

# **The importance of corporate foreign debt as an alternative to currency derivatives in actual management of exchange rate exposures**

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This empirical study of the exchange rate exposure management of Danish non-financial firms listed on the Copenhagen Stock Exchange shows that debt denominated in foreign currency ("foreign debt") is a very important alternative to the use of currency derivatives. The results show that the relative importance of foreign debt is positively related to (1) the extent of foreign subsidiaries, (2) the relative value of assets in place, (3) the size of the firm, and (4) the debt ratio. The pivotal role of time horizon is emphasized. These findings are important to firms in other countries with open economies.

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*Key words:* Exchange rate exposure management; Financial hedging; Foreign debt.

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## **Abstract**

This empirical study of the exchange rate exposure management of Danish non-financial firms listed on the Copenhagen Stock Exchange shows that debt denominated in foreign currency (“foreign debt”) is a very important alternative to the use of currency derivatives. The results show that the relative importance of foreign debt is positively related to (1) the extent of foreign subsidiaries, (2) the relative value of assets in place, (3) the size of the firm, and (4) the debt ratio. The pivotal role of time horizon is emphasized. These findings are important to firms in other countries with open economies.

## **1. Introduction**

Empirical studies on the management of exchange rate exposures in non-financial firms suggest that debt denominated in foreign currency (“foreign debt”) is a substitute for currency derivatives and that foreign debt is used for hedging purposes. Using a sample of the long-term borrowing of 44 listed Finnish corporations between 1985 and 1991, Keloharju and Niskanen (2001) find that firms raise foreign debt in order to hedge their foreign exchange exposures (positive correlation between foreign debt and export share) and in order to speculate (borrow when foreign interest rates are low). Elliott, Huffman, and Makar (2003) analyze a sample of 88 US firms for the period of 1994-1997. They find that foreign debt is used for hedging purposes (positive correlation between foreign debt and exposure as measured by the foreign sales ratio) and that foreign debt substitutes for the use of derivatives in reducing currency risk (negative correlation for a given exposure between foreign debt and the use of derivatives). Kedia and Mozumdar (2003) examine the determinants of public debt

issuance in ten major currencies by large U.S. firms. They find strong evidence that firms issue foreign currency debt in order to hedge exchange rate exposures. The aim of this paper is to address the *relative* importance of foreign debt vis-à-vis currency derivatives.

A European firm exporting to the U.S. is exposed to the development in the exchange rate between the currency of the European country (EUR) and the U.S. dollar (USD). If the European firm exports goods to the U.S. worth USD 100 million a year, the firm may lose (gain) EUR 10 million on an annual basis in case of a depreciation (appreciation) of the USD of ten percent and assuming constant prices in USD terms. Currency derivatives can be used to hedge such an exposure. The exporter can sell forward USD against EUR in an amount corresponding to the expected USD cash inflow and at dates matching the expected dates of receipt. An obvious and straightforward alternative to the use of currency derivatives is the use of foreign debt. The exporter can hedge the USD exposure by raising foreign debt (or change the currency denomination of existing EUR denominated debt) in an amount equal to the likely inflow of USD from exports and in a repayment profile more or less matching the inflows of USD. In risk management terms the two instruments are more or less identical. Géczy et al. (1997) support the notion that foreign debt and currency derivatives are substitutes.

The Danish firm, Novozymes, is an example of a firm that treats foreign debt as an alternative to currency derivatives. Novozymes is a biotech-based world leader in enzymes and microorganisms with total sales of EUR 0.7 billion in 2001. Novozymes wrote in their 2001 Annual Report that “Hedging is carried out, primarily for USD and JPY, a number of

months ahead through a combination of loans, forward contracts, currency swaps and options”.

Empirical research, economic intuition, and anecdotal evidence suggest that foreign debt is a substitute for currency derivatives in managing foreign exchange exposures in non-financial firms. Still, surveys on exchange rate exposure management practices in non-financial firms tend to either exclude or only treat marginally the use of foreign debt (e.g. Bodnar et al., 1998; Bodnar and Gebhardt, 1999; Fatemi and Glaum, 2000). An unanswered question is the *relative* importance of foreign debt vis-à-vis currency derivatives in managing exchange rate exposures in non-financial firms.

Thus, the purpose of this paper is to empirically investigate

- (1) the relative importance of foreign debt vis-à-vis currency derivatives in hedging exchange rate exposures in non-financial firms, and
- (2) to what degree the relative importance of foreign debt can be explained by company characteristics.

Based on public information and on questionnaires sent to Danish, non-financial firms listed on the Copenhagen Stock Exchange as of the end of 2001, this study shows that (1) foreign debt *is* an important alternative to the use of currency derivatives in actual decision making in non-financial firms and that (2) the importance of foreign debt is positively related to the number of countries in which the firm has subsidiaries, the extent to which the value of the

firm relies on assets in place as opposed to growth options, the size of the firm, and the debt ratio. Furthermore, the study suggests that the economic sector to which the firm belongs is an important parameter. The results emphasize the pivotal role of time horizon in understanding the importance of foreign debt vis-à-vis currency derivatives in managing exchange rate exposures in non-financial firms.

Due to its high degree of international involvement / dependence and due to the ready access to foreign debt, Denmark is an interesting country for analyzing exchange rate exposure hedging strategies. Denmark is a small (5.4 million inhabitants), open (exports as a percentage of GDP is 45 percent) economy with a standard of living among the highest in Europe and closely following the U.S. In being a small and open economy with its own currency (DKK is pegged to EUR at 7.46 DKK with a band of +/- 2.25 percent) Danish firms are used to dealing in and being exposed to various currencies. Denmark's main trading partner is Germany followed by Sweden, the U.K., the U.S., and France. Danish firms have ready access to debt denominated in foreign currency as well as currency derivatives. Few firms have issued bonds and the primary channel through which Danish firms have access to foreign debt is through loan arrangements with either Danish or foreign banks.

This paper contributes to the existing literature by focusing explicitly on the relative importance of corporate foreign debt as an alternative to the use of currency derivatives in managing exchange rate exposures in non-financial firms. The results of the study emphasize “the need to go beyond the firms’ derivative positions and look at other financial and operational hedges to fully comprehend the firms’ exposures and risk management activities”

(Kedia and Mozumdar, 2003). The results are important to firms in other countries with open economies such as the U.S., the U.K., Germany, and Australia among others.

The only other study that explicitly addresses the importance of foreign debt compared to the use of currency derivatives is Allayannis and Ofek (2001). Based on 1993 data for a sample of S&P 500 non-financial firms, Allayannis and Ofek find that firms use foreign debt to hedge exchange-rate exposures. They find no significant evidence that multinationals with operations abroad prefer to use either currency derivatives or foreign debt to hedge exchange rate exposures. However, they do find significant evidence that exporters prefer foreign currency derivatives. Allayannis and Ofek suggest that this finding may be explained by the nature of exporting, which can require customized, short-term contracts that are better served by derivatives than by long-term foreign debt. As such, this paper fills an important gap in the literature.

The paper proceeds as follows. The next section states the methodology of the study. The third section surveys the importance attached to foreign debt vis-à-vis currency derivatives in managing foreign exchange exposures. The fourth section tests which firm specific factors can explain the relative importance of foreign debt. The fifth section concludes.

## **2. Methodology of Study**

This study is based on public information and on questionnaires sent to Danish, non-financial firms listed on the Copenhagen Stock Exchange as of the end of 2001. The Copenhagen Stock Exchange uses the Global Industry Classification Standard (GICS) developed by

Standard & Poor's and Morgan Stanley Capital International. GICS is comprised of 10 economic sectors: (10) Energy, (15) Materials, (20) Industrials, (25) Consumer Discretionary, (30) Consumer Staples, (35) Health Care, (40) Financials, (45) Information Technology, (50) Telecommunication, and (55) Utilities.

Questionnaires were sent to firms in all economic sectors except Energy (10) and Financials (40)<sup>1</sup>. Furthermore, within the economic sector of Consumer Discretionary (25) the industry group Hotels Restaurants & Leisure (2530) was excluded because local soccer clubs with little international involvement comprise the main elements of this group. Firms with headquarters outside Denmark were excluded and finally some firms were excluded in order to avoid de facto double representation<sup>2</sup>.

Following the modifications above, the population consists of 117 Danish, non-financial firms listed on the Copenhagen Stock Exchange. In October 2001, the target persons were identified from telephone conversations. The target persons were primarily finance managers (but also CFOs and treasurers). A questionnaire containing 17 closed-end questions was sent to the 117 target persons. The firms were promised confidentiality. In November, the firms that had not responded were contacted by telephone (or by e-mail). By the end of December, 52 firms had sent in filled-out questionnaires resulting in a response rate of 44 percent.

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<sup>1</sup> No energy firms are listed at the Copenhagen Stock Exchange and financial firms are excluded because the focus of this study is non-financial firms.

<sup>2</sup> The following three groups of firms are excluded: (1) Firms whose main activities are to hold stocks in listed firms that are themselves included in the study; (2) Firms in which an overwhelming majority of stocks is held by another listed firm which is included in the study on its own and which has "own" activities; (3) Almost identical sister firms dominated by the same main shareholders.

Four firms chose not to answer all the questions related to the present study. Furthermore, due to the limited number of firms in the two last economic sectors, Telecommunication and Utilities, these sectors are excluded from the study. Consequently, the final sample consists of 47 firms in six economic sectors as illustrated in Table 1.

\* Please insert Table 1 \*

The group of firms responding was compared to the group of firms not responding in relation to size (consolidated turnover) and economic sector in order to address the problem of non-response bias. Except for the firms in Health Care that tend to be more likely to respond than the average firm, no statistically significant deviations are found using difference in mean tests. As such, the sample of firms resembles the population of Danish non-financial firms listed on the Copenhagen Stock Exchange as of the end of 2001.

### **3. The Importance of Foreign Debt as an Alternative to Derivatives**

This section provides empirical evidence on the importance of corporate foreign debt as an alternative to the use of currency derivatives in relation to the hedging of exchange rate exposures in non-financial firms. The study is based on responses from the 47 non-financial Danish firms that completed a questionnaire and that responded to the question relevant for this study. The question asked was:



*"Financing (/making deposits) in foreign currency and the use of derivatives are often alternative financial ways of managing exchange rate exposures. How is the magnitude of importance between loans (/deposits) and derivatives in relation to hedging the exchange rate exposures that arise from the underlying business activities?"*

The respondents were asked to indicate the importance of foreign debt for exchange rate exposures in general, as well as for four subcategories of exchange rate exposures: transaction exposure, anticipated transactions 1 year or less, anticipated transactions over 1 year, and competitive exposure. The respondents indicated the relative importance of foreign debt for each of these exposures by choosing one of three alternatives: (1) derivatives more important, (2) of equal importance, or (3) loans (/deposits) more important. Table 2 lists the results.

\* Please insert Table 2 \*

Table 2 shows the importance that finance managers attach to the use of foreign debt as an alternative to the use of currency derivatives in dealing with exchange rate exposures in general or in dealing with one of the subcategories of exchange rate exposures. Table 2 shows in italics the number of firms that do not hedge exchange rate exposures. The number of firms that do not hedge exchange rate exposures shows that firms are reluctant to hedge long term exposures and more inclined to hedge short term exposures. Thus, only five firms do not hedge transaction exposure while almost half of the firms do not hedge transactions that are anticipated to materialize beyond one year.

A large majority of 41 companies (15+18+8) state that they hedge exchange rate exposures in general. Only six firms do not hedge exchange rate exposures in general. The majority of the former (64 percent) either think that the use of corporate foreign debt (/deposits) is *as* important as or *more* important than the use of currency derivatives. This is the first indication that foreign debt is a very important alternative to the use of currency derivatives in actual decision making in non-financial firms in relation to the hedging of exchange rate exposures that arise from the underlying business activities.

Table 2 also shows the relative importance that the finance managers attach to the use of foreign debt compared to the use of currency derivatives when the question relates to transaction exposure, anticipated transactions within 1 year, anticipated transactions beyond 1 year, and competitive exposure. Currency derivatives are preferred for the hedge of transaction exposure. However, the relative importance of foreign debt increases the more long-term and indirect the exposure. This is consistent with the findings of Allayannis and Ofek (2001) on exporters' preference for currency derivatives and on multinational companies' lack of preference.

Two main observations can be made from Table 2:

- (1) The use of foreign debt is an important alternative to the use of currency derivatives when finance managers make hedging decisions related to exchange rate exposures that arise from the underlying business activities.

- (2) The relative importance of foreign debt increases with the length of the hedging horizon.

The results emphasize foreign debt as a crucial element in managing exchange rate exposures in non-financial firms. Excluding the use of foreign debt when trying to understand hedging strategies of non-financial firms leads to a biased view of actual hedging behavior. This is especially the case in countries where firms have ready access to debt denominated in foreign currency. The findings of Batten and Mellor (1993), Joseph (2000), and Keloharju and Niskanen (2001) confirm that such access is not a particular Danish phenomenon but is widespread.

As noted by Allayannis and Ofek (2001) and Kedia and Mozumdar (2003), since the payback of foreign debt represents a cash outflow in a foreign currency, it can only be used as a hedge when a firm has revenues (cash inflows) in foreign currency, either from operations abroad or from exports. By contrast, imports, which represent cash outflows in a foreign currency, cannot be hedged through foreign debt. In principle, the use of deposits (or bonds) denominated in a foreign currency is as straightforward a hedge against fluctuations in the value of a currency in which the firm has cash outflows (costs) than the use of foreign debt is a hedge against fluctuations in the value of a currency in which the firm has cash inflows (revenues). However, in a typical non-financial firm the amount of debt far exceeds the amount of deposits. Thus, from a practical point of view the possibility of using foreign debt as an alternative to the use of currency derivatives is more obvious than the use of deposits denominated in a foreign currency. The formulation of the question includes the use of

deposits in foreign currency. However, for brevity, we use the word “foreign debt” in place of the actual words used in the survey “loans (/deposits)”.

#### **4. Factors behind the importance of foreign debt**

The purpose of this section is to analyze firm characteristics that can explain the varying importance that firms attach to the role of foreign debt. For the remainder of this study we exclude the six firms that do not hedge exchange rate exposures in general (Table 2). Thus, our sample for the regression analysis comprises the 41 firms that do hedge exchange rate exposures in general. These 41 companies are listed in the last column of Table 1. The 41 firms either find (1) derivatives to be more important than foreign debt in hedging the exchange rate exposures that arise from the underlying business activities, (2) derivatives and foreign debt to be equally important, or (3) foreign debt to be more important than derivatives. Six firm characteristics are hypothesized to explain this variation in the relative importance of foreign debt:

Size (as measured by the log of consolidated total assets) is hypothesized to have a *positive* relationship to the relative importance of foreign debt. Small firms may find the start up costs and the inflexibility of foreign debt as compared to e.g. the use of forward contracts a barrier. Allayannis and Ofek (2001) do not find any significant correlation between size and a particular preference for either foreign debt or currency derivatives. They do find that larger firms are more prone to use foreign debt. However, *if* a firm uses foreign debt they find that smaller firms issue larger amounts of foreign debt (consistent with high fixed start-up costs of issuing foreign debt).

Exposure to exchange rates (as measured by foreign sales / total sales) is hypothesized to have a *negative* relationship to the relative importance of foreign debt. We use foreign sales as a proxy for exposure to exchange rates in accordance with Bodnar and Gentry (1993) and in line with Geczy et al. (1997). The more direct and the more short term the exposure, the more likely it is that firms will use forward contracts as opposed to more long term foreign debt arrangements. Allayannis and Ofek (2001) find that exporters prefer currency derivatives over foreign debt. However, our measure is not a direct measure of exports but rather of foreign sales thus not differentiating between direct exports and sales from foreign subsidiaries. As such, we do not expect a strong relationship (if any) between the exposure to exchange rates and the relative importance of foreign debt.

Number of foreign countries in which the firm has subsidiaries (as measured by the number of foreign countries in which the firm has subsidiaries divided by total assets) is hypothesized to have a *positive* relationship to the relative importance of foreign debt. Following Caves (1971) we use subsidiaries abroad as a proxy for commitment and exposure to a foreign market. Bradley and Moles (2002) find that 84 percent of a sample of UK firms that do have foreign subsidiaries use foreign debt while only 20 percent of the firms that do not have foreign subsidiaries use foreign debt. Kedia and Mozumdar (2003) also find that firms with greater foreign operations are more likely to issue foreign debt.

Debt ratio (as measured by total debt / total assets) is hypothesized to have a *positive* relationship to the relative importance of foreign debt. Following the pecking order hypothesis of Myers and Majluf (1984), firms prefer to finance their business activities with

internally generated funds, then next with external debt, and finally with external equity. If a firm does not have debt or very little debt, the likelihood is small that such a firm will issue foreign debt in order to hedge exchange rate exposures.

Tobin's Q (as measured by the market value of assets divided by book value of assets) is hypothesized to have a *negative* relationship to the relative importance of foreign debt. Tobin's Q is used as a proxy for a firm's growth opportunities in line with Guay and Kothari (2003) and Kedia and Mozumdar (2003). A low Tobin's Q means that the majority of the value of the firm is related to the assets in place while a high Tobin's Q means that the majority of the value of the firm is related to growth options. The time horizon for which finance managers are able to make qualified estimates of the likely future exposures to exchange rates is longer the more the value of the firm is related to the already existing assets of the firm. Thus, to the extent that firms tend to use foreign debt to hedge long term exposures, a firm with a low Tobin's Q will find foreign debt more important than firms with a high Tobin's Q.

Economic sector is the final factor for explaining the relative importance of foreign debt. No clear-cut economic sector effect is hypothesized. However, economic sectors characterized by long-term investments and projects should be more likely to have a time-horizon that corresponds to the use of foreign debt than firms in sectors more characterized by day-to-day trading or short-term survival. To the extent that this effect is not captured by the previous factors, the economic sector variable is important.

Descriptive statistics and correlation coefficients for the independent variables used in the regression analysis are presented in Table 3. As shown in Panel A, the average (median) firm has: total assets of DKK 7.5 billion (DKK 1.8 billion) equivalent to EUR 1.0 billion; foreign sales ratio of 66 percent (75 percent); subsidiaries in 11 countries (7 countries); debt ratio of 51 percent (54 percent); and Tobin's Q of 1.63 (1.09). A few of the variables are correlated as indicated in Panel B. Size (log of total assets) and countries with subsidiaries (number of foreign countries divided by total assets) have the highest absolute correlation coefficient of 0.50. This will be addressed at a later stage.

\* Please insert Table 3 \*

As discussed above, it is hypothesized that the firm characteristics for size, foreign sales/total sales, number of foreign countries in which the firm has subsidiaries, debt/total assets, Tobin's Q, and economic sector influence the relative importance of foreign debt. The dependent variable is an ordered variable with the values of 1 (currency derivatives are more important than foreign debt), 2 (currency derivatives and foreign debt are equally important), and 3 (foreign debt is more important than currency derivatives). Based on the hypotheses, the following ordered probit regression is analyzed:

$$IMP_i = \lambda_1 SIZE_i + \lambda_2 FSALES_i + \lambda_3 FCOUNTRIES_i + \lambda_4 DEBTASS_i + \lambda_5 TOBINQ_i + \lambda_6 MATERIALS_i + \lambda_7 CD_i + \lambda_8 CS_i + \lambda_9 HEALTHCARE_i + \lambda_{10} INFOTECH_i + \omega_i \quad (1)$$

where:  $IMP_i$  is the importance of foreign debt compared to currency derivatives for firm  $i$

with 1: less important, 2: equally important, and 3: more important,

$SIZE_i$  is the logarithm of total assets for firm  $i$  in 2001,

$FSALES_i$  is foreign sales / total sales for firm  $i$  in 2001,

$FCOUNTRIES_i$  is the number of foreign countries in which firm  $i$  in 2001 has  
subsidiaries divided by total assets,

$DETBASS_i$  is total debt / total assets for firm  $i$  in 2001,

$TOBINQ_i$  is the sum of total debt plus the market value of equity (approximation for  
market value of assets) divided by the sum of total debt plus the book value of  
equity (approximation for replacement value of assets) for firm  $i$  in 2001,

$MATERIALS_i$ ,  $CD_i$ ,  $CS_i$ ,  $HEALTHCARE_i$ ,  $INFOTECH_i$ , are indicator variables coded  
as a “1” if firm  $i$  is in the GICS economic sector or “0” otherwise. The GICS  
economic sectors are, respectively: Materials, Industrials (default), Consumer  
Discretionary, Consumer Staples, Health Care, and Information Technology,

$\omega_i$  is the error term.

Table 4 reports the results for the ordered probit regression analysis. Analysis is conducted on the full model (Model 1), a model which excludes economic sectors (Model 2), and a reduced model (Model 3). As shown in Model 1, the results indicate that size, number of countries, debt ratio, and Tobin’s Q are statistically significant at the one or five percent level in explaining the relative importance of foreign debt. Only the foreign sales ratio is not statistically significant. All signs are as hypothesized. Furthermore, two of the indicators for economic sectors (Health Care and Information Technology) are statistically significant at the one percent level whereas two other indicators (Materials and Consumer Discretionary) are significant at the ten percent level. In Model 2 the indicators for economic sectors are excluded. Only number of foreign countries is statistically significant (five percent level) in



explaining the importance of foreign debt. In Model 3 all the variables that are not statistically significant at the five percent level in the full model (Model 1) are excluded. All included variables stay statistically significant (although the debt ratio only at the ten percent level). While Model 1 and Model 3 have an overall fit that is significant at the one percent level as measured by the LR test statistic, Model 2 is only significant at the ten percent level. This highlights the information content in the economic sector indicators.

\* Please insert Table 4 \*

One firm characteristic distinguishes itself in its ability to explain the variation in the relative importance of foreign debt among firms. Number of foreign countries (as measured by the number of foreign countries in which the firm has subsidiaries divided by total assets) is statistically significant at the one percent level in Model 1 and Model 3 *plus* it is the only variable which is also statistically significant when excluding the economic sector variables in Model 2. The results suggest that a firm's foreign involvement in the form of geographical expansion by the establishment of subsidiaries is closely linked to a hedging strategy that favors foreign debt over currency derivatives. The significance of number of countries and the insignificance of the foreign sales ratio highlights the importance of commitment and time horizon in understanding the difference between the corporate use of foreign debt and the corporate use of currency derivatives. The importance of time horizon is further emphasized by the significance of Tobin's Q.

The Danish firm, Carlsberg, is an example of a firm that uses foreign debt to hedge the exposure related to its foreign subsidiaries. Carlsberg's primary focus is the production, sale

and marketing of beer. It has revenues of DKK 47 billion of which more than 90 percent is earned abroad. In its 2001 Annual Report Carlsberg writes in relation to direct adjustments to equity that this “is also the case with long-term loans in foreign currencies raised to hedge investments in subsidiaries”. Carlsberg further writes that “net debt is an important element in the firm’s hedging of exchange rate risks”.

The results in relation to the economic sector indicators further emphasize the importance of time horizon (although the limited number of firms in each sector restricts the usefulness of putting too much emphasis on the results). The indicators for Health Care and Information Technology are both statistically significant at the one percent level in explaining the relative importance of foreign debt. This makes intuitive sense for firms in the Health Care sector. Many of the firms in this sector are engaged in long-term projects associated with the research, development, and production of pharmaceuticals and biotechnology products.

An example of a firm in the Health Care sector with a long time horizon is the Danish firm, Coloplast. Coloplast is listed at Copenhagen Stock Exchange and is a medical device firm developing, marketing and selling products and services within the business areas: ostomy, continence care, wound care, breast care and skin care. Coloplast has revenues of DKK 6 billion of which 97 percent is earned abroad – primarily in Europe. Coloplast is mainly operating in a niche market with few large suppliers and is represented by own sales subsidiaries in the major markets. Through extensive distribution networks and a strong cooperation with health professionals Coloplast has a firm grip on the European market and feels confident that it will also have a strong presence in the future. The long term perspective

allows Coloplast to take long term decisions also in relation to its hedging of exchange rate exposures.

The results from Table 4 are generally robust to alternative measurements of the variables (e.g. turnover *instead of* total assets; number of foreign countries in which the firm has subsidiaries *instead of* number of foreign countries in which the firm has subsidiaries divided by total assets; solvency ratio *instead of* debt ratio). The insignificance of the foreign sales ratio also holds for alternative measurements of exposure such as the one proposed by Bodnar and Marston (2000). The variables related to size and foreign subsidiaries and the variables related to debt ratio and Tobin's Q have correlation coefficients of -0.50 and -0.41 respectively (Table 3). When excluding the variables related to size and debt ratio from the full model, the conclusions as to the remaining variables are unaffected.

Goldberg et al. (1998) find that the use of currency derivatives by US non-financial firms is positively correlated with the variability of accounting returns on assets. Thus, the variability of return on total assets could be a relevant variable in explaining the relative importance of foreign debt. However, we do not find any statistical significance when this or related variables (growth in assets, growth in turnover, return on assets, return on equity) are included in the regression analysis.

Kedia and Mozumdar (2003) find that higher credit-rated firms issue significantly more foreign debt than lower credit-rated firms. This is in line with our considerations on the importance of time horizon or it is a result of the unavailability of foreign debt at attractive terms. If we include a credit rating variable in our regression analysis, the coefficient has the

expected sign but without being statistically significant. Only when included in Model 1, the credit rating variable is statistically significant at a ten percent level. The inclusion of a credit rating variable does not alter the conclusions as to the other variables.

## 5. Conclusions

This empirical study of the exchange rate exposure management of Danish non-financial firms listed on the Copenhagen Stock Exchange makes two important contributions to the literature. First, the study shows that debt denominated in foreign currency *is* an important alternative to the use of currency derivatives. More than half of the firms surveyed responded that the use of foreign debt is as important as or more important than the use of currency derivatives in hedging exchange rate exposures that arise from the underlying business activities. Second, the results show that the relative importance of foreign debt is *positively* related to (1) the geographical expansion and commitment to foreign markets in the form of subsidiaries, (2) the extent to which the value of the firm relies on assets in place (negatively related to Tobin's Q), (3) the size of the firm, and (4) the debt ratio. Furthermore, the study suggests that the economic sector to which the firm belongs is important to the use of foreign debt. The results emphasize the importance of time horizon in understanding the corporate maneuvering between the use of foreign debt and the use of currency derivatives.

We believe that the generality of the findings can be extended to other countries with open economies. Allayannis et al. (2003) find that non-U.S. firms raise a large proportion of their debt in foreign currency. The ready access to foreign debt is not an isolated Danish

phenomenon. As such, we expect the findings of this study to be relevant for a wide range of firms in open economies.

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**Table 1**  
**Global Industry Classification Standard (GICS) and response rates for sample firms**

GICS	Economic Sector	Number of firms sent survey	Number of surveys returned	Response rate	Number of firms in final sample	Number of firms in regression analysis
15	Materials	8	5	62%	5	5
20	Industrials	50	19	38%	18	15
25	Consumer Discretionary	21	7	33%	7	7
30	Consumer Staples	9	5	56%	4	4
35	Health Care	12	9	75%	8	6
45	Information Technology	14	6	43%	5	4
50	Telecommunication	1	0	0%	0	0
55	Utilities	2	1	50%	0	0
	Total	117	52	44%	47	41

This table lists survey results for sample Danish firms listed on the Copenhagen Stock Exchange. Firms are classified by the Global Industry Classification Standard. The difference between the final sample and the sample of firms returning surveys is: (1) 4 firms did not respond to the relevant questions and (2) the single firm in Utilities is excluded. The difference between the final sample and the firms in the regression analysis is the 6 firms that do not hedge exchange rate exposures in general.

**Table 2**  
**The importance of foreign debt versus currency derivatives**

	N	<i>No hedge</i>	Derivatives more important	Of equal Importance	Debt more important
Exchange rate exposures in general	47	6	15 (37%)	18 (44%)	8 (20%)
Transaction exposure	47	5	25 (60%)	10 (24%)	7 (17%)
Anticipated transactions 1 year or less	47	7	16 (40%)	15 (38%)	9 (23%)
Anticipated transactions over 1 year	47	22	6 (24%)	9 (36%)	10 (40%)
Competitive exposure <sup>1</sup>	46 <sup>1</sup>	33	3 (23%)	6 (46%)	4 (31%)

<sup>1</sup> One firm chose not to answer this specific question.

This table provides the survey responses to the question: “Financing (/making deposits) and the use of derivatives are often alternative financial ways of managing exchange rate exposures. How is the magnitude of importance between loans (/deposits) and derivatives in relation to hedging the exchange rate exposures that arise from the underlying business activities?”. Respondents were asked to respond “No hedge”, “Derivatives more important”, “Of equal importance”, or “Debt more important” in relation to exchange rate exposures in general (upper part) or in relation to specific exchange rate exposures (lower part). The number of firms is provided in each cell. The percentages refer to the percentage of the firms that do hedge the exposure in question.

**Table 3**  
**Descriptive statistics and correlation coefficients of independent variables**

**Panel A: Descriptive statistics**

Variable	N	Mean	Median	Std. Dev.	Minimum	Maximum
Size (total assets in 2001 in million DKK)	41	7,536	1,812	26,501	58	169,598
Size (log total assets)	41	3.2	3.3	0.7	1.8	5.2
Foreign sales / total sales (percentage)	41	66	75	33	0	100
# of foreign countries	41	11	7	12	0	60
# of foreign countries / total assets	41	0.006	0.003	0.008	0.000	0.039
Debt / total assets (percentage)	41	51	54	16	6	78
Tobin's Q	41	1.63	1.09	1.41	0.68	6.57

**Panel B: Correlation coefficients**

Variable	Size (log total assets)	Foreign sales / total sales	Foreign countries / total assets	Debt / total assets
Size (log total assets)	1.00			
Foreign sales / total sales	0.27	1.00		
# of foreign countries / total assets	-0.50	-0.06	1.00	
Debt / total assets	-0.06	0.03	0.14	1.00
Tobin's Q	0.09	0.11	0.21	-0.41

This table provides descriptive statistics and correlation coefficients for independent variables used in the ordered probit regression analysis. Panel A contains descriptive statistics and Panel B lists correlation coefficients. The economic sector variables are excluded from the table, but are listed in Table 1.

**Table 4**  
**Ordered probit regression analysis for importance of foreign debt**

	Model 1	Model 2	Model 3
Variable	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
Size (log total assets)	1.19** (0.0321)	0.43 (0.2257)	1.03** (0.0344)
Foreign sales / total sales	-0.68 (0.4676)	-0.61 (0.3208)	----
# of foreign countries / total assets	282*** (0.0013)	116** (0.0150)	216*** (0.0016)
Debt / total assets	6.22** (0.0251)	-0.58 0.6597	3.87* (0.0654)
Tobin's Q	-2.37** (0.0142)	-0.09 (0.5688)	-1.96*** (0.0033)
Materials indicator	-1.51* (0.0818)	----	----
Consumer Discretionary indicator	-1.41* (0.0556)	----	----
Consumer Staples indicator	-0.39 (0.6218)	----	----
Health Care indicator	10.64*** (0.0054)	----	8.94*** (0.0011)
Information Technology indicator	5.65*** (0.0045)	----	4.83*** (0.0011)
N (number of observations)	41	41	41
LR index (Pseudo-R2)	0.56	0.13	0.49
LR statistic	47.88	10.91	41.86
Probability (LR stat)	0.0000***	0.0531*	0.0000***
Log likelihood	-19.03	-37.52	-22.05

This table reports ordered probit estimates of the relationship between the importance of foreign debt and firm characteristics. P-values are listed in parentheses. The dependent variable is the importance of foreign debt compared to

currency derivatives as measured by 1 (derivatives more important), 2 (of equal importance), and 3 (debt more important) as described in Table 2. The independent variables are: the logarithm of total assets, foreign sales / total sales, number of foreign countries in which the firm has subsidiaries / total assets, debt / total assets, Tobin's Q, and indicator variables for five different Global Industry Classification Standard (GICS) economic sectors (Materials, Consumer Discretionary, Consumer Staples, Health Care, and Information Technology). Significance levels are indicated as follows: \*\*\* (1 percent), \*\* (5 percent), and \* (10 percent).