59e-03)	(1.68e-03)
No. obs.	238	72	53

Table 9: Profile of the Speculator in Sub-Samples

This table presents the results of regressing our proxy for speculation $\sigma_{RES_{fcd}}$ - standard deviation of residuals of derivatives holdings on fundamentals - for each firm on a set of average firm's and CEO's characteristics over our sample period, controlling for industry, in six sub-samples. The first two columns split the sample according to CEO age below/above median. The third and fourth columns split the sample according to CEO working experience below/above median. The last two columns split the sample according to CEO *early* success above/below median, where *early* success is calculated as the residual from regressing derivatives holdings on fundamentals multiplied by the currency returns in the following year for the first half of the sample. The firm characteristics are: *foreign sales over total sales*, the firm *Size*, the *Debt Ratio*, the *Quick Ratio*, and the firm *Growth* opportunities. The CEO compensation characteristics are *Delta* and *Vega*. The personal manager characteristics are the *Age* of the CEO in years, the *Tenure* as the number of years that the CEO has been the CEO, the number of companies the CEO has worked for. The market control variables are the volatility of foreign sales and the volatility of the firm-specific foreign-exchange rate. Further details on the variables construction are reported in the Appendix.

Dependent variable:	$\sigma_{RES_{fcd}}$	$\sigma_{RES_{fcd}}$	$\sigma_{RES_{fcd}}$	$\sigma_{RES_{fcd}}$	$\sigma_{RES_{fcd}}$	$\sigma_{RES_{fcd}}$
	Young CEOs	Old CEOs	CEOs short experience	CEOs long experience	Early Success CEOs	Early Failure CEOs
Foreign/Total Sales	0.024	0.039**	0.016	0.048**	0.080**	0.018
	(0.034)	(0.015)	(0.029)	(0.019)	(0.039)	(0.030)
Size	-1.55e-07	-1.28e-08	-1.04e-07	-1.11e-07	1.26e-07	-4.33e-08
	(1.14e-07)	(4.23e-08)	(6.47e-08)	(1.37e-07)	(1.69e-07)	(7.91e-08)
Debt Ratio	-0.007	-0.008	-0.017	-0.010	0.057	0.009
	(0.078)	(0.016)	(0.021)	(0.036)	(0.042)	(0.033)
Quick Ratio	-0.004	0.21e-03	-0.008	0.62e-04	0.009	0.003
	(0.007)	(3.68e-03)	(0.005)	(0.005)	(0.005)	(0.012)
Growth	-0.008	0.003	0.041	-0.018*	0.002	0.002
	(0.016)	(0.006)	(0.024)	(0.009)	(0.010)	(0.010)
Delta	2.49e-07	-8.78e-07	1.59e-07	-4.50e-06**	-4.13e-07	1.45e-06
	(2.26e-07)	(9.94e-07)	(7.47e-07)	(2.18e-06)	(7.16e-07)	(1.64e-06)
Vega	-8.28e-06	5.36e-06	-4.95e-06	0.25e-04**	0.21e-04*	0.19e-04
	(6.62e-06)	(5.54e-06)	(0.17e-04)	(0.11e-04)	(0.11e-04)	(0.14e-04)
Age			0.77e-03	-0.002	0.54e-04	-0.001
			(0.75e-03)	(0.001)	(1.17e-03)	(0.81e-03)
Tenure	0.26e-03	-0.31e-03	0.49e-03	0.001*	0.001	0.718e-03
	(1.35e-03)	(0.35e-03)	(0.87e-03)	(0.84e-03)	(0.001)	(0.875e-03)
No. of companies	-0.002	-0.79e-03			-0.006*	-0.001
	(0.002)	(1.35e-03)			(0.003)	(0.004)
MBA	**0.020***	**0.003**	**0.023****	**0.003**	**0.019***	**0.012**
	(0.012)	**(0.005)**	**(0.010)**	**(0.009)**	**(0.011)**	**(0.013)**
Foreign Sales Volatility	2.04e-06	-6.04e-07	7.66e-07	5.65e-07	-7.15e-07	-1.77e-07
	(1.06e-06)	(5.29e-07)	(1.07e-06)	(6.15e-07)	(1.19e-06)	(1.21e-06)
Forex Volatility	0.232	0.097	0.19	0.119	0.629	0.113
	(0.168)	(0.102)	(0.165)	(0.123)	(0.389)	(0.179)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Robust Std. Err.	Yes	Yes	Yes	Yes	Yes	Yes
No. obs.	63	63	66	66	46	46
Adj-R^2	0.41	0.35	0.44	0.49	0.49	0.29

***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively. Standard errors are corrected for heteroskedasticity and reported in parenthesis.

Table 10: Profile of the Speculator for MBA CEOs

This table presents the results of regressing our proxy for speculation $\sigma_{RES_{fcd}}$ - standard deviation of residuals of derivatives holdings on fundamentals - for each firm on a set of average firm's and CEO's characteristics over our sample period, controlling for industry, conditioning on the CEO holding an MBA degree. The firm characteristics are: *foreign sales over total sales*, the firm *Size*, the *Debt Ratio*, the *Quick Ratio*, and the firm *Growth* opportunities. The CEO compensation characteristics are *Delta* and *Vega*. The personal manager characteristics are the *Age* of the CEO in years, the *Tenure* as the number of years that the CEO has been the CEO, the number of companies the CEO has worked for. The market control variables are the volatility of foreign sales and the volatility of the firm-specific foreign-exchange rate. In the second column, we add a prxy for *early* success, where *early* success is calculated as the residual from regressing derivatives holdings on fundamentals multiplied by the currency returns in the following year for the first half of the sample. Further details on the variables construction are reported in the Appendix.

Dependent variable:	$\sigma_{RES_{fcd}}$	$\sigma_{RES_{fcd}}$
	only MBA degree holders	
Foreign/Total Sales	0.023	0.057**
	(0.039)	(0.023)
Size	-8.29e-08	-2.04e-07*
	(2.25e-07)	(1.11e-07)
Debt Ratio	0.052	-0.30e-03
	(0.140)	(0.028)
Quick Ratio	0.011	0.002
	(0.014)	(0.006)
Growth	-0.016	0.009
	(0.033)	(0.009)
Delta	6.75e-06	8.68e-07
	(4.09e-06)	(2.64e-06)
Vega	0.40e-04	-9.54e-06
	(0.23e-04)	(0.21e-04)
Age	-0.002	-0.48e-03
	(0.002)	(0.94e-03)
Tenure	0.67e-03	0.95e-03
	(2.44e-03)	(1.39e-03)
No. of companies	-0.009*	-0.004*
	(0.004)	(0.002)
Early success		6.117**
		(2.64)
Foreign Sales Volatility	-3.56e-06	9.90e-07
	(4.54e-06)	(1.29e-06)
Forex Volatility	0.449	0.241
	(0.53)	(0.147)
Industry dummies	Yes	Yes
Robust Std. Err.	Yes	Yes
No. obs.	70	53
Adj-R^2	0.69	0.56

***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively. Standard errors are corrected for heteroskedasticity and reported in parenthesis.