FUNDAÇÃO GETULIO VARGAS
ESCOLA DE ADMINISTRAÇÃO DE EMPRESAS DE SÃO PAULO

RAFAEL FELIPE SCHIOZER

ESSAYS IN CORPORATE RISK MANAGEMENT

SÃO PAULO
2006

RAFAEL FELIPE SCHIOZER

ESSAYS IN CORPORATE RISK MANAGEMENT

Tese apresentada à Escola de Administração de Empresas de São Paulo da Fundação Getulio Vargas, como requisito para obtenção do título de Doutor em Administração de Empresas

Campo de conhecimento:
Administração Contábil e Financeira

Orientador: Prof. Dr. Richard Saito

SÃO PAULO

2006

Schiozer, Rafael Felipe.
Essays in Corporate Risk Management / Rafael Felipe Schiozer - 2006.
f.

Orientador: Richard Saito.
Tese (doutorado) - Escola de Administração de Empresas de São Paulo.

1. Risk Management. 2. Financial Derivatives. 3. Foreign currency. 4. Latin America. I. Saito, Richard. II. Tese (doutorado) - Escola de Administração de Empresas de São Paulo. III. Título.

CDU 336.722.8

RAFAEL FELIPE SCHIOZER

ESSAYS IN CORPORATE RISK MANAGEMENT

Tese apresentada à Escola de Administração de Empresas de São Paulo da Fundação Getulio Vargas, como requisito para obtenção de título de Mestre em Administração de Empresas

Campo de conhecimento:
Administração Contábil e Financeira

Data de aprovação:

____/____/_____

Banca examinadora:

_____
Prof. Dr. Richard Saito (Orientador)
FGV-EAESP

_____
Prof. Dr. Afonso de Campos Pinto
FGV-EAESP

_____
Prof. Dr. Newton C. A. da Costa Jr.
UFSC

_____
Prof. Dr. Jairo Laser Procianoy
UFRGS

_____
Prof. Dr. Hudson Fernandes Amaral
UFMG

This work is dedicated to my wife Ludmila.

ACKNOWLEDGEMENTS:

I thank Prof. Richard Saito for all the helpful insights, orientation and patience towards me during these four years. He has been a great source of knowledge in Finance since I first applied for the doctoral program at FGV/EAESP and has tutored me with excellence during the whole time. His efforts have made all the hard work of obtaining a doctoral degree a little less burdening to me than it would have been otherwise.

I am also indebted to Prof. Afonso de Campos Pinto and Prof. Antonio Gledson de Carvalho for all the valuable suggestions to this text made in the occasion of my qualification exam. I am sure their suggestions helped a lot in improving the quality of this text. I would also like to acknowledge the contribution of several anonymous referees who have read the draft versions of this work at some point in time, and to thank the comments received from the participants of the Enanpad meetings in 2004, 2005 and 2006, the Global Finance Conference, BALAS, EFMA and the FMA meetings in 2006.

I express my deepest acknowledgements to Prof. Jefferson Duarte, who agreed on supervising my research while I was a visiting student at the University of Washington. He also gave several tips and advices that contributed a lot to this work.

I also thank all the professors at FGV/EAESP and University of Washington from whom I have learned a lot in their courses. I make a special reference to Prof. Jarrad Harford and Prof. Luiz Felipe P. de Andrade, who were very important for my understanding of Finance in a broader sense. I also make a reference to all my fellow professors at the Finance Department of FGV/EAESP. I would also like to thank Prof. Saul Suslick at UNICAMP who guided my first steps as a researcher when I was a MSc student. Saul has been a great friend since then.

The students at FGV/EAESP and UW turned these years into a lot more fun than it could be without them. I can mention Sônia, Sheng, João André, Brasil, Florence and Rob, who were special friends and good guys to work, study and have fun with. I would also like to mention my friends Ricardo Furtado and Gabriel Lima at UNICAMP, whose expertise in Statistics and Economics helped me in being a better student in Finance. My band mates (“non-academic” friends), Moisés, André, Pita

and Ricardo were also crucial in making these four years a lot easier and more fun to go through.

I am also truly indebted to the graduate committee of the Central Bank of Brazil that allowed me to leave my activities at Bacen to pursue my graduate studies. Francisco da Silva Coelho gave important tips and insights to my proposal and has been overseeing my work towards the completion of the doctoral program at FGV since it first started. Virgínio Santos Neto, José Antonio Marciano, Luiz Fernando Maciel and Emilio Dantas were also very important in helping me. It has been good to have all the support from my friends at Bacen, specially Mario, Carlos, Daniel, Alexandre, Luiz Maurício and Malu.

I also acknowledge the financial support received from CAPES for my visiting student term at the University of Washington.

It is an honor to thank the support received from my family, specially my parents Dayr and Wanda. Their love and kindness is hard to be described in words. Thanks also to my brothers Ivan, Denis and Wandir.

And last, but by no means least, Ludmila, my wife, was the greatest source of energy and motivation to start and complete this work. I could not even imagine going through these last four years without her love, patience, helpfulness and understanding. Thank you so much!

Derivatives are like finely tuned racing cars… Untutored users can crash and burn. Nonusers cannot win the race.

René M. Stulz

ABSTRACT:

This research investigates the factors that lead Latin American non-financial firms to manage risks using derivatives. The main focus is on currency risk management. With this purpose, this thesis is divided into an introductory chapter that brings the main motivations for this work and reviews the extant literature regarding financial risk management, two main chapters, and a conclusion.

The second chapter describes the results of a survey on derivatives usage and risk management responded by the CFOs of 74 Brazilian non-financial firms listed at the São Paulo Stock Exchange (BOVESPA), and the main evidence found is: i) larger firms are more likely to use financial derivatives; ii) foreign exchange risk is the most managed with derivatives; iii) Brazilian managers are more concerned with legal and institutional aspects in using derivatives, such as the taxation and accounting treatment of these instruments, than with issues related to implementing and maintaining a risk management program using derivatives.

The third chapter studies the determinants of risk management with derivatives in four Latin American countries (Argentina, Brazil, Chile and Mexico). I investigate not only the decision of whether to use financial derivatives or not, but also the magnitude of risk management, measured by the notional value of outstanding derivatives contracts. This is the first study, to the best of my knowledge, to use derivatives holdings information in emerging markets. The use of a multi-country setting allows the analysis of institutional and economic factors, such as foreign currency indebtedness, the high volatility of exchange rates, the instability of political and institutional framework and the development of financial markets, which are issues of second-order importance in developed markets.

The main contribution of this thesis is on the understanding of the relationship among currency derivatives usage, foreign debt and the sensitivity of operational earnings to currency fluctuations in Latin American countries. Unlike previous findings for US firms, my evidence shows that derivatives held by Latin American firms are capable of producing cash flows comparable to financial expenses and investments, showing that derivatives are key instruments in their risk management strategies.

It is also the first work to show strong and robust evidence that firms that benefit from local currency devaluation (e.g. exporters) have a natural currency hedge for foreign debt that allows them to bear higher levels of debt in foreign currency. This implies that firms under this revenue-cost structure require lower levels of hedging with derivatives. The findings also provide evidence that large firms are more likely to use derivatives, but the magnitude of derivatives holdings seems to be negatively related to the size of the firm, consistent with findings for US firms.

RESUMO:

Este trabalho investiga quais são os fatores que levam empresas não financeiras da América Latina a gerenciar seus riscos usando derivativos. O foco principal é a gestão de risco cambial. Para tal, a pesquisa foi escrita dividindo-se em um capítulo introdutório, contendo a motivação da pesquisa e uma revisão da literatura sobre gestão de riscos financeiros, dois capítulos principais e uma conclusão.

O segundo capítulo mostra os resultados de um questionário respondido pelos diretores financeiros de 74 empresas listadas na Bolsa de Valores de São Paulo (BOVESPA), em que se constatou que: i) empresas maiores são mais propensas a usar derivativos; ii) o risco cambial é o mais freqüentemente gerenciado com derivativos; iii) as questões relativas ao arcabouço jurídico-institucional, tais como a tributação sobre uso de derivativos e o tratamento contábil das operações de *hedge* preocupam mais os gestores financeiros do que as questões relacionadas à implementação, operacionalização e manutenção dos programas de hedge usando derivativos.

O terceiro capítulo estuda os determinantes da gestão de risco nos quatro países mais importantes da América Latina (Argentina, Brasil, Chile e México). Investiga-se não apenas a decisão de utilizar derivativos, como uma variável binária, mas também a intensidade de utilização de derivativos, medida pelo valor nominal dos contratos em aberto. Trata-se do primeiro estudo a utilizar informações sobre as carteiras de derivativos de empresas de países emergentes. O uso de um conjunto de países permite que se compreenda a influência de fatores econômicos e institucionais, em especial o maior endividamento em moeda estrangeira, a maior volatilidade das taxas de câmbio e juros nos países latinoamericanos, a menor estabilidade político-institucional e o menor desenvolvimento dos mercados financeiros, questões que têm uma importância menor em mercados desenvolvidos.

A contribuição principal deste trabalho está em auxiliar o entendimento da relação entre o uso de derivativos cambiais e a sensibilidade dos resultados operacionais às flutuações cambiais. Distintamente do que mostram trabalhos anteriores para empresas norte-americanas, a evidência obtida nesse trabalho mostra que as carteiras de derivativos de câmbio das empresas latinoamericanas são capazes de

gerar fluxos de caixa comparáveis, em ordem de magnitude, às despesas financeiras e aos investimentos, mostrando que os derivativos são instrumentos-chave nas estratégias de gestão de risco das empresas.

Também se trata do primeiro trabalho a mostrar evidência forte e robusta que firmas cujos lucros operacionais se beneficiam da desvalorização da moeda local (por exemplo, exportadores), têm uma proteção natural contra o risco de dívida em moeda estrangeira, que permite a essa empresas captar mais dívida externa. Isso implica que empresas que possuem essa estrutura de receitas e custos precisam de menos derivativos para fazer hedge. Também se mostra que empresas maiores são mais propensas a usar derivativos, mas a magnitude das carteiras de derivativos está negativamente relacionada ao tamanho da empresa, o que é consistente com a teoria financeira e está em linha com os resultados obtidos para empresas dos Estados Unidos.

Figure Index

Figure 1.1: Tax function convexity 18

Figure 2.1 Exposure to Foreign Currency: users and non users 31

Tables Index:

Table 2.1: Derivatives usage across countries and year of research 26

Table 2.2: Derivatives usage across risk classes and instruments..... 27

Table 2.3: Main issues of concern for managers..... 28

Table 2.4: Derivatives usage compared to previous year: 2003/2002 and 2002/2001 29

Table 2.5: Impacts of a market view. 31

Table 2.6: Assessment of risk management function..... 32

Table 3.1: Risk classes managed with derivatives by country 38

Table 3.2A: Descriptive statistics: Derivatives users x non-users..... 39

Table 3.2B: Descriptive statistics: FX users x non-users of currency derivatives..... 40

Table 3.2C: Descriptive statistics: FX users x users of derivatives other than currency 42

Table 3.2D: Descriptive statistics: split by country 42

Table 3.3A: Sensitivity of derivatives holdings relative to hedging objectives – split by year 45

Table 3.3B: Sensitivity of derivatives holdings relative to hedging objectives – split by country 46

Table 3.4: LOGIT tests..... 52

Table 3.5: Estimation of the TOBIT tests..... 60

Table of Contents

1 Motivation and Literature Review 16

1.1 Rationales for risk management and extant empirical evidence 17

2 Derivatives usage in Brazil. A survey 23

2.1 Description of the survey 25

2.2 Results and analysis 25

3 Determinants of risk management in Latin American non-financial firms 35

3.1 Derivatives data and sample 37

3.2 Cash flow sensitivities of derivatives contracts 44

3.3 The determinants of corporate hedging – empirical analysis 47

4 Conclusions 63

5 References cited in the text 70

Appendix A: Survey questionnaire and response tallies 76

Appendix B: Sensitivity analysis of cash flow from derivatives 87

1 Motivation and Literature Review

A company can manage its financial risks in several different manners, using financial derivatives or not. For example, an exporting company is able to mitigate its foreign exchange exposure by obtaining funds in the same currency in which its revenues are denominated. Petersen and Thiagarajan (2000) classify this type of risk management as an operational hedge, and show evidence that this strategy is able to produce better results for long-term exposures, while financial hedging, that uses derivatives and other instruments to mitigate financial risks, is more efficient in the management of short-term fluctuations in foreign exchange rates, interest rates and commodity prices.

In Latin America, however, large firms have several incentives beyond operational hedge to obtain funding overseas, specially in developed markets. Fundamentally, the availability of funding is limited in their domestic markets, which makes funds overseas easier and cheaper for firms with a minimum of international visibility. With a few exceptions, due to foreign indebtedness, cash outflows in foreign currency are larger than inflows, creating currency exposure for these firms. In addition, foreign debt produces an exposure to international interest rates, such as the London Interbank Offered Rate (LIBOR), the Japanese Interbank Offered Rate (JIBOR) etc.

This work investigates empirically which of the factors pointed by financial theory as rationales for risk management are relevant to the decision of using derivatives and how these factors influence the magnitude of derivatives holdings in Latin American firms. The main focus is on currency risk management, since, as shown in chapters 2 and 3, this is by far the most managed with financial derivatives. The first part of this research (chapter 2), shows the results of a survey on risk management and derivatives usage responded by financial managers of 74 non-financial Brazilian firms listed at São Paulo Stock Exchange (BOVESPA) in 2004. In the second part of this research (chapter 3), I investigate the determinants of the decision of whether to use derivatives or not and the magnitude of financial hedging of non-financial firms from Argentina, Brazil, Chile and Mexico, that are constituents of the *Bank of New York Latin American ADR Index*, using a sample of 186 firm-years, in a panel from 2001 to 2004. The rationale for using only firms that have issued ADRs (American Depositary Receipts) is that financial statements and reports are relatively uniform,

using USGAAP (United States Generally Accepted Accounting Principles) allowing to obtain information on derivatives holdings for each firm. Restricting the sample to firms with ADRs is also necessary due to disclosure requirements for derivatives usage to be different in each country.

The decision of investigating three countries other than Brazil (which was chosen for an in-deep study described in chapter 2) is fundamentally related to the possibility of comprehending and identifying determinant factors for risk management under different institutional and legal frameworks, albeit having many economic, legal and cultural similarities. Besides, increased sample size is able to improve the quality of statistical inferences. As far as I was able to find, there is no study on the determinants of risk management for any country in Latin America. With the exception of Bartram, Brown and Fehle (2003), that investigates only the binary decision of using derivatives or not in more than 40 countries, I was not capable of identifying any study on risk management in a multi-country setting.

1.1 Rationales for risk management and extant empirical evidence

In the absence of market imperfections, risk management – as the choice of capital structure and dividend policy - is unable to create value. In a world with no taxes, agency costs, information asymmetry or transaction costs, there would be no demand for hedging instruments. The existence of a huge derivatives market is only explained if some of the assumptions of perfect markets are relaxed. In a broad sense, financial literature has built two main explanations for risk management. The first focuses on risk management as a way to maximize firm value by reducing the costs of financial distress and expected taxes and mitigating informational asymmetry problems, and the second finds reasons for risk management in managers' utility maximization. These theories and their main empirical implications, in terms of how individual firm characteristics are determinant for the decision of managing financial risks, are described below.

A – Costs of financial distress

Smith and Stulz (1985) and Stulz (1984) show that risk management can reduce the costs of financial distress. This allows the firm to increase debt capacity and raise funds at a lower cost than would be possible without hedging. Interest coverage is

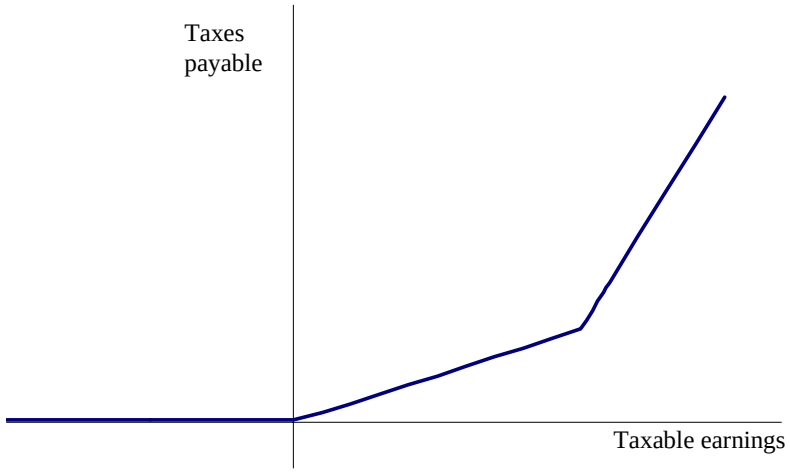
widely used by previous papers to measure financial distress. Many of these studies (e.g. Dolde (1995), Geczy, Minton and Schrand (1997), and Haushalter (2000)), define interest coverage as the average EBIT (Earnings before interest and taxes) of the last 3 years, divided by interest expenses in the last fiscal year. In chapter 3, I use this indicator and, alternatively, also define interest coverage as the EBIT of a given fiscal year divided by interest expenses in the same year. The greater the interest coverage, the less financially distressed the firm is, and, thus, the less are the incentives to hedge. The level of indebtedness and the debt attached to foreign currency are also expected to be positively related to hedging, since foreign debt is almost always a source of exposure.

B - Tax Benefits

Mayers and Smith (1982) and Smith and Stulz (1985) show that, if a firm is subject to a tax schedule that yields a convex function of the before-tax firm value (or earnings before taxes), then the after-tax firm value is a concave function of before-tax firm value (or earnings). Hedging is able to reduce the volatility of earnings and, therefore, decrease expected tax expenses, increasing firm value.

Figure 1.1: Tax function convexity

Illustration of a typical tax function. Convexity is characterized by the fact that losses generally can only be offset for tax purposes in the next fiscal period (i.e., losses can only be carried forward). Besides, progressive tax brackets contribute to increase convexity.



Source: the author

A progressive corporate tax schedule is the classical case of a convex tax function, as shown in figure 1. In addition, the possibility of carrying losses from one period to another also increases the convexity of the tax function. For example, in Brazil, the amount of earnings exceeding 240,000 BRL (Brazilian Reais, equivalent to about USD106,000 as of December 2005) is subject to an additional rate of 10%, creating a clear convexity in the tax schedule. To characterize whether or not a firm is subject to this convexity, I build a proxy similar to what was used by Nance, Smith and Smithson (1993) and Mian (1996): the standard deviations of earnings before taxes (in domestic currency) is estimated for a 4-year period, and a 95% confidence interval is built around the observed value for each year's taxable income. If this interval includes the threshold tax values (values for which the tax rate changes, i.e., at least one of the "kinks" illustrated in figure 1), the dummy of tax convexity assumes value 1. This dummy also assumes 1 if the firm has had any negative earnings carried to subsequent fiscal years in the last 4 years. Otherwise, the dummy assumes zero[1]. Graham and Smith (1999) show that, for firms with convex tax schedules, hedging may decrease expected taxes by 5.4% on average, reaching 40% in extreme cases, under the US fiscal regime.

Since, *ceteris paribus*, debt financing creates tax gains, increased debt capacity created by hedging is also able to generate indirect tax benefits (Ross (1997) and Leland (1998)). Graham and Rogers (2002) show that, for US firms, this gain is superior to tax benefits caused by decreased volatility in earnings. Hence, a positive relation between debt ratio and hedging is expected.

C - Costly external financing, information asymmetry and underinvestment

Froot, Scharfstein and Stein (1993) show that risk management may guarantee optimal investment when cash flows of current activities are uncertain to generate enough cash to internally fund all positive NPV projects. If external financing is costly

[1]Irecognize that this is an imperfect measure to proxy for whether a firm is subject to a convex tax schedule. Hedging may be used exactly to decrease volatility in earnings, so the perfect measure is the earnings that firms would have experimented, had they not hedged, which is obviously non-observable.I return to this issue during the discussion of results.

or inexistent (for example, due to information asymmetry), hedging creates value by transferring resources from one state of the world where resources are abundant to another where resources are scarce. Without hedging, the firm might have to bypass some valuable investment opportunities (in other words, underinvest) if an unfavorable state of the world occurs. On the other hand, if a favorable state of the world occurs, the firm would have to deal with the excess of cash, what might also be non-optimal, considering the agency costs of free cash flow described by Jensen (1986).

Tufano (1998) argues that managers will have incentives to hedge to guarantee funding for their “pet” projects. The absence of the discipline imposed by the capital markets can lead to investment in negative NPV projects that bring private benefits to managers. In this sense, hedging can also be value-destroying. For this purpose, managers may be willing to increase information asymmetry to avoid market scrutiny.

Regardless of the purpose of hedging (i.e. to guarantee funding for value-creating or value-destroying projects), a positive relationship between information asymmetry and hedging is expected. To distinguish between value-creating and value-destroying hedge, one has to assess the set of investment opportunities available to the firm. The most common proxies for investment opportunities are market-to-book ratio and R&D expenditures scaled by size (e.g. Mian, 1996 and Nance et al, 1993). Unfortunately, R&D is not available for most of the firms in the sample, and market-to-book also tends to be highly correlated with proxies used for information asymmetry. Following Mian (1996) and Allayannis and Ofek (2001), I use an alternative measure for information asymmetry, which is a dummy that returns 1 if the firm is from a regulated industry and zero otherwise. The reason for regulated industries to have less informational asymmetries than firms in non-regulated economic sectors is that its investment projects are generally subject to governmental approval and therefore must be made public, at least in part. This argument is equally valid in the US as it is in Latin America.

Related to Froot, Scharfstein and Stein’s (1993) costly external finance problem is the classical underinvestment problem described by Myers (1977), in which shareholders may decide not to accept projects even if they are value-enhancing, if

they assess that a significant fraction of the economic rent of low-risk projects go to creditors. Debtholders anticipate this behavior, adding this factor to borrowing costs. Deriving from the ideas of Myers and Majluf (1984) and Mayers and Smith (1982 and 1987), risk management mitigates the underinvestment problem by equalizing high and low-risk projects. If the firm is able to credibly commit to risk management at the time of its financing decision, the value of debt should be less sensitive to investment decisions not yet taken (Bessembinder (1991)), and then hedging might create value. With an analogous effect to Froot, Scharfstein and Stein's implications, Myers's underinvestment problem is more likely to affect firms with high investment opportunities and, therefore, the expected relation between hedging and investment opportunities is positive.

D - Transaction costs

Using derivatives implies incurring in variable transaction costs, such as brokerage fees. Most of the costs, however, should be understood as fixed rather than variable: the necessity of specialized personnel, investments in software, hardware, etc. Therefore, there may be economies of scale associated to risk management using derivatives. The development of tailor-made over-the-counter derivatives is also associated to high fixed costs that make the use of small contracts uneconomic. This implies that there is a positive relationship between firm size and derivatives usage. On the other hand, small firms are more likely to be financially constrained, which makes them more susceptible to financial risks and, thus, more likely to manage these risks. The relationship between size and risk management is, therefore, an empirical issue. In their vast majority, empirical studies have found a positive relation between size and derivatives usage, as a binary variable. The studies that investigate the magnitude of hedging (e.g. Guay and Kothari (2003), Graham and Rogers (2002)) find negative or no relation between hedging and the amounts hedged, what may show that size is a constraining, but not determinant, factor for risk management.

E - Rationales for risk management in Emerging Markets

There are reasons to believe that the factors that lead firms to manage risks in emerging economies are different from the determinants found for US firms and

other mature economies. An especially important difference is the ubiquitous high volatility of exchange and interest rates in emerging countries (except in those that adopt fixed or crawling exchange rate regimes). In addition, the relative scarcity of domestic funding faced by firms in emerging economies leads firms to raise funds overseas to finance investment projects. The portion of debt denominated in foreign currency is almost always a source of great exposure for large Latin American firms. It has been shown that currency depreciation may produce important balance sheet effects for Brazilian, Mexican and Chilean firms (respectively, Bonomo et al., 2003 , Pratap et al., 2003 and Benavente et al., 2003) with direct impacts on earnings, cash flow and investment.

A second important difference between mature and emerging economies to be considered is the availability of hedging instruments, which depends fundamentally on the development of domestic financial markets and access to international markets. I return to these issues in detail in Chapter 3.

2 Derivatives usage in Brazil. A survey

Derivatives usage has been increasing dramatically in the last few years. Data by the Bank of International Settlements – BIS (2006) show, for example, that the amounts outstanding of over the counter (OTC) derivatives has grown from US$197.2 trillion in December 2003 to US$284.8 trillion in December of 2005, an increase of nearly 45% in 2 years. In organized exchanges, the growth was of 61% for option contracts and 42% for future contracts from June 2001 to June 2003 (BIS, 2004). Although a major share of these amounts refer to contracts between financial institutions, non-financial firms respond for about 25% of commodities-linked (CM) derivatives, 20% of foreign exchange (FX) contracts and 10% of interest rate (IR) contracts. This tendency of growth in the use of derivatives can also be observed in Brazil, where the overall traded volume of the Brazilian Mercantile and Futures Exchange (BM&F) has been reaching records day after day.

Despite the fact that firms have been using derivatives for decades, little is known about managerial practices in the use of derivatives, the attitudes and perceptions of managers toward different classes of risk exposure and the formal evaluation procedures of risk management activities in non financial firms.

The main motivation for this study is to understand: 1) what are the economic and financial rationales that lead managers to use financial derivatives; fundamentally, whether these instruments are being used to mitigate risks, as the common sense suggests and financial theory recommends or for speculative purposes; 2) what are the risk classes most managed with derivatives, comparing to international evidence; 3) what are the concerns of financial managers in using derivatives, and what importance is given to institutional / legal aspects and to economic and financial issues.

Even in developed markets, only in the last ten years or so these issues have been studied in a systematic manner, and one of the path breaking works is the survey made by Bodnar et al (1995), with financial managers of American firms, which was the first of a series that is known as the Wharton Derivatives Survey. This survey was twice re-edited by Bodnar, Hayt and Marston (1996 and 1998). A study by

Bodnar and Gebhardt (1998) reports the same survey responded by German financial managers, comparing the results of US and German firms.

The evidence obtained in these surveys indicates that companies use derivatives mostly with the purpose of hedging rather than speculating. There is also strong evidence that, in both countries, the risk classes most managed with derivatives are foreign exchange (FX), interest rate (IR), and commodities (CM) in this order. Although it may be impossible to fully dissociate legal and institutional from economic and financial issues of concern in using derivatives, it was possible to identify that US managers are equally concerned with legal aspects (such as accounting treatment of derivatives) and economic problems (such as market and liquidity risks, in addition to the evaluation of hedge programs), whereas German managers showed more concern with investor perceptions in using derivatives. The concern of US managers with accounting treatment may be explained by the rules that guide how derivatives should be disclosed, namely instructions SFAS (Statement of Financial Accounting Standard) 119 and SFAS 133, that were being discussed at the time the US surveys were done.

The Wharton Survey was then replicated in many countries, such as Downie, McMilan and Nosal (1996) in Canada, Alckeback and Hagelin (1999) re-edited by Alckeback, Hagelin and Pramborg (2003) in Sweden, Sheedy (2002) in Singapore and Hong Kong, El-Masry (2003) in the United Kingdom and others. There are also some comparative studies such as Bodnar, Jong and Macrae (2002) comparing Dutch to American firms, Pramborg (2003) comparing Swedish to Korean firms and Bodnar and Gebhardt (1998), that compares American to German firms.

The questionnaire applied for Brazilian firms contained basically the same questions of the 1998 Wharton survey, with only a few adaptations for Brazilian market. However, differently from the other surveys, where paper questionnaires were sent and received by mail, the Brazilian survey was completely electronic. Managers were invited by e-mail to access the survey web page using a password and username, allowing for a quicker process (feeding of the database and response tallies).

I show in this chapter a summary of the results and, when appropriated, make comparisons between the results obtained for Brazil with those of other countries,

specially US and Germany, since the consolidated data for these surveys is almost completely public, and the German and US surveys have already been compared in Bodnar and Gebhardt (1998). A comparative study, however, would involve the full access to analytical data of other surveys, which is not available. Because of that, caution is in order in interpreting the comparisons.

2.1 Description of the survey

The survey questionnaire was sent to a broad based sample of all non-financial firms listed at BOVESPA (Sao Paulo Stock Exchange). In the beginning of March 2004, the emails inviting financial managers to answer the questions were sent to 378 firms. A second round of invitations was sent in mid April. From this sample, 74 firms responded, yielding a response rate of 19.6%. In order to check for response bias, the sample was compared to a random sample of 74 firms listed at BOVESPA in terms of size (measured by the natural logarithm of assets) and debt/asset ratio. The comparison of means and medians showed that there is no significant difference between respondents and non-respondents. Appendix A presents the original survey questions together with the raw tabulation of the responses.

2.2 Results and analysis

Table 2.1 gives a general picture about sample sizes and rates of derivatives users across countries researched. Although there are differences regarding the year in which the surveys were made, it is not possible to reject the hypothesis that the proportion of firms using derivatives in Brazil is equal from that observed in other countries, with the exception of Germany and the two earliest US surveys. Bodnar and Gebhardt (1998), comparing US to Germany, attribute the higher proportion of users of derivatives in Germany to the fact that US firms had in 1998 a much larger single currency domestic market, whereas in Asian and European countries researched the foreign market plays a more important role. An inspection in international data shows that the relation *Foreign Trade / GDP* is substantially higher for European and Asian countries researched than for Brazil. A possible explanation for the proportion in Brazil to be similar to these countries (only smaller than in Germany) is the high volatility of Brazilian FX and IR markets, what makes the demand for hedge against these risks naturally greater, compensating the lower

volume of foreign trade compared to domestic market. In the Netherlands, Germany and Sweden, the introduction of the Euro may have reduced the currency exposure of non-financial firms, and it is thus difficult to compare the results of surveys made in 1998 with more recent surveys.

Table 2.1: Derivatives usage across countries and year of research

General picture of derivatives usage across countries researched. The last column is the z statistic with Brazil, indicating whether the proportion of firms using derivatives is statistically different from the proportion observed in Brazil. The years when the surveys were made not necessarily correspond to the year of publication.
(1) Proportion of users different from Brazil, significant at: (**)5% e (***)1%.

Country	Year	# of surveys sent to firms	# of responding firms	Response rate	% of users (responding firms)	Statistic z (with Brazil)
Brazil	2004	378	74	19.6%	57%	-
USA	1998	1928	399	20.7%	50%	1.08
USA	1995	2000	350	17.5%	41% (**)	2.49
USA	1994	2000	530	26.5%	35% (***)	3.63
Germany	1998	368	126	34.2%	78% (***)	-3.16
Holland	1998	167	84	50.3%	60%	-0.41
UK	2002	401	173	43.1%	67%	-1.53
Sweden	2003	261	134	51.3%	59%	-0.31
Sweden / Korea	2001	250 / 387	103 / 60	41.2 / 15.5%	57% / 62%	-0.03 / -0.61

Source: the author

As observed in all countries mentioned in Table 2.1, the classes of risk mostly managed with derivatives in Brazil also followed the order FX, IR, CM and others. Table 2.2 shows that among firms that use derivatives, 97.6% use FX instruments, 83.3% use IR, 35.7% use CM and 21.4% use other derivatives. As expected, US dollar instruments are used by all FX users, followed by Euro (32.5%), Yen (17.5%) and other currencies (5.0%). When financial managers were asked what benchmarks they used for assessing FX risk over the budget/planning period, 12.8% of them indicated they did not have a benchmark for evaluating such risks. 51.3% used internal or external analysts' reports, 48.7% used beginning of period forward rates, 33.3% used beginning of period spot rates, and 28.2% used other benchmarks. For IR risk assessment, 21.6% used no benchmark, 62.2% used some basket of interest rate indexes, 43.2% used the firm's cost of capital, 24.3% used

inflation indexes and 16.2% used other benchmarks. Another relevant result is that 29% of firms using derivatives indicated doing more than 50% of their hedge overseas.

Table 2.2: Derivatives usage across risk classes and instruments

The row "Firms using derivatives" indicates how many firms use derivatives to manage each of four risk classes. The remaining rows show the types of products/markets used and the proportion of these markets relative to total users in each risk class. The last column informs how many firms, in overall computation, use exclusively organized, OTC or both markets.

	Risk classes managed with derivatives				Total
	FX	IR	CM	others	
Firms using derivatives (% of derivatives users)	40 95.2%	35 83.3%	15 35.7%	9 21.4%	42 100%
Use exclusively organized markets	4 10.0%	3 8.6%	4 26.7%	2 22.2%	1 2.4%
Use only OTC markets	27 67.5%	20 57.1%	2 13.3%	5 55.6%	16 38.1%
Use both OTC and organized markets	9 22.5%	12 34.3%	9 60.0%	2 22.2%	25 59.5%

Source: the author

Table 2.2 also shows that more than half of the firms use exclusively OTC market to trade FX and IR derivatives, and only a small fraction of companies use exclusively organized markets[2]. For commodities, however, 86.7% of the firms trade at organized markets (exclusively or not). Considering all risk classes, only one firm (2.4%) indicated recurring only to organized markets, whereas 38.1% recur exclusively to OTC markets, and the remaining companies (59.5%) make use of both organized and other providers of financial services. An inspection to the number of contracts outstanding at Brazilian Mercantile and Futures Exchange (BM&F) shows that, for future contracts of US dollar, and other FX and IR contracts, the share corresponding to non financial companies is about 1 to 3% of the total number of contracts, whereas for agricultural commodities contracts (sugar, coffee, alcohol and cattle, for example), the share is substantially greater, about 30 to 70%. Possibly contributing to the low use of FX and IR futures by non financial firms is the incidence of taxes like PIS (Plano de Integração Social), COFINS (Contribuição para o Financiamento da Seguridade Social) and CPMF (Contribuição Provisória sobre

[2] Brazilian Mercantile & Futures Exchange (BM&F) is the main organized market for derivatives in Brazil.

Movimentação ou Transmissão de Valores e de Créditos e Direitos de Natureza Financeira), that were charged over daily margin calls[3]. The higher the volatility and maturity of the contracts, the higher is the tax burden, making the use of these instruments less likely.

The results shown in Table 2.3 also suggest that taxation over derivatives usage may inhibit the use of future contracts. Considering derivatives users, the proportion of firms that indicated high or moderate concern with taxation was 92.7%, and half of the managers indicated taxation as the first and second most important issues of concern respectively, quite differently from what was observed in US and Germany. Among non users, taxation was the third most indicated reason for not using derivatives. The two most cited were "exposure effectively managed by other means" (54.6%) and "insufficient exposure" (50.0%), similarly to what has been obtained in US and Germany.

Table 2.3: Main issues of concern for managers

Shows the proportion of managers highly or moderately concerned with cited issues, and ranking of issues as a source of concern. – in parenthesis. The question asked was "indicate your degree of concern about derivatives usage", and allowed 4 answers: "no concern", "low", "moderate" or "high". Of the 9 items presented in the survey, the 5 most relevant for effects of comparison Brazil/USA/Germany are shown.

Issue of concern / Country	Tax issues	Accounting treatment	Market risk	Perception of analysts and investors	Monitoring and evaluating
Brazil	● (1st)	● (2nd)	◕ (3rd)	◑ (7th)	◕ (5th)
USA (1998)	◑ (4th)	◕ (1st)	◑ (3rd)	◑ (9th)	◕ (2nd)
Germany	○ (8th)	◔ (6th)	N/a	◑ (1st)	◔ (2nd)

○ Less than 20%; ◔ 20 to 40%; ◑ 40 to 60%; ◕ 60 to 80%; ● 80% and over

Source: the author

Other important result shown in Table 2.3 is that Brazilian managers show a higher degree of concern compared to American and German managers for almost all 9 issues asked, and that German managers are, by far, the ones that show the lowest

[3] This situation has changed since 2005, when federal regulation allowed compensation of gains and losses in future contracts.

degree of concern. For example, the issue of less relevance for Brazilian managers, "secondary market liquidity", was indicated by 30.8% of Brazilian managers as an aspect of high or moderate concern, greater than the second item most cited by German managers ("monitoring and evaluating", with less than 30%). This fact leads us to ask whether German managers ignore the risks of using derivatives. Bodnar and Gebhardt (1998) consider this highly improbable. In this way, such disparity between German and US managers makes any comparison between Brazilian and US/German managers based upon these proportions very difficult to be trusted. Hence, the ranking of issues of concern seems to bring much more information than the proportions themselves.

The results of Table 2.3 also indicate that, despite the high volatility of Brazilian markets, the two major concerns of Brazilian managers are much more linked to legal and institutional aspects ("taxation" and "accounting treatment"). If concern with taxation may be explained by the incidence of taxes on future contracts and by the complex Brazilian tax structure, the concern shown with accounting treatment is especially surprising. Although the degree of disclosure on derivatives usage regarded by US authorities is much greater than what is regarded in Brazil, there is no significant difference between the proportion of Brazilian and US managers concerned with this issue. Hence, the results obtained indicate that legal and institutional aspects are the most important in Brazil, differently from what was observed in US and Germany.

Table 2.4: Derivatives usage compared to previous year: 2003/2002 and 2002/2001

Shows the number (and proportion) of firms that indicated to have increased, decreased or remained constant the usage of derivatives in 2002 and 2003 compared to the previous year, based on total value of contracts. The last column shows the number and proportion of firms that has increased, decreased or remained Constant the usage of derivatives in both years.

	2002 in relation to 2001	2003 in relation to 2002	Same answer for both years
Usage has increased	32 76.2%	18 42.9%	15 35.7%
Usage has decreased	3 7.1%	8 19.1%	2 4.8%
Usage has remained constant	7 16.7%	16 38.1%	4 9.6%

Source: the author

The presidential elections of 2002 caused great oscillations in Brazilian financial markets compared to 2003. For example, the exchange rate (in BRL - Brazilian Reais - to USD – US Dollar) in 2002 varied in the interval [2.2701; 3.9544], whereas in 2003 the interval was [2.8211; 3.6615], which means that the range observed in 2002 is almost the double of what was observed in 2003. Table 2.4 shows the proportion, among users, of firms that increased, decreased or remained the usage of derivatives constant (based on total notional value of contracts), from 2001 to 2002 and from 2002 to 2003. In 2002, 76.2% of firms increased the use of derivatives, against 35.7% in 2003. There was also a greater proportion of firms (17.5%) that decreased the usage from 2002 to 2003 than from 2001 to 2002 (7.5%). This indicates that a perception of increasing risk leads managers to increase derivatives usage (although it is impossible to say whether this increase in derivatives usage is motivated by hedging or speculation). The proportion of firms that increased derivatives usage in both years was 42.5%, suggesting that there is, independently of macroeconomic factors, a tendency of increasing derivatives usage.

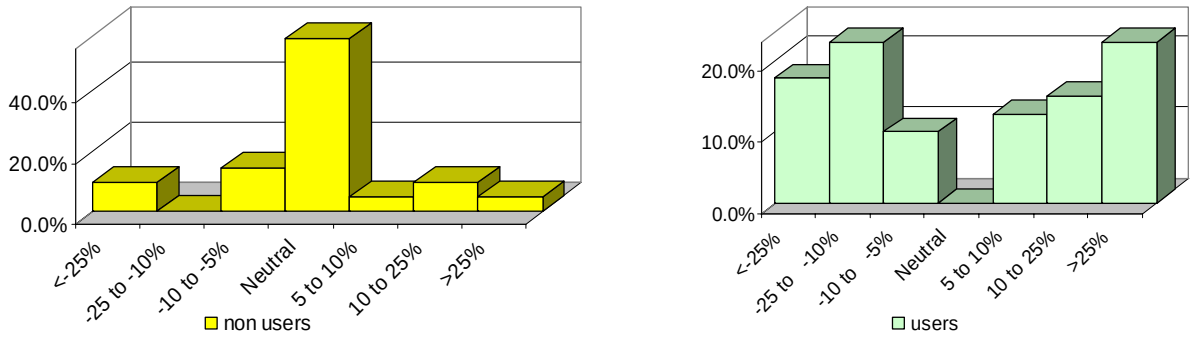
Figure 2.1 shows the net exposure of operation to foreign currency, from questions regarding the percentage of revenues and expenses attached to any foreign currency. Although revenues and expenses may be attached to different currencies (for example Euro and US dollar), I believe that the main source of FX risk in Brazil is associated to the (de)valuation of the Brazilian Real (BRL) compared to other currencies as a whole. I define FX exposure (FXE) as the difference:

FXE = % of revenues in foreign currency - % of expenses in foreign currency (1)

The histograms in Figure 2.1 show that, among derivatives users there is not a single firm with neutral exposure, whereas 76.2% of non users have FXE below 10% in absolute value. This clearly indicates that foreign exchange exposure is relevant in determining whether to use derivatives or not, what suggests that derivatives are being mostly used to manage risks. The results shown for non-users are consistent with the reasons pointed by managers for not using derivatives, “insufficient exposure”.

Figure 2.1 Exposure to Foreign Currency: users and non users

This figure shows FX exposure to which users and non users are subject. The level of FX exposure as defined in Equation 1 is shown on the horizontal axis, and the vertical axis shows the proportion of firms in each of the classes. The classes to the left (right) indicate firms with negative (positive) FXE, which means that they have a percentage of expenses (revenues) greater than the percentage of revenues (expenses) in foreign currency. The class "neutral" contains the firms with FXE equal to zero.



Source: the author

Table 2.5: Impacts of a market view.

This table tabulates the answers to the question: "How often does a market view cause you to:" 1) "actively take positions"; 2) "alter the timing of hedges"; 3) "alter the size of hedges". The respondent had 3 options ("never", "sometimes" or "frequently") for each of these items in both risk classes (FX and IR).

		IR			FX		
		Never	Sometimes	Frequently	Never	Sometimes	Frequently
Actively take positions	Brazil	●	○	○	●	○	○
	US	◑	◔	○	◕	◔	○
	Germany	◕	◔	○	◑	◔	○
Alter timing of hedge	Brazil	◑	◑	○	○	◕	○
	US	◔	◑	○	◑	◑	○
	Germany	○	◕	◔	◔	◑	◔
Alter size of hedge	Brazil	◔	◑	○	○	◑	◔
	US	◑	◑	○	◔	◑	○
	Germany	○	◕	○	○	◕	◔

○ Less than 20%; ◔ 20 to 40%; ◑ 40 to 60%; ◕ 60 to 80%; ● 80% and over

Source: the author

Table 2.5 shows how managers from Brazilian, US and German firms react to market views about foreign currency and interest rates. In terms of altering the size and timing of hedges, it is possible to verify that: 1) German and Brazilian are more active than American firms in managing FX risk (what is made clear by the proportion of American firms that responded “never” going to derivatives markets to alter timing or size of hedges). Again this result suggests that the size of the American domestic market is determinant for US firms to have less necessity of managing FX risks. Once again, it is necessary to emphasize that the German survey was conducted in 1998, before the introduction of the Euro. After the Euro, a great portion of German firms’ foreign market transactions are made in Euros, decreasing the necessity of an active FX risk management; 2) German managers are the most active in managing IR risks (given the smaller proportion of managers that answered “never” going to IR derivatives markets to alter timing and size of hedges). Comparing US to Brazilian managers, the results show that Brazilian managers are more inclined to alter the size of hedges, whereas US managers alter the timing of hedges.

Table 2.6: Assessment of risk management function

Shows the proportion of each of 4 criteria by which risk management activity is evaluated. The first column indicates a criterion only based on risk reduction, whereas the second indicates a criterion linked to the relation return/risk. The last two columns have no reference to reduced risk or volatility, indicating criteria only attached to increased profits, with no adjustment to the degree of exposure of the firm.

	Reduced volatility compared to a benchmark	Risk adjusted performance (profits or savings adjusted for volatility)	Absolute profit / loss	Increased profit (reduced loss) relative to a benchmark
Brazil	○	○	◑	○
US	◔	◔	○	◔

○ Less than 20%; ◔ 20 to 40%; ◑ 40 to 60%; ◕ 60 to 80%; ● 80% and over

Source: the author

Table 2.6 show the criteria by which risk management activity is evaluated, in Brazil and US. It is surprising that, given that the ultimate purpose of risk management activity is actually creating value through risk reduction and not by the generation of extra profits, 40% of American and 70% of Brazilian firms use criteria only based on

profits (corresponding to the last two columns of Table 2.6). If these are also compensation criteria, this may create incentives for managers to take speculative positions with derivatives. Also surprising is the fact that, despite receiving incentives to speculate, evidence suggests that the great majority of Brazilian managers use derivatives as a manner of hedging.

This chapter shows the results obtained from a survey on derivatives usage and risk management practices made from a sample of 74 Brazilian non financial firms, stating comparisons with similar surveys made in other countries, specially USA and Germany. However, this is not a complete comparative study, once this would imply access to analytical data obtained by these other surveys. Hence, in stating comparisons, it is only possible to obtain indicators of different and similar characteristics of Brazilian and other managers.

The proportion of Brazilian firms using derivatives is not significantly different from the majority of countries researched, with the exception of Germany, where the proportion of users is greater. However the time lag existent between this and other surveys may distort this result. As observed in most countries where surveys were conducted, the classes of risk most managed with derivatives in Brazil are foreign currency, exchange rates, commodities and others, in this order.

Despite the high volatility of foreign currency and exchange rate markets in Brazil and the susceptibility of Brazilian economy to internal and external crises, Brazilian managers are more concerned with legal and institutional aspects than with financial and economic issues, contrarily to what was observed in US and Germany. The taxation on derivatives is the main issue of concern by Brazilian managers, followed by accounting treatment. The impacts of taxation on derivatives can be a good issue for further studies.

Also similarly to what was observed internationally, and in line with what the Financial Theory prescribes, the evidence suggests that Brazilian financial managers use derivatives mainly for hedging against risks, and not with speculative purposes, although the majority of managers responded that risk management activities are evaluated based upon profits and not risk reduction, what could incentive speculation.

The main limitations of my results refer to the sample used. The relatively small number of firms responding the survey made controlling the results by size and/or industry impossible. Besides, the great majority of firms responding the survey are companies listed at Sao Paulo Stock Exchange (BOVESPA), what can be a source of bias, once it is known that there are a great number of important privately held companies in Brazil.

3 Determinants of risk management in Latin American non-financial firms

The disclosure of derivatives holdings and risk-management strategies in corporations has been an issue of concern among investors and regulators. Many attempts have been made in the last few years to increase the transparency of risk-management activities in the US – namely SFAS (Statement of Financial Accounting Standards) 119 requiring companies to make a clear distinction between instruments held for hedging and trading purposes, and SFAS 133, which states that the company is required to establish at the inception of the hedge, the method it will use for assessing the effectiveness of the hedging with derivative financial instruments and the measurement approach for determining the ineffective aspect of the hedge - and a lot of effort is still being made towards this direction. The availability of publicly disclosed data has boosted research in the area, which has helped in clarifying many questions about the determinants of risk-management activities (see, among others, Graham and Smith (1999), Haushalter (2000), Graham and Rogers (2002), Guay and Kothari (2003) and Jin and Jorion (2005)), but there is still some mixed evidence on the importance of financial leverage and growth opportunities to hedging activities. Most of the literature to date, however, has focused on US firms[4].

In this chapter, I investigate the determinants of risk management in the four most developed Latin American countries (Argentina, Brazil, Chile and Mexico). These equity capital markets jointly account for approximately 90% of the total market capitalization in Latin America. To the best of my knowledge, this is the first study to focus on risk management in emerging markets in a multi-country setting[5]. I use a sample of firms with ADRs (American Depositary Receipts) traded on the main US exchanges (NYSE, Nasdaq and Amex) to assure that information about derivatives activity is disclosed consistently according to FASB (Financial Accounting Standards Board) requirements. As in mature economies, more than 75% of these firms used some sort of derivative contracts to manage financial risks as of year-end 2004. Most

[4] An important exception is a work by Kim and Sung (2005), which investigates the determinants of FX risk management in Korea using survey data.

[5] Bartram et al (2003) make use of a broad sample of firms in 48 mature and emerging economies, but few Latin American firms are included in the sample.

of these firms have a high proportion of their indebtedness attached to foreign currency, which explains why currency risk is by far the exposure most commonly managed with derivatives.

The relatively good disclosure of derivatives activities allows us to study not only the decision on whether to use derivatives or not, but also the decision of the magnitude of risk being managed with derivatives. I find that the factors that determine the decision of whether to use derivatives or not may differ from the reasons that determine the magnitude of risk being managed with derivatives. I show evidence that, while larger firms are, *ceteris paribus*, more likely to use derivatives, there is a negative relationship between size and the magnitude of risk management. Unlike what was found by Guay and Kothari (2003) for US firms, I find that derivative contracts held by Latin American firms are capable of producing cash flows comparable in magnitude to investment expenditures and earnings in the event of shocks in the prices of the underlying assets. These cash flows may also alter firm value by about 3% for the median firm.

An alternative to the use of derivative contracts is the operational hedge, in which the firm matches the values of assets and liabilities to the same risk factor (for example, an exporter may raise debt attached to the same currency in which its revenues are denominated). My evidence also shows that this “natural” currency hedge reduces the magnitude of derivatives holdings for risk-management purposes. Firms that have operational results positively sensitive to local currency devaluation hold smaller derivatives portfolios than firms whose operational results are negatively or not sensitive to currency devaluation, controlling for the level of foreign debt. I also find strong evidence that the costs of financial distress, either measured by financial leverage, coverage ratio or debt in foreign currency, are the main determinant of risk management for the firms of our sample and, as a second-order determinant, firms engage in derivatives programs to be able to assure funding for valuable investment opportunities. There is no empirical support for the hypothesis that firms use derivatives to gain with the tax advantages of hedging due to reduced volatility of taxable income. I find evidence that hedging is able to reduce taxes, however, as long as it increases firms’ debt capacity.

Since the extant theoretical rationales for risk management presented by the financial literature and the main results of empirical studies so far have already been presented in the introductory chapter, the remainder of this chapter is divided into four sections as follows: section 1 presents the sample, the procedures used to collect data, and description of most relevant statistics. In section 2, the sensitivities of currency and interest rate derivatives holdings to changes in the prices of the underlying assets are estimated, comparing the potential cash flows produced by the derivatives to relevant measures, such as investments, earnings, and firm value. Section 3 presents the methodology and the results of the panel data LOGIT and TOBIT analyses used to test the hypotheses related to the determinants of derivatives usage and the magnitude of foreign exchange (FX) derivatives holdings. Section 4 concludes.

3.1 Derivatives data and sample

My sample is composed of firms from 4 different countries (Argentina, Brazil, Chile and Mexico) that belonged to the *Bank of New York Latin American ADR Index* as of year-end 2004, excluding financial firms and firms that are subsidiaries of other firms in the sample. I exclude financial firms since it is often hard to distinguish between derivatives used for trading purposes from derivatives used for asset-liability management. Data on derivatives holdings as of year-end 2001 to 2004 are obtained from the 20-F files submitted to the Securities and Exchange Commission (SEC). The total number of firms is 55 (26 from Brazil, 14 from Mexico, 12 from Chile and 3 from Argentina), and since some 20-F forms were unavailable for the years 2001 and 2002, I end up with a total of 183 firm-year observations. Although ADR firms represent a small portion of the total number of publicly traded firms in these countries, the sample is truly representative in terms of market capitalization and stock negotiability in Latin America. The firms in the sample represent more than 50% of total market capitalization in these countries. Specifically for Brazil, for instance, the 26 firms that are present in the sample constituted more than 75% of the BOVESPA index as of year end 2004, which is the main stock index in Brazil, and represents roughly 80% of the stock market trading in the Brazilian market[6]. The

[6] Roughly 10% of the Bovespa index portfolio is constituted by stocks of financial firms, so the 26 Brazilian firms in the sample respond for nearly 85% of the non-financial firms in the index.

Chilean and Mexican firms in the sample also correspond to more than 50% of the IPSA (Índice de Precios Selectivo de Acciones) and IPC (Indice de Precios y Cotizaciones), respectively, the main stock indexes of these countries.

Table 3.1: Risk classes managed with derivatives by country

This table shows the number of firms that used derivatives to manage each class of the risk classes described below for each of the countries considered. Each individual firm may use more than one class of financial derivative instrument, explaining why the numbers in each risk class (Currency, domestic Interest Rate, Foreign Interest Rate and Commodities) do not add up to the total users row in each year. The majority of currency contracts exchange dollars for the local currency, and the most common interest rates are the LIBOR, CETES (Mexico), PDBC (Chile) and CDI (Brazil).

Country		2001	2002	2003	2004
Argentina	Currency	-	1	1	1
	Domestic IR	-	0	0	0
	Foreign IR	-	0	0	0
	Commodity	-	0	0	0
	Total users	**-**	**1**	**1**	**1**
	Non-users	-	2	2	2
Brazil	Currency	10	19	21	21
	Domestic IR	1	1	0	4
	Foreign IR	1	5	4	6
	Commodity	2	3	5	6
	Total users	**10**	**19**	**21**	**22**
	Non-users	2	5	3	4
Chile	Currency	5	9	11	10
	Domestic IR	0	0	0	3
	Foreign IR	1	3	3	2
	Commodity	1	2	3	3
	Total users	**5**	**10**	**12**	**11**
	Non-users	0	0	0	1
Mexico	Currency	3	7	6	8
	Domestic IR	0	1	3	3
	Foreign IR	3	4	5	5
	Commodity	3	6	5	6
	Total users	**4**	**10**	**9**	**10**
	Non-users	4	4	5	3

Source: the author

Disclosure of derivatives holdings can be found either in Section 11 *quantitative and qualitative disclosure about market risk*, or in the footnotes of financial statements. Information other than derivatives holdings was extracted from Datastream and Economatica databases. In the case of missing or conflicting information[7], I recurred directly to financial statements and 20-F forms. The instructions SFAS 119 and SFAS 133 recommend that firms disclose whether derivatives are being held for trading or for other purposes. Only three firms (10 firm-years) declared holding

[7] There was a lot of missing information on debt attached to foreign currency in the databases cited, so most of this information was also hand-collected from the 20-F forms.

derivatives for trading purposes, but it is still possible to distinguish the part of their portfolio that was being used for hedging, since SFAS 119 and 133 require firms to clearly disclose hedging instruments. In section 3, the tests were performed both including and excluding these firms for robustness.

Table 3.2A: Descriptive statistics: Derivatives users x non-users

This set of tables shows descriptive statistics for the main variable of the 183 firm-years in the sample. From the 55 firms, 3 are Argentinean, 26 are Brazilian, 12 from Chile and 14 from Mexico. Gross margin is defined as EBIT/net operational revenue. The F statistic for the comparison of means between derivatives users of any risk class (146 firm-years) and non-users, i.e., firms that did not hold any kind of financial derivative instrument as of the considered year-end (37 firm-years), is shown in the last column. In parenthesis is the P-value associated to this statistic, and the symbols ** and * indicate statistical significance at 1% and 5% respectively.

	All Firms		**Non-users of derivatives of any risk class**		**Users of derivatives of any risk class**		
N	**183**		**37**		**146**		
	Average	**Median**	**Average**	**Median**	**Average**	**Median**	**Stat. F**
Total Assets (millions of US dollars)	5,113	2,751	2,658	2,001	5,735	3,136	2.320 (0.011)*
Sales (millions of US dollars)	2,734	1,478	1,204	1,061	3,121	1,728	2.198 (0.015)*
Gross Margin of Sales (%)	38.77	38.60	44.89	40.2	37.21	38.40	2.804 (0.003)**
Capex / Depreciation (%)	131.97	90.65	98.19	83.6	140.23	90.70	1.717 (0.044)*
Total Debt / Total Assets (%)	59.71	60.90	58.18	63.00	60.10	60.85	0.572 (0.284)
Foreign Debt / Total Debt (%)	62.23	68.55	51.20	59.00	64.89	71.87	2.451 (0.008)**
Fixed Assets / Total Assets (%)	63.15	48.95	52.92	46.55	65.75	49.31	0.515 (0.308)

Source: the author

Derivative contracts were classified into 4 distinct classes: foreign exchange, domestic interest rates, international interest rates and commodities, according to what was reported on the 20-F forms. Table 3.1 shows the number of firms that use each class of derivatives for each country. FX derivatives are the most used, what is

consistent with a number of surveys on derivatives usage performed worldwide[8]. Swaps are the most common instruments used to manage currency and interest-rate risks. It was not possible to gather information on the maturities of all contracts but, for those for which this information was available, swaps typically have original maturities ranging from 3 to 6 years, with cash exchange every 6 months, although there were a number of contracts with quarterly exchange of cash. Futures and forwards are generally short-term contracts, with maturities up to 6 months.

The majority of currency contracts involved the exchange of the local currency against the US dollar. The interest rate swaps were mainly plain vanilla exchanging fixed for floating rates, and the most widely used rates were the LIBOR (international), CDI (*Certificados de Depósitos Interbancários - Brazil*), CETES (*Certificados de la Tesoreria de la Federacion - Mexico*) and PDBC (*Pagarés Descontables del Banco Central - Chile*). No Argentinean firm used domestic interest rate derivatives.

Tables 3.2A and 3.2B show the descriptive statistics of relevant variables for firms in our sample. Table 3.2A splits the sample into users (146 firm-years) and non-users (37 firm-years) of financial derivatives of any class (currency, interest rates or commodities), and Table 3.2B splits the sample into users (133 firm-years) and non-users (50 firm-years) of currency derivatives (hereafter called FX users and FX non-users). FX users (statistics shown in Table 3.2B) obviously form a subset of the users of any class of derivatives (listed in Table 3.2A), and thus there are 13 firm-years that use exclusively derivatives unrelated to currency (10 firm-years use only CM derivatives, 2 use only IR derivatives and 1 uses both IR and CM – but not FX - instruments).

Tables 3.2A and 3.2B show that derivatives users are, on average, larger than non-users, whichever is the definition used for size (total assets or sales). Derivatives users have significantly more debt attached to foreign currency and more investment opportunities, as measured by capital expenditures (Capex) per dollar of depreciation, consistent with Froot, Scharfstein and Stein's (1993) theory. However,

[8] To name a few, Bodnar et al (1995, 1996 and 1998) in the US, Saito and Schiozer (2004) in Brazil, Alkeback et al (2003) in Sweden, Bodnar and Gebhardt (1998) in Germany, and El-Masry (2002) in the UK.

this relation may also be showing that financially constrained firms have, at the same time, little funding for their projects and difficulty in finding counterparts for derivatives transactions due to credit risk, as Mello and Parsons (2000) suggest. I return to this issue in the next sections.

Table 3.2B: Descriptive statistics: FX users x FX non-users

This set of tables shows descriptive statistics for the main variable of the 183 firm-years in the sample. From the 55 firms, 3 are Argentinean, 26 are Brazilian, 12 from Chile and 14 from Mexico. Gross margin is defined as EBIT/net operational revenue. The F statistic for the comparison of means between users of currency derivatives (133 firm-years) and non-users of currency derivatives, i.e., firms that did not hold any kind of financial derivative instrument as of the considered year-end plus firms that used derivatives other than currency (50 firm-years) is shown in the last column. In parenthesis is the P-value associated to this statistic, and the symbols ** and * indicate statistical significance at 1% and 5% respectively.

	All Firms		**Non-users of currency derivatives**		**Users of currency derivatives**		
N	**183**		**50**		**133**		
	Average	**Median**	**Average**	**Median**	**Average**	**Median**	**Stat. F**
Total Assets (millions of US dollars)	5,113	2,751	2,816	1,864	5,977	3,401	2.656 (0.004)**
Sales (millions of US dollars)	2,734	1,478	1,419	1,018	3,228	1,821	2.303 (0.011)*
Gross Margin of Sales (%)	38.77	38.60	40.39	37.20	38.17	38.70	0.884 (0.189)
Capex / Depreciation (%)	131.97	90.65	103.57	83.45	142.46	92.8	1.774 (0.039)*
Total Debt / Total Assets (%)	59.71	60.90	57.13	60.90	60.68	60.9	1.178 (0.120)
Foreign Debt / Total Debt (%)	62.23	68.55	54.21	60.12	65.15	71.76	2.180 (0.015)*
Fixed Assets / Total Assets (%)	63.15	48.95	87.26	52.21	50.34	48.63	2.113 (0.018)*

Source: the author

Although the difference is not statistically significant, derivatives users have more debt financing than non users as measured by *total debt / total assets*. The gross margin of sales is smaller for derivatives users. However, Table 3.2B shows that, when the sample is split between FX users and non-users, the gross margin of sales in each group is not statistically different from the other group. This might evidence

that commodity producers, which account for a great part of the 13 firms that use derivatives but do not use FX derivatives, typically operate with lower gross margins, due to the characteristics of their products and the low prices of commodities observed in the period of this study. This is confirmed in Table 3.2C, where only derivatives users are shown, and then are split into FX users and users of other classes of derivatives. The gross margin of sales of non FX users is lower than that of FX users. It is also evidenced in Table 3.2C that these commodity producers have a greater portion of their total assets in the form of fixed assets, which is a characteristic of commodities producers.

Table 3.2C: Descriptive statistics: FX users x users of derivatives other than currency

This set of tables shows descriptive statistics for the main variable of the 183 firm-years in the sample. From the 55 firms, 3 are Argentinean, 26 are Brazilian, 12 from Chile and 14 from Mexico. Gross margin is defined as EBIT/net operational revenue. The F statistic for the comparison of means between users of currency derivatives (133 firm-years) and firms that used derivatives other than currency (13 firm-years) is shown in the last column. In parenthesis is the P-value associated to this statistic, and the symbols ** and * indicate statistical significance at 1% and 5% respectively.

	Derivatives Users		**Users of currency derivatives**		**Users of derivatives other than currency**		
N	**146**		**133**		**13**		
	Average	**Median**	**Average**	**Median**	**Average**	**Median**	**Stat. F**
Total Assets (millions of US dollars)	5,735	3,136	5,976	3,401	3,266	1,438	1.171 (0.122)
Sales (millions of US dollars)	3,121	1,728	3,227	1,820	2,033	811	0.779 (0.218)
Gross Margin of Sales (%)	37.22	38.40	38.17	38.70	27.58	26.20	2.853 (0.003)**
Capex / Depreciation (%)	140.23	90.70	142.46	92.80	118.02	82.30	0.595 (0.276)
Total Debt / Total Assets (%)	60.10	60.85	60.68	60.90	54.14	57.30	1.523 (0.065)
Foreign Debt / Total Debt (%)	64.90	71.87	65.15	71.76	62.31	79.00	0.340 (0.367)
Fixed Assets / Total Assets (%)	65.75	49.32	50.34	48.63	83.43	60.00	4.235 (0.000)**

Source: the author

Table 3.2D: Descriptive statistics: split by country

This table shows descriptive statistics for the main variable of the 183 firm-years in the sample. From the 55 firms, 3 are Argentinean, 26 are Brazilian, 12 from Chile and 14 from Mexico. Gross margin is defined as EBIT/net operational revenue.

Countries	Argentina		Brazil		Chile		Mexico	
N	9		86		39		49	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Total Assets (millions of US dollars)	1,720.3	787.1	5,752.7	3,742.5	3,933.2	1,362.3	5,553.4	2,742.4
Sales (thousands of US dollars)	532.1	220.1	3,493.6	1,893.0	1,264.8	789.1	2,973.3	1,957.5
Gross Margin of Sales (%)	33.53	29.70	39.67	40.25	34.96	36.80	41.27	42.95
Capex / Depreciation (%)	26.08	19.70	172.96	124.40	95.92	72.40	112.37	83.30
Total Debt / Total Assets (%)	66.69	66.70	62.04	61.35	56.27	49.80	57.09	61.20
Foreign Debt / Total Debt (%)	64.6	80.0	65.7	71.9	58.9	67.2	58.5	63.0
Fixed / Total Assets (%)	74.6	78.4	53.7	45.9	58.2	57.2	81.6	81.8

Source: the author

Table 3.2D shows the descriptive statistics of the sample, with firms split on a country-level basis. The firms from Brazil and Mexico are significantly larger than firms in Chile, and Argentinean firms are the smallest on average. Brazilian and Mexican firms also have significantly more capital expenditures (Capex) relative to depreciation, indicating that these firms possibly have a larger set of investment opportunities. There is no significant difference among countries in relation to total indebtedness and foreign indebtedness, indicating that most of the firms in the sample have access to foreign funding (this was already expected since they are all ADR firms). It is also possible to identify that firms in Mexico and Argentina have a higher portion of fixed assets relative to total assets in comparison to firms in Brazil and Chile.

3.2 Cash flow sensitivities of derivatives contracts

I investigate whether derivatives held by firms are capable of generating cash flows with magnitude similar to that of variables that are the potential objects of hedging (financial expenses, investments and profits). In other words, I check if the potential cash flows generated by derivatives are economically significant when compared to those variables. I focus the analysis on interest rate and currency derivatives.

Guay and Kothari (2003) show that potential cash flows produced by US firms' derivatives holdings have a much smaller order of magnitude than capital expenditures, taxable earnings and financial expenses, and therefore conclude that derivatives holdings may be understood only as a fine-tune portion of risk management.

In order to estimate the magnitude of risk being managed with derivatives, I follow the methodology used by Guay and Kothari (2003), where three assumptions are made: 1) the cash flow generated by each derivative security is perfectly negatively correlated with the firms' unhedged cash flow (i.e., derivatives manage the firm's downside risk exposure); 2) the cash flow sensitivity of the derivatives portfolio is the potential cash flow generated by the derivatives portfolio in an extreme change in the price of the underlying asset. *Extreme changes* are defined as 3 times the annualized volatility of the movements in the asset prices in each year; 3) There are no offsetting positions within the portfolio of derivatives, i.e. I use the gross notional principal value of derivatives holdings for each risk class[9]. Since the main purpose is to estimate the order of magnitude of the cash flow sensitivity of derivatives holdings, it is arguable that there is no substantial error due to these assumptions. The assets chosen to represent each risk class are the exchange rate of the US dollar versus local currency (for currency risk), LIBOR (international interest-rate risk) and the CDI, PDBC and CETES rates respectively for Brazilian, Chilean and Mexican domestic interest-rate risk.

[9] I use this procedure even for firms that disclose derivatives activities on a contract-by-contract basis. The amount of offsetting long and short positions has not reached 15% of the nominal value of derivatives holdings. Graham and Rogers (2002) report that, for their sample of American firms, after netting out long and short positions, firms' net notional principal is about 70% of gross notional principal.

Table 3.3A: Sensitivity of derivatives holdings relative to hedging objectives – split by year

This table shows the descriptive statistics of the potential cash flow produced by the derivatives portfolio in the event of a 3 standard deviation shock to the price of the underlying asset relative to hedging objectives (financial expenses, EBIT and capital expenditures), splitting the sample year by year. The sensitivity is estimated following the procedure adopted by Guay and Kothari (2003). I use the largest sensitivity among the 3 estimated (currency, domestic and international interest rates) for each firm. All the variables considered (CapEx, EBIT, financial expenses and assets) are extracted from the financial statements relative to each of the years considered. The high values obtained for the average CF derivatives / CapEx and CF derivatives / EBIT are due respectively to: i) some firms that had capital expenditures near zero in a given year and 2) some firms that had EBIT near zero in a given year. The mean values are distorted by extremely high values in these cases and have little economic sense. Firms with negative EBIT in a given year were excluded from the computation of CF from derivatives / EBIT.

	2001	2002	2003	2004	All years
CF derivatives / financ. expense					
1st quartile	0.00	0.01	0.10	0.06	0.03
Median	0.31	0.49	0.54	0.29	0.39
3rd quartile	1.29	1.29	1.46	1.05	1.31
Mean	1.02	1.16	1.16	1.03	1.10
CF derivatives / Capex					
1st quartile	0.01	0.09	0.44	0.26	0.19
Median	6.18	3.70	1.84	1.48	2.07
3rd quartile	16.12	25.90	13.75	5.65	13.38
Mean	82.53	523.49	100.47	13.02	189.96
CF derivatives / EBIT					
1st quartile	0.00	0.01	0.01	0.01	0.01
Median	0.29	0.24	0.16	0.08	0.14
3rd quartile	0.80	1.10	1.09	0.30	0.69
Mean	2.48	18.22	3.48	0.89	6.74
CF derivatives / Total Asset					
1st quartile	0.000	0.000	0.002	0.002	0.00
Median	0.016	0.021	0.017	0.007	0.01
3rd quartile	0.071	0.124	0.051	0.028	0.05
Mean	0.051	0.123	0.042	0.018	0.06

Source: the author

Unlikely Guay and Kothari (2003), who add the sensitivity of all risk classes in order to compare them to the variables of potential hedge, I choose the largest of the 3 sensitivities estimated (currency, domestic interest rates and international interest rates) to be compared to the potential hedging objectives. Thus, while the procedure used by Guay and Kothari (2003) deliberately **overestimates** the sensitivity of derivatives holdings to shocks, the procedure used here **underestimates** potential cash flows yielded by the firm's derivatives portfolio, since it ignores commodity derivatives and does not add the effect of currency and interest rates at a time (in other words, I deliberately ignore the correlation between exchange rates and interests rates). Detailed explanation on how potential cash flows and sensitivities are estimated can be found in Appendix B.

Table 3.3B: Sensitivity of derivatives holdings relative to hedging objectives – split by country

This table shows the descriptive statistics of the potential cash flow produced by the derivatives portfolio in the event of a 3 standard deviation shock to the price of the underlying asset relative to hedging objectives (financial expenses, EBIT and capital expenditures), splitting the sample country by country. The sensitivity is estimated following the procedure adopted by Guay and Kothari (2003). I use the largest sensitivity among the 3 estimated (currency, domestic and international interest rates) for each firm. All the variables considered (CapEx, EBIT, financial expenses and assets) are extracted from the financial statements relative to each of the years considered. The high values obtained for the average CF derivatives / CapEx and CF derivatives / EBIT are due respectively to: i) some firms that had capital expenditures near zero in a given year and 2) some firms that had EBIT near zero in a given year. The mean values are distorted by extremely high values in these cases and have little economic sense. Firms with negative EBIT in a given year were excluded from the computation of CF from derivatives / EBIT.

	Argentina	Brazil	Chile	Mexico	All countries
CF derivatives / financ. expense					
1st quartile	0.00	0.10	0.18	0.00	0.03
Median	0.00	0.63	0.73	0.09	0.39
3rd quartile	3.12	1.43	2.72	0.39	1.31
Mean	1.04	1.34	1.45	0.40	1.10
CF derivatives / Capex					
1st quartile	0.00	1.22	0.37	0.00	0.19
Median	0.00	6.49	1.41	0.51	2.07
3rd quartile	0.59	25.90	13.00	3.34	13.38
Mean	0.63	382.53	17.70	5.18	189.96
CF derivatives / EBIT					
1st quartile	0.00	0.05	0.02	0.00	0.01
Median	0.00	0.34	0.17	0.05	0.14
3rd quartile	0.03	1.09	0.55	0.25	0.69
Mean	0.08	13.10	0.93	1.40	6.74
CF derivatives / Total Asset					
1st quartile	0.00	0.00	0.00	0.00	0.00
Median	0.00	0.03	0.02	0.00	0.01
3rd quartile	0.03	0.10	0.04	0.01	0.05
Mean	0.05	0.08	0.03	0.04	0.06

Source: the author

Tables 3.3A and 3.3B show the sensitivity of derivatives holdings relative to the variables of hedge on an annual (Table 3.3A) and country-level (Table 3.3B) basis. For instance, if a three-standard-deviation shock occurs in the price of the most important underlying asset (exchange rate, domestic or international interest rate), the portfolio of derivatives of the median firm is capable of generating a cash flow equivalent to 29% of financial expenses, 148% of capital expenditures and 8% of EBIT for the median firm in 2004. This cash flow is also equivalent to 0.7% of total assets for the median firm and 1.8% for the average firm. For the years 2002 and 2003, the potential cash flow from derivatives yielded by a shock in the underlying asset would be larger than EBIT, Capital Expenditures and financial expense for more than 25% of the firms. These numbers show that derivatives may play an

important role in firm's risk management strategies, differently from what was found by Guay and Kothari (2003) for US firms, even though the potential cash flows yielded by derivatives holdings are underestimated by the procedure adopted here.

I believe that there are two main reasons for finding evidence different from that obtained by Guay and Kothari (2003) for their sample of US firms. First, the volatility of exchange and interest rates in Latin American countries are significantly greater than in the US, what makes the sensitivity to three-standard-deviation shocks higher in this study compared to Guay and Kothari's. This is evidenced by the fact that the ratios shown in Table 3.3B are larger in 2002 and 2003 than in 2004 due to the volatility of interest and exchange rates in Brazil in 2002 and of Mexico in 2003.

The second reason for finding results different from Guay and Kothari (2003), is that there is a 4 to 7-year difference between the data used in the two studies, since Guay and Kothari use data from 1997. There is no doubt that risk-management practices using derivatives have become more common in the last years, what means that, if Guay and Kothari's study had been performed using data of 2004, the results would probably be different. BIS (2004) data show that the gross notional value of outstanding over-the-counter derivatives more than tripled between 1998 and 2004.

It is shown in Table 3.3B that the potential cash flow yielded by derivatives is larger for Brazilian and Chilean firms than it is for Mexican firms. Caution is in order when interpreting the results for Argentina, since only 9 observations are from Argentinean firms. There is also little economic sense in the average values observed for both Table 3.3A and 3.3B, since there are a few firm-years with Capex or EBIT near zero, what makes the ratios *Cash Flow from Derivatives / Capex* and *Cash Flow from Derivatives / EBIT* extremely high for these observations. Observations in which EBIT is negative were excluded for the computation of the *Cash Flow from Derivatives / EBIT* ratio.

3.3 The determinants of corporate hedging – empirical analysis

In this section, I investigate what the driving forces for using derivatives are, and also what determines the magnitude of risk being managed with derivatives. Since the bulk of firms use mainly FX derivatives, I focus on this class of instrument.

In order to answer the first question, I use a binary variable that indicates whether or not the firm had currency derivatives as of December of each year, and LOGIT tests are performed. For the second question, I use, as the dependent variable, the gross notional value of derivatives holdings per total assets and perform TOBIT tests. As observed by Graham and Rogers (2002), a more precise measure of the magnitude of the exposure being managed with derivatives would be the netted value of derivatives holdings (offsetting long and short positions), but this information is only available for a few firms in the sample. Even in Graham and Rogers's paper, they admit that using net positions as apposed to gross notional values is only marginally important to identify the determinants of corporate hedging decisions. Besides, when attempting to identify short and long positions in derivatives holdings, a great part of the contracts are classified as *unsure* in their sample. Apparently, the measurement error associated to this variable, caused by the use of notional gross value rather than netted positions, is small.

As pointed out in the previous sections, risk management is likely associated with managerial compensation, for which there is no data. Since this unobservable firm characteristic is possibly correlated with some of the independent variables in the model, inference made from a standard single-year or pooled estimation would de flawed. Using a panel random effects specification to estimate the decision to use derivatives (LOGIT tests) and the magnitude of hedging (TOBIT tests) controls for the unobserved heterogeneity. Running fixed-effect regressions is ruled out since many of the variables used, such as the country and regulated industry dummies specified below, are time constant (i.e., their values are repeated in subsequent years). It is also clear that the panel is unbalanced in terms of not having the same cross section units over time, as it is easy to find from the statistics described in section 2. However, I have strong reasons to believe that the sample selection bias due to this issue, if there is any, is minimal[10].

[10] The unavailability of data for some firms in 2001 is mostly related to the fact that the 20-F forms could be sent in their paper versions (as opposed to the electronic version) in that year. This is what Wooldridge (2002) calls a rotating panel, and software estimation of these panels automatically account for the necessary corrections in the estimation process. From 2002 on, firms were compelled to send the electronic 20-F forms, which are readily available at the EDGAR database.

Since the decisions on level of foreign indebtedness and derivatives usage are intertwined, I use a two step estimation procedure for both the LOGIT and TOBIT tests, similarly to Geczy et al (1997) and Graham and Rogers (2002), respectively. This two-step procedure is able to address the endogenous relationship between derivatives usage and foreign debt.

The dependent and independent variables are described below. For obvious reasons, all the monetary variables (such as assets and sales) are converted into the same currency (US dollars):

FX Use: Dummy variable indicating whether a firm held derivatives or not as of the end of each fiscal year considered. It is used as the dependent variable in the LOGIT tests;

FX derivatives / Assets: Gross principal notional value of currency derivatives held by the firm divided by total assets in a given year. It is used to measure the magnitude of currency hedging with financial derivatives and is the dependent variable for the TOBIT tests;

Foreign to total debt: debt attached to foreign currency divided total debt as of each year-end, including both long and short-term liabilities. It is understood as one of the exposures to currency fluctuations, and a possible cause of financial distress. It is used as the dependent variable in one of the structural equations of the model as well as an independent variable in the first step of the estimation procedure. For robustness, I also use *foreign debt / total assets* (results not tabulated) as a measure of currency exposure due to debt.

Asset: Natural logarithm of the total assets as of each year-end, used to proxy for firm size;

Sales: Natural log of sales in each year, an alternative proxy for firm size;

Tax convexity: a dummy indicating whether the firm is subject to a convex tax function or not. A 95% confidence interval is built around each year's pre-tax

operating income[11] for each firm, using the standard deviation estimated from the 5 previous years, and assuming normality. If this interval contains the progressive region, the dummy assumes value 1. It also assumes 1 if there was a tax credit transferred from one year to another during the period in the previous 5 years (i.e., for an observation in 2001, I use the period 1996-2000, for an observation in 2002, I use the period 1997-2001 and so on). Otherwise, the dummy assumes value 0. I excluded firms with less than 3 valid observations of pre-tax operating income.

Coverage ratio: defined as pre-tax operating profit divided by financial expenses in each year. I excluded firms for which data was unavailable from 2001 to 2004. For robustness, I also use a second definition of coverage ratio: instead of using the single-year operating profit, I use the 3-year average pre-tax operating profit in the numerator.

Regulation: dummy that returns 1 if the firm is from a regulated industry (oil & gas, pharmaceuticals, energy and transportation), and 0 otherwise. It is used to proxy for informational asymmetry, since regulated industries are subject to intense regulatory enforcement, and thus there is less informational asymmetry regarding their operations. I exclude telecom firms because, albeit being strongly regulated, the rapid growth of telecommunication services and the intense M&A activity in the last few years contribute to increasing informational asymmetry in this industry.

Capex / Depreciation: this variable captures the degree of investment opportunities for the firm. I do not use the traditional *market-to-book ratio*, since it may be affected by country and market-specific factors, such as local crises and political uncertainty.

Liquidity: defined as the natural logarithm of the ratio *current assets / current liabilities*. I use the logarithm to mitigate right-tail asymmetry in the observed values of this ratio in its natural form;

Country dummies: four dummy variables corresponding to the country of origin, assuming 1 when the firm is from Argentina, Brazil, Chile, and Mexico, respectively, and 0 otherwise.

[11] For this specific variable, pre-tax operating income is denominated in local currency, since the values have to be compared to the "kinks" of the tax function for each country.

Since the existence of operational hedge mitigates currency exposure, it is imperative that I control for this factor. An operational hedge for foreign debt is characterized when the operation of the firm produces results denominated in foreign currency, mitigating the currency exposure due to foreign debt. To identify the existence of operational hedge, I perform a regression of the earnings before interest and taxes (EBIT) against the exchange rate (measured in US dollars / local currency), as shown below[12]:

$$\Delta EBIT_{i,t} = c_i + \sum_{l=0}^{n} \beta_{i,l} \Delta e_{t-l} + \varepsilon_{i,t} \ , \qquad (1) \qquad \text{where}$$

$\boldsymbol{\Delta EBIT_{i,t}}$ is the first difference for the 12-month EBIT for firm *i* in quarter *t*, measured in domestic currency;

$\boldsymbol{c_i}$ is the intercept of the regression equation;

$\boldsymbol{\Delta e_t}$ is the first difference of the 12-month average exchange rate in quarter t, measured in local currency relative to the US dollar;

n is the number of quarterly lags between observed earnings and exchange rate[13];

$\boldsymbol{\beta_{i,l}}$ are the regression coefficients;

$\boldsymbol{\varepsilon_{i,t}}$ are the regression residuals.

I use the operational earnings, since this measure is not affected by capital structure or hedging operations, and I choose a 12-month period to avoid seasonal adjustment issues. A positive $\beta_{i,l}$ coefficient indicates that the operational profit varies in the same direction as the exchange rate, i.e. profits are higher when local currency is depreciated. In this case, if the firm has debt in foreign currency, this exposure is being mitigated by its operation that produces results that are sensitive to the exchange rate. Based on these regressions, I build a dummy variable that assumes value 0 if any of the coefficients $\beta_{i,t}$ are positive and statistically significant at 10% in

[12] I use quarterly data from 2000-Q1 to 2004-Q4 for this regression;

[13] The number of lags used for each firm was based on the Akaike criterion and, in all regressions, stayed between 1 and 3.

a given year, and 1 otherwise. Thus, this dummy measures the inexistence of operational hedge in a given year and is called ***no operational hedge***. I argue that this measure is superior to other simple proxies often used in the literature for operational exposure (such as dummies indicating whether the firm is an importer or an exporter etc) because: 1) it is actually capable of addressing possible netting between imports and exports; 2) takes into account the importance of exchange rates in the domestic product market (i.e., even if a firm buys and sells exclusively in the domestic market, currency devaluation may favor the entrance of imported substitutes for its products, for example); 3) foreign-currency-denominated sales in the domestic market (which is the case of many commodities producers.

The decision on whether to use currency derivatives

A two-stage procedure is used in the estimation of the foreign debt and derivatives-hedging decisions. In the first stage, I run two separate regressions: the first is a GLS random-effects regression that uses *foreign to total debt* as the dependent variable, and in the second, a random-effects LOGIT regression, the dependent variable is the FX use dummy. The foreign debt equation uses *size*, *fixed to total assets*, *liquidity*, *country* and the *no operational hedge* dummies, beyond the *FX use* dummy. While the first four (size, fixed to total assets, liquidity and country dummies) are standard variables in the foreign-debt-related literature, I use a different measure of operational hedge and include currency derivatives usage to explore whether derivatives usage is determinant for the decision of issuing foreign debt. The second equation (LOGIT) uses the standard proxies for financial distress (including foreign debt), tax gains and informational asymmetry, and the *operational hedge* dummy.

In the second stage, I run structural random effects GLS and LOGIT equations using as explanatory variables the predicted values obtained for the dependent variables in the first stage (the predicted value of *FX use* is “plugged” as an explanatory variable to the GLS equation and the predicted value of *foreign to total debt* is “plugged” into the LOGIT equation). There is a discussion on whether non-significant variables should be dropped from the first stage estimations to obtain the predicted values to be “plugged” into the second stage. The results reported in Tables 3.4 and 3.5 do not drop those variables. However, unreported tests indicate that my conclusions are not qualitatively affected by dropping these variables. Hereafter this two-step approach

will be simply referred to as the ***LOGIT tests*** (and its reported results are the coefficients of both a LOGIT and the GLS estimations in the second stage)[14]. The results of the second-stage estimates of the LOGIT tests are shown in Table 3.4.

Table 3.4: LOGIT tests

This table presents the estimators for the regression coefficients for the second stage of a two-stage simultaneous-equations procedure. In the first stage, two separate regressions are ran: the first is a GLS random-effects regression that uses foreign to total debt as the dependent variable, and in the second, a random-effects LOGIT regression, the dependent variable is the FX use dummy. In the second stage, structural random effects GLS and LOGIT equations are ran, using as explanatory variables the predicted values obtained for the dependent variables in the first stage (the predicted value of FX use is "plugged" as an explanatory variable to the GLS equation and the predicted value of foreign to total debt is "plugged" into the LOGIT equation). Estimates for the intercept are suppressed. The p values for the chi-square test (Wald statistics) are shown in parenthesis. The symbols *, ** and *** indicate statistical significance at 10%, 5% and 1% respectively. The correct prediction row indicates the proportion of cases correctly predicted by the model, i. e., the percentage of firms for which there is coincidence between predicted and observed values for currency derivatives usage. Model adjustment measures shown are the overall R^2 for the GLS regression and the Wald Statistics. Variable descriptions can be found in section 3 of the chapter.

	Logit Estimation of *FX Use*			GLS Estimation of *Foreign / Total Debt*		
	Exp. Sign	Slope	P-value	Exp. Sign	Slope	P-value
FX Use *				+	-0.014	0.787
Foreign / Total debt*	+	-12.117	0.444			
Size	+	1.163	0.010**	+	0.020	0.430
No operational hedge	+	-2.735	0.190	-	-0.161	0.068*
Tax Convexity	+	0.012	0.723			
Coverage ratio	-	-0.137	0.060*			
Brazil	?	2.936	0.004***	?	0.026	0.747
Chile	?	3.324	0.007***	?	0.025	0.765
Regulated industry	-	-2.778	0.006***	+	0.930	0.671
Capex / depreciation	+	0.005	0.089*			
Liquidity	+	-0.057	0.955			
Fixed / Total assets				+	0.017	0.242
Observations		172			172	
	Correct prediction	83.72%		R2 (overall)	0.289	
	Wald Statistic	19.03	0.025**	Wald Statistic	20.69	0.008***

Source: the author

[14] Sensitivity to quadrature approximation for the random effects estimators was checked using the *quadchk* command of Stata, and none of the results changed by more than 0.5% from original values.

It is shown in Table 3.4 that, the larger is the firm, the more likely it is to use currency derivatives. This is consistent with almost every research on derivatives usage to date in developed markets, indicating that the economies of scale effect is more relevant than the financial distress effect for the decision of using currency derivatives. In the GLS regression, although the coefficient of size is positive as expected, it is not significant at usual levels. Table 3.4 also shows that there is no causality between currency derivatives usage and the level of foreign debt in neither direction at significant levels (actually the relationship between foreign debt and derivatives usage was expected to be positive, but the obtained coefficient is negative, although insignificant). The coefficient for the tax convexity dummy also show that firms do not decide to use currency derivatives in response to tax incentives.

It can also be seen that, while the level of foreign debt of Brazilian and Chilean companies is not significantly different from Mexican firms[15] (which is the benchmark in the reported regressions), the firms in these countries are more likely to use currency derivatives. I return to these results when analyzing the results of the TOBIT regressions. Firms in regulated industries are less likely to use currency derivatives, even controlling for all other factors. This may be showing that firms with lower degree of informational asymmetry in their operations, which is consistent with Froot, Scharfstein and Stein (1993). However, there is only weak evidence that firms with higher levels of investment opportunities (as measured by *capex / depreciation*) are more likely to use FX derivatives, since this coefficient is only significant at 8.9%. I also return to this issue in the next section.

The estimates of *no operational hedge* in the GLS regression indicate that firms whose operational earnings are positively sensitive to local currency devaluation decide to issue more debt attached to foreign currency. However, the estimates on the LOGIT equation shows that this operational hedge is not a complete substitute for financial hedging (i.e., there is no evidence that firms decide not to use currency

[15] Mexican firms are used as the benchmarks in the reported results. The coefficient for Argentina is not reported, but is not significantly different from zero. When the benchmark is switched to Brazil or Chile, negative coefficients are obtained for Mexico and Argentina and non-significant coefficients are obtained for the third country (Brazil or Chile).

derivatives just because they have a natural operational hedge, which is shown by the non-significance of the coefficient for *no operational hedge*).

The decision on the magnitude of currency derivatives holdings

In the second series of empirical testing, I want to analyze the determinants of the magnitude of firms' hedging. For this case, our dependent variable is the gross notional value of currency derivatives holdings divided by total assets in a giver year end. For this purpose, I use again the same two-step procedure as in the previous section. The main difference is that, since nearly one fourth of the observations are censored at zero for the dependent variable, TOBIT tests are used, and hereafter I refer to this whole two-step approach as the *TOBIT tests*.

I classify the firms that use currency derivatives in three different groups, according to the purposes for holding derivatives stated in their 20-F forms: 1) those that declared holding derivatives for trading purposes as of any year-end in the period of this study are classified as "traders" (10 firm-years); 2) those firms that stated not to be currently holding derivatives for trading as of the end of period of that report, but could eventually hold derivatives for trading were classified as "unsure"; 3) All other firms were classified as "non-traders" (independently of using currency derivatives or not). It is important to note that, regardless of the group a firm is classified into, the dependent variable (*FX derivatives / Assets*) in the TOBIT tests includes exclusively the portfolios stated to be used for hedging purposes in the forms 20-F.

Table 3.5 shows the results of the TOBIT tests, using 3 different samples: i) all firms; ii) all firms except those who were classified as *unsure* and; iii) exclusively non-traders. The results obtained for these tests are only marginally different from each other. For the second sample, I include a dummy variable for the *traders*, in order to check whether firms that deliberately trade derivatives also hold more derivatives for hedging purposes (or whether these firms disclose as hedging instruments some of the derivatives eventually used for trading). There is no clear indication that this is the case because, although the coefficient for the traders in the TOBIT estimation is positive, it is not statistically significant at usual levels.

While issuing foreign debt is determinant for the magnitude of currency derivatives holdings (what can be seen by the estimate for the *foreign / total debt* in the TOBIT

equation in Table 3.5), derivatives holdings seem not to affect the level of foreign debt significantly, as shown by the *FX derivatives / asset* in the GLS Equation. Thus, the decision to issue foreign debt seems to occur in priority relative to the degree of derivatives hedging, i.e., firms seem to decide how much foreign debt they should issue, and then, as a consequence of this decision, the magnitude of derivatives holdings is set. One possible explanation for this result is that it is easier and cheaper to obtain access to financial derivatives instruments than it is to issue foreign debt overseas, even for firms that have ADRs traded in major US exchanges and thus are more visible to investors than non-ADR firms. Once again, the fixed costs of using derivatives play an important role in the *hedging / funding* decision. While the level of foreign debt had no impact on the decision of using derivatives (LOGIT tests), it is directly related to the magnitude of derivatives holdings, i.e., once the firm has decided to use derivatives, increasing the size of its portfolio has a low marginal cost.

Firm size is negatively related to the magnitude of currency hedging. Therefore, while firm size is positively determinant for the decision of using derivatives or not (LOGIT tests), indicating the existence of economies of scale in derivatives usage, the hypothesis that larger firms have proportionally less costs of financial distress is confirmed. Our results for currency hedging in Latin American firms are identical to those of Haushalter (2000) for oil-price hedging in US oil companies. Graham and Rogers, using a broad sample of US firms, conclude that larger firms are more likely to use derivatives, but there is no relationship between firm size and the magnitude of derivatives holdings.

The GLS estimations shown in Table 3.5 also confirm, although with a significance of only around 7% for the *no operational hedge* dummy, the results already obtained in the LOGIT tests, that there is a relationship between the proportion of foreign debt issued and having operational results positively sensitive to local currency devaluation (i.e., an operational hedge for this debt). The estimates of the *no operational hedge* variable in the TOBIT equation indicate that operational hedging decreases the necessity of hedging with financial derivatives. Thus, while the LOGIT tests show that operational hedge is almost irrelevant for the decision on whether to use currency derivatives or not, it is very important for the decision on the magnitude

of financial derivatives hedging. Firms that have a natural hedge for foreign debt (e.g., exporters) hold significantly less currency derivatives. This might indicate that, firms that do not face a high sensitivity to currency devaluation in their operational earnings are less concerned with (or less aware of) the risks represented by currency volatility and may be less likely to use financial derivatives than firms whose sensitivity to FX is high. Thus, while among the firms that use derivatives, the ones that have a natural hedge use less currency derivatives (what is consistent with theory), there is a number of firms in the sample that decide not to use financial derivatives as part of their risk management strategies, even if they have an exposure due to foreign debt which is unhedged by operations.

There is no evidence that the magnitude of derivatives holdings is smaller for firms with lower informational asymmetry (proxied by the regulated industries dummy), as Froot, Scharfstein and Stein's (1993) theory would suggest. Thus, although it is less probable that these firms use derivatives (as shown in the LOGIT tests), the magnitude of derivatives holdings for these firms is not different from of that of unregulated firms. It is also possible that this dummy may be capturing some firm characteristic other than simply less informational asymmetry. A great part of these firms are utilities that are still owned by the central or local governments[16]. It is possible that investors see a higher degree of informational asymmetry due to this issue. Similar to the LOGIT tests, the coefficient for *capex / depreciation*, that is the proxy for investment opportunities, is only significant at the 10% level in the TOBIT tests. Therefore, there is evidence (although weak), that firms with higher degrees of investment opportunities hedge more.

Firm liquidity does nor play an important role in explaining the magnitude of derivatives hedging. Mello and Parson's (2000) theory, firms with low liquidity have difficulty in finding counterparts for issuing financial derivatives and for using exchange-traded derivatives due to the necessity of margin calls. In fact, it would also be expectable that liquidity would influence the decision of whether or not to use

[16] For example Vale do Rio Doce has been privatized recently, and Eletrobras, Sabesp, Cemig and Copel are still owned by the central government and the state governments of Sao Paulo, Minas Gerais and Parana, respectively.

derivatives, but the LOGIT tests show that this is not the case, since derivatives usage and liquidity are almost unrelated.

There is also strong evidence that firms in Brazil and Chile not only are more likely to use currency derivatives (as shown by the signs of the country dummies in Table 3.4), but also hold significantly more FX derivatives than Mexican and Argentinean firms. The reasons for these results are not straightforward, since there are many differences in the financial systems, micro and macroeconomic conditions in these countries. Although the number of Argentinean firms is small to draw any conclusive inference, the adoption of a fixed exchange rate regime by the central government until late 2001 caused corporations to fail to hedge their foreign exchange risk, as mentioned by Bustelo (2004). Burnside et al (1999) and McKinnon and Pill (1999) mention that firms tend to overborrow in foreign currency relative to their hedging capacity under fixed exchange rate regimes (this was the case of Russia, Mexico and Brazil before their crises). In the period 2002 - 2004, the aftereffects of the currency collapse were still present, since the Argentinean economy faced an enormous slowdown right after the crisis. Low liquidity and financial distress may have prevented Argentinean firms from starting a risk management or derivatives program even after identifying a clear necessity to hedge. Another plausible reason for less derivatives usage in Argentina is that it is the country with the less developed financial market among the four studied, what makes hedging instruments less readily and easily available to local companies.

It is also not obvious to explain why Brazilian and Chilean firms use more FX derivatives than their Mexican counterparts. I find two possible reasons, both relating to institutional and macroeconomic differences between Mexico, Brazil and Chile. The first is that firms in Mexico have less foreign ownership in their shares due to the use of segmented share classes, as shown by Davis-Friday and Frecka (2004). International investors may be less willing to run currency risk, what increases the incentives to hedge currency risks in Brazil and Chile. The second reason for less derivatives hedging in Mexico is that it is the country with the lowest exchange rate volatility among the four countries examined in the period of this study, what naturally decreases the necessity of derivatives for hedging currency risks.

Similarly to the results obtained in the LOGIT tests, tax incentives seem not to be important to the size of the derivatives portfolio, as shown by coefficients obtained for the tax convexity dummy in Table 3.5. There are two main factors that may be an issue of concern before drawing conclusions from this result. First, the dummy used to proxy for tax convexity is an improper measure of actual tax convexity, since it relies on observed pre-tax earnings over time. The major problem is that observed taxable income already includes the results of hedging operations, causing the volatility of taxable earnings to be underestimated. A more precise measure of tax convexity would be the volatility of taxable earnings had the firm not hedged, which is unobservable. Second, since pre-tax earnings used to build this dummy are from the period 1996-2004, these values may be skewed due to the several emerging markets crises occurred in this period. Other studies (Nance et al (1993), Mian (1996) and Haushalter (2000)) also find similar results.

Table 3.5: Estimation of the TOBIT tests

This table presents the estimators for the regression coefficients for the second stage of a two-stage simultaneous-equations procedure. In the first stage, two separate regressions are ran: the first is a GLS random-effects regression that uses foreign to total debt as the dependent variable, and in the second, a random-effects TOBIT regression, the dependent variable is the FX use dummy. In the second stage, structural random effects GLS and TOBIT equations are ran, using as explanatory variables the predicted values obtained for the dependent variables in the first stage (the predicted value of FX use is "plugged" as an explanatory variable to the GLS equation and the predicted value of foreign to total debt is "plugged" into the TOBIT equation). Estimates for the intercept are suppressed. The procedure is applied to three slightly different samples: i) all the firms in the sample for which data on all the variables was available (172 firm-years); ii) all firms in the sample for which data was available except firms that declared that could eventually hold derivatives for trading, i.e. firms classified as "unsure" (167 firm-years); iii) all the firms except those that declared effectively or eventually holding derivatives for trading purposes (157 firm-years). Estimates for the intercept are suppressed. The p values for the chi-square test (Wald statistics) are shown in parenthesis. Model adjustment measures shown are the overall R^2 for the GLS regression and the Wald Statistics, which is adjusted according to the number of degrees of freedom. Variable descriptions can be found in section 3 of the chapter. The symbols *, ** and *** indicate statistical significance at 10%, 5% and 1% respectively.

	TOBIT Estimation of *FX derivatives / Assets*							GLS Estimation of *Foreign / Total Debt*						
		All Firms		Excluding *unsure*		Only *non-traders*			All Firms		Excluding *unsure*		Only *non-traders*	
	Exp. Sign	Slope	P-value	Slope	P-value	Slope	P-value	Exp. Sign	Slope	P-value	Slope	P-value	Slope	P-value
FX derivatives / Assets *								+	0.003	0.358	0.003	0.355	0.006	0.355
Foreign / Total debt*	+	1.632	0.000***	1.594	0.000***	1.073	0.000***							
Size	?	-0.029	0.000***	-0.030	0.000***	-0.015	0.002***	+	0.019	0.465	0.019	0.464	0.019	0.494
No operational hedge	+	0.362	0.000***	0.356	0.003***	0.250	0.000***	-	-0.182	0.072*	-0.182	0.072*	-0.178	0.087*
Tax Convexity	+	0.002	0.875	-0.001	0.884	0.002	0.903							
Coverage ratio	-	0.160	0.000***	0.157	0.000***	0.114	0.000***							
Brazil	?	0.094	0.000***	0.086	0.000***	0.076	0.000***	?	-0.023	0.792	-0.023	0.792	-0.038	0.673
Chile	?	0.141	0.000***	0.136	0.000***	0.119	0.000***	?	-0.057	0.565	-0.057	0.565	-0.058	0.568
Argentina	?	0.070	0.131	0.068	0.131	0.076	0.200	?	0.262	0.395	0.262	0.395	0.260	0.412
Regulated industry	-	-0.011	0.641	-0.005	0.781	-0.027	0.155	+	-0.018	0.820	-0.018	0.820	-0.004	0.960
Capex / depreciation	+	0.001	0.090*	0.000	0.080*	0.000	0.074*	?	0.000	0.831	0.000	0.831	0.000	0.798
Liquidity	+	-0.001	0.416	-0.001	0.376	-0.001	0.544							
Fixed / Total assets								+	0.015	0.290	0.015	0.289	0.015	0.296
Trader	+			0.049	0.114									
Observations		172		167		157			172		167		157	
Censored obs. (TOBIT)		40		40		40								
Overall R2 (OLS)									0.142		0.140		0.144	

Source: the author

Robustness issues

The replacement of *foreign debt / total debt* with *foreign debt / total assets* yields similar results (not shown), but with lower fit and significance. An alternative to capture the joint effect of the exposure due to foreign debt and its mitigation with operational hedge is to build a variable that is the product of *foreign to total debt* by *no operational hedge*. The regressions adding this variable yield positive but non significant coefficients (results not shown), and the fit is also not improved relative to the specifications shown in Table 3.5.

Replacing the log of assets with the log of sales to proxy for firm size also causes the results (unreported) to be unaltered qualitatively. The significance and fit of the model is similar to what was obtained in the TOBIT tests, but overall fit and significance is a little worse in the LOGIT tests than those shown in Table 3.4.

4 Conclusions

Financial risk management has increasingly been managed with derivative instruments by firms in mature and emerging economies. Derivatives usage has also been the main cause of financial distress and even bankruptcy in several widely known cases, such as Mettalgeselschaft, Barings, Enron, WorldCom and many others. Risk managers are introduced to new risk management products all the time, and investors and regulators are increasingly trying to make sure that risk managers are able to evaluate company exposure and suitability of financial derivatives to mitigate such risks. Instructions SFAS 119 and 133 attempt to increase disclosure on derivatives usage and risk management strategies. More recently, the passing of the Sarbanes-Oxley Act, with the intent of improving the reliability of financial statements and control procedures within companies with stocks traded in the US, provides for new levels of auditor independence, and personal accountability for CEOs and CFOs of these companies. All those changes have direct impacts not only to the end-users of financial derivatives, but also to the providers of financial services, be it expertise or new financial products.

This research contributes to a better understanding of the economic factors that lead firms to use derivatives in four Latin America countries (Argentina, Brazil, Chile and Mexico), with a deeper view drawn into Brazil, where I investigate not only the determinants of corporate risk management, but also the perceptions and attitudes of risk managers. Latin American economies have faced severe difficulties in the last decade, which resulted in increased volatility in exchange and interest rates compared to the 70s and the 80s. After a period of relative stability in the 80s and early 90s, the prices of commodities also started to present higher volatility since the second half of the nineties. Because many among the largest firms in these countries are producers of commodities, this also resulted in increased uncertainty in the cash flows of companies, with major impacts in financing and investment decisions.

Although the four countries studied share many similarities in terms of culture and legal system, there are many macro and microeconomic peculiarities to each of them. While Brazil and Argentina are founder members of the Mercosur since 1991,

Chile only partially joined the trading group as an associate member in 1996, and Mexico reinforced its trading partnership with the US and Canada joining the NAFTA (North American Free Trade Agreement) in 1994. Also, while Brazil and Argentina have both been struggling to beat inflation in the last 15 years, Chile and Mexico have been facing less problems with price stability.

Because it was not practical to survey risk managers in the four countries, I chose Brazil for an in-deep study of risk management practices and concerns of financial managers regarding derivatives. Chapter 2 shows the results obtained from a survey on derivatives usage and risk management practices made from a sample of 74 Brazilian non financial firms, stating comparisons with similar surveys made in other countries, specially USA and Germany. However, this is not a complete comparative study, since this would imply access to analytical data obtained by these other surveys. Hence, in stating comparisons, it is only possible to obtain indicators of different and similar characteristics of Brazilian and other managers.

The proportion of Brazilian firms using derivatives is not significantly different from the majority of countries researched, with the exception of Germany, where the proportion of users is greater. However the time lag existent between this and other surveys may distort this result. As observed in most countries where surveys were conducted, the classes of risk most managed with derivatives in Brazil are foreign currency, exchange rates, commodities and others, in this order.

Despite the high volatility of foreign currency and exchange rate markets in Brazil and the susceptibility of Brazilian economy to internal and external crises, Brazilian managers are more concerned with legal and institutional aspects than with financial and economic issues, contrarily to what was observed in US and Germany. The taxation on derivatives is the main issue of concern by Brazilian managers, followed by accounting treatment. The fact of taxation being pointed as the main issue of concern of financial managers in Brazil is probably related to its intricate tax structure and the charge of CPMF, PIS and COFINS over daily margin calls of future contracts when the survey was performed. This has changed only in 2005, when federal regulation allowed the compensation of gains and losses with derivative contracts. The impacts of taxation on derivatives, specially the effect of the federal regulation which allowed compensation in future contracts, can be a good issue for further studies.

Also similarly to what was observed internationally, and in line with what the Financial theory prescribes, the evidence suggests that Brazilian financial managers use derivatives mainly for hedging financial risks, and not with speculative purposes, although the majority of managers responded that risk management activities are evaluated based upon profits and not risk reduction, what could incentive speculation. I also find that more than one third of the firms surveyed do more than 50% of their currency hedging outside Brazil. This is probably related to the fact that the issuance of foreign debt is combined with hedging instruments, i.e., funding and hedging may come as a "package".

Chapter 3 uses publicly disclosed data on derivatives of Latin American ADR firms to study the determinants of corporate hedging in these countries, using a panel sample of 55 firms with ADRs traded on major US exchanges, in the period 2001-2004, totaling 183 firm-years. I investigate not only derivatives usage as a binary variable, but also the magnitude of currency hedging with derivatives. Data on derivatives holdings was hand collected directly from the 20-F files submitted to the Securities and Exchange Commission (SEC). Foreign exchange risk is the most commonly managed with derivatives, consistent with virtually all surveys conducted on derivatives usage worldwide.

I find that derivatives are capable of producing cash flows comparable in order of magnitude to the potential variables of hedging (earnings, financial expenses and investment). For the median firm, in the period 2001 to 2004 the portfolio of derivatives is able to produce a cash flow equivalent to 30-50% of financial expenses, 8-30% of earnings before tax and interest and more than 100% of capital expenditures in the event of a 3 standard deviation shock in the price of the underlying asset. This result is different from that found by Guay and Kothari (2003) for US firms. I offer two main explanations for finding different results. First, Guay and Kothari use data from 1997 as opposed to our study that uses data from 2001 to 2004. There is a 4 to 7 years period of difference between this and that studies, and derivatives have probably become more common in corporate hedging strategies, given BIS data showing that the value of OTC derivatives more than tripled in this period. Second, Latin American economies face substantially more volatility in their

exchange and interest rates, which may explain why Latin American firms could proportionally hold more derivatives to hedge against these sources of exposure.

I use a method to account for the endogeneity between hedging and financing decisions, and show that derivatives holdings are more affected by foreign debt than vice-versa. The use of a panel data is able to deal with unobservable firm characteristics, such as managerial compensation and ownership.

Consistent with the findings of Haushalter (2000) and Jin and Jorion (2005) for US oil firms, and Graham and Rogers (2002) for a broad range of US firms, I find that the decision on whether to use derivatives or not has distinct determinants from the decision on the magnitude of risk to be managed with derivatives in Latin America. My results show that firm size is positively related to the decision of using derivatives, but negatively related to the magnitude of hedging. These findings are consistent with both the economies-of-scale hypothesis and the costs of financial distress hypothesis, i.e., larger firms are more likely to use derivatives, since there are economies of scale in derivative usage. In other words, there are fixed costs in using derivatives that only large firms can bear. On the other hand, larger firms face less costs of financial distress, what may explain why the relation between the magnitude of derivatives holdings and firm size, if there is any, is negative.

I find that the costs of financial distress related to currency exposure are the main driving force for both the decision of using derivatives and the magnitude of derivatives holdings, which is consistent with most of the empirical studies on corporate hedging. Debt in foreign currency is positively related to the magnitude of hedging, but seems to be unrelated to the decision of using currency derivatives. I also find the operational currency hedge (the mitigation of risk by matching of debt and earnings in foreign currency) is an important substitute for derivatives, i.e., firms that hedge debt with their operations use proportionally less currency derivatives.

Consistent with financial theory, I find that firms hedge to mitigate underinvestment problems. Informational asymmetry and growth opportunities are both positively related to hedging decisions, but the first is more related to the decision of using FX derivatives than to the magnitude of hedging. This shows that firms hedge to assure the internal generation of cash flows for future investment (Bessembinder (1991) and

Froot, Scharfstein and Stein (1993)) and also try to mitigate agency disincentives to invest in low-risk projects, equalizing the potential exposure of low and high-risk projects (Myers (1977) and Myers and Majluf (1984)).

I found no evidence of firms hedging to decrease expected taxes. Tax-function convexity has shown to be unimportant for both the decision of using derivatives and the magnitude of derivatives holdings. I recognize, however, that the variable used to proxy for convexity of the tax function may be an imperfect measure of actual convexity. The proper variable would consider what the firm's pre-tax income would be, had it not hedged, which is clearly unavailable. In most of the studies that use similar proxies for tax convexity, the results were similar to ours. Another possible cause for this result is that, due to several crises occurred in the last 10 years, past earnings do not necessarily reflect future expectations on earnings of Latin American firms.

On a country-level basis, I find that Brazilian and Chilean firms are not only more likely to use derivatives but also hedge more in terms of magnitude. Although the reasons for this result would require further investigation, I believe that this result is mainly explained by the fact that the Argentinean government adopted a pegged exchange rate regime up until late 2001, which caused the supply of hedging instruments to be scarce, also affecting hedging practices and the culture of hedging in non-financial firms, still incipient relative to other major Latin American countries. A possible explanation for Chilean and Brazilian firms hedging more than their Mexican peers is the lower volatility of exchange rates in Mexico or the low level of foreign ownership in Mexican firms. It cannot be ignored, however, that the fact of Mexico being more tied to the US economy due to the NAFTA may be a reason for less derivatives usage. The availability of hedging products, be it in organized or OTC markets (which is clearly related to the development of financial systems), may also be important in explaining these results, but I leave this issue for future studies.

I believe there are two main limitations to this study. The first is related to sample size, which makes it impossible to control for industry, and limits the results to a selected group of firms with relatively good conditions in terms of liquidity, corporate governance, international visibility, access to capital markets and financial health (with a few exceptions). Benavente et al (2003) show evidence that larger Chilean

firms have more dollar-denominated debt than their smaller peers and Bonomo et al (2003) show that, in Brazil, larger firms are able to react faster than smaller companies to a shift in exchange-rate risk by reducing debt in foreign currency. Unfortunately, disclosure on derivatives is worse for smaller firms, even for those listed in US exchanges. The random effects estimation adopted here, is able to mitigate this problem, washing out the effect on hedging behavior of the characteristics (better governance, visibility, etc) that made those firms able to issue ADRs. The second limitation is the lack of tests on managerial risk aversion as a hedging determinant. Although the results obtained here are not biased by omitting this unobservable firm characteristic (since I use random effects that captures these unobservables), Tufano (1996) shows, using a sample of gold-mining firms, that risk management is strongly associated to managerial characteristics and their compensation packages (managers who have a greater portion of their pay in the form of stock options tend to manage less risk than those who receive stocks). It would be desirable to be able to identify how managerial ownership and compensation affects hedging behavior, but compensation data is unavailable for most of the firms, and, when disclosed, there is no clear pattern that would allow a valid comparison among compensation packages. Non-public information (e.g., collected by survey or other means) could help in understanding the managerial rationales for risk management, but I leave this issue for future studies.

It is also important to note that this research was based on data from the period 2001-2004, which was a period of relative economic instability in the countries studied (perhaps less pronounced in Chile than in Brazil, Argentina and Mexico). Argentina faced a severe currency crisis in 2001, Mexico and Brazil were still facing the aftereffects of their currency crises from 1995 and 1999, respectively, and the presidential elections of 2002 in Brazil also contributed for increased volatility. Events external to the countries studied, such as the Russian crisis of 1998/99 and the September 11th of 2001 also had important impacts in the economies of Latin America. It would be interesting to study how risk management determinants and attitudes of managers towards risks evolve over time. Latin American ADR firms will have to comprise with Sarbanes-Oxley requirements, which will probably modify perception of managers, investors and regulators towards risks. The costs of implementing control procedures to adhere to Sarbanes-Oxley may also cause

smaller firms to unlist their ADRs from major US exchanges (i.e., firms may downgrade from levels 2 and 3 to level 1). Future surveys, not only in Brazil, but also in other Latin American countries would further improve on the evidence found here.

Macroeconomic conditions also point to a more stable business environment in the coming years, such as 2005/06 have been, and future studies investigating the evolvement of the determinants of risk management as well as perceptions of managers would shed more light on the understanding of risk management. I hope that the database generated by the Brazilian survey and the inferences made from the research with ADR firms can be helpful for future studies in corporate risk management, broadening the knowledge of corporate finance in emerging economies.

The results of this research have implications not only for non-financial firms, but also to the providers of financial services, especially those that supply financial products for hedging and or expertise in risk management. It is important for these players to understand what the real sources of exposure in non-financial firms are, and how operational hedge is able to mitigate currency risks without the need of financial derivatives. Regulators and financial authorities may also benefit from a better understanding of how and why firms manage risks, and what are the perceptions of managers towards the different sources of risks faced by companies in Latin America.

5 References cited in the text

Adam, T. R., Fernando, C. S., Are There Speculative Components in Corporate Hedging and Do They Add Value? Working Paper, 2003. Available at <www.ssrn.com>, acessed May 31st, 2005.

Alkeback, P., Hagelin, N. Derivative Usage by Nonfinancial Firms in Sweden with an International Comparison, **Journal of International Financial Management and Accounting**, New York, 10, 2, p105-121, jun. 1999.

Alkeback, P., Hagelin, N. Pramborg, B., Derivative Usage by Non-Financial Firms in Sweden 1996 and 2003: What Has Changed?, 2003. Working Paper. Available at <www.ssrn.com>, acessed March 31st, 2006.

Allayannis, G., Ofek, E., Exchange Rate Exposure, Hedging, and the Use of Foreign Currency Derivatives, **Journal of International Money and Finance**, 20, p 273-296, 2001.

Allayannis, G., Lel, U., Miller, D. Corporate Governance and The Hedging Premium Around the World, Working Paper, 2003. Available at <www.ssrn.com>, acessed October 31st, 2004.

Bank for International Settlements, BIS Quarterly Review, March 2004, Basle, pA99-A104, 2004.

Bartram, S.M., Brown, G.M. Fehle, F.R. International Evidence on Financial Derivatives Usage, Working Paper, 2003. Available at <www.ssrn.com>, acessed May 31st, 2005.

Baxter, N.D., Leverage, Risk of Ruin and the Cost of Capital, **Journal of Finance**, V22, p395-403, 1967

Benavente, J.M., Johnson, C.A., Morandé, F.G., Debt composition and balance sheet effects of exchange rate depreciations: a firm-level analysis for Chile, **Emerging Markets Review** 4, p 397-416, 2003.

Bessembinder, H., Forward Contracts and Firm Value: Investment Incentive and Contracting Effects, **Journal of Financial and Quantitative Analysis**, 26, p519-532, 1991.

Bodnar, G. M., Hayt, G. H., Marston, R.C. Smithson, C.W., Wharton Survey of derivatives usage by U.S. Non-Finacial Firms, **Financial management**, 24, 2, p104-114, Summer 1995.

Bodnar, G. M., Hayt, G. H., Marston, R.C. Wharton Survey of derivatives usage by U.S. Non-Finacial Firms, 25, 4, p113-133, Winter 1996.

Bodnar, G. M., Hayt, G. H., Marston, R.C. 1998 Survey of derivatives usage by U.S. Non-Finacial Firms, Wharton School of the University of Pennsylvania, Philadelphia, 1998.

Bodnar, G. M., Gebhardt, G., Derivatives Usage in Risk Management by U.S. and German Non-Financial Firms: A Comparative Survey, CFS Working Paper 98/17, 1998.

Bodnar, G.M., Jong, A., Macrae, V., The Impact of Institutional Differences on Derivatives Usage: a Comparative Survey of American and Dutch Firms, Working Paper, 2002. available at <www.ssrn.com>, accessed on September 30th, 2006.

Bonomo, M., Martins, B., Pinto, R., Debt composition and exchange rate balance sheet effects in Brazil: a firm level analysis, **Emerging Markets Review** 4, p368-396, 2003.

Brown, G., Managing Foreign Exchange Risk with Derivatives, **Journal of Financial Economics**, 60 2, p401-449, 2001

Brown, G., Khoker, Z., Corporate risk, Market Imperfections and Speculative Motives, Working Paper, 2001, available at <www.ssrn.com>, accessed on September 30th, 2006.

Bulow, Jeremy and J. B. Shoven, The Bankruptcy Decision, **Bell Journal of Economics** 9: 437–56, 1978.

Burnside, C., Eichenbaum, M., Rebelo, S., Hedging and Financial Fragility in Fixed Exchange Rate Regimes, National Bureau of Economic Research (NBER) Working Paper, 1999, available at <www.ssrn.com>, accessed on September 30th, 2006.

Bustelo, P., Capital Flows and Financial Crises: a Comparative Analysis of East Asia (1997-98) and Argentina (2001-02), working paper, 2004, available at <www.ssrn.com>, accessed on September 30th, 2006.

Castanias, R., Bankruptcy Risk and Optimal Capital Structure", **Journal of Finance** 38, p1671-1706, 1986

Davis-Friday, P. Y. and Frecka, T. J., Which Firms Choose to List as American Depositary Receipts (ADRs)?: Evidence from Mexican Cross Listings, 2004. Available at <www.ssrn.com>, accessed July 31st, 2006.

Dolde, W., Hedging, Leverage and primitive risk, **Journal of Financial Engineering,** 4, 187-216, 1995

Downie, D., McMilan, J., Nosal, E., The University of Waterloo Survey of Canadian Derivatives Use and Hedging Activities. In Smithson, Charles W. **Managing Financial Risk**, Yearbook 1996, p.214-233, 1996.

El-Masry, A.A., A Survey of Derivatives Use by UK Nonfinancial Companies, Working Paper, 2003. Available at <www.ssrn.com>, acessed March 31st, 2006.

Froot, K. A., Scharfstein, D. S., Stein, J. C., Risk Management: Coordinating Corporate Investment and Financing Policies, **Journal of Finance**, 48, p1629-1658, 1993.

Geczy, C., Minton, B., Schrand, C., Why Firms Use Currency Derivatives, **Journal of Finance**, 52, p1323-1354, 1997.

Gertner, R., Scharfstein D., A Theory of Workouts and the Effects of Reorganization Law, **Journal of Finance**, 46: 1189-1222, 1991

Graham, J. R., Rogers, D. A., Is Corporate Hedging Consistent with Value Maximization: An Empirical Analysis, Working Paper, 1999. Available at <www.ssrn.com>, accessed July 31st, 2006.

Graham, J. R., Rogers, D. A, Do firms hedge in response to Tax Incentives, **Journal of Finance**, 57, p815-839, 2002.

Graham, J. R., Smith, C. W, Tax Incentives to Hedge, **Journal of Finance**, 54, p2241-2262, 1999.

Guay, W., Kothari, S.P., "How Much Do Firms Hedge With Derivatives?", **Journal of Financial Economics**, 70, 3, 2003

Haushalter, G. D., Financing Policy, Basis Risk, and Corporate Hedging: Evidence from Oil and Gas Producers, **Journal of Finance**, V55, p107-152, 2000.

Jensen, M.C., Meckling, W.H. Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure, **Journal of Financial Economics**, v3, n4, p305-360, 1976.

Jensen, M. C., Agency Costs of Free Cash Flow, Corporate Finance and Takeover, American Economic Review, 1986.

Jin, J., Jorion, P., Firm Value and Hedging: Evidence from US Oil and Gas Producers, **Journal of Finance**, V 61, 2, 2005.

Krawiec, K. D., Derivatives, Corporate Hedging and Shareholder Wealth: Modigliani-Miller Forty Years Later, working paper, 2001, available at <www.ssrn.com>, accessed September 30th, 2006.

Leland, H.E., Agency Costs, Risk Management and Capital Structure, **Journal of Finance**, V53, p1213-1243, 1998.

Mayers, D., Smith, C. W., On the Corporate Demand for Insurance, **Journal of Business**, v55, p281-296, 1982.

Mayers, D., Smith, C. W., Corporate Insurance and the Underinvestment Problem, **Journal of Risk and Insurance**, V 54, 45-54, 1987.

McKinnon, R. I., Pill, H., Exchange rate regimes for emerging markets: moral hazard and international overborrowing, working paper, 1999, available at <www.ssrn.com>, accessed September 30th, 2006.

Mello, A. S., Parsons, J.E., Hedging and Liquidity, **The Review of Financial Studies**, Vol. 13, n. 1, pp 127-153, 2000.

Mian, S. L., Evidence on Corporate Hedging Policy, **Journal of Financial and Quantitative Analysis**, V31, p419-439, 1996.

Myers, S. C., Determinants of Corporate Borrowing, **Journal of Financial Economics**, v5, p147-175, 1977.

Myers, S. C., Majluf, N. S., Corporate Financing and Investment Decisions When Firms Have Information that Investors Do Not Have, **Journal of Financial Economics**, v13, p187-221, 1984.

Nance, D. R., Smith, C. W., Smithson, C. W., On the Determinants of Corporate Hedging, **Journal of Finance**, V48, p267-284, 1993.

Petersen, M. A., Thiagarajan, S.R., Risk Management and Hedging: With and Without Derivatives, **Financial Management**, 29, Vol. 4, pp 5-30, 2000.

Pramborg, B. Foreign Exchange Risk Management by Swedish and Korean non Financial Firms: a Comparative Survey, Working Paper, 2004. Available at <www.ssrn.com>, acessed March 31st, 2006.

Pratap, S., Lobato, I., Somuano, A., Debt composition and balance sheet effects of exchange rate volatility in Mexico: a firm level analysis, **Emerging Markets Review** 4, p 450-471, 2003.

Ross, M. P., Corporate Hedging: what, why and how, working paper, 1997, available at www.haas.berkeley.edu/finance/WP/rpf280.pdf, accessed September 30th, 2006.

Saito, R., Schiozer, R.F.., Uso de Derivativos e Gerenciamento de Risco em Empresas Não Financeiras: Uma Comparação entre Evidências Brasileiras e Internacionais, **XXVIII ENANPAD**, 2004.

Schiozer, R. F., Saito, R., Fatores Determinantes da Gestão de Risco em Empresas não-financeiras Brasileiras, **XXIX ENANPAD**, 2005.

Sheedy, E., Corporate Use of Derivatives in Hong Kong and Singapore: a Survey, Working Paper, 2002. Available at <www.ssrn.com>, acessed March 31st, 2006.

Smith, C.W, Stulz, R.M., The determinants of Firms' Hedging Policies, **Journal of Financial and Quantitative Analysis**, 20, 4, p391-405, 1985

Stulz, R.M., Optimal Hedging Policies, **Journal of Financial and Quantitative Analysis**, 19, 2, p127-140, 1984.

Stulz, R.M., Managerial Discretion and Optimal Financing Policies, **Journal of Financial Economics**, 26, 1, p3-27, 1990.

Stulz, R.M., Rethinking Risk Management, **Journal of Applied Corporate Finance**, 9, 3, p8-24, 1996.

Titman, S., Wessels, R., The Determinants of Capital Structure Choices, **Journal of Finance**, 43, 1, p1-19, 1988.

Tufano, P., Who Manages Risk? An Empirical examination of Risk management Practices in the Gold Mining Industry, **Journal of Finance**, 51, p1097-1137, 1996.

Tufano, P., Agency Costs of Corporate Risk Management, **Financial Management**, 27, p67-77, 1998.

Wooldridge, J. M., Econometric Analysis of Cross Section and Panel Data, MIT Press, Cambridge, MA, 2002.

Appendix A: Survey questionnaire and response tallies

Note: The original questionnaire was applied in Portuguese. The questions shown here are a free translation to English made by the author.

Screen #1

Derivatives Usage

1.1 Does your firm use derivatives?

Yes	42
No	33

Screen #2 (shown only to those that answered "No" to Question 1.1)

2.1 Please indicate the *three* most important factors in your decision not to use derivatives.
(Please rank: 1 - Most important; 2 - Second most important; 3 - Third most important.)

	1	**2**	**3**
a) Insufficient exposure to financial or commodity prices	8	4	3
b) Exposures are more effectively managed by other means	8	8	2
c) Difficulty pricing and valuing derivatives	2	1	1
d) Disclosure requirements of the CVM (Comissao de Valores Mobiliarios)	1	1	1
e) Accounting treatment	0	3	4
f) Our company hedges abroad without derivatives	0	2	2
g) Concerns about perceptions of derivative use by investors, regulators and the public	0	5	5
h) Costs of establishing and maintaining a derivatives program exceed the expected benefits	6	3	0
i) Volatility implies large margin calls that may cause liquidity problems	1	2	2
j) Taxation on derivatives usage is a costly barrier	2	3	8
k) Others	4	0	4
Total	**32**	**32**	**32**

2.2 What percentage of your consolidated operating revenues are in foreign currency?

0%	5%	10%	15%	20%	25%	30%	40%	50% or more
15	7	1	0	0	1	1	1	1

2.3 What percentage of your consolidated operating costs are in foreign currency?

0%	5%	10%	15%	20%	25%	30%	40%	50% or more
11	8	4	0	0	0	3	0	1

End of survey questionnaire for firms that do not use derivatives

Screen #3 (shown only to those that answered "Yes" to Question 1.1)

3.1 Based upon the notional value of contracts, how does your firm's derivatives usage compare to last year?

	2002 relative to 2001	2003 relative to 2002
Usage has increased	33	19
Usage has decreased	2	5
Usage has remained constant	7	18

3.2 From the risk classes below, which are managed with derivatives, and what kind of markets does the company use?

	FX	IR	CM	Others
Exposure not managed with derivatives	2	6	27	34
Exclusively products of BM&F	4	1	3	1
Exclusively OTC contracts	27	21	3	5
Both BM&F and OTC contracts	9	14	9	2

3.3 Indicate your degree of concern about the following issues with respect to derivatives.

	None	Low	Moderate	High
a) Accounting treatment	2	4	20	16
b) Credit Risk	2	21	17	2
c) Market Risk	2	10	22	8
d) Monitoring and evaluating hedge results	7	10	12	13
e) Reaction by analysts and investors	7	16	10	9
f) Legal requirements	4	14	16	8
g) Secondary market liquidity	11	15	12	2
h) Taxation	1	1	12	28
i) Operational demands for trading at BM&F	1	12	15	12

3.4 Indicate the three issues of greatest concern from the list below

	Most serious	2nd most serious	3rd most serious	Total cites
a) Accounting treatment	3	13	5	21
b) Credit Risk	1	1	4	6
c) Market Risk	6	2	6	14
d) Monitoring and evaluating hedge results	2	6	3	11
e) Reaction by analysts and investors	1	0	11	12
f) Legal requirements	2	5	5	12
g) Secondary market liquidity	0	0	3	3
h) Taxation	20	11	1	32
i) Operational demands for trading at BM&F	7	4	2	13

3.5 Does your firm calculate the “value-at-risk” for some or all of its derivatives portfolio?

The firms does not use any kind of V@R approach	18
V@R is calculated for specific portfolios (derivatives, financial investments, etc)	15
V@R is calculated globally, for all securities held by the firm	8

Screen #4: (shown to all that answered “Yes” to Question 1.1)

Currency exposure

4.1 What percentage of your consolidated operating revenues are in foreign currency?

0%	5%	10%	15%	20%	25%	30%	40%	50% or more
10	3	1	2	1	2	9	2	9

4.2 What percentage of your consolidated operating costs are in foreign currency?

0%	5%	10%	15%	20%	25%	30%	40%	50% or more
2	1	5	4	3	2	4	7	8

4.3 Which benchmark does your firm use for evaluating foreign currency risk management over the budget/planning period?

a) Our firm does not use a benchmark	5
b) Future and forward rates available at the beginning of the period	17
c) Spot rates at the beginning of the period	13
d) Optimal hedging strategy is used, independent of benchmark	12
e) Analysts / specialists forecasts	20

4.4 Does your firm use currency derivatives?
(please indicate which currency)

	US Dollar	Euro	Yen	Other
Yes	39	11	7	3
No	0	28	32	36

Screen #5: (shown only to those who marked "yes" to at least one of the currencies in question 4.4)

5.1 How often does your firm transact in the currency derivatives markets to hedge:

	Not applicable	never	sometimes	often
a) Operational cash inflows and outflows	7	10	8	12
b) New investments / increasing assets	6	4	11	16
c) New or pre-existing debt	2	0	15	20
d) Repatriations	22	11	2	2

5.2 What percentage of the following operations is hedged with derivatives?
(check one response for each COLUMN)

	Operational cash inflows and outflows	New investments / increasing assets	New or pre-existing debt	Repatriations
Less than 25%	19	11	5	12
25 – 50%	7	10	8	2
50 – 75%	1	8	15	0
75 – 100%	2	3	6	1

5.3 For each of the following exposures, which describes best your hedging horizon?
(check one response for each COLUMN)

Hedge horizon	Operational cash inflows and outflows	New investments / increasing assets	New or pre-existing debt	Repatriations
Hedge shorter than maturity of exposure	2	12	13	3
hedge the maturity of the exposure	17	14	18	3
Hedge longer than maturity of exposure	2	1	1	0
Hedge until the end of the budgeting period	2	2	2	2

5.4 How often does your market view of exchange rates cause you to
(check one response for each COLUMN)

	Never	sometimes	Often
a) Alter the maturity of hedges	3	26	6
b) Alter the size of hedges	2	21	12
c) Take positions in currency derivatives	31	3	0

5.5 What percent of your total foreign currency derivatives (by face value of contracts) have the following original maturities?
(check one response for each COLUMN)

	Less than 90 days	From 90 to 180 days	From 180 to 360 days	More than 360 days
0%	4	0	3	13
1% to 25%	12	4	6	4
25 to 50%	3	17	9	1
50 to 75%	1	1	6	6
75 to 100%	0	1	2	1

5.6 What proportion of your currency hedging is done:

	In Brazil		**Abroad**
	Using BM&F derivatives	Using OTC markets	
Up to 50%	33	24	28
50 to 75%	3	1	2
75 to 100%	3	14	9

Screen #6 (shown only to those firms that answered “Yes” to question 1.1)

Interest Rate Exposure

6.1 Which benchmark does your firm use to evaluate interest rate exposure on the debt portfolio? (indicate as many as you want)

a) Our firm does not use a benchmark for the debt portfolio	6
b) A single interest rate or a basket of interest rates (Libor, CDI, TJLP etc)	27
c) A single inflation index or a basket of inflation indexes (IPCA, IGP-M etc)	8
d) Company cost of capital	19
e) Other	6

Screen #7: (shown only to those firms that answered managing IR risks with derivatives in question 3.2)

7.1 How often does your firm transact in the interest rate derivatives markets to…

	Not applicable	never	sometimes	Frequently
a) Swap from fixed rate to floating rate debt	2	13	16	2
b) Swap from floating rate to fixed rate debt	2	9	18	5
c) Reduce costs or lock-in rates based upon a market view	3	9	16	5

7.2 How often does your market view of interest rates causes you to

	Never	sometimes	Frequently
a) Alter the timing of hedges	10	18	4
b) Alter the size of hedges	10	19	3
c) take positions in interest rate derivatives	30	3	0

Screen #8: (shown only to those who marked “yes” to question 1.1)

Options and swaps

7.3 Indicate which of the following types of option contracts your firm has used in the past 12 months for the indicated exposures:
(please indicate as many as you wish)

	Types of exposures			
	Currency	Interest Rate	*Commodity*	Others
a) Standard European-style options	20	12	1	3
b) Standard American-style options	14	9	3	1
c) Average rate (price) options	6	3	1	0
d) Basket options (options on two or more prices)	6	0	0	1
e) Contingent premium (options with deferred or conditional premiums)	5	0	0	0
f) Option combinations (i.e. collars, straddles, etc.)	11	0	2	2
g) Other	7	2	1	2

Screen #8: (shown only to those who marked “yes” to question 1.1)

Control and reporting procedures

8.1 Does your firm have an explicit and documented policy with respect to the use of derivatives?

Yes	18
No	23

8.2 How frequently is derivatives activities reported to the board of directors?

a) monthly	15
b) quarterly	3
c) annually	0
d) as needed / no set schedule	21
e) Other	2

8.3 How frequently do you value your derivatives portfolio?

	Currency	Interest Rates	Commodities
a) Daily	22	20	4
b) Weekly	9	4	2
c) Monthly	3	5	0
d) Quarterly	0	1	0
e) Annually	0	0	0
f) as needed / no set schedule	5	5	11

8.4 How do you evaluate the risk management function?

a) Reduced volatility relative to a benchmark	4
b) Increased profit (reduced costs) relative to a benchmark	9
c) Absolute profit/loss	21
d) Risk adjusted performance (profits or savings adjusted for volatility)	7

Appendix B: Sensitivity analysis of cash flow from derivatives

The analysis contained in section 3.3 uses as its basic element the sensitivity of derivatives holdings to 3 standard deviation shocks in the prices of the underlying assets. These sensitivities and the comparison to potential hedging variables were built as described in this appendix.

The sensitivity of cash flow from a given derivative instrument is defined as the cash flow yielded by this contract when a 3 standard deviation shock in the price of the underlying asset occurs. The sensitivity of a portfolio is defined as the sum of the cash flows produced by each individual contract that belongs to the portfolio in each risk class (FX, domestic IR and international IR). I deliberately ignore commodities derivatives. Thus, it is assumed that there are no offsetting positions (long and short contracts of the same asset, for example) in the portfolio. I use the gross notional value (i.e. the sum of the notional values of all the contracts) instead of a netted value since, for most of the firms, it is impossible to make a clear distinction between long and short positions. For the firms in which it was possible to identify the nature (long or short) of each contract, the offsetting effect is less than 15% of total notional value, and for a great part of the firms, there is no offsetting at all, indicating that the measurement error associated to this variable is small.

Because the aim of this analysis is to compare the order of magnitude of potential cash flows yielded from derivatives with hedging variables (such as CapEx, EBIT and financial expenses), some simplifications are made:

1 – To estimate the annualized standard deviation of the underlying assets, the simple standard deviation of exchange rates against the US dollar (in first differences), domestic and international interest rates are calculated using monthly data from the 2 previous years, and this result is multiplied by the square root of 12 (i.e., for year-end 2001, the data used is from 2000 and

2001 and so on[1]) This simplified procedure assumes that FX and IR returns are independent from previous returns. First order autocorrelations are 0.13, -0.14, -0,10 and 0.12 for Argentinean, Brazilian, Chilean and Mexican exchange rates respectively, and 0.21 for Brazilian interest rates (90-day Swap-CDI), 0.09 for Chilean IR (90-day PDBC) 0.23 for Mexican IR (90-day CETES rate) and 0.40 for the LIBOR. With the exception of the last 2, all these autocorrelations are not significant at usual levels.

2 – It is assumed that contracts have full liquidity, i.e., the change in the value of the contracts due to the change in the price of the underlying asset can be immediately converted into cash, with the exception of contracts maturing in more than one year (which is the case of most of the currency swaps in the sample). For swaps maturing in more than 1 year, only the cash yielded by the exchange in cash flows in the next 12 months are considered, since it is natural to consider that, since most of these contracts have financial institutions as counterparts, they are not willing to settle the contract paying its fair value immediately.

A – Currency contracts

A.1 – Futures and forwards:

The cash flows yielded by FX futures and forwards for a 3 standard deviation shock in the price of the underlying asset is given by:

$CF = NV \times 3\sigma \times \Delta t^{1/2}$, where

CF is the cash flow yielded by the derivative contract, NV is the notional value in domestic currency, σ is the annualized standard deviation of exchange rate and Δt is the minimum between 1 year and the maturity of the contract measured in years (this avoids the overestimation of cash flows yielded by contracts with maturity over 1 year – which was very seldom observed). In the many cases where the maturity of contracts was unreported,

[1] For the Argentinean exchange rate as of the end of 2002, I use solely the data from this year, since in 2001 Argentina faced a fixed exchange rate relative to the US dollar.

a 3 month maturity was assumed for forwards and futures. Sinve NV is measured in local currency, CF also results in local currency.

A.2 – FX Swaps:

The value V of a swap contract is given by: (see Hull (1998), Portuguese version, page 140):

$V = SB_F - B_D$, where S is the exchange rate and B_F and B_D are the values of the contract denominated in foreign and domestic currency, respectively. Assuming that the values SB_F and B_D are equivalent and thus equal to the notional value of the contract (what is approximately true at least in the beginning of a contract), the change in the value of the swap when a 3 standard deviation in the exchange rate occurs is:

$CF = NV \times 3\sigma \times \Delta t^{1/2}$, where CF, NV, σ and Δt are defined as above. For the contracts with unreported maturity, a 1 year maturity was assumed.

For many swaps, the reports are not clear on whether they are old or recent contracts, and as they mature, the relationship between B_F and B_D may be uneven. Still, the formula above is expected to be approximately valid.

In general, swaps that include the exchange of both interest and exchange rates are classified as currency hedges in the 20-F forms. Although the value of these contracts are sensitive to both interest and exchange rates, the effect of IR fluctuations in these contracts was not considered since the main objective of these contracts is FX hedge. Besides, FX is greater than IR volatility in all 4 countries, what makes the sensitivity (in absolute value) of these contracts larger when the shock considered is in the exchange rate.

A.3 – Options

It is assumed that all the options are enough deep in the money for the cash flow sensitivity of these options to FX be linear (i.e., options have delta = 1). The violation of this assumption has a small impact in the overall results since options are the less used type of instrument. Still, sensitivities were estimated disconsidering option contracts (what is equivalent to assuming that they are

deep out of the money and thus insensitive to changes in the price of the underlying assets). The results shown in Tables 3.3A and 3.3B would be practically unaltered.

B – IR derivatives

B.1 – Futures and forwards

It is assumed that future and forward contracts are based on 90-day rates (CDI for Brazil, PDBC for Chile, CETES for Mexico and LIBOR for international IR). All contracts have maturity inferior to 6 months, and a standard maturity of 3 months was adopted for all contracts. For each of the IRs considered the quarterly standard deviation was estimated (equal to half the annualized volatility, i.e. the monthly standard deviation multiplied by the square root of 3), applying this shock to the current rates as of each year-end. The cash flow from a IR future or forward is understood as the variation in value of a zero coupon bond maturing in 3 months, with face value equal to the notional value of the derivative contract.

Example: A certain Brazilian firm holds a future contract of domestic interest rates with notional value of BRL 1 million. The 90-day CDI as of 12/31/2004 was 18.15% and the 3-month standard deviation for this rate was 5.7%. A 3 standard deviation shock would take this rate to *(18.15 + 3 x 5.7) = 35.25%* . Thus:

$$CF_{IR} = \frac{1000000}{(1.1815)^{0.25}} - \frac{1000000}{(1.3525)^{0.25}} = 31{,}871 \text{ BRL}$$

Obviously, notional values must be denominated in local currency when domestic interest rates are considered (and thus cash flow will result in local currency), and in US dollars when international interest rates are considered.

B.2 – Swaps

In a plain vanilla swap (fixed for floating interest rate or vice-versa) the cash flow yielded by a shock is straightforward:

$CF = NV \times 3\sigma \times \Delta t^{1/2}$, where *CF, NV, σ* and *Δt* are defined as above. Note that limiting *Δt* to a maximum of 1 year avoids overestimation of the sensitivity, since for longer contracts it may be difficult to convert into cash all the variation ocurred in the value of the contract.

B.3 – Caps, floors and collars

Caps, *floors* and *collars* are similar to swaps, with the difference that cash flows are exchanged only if the rate goes over or under some threshold. As in the FX options, it is assumed that all contracts are enough deep in the money to have delta = 1. All contracts in the sample have a maturity inferior to 6 months, so a standard maturity of 3 months was adopted for all caps, floors and collars. Thus, the sensitivity is given by:

$CF = NV \times 3\sigma \times 0{,}25^{1/2}$, where *FC, VN,* and *σ* are defined as above.

Comparison of cash flow sensitivities to hedging variables.

After the estimation of cash flows from derivatives following the procedures mentioned aboved, these potential cash flows are compared to hedging variables (financial expense, capital expenditures and earnings). As a complement, cash flow is also compared to total assets.

Example.: Suppose that a certain Brazilian firm has, as of year end 2004 FX futures with notional values equal to USD 50 million, domestic IR futures BRL 200 million and plain vanilla swaps exchanging a fixed rate x LIBOR of USD 150 million, all with maturity over 1 year. Financial expense, EBIT and CapEx in 2004 are shown below. Since these are flow variables, the are converted to US dollars using the average exchange rate. Total assets as of year end 2004 was 1 billion BRL (or 376.7 million USD, converted using the exchange rate of 12/31/2004). Foreign / total debt for this firm was 60% as of year end 2004, and the annualized standard deviations were 22.0% for FX, 11.4% for domestic IR and 7.2% for the LIBOR.

	Values in millions of BRL			Values in millions of USD		
	Financial expense	EBIT	CapEx	Financial expense	EBIT	CapEx
	85	**160**	**80**	**28,6**	**53,8**	**26,9**

- Step 1: Estimation of sensitivities:

CF_{FX} = *50 x 2.6544 x 3 x 0.22* = 87.6 million BRL
CF_{IRD} = *200 x 3 x 0.114* = 68.4 million BRL
CF_{IRL} = *150 x 3 x 0.072* = 32.4 million USD ~ 86 million BRL

- Step 2: Comparison to hedging objectives:

From the 3 classes derivativos portfolios (FX, domestic IR and international IR), the one with larger sensitivity is chosen[2]. In the example above, it is the FX derivatives portfolio. This sensitivity is then compared to potential hedging variables.

It is questionable whether the values obtained should be compared to the hedging variables in local currency or in US dollars[3]. Since one of the hedging objectives may be to reduce expected taxes, and taxes are charged over earnings in local currency, cash flow from derivatives is compared to EBIT in local currency. For CapEx, it would be necessary to know what is the proportion of imported goods in capital expenditures, or if investments are being made abroad. For simplification, the CapEx in local currency is used. For financial expenses, the following criterion was adopted: if the proportion of *foreign debt / total debt* is superior to 50%, expenses in USD are considered, otherwise, expenses are denominated in local currency.

Thus, I have:

CF_{FX}/Fin. Exp. = (87.6/2.6544)/28.6 = 1.15
FC_{FX}/EBIT = 87.6/160 = 0.55

[2] This is the main difference between my and Guay and Kothari's (2003) procedures. In that paper, the authors added the sensitivities of all risk classes, whereas I choose the largest. Adding all potential cash flows admits the occurrence of a simultaneous 3 standard deviation shock to all underlying assets, what is very unlikely. Thus, their procedure deliberately overestimates cash flows yielded from derivatives, while my procedure deliberately underestimates the cash flows.

[3] The results are not the same, since potential cash flows from derivatives are converted using spot exchange rate as of each year end, and flow variables are converted using yearly average exchange rate.

FC_{FX}/CapEx = 87.6/80 = 1.09

FC_{FX}/Assets = 87.6/1000 = 0.087

The results above indicate that, in the occurrence of a 3 standard deviation shock in the exchange rate, derivatives holdings would produce a cash flow equivalent to 115% of financial expenses, 55% of EBIT, 109% of CapEx and 8.7% of total assets.

The portfolio of currency derivatives is almost always the one that produces higher cash flows. Only in two firm-years, the international IR derivatives were the ones to yield the highest cash flows and none of the Mexican CETES derivatives were the ones to yield the highest cash flows. This indicates that the high autocorrelation identified in the LIBOR and CETES series should not be an issue of concern.

Livros Grátis

(http://www.livrosgratis.com.br)

Milhares de Livros para Download:

Baixar livros de Administração
Baixar livros de Agronomia
Baixar livros de Arquitetura
Baixar livros de Artes
Baixar livros de Astronomia
Baixar livros de Biologia Geral
Baixar livros de Ciência da Computação
Baixar livros de Ciência da Informação
Baixar livros de Ciência Política
Baixar livros de Ciências da Saúde
Baixar livros de Comunicação
Baixar livros do Conselho Nacional de Educação - CNE
Baixar livros de Defesa civil
Baixar livros de Direito
Baixar livros de Direitos humanos
Baixar livros de Economia
Baixar livros de Economia Doméstica
Baixar livros de Educação
Baixar livros de Educação - Trânsito
Baixar livros de Educação Física
Baixar livros de Engenharia Aeroespacial
Baixar livros de Farmácia
Baixar livros de Filosofia
Baixar livros de Física
Baixar livros de Geociências
Baixar livros de Geografia
Baixar livros de História
Baixar livros de Línguas

Baixar livros de Literatura
Baixar livros de Literatura de Cordel
Baixar livros de Literatura Infantil
Baixar livros de Matemática
Baixar livros de Medicina
Baixar livros de Medicina Veterinária
Baixar livros de Meio Ambiente
Baixar livros de Meteorologia
Baixar Monografias e TCC
Baixar livros Multidisciplinar
Baixar livros de Música
Baixar livros de Psicologia
Baixar livros de Química
Baixar livros de Saúde Coletiva
Baixar livros de Serviço Social
Baixar livros de Sociologia
Baixar livros de Teologia
Baixar livros de Trabalho
Baixar livros de Turismo