

Foreign Exchange Risk Management in German Non-Financial Corporations: An Empirical Analysis

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1 Introduction

By definition, all entrepreneurial activities incur risks, and coping with risk has therefore always been an important managerial function. In recent years, however, risk management has received increasing attention in both corporate practice and the literature. This is particularly true for the management of financial risks, i.e. the management of foreign exchange risk, interest rate risk and other financial market risks. A major reason for this is the development of markets for derivative financial instruments. Forward contracts, futures, options, swaps and other, more complex financial instruments today allow firms to transfer risks to other economic agents who are better able, or more willing, to bear them.

Derivatives, however, can be used not only to hedge existing risks but also to build up additional, speculative positions in financial markets. The spectacular losses a number of large and well-known firms have experienced in connection with the use of derivatives have shown that these instruments themselves, therefore, constitute a source of risk. Hence, it has to be stressed that "in financial risk management, derivatives are only a part of the process and not the process itself."¹

A number of studies have attempted to provide insights into the practices of risk management within the corporate sector. Reports by *Price Waterhouse* (1994, 1995) describe corporate practices in the wider area of treasury management. *Glaum/Roth* (1993), *Batten et al.* (1993), *Aabo* (1999) and *Greenwich Treasury Advisors* (1999) focus on the exchange risk management practices of multinational

1 Baldoni 1998, p. 30.

corporations. Others report on the use of derivative financial instruments by non-financial firms (see, for example, *Bodnar et al.* 1995, 1996, 1998; *Grant/Marshall* 1997; *Howton/Perfect* 1998; *Bodnar/Gebhardt* 1999). These empirical studies are interesting not only from an academic standpoint. In the absence of clearcut theoretical answers to the question of how corporate risk management should be organized, these surveys provide managers with information on the current practices of other firms. This kind of information is valuable since it allows managers to critically assess and analyse their own strategies. *Cohen/Wiseman* (1997) explain which questions should be asked in this context: "Companies should use this information to assess where they stand in comparison with other companies. The survey findings do not necessarily represent best practice, but they should be used as a guide for a treasury to compare itself with other organizations and ask: Where are we similar? Where are we different? Should we be different? What should we do about it?"²

The present paper reports the findings of an empirical study on the exchange risk management practices of large German non-financial corporations. It is based on a questionnaire survey conducted in late 1998, early 1999. Of the 154 companies addressed, 74 took part in the survey (response rate: 48 %). The aim of the study was to find out how these firms measure their exchange rate exposures, which strategies they follow, which instruments and techniques they use, and which problems they encounter.³

The rest of the paper is organized as follows. In part 2, a brief overview over the main theoretical concepts of foreign exchange risk management is given. In part 3, the methodology of the empirical study is explained. The findings of the survey are then described in part 4. The paper concludes with a brief summary.

2 Theoretical framework: Measurement and management of foreign exchange risk

Firms are exposed to foreign exchange risk if the results of their projects depend on future exchange rates and if exchange rate changes cannot be fully anticipated. In order to provide a conceptual framework for corporate exchange risk management, the following three questions have to be asked: Firstly, should firms

2 *Cohen/Wiseman* 1997, p. 25; also see *Phillips* 1997, p. 80.

3 The study actually addressed a broader range of questions on corporate risk management (strategic risk management, use of derivatives, management of exchange rate risk and interest rate risk, accounting for financial instruments and risk disclosure). However, only the results on exchange rate risk management are reported here. For an overview over the results in general, see *Glaum* 2000.

be concerned about exchange risk at all, that is, should firms attempt to manage this type of risk? Secondly, if the firm decides to take an active stand towards exchange rate risk, how should the firm's exposure to this risk be measured? Thirdly, after the firm has identified and measured the risks it faces, it then has to decide how its exchange risk management should be organized, which strategy it should adopt and which instruments it should use.

In the traditional, more practically oriented literature, it was generally assumed that firms should adopt a strictly risk averse attitude to financial risks. Therefore, it was argued that firms engaged in exporting or importing activities as well as multinational corporations with foreign subsidiaries should hedge their exposed positions. The authors then described the various instruments and techniques that enable firms to achieve this goal.

A very different attitude was taken up by theoreticians belonging to the neoclassical school of thought. Pointing out to equilibrium relationships in international financial markets they argued that the management of financial risks is unnecessary and potentially even harmful. In an influential article, *Dufey/Srinivasulu* (1984) pointedly paraphrased this attitude with respect to exchange risk management: "Foreign exchange risk does not exist; even if it exists, it need not be hedged; even if it is to be hedged, corporations need not hedge it."⁴ *Dufey/Srinivasulu* then went on to critically assess each of these contentions. They showed that the underlying neoclassical assumptions do not hold in the real world and that, therefore, a case for corporate risk management can be made.

In recent years, a more detailed discussion of the arguments for and against corporate hedging activities has developed. Several papers have shown under which conditions corporate hedging of exchange risk and other financial risks may add to firm value (see, for instance, *Smith/Stulz* 1985; *Nance et al.* 1993; *Froot et al.* 1993).⁵ The conditions are based on market imperfections which are neglected in neoclassical capital market theory. Examples are the costs of financial distress, the problems of synchronizing investments and financing activities coupled with the costs of external funding, agency conflicts between managers and shareholders, and the convexity of the tax function.

The second component of the theoretical framework for corporate exchange risk management concerns the measurement of exchange risk. The academic literature generally distinguishes three concepts for measuring the effects of exchange rate changes on the firm. The *accounting exposure concept* (translation or book exposure) measures the impact parity changes have on accounting profits and on owners' equity. However, accounting exposure is based on historical book values

4 *Dufey/Srinivasulu* 1984, p. 54.

5 For further references, also see the literature review by *Hommel/Pritsch* 1997.

and it is a function of the accounting methods applied in the translation of foreign currency denominated balance-sheet and profit-and-loss account items. Furthermore, the accounting effects of exchange rate changes do not have any direct impact on the firm's cash flows (unless the firm has committed itself to maintaining certain accounting ratios). Consequently, it has long been argued that firms should not actively manage their accounting exposures (see *Dufey* 1972).

What should concern management is cash flow exposure. The *transaction exposure concept* concentrates on contractual commitments which involve the actual conversion of currencies. A firm's transaction exposure thus consists of its foreign currency accounts receivables and payables, its longer-term foreign currency investments and debt, as well as those of its foreign currency cash positions which are to be exchanged into other currencies. Until these positions are settled, their home currency value may be impaired by unfavorable parity changes.

Transaction exposure can be neutralized ("hedged") fairly easily by setting up counterbalancing positions. For example, a German firm expecting a US-dollar inflow at a known future date can sell these dollars today in the forward markets. The effects of exchange rate changes on the receivable and on the forward market position will now cancel each other out, the home currency value of the future cash flow is fixed (US-dollar amount times the forward rate). Instead of using the forward markets, the firm can achieve the same effect by borrowing US dollars and converting them into Deutschmarks today; the future dollar revenues will then be used to repay the dollar loan ("money market hedge"). Alternatively, the firm can buy a put option which will give it the right to sell the incoming dollars at a prearranged rate. In contrast to the forward hedge, the option does not oblige the firm to use this rate for the conversion. If at the time of maturity the spot market offers a more favorable rate, the firm will let the option expire and sell its dollars at the spot rate. The currency option, in other words, provides the firm with protection against foreign exchange losses while leaving open the possibility to participate in favorable exchange rate changes.⁶

Previous empirical studies have shown that the management of transaction exposure is the centrepiece of corporate exchange risk management (see *Glaum/Roth* 1993; *Aabo* 1999). For a number of years, however, the academic literature has pointed out that this exposure concept also has its shortcomings. Numerous empirical studies have shown that the theory of purchasing power parity does not hold over the short and medium run (see, for instance, *Taylor* 1995). This means that exchange rate changes can lead to changes in the relative

6 For a detailed discussion on the use of currency options in corporate exchange risk management, see *Dufey/Giddy* 1995; *Dufey/Hommel* 1999. For a general overview over transaction exposure management instruments and techniques, see *Dufey/Giddy* 1997; *Stapleton/Subrahmanyam* 1997; *Eun/Resnick* 1997; *Shapiro* 1999.

prices of the firm's inputs and outputs. The relative price changes can affect the firm's competitive market position leading to changes in cash flows and, ultimately, in firm value. An exchange risk management approach which limits itself to transaction exposure, i.e. to those foreign currency cash flows which are contracted at any given point in time, ignores these fundamental, longer-term effects of exchange rate changes.

The *economic exposure concept* intends to capture these effects. Economic exposure is defined as the sensitivity of the firm's future cash flows to unexpected exchange rate changes. The exposure encompasses all cash flows, no matter whether a currency conversion is involved and regardless of their timing. The firm's economic exposure thus includes its transaction exposure, but it also comprises the expected cash flows of future periods which are not contracted yet. The exposure can be measured by sensitivity analysis, simulation or by regressing the firm's cash flows on the foreign exchange rates.⁷

Although the above-mentioned studies provide answers to the question of whether firms should manage financial risks at all, they do not, however, supply managers with a guide as to how exactly their firms' risk management should be organized, that is, which objectives they should follow, which strategies they should implement, or which instruments and techniques they should use. As has already been pointed out, this lack of clearcut theoretical guidelines means that survey studies of current corporate practice contain valuable information for managers.

3 Methodology of the empirical study

The results presented in this paper are based on a questionnaire study undertaken in late 1998, early 1999. The questionnaires were sent to the Chief Financial Officers of major German public corporations („börsennotierte Aktiengesellschaften“). We addressed all listed German corporations that were not subsidiaries of other companies and had revenues of at least DM 400 million in 1997. Excluded from the survey were banks and insurance companies. This left us with a total sample of 154 companies. Of these, 74 sent us responses. The resulting response rate of 48.1% is high for a survey of this type. One may assume that the high participation rate was due to the strong interest the companies take in the problem discussed. This is also reflected by the hierarchical positions of the respondents: about a quarter of the questionnaires were filled out by a member of the board; almost all questionnaires were answered by senior managers.

⁷ See *Stulz/Williamson 1997* For a practical application of the economic exposure concept to the case of the Swedish automobile producer Volvo, see *Oxelheim/Wihlborg 1995*.

In Table 1, the corporations that were addressed are characterized by important economic indicators. The figures show that the willingness to participate in the study was correlated to the size of the corporations: the responding corporations recorded average annual sales (in 1996) of about DM 12.5 bn, whereas for the non-responding enterprises, the corresponding figure amounted to only DM 6.1 bn. The responding corporations employed an average of almost 37,000 workers compared with 18,000 for the non-responding ones.⁸ Thus, taking into account that we approached all listed German companies that fulfilled the above-mentioned requirements, and the response rate of roughly 50%, the results of this survey can be said to be representative for the largest German corporations.

An analysis of the industry pattern of the corporations included in the study showed that all major industrial segments are represented in the survey. In accordance with the industrial structure of the German economy as a whole, chemical and pharmaceutical companies, companies engaged in construction, mechanical and electrical engineering and service firms are represented most strongly.

Table 3.1 Characteristics of responding and non-responding corporations

	Responding Corporations (n = 74)		Non-responding Corporations (n= 80)	
	mean	standard-deviation	mean	standard-deviation
Revenues (million DM) – percentage abroad	12,492.7 44.36%	23,845.2 31.30%	6,111.7 38.89%	12,243.0 26.65%
Employees – percentage abroad	36,762 38.77%	72,237 23.01%	17,906 32.32%	30,298 26.19%
Market Value (million DM)	7,352.6	15,282.9	2,441.8	5,054.3

Notes: (i) Figures for sales revenues and employees are for the calendar year 1996. (ii) The number of employees is the average for 1996. (iii) Market capitalization figures are based on the prices of common and preferred shares as of December 31, 1997. Sources of data: (i) Revenues and employees: annual reports and telephone inquiries; (ii) Market value: Börse online, No. 52, 1997.

8 The significance of the differences in turnover, number of employees and market capitalisation was tested with a two-tailed *t*-test; the test statistics are: *t* = 2.05, *p* = 0.043 (turnover); *t* = 2.07, *p* = 0.041 (number of employees) and *t* = 2.59, *p* = 0.011 (market capitalisation).

4 Results of the empirical study

4.1 Exposure concepts

Given the results of previous studies, it comes as no surprise that the risk management of the German firms focuses on the management of transaction exposure. As can be seen in Table 4.1, almost two thirds of the respondents explain that their firms actively manage their transaction exposure. 27% of the firms restrict themselves to periodic and systematic assessments, and the remaining 9% indicate that they have little or no concern about their transaction exposure. The other two types of exposure, accounting and economic, are of similar importance: 16% of the respondents actively manage their accounting exposure and 15% do the same for their economic exposure. About half of the respondents perform periodic and systematic assessments of each type of exposure and the remainder indicate that they have little or no concern about them.

Table 4.1 Exposure concepts in foreign exchange risk management

Effects of exchange rate changes on ...	no regular assessment or management	regular assessment	active management (hedging)
... accounting profits and owners' equity (<i>accounting exposure</i>)	35 %	49 %	16 %
... home currency values of foreign currency receivables and payables (<i>transaction exposure</i>)	9 %	27 %	64 %
... competitive position of the firm and on the expected future operational cash flows (<i>economic exposure</i>)	33 %	52 %	15 %

In order to get a more precise understanding of the firms' practices and to prevent conceptual misunderstandings, the respondents were also asked how the positions which are actually hedged against exchange risk are made up. In 50% of those firms which actively manage their exchange risk (see below), the position that is subject to hedging decisions is made up of both contracted foreign currency receivables and payables as well as of expected future foreign currency transactions (the time horizon of the hedging activities is discussed below). 23% of the firms hedge only booked transactions, and 27% claimed that only expected future cash flows are considered for hedging. 7% of the respondents explained that the position that is being hedged comprises the net investments in foreign

subsidiaries. However, in all of these firms, booked foreign currency contracts or expected currency transactions are also included in the hedging activities.

Firms that aim to reduce or eliminate exchange risk can hedge individual foreign exchange positions, such as accounts receivable resulting from export transactions or accounts payable resulting from importing activities. Each position can be neutralized with a counterbalancing transaction in the forward markets, with a currency option or with another hedging instrument ("micro hedge approach"). Alternatively, the firm can first identify its net position in a given currency by subtracting expected cash outflows ("short positions") from expected cash inflows ("long positions") of the same time horizon. Since the effects exchange rate changes have on long and short positions cancel each other out, only the net position is effectively exposed to exchange risk, and hence only this net exposure needs to be considered for hedging ("macro hedge approach").

Compared to the micro hedge approach, the macro hedge approach reduces the number and volume of the hedging transactions. Especially multinational corporations with intensive two-way cross-border activities (e.g. with exporting and importing activities) can realize substantial savings of transaction costs if their exchange risk management is conducted on a net exposure basis. The approach, however, requires a centralized treasury management and an efficient information system.

44% of those firms in our sample which actively manage their exchange risk (see below) do so on the basis of the micro hedge approach, that is, they hedge individual open currency positions with individual hedge transactions. 48% of the firms follow the macro hedge approach, that is, the firms identify their net exposure for each currency and this position is then subject to hedging decisions. The remaining 8% explained that they follow both approaches, meaning that as a matter of routine, they follow a macro hedge approach whereas certain positions (large transactions, unusual currencies) are hedged individually.

The above observations can be commented as follows.

(a) In practice, the majority of firms (65% in our sample) include foreign exchange transactions which are expected over a certain time horizon (e.g., over the forthcoming 12 months) in their hedging activities. This form of exposure management is not covered adequately by the usual taxonomy of international financial management textbooks. The expected transactions are neither part of transaction exposure since they are not contracted yet, nor do they make up the firm's economic exposure (the time horizon is limited, only foreign currency transactions are considered, and the firms do not apply any form of sensitivity analysis). At best, the approach can be interpreted as an "extended transaction exposure management".

(b) The second comment concerns the practical relevance (or irrelevance) of the (true) economic exposure concept. The fact that most firms do not attempt to

manage their economic exposure can be explained by the complexity of this concept. In order to measure a firm's economic exposure one needs to analyze the elasticity of demand in its markets for inputs and outputs, the flexibility of its production processes and the strategies of its competitors. The tools which are available for altering a firm's economic exposure are the choice of its products and markets, the restructuring of its sourcing, production and marketing processes, and changes in its longer-term financial policies. Obviously, such policies cannot be implemented easily as they require time and are expensive. Furthermore, an economic-exposure oriented exchange risk management requires a strategic, top management approach; it cannot be seen as the responsibility of financial managers alone (see *Glaum* 1990).

(c) Considering that academics have been pointing out for many years that the accounting concept of exchange exposure is not an appropriate concept to be used in foreign exchange risk management, it is surprising that a number of firms still aim to hedge this type of exposure. By eliminating their translation exposure, the firms may actually create additional transaction exposure. The former has no direct cash flow implications, the latter involves real cash flows. The firms, in other words, hedge against "paper losses" while at the same time incurring the risk of real losses from their hedging transactions (see, for instance, *Eun/Resnick* 1997).

(d) Finally, it is astonishing that almost half of the firms (44%) base their hedging activities on individual currency positions. Further analysis of the data reveals that there is a tendency for larger firms to follow a macro hedge approach (net exposure hedging). However, among those who do not net their currency inflows and outflows, there are also some very large multinational corporations. One would expect these firms to be able to realize substantial savings by restructuring their exchange risk management.

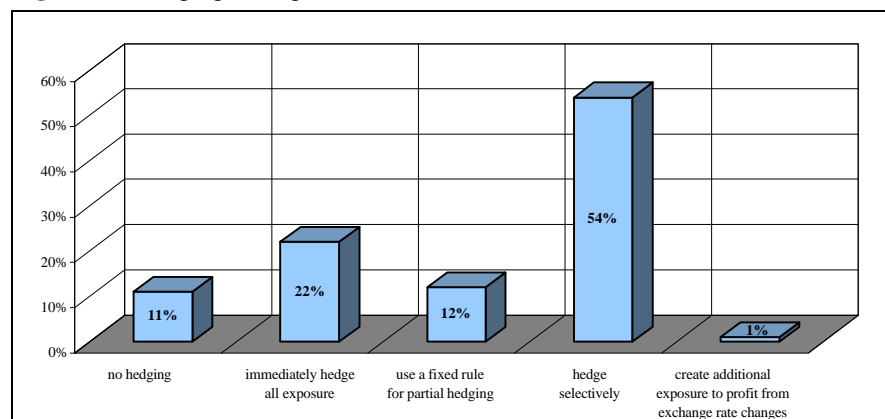
4.2. Exchange risk management strategies

Ultimately, the most important part of a firm's exchange risk management in practice is its hedging strategy. Based on an earlier interview-based empirical study (see *Glaum/Roth* 1993), the respondents were given descriptions of alternative hedging strategies; they were then asked to indicate which of them best describes the rules and procedures of their own firm's foreign exchange risk management. The results are depicted in Figure 4.1.

- 11% of the firms taking part in the study (or, in absolute numbers: eight firms) do not hedge their foreign exchange rate risk at all. Of these eight firms, five explained further that they are not (significantly) exposed to foreign exchange risk.

- 22% of the firms follow the strategy to hedge all open positions immediately.
- 12% of the firms follow a fixed rule according to which they always hedge a certain portion of their exposure with forward and/or option contracts, while leaving the remainder exposed. For example, some firms always hedge half of their exposure, others always hedge a third of their position with forward contracts, another third with currency options and leave the remaining third unhedged.

Figure 4.1 Hedging strategies

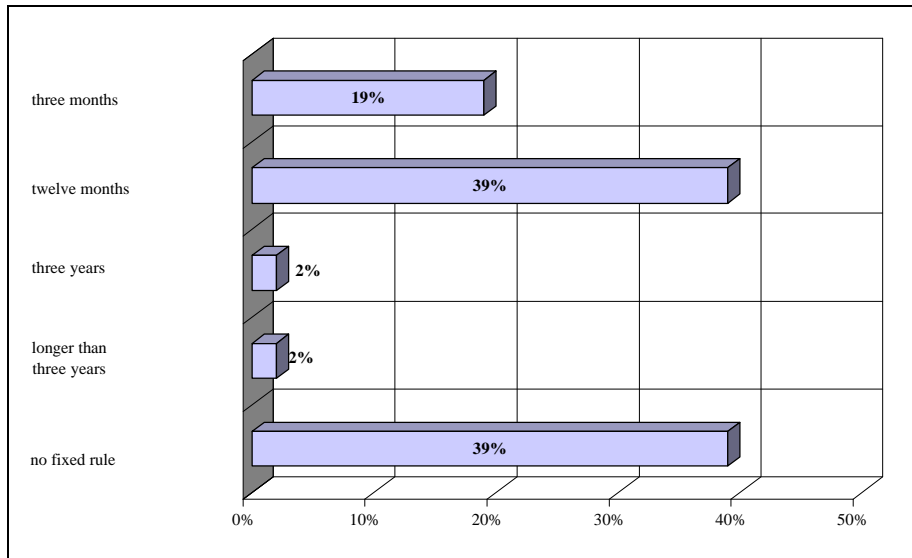


- The majority of firms (54%) follow a so-called selective hedging strategy. This means that the firms hedge only those positions for which they expect a currency loss while leaving open positions for which they expect a currency gain. Obviously, such a strategy is based on forecasts of future exchange rate changes. The managers must predict which foreign currencies will appreciate and which will depreciate over the time horizon of the open positions. About a third of the firms in this category always hedge a certain minimum percentage of their exposures; the remainder may then be left unhedged depending on the exchange rate forecast. In the other two thirds of the firms, the managers have full discretion to leave up to 100% of the positions unhedged.
- Finally, one of the respondent firms indicated that, based on exchange rate forecasts, it is willing to create exchange risk exposure beyond that arising from its business activities in order to profit from exchange rate movements.

The participants were also asked about the time horizon of their firms' hedging activities. As is shown graphically in Figure 4.2, 39% of the firms do not have a fixed rule concerning the time horizon of their hedging activities. 19% of the firms regularly hedge open positions over a horizon of three months; this is equal to the usual terms of payments in many industries. 39% of the firms hedge over a

horizon of 12 months; this time frame corresponds with the budget period of most firms. Only a small minority of firms regularly hedged over longer periods of time.

Figure 4.2 Time horizon of hedging activities



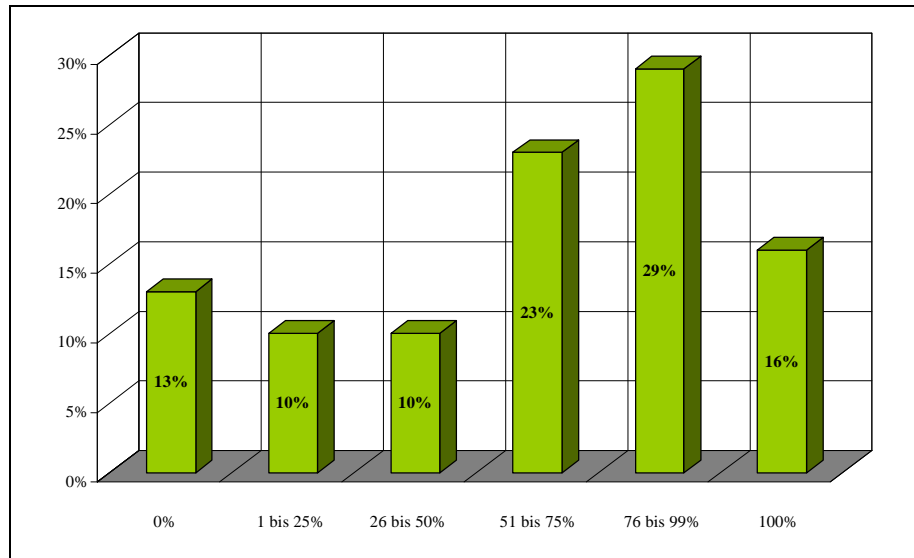
In order to get a deeper insight into the exchange risk management practices of the firms, we asked the participants further detailed questions about their strategy towards their firms' US-dollar exposures. Firstly we asked whether the firms have a significant exposure towards the US-dollar and, if so, whether this exposure consists of a "long position" (net inflows in US-dollars) or a "short position" (net outflows in US-dollars). Given the traditional export orientation of German firms, it was not surprising that the majority of the firms (55%) reported that their operations typically generated net inflows in US-dollars. In 19% of the cases, the exposure had the opposite sign, that is, these firms typically generated net outflows in US-dollars. The remaining 26% do not have significant US-dollar exposures.

The firms' hedging strategies towards the US-dollar are summarized in Figure 4.3. 13% of the firms that replied to this question⁹ explained that they had not hedged their US-dollar position at all. However, with one exception all of these firms have no significant US-dollar exposure. 10% of the firms had hedged up to 25% of their exposure, and another 10% had realized a hedge ratio between 25 and 50%. 23%

⁹ Six firms decided not to respond to this question.

of the firms had hedged between 51% and 75%, and 29% had hedged between 76% and 99% of their exposure. A minority of 16% was fully hedged. Firms with long positions had a tendency to choose relatively high hedge ratios while firms with short positions tended to have rather low hedge ratios.

Figure 4.3 Current hedge ratio of US-dollar position



Another observation can be made. As was shown earlier, 22% of the respondents (or, in absolute numbers, 16 firms) claimed that their firms always fully hedge open currency positions (see Figure 4.1). However, of these 16 firms, only seven had a fully hedged US-dollar position at the time of our survey. Of the other nine firms, one did not respond to the question about the US-dollar position; five firms had hedged between 75% and 99% of their dollar positions, two had hedged between 51% and 75%, and one firm had hedged only between 1% and 25%. Each of these nine firms had, according to their own answers in the study, significant US-dollar exposures.

Overall, the above results are in line with previous empirical studies on corporate exchange risk management (see *Glaum/Roth* 1993; *Batten et al.* 1993; *Aabo* 1999; *Greenwich Treasury Advisors* 1999). They show that only a very small minority of firms do not hedge their foreign exchange risks at all. However, they also show that only a small minority of firms fully hedge their risks. What may be the most surprising result from an academic point of view is the fact that a majority of firms

follow profit-oriented, selective hedging strategies.¹⁰ The managers of these firms obviously believe that, in comparison to a strategy of always fully hedging their positions, they can increase the firms' cash flows. In order to achieve this goal, they willingly accept the risk of currency losses due to the open positions. The speculative nature of the selective hedging strategy has been pointed out very sharply by *Lessard/Nohria* (1990, p. 198/199): "In fact, to the extent that it includes a speculative element by factoring possible gains into the hedging decision, [selective hedging] differs little from staking the assistant treasurer with a sum of money to be used to speculate on stock options, pork bellies or gold."

The selective hedging strategy is based on the managers' ability to forecast appreciations and depreciations of the relevant currencies over the planning horizon. The managers thus implicitly reject one of the foundations of modern finance theory, namely, the efficient market hypothesis. According to this hypothesis (in its semi-strong version), financial market prices always reflect all publicly available information. Therefore, it is impossible for individual market participants to generate abnormal returns by forecasting future market prices. A strict interpretation of the efficiency hypothesis is not very plausible because in this case nobody would have an incentive to invest in the production or analysis of new information. Instead, one can argue that financial markets in reality display a high degree of information efficiency precisely because so many private and professional market participants are continuously striving to gain access to new and better information and to analyze the available information most carefully.

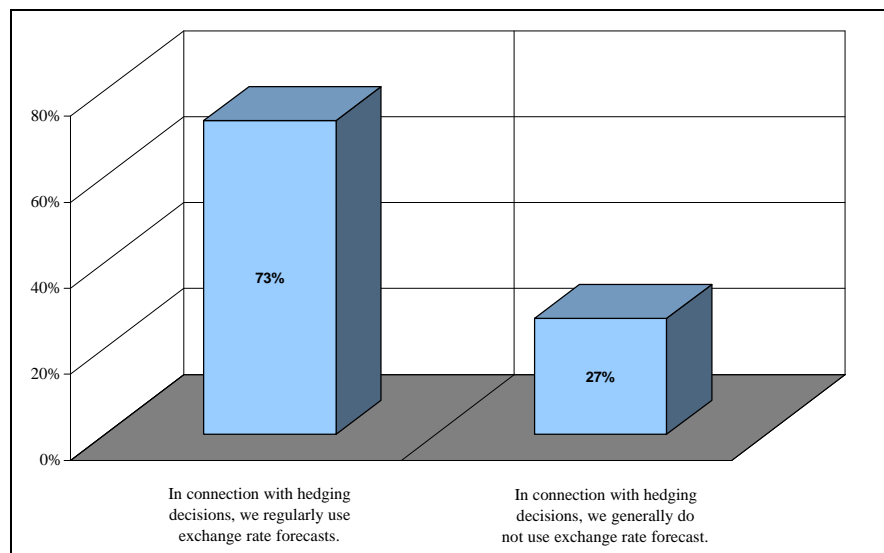
The efficiency of the foreign exchange markets was subject to numerous empirical tests. The results of some studies show that it would have been possible to make speculative gains in certain markets over certain periods of time. However, these studies analyze *historical* exchange rate time series. Economists are extremely doubtful about the possibilities of making predictions of *future* exchange rate changes (see *Frankel/Rose* 1995; *Lewis* 1995; *Taylor* 1995). To conclude, unless financial markets are seriously distorted by government restrictions or interventions (including fixed exchange rate regimes), it appears to be very difficult indeed to generate profits on the basis of exchange rate forecasts. Therefore, financial managers should analyze very (self-) critically whether their firms have access to privileged information or whether they possess superior abilities to analyze the publicly available information. If this is not the case, it is unlikely that speculative activities, including selective hedging, will systematically increase the value of the firm (see *Glaum* 1994; *Dufey/Giddy* 1997 on this point).

10 Empirical evidence seems to suggest that European firms are more inclined than US firms to accept open foreign exchange positions based on exchange rate forecasts; see *Bodnar/Gebhardt* 1999; *Greenwich Treasury Advisors* 1999.

4.3 The use of foreign exchange rate forecasts

Despite the critical attitude of the academic literature, exchange rate forecasts appear to be very popular in practice. As was shown in the previous section, this is also true for the current study. In order to gain further insights into the use of exchange rate forecasts, we directly asked the survey participants whether they use forecasts in connection with hedging decisions. As is shown graphically in Figure 4.4, exchange rate forecasts are employed in 73% of firms. This means that the financial executives of almost three quarters of the largest German firms do not believe that currency markets are information efficient and that they are able to profit systematically from exchange rate forecasts.

Figure 4.4 Use of foreign exchange forecasts



We were also interested in the techniques and the sources of information used in the preparation of the exchange rate forecasts. Our results indicate that costfree forecasts provided by banks or consultants are the most important source of information. On a scale of 0 (= no importance) to 4 (= very important), these forecasts received an average score of 2.9. With an average rating of 2.7, forecasts based on the fundamental analysis of macroeconomic data also play an important role. Third come the managers' subjective, personal views on the future development of the parity rates (2.1), followed by technical analysis of the exchange rate history (1.9). Commercial forecasts which have to be purchased by the firms play only a very minor role (average rating: 0.8).

4.4 Organization of exchange rate management

Multinational corporations have to decide on the degree of centralization of their exchange risk management function. In a totally decentralized system, each corporate unit is responsible for managing its own exposure. In a fully centralized system, risk management is the sole responsibility of the corporate center. As has already been mentioned, centralized risk management offers certain advantages. It is possible to balance out long and short positions and to calculate the group-wide net position for each currency. Only these net exposures need to be hedged in the derivatives markets. Furthermore, centralization allows the firm to benefit from economies of scale (larger overall positions, employment of specialized know how, access to international financial markets). On the other hand, the introduction of a centralized risk management system may be costly, and it may meet with resistance by the management of the local subsidiaries. In addition, the firms have to take into account capital controls and other legal restrictions which in some countries may impose limitations on the centralization of exchange risk management.

Previous surveys in the US indicate that the risk management of US firms tends to be highly centralized (see *Bodnar et al.* 1998; *Greenwich Treasury Advisors* 1999). In an earlier study, *Glaum/Roth* (1993) showed that German multinationals had developed very heterogeneous organizational forms in the area of financial risk management. On the whole, however, they also displayed a high degree of centralization.

The current study distinguishes between the centralization of risk management decisions and the centralization of the actual implementation of these decisions. With respect to decision making, we supplied the participants with three alternative categories and asked them which of these best describes the organization of their firms' risk management function: (i) all hedging decisions are taken by the corporate center or are determined by rules which are administered by the center (*high degree of centralization*); (ii) within guidelines set by the head office, the subsidiaries may decide on their own about hedging financial risks (*medium degree of centralization*); (iii) the subsidiaries are totally free to make hedging decisions independently of the headquarters (*low degree of centralization*).

Interestingly, not a single corporation relies on a low degree of centralization. 47% of the respondents indicate that a high level of centralization best describes the decision making process for financial risk management in their firms while the medium level of centralization is the best descriptor for the remaining 53%.

The implementation of risk management activities are even more strongly centralized. Again, we presented the participants with three possible answers: (i) the subsidiaries are obliged to conduct all hedging transactions with the corporate center (*high degree of centralization*); (ii) subsidiaries can, within guidelines set by the head office, carry out their own hedging transactions with independent

market partners (*medium degree of centralization*); and (iii) the subsidiaries are totally free to conduct hedging transactions with independent market partners without interference by the corporate center (*low degree of centralization*).

Again, there is not a single case where the subsidiaries are fully autonomous with respect to the implementation of hedging decisions. 47% of the firms are characterized by a medium degree of centralization and in 53 % of the firms the local financial managers are obliged to settle all hedging transactions with the head office.

4.5 Further Arguments and Hypotheses on Exchange Risk Management

Finally, we confronted the participants with several arguments and hypotheses related to the management of foreign exchange rate risk and asked them to indicate whether they agree or disagree with them on a scale of 0 (= do not agree at all) to 3 (= fully agree).

(a) Our first statement held that during “good times” (i.e., in periods with relatively high profits), firms protect themselves less intensively against unexpected exchange rate changes than they usually do. Most respondents disagreed strongly with this statement; the average score on our scale of 0 to 3 is 0.5.

(b) One of the determinants of hedging which are discussed in the more recent academic literature is the firm's tax function. If the tax function is convex, firms can reduce taxes by smoothing taxable income. Furthermore, reducing the volatility of the firm's cash flows enables the firm to take on more debt which again leads to tax advantages (see Ross 1996; Graham/Smith 1998). We therefore asked the survey participants whether they agree with the statement that reducing taxes is an important goal in foreign exchange risk management. Our results show that the managers do not agree with this argument at all (average consent rating: 0.5).

(c) The contention that the (perceived) risk management practices of the firms' most important competitors exert an influence on the firms' own hedging decisions also received a very low level of support. The average consent rating of 0.4 is the lowest of all the arguments and hypotheses in our list (similar results were obtained by Aabo 1999).

(d) From a theoretical perspective, exchange rate risk matters only in so far as it contributes to the firm's overall risk. In the case of less than perfect positive correlation between different categories of risk, there are diversification effects; and if exchange risk happens to be negatively correlated to the firm's other risk factors, the hedging of exchange risk could actually increase the overall volatility of the firm's cash flows. About half of the respondents explained that the correlation to other business risks does influence their firms' exchange risk

management decisions whereas this is not the case in the other half. The almost even distribution of answers resulted in an average consent rating of 1.6.

(e) In a previous part of the study it was shown that the majority of firms include expected future cash flows in their hedging decisions. It has already been suggested that this might be interpreted as an "extended transaction exposure management" rather than as an approximation to management of economic exposure. In another section of the study, numerous managers had indicated that they regularly assess their firms' economic exposure (52 %) or even actively manage it (15 %). One of our statements was directly related to the economic exposure concept. The statement held that the managers systematically examine the influence of exchange rate changes on the stock prices of their firms. The responses we received to this statements reveal that the central idea of the economic exposure concept has no support in corporate practice: 91% of the respondents do not agree with the statement; only 8% indicate some support and only one participant "fully agreed" with the statement (average consent rating: 0.6).

(f) Next, we confronted the managers with the notion that because of the informational efficiency of the exchange markets, forward rates are the most reliable source of information for risk management decisions. The hypothesis that the forward rates are unbiased predictors of future foreign exchange rates ("forward market efficiency") is the subject of an intensive debate in the literature (see *Frenkel* 1994; *Lewis* 1995 for details). Over recent years, several empirical studies have shown that the forward rate does not predict future spot rates without bias. The deviations may be the result of systematic expectational errors or they are due to a risk premium (or both). Whatever the explanation, the deviations appear to be highly volatile and their sign changes over time. Furthermore, so far no adequate model exists which would make it possible to forecast the prediction error of the forward rates. For these reasons, the deviations may be largely irrelevant for practical purposes. In the words of *Shapiro* (1999): "However, the premium appears to change signs – being positive at some times and negative at others – and averages near zero. ... In effect, we wind up with the same conclusion: ... That is, on average, the forward rate is unbiased."¹¹

The hedging strategies followed by the firms, in particular the widespread use of exchange rate forecasts, has already shown that the managers do not believe in the validity of the forward market efficiency hypothesis. This is also reflected in the responses we received to the above statement. Only a minority of 6% of the respondents fully agreed with the statements that forward rates are the most reliable sources of information for risk management decisions. 22%, on the other hand, strongly disagreed. The remaining participants indicated either moderate agreement or disagreement (overall average consent rating: 1.3).

11 *Shapiro* 1999, p. 233; similarly *Dufey/Giddy* 1997, p. 8.

(g) The last two statements focused on the performance of the managers' hedging decisions. The first of the two statements postulated that the firms periodically measure the success of their exchange rate management policy. This statement met with strong support; 80% of the participants either fully or at least moderately agreed with the statement (average consent rating: 2.1). The second statement held that in recent years the firms had usually been correct with their exchange rate forecasts and that, therefore, they had earned high profits through their selective hedging strategy (compared to a full hedging strategy). Looking at only those firms which do follow a selective hedging strategy, the average consent rating is 1.4. Interestingly, not a single firm totally agrees with the statement. One half of the firms moderately agreed, the others disagreed; 42% of the firms "somewhat disagreed", the 8% totally disagreed.

5. Conclusion

The paper reports the results of an empirical study into the foreign exchange risk management of large German non-financial corporations. Of the 154 firms that were addressed, a total of 74 took part in the study. The managers of these firms were asked about the measurement of exchange risk, about their management strategies, and about organizational issues. The results can be summarized as follows. The majority of the firms are concerned about managing their transaction exposure. Most firms adopted a selective hedging strategy based on exchange rate forecasts. Only a small minority of firms do not hedge foreign exchange risk at all, and only few companies hedge their transaction exposure completely. Looking in more detail at the management of the firms' exposure to the US-dollar, we found that only 16% of the firms were fully hedged. The majority of firms had realized hedge ratios between 50 and 99%.

The survey found a number of interesting discrepancies between the positions of the academic literature and corporate practice. For instance, numerous firms are concerned about their accounting exposure and some firms are actively managing it. The exposure concept favored by the academic literature, that is, economic exposure, is of little importance in practice. Further, we found that almost half of the firms manage their exchange positions on the basis of the micro hedge approach. In other words, they forego the possibility to establish the firm's net exposure by balancing out cash outflows and inflows first. The most interesting finding from an academic point of view, however, is the widespread use of exchange rate forecasts and of exchange risk management strategies based on forecasts (selective hedging). By adopting such strategies, the managers indicate that they do not believe that the foreign exchange markets are information efficient and they are able to beat the market with their own forecasts. The academic literature, on the other hand, emphasizes that it is very difficult indeed to make systematically successful exchange rate forecasts. Further research is required in order to analyze whether the firms' current practices in this area are ill-

conceived or whether they really do have access to privileged information or possess superior abilities which allow them to generate profits in the foreign exchange markets.

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