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Framework for Evaluating Foreign Exchange Exposure Management Practices of Non-Financial Companies: A managerial approach

International Business

Master's thesis

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Abstract

Foreign currencies are an integral part of doing international business. Their role is often accepted as a necessity, while the significance of the risks associated with uncertain future exchange rates is dismissed. Previous studies have shown that actively managing foreign exchange (FX) exposure can be beneficial. Few studies, however, have comprehensively explored how to manage FX exposure. The purpose of this study is to examine the FX exposure management practices of non-financial companies involved in international business and ultimately to evaluate their practices.

This study contributes to existing literature by outlining a framework for FX exposure management. Previous studies have been content to conclude FX management practices to vary significantly across companies, but this study asserts that sufficient similarities do exist for identifying common developmental paths. Identifying them enables evaluation and comparison of FX exposure management practices between companies. For managers the study includes a tool for self-evaluation and benchmarking purposes.

The empirical part of the study gives an overview of the prevailing FX exposure management practices in Finnish non-financial companies. For the empirical part an online survey was conducted in between December 2010 and January 2011. 1110 Finnish non-financial companies were asked to participate out of which 86 applicable responses were received. This constituted overall a 7,7 % response rate.

The results of the survey study showed that company size, quantity of FX exposure and the number of foreign currencies used by a company in its operations have positive relationships with the sophistication of prevailing FX exposure management practices. Still the study found that there are significant variations in managing practices of companies with similar FX exposure profiles. Overall performance evaluation was the most neglected component of FX exposure management.

Keywords: Currency, Foreign Exchange, FX, Foreign Exchange Exposure
            Management, Foreign Exchange Risk Management, Hedging

Tiivistelmä

Ulkomaanvaluutat ovat olennainen osa kansainvälistä liiketoimintaa. Niiden rooli hyväksytään kaupan edellytyksenä, mutta usein valuuttakurssimuutoksiin liittyvien riskien merkitys jätetään huomiotta. Aiemmat tutkimukset ovat osoittaneet aktiivisen valuuttahallinnon hyödyt yritykselle. Harvat tutkimukset ovat kuitenkaan tarkastelleet kokonaisvaltaisesti valuuttahallinnon käytännön menettelytapoja. Tämän tutkimuksen tavoite on tarkastella ja arvioida valuuttahallinnon menettelytapoja kansainvälistä liiketoimintaa harjoittavissa yrityksissä, poislukien rahoitus-alan yritykset.

Tässä tutkimuksessa esitetään valuuttahallinnon teoreettinen mallinus, jossa valuuttahallinto on jaettu viiteen osioon. Aiemmat tutkimukset ovat tyytyneet toteamaan yritysten välillä olevan merkittäviä eroja valuuttahallinnon menettelytavoissa. Tässä tutkimuksessa puolestaan väitetään, että menettelytavoissa on riittäviä yhteneväisyyksiä yhteisten kehityspolkujen havaitsemiseksi. Yhteneväisyydet mahdollistavat yritysten arvioimisen ja vertailun valuuttahallinnon menettelytapojen suhteen. Tutkimus sisältää myös itsearviointi- ja vertailutyökalun yritysjohdolle.

Tutkimuksen empiirinen osuus luo katsauksen hallitseviin valuuttahallinnon menettelytapoihin suomalaisissa yrityksissä. Empiiristä osuutta varten toteutettiin internetkyselytutkimus Joulukuun 2010 ja Tammikuun 2011 välisenä aikana. Kyselykutsu lähetettiin 1110 suomalaiseen yritykseen, jotka harjoittivat kansainvälistä liiketoimintaa. Kyselyyn saatiin 86 tutkimukseen soveltuvaa vastausta, joista muodostui vastausprosentiksi 7,7 %.

Tutkimuksen tulokset osoittivat, että yrityksen koolla, ulkomaanvaluuttavirtojen määrällä ja kaupankäyntivaluuttojen määrällä oli positiiviset suhteet valuuttahallinnon menettelytapojen kehittyneisyyteen. Tästä huolimatta tutkimuksessa havaittiin, että menttelytavoissa oli merkittäviä eroja samanlaisen profiilin omaavien yritysten kesken. Valuuttahallinnon suorituskyvyn arvioinnin huomattiin olevan yleisesti heikoiten toteutettu valuuttahallinnon osio.

Avainsanat: Ulkomaanvaluutta, Valuuttahallinto, Valuuttariski, Valuttasuojaus

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1   Introduction

Foreign currencies are an integral part of doing international business. With globalization an increasing number of goods and services flow from one currency zone to another. Simultaneously the global investment environment is rapidly growing and asserting increasing influence on foreign exchange rates. A larger and faster global economy makes foreign exchange an important issue to a growing number of companies and its significance ever greater to individual companies particularly in open economies such as Finland[1].

For companies foreign exchange (FX) can be a source of significant risk and opportunity because of the uncertainty of future exchange rates. Entering into for example a purchase or a sales contract involving foreign currencies exposes companies to parity fluctuations i.e. the fluctuations in the value of one currency in terms of another. Typically only the profits from the contract are affected by any gains or losses brought about by the parity shift. Thus, the impact of this exposure can quickly increase as the effect of a parity shift to the value of the contract is leveraged naturally by the profit margin of the company.

The effect of the natural leverage combined with significant volatility that the FX markets tend to experience should be recognized by companies. Considering a contract with a 30% profit margin, then a 1% parity shift would have a 3,33% change on real returns from the contract. The effects of the natural leverage increase as the profit margin of the contract decreases. While also considering that a 1% parity shift is common place within a week's time frame, does the nature of FX exposure become clearer. On a larger scale consider that in fact the EUR/USD currency pair experienced

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[1] Finland as an open economy trades with many countries in different currency zones. In 2009 out of the top 30 foreign export and import partners of Finland 20 were countries with national currencies other than the Euro. The combined imports from these 20 countries to Finland were worth 25 500 M€ in 2009 and correspondingly Finland's exports to them were worth 24 900 M€. Source Tulli import and export statistics of 2009.

a 19% parity shift in 2009, the EUR/JPY respectfully a 17% parity shift and the USD/JPY respectfully a 15% parity shift. From this quick overview alone it should be clear enough that FX exposure management is of considerable importance to companies involved in international business. Never-the-less many large companies ranging from airlines to Korean multinational conglomerates who imaginably should have known better have been driven to bankruptcy by underestimating the impact of fluctuating currencies[2].

Several books and studies have been written about foreign exchange in the corporate realm through out the years. Generally this literature has focused on risk management aspects (FERM, Foreign Exchange Risk Management). In addition specialist literature exists in financing dealing with individual foreign exchange instruments, derivatives and business practices. Most general management books on international business, international financing and multinational companies briefly go over similar subjects. On the other hand financial literature includes books and studies on profit making strategies related to foreign exchange and individual instruments. Other significant fields of foreign exchange exposure management literature include taxonomical literature, tackling the nature of exposure, and literature dealing with effectiveness of hedging foreign exchange exposure.

For non-financial companies foreign exchange management is mostly perceived in literature as risk management and focuses on limiting exposure. However, a study of FX exposure management practices by Hakkarainen et al.[3] found that the more experienced the companies are the more inclined they are to accept foreign exchange exposure risk by selectively leaving open positions unhedged. Profit seeking foreign exchange strategies are covered in financial literature along with literature on foreign exchange derivatives, however, a company involved in foreign trade is a different context than a purely financial company engaged in profit seeking activities in the realm of foreign exchange. In the case of an importer or exporter the balancing required between

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[2] Shapiro, A., 2006
[3] Hakkarainen et al., 1996

demands of core business processes and employment of profit seeking foreign exchange strategies exposes the foreign exchange management to elements of two worlds, finance and operational. This study aims to look beyond the conventional risk management approach and to examine connections between the core business processes of non-financial companies and alternative approaches to foreign exchange exposure management.

Foreign exchange management is usually conducted via instruments and services provided by financial companies, e.g. commercial banks, offering varying ranges of services. These companies create the over-the-counter (OTC) means to manage FX exposure. In addition exchange type of market places exist where exchange traded FX financial instruments, e.g. options, are traded. The geographical distribution of these middle men and market places may create differences in the possibilities available to companies in different regions for managing their foreign exchange exposures. These issues can be related to the size of the company in respect of the extent of its international operations as well as the resources available for foreign exchange management.

Majority of FX exposure management literature has addressed the practices of multinational companies and larger companies but there exist a large number of smaller importers and exporters without resources for dedicated financial managers. Still the benefits from foreign exchange exposure management are as real to smaller companies as to larger ones. As the needs of this group of companies have limited exposure in the literature a possible gap in research has been identified. A Finnish survey study into foreign exchange exposure management conducted in the Vaasa area[4] provides some quantitative results portraying the SMEs' foreign exchange management as underdeveloped. Another study[5] examining FX exposure management practices of a larger international Finnish company, Tecnomen, showed that even larger companies' foreign exchange management can be underdeveloped. The challenge in the case of

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[4] Harju, M. & Martikainen, T., 1997
[5] Kiuru, J., 2007

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Tecnomen was tracking future cash flows, a key component of successful FX exposure management.

The financial instruments such as foreign exchange derivatives are somewhat complex and efficiently managing a portfolio of them can be challenging. Financial corporations that deal in foreign exchange instruments provide a limited number of clear and standardised services to go with the instruments. In literature FX exposure management is without exception portrayed as an internal process of an importer's or exporter's financial department. With the limited resources available to SMEs this combination poses a dilemma. Could there be a more or less standardised service aimed at foreign exchange exposure management that the current financial companies could provide to SMEs but are not currently doing so?

The general public's increasing access to OTC financial instruments has been a strong trend in recent years. As accessibility to OTC financial instruments improves the means to manage FX exposure by SMEs eases. This development is complemented by political pressures in Western countries brought on by the recent financial crisis to bring more derivatives to public exchanges and, thus, increase transparency of the market. Were this trend to continue access to and availability of foreign exchange OTC derivatives will increase and likely we will see an increase in interest towards FX exposure management among companies of all sizes.

2   Scope of the study and research question

This study addresses the question of *how to evaluate FX exposure management practices of non-financial companies*. The answer to this question should prove valuable to a number of groups. Foremost it should give companies an objective tool for evaluating their own practices and help in self-improvement. It should also be of use for consultancies by providing a quick tool for assessing a client company's FX exposure

management practices and perhaps provide a basis for categorizing case companies in records for future reference. Another group who could be among beneficiaries from this study are FX management service providers or other companies, e.g. commercial banks, that may be interested in developing standardised services for FX management functions of companies. By providing a solid tool for comparison these companies may identify market segments and develop standardised services for them. The benefits for the scientific community should not be overlooked either. Although a lot has been written on the subject of FX exposure management a unified framework has not emerged[6]. Survey studies for instance would greatly benefit from enhanced cross compatibility of results.

The purpose of this study is to examine the FX exposure management practices of companies involved in foreign trade. This means that the focus will be on non-financial companies that practice import or export activities or companies with foreign subsidiaries which make FX exposure management relevant to their core business operations. Financial companies were excluded in order to assure that FX exposure is an unintended by-product of core business operations and in order to focus on end-users rather than producers of financial services.

The main research question of this study is:

> *How to evaluate FX exposure management practices of non-financial companies?*

The study is guided by three additional questions further decomposing the research question:

- *How do companies manage FX exposure?*
- *Does a common developmental path for FX exposure management practices exist?*
- *How could FX exposure management practices of different companies be compared?*

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[6] Hakkarainen, A. et al., 1996 pg 10

Due to practical limitations the empirical part of this study will be limited to Finnish companies. This limitation, however, ensures that all the companies operate in a similar regulatory environment. This eliminates variations in results due to regulatory differences. The study also attempts to take into consideration the needs of SMEs as the majority of literature focuses on large and multinational companies.

It is important to note that this study does not address the question of why should a company manage their FX exposure. This question has been extensively addressed by a number of prior studies[7] examining the benefits of FX exposure management. The aim of this study is therefore to look at FX exposure management from a more managerial perspective of how to implement FX exposure management by presupposing the need for it.

3   Foreign exchange exposure

3.1. Foreign exchange exposure types

The contemporary literature typically distinguishes between three types of foreign exchange exposures. These include transaction exposure, economic exposure and translation exposure. The categorization of foreign exchange exposure is loosely based on temporal differentiation of cash flows and much variance exists between interpretations by different authors. The only exposure that authors extensively agree upon is the definition of transaction exposure.

Transaction exposure measures the quantity of future cash flows (committed or anticipated) exposed to potential currency exchange rate changes.[8] It comprises of cash

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[7] For a comprehensive review of theoretical arguments for why companies should hedge see Pramborg, B., 2002
[8] Pramborg, B., 2002

flows which require actual conversion of currencies (i.e. transactions) and arises whenever there is a time gap between a company committing to a cash flow and the time of its settlement.[9] It is the simplest source of foreign exchange exposure and the most relevant to most companies. Transaction exposure has the greatest impact on profitability at least in the short and arguably in the medium term, and it is the primary object of foreign exchange exposure management for any company involved in foreign trade.

There is much controversy around the concept of *economic exposure* in literature. As a generalization it is concerned with long term future cash flows that are currently unidentifiable. Glaum[10] defines economic exposure as the future operating cash flows of the company that are exposed to potential currency exchange rate changes. Pramborg[11], however, defines economic exposure to be combination of transaction exposure and competitive exposure. For him competitive exposure consists of unidentifiable anticipated transactions. Yet other authors coin the term economic exposure with operational exposure.[12] The two terms operational and competitive shed light on the dual nature of economic exposure in contemporary literature. On the one hand it has to do with future (operational) cash flows originating from e.g. the company's foreign subsidiaries, foreign direct investments or day-to-day international trade which as Pramborg puts it, are as of yet unidentifiable anticipated transactions. But on the other hand in a more sophisticated manner economic exposure has to do with the international competitive environment of each company.

To illustrate the significance of foreign exchange rate changes on the competitive environment consider a company with a foreign subsidiary. In the case that the exchange rate of the local currency of the subsidiary changes it will affect the costs of its production factors and thus the margins on its outputs. Should the subsidiary have a foreign competitor whose production factors and thus margins were not affected by the

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[9] Glaum, M., 1990
[10] Glaum, M., 1990
[11] Pramborg, B., 2002
[12] Daniels, J., 2004

parity shift then the competitive position between the two competitors has changed. The effects, however, continue as the net profits of the subsidiary are transferred to its parent company. To put it simply parity changes in currency pairs can affect the competitive position of subsidiaries, their net profits and net profits converted to home currencies of parent companies.[13]

Economic exposure differs from transaction exposure in a number of significant ways. Firstly the concept of economic exposure tends to be very company and industry specific. Its effects reach further than when to convert a given amount to or from a foreign currency and at what exchange rate, but it will actually have effect also on size of the amount being converted. It is also note worthy that virtually every company irrespective of whether it is involved in foreign trade or not has economic exposure.[14] As a simplification, however, economic exposure can be thought of as future cash flows that are exposed to potential currency exchange rate changes that will eventually, when they are identifiable, change into transaction exposures.

Translation exposure is a financial accounting technicality and arises when financial accounting statements of foreign affiliates are translated into the home currency of the parent company.[15] It does not reflect realized profits or losses and it is subject to the translation methods used i.e. local accounting standards. The general view of authors[16] on foreign exchange exposure management is that translation exposure should not be hedged because it does not add value to the company. However, survey results have indicated that it is often being hedged. Hakkarainen et al.[17] explain translation exposure hedging by the existence of management compensation schemes which are often tied to financial statements and are thus affected by translation gains and losses.

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[13] For more discussion see Dufey, G., 1972 or examples of competitive exposure in import and export companies provided by Holland, J., 1993, pages 157-161
[14] For more discussion see Laitiainen, T., 1996
[15] Pramborg, B., 2002
[16] See e.g. Dufey, G., 1972 and Pramborg, B., 2002
[17] Hakkarainen, A. et al., 1996

From the point of view of foreign exchange exposure management often a more practical way of differentiating among exposure types is to divide them into contractually based and forecasted exposures. In this way the focus is on real future exposures and the usefulness of this will become apparent later in calculating FX exposure positions.

One additional ambiguity in FX exposure management literature is simply the definition of exposure. Authors use exposure without explicitly informing the reader of their definition and different authors tend to have different definitions. This shows that the concept of exposure in FX is not altogether that straightforward. Unfortunately it contributes to general ambiguity in literature and complicates devising practical applications for FX exposure management. This study adopts a simple definition of exposure to enhance readability: Exposure is the foreign currency value of assets and liabilities that are denoted in foreign currencies. I.e. a company with all assets and liabilities in its home currency except for a USD 1000 bank deposit has an exposure of USD 1000. An important aspect of exposure is that it is not directly proportional to the extent of a company's foreign activities. A company with assets and liabilities denoted in foreign currencies may have no exposure if the assets and liabilities are offsetting e.g. if the above mentioned company has a USD 1000 invoice payable in addition to its bank deposit it then does not have FX exposure.

An important distinction from exposure is risk which can be measured with a number of metrics and is concerned with how much the home currency value of the exposure varies. Authors often use FX exposure and FX risk interchangeably.

3.2. Open position

In the foreign exchange literature the concept of position is used to describe binding commitments to buy or sell a given amount of a currency. It can also refer to the amount

of a currency held by a company at a time. Positions are either long or short depending on whether the company is committed to buying or selling the currency in question, i.e. committing to buying or owning a position in a currency is a long position in that currency. Because currencies always trade in pairs a given position is always simultaneously short in one currency and long in the other. Most companies would speak of positions in terms of the currency of its head office i.e. home currency. A position becomes open when the company has committed to a short or long position in a currency pair. Subsequently the position remains open until it has been closed by resolving the transaction.

The concept of an open position is of importance for companies in calculating FX exposure in different currencies at a given time. The concept of net position becomes relevant when a company has more than one open position in a given currency pair. It is a simple calculation of subtracting short open positions from long open positions in the currency pair. However, minding the time structure of open positions is important as a net position changes if only one of offsetting positions is closed. Similarly to open positions net positions are also described as being long or short.

4 Foreign exchange exposure management

Foreign exchange exposure management is the practice of companies to limit the FX exposure that is inherent in their core businesses. In practice companies take actions to enumerate the extent of exposure and seek ways of managing it. FX exposure management literature has explored the various aspects of effective FX exposure management practices often focusing more on one or another aspect. The lack of a general framework has resulted in fragmented literature with studies focusing rather eclectically on individual aspects. From a review of the literature, however, FX exposure management can be perceived as a comprehensive system with five distinct components. These include policy, position calculation, forecasting exchange rates,

hedging and performance evaluation. Each component has its particular purpose and they work together effectively creating the FX exposure management process.

In this part we will address individually each of the five components. Next part will then draw together current advancements in literature of each component in an effort to form a general framework. This framework will then be used for categorization and ultimately evaluation of individual companies' FX exposure management practices. A categorization of companies that describes the level of sophistication of their foreign exchange exposure management practices would be useful for empirical studies of FX exposure management as well as for companies to conduct self assessment. As this part will show, effective FX exposure management has a number of features which are to a great extent uniform across companies. The categorization would, thus, enable a company to quickly analyze its own situation and see to which component it should next focus its efforts on, in order to improve its FX exposure management practices.

4.1. FX Policy

For any company wanting to manage its FX exposure the first step is to make a decision on committing to the activity. As with any other organizational activity that requires substantial effort and affects broadly the organization, a commitment of the top management is necessary for implementing effective FX exposure management practices. This commitment should be formalized in a FX policy. For an SME an informal policy may be more practical but quickly as the organizational size grows a formal document becomes useful, even necessary to communicate to employees the essential characteristics of FX exposure management to be practiced in the particular company. In a study of foreign exchange exposure management practices in large Finnish companies[18] the authors found that 73% of the companies had either formalized or general documented FX policies.

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[18] Hakkarainen, A. et al., 1996

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In a FX policy a company outlines what FX exposure management means for them and what its aims are. It usually contains a definition of FX exposure, the aim of FX exposure management, the amount of exposure allowed and the hedging methods selected for managing it. It may also contain information about responsibilities and procedures involved in FX exposure management[19]. Large companies have been reported to also include time horizon, permissible derivatives, permissible trading techniques, performance evaluation measures, performance compensation, internal controls and compliance and risk oversight practices. It is natural for a large organization to also document in their policy who has the authority to approve changes to it and exceptions from it[20].

In terms of the aim of FX exposure management, FX policies can be divided into passive and active policies. Companies adopting a passive policy choose not to engage in effective management of their FX exposure. All else falls into the category of active policies which can then further be divided according to the aims set for FX exposure management. A company can either take a risk averse or a profit seeking stance towards its FX exposure. As noted before most literature considers FX exposure management as risk management. Proponents of risk averseness most often point to the efficient market hypothesis and declare that consistent profits are impossible in the FX market.[21] Survey studies' results, however, show that despite concerns raised against profitability of FX exposure management many companies practice profit seeking FX exposure management.[22] These studies are complemented by literature discrediting the applicability of the efficient market hypothesis to the FX market.[23] Without taking sides in this debate it is sufficient to say, in the words of Glaum, that FX risk can "result in

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[19] See e.g. Koh, A., 1997
[20] Wallace, J., 1999
[21] For a detailed discussion see for instance Giddy, I.. & Dufey, G., 1975
[22] In his study Pramborg, B. (2002) reported that 61% of Swedish companies used profit-based evaluation criteria for their FX exposure management. Comparatively 71% of Korean companies included in the study had similar evaluation criteria. Similarly in a study of Finnish companies Hakkarainen, A. et al. (1996) found that 33% of the companies pursued profitable FX trading strategies.
[23] See for instance Alexander, C. & Johanson, A., 1992

gains as well as losses, and by the same token foreign exchange risk management may aim at making profits as well as preventing losses."[24]

A company with an active profit seeking FX policy would aim to increase its assets and decrease its liabilities in appreciating currencies and simultaneously decrease its assets and increase its liabilities in depreciating currencies.[25] A risk averse policy on the other hand would aim the company's efforts towards minimizing exposure in all foreign currencies. While the aim of the policy can be either of the two, most policies define acceptable levels of exposure.[26] Limits to total exposure or targeted exposure levels are commonly defined in policies. Limits to risk metrics are also used as indirect exposure limits.[27] A Finnish study found that companies with more experience in FX exposure management were more likely to take risk and not to set exposure limits[28].

4.1.1. Operational structure

The consensus in contemporary literature supports a policy of centralized FX exposure management.[29] Decentralizing hedging decisions can be costly for a company as it may result in double hedging i.e. hedging separately two transactions in the same currency pair but in different directions of conversion, when at the aggregate level it could have been seen that they offset each other.[30] Decentralization also reduces transaction sizes, increases transaction frequency and requires more employees to manage FX exposure. Thus, centralization can be cost effective and concentrating FX exposure management skills in one place can be beneficial for the treasury in improving its ability to fulfil its

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[24] Glaum, M., 1990, page 65
[25] Holland, J., 1993
[26] Batten and Livermore (1995) found that a general trend in FX exposure management is away from complete elimination of FX exposure.
[27] Pramborg, B., 2002
[28] Hakkarainen, A. et al., 1996
[29] See e.g. Batten, J. and Livermore, A., 1995
[30] The practice of offsetting long and short positions in the same currency is often called matching, but in this study it will be discussed under position calculation.

advisory role in the company.[31] Even though the overall control is centralized often some aspects of FX exposure management must be decentralized. As the other units of the company are most often the sources for transaction exposure, a centralized FX management will have an important responsibility in providing tools and support for those units. Partial decentralization will also enable the company to gather local knowledge[32] and can be organized in a way that local management can take advantage of particular situations with which only they may be familiar with.

Discussion of the way in which to organize FX exposure management is rather limited in literature. Some authors note that there is no generally accepted way to organize for FX exposure management[33]. They point out that companies have adopted a variety of ways in which to cope with FX exposure. Others are somewhat more descriptive. The early stages of FX exposure management are described to be characterized by it being the responsibility of a single person in the company e.g. the finance director, accountant[34] or managing director[35]. This is followed by the employment of a small team of FX specialists as the scale of international trade grows to justify it.[36] Examining characteristics of FX exposure management from the perspective of general organizational structure literature, the functional structure would likely be the one that FX exposure management would gravitate towards. This is because a divisional structure would in turn mean a significant degree of decentralization as business units would manage their exposures separately. As this study presents FX exposure management in four distinct activities (position calculation, forecasting future FX rates, hedging and performance evaluation) it also asserts that companies would most of the time develop towards a functional division of labour along the lines of the four activities within its team of FX specialists.

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[31] In a study of FX exposure management in 14 large Australian companies all of the companies had centralized treasuries. The reasons for centralizing FX exposure management were cheaper rates due to access of the wholesale markets and separating treasury left other units able to concentrate on their core activities. Batten, J. and Livermore, A., 1995
[32] Shapiro, A., 2006
[33] see e.g. Karppinen, A., 1997
[34] Hakkarainen, A. et al., 1996
[35] Harju, M. and Martikainen, T., 1997
[36] Hakkarainen, A. et al., 1996

4.2. Position calculation

In order to effectively manage FX exposure detailed information of all foreign-currency-denominated future transactions need to be gathered and compiled.[37] The information needed includes currency denominations, amounts and maturities for all transactions.[38] This information is then compiled into a FX position calculation which determines the net positions. A net position is calculated for each currency and each maturity separately. The position calculation is then used as the basis for hedging decisions.

A recent benchmark study[39] found that the biggest challenge in effective FX exposure management that companies face is attaining accurate and timely FX exposure data and turning them into accurate position calculations. Thus the importance of position calculations should not be underestimated. In fact significant differences exist in position calculations among companies. Many of the differences arise from decisions concerning how to enumerate transactions with uncertainties concerning their amounts, maturities or both. By conforming to the division of contractually based and forecasted exposures differences among companies due to taxonomical debates can be avoided, i.e. whether an exposure is a transaction or an economic exposure.[40] The only meaningful questions can then be pointed out to be how to forecast the amount and maturity of an exposure and how accurate the forecasting models are.

Contractual exposure is most often simple to calculate. Information regarding contractual commitments in larger companies is gathered using scheduled exposure reports that business units and subsidiaries submit to the head office.[41] A more sophisticated way of conducting reporting is to integrate FX exposure management into

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[37] In effect the only available alternatives to compiling a position calculation are a passive FX policy and hedging each individual transaction separately.
[38] Karppinen, A., 1997
[39] Koester, W., 2010
[40] A Finnish study found that large Finnish companies usually divide FX positions into commercial flow, financial flow and estimated flow. Isokallio, K., 1996
[41] For instance Finnair's business units report their FX exposures to the corporate treasury every three months for the purpose of position calculation. Mattila, T., 1999

a company's IT infrastructure such as an enterprise resource planning system (ERP). However, studies have reported that FX exposure management often relies on separate IT systems and all too often is run on a single Excel sheet.[42] Sources of contractual exposure include for example accounts receivable and payable, capital amounts of loans receivable and payable, purchase and sale orders and interest income and expenses. It must be kept in mind, however, that parity shifts change the home currency value of some contractual positions differently than others i.e. contractual position may have differing systemic relationships with parity shifts. These include e.g. contracts with adjustment clauses linking their prices to exchange rate changes[43] and some financial instruments used in hedging with more sophisticated pricing models. Systemic relationships will be discussed further in 4.2.2.

In literature discussion concerning the accuracy with which maturities of transactions should be reported in a position calculation brings about different suggestions. The suggestions of authors vary between accuracies ranging from days to months for calculating maturities of positions. As the maturities of FX exposures are tracked more accurately so can the time a position remains open be shortened and the company's net exposure be reduced. The appropriate accuracy for a given company depends of course on the nature of the business and frequency of its FX transactions. A relatively frequently proposed model dictates that on a rolling basis a company should aim for daily accuracy for positions expiring during the first week, a weekly accuracy for positions expiring during the following weeks of the first month and a monthly accuracy for the rest of the first year[44]. Often noted is that the accuracy of forecasts regarding the maturity and the amount of future transactions deteriorates the further in the future they are expected to occur[45].

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[42] Edens, C., 2010
[43] Laitiainen, T., 1996
[44] See e.g. Laitiainen, T., 1996
[45] A study of 11 Finnish MNCs found that all of the companies found it difficult to forecast future cash flows beyond six months. Karppinen, A., 1997

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Literature suggests that position calculations should ideally be compiled 1-4 times a month.[46] Pramborg[47] found that over 50% of the large Swedish companies evaluated their FX risk at least weekly. Comparatively the same study found that 56% of large Korean companies evaluated their FX risk at least monthly. A significant positive association was found with the size of the company as well as the size of its FX exposure and the frequency of evaluations. This may be in part because more sophisticated hedging programs require as a prerequisite a more accurate and up-to-date position calculation. Companies should keep in mind that while the position calculation may be compiled at some frequency the net position may also be valued in home currency more often, i.e. marked-to-market. Large financial companies are known to value their net position daily[48].

4.2.1. Forecasted exposure

As mentioned above measuring and accounting for non-contractual exposure in position calculations is often complicated. Non-contractual exposure is characterized by uncertainties concerning the amounts and maturities of the future transactions. The underlying reason for forecasting exposure is that FX exposure management can only protect margins as far as future exposure can be forecasted. All exposure beyond accurate forecasts cannot be hedged and will therefore be exposed to adverse parity shifts.

There are substantial differences in the forecastability of exposure between industries. In some established industries future cash flows can be fairly accurately forecasted over extended periods. For instance some resource based companies are able to forecast their FX exposures 2 to 3 years forward.[49] Companies in more volatile industries, however, can face significant challenges with forecasting exposure beyond their currently booked

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[46] Laitiainen, T., 1996
[47] Pramborg, B., 2002
[48] Saunders, A. and Cornett, M., 2008
[49] Batten, J. and Livermore, A., 1995

orders. Porsche, however, is an example of a company that has managed to develop sophisticated exposure forecasting capabilities. It has been reported that Porsche secured its profit margins in 2004 up to July 2007 by hedging against the rise of EUR/USD[50].

It is important for companies to make a clear distinction between position calculation and hedging decisions. The goal of a position calculation should be to determine the amount of exposure and its maturities to the highest possible degree of accuracy. The decisions regarding how much of the exposure to hedge should be kept separate and should solely be the concern of the hedging activity. Maintaining this distinction is of great significance particularly when forecasting future exposure because it is easy to accidentally incorporate hedging decisions into exposure forecasts. For example the forecaster may be biased towards a currency pair and thus may influence the quantities of forecasted exposure. This could potentially result in hedging twice particularly if the two activities of position calculation and hedging are performed by separate entities in the organization.

Several approaches have been suggested for including non-contractual flows in position calculations. One of the most conventional practices is to use already existing budgets as the basis for forecasting. This would include the examination of purchase and sales budgets and using them either directly as forecasts or modifying them in some fashion. The usefulness of this practice is obviously dependant upon the method of budgeting that a company is employing and subsequently on its accuracy.

Many companies have indicated that forecasting cash flows further than six months into the future is difficult.[51] As a response at least one author has suggested a somewhat crude method of applying a descending probability to budgeted cash flows beyond six months. In this scheme all forecasted cash flows up to six months were included in their full amount and those beyond would be multiplied by a probability of $(1 - (0,2 * (n -$

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[50] Shapiro, A., 2006
[51] Karppinen, A., 1997

6))), where n is the number of the month in question.[52] Certainly an increase in time brings about a degree of uncertainty to non-contractual cash flows, but these views may also reflect the unrealized potential for development in the forecasting methods used by the companies in question.

A frequently raised question in FX exposure management literature is that of how to hedge against uncertain exposure resulting from bid entries. The bids are contractual, however, uncertain. The problem is of considerable importance e.g. for manufacturing companies for whom the size of the contracts they bid for are considerable in terms of their annual revenues. An adverse parity shift in these cases could cause financial distress for the companies. The problem has many challenging dynamics for instance that the size of the exposure is large and thus the price of hedging is great, all the while the realization of the exposure is uncertain. Generally these cases are suggested to be individually assessed for the probability of success of the bid as opposed to using the same probability for all bids or deriving the probability from the maturity of the bid[53].

Individual consideration of all forecasted exposures in most cases is inefficient. This is dependant upon company characteristics such as the frequency and quantity of its FX exposures, but as the quantity of transactions grows the effort needed to evaluate all transactions may become a burden. Never the less, at least whether an exposure is certain or not should be maintained and updated at all times, hence, it is important to keep contractual and forecasted exposures separate in position calculations. Nokia for instance uses a progressive position calculation with three levels of exposures.[54] Individual exposures travel through the levels beginning at the 3rd level, which includes forecasted exposures, followed by the 2nd level, which includes certain exposures that the company is committed to but which have not yet been included in the financial accounting system, and further to the 1st level, which consists of exposures in financial accounting[55]. This type of progressive position calculation is also in agreement with the

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[52] Mattila, T., 1999
[53] See e.g. Laitiainen, T., 1996
[54] Isokallio, K., 1996
[55] See Appendix B for Nokia's position calculation

above discussed nature of economic exposure to eventually change into transactional exposure.

4.2.2. Risk assessment

In order to further assess the extent of their exposure companies have come up with sophisticated methods to improve and complement position calculations. Knowing the net position is paramount but in order to interpret it the concept of effective size is useful.

There are two things that influence the effective size of a position. Firstly currency pairs behave differently which can be depicted by their volatility. Two identical open positions in different foreign currencies of equal value in home currency are most likely not going to change in value equally, i.e. their effective sizes are different.

Secondly the type of asset and liability a position consists of influences effective size. Different assets and liabilities may have different systemic relationships between exchange rate changes and home currency value changes. Where a cash position has a directly proportional inverse relationship, i.e. a 1% parity shift translates to a -1% home currency value change, another asset such as a foreign currency-denominated bond could have a systemic relationship in which direct proportionality does not hold due to e.g. the international Fisher-effect[56].

Some of the methods presented in this part are discussed in literature under hedging.[57] It is important to make the distinction that this study considers them to belong under the

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[56] The international Fisher-effect states that "the spot exchange rate should change in an equal amount but in the opposite direction to the difference in interest rates between two countries" (Eiteman, D. et al., 1998, page 121). For further examples and discussion on these dynamics of exposure see Levi (2005) starting page 288.

[57] It is noteworthy that position calculation is also considered a hedging method by some, and is known as matching in literature. This line of thought, I believe, is a relic from earlier evolutionary stages of FX exposure management literature and its use should be discontinued. Nothing is offset in ascertaining the extent of exposure.

position calculation –activity because no hedging decisions are made. These methods are only used to accurately determine the extent of exposure. Hedging decisions then follow to offset the exposure identified by position calculation.

Cross-hedging

One of the methods that companies use is cross-hedging[58]. It involves covariance analysis across all the currencies in which a company has net open positions. Covariances are then used to calculate net exposures so that long and short positions in different currencies can partially offset each other effectively reducing overall net exposure.[59] It is a probability model used to determine the likelihood that an unanticipated parity shift in one currency pair is offset to a degree by a parity shift in another.[60]

VAR analysis

VAR stands for "Value at Risk" and it is a metric[61] used for measuring risk of loss on a portfolio. It is used for a variety of assets but it is compatible with FX positions. As an output a VAR analysis produces a single home currency value (VAR) which stands for the amount of loss that the net position can incur in one day measured to a certain confidence level[62]. VAR analyses are usually conducted daily by large companies[63] and several methods exist. These include covariance analysis (e.g. RiskMetrics), historic/back simulation and Monte Carlo simulation[64]. RiskMetrics uses a covariance analysis with normal probability distributions and has attracted some criticism

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[58] It should be noted that the term cross-hedging can refer to a number of other ways in which to use correlating currencies, commodities or derivatives linked to them to hedge against unexpected value changes in another currency or commodity.
[59] Karppinen, A., 1997
[60] Holland, J., 1993
[61] Note that VAR is also used to refer to the method which produces the metric.
[62] Usually 95% or 99% confidence levels are used.
[63] Saunders, A. and Cornett, M., 2008
[64] For insight into the details of conducting any of these three analyses Linsmeier and Pearson (1997) is highly recommended reading.

particularly for using normal distribution even for currencies[65]. Historic simulation does not use covariance analysis but instead uses historic market values of current positions to determine probability distributions. Monte Carlo simulation generates additional simulated market value observations that are usually used in conjunction with historic simulation. Naturally companies have made variations to these standard models to produce internal models of their own.

FX policies can use net exposures as their basis for hedging decisions by e.g. setting maximum or targeted levels of net exposures. VAR values can be used in a similar fashion instead of net positions, but they also provide additional information. In VAR analyses each currency position's VAR value is calculated and these values can be used to direct hedging efforts to the positions in which portfolio VAR can be reduced with the least amount of hedging.

Among other methods that companies use to complement position calculations or assess FX risk are stress tests and scenarios[66], linear programming, simulation, sensitivity analyses and various optimization models. Although VAR analysis is often considered a powerful tool it is recommended to use several methods simultaneously due to limitations associated with each individual method[67].

4.3. Forecasting future FX rates

Forecasting is a process of forming a justified opinion regarding the future parity of a currency pair. FX forecasting methods can be divided into market-based and model-based methods. While there are numerous forecasting methods that are being used, the choice of a method should be based on an evaluation of accuracy and correctness of the method.[68] There are several elements in the behaviour of parity of a currency pair that

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[65] See e.g. Rogalski, R. and Vinso, J., 1978
[66] Mattila, T., 1999
[67] Linsmeier, T. and Pearson, N., 1997
[68] Shapiro, A., 2006

can be observed and measured. Parity can shift to one direction or another or it can stay within a range. From these observations it can be further deduced that the degree and direction of change or the lack there of and the time of the change are all measurable elements. Therefore regardless of the method of forecasting the outputs will be forecasts determining the value of one or more of these elements.

Future FX rate forecasts are necessary for companies pursuing an active profit seeking policy. This is natural because forecasts are necessary inputs for selective hedging decisions. As inputs their accuracy will have direct effect on the profitability of FX exposure management. It is important therefore to be able to measure the accuracy and correctness of any forecasting method before, and even more so during, its use as the company's source of information. In contrast, risk averse active policies can be maintained without having opinions on future parities by simply minimizing risk and selecting the most cost efficient hedging method. However, companies with risk averse active policies can also benefit from the use of forecasts in their hedging decisions if the accuracy of their forecasts can be measured.

The accuracy of a forecasting method can be defined as the difference between forecasted exchange rate and actual exchange rate. The correctness on the other hand examines the direction of parity shift and whether the forecasted direction and the real change occur in the same direction.[69] Accuracy and correctness should be assessed in numerical terms. A forecasting method in itself is not profitable, for this it also needs a decision rule.[70] A decision rule would dictate when to act and with what amount. The FX policy of a company should be a source for the variables of a decision rule. Only a combined analysis of these variables would be sufficient to compare and choose the appropriate forecasting method, i.e. the combination of a FX policy and forecasting method.

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[69] Shapiro, A., 2006
[70] Gotthelf, P., 2003

Literature recognizes that a market-based forecasting method can be used to forecast future spot rates[71]. This activity culminates in the pricing of forward rates that are used in forward contracts. Market-based forecasting is based on equilibrium relationships governed by the law of one price, which states that in an efficient market all identical goods must have only one price. The method is a standard mathematical formula which uses inflation rate differentials, interest rate differentials and spot rates to forecast future spot rates. It is often considered the most accurate prediction particularly by those considering FX markets to be efficient. Forward contracts have been found by many studies to be the most popular hedging method[72].

Many different model-based FX forecasting methods exist. FX literature most commonly categorizes them in either fundamental or technical analysis. Fundamental analysis examines the macro economical variables and regulatory policies that are likely to influence a currency's prospects. Technical analysis on the other hand focuses on historical price and volume movements of a currency pair to uncover patterns which repeat themselves.[73] Reviewing all of these forecasting methods is far beyond the scope of this study; however, observing some of the ways in which forecasting practices are used by companies may prove useful in assessing a company's ability to forecast successfully.

Previous studies have found that some companies prefer to use external sources for acquiring FX forecasts while others have developed and employ internal forecasting methods. External sources cited include media such as financial news papers, banks' FX departments and commercial forecasting services. These methods are very common among SMEs which are at early stages of FX exposure management. SMEs use free forecast sources and prefer financial news papers and banks' forecasts.[74] The use of internal methods has been found to be more common among companies with longer

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[71] E.g. Karppinen, A., 1997, Stonehill, A. and Moffett, M., 1997, and Hakkarainen, A. et al., 1996
[72] E.g. Pramborg, B., 2002 and Hakkarainen, A. et al., 1996
[73] Shapiro, A., 2006
[74] Harju, M. and Martikainen, T., 1997

history in the practice of FX exposure management.[75] This finding is understandable when considering the time and effort required to explore and to evaluate the accuracy of different forecasting methods. In addition formulating forecasting methods requires specialized skills that have been asserted to be often out of the reach of smaller companies.[76] However, one would expect companies with more sophisticated FX exposure management practices to evaluate the accuracy of forecasts they acquire from external sources as well, particularly if money is spent on acquiring forecasts from a FX forecasting service.

A study by Hakkarainen et al.[77] indicates that companies view long-term FX rate forecasting to be more difficult than short-term. Many companies do not believe that long-term parity shifts can be forecasted. This issue is related to the more general debate on efficiency of FX markets, as discussed earlier. Interestingly companies have mixed feelings towards short-term forecasting.[78]

In discussing benefits for a company from forecasting future FX rates Holland[79] pays attention to local market information from subsidiaries. He points out that a company can get a comparative advantage over its competitors by forecasting relative price changes in its industry or relative price changes specific to itself. These advantages, allied with knowledge of local conditions, may give the firm an advantage in assessing the impact of real exchange rate changes on the firm. The main effect in this is associated with economic exposure and more accurately its competitive component. However, it raises questions regarding the value of local market information that firms' subsidiaries may have. Particularly in the case of exotic foreign currencies local subsidiaries may be valuable sources of information for future FX rate forecasting.

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[75] Hakkarainen, A. et al. (1996) found that companies in which FX policies had existed for more than seven years placed more emphasis on internally generated forecasts where as companies with FX policies in place for less than seven years placed more emphasis on the views of other players in the market.
[76] E.g. Pramborg, B., 2002
[77] Hakkarainen, A. et al., 1996
[78] Hakkarainen, A. et al., 1996
[79] Holland, J., 1993

4.4. Hedging methods

One way of looking at the hedging possibilities available to companies is to categorize financial transactions according to counterparties involved in them. For the most extensive case, that of a MNC, four major choices exist in implementing active foreign exchange exposure management. Firstly the MNC can transfer funds internally between parent and subsidiary, and between subsidiary and subsidiary. Secondly all units of the MNC can transact in the offshore or Eurocurrency market (the international financial market). Thirdly all units of the MNC can transact in their locally based capital and foreign exchange markets. In addition each unit may have access to another unit's local markets through their subsidiaries; the funds would then be internally transferred. Finally the payments to suppliers and receipts from customers are a source of domestic and foreign currency and thus adjustments to payment terms can be used.[80] The same categorization can be adopted for any company by minding the company specific parameters. For instance a domestic SME would not have foreign subsidiaries and thus its choices would be more limited.

In categorizing hedging methods FX exposure management literature commonly likes to make a distinction between hedging techniques that involve the use of financial instruments and other techniques. The former are grouped under the term external hedging techniques and the latter are denoted internal hedging techniques. From the perspective of position calculations, as discussed previously, it is often not enough only to account for external methods. In fact in hedging literature the position calculation is in itself an internal method referred to as matching inflows and outflows. This categorization has some other problems as well, as for instance in the case of MNCs or conglomerates where the central treasury may act as a bank, and a market for financial instruments within the company may emerge. These problems aside the division into internal and external hedging techniques serves well enough for the purpose of this study.

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[80] Holland, J., 1993

There is strong evidence in literature supporting the view that companies prefer to use internal hedging techniques before turning to external techniques.[81] This is because internal hedging is considered to be more cost effective than using financial instruments.[82] Support for this assertion can be found from Pramborg's[83] survey study. He reports that there is a positive correlation between company size and extent of the use of external techniques. Furthermore he concluded that expenses associated with setting up a hedging program are often the reason not to use any external hedging as economies of scale are a factor of importance in using financial instruments.

The amount needed to be hedged, i.e. the net exposure, is not directly proportional to the extent of foreign operations of a company. Companies' net exposures start at a low level when they enter into international trade. Very quickly, however, as the magnitude of companies' international trade grows net exposures in absolute terms reach their peak levels.[84] The quick rises in FX net exposures are most likely due to passive policies and undeveloped FX exposure management practices. As companies' international businesses grow the net exposures begin to decline. Evidence from literature[85] suggests that this decline continues ever after except perhaps in some instances where the treasuries have engaged in massive FX speculation. The decline of net exposures is certainly to some extent explained by the increase in sophistication of FX exposure management as the companies grow, however, another factor of importance is at play. As companies advance towards becoming MNCs they trade in ever growing number of currencies. The diversification into more currencies begins to reduce the net exposure due to the portfolio effect: the decreases in value of some currencies are offset by increases in the value of others. While some authors advice companies to

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[81] See e.g. Holland, J., 1993
[82] Pramborg (2002) found that Swedish firms that chose not to use derivatives for hedging did so because associated expenses relative to expected returns were higher and because other means were considered to be more effective. In the case of Korean companies the top reasons were difficulty in pricing and valuing derivatives and insufficient exposure, respectively.
[83] Pramborg, B., 2002
[84] Pramborg, B., 2002
[85] Glaum (1990) points out that internationalization increases the portfolio effect which in turn reduces a company's FX exposure.

geographically diversify for the sole purpose of reducing FX exposure[86] this may be taking it to extremes. None-the-less the portfolio effect can be used by smaller companies as well by actively seeking to diversify their currency portfolio, i.e. increase the number of currencies in which they conduct business. Also what should be taken from this relationship between the extent of international operations and the net exposure of a company is that in fact it is the comparatively smaller companies that require FX exposure management more or at least that smaller companies would greatly benefit from devoting resources to it and adapting active policies.

4.4.1. Internal hedging techniques

Internal hedging techniques cited in literature include at least the following: leading and lagging, matching inflows and outflows[87], inter-company netting of receipts and payments, domestic (home) currency invoicing, adjustment clauses in sales or purchase contracts, currency portfolio diversification, currency portfolio correlation analysis, geographical diversification of operations, transfer pricing agreements and adjustments to internal financial flows such as royalties or fees. The unifying element with these techniques is that usually their use concerns solely the company itself.

Differences exist in the popularity of internal hedging methods between companies of different sizes and different nationalities. In a study focusing on larger companies[88] most popular internal hedging techniques were found to be inter-company netting, domestic currency invoicing and leading and lagging. The same study reported of differences in internal hedging between Swedish and Korean companies. Another study focusing on smaller companies[89] found the most popular methods to be invoicing currency selection and currency portfolio diversification. We will now go into more details of selected techniques.

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[86] Stonehill, A. and Moffett, M., 1997
[87] Already discussed above under position calculation.
[88] Pramborg, B., 2002
[89] Harju, M. and Martikainen, T., 1997

Contractual Adjustments

A company can influence the contractual part of their FX exposure by adjusting its own terms of trade or seek a FX risk sharing agreement with their business partner. One way in which companies can do this is by adding an adjustment clause to sales or purchase contracts. A clause can work for instance by effectively creating an exchange rate channel i.e. so that if the parity changes considerably during the running time of the contract then the price will change to offset the parity change. Another commonly used method is to adjust the currency of trade.[90] Most often this means home currency invoicing, thus eliminating the transaction exposure of the contract in question. However, not all companies are able to make these adjustments to their contracts because of e.g. established business practices or competitive forces.

Internal Trade

Large companies with foreign subsidiaries have a variety of ways in which to influence their FX exposure by making adjustments to the variables of internal trade. Adjustments in royalties, managerial or legal fees, transfer prices and invoicing currencies can be used to adjust net exposures. Adjustments to internal trade are, however, subject to government regulation in many countries and their use is case specific. Widely used internal hedging techniques involving internal trade are leading and lagging and netting, both of which deserve separate examination.

Leading and Lagging

Practiced by companies with foreign subsidiaries, leading and lagging is the practice of making adjustments to credit terms between its units.[91] In effect it is speeding up or slowing down of currency flows from one unit of a company to another. It can be used

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[90] Survey study by Harju and Martikainen (1997) found that the most used internal hedging technique by Finnish SMEs (43%) was choice of invoicing currency.
[91] Holland, J., 1993

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with a risk averse as well as a profit seeking FX policy, however, a complementing forecasting program is necessary for it to be used for profit seeking. Holland[92] asserts that forecasts of the expected development of exchange rates for a 12 month period are essential in developing a leading and lagging –policy. These are then used to determine the relative strengths of currencies which are further used to craft guidelines for subsidiaries to follow. A centralized FX exposure management policy can thus be seen as an important prerequisite for the company to effectively use leading and lagging. It is also worth noting that some governments regulate leading and lagging practices[93].

Netting

Netting is a popular internal hedging technique[94] and it can be practiced by companies with foreign subsidiaries. It involves a scheduled calculation of net amounts owed by each unit of the company to other units of the company. In other words a calculation of payments and receipts originating from trade within the company is conducted. Afterwards only the net amounts are transferred to minimize transaction costs. When flows in several currencies are involved foreign exchange conversions can be a source of significant transaction costs. With many subsidiaries generating a significant number of multicurrency payments and receipts netting can become highly complex.[95] In addition netting involves choosing the timing of settling net amounts and thus inherently involves taking a view on future development of foreign exchange rates. Netting is subject to government regulation in many countries. Centralized FX exposure management and effective position calculation are prerequisites to netting. Computerised modelling in conjunction with netting can provide significant savings for the company[96].

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[92] Holland, J., 1993
[93] To demonstrate the popularity of leading and lagging, over 50% of the large Korean companies participating in a survey study by Pramborg (2002) used it.
[94] Pramborg's (2002) survey study found that over 60% of Swedish listed companies used it as part of their FX exposure management practice.
[95] Holland (1993) provides a useful example of netting in a MNC and a linear optimization model for resolving transaction cost minimization. Pages 192-198
[96] Holland, J., 1993

4.4.2. External hedging techniques

External hedging techniques involve contracts with external parties that are often in the form of financial instruments. They include at least the following: forward contracts (OTC), futures contracts (exchange-traded), swaps, options (OTC or exchange-traded), options on futures, non-deliverable forwards (NDF), foreign denominated debt, foreign currency bank accounts, margined FX trading accounts and money market hedging. Extensive review of these instruments and hedging strategies associated with them is beyond the scope of this study. For specific details readers are referred to dedicated literature, of which there are volumes[97]. A few characteristics, however, will be considered that are beneficial for this study.

Forward contracts are widely reported as the most common external hedging technique used by companies[98]. Options are considered more expensive, but they are better for hedging forecasted exposure because they do not need to be exercised. Particularly compounded options (options on options) are recommended for hedging forecasted exposure from bid offers[99]. The forward and money market hedging techniques both secure a fixed exchange rate and are better tools for a risk averse policy. Leaving open positions or using options on the other hand leave room for value fluctuations and are more suitable for profit seeking policies.

A rather recent development in the foreign exchange market is the emergence and popularity of electronic FX spot trading platforms. These platforms are primarily used for speculation and their recent emergence may be a reason why their hedging potential has not been addressed by literature. None-the-less, these platforms provide users with a number of advantages including tight spreads, significant liquidity, quick execution, easy access and perhaps most importantly margined accounts. With a margin requirement of 1-2% their use may be cost effective compared to options for instance.

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[97] See e.g. Kolb and Overdahl (2007) for detailed descriptions of most these instruments.
[98] E.g. Pramborg (2002) found that ~80% of companies used OTC forward contracts.
[99] Laitiainen, T., 1996

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Due to their electronic nature the platforms enable the construction and automation of complex hedging strategies.

While the use of external techniques is indicative of a more advanced FX management practice so can the relationship a company has with its derivative provider. A company in its early stages of FX management seeks to build a foreign exchange relationship with a bank that already is providing it with other financial services. The early relationship is characterised with the bank providing the company with advice on alternative derivatives and to supply them at market prices. As a more active policy is adopted or trading volumes increase the relationship becomes more profitable for the bank and the company may be able to establish foreign exchange relationships with more than one bank. Finally when a company is an active trader in foreign exchange markets, then bank margins become narrower as the company seeks inter-bank spreads. If the company has the means to make very large deals it may enter into a wholesale relationship with banks and act much like a bank would.[100] However, as capabilities for use of internal methods of hedging improve the need for external hedging is expected to be reduced.[101]

4.5. Performance evaluation

The purpose of performance evaluation is to assess the quality of current FX exposure management practices. It is the process of obtaining, analyzing and recording information about recent performance such as successes, failures and profitability by means of a select set of evaluation metrics. As the saying goes "what cannot be measured, cannot be managed".

The central performance criterion for evaluation of FX exposure management is the aim of a company's FX policy. In fact the FX policy itself should list the metrics by which

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[100] Canaday, J. and Feenstra, F., 1991
[101] Holland, J., 1993

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FX exposure management is to be measured by. It is critical that the performance measurements are aligned with the aims of the FX policy. A mismatch between policy and performance measurement such as evaluating a risk averse FX policy by measuring its profitability will increase confusion and most likely fail in effectively reducing risk.

The aims of active FX policies can be categorized into risk averse and profit seeking policies. Therefore there are two primary performance metrics correspondingly. Risk can be measured by the volatility of the home currency value of net exposure and value addition by measures of profitability. Alternatively a company can use a risk-adjusted performance metric such as VAR, in which volatility and profitability both are considered.[102] These three types of metrics form the basic FX exposure management performance measures from which most companies choose when a single metric approach is adopted.

Literature recommends using more than one metric for FX exposure management performance evaluation[103]. For example VAR alone is not sufficient in assessing the over-all success of FX exposure management because developments in some areas of FX exposure management, such as forecasting future FX rates, are not reflected in changes of VAR. The five separate components of FX exposure management that are identified by this study can be used as a basis for performance evaluation. The performance of individual components of position calculation, future FX rate forecasting and hedging can be individually evaluated with specific numerical metrics. Some of the metrics for these components have already been discussed in previous parts. Additionally it is recommended that the FX policy go under a formal review every two to three years to make sure its applicability to current conditions[104]. Using several metrics helps to track and reward improvements in performance as well as to allocate resources to the areas needing extra effort. However, extensive reporting can be

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[102] Pramborg, B., 2002
[103] Majority of the 31 MNCs included in the study by Wallace (1999) used more than one performance evaluation metric for measuring FX exposure management performance.
[104] Wallace, J., 1999

a big effort for small companies and thus it is presumable that smaller companies prefer to use fewer evaluation metrics.

There are very many different metrics that are used for performance evaluation. No standard set can be identified and companies have to choose by themselves the ones that they judge to suit best their needs and capabilities. Some aspects, however, are quite important and it is worth looking into measuring their performance. One of them concerns position calculation evaluation. Position calculations which include forecasted exposure need to be measured for forecast errors. A study by Wallace[105] of 31 MNCs found that 75% of the companies with risk averse policies (6 of 8 companies) did not control their forecast errors. It is important to keep in mind that even the best traders, systems and controls cannot prevent losses from derivatives hedging an exposure that does not exist[106]. Another important measurement that concerns companies which use future FX rate forecasts is measuring the accuracy of the forecasts. Hedging performance should be measured as well by frequently marking-to-market the outstanding hedges as well as the underlying exposures. Hedging performance evaluation needs a benchmark for comparison but no benchmark has become a standard practice. Because the choice of a benchmark can drive hedging results to cluster around it, a benchmark should be chosen with care[107]. Therefore the aim of the FX policy should naturally be considered when choosing a benchmark to promote a common direction.

Performance compensation is a common practice particularly in larger companies to direct attention and to improve performance of employees. Similarly to mismatches between policy and performance measurement, a performance evaluation metric that is not aligned with management and employee evaluation and compensation will either be ineffective or require change in how personnel are evaluated and compensated[108]. Over

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[105] Wallace, J., 1999
[106] Wallace, J., 1999
[107] Wallace, J., 1999
[108] Wallace, J., 2002

half of the 31 MNCs included in a study[109] compensated their traders based on performance. Active hedgers among the MNCs used stronger positive correlation between performance and bonuses. Examining whether people involved in FX exposure management are compensated on the basis of the performance of FX exposure management could be used as a proxy for sophistication of the performance evaluation component.

The two activities of segregating the back office function and organizing risk oversight are associated with performance evaluation of FX exposure management. They have more to do with compliance to policies than performance per se, however, the risks associated with the lack of these procedures and the need to segregate them from personnel performing other activities of FX exposure management warrant their placement under performance evaluation.

Back office activities of FX exposure management such as confirmations, accounting and settlements need to be performed by different personnel than trading.[110] The history of derivatives usage in companies is littered with examples of massive losses from FX speculation.[111] An important point to understand, however, is that these losses have been a cause of failures in risk management systems and controls rather than any inherent risk in the use of derivatives themselves[112]. Shapiro[113] provides a list of practices recommended to be implemented in companies engaging in active FX exposure management:

- Those trading derivatives should be separated from those who monitor them. This allows for an independent review of FX exposures by preventing faulty book keeping.

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[109] Wallace, J., 1999
[110] Wallace, J., 1999
[111] For instance see Dunne, T. et al., 2003
[112] Shapiro, A., 2006
[113] Shapiro, A., 2006

- Derivatives positions should be limited and they should be marked-to-market value every day to avoid massive losses.

- Compensation schemes should place some of the risk on the shoulders of those taking the risk to make them more cognizant of the risks they are taking.

- A system of scanning for and quickly reacting to early warning signals should be put in place. It is not sufficient to pay attention only to things that look bad, but to all things out of place such as excessive profits.

A study of the FX exposure management practices of 31 MNCs[114] confirms the importance of segregating back office functions. 93% of the 31 MNCs did not allow their traders to confirm, do accounting or settle their trades. These actions are necessary to prevent frauds in FX exposure management function.

Risk oversight deals with compliance by all parts of the company with the FX policy. Companies are recommended to have a risk oversight committee consisting of senior management to ensure that procedures of the FX management comply with the approved FX policy.[115] The risk oversight committee does not partake in tactical decision-making but reviews FX strategies, exposure limits and may approve when necessary exceptions to FX policy. Companies with significant FX exposure to manage should also have a compliance function ensuring operational compliance with policy. Its tasks include monitoring that only approved derivatives are used, trading procedures are followed, exposures are properly calculated and FX risk correctly measured. The compliance function set up for this purpose can be a part-time or a dedicated function depending on the extent of FX exposure management. 90% of MNCs included in a study[116] had risk oversight practices consisting of a risk oversight committee (69%), compliance function (84%) or both (61%). By contrast a study by Hakkarainen et al.[117] reported that 17% of respondents did not monitor implementation of hedging decisions at all.

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[114] Wallace, J., 1999
[115] Wallace, J., 2002
[116] Wallace, J., 1999
[117] Hakkarainen, A. et al., 1996

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5   Framework for evaluating FX exposure management practices

Previous studies have indicated that translation exposure should not be hedged and that the competitive component of economic exposure is highly company and industry specific. Considering the practicality of FX exposure management it is evident that transaction exposure is essential but in addition there is a need for companies to account for future foreign currency denominated cash flows currently unbound by contractual agreements. As such a framework is needed that will account for both transaction exposure and the operational part of economic exposure and concentrate on the division of exposures into contractual and forecasted exposures.

Reviewing literature has revealed five distinct components that compose effective FX exposure management. FX policy is the first component and the basis upon which other FX exposure management components are built. A position calculation is performed to establish the net exposure which is used as a basis for the following FX exposure management activities. Forecasting future FX rates follows, but it can be considered as a more advanced FX exposure management activity and is not a necessity for risk averse policies. Hedging is another distinct component. It is the only activity which actually affects the FX exposure and it uses the three preceding components of policy, position calculation and forecasting future FX rates as its inputs. The last activity is performance evaluation which assesses the output of the FX exposure management process and the performance of its individual components. Performance evaluation should have a dynamic relationship with the other components so that the overall performance of FX exposure management could be improved. Despite the dependencies that the components have with each other, they are in themselves distinct iterative processes. The FX exposure management process can be depicted in a framework diagram such as in Figure 5.1.

Figure 5.1 – FX Exposure management framework
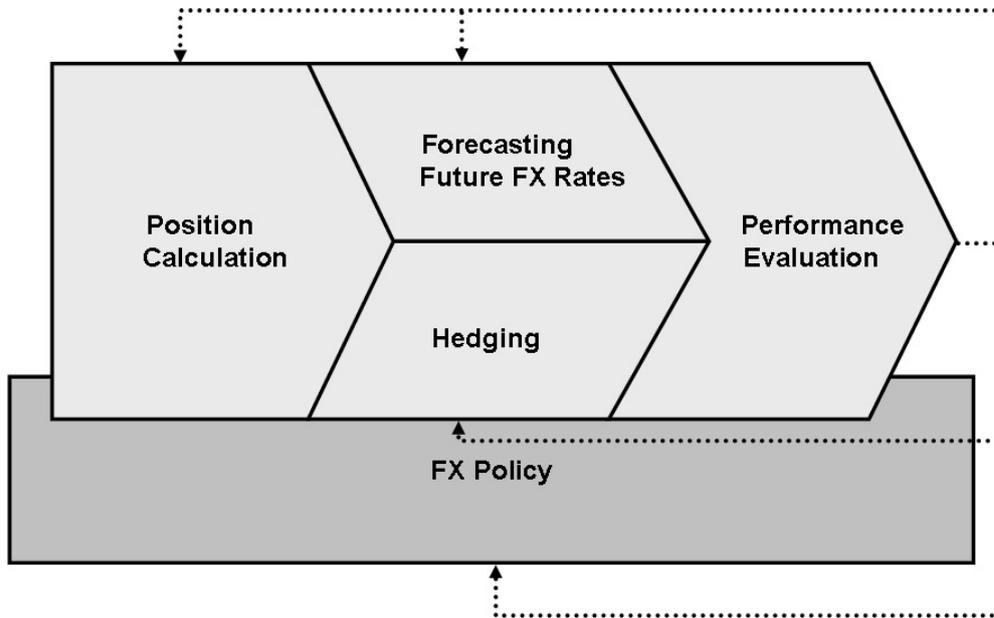
The aim of this study is to be able to evaluate the FX exposure management practices of companies in comparable terms. This can be achieved by firstly evaluating each component separately. Earlier studies have reported a range of ways in which companies perform the activities of the components depicted in this study. Additionally to an extent a hierarchy has been established among the practices available within each component. These can be used as a basis for an evaluation of the sophistication of each component and as a proxy for the effectiveness of the overall FX exposure management practice.

Being able to compare the sophistication of individual components between different companies leads to the challenge of combining the individual evaluations into an overall evaluation of the effectiveness of the FX exposure management practice of a company. The underlying assumption here is that a balance of sophistication should be maintained between the individual components. To illustrate this idea consider a company with a highly sophisticated FX exposure management practice in all areas except for its position calculation which is performed infrequently and fails to account for a significant portion of the company's exposure. The shortcomings of the position

calculation component will obviously affect the overall performance and no degree of further improvement in e.g. the hedging activity will improve the overall performance. Due to these interdependencies the evaluation should be balanced so that it can point out which components require efforts of improvement in order to improve the overall performance of the FX exposure management practice. To be able to measure the sophistication of FX exposure management practices of companies and to be able to do company comparison a survey study is undertaken.

6   Survey study

A survey study was constructed to study the FX exposure management practices of companies. The survey was conducted between December 2010 and January 2011 as an online questionnaire. An e-mail invitation to participate in the study was sent to 1110 Finnish non-financial companies involved in foreign trade. The companies selected for the study were gathered from a database of Finnish companies involved in foreign trade compiled by Finpro and the list of companies publicly listed in the Finnish stock exchange (OMX Helsinki). The invitation was directed to the manager responsible for FX exposure management or the chief financial officer depending on availability of contact information. Of these companies 110 participated in the survey and a total number of 86 responses were applicable for this study. 24 responses were excluded from further analysis because they indicated that 0% of their annual revenues and expenditures were in foreign currencies[118]. The applicable responses constituted an overall 7,7 % response rate. A copy of the survey can be found in appendix A. The survey was translated into Finnish and the respondents had the opportunity to choose between answering in Finnish or English.

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[118] At least partially the loss of 24 responses is attributable to the question setting for *ii. Foreign exchange exposure*. 10% was the smallest positive choice in the question for the portion of revenues and expenditures in foreign currencies. Among the 24 companies some likely had positive foreign exchange exposures despite choosing 0% for both revenues and expenditures.

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This part will first go over the variables used in the study and then progress towards describing the sample in more details. Finally the empirical results are presented for each dependant variable in accordance with the five FX exposure management components giving and overview of each component.

6.1. Variable definitions

Explanatory variables:

Size of a company and the extent of its foreign exchange exposure have been extensively shown by studies to be strong explanatory variables for the sophistication of FX exposure management practices[119]. In addition to these two variables the number of foreign currencies a company conducts its business in may be of interest. Therefore these three variables are used as the explanatory variables in this study. The components of FX exposure management identified in this study and their individual aspects depicted by the dependant variables are evaluated in terms of sophistication by using the explanatory variables.

i. Size (A1[120])

Size of a company is measured in this study by its annual revenues. Revenue was chosen because it accounts for the core business and real cash flows. Net assets used by some studies could have been an alternative measure; however, net assets have more importance for studies of translation exposure than transactional exposure. Several studies have reported changes in FX exposure management practices as company size grows[121]. Further more companies were divided into five size categories based on annual revenues (*r*):

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[119] See e.g. Hakkarainen, A. et al., 1996 and Pramborg, B., 2002
[120] A1, A2, A3, and so forth refer to the question numbers on the survey. See appendix A.
[121] See e.g. Hakkarainen, A. et al., 1996 and Pramborg, B., 2002

1. $r \leq 2 \ M€$
2. $2 \ M€ < r \leq 10 \ M€$
3. $10 \ M€ < r \leq 50 \ M€$
4. $50 \ M€ < r \leq 500 \ M€$
5. $r > 500 \ M€$

Size categories were selected to reflect the EU recommendation 2003/361/EC for SME size definitions. This accounts for the three smallest categories. For the purpose of this study it was perceived useful to divide large companies further into two categories. Logarithmic scale was chosen to set the division between the two largest size categories.

ii. Foreign exchange exposure (A2)

Having foreign exchange exposure is a prerequisite for managing it. As the size of FX exposure grows it also becomes more important to manage and more elaborate methods are required from an operational perspective. Also as exposure grows new tools like FX derivatives become financially feasible options. Thus it is presumable that foreign exchange exposure is positively related to the sophistication of FX exposure management practices.

This study uses the average of the percentages of a company's annual revenues and expenditures that are denominated in foreign currencies multiplied by its annual revenue as a proxy for foreign exchange exposure. There was no indirect way to assess the operating profit of the participating companies and directly asking it was perceived to influence survey response rate negatively. Thus, the formula for calculation the foreign exchange exposure was selected to give a good estimate across companies. Also a similar measure was used at least in one previous study[122].

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[122] Pramborg, B., 2002

iii.   Foreign currencies (A3)

Ten foreign currencies most used[123] by Finnish companies in foreign trade were selected in addition to an 11th category encompassing all other foreign currencies. In addition to foreign exchange exposure the number of foreign currencies a company conducts its business in is a proxy for the extent of its foreign business. A company with more currencies to manage is presumably more likely to adopt FX exposure management practices and a positive relationship is expected between this variable and the sophistication of FX exposure management practices in companies.

Dependant variables:

The dependant variables in this study represent companies' decisions on how to manage FX exposure. This examination is built around the five components of FX exposure management examining each component individually.

FX policy:

a.   Policy format (A4)

Policy format measures to what extent companies have progressed in developing and formalizing their FX policy. Earlier studies[124] have used similar categorizations.

b.   Policy aim (A5)

Empirical evidence[125] suggests that companies with more sophisticated FX exposure management practices are more prone to seek profits from FX exposure management. Conversely less developed companies follow more risk averse policies. Thus, it would be presumable that the explanatory variables would be positively related to active and profit seeking FX policy aims. Companies with a policy format of no policy were not included in the analysis.

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[123] Source Tulli import and export statistics of 2009, Finland's 10 largest trade partners measured by combined value of imports and exports excluding all countries using EUR as their domestic currency.
[124] See e.g. Hakkarainen, A. et al., 1996
[125] See e.g. Hakkarainen, A. et al., 1996 and Doukas, J. and Lang, L., 1995

c. *Centralization (A6)*

Literature considers centralized FX exposure management as a best practice. However, some authors[126] have pointed out the value of local market knowledge. This would suggest a development from decentralized to centralized and further to a hybrid model as FX exposure management becomes highly sophisticated. Companies with a policy format of no policy were not included in the analysis.

d. *Policy components (A7)*

This is a measure of the degree of sophistication of the FX policy. It is evaluated quantitatively on a scale of 0-15 with all items valued equally. Companies with a policy format of no policy and general guidelines which are not documented were not included in the analysis.

Position calculation:

e. *Position calculation (B1)*

This dummy variable measures whether a company uses a position calculation to manage its FX exposure. This variable is assigned a value of 1 in the case a company uses a position calculation and 0 otherwise.

f. *Position update (B2)*

This variable measures the frequency with which a company reviews the size of its FX exposure. When the updating frequency is low reacting to changes in FX exposure become delayed and new positions remain open for longer periods. It is presumable that updating of the position calculation becomes systematic and more frequent as the sophistication of FX exposure management increases. Only companies that had a position calculation were included in the analysis.

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[126] Daniels, J., 2004

g. *Time horizon (B3)*

Unsophisticated FX exposure management practices are expected to have short time horizons on their position calculations. As exposure forecasting capabilities improve time horizons are expected to increase. However, the ability to forecast exposures may be hindered by industry dynamics and divergence is expected to be larger among companies with more sophisticated practices. Only companies that had a position calculation were included in the analysis.

h. *Position calculation contents (B4)*

This variable represents the sophistication of the position calculation and whether a company employs exposure forecasting. Only companies that had a position calculation were included in the analysis.

i. *Use of IT (B5)*

The use of IT dramatically improves accuracy and timeliness of position calculations and overall FX exposure management capabilities. This variable assess the sophistication of IT infrastructure used for purposes of FX exposure management. Presumably the explanatory variables are positively correlated with the use of IT. Only companies that had a position calculation were included in the analysis.

j. *Analytic methods (B6)*

Analytic methods improve exposure and risk assessment which may lead to cost reductions and improvements in performance of FX exposure management. This variable measures the range of analytic methods employed by companies and uses a quantitative analysis with a scale of 0-9 and all items equally valued. Only companies that had a position calculation were included in the analysis.

Forecasting future FX rates:

k. *Forecast usage (C1)*

Use of future FX rate forecasts can improve hedging decisions and are needed by companies with active profit seeking policies. Earlier studies have shown that companies find long-term forecasting difficult and thus, it is presumed that less sophisticated companies will use only short-term forecasts. The use of forecasts is expected to be positively related to the explanatory variables.

l. *Forecast source (C2)*

Empirical evidence[127] shows that companies with more sophisticated FX exposure management practices prefer to develop internal forecasting capabilities. Smaller companies have been shown to prefer external sources[128]. Thus, a positive relationship between size and internalization of future FX rate forecasting is presumed. Companies that did not use any forecasts were excluded from analysis.

m. *Local knowledge (C3)*

This variable represents the use of local knowledge from foreign subsidiaries in FX rate forecasting. Particularly in smaller economies, it may be that local managers have better access to local information which could be valuable for forecasting future FX rates. The use of local knowledge is expected to increase with company size.

Hedging:

n. *Internal hedging (D1)*

This variable measures the range of internal hedging techniques used by a company. Some techniques like netting are only available to larger companies so positive

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[127] Hakkarainen, A. et al., 1996
[128] Harju, M. and Martikainen, T., 1997

relationship between size and the extent of internal hedging techniques use is expected.

o. External hedging (D2)

Derivative hedging requires specialized knowledge and may present challenges with e.g. pricing. Standard contract sizes may also exclude their use from smaller companies. It is therefore presumable that the use of external hedging methods increases with the explanatory variables.

p. Speculation (D3)

Preceding studies have shown that some companies allow speculation with derivatives while others do not allow it. Speculation is usually associated with profit seeking policies and thus a relationship similar to that between active profit seeking policy and the explanatory variables is expected.

Performance evaluation:

q. Primary metrics (E1)

To evaluate the performance of FX exposure management a company needs to measure it. Literature has suggested three categories of measurements suitable for FX exposure management[129]. This variable measures which type of metric is chosen by the company to evaluate their FX exposure management by.

r. Secondary metrics (E2)

Assessing the performance of the main components of the FX exposure management process gives management improved oversight. This variable measures whether performance metrics are set for three of the FX exposure management components identified in this study. A positive relationship with their use and both of the explanatory variables is expected.

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[129] Wallace, J., 2002 and Pramborg, B., 2002

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s. Policy review (E3)

This variable measures how often a company reviews and renews its FX policy. Taking a systematic approach to improving FX policy enables a company to react to change in its operating environment. Policy review frequency is presumed to be positively related to the explanatory variables.

t. Position valuation (E4)

Frequently valuing hedges and underlying exposures reduces risk of excessive losses. Also a company capable of valuing its positions frequently is well set for performing other advanced FX exposure management activities requiring proper position calculations. Frequency of position valuation is presumed to be positively related to both of the explanatory variables.

u. Back office segregation (E5)

Segregating back office functions reduces risk of fraud and improves compliance to FX policy. Smaller companies are expected have less back office segregation as they have fewer employees involved in FX exposure management. Empirical evidence[130] shows that very few MNCs do not segregate back office functions and thus a positive relationship between the explanatory variables is presumed. It is also expected that companies allowing speculation are more likely to segregate back office functions.

v. Risk oversight (E5)

Empirical evidence[131] shows that larger companies implement risk oversight mechanisms such as risk oversight committees or compliance functions to manage FX risk. This variable dummy variable has a value 0 when a company has not developed the risk oversight mechanism and 1 when it has. A positive relationship between the explanatory variables and risk oversight is expected. It is also expected

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[130] Wallace, J., 1999
[131] Wallace, J., 1999

that companies allowing speculation are more likely to have risk oversight committees or compliance functions.

w. *Performance compensation (E6)*

This variable measures whether performance compensation is aligned with FX policy. A mismatch would undermine FX policy aims and reduce FX exposure management effectiveness. Smaller companies with less exposure are expected to use performance compensation less and as the sophistication of FX exposure management improves performance compensation is expected to be tied to FX performance metrics.

6.2. Sample description

The data in this study includes 86 Finnish non-financial companies that are involved in international business using foreign currencies. Each size category was represented by at least 14 companies. The average annual revenue of the participating companies was 786 M€ with the median being 17 M€ (see figure 6.1 below). On average 27,0% of companies consolidated revenues and 21,4% of their consolidated expenditures were in foreign currencies. The average for the explanatory variable *Foreign exchange exposure* was 467 M€ and the median 2,89 M€ (see figure 6.2 below). Among the participating companies perhaps to no surprise USD was the most popular currency of trade with 75,6% of all companies using it. This was followed by the Swedish krona (62,8%) and only then came the British and Norwegian currencies (both at 39,5%). On average companies used 3,7 foreign currencies in their business operations (see figure 6.3). The number of currencies used by a company was positively correlated with *Size* (0,402) and *Foreign exchange exposure* (0,348).

Figure 6.1 – Size distribution of companies participating in the survey study
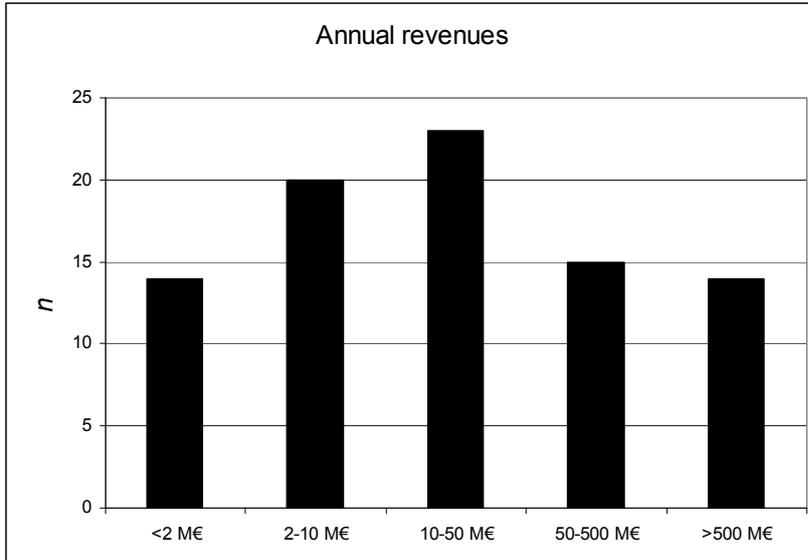
Figure 6.2 – Distribution of values for the explanatory variable *Foreign exchange exposure* in the sample
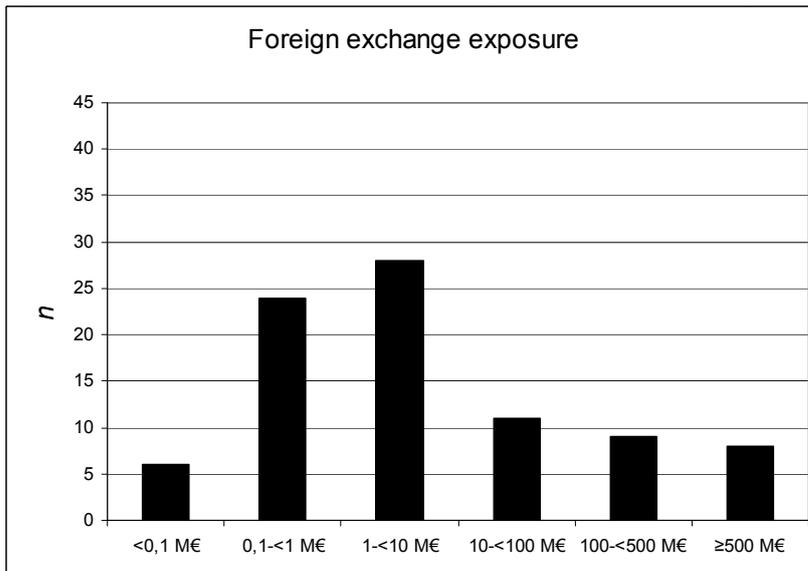
Figure 6.3 – Number of foreign currencies used by companies
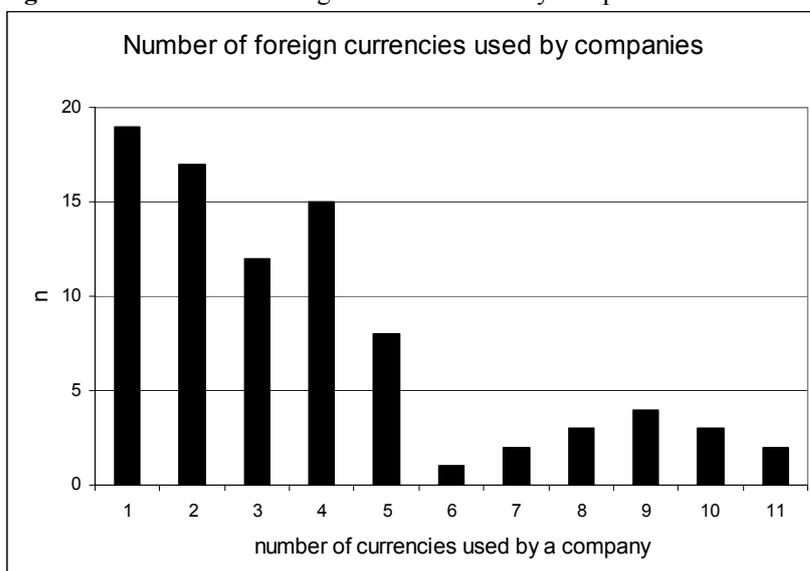
Note that the category 11 means that companies used at least 11 foreign currencies.

6.3. Empirical results

This section presents the empirical results from the survey study. The results are reported for each component separately. Within each component the results for the subsequent dependant variables are presented. Each part includes a table of results which features the following components:

- the number of replies to each specific question (*n=*)
- the correlations between the results of the question and each of the explanatory variables (*Size, Foreign exchange exposure & Foreign currencies*)
- the value of Kendall's tau coefficient[132] for the results of the question and *Size* (five *Size* categories are used for calculating the Kendall's tau coefficient) when applicable to the dependant variable

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[132] Kendall's tau is a measure of rank correlation. It receives values from -1 to 1, -1 indicating perfect disagreement between two rankings and 1 indicating perfect agreement between two rankings.

- the p-value from a Pearson Chi-square test for independence for the results of the question and *Size* (five *Size* categories are used for calculating the p-value) when applicable

Kendall's tau coefficient was used to validate the sophistication rank order of FX exposure management practices for individual dependant variables. It also complements correlation analysis by giving an additional perspective on the results. The number of replies varies between questions due to skip logic that was implemented to ease participation in the survey and to improve response quality. The specifics of the skip logic can be seen in Appendix C. Note that all percentages reported in the empirical results relate to the sample sizes reported for each dependant variable in question unless specifically stated otherwise.

6.3.1. FX Policy

The survey included four questions regarding the nature of FX policies. The results are summarized in Table 6.1 below. Overall the results give an impression that the level of sophistication of FX policy is positively related to the explanatory variables. In light of the results it seems viable that a common developmental path may exist for companies in developing their FX exposure management practices.

Table 6.1 – FX Policy results

	a. Policy format	*b. Policy aim*	*c. Centralization*	*d. Policy components*
n=	86	61	86	31
i. Size	0,247	0,071	0,319	0,285
ii. FX exposure	0,203	0,059	0,323	0,245
iii. Foreign currencies	0,560	0,243	0,209	0,638
Kendall's tau	0,605	0,284	0,116	n/a
p-value	$3,83*10^{-6}$	0,0881	0,290[133]	n/a

a. *Policy format (A4)* showed positive correlation to all explanatory variables with the number of foreign currencies used by a company having the strongest

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[133] None of the respondents indicated that they were uncertain concerning centralization. Therefore "not certain" was excluded from the Chi-square test to get a p-value.

correlation. Kendall's tau also showed significant support for the developmental path from no policy towards documented and finally formalized policies as revenues grow. The p-value of less than 1% lets us reject the null hypothesis at a 99% confidence level and conclude that *Size* and policy format are not independent of each other. 73,3% of all companies had a FX policy and 33,7% had a documented policy. The results were much as expected.

b. *Policy aim (A5)* showed lower, however, positive correlations to all of the explanatory variables. The sophistication rank order of results was modified from the original order in the questionnaire so that the reply "Not Certain" was ranked least sophisticated followed by passive policies, active and risk averse and finally active and profit seeking policies representing the most sophisticated policy. Kendall's tau showed this ranking to fit the data moderately well, however, 68,9% of all companies had an active and risk averse policy. The null hypothesis that policy aim and *Size* are independent was not rejected at 95% confidence level. Cell count, however, was low which may have caused high p-value. For this reason a second null hypothesis was tested: *Size* does not influence whether a company has a passive or an active policy. For this p-value was 0,0181 which lets us reject the second null hypothesis at 95% confidence level. The results show that a positive relationship exists between the explanatory variables and development from passive to active policies, however, the relationship between risk averse and profit seeking remains unclear. Only four out of 61 companies had an active and profit seeking policy. In contrast 21,3% of companies had a passive policy, which were dominantly smaller companies belonging in the three smallest size categories.

c. *Centralization (A6)* proved to be the most common way of organizing FX exposure management (81,4% of all companies had centralized FX exposure management). The theory that companies would develop from decentralized to centralized did not uphold with the data as can be seen from the p-value. The positive correlations with all the explanatory variables suggest that companies

tend to move from centralized towards decentralized and hybrid models. However, this does not always seem to be the case. The evidence suggests that there are other explanatory variables affecting this decision possibly general organizational structure and industry. Kendall's tau's weak positive value gives us more insight in this case than the correlations of size and FX exposure (see Figure 6.4 below).

Figure 6.4 – Centralization
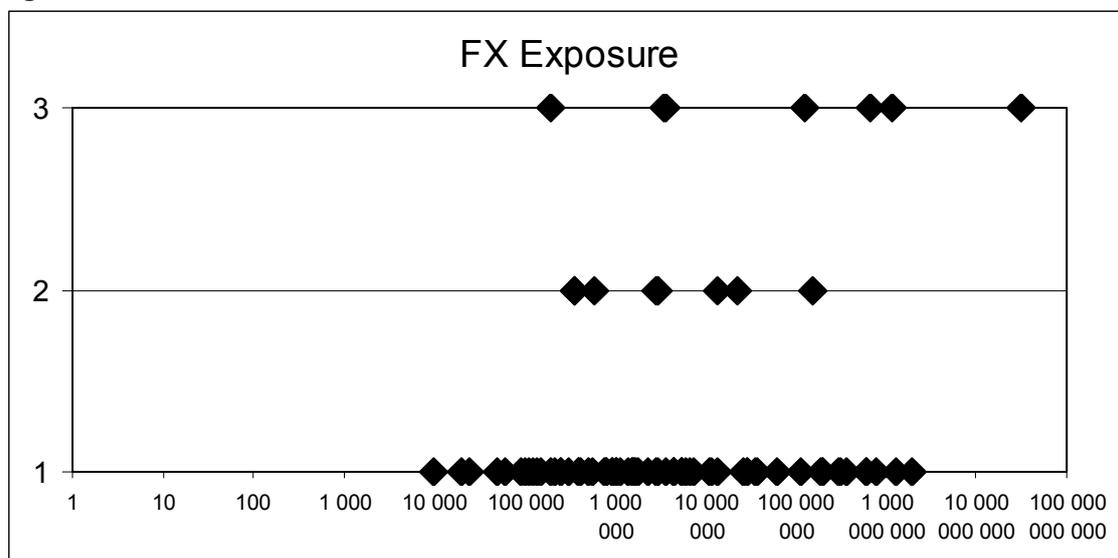
X-axis displayed on the logarithmic scale represents the explanatory variable of FX exposure and on the Y-axis value 1 represents *centralized*, 2 represents *decentralized* and 3 represents *hybrid* model.

d. *Policy components (A7)* was measured by the number of components a company had included in their documented FX policy. A clear positive correlation was found from the survey results linking the number of policy components with the explanatory variables. The aim of FX exposure management or hedging objective was the most common component of documented policies (87,1%) followed by hedging methods to be used (80,7%) (see Figure 6.5 below). It is worth noting that performance compensation was not included in any of the policies and performance measures were included in only 16,1% of the policies.

Figure 6.5 – Policy components
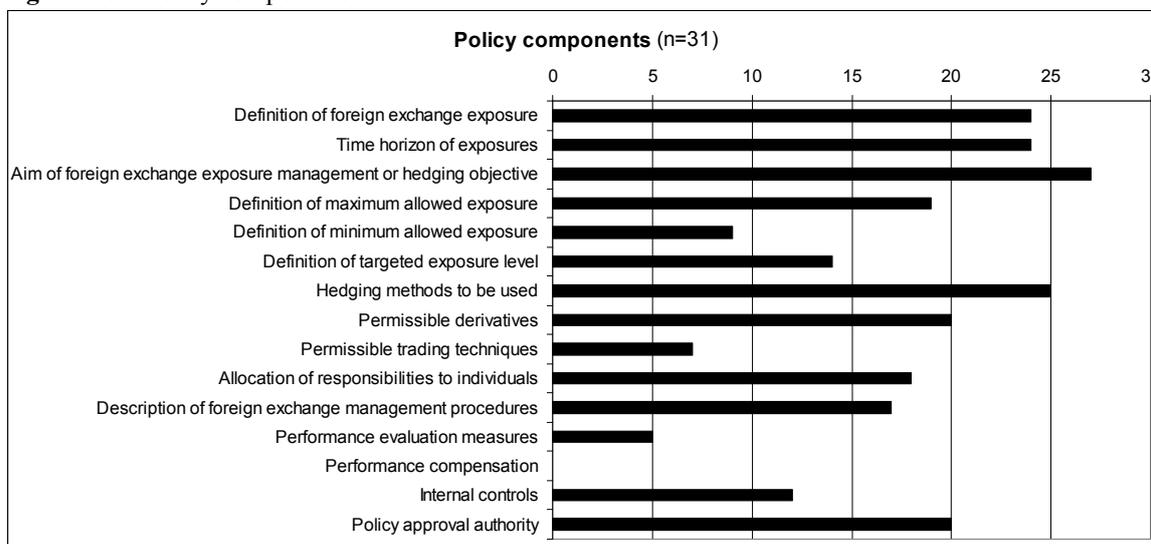
Displays in how many companies each of the policy components were included in their documented policies

6.3.2. Position calculation

Six questions regarding position calculations were included in the survey. The results are summarized in Table 6.2 below. The popularity of using position calculations was surprisingly low. However, it was positive to see that a majority of companies that used position calculations included forecasted exposures in them. Low use of IT as reported by earlier studies was confirmed.

In companies that do not use position calculations each exposure is managed separately. This means replication of activities which can easily lead to a lack of a broader picture. Also performing FX exposure management on individual exposures may lead to varying standards of practice which translate to case-by-case varying performance.

Table 6.2 – Position calculation results

	e. Position calculation	f. Position update	g. Time horizon	h. Position calculation contents	i. Use of IT	j. Analytic methods
n=	86	33	33	33	29	33
i. Size	0,188	-0,130	0,548	0,248	0,355	0,803
ii. FX exposure	0,161	-0,089	0,526	0,214	0,333	0,798
iii. Foreign currencies	0,494	-0,535	0,362	0,541	0,412	0,429
Kendall's tau	n/a	-0,560	n/a	0,483	0,293	n/a
p-value	$1,57*10^{-5}$	0,0107 [134]	n/a	0,0386	n/a	0,333

e. *Position calculation (B1)* was compiled by 38,4% of all companies. This was a fairly low percentage and it is rather surprising that three out of 14 companies with revenues over 500 M€ did not compile a position calculation. The correlations with the explanatory variables were positive but not very strong. Yet again the number of foreign currencies was the strongest indicator for compiling a position calculation. The p-value enabled the rejection of the null hypothesis that *Size* does not influence policy format at a confidence level of 99%.

f. *Position update (B2)* showed negative correlation with all explanatory variables as was expected. The strong negative Kendall's tau value supports the weaker correlations with size and FX exposure which are influenced strongly by one extreme value. By removing the extreme value from the analysis the correlations are for *Size* -0,504 and for *FX exposure* -0,482. A Chi-squared test for independence was done with some modifications[135] and after excluding the extreme value. The p-value allowed the rejection of the null hypothesis that *Size* does not influence position update at a 95% confidence level. The cell count still remained low and may have influence the p-value.

The most common frequency for updating the position calculation was monthly (51,5%) and over two thirds of the companies updated it at least monthly. In

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[134] Due to small cell count the p-value was calculated after combining the three smallest *Size* categories into one category (representing SMEs) and the two largest categories into on category (representing large companies).

[135] See footnote 134 above.

light of this evidence the presumption that updating position calculations becomes systematic and more frequent as FX exposure management practices become more sophisticated is supported.

g. *Time horizon (B3)* is a measure for how far in the future does a position calculation track FX exposure. The average time horizon was 9,1 months with 54,5% of companies using a 12 month horizon. The correlations of the explanatory variables were significantly positive supporting the progressive relationship.

To evaluate whether larger companies have a larger divergence in their capabilities to forecast exposure the results of the largest companies (>500 M€ revenues) were compared to smaller companies (<500 M€). This was done by comparing the slopes of the logarithmic regression lines for the variables of *Time horizon* and *Size*. For the smaller companies the slope was 1,122 and for the largest companies it was 2,717. The values for *Time horizon* ranged for the smaller companies from 0 to 12 months and for the larger companies from 3 to 24 months. The larger slope and the larger span both support the presumption that greater divergence exists for larger companies.[136]

h. *Position calculation contents (B4)* The survey results showed that the order of sophistication presumed in the survey for the contents of position calculation was correct. This was indicated by the Kendall's tau value of 0,483. In addition the p-value enabled the rejection of the null hypothesis that *Size* and position calculation contents were independent at a 95% confidence level. In short companies include financial hedges along with contractually binding exposures in their position calculation before incorporating forecasted exposures into their position calculations. Due to low cell count in the Chi-squared test for

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[136] The choice of using 500 M€ revenues as the point of comparison was based on sample dynamics. Most of the companies in the sample for this variable had revenues of over 50 M€ leaving too few companies in the smaller categories. Also 33% of the companies in the sample belonged in the largest size category so it was a natural choice.

independence future research should attempt to verify these results. 60,6% of companies included forecasted exposures in their position calculations and 39,4% had all three, contractually binding exposures, forecasted exposures and financial hedges, in their position calculations.

i. *Use of IT (B5)* was limited to simple calculations with e.g. Excel in 69,0% of the companies. This was not a surprise as previous studies and literature had described this to often be the case. Never-the-less, positive correlation with the explanatory variables supports the presumed positive correlation. Kendall's tau adds further support and validates the order of sophistication presumed in the survey. In 17,2% of companies position calculations were part of a separate treasury or accounting software with only 1 company reporting it to be a part of their ERP[137] software.

j. *Analytic methods (B6)* had high positive correlations with the explanatory variables. The results were dominated by low usage of analytic methods for assessing exposure and risk. 54,5% of companies did not use any of the analytic methods and only one company used more than two methods. Sensitivity analysis was the most popular method (24,2%) with cross hedging following right behind (21,2%). None of the companies used linear programming or optimization. Stress testing or scenarios were also popular with five of the 33 companies using them. The null hypothesis that *Size* does not influence use of analytical methods was not rejected, but again low cell count may have influenced the p-value[138].

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[137] ERP = Enterprise Resource Planning

[138] For this reason the same null hypothesis was retested after combining the three smallest *Size* categories into one category (representing SMEs) and the two largest categories into on category (representing large companies). This resulted in a p-value of 0,0744 which still did not allow for rejecting the null hypothesis at a 95% confidence level.

6.3.3. Forecasting future FX rates

The survey included three questions on future FX rate forecasting practices. Table 6.3 below summarizes the results. The small number of questions was a limitation for this component. The results for *Forecast usage* and *Local knowledge* were somewhat unexpected. *Forecast source* results showed that companies progress towards producing future FX rate forecasts internally. *Local knowledge* results were more peculiar and contradicted the theory that the use of local knowledge would increase as FX exposure management developed.

Table 6.3 – Forecasting future FX rates results

	k. Forecast usage	l. Forecast source	m. Local knowledge
n=	86	36	27
i. Size	-0,023	0,591	-0,288
ii. FX exposure	-0,052	0,633	-0,272
iii. Foreign currencies	0,314	0,467	-0,357
Kendall's Tau	0,224	0,354	-0,460
p-value	0,158	0,156	n/a

k. *Forecast usage (C1)* examined whether companies use future FX rate forecasts in their foreign exchange exposure management. Further it examined whether long-term or short-term forecasts were used. 58,1% of companies did not use any FX rate forecasts and short-term forecasts were two times more commonly used than long-term forecasts. The results were somewhat mixed with *Size* and *FX exposure* having weak negative correlations and *Foreign currencies* having a moderate positive correlation. Kendall's tau supports the positive connection between size and forecast usage which does not seem to hold according to the p-value. The null hypothesis that *Size* and use of forecasts are independent was not rejected at 95% confidence level. FX rate forecasts were used in over 50% of companies in both of the largest size categories 4 and 5 where as less than 35% of companies in each of the smaller size categories used them. Overall the low correlations suggest other explanatory factors influence forecast usage and are thus partially contradictory to expectations. The findings, however, confirm that

short-term forecasting is used more often than long-term forecasting as suggested by findings in earlier studies[139]. Interestingly *Time horizon* had a distinct connection with the use of short- and long-term forecasts. The use of both short- and long-term forecasts (38,1%) was more popular than use of only short-term forecasts (23,8%) among companies with *Time horizon* over six months. The converse applied to companies with *Time horizon* less or equal to six months, where as the use of only short-term forecasts (50,0%) was more popular than the use of both short- and long-term forecasts (10,0%).

l. *Forecast source (C2)* showed significant positive correlation between the explanatory variables and development of internal forecasting capabilities. *FX exposure* had a particularly strong correlation with forecast source. The order of sophistication or forecast sources presumed by the survey was supported by Kendall's tau. The p-value, however, didn't justify rejecting the null hypothesis that *Size* and producing forecasts internally are independent at 95% confidence level[140]. 58,3% of companies obtained their forecasts from their banks which made it by far the most popular source. This result was expected based on results from earlier studies[141]. 19,4% had developed internal forecasting capabilities. Notable was, however, that none of the companies used primarily technical analysis to obtain their forecasts (see Figure 6.6 below).

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[139] E.g. Hakkarainen, A. et al., 1996

[140] Sample size for this variable was too small and likely affected negatively establishing statistical significance. For comparison the null hypothesis was tested by using only two size categories, combining the three smallest categories into one category (representing SMEs) and the two largest into another (representing large companies). The p-value was then recalculated and received the value of 0,0230, thus, rejecting the null hypothesis at a 95% confidence level.

[141] E.g. Harju, M. & Martikainen, T., 1997

Figure 6.6 – Forecast source
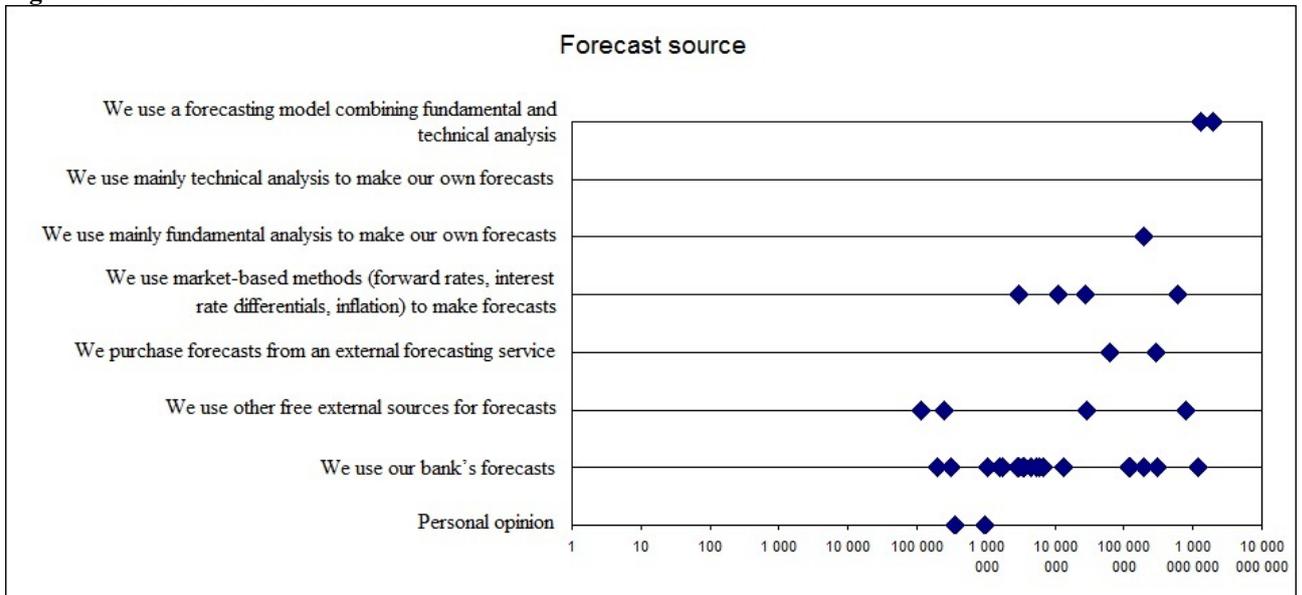
X-axis displayed on the logarithmic scale represents the explanatory variable of FX exposure

m. *Local knowledge (C4)* gave across the board negative correlations with
   Kendall's tau's significantly negative value adding support for them. These
   findings were contrary to preliminary expectations. Considering these findings
   with results for *Centralization* which showed positive correlation between the
   explanatory factors and decentralization the implications seem contradictory.
   One possible interpretation for these results is that as the explanatory variables
   grow future FX rate forecasting is not decentralized where some other activities
   of FX exposure management are. It may also suggest that benefits from local
   knowledge are limited for larger companies. It should be noted that 21 of the 27
   companies did not use local knowledge making the number of companies using
   local knowledge rather small.

6.3.4. Hedging methods

The survey included three questions on hedging practices. The results are summarized
in Table 6.4 below. For dependant variables *Internal hedging* and *External hedging* two
different correlations are reported for each explanatory variable. The difference between

the two is that in the survey companies were asked to indicate which hedging methods they used frequently and which methods sometimes. The first correlation reports the relationship of the explanatory variables and the sum of hedging results that were used either frequently or sometimes. The latter correlation reports the relationship between the explanatory variables and the sum of hedging methods that companies reported to use frequently.

Hedging has been studied in literature rather extensively and results by this study support previous findings[142] particularly in part of hedging methods. Speculation was found not to be so strongly related to the explanatory factors which leaves room for further study.

Table 6.4 – Hedging methods results

		n. Internal hedging	o. External hedging	p. Speculation
	n=	86	86	55
i. Size	Frequently & Sometimes	0,149	0,225	0,051
	Only Frequently	0,310	0,412	
ii. FX exposure	Frequently & Sometimes	0,132	0,176	0,029
	Only Frequently	0,301	0,372	
iii. Foreign currencies	Frequently & Sometimes	0,340	0,564	0,027
	Only Frequently	0,321	0,613	
	Kendall's Tau	n/a	n/a	0,162
	p-value	0,0225 [143]	$1,36*10^{-9}$ [144]	0,427

> *n. Internal hedging (D1)* was popular among all companies and 91,9% of all companies used at least one internal hedging method (see Figure 6.7 below). Correlations of all explanatory variables were positive. When accounting only responses indicating frequent usage of a method the correlations improved significantly in *Size* and *FX exposure*. In *Foreign currencies*, however, both correlations were similar. While the correlations were generally positive it can

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[142] E.g. Pramborg, B., 2002

[143] The p-value was calculated for number of only frequently used methods. None of the respondents indicated that they used frequently more than five methods. Therefore the categories used for the Chi-square test for independence included 0, 1, 2, 3, 4 and 5 methods used.

[144] The p-value was here as well calculated based on the number of only frequently used methods. None of the respondents indicated that they used frequently more than 6 methods. Subsequently the categories for external hedging were 0, 1, 2, 3, 4, 5 and 6 methods used.

be concluded that the number of methods used frequently is a better indicator of sophistication of internal hedging practices. The null hypothesis stating that *Size* does not influence the number of frequently used internal hedging methods was rejected on a 95% confidence level. However, cell values in this case were low and this may have influenced the p-value. For comparison a second null hypothesis was formed: *Size* does not influence the use[145] of internal hedging. This hypothesis was rejected at 99% confidence level as the p-value was 0,00081. It is interesting to note that, even though domestic currency invoicing was the most popular method, the positive correlation between *Size* and *Foreign currencies* suggests that large companies do not use their bargaining power extensively to increase the use of their home currency.

Figure 6.7 – Internal hedging methods
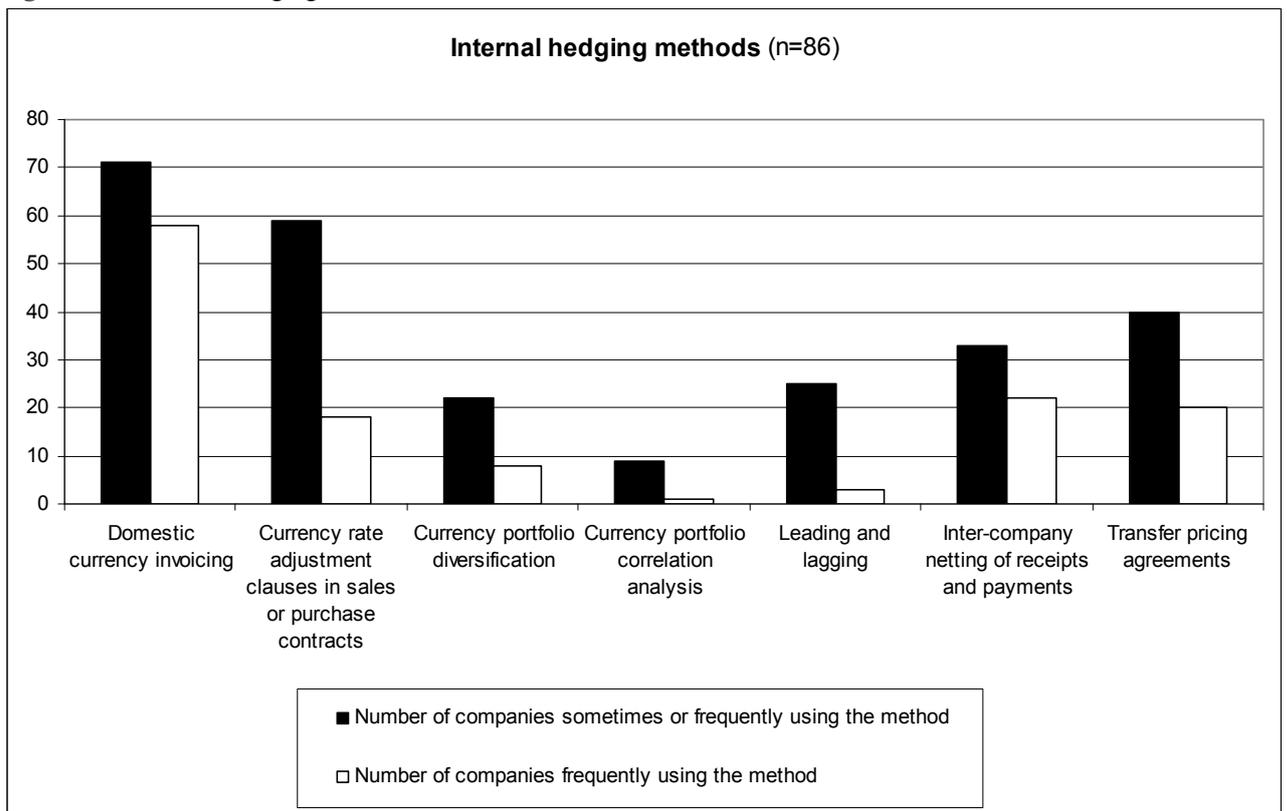
The figure displays the popularity among the sample companies of various internal hedging methods.

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[145] Note that this includes use of the methods both frequently and sometimes

o. *External hedging (D2)* showed across the board positive correlations with the explanatory variables. These results confirm Pramborg's[146] results of positive correlation between *Size* and the use of external hedging methods. The correlations were stronger than with *Internal hedging* and limiting the analysis to include only methods used frequently by the companies improved correlations significantly. The null hypothesis that *Size* does not influence external hedging was rejected at a 99% confidence level.

The particularly strong correlation with *Foreign currencies* should be noted. As expected external hedging was less popular than internal hedging with 87,2% of all companies using at least one external method at least sometimes (see figure 6.8 below). Currency purchases/foreign currency bank accounts was the most popular method with 79,1% of companies using it. The most popular derivative was forward contract which provided no surprises compared to previous studies. Interestingly futures contracts and NDFs were almost as popular.

Figure 6.8 – External hedging methods
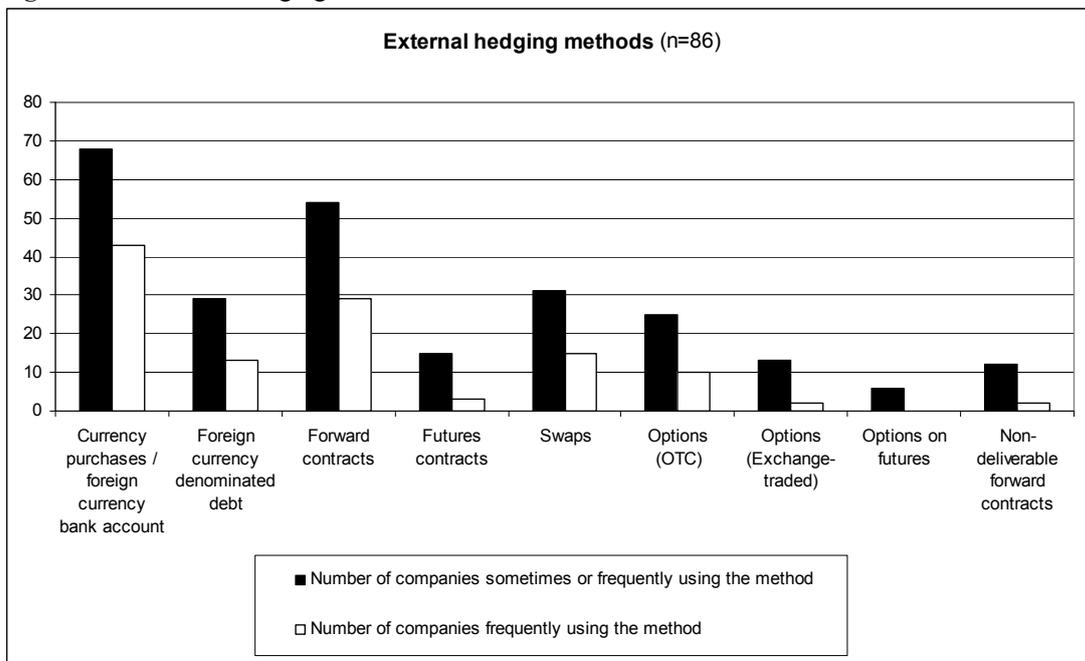
The figure displays the popularity among the sample companies of various internal hedging methods.

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[146] Pramborg, B., 2002

p. *Speculation (D3)* showed weak but positive correlations with all of the explanatory variables after the sophistication rank order was modified from the original questionnaire order. "Undetermined/Do not know" was switched to be the least sophisticated and "Yes" speculation is allowed was set to represent the most sophisticated choice. Kendall's tau supported this new order as did general logic. Chi-squared test for independence, however, did not reject the null hypothesis that *Size* is independent of allowing speculation. The large p-value clearly suggests that other explanatory variables are also influencing this decision. 72,7% of the 55 companies that used derivatives had prohibited speculation and six out of 55 companies allowed speculation.

6.3.5. Performance evaluation

The survey included eight questions on performance evaluation which contributed to seven dependant variables. The results are summarized in Table 6.5 below. Performance evaluation was not the most popular activity of FX exposure management in companies. 79,1% of all companies did not use any metrics to evaluate the performance of FX exposure management. The use of performance metrics had positive correlations with the explanatory variables (0,278 for *Size*, 0,250 for *FX exposure* and 0,474 for *Foreign currencies*). A Chi-squared test for independence was also conducted for a null hypothesis which stated that *Size* is independent of using performance metrics. This test resulted in p-value of 0,000198 which rejected the null hypothesis with a 99% confidence level. Besides general neglect towards performance evaluation the results were as expected.

Table 6.5 – Performance evaluation results

	q. Primary metrics	r. Secondary metrics	s. Policy review	t. Position valuation	u. Back office segregation	v. Risk oversight	w. Performance compensation
$n=$	18	18	30	86	86	86	18
i. Size	n/a	0,045	0,061	-0,134	0,188	0,235	0,197
ii. FX exposure	n/a	0,035	0,020	-0,107	0,166	0,202	0,166
iii. Foreign currencies	n/a	0,216	0,337	-0,362	0,323	0,445	0,131
Kendall's Tau	n/a	n/a	0,356	-0,361	n/a	n/a	n/a
p-value	n/a	n/a	n/a	0,0122	0,0160	0,00139	n/a

q. *Primary metrics (E2)* showed that most companies (66,7%) use profitability (or reduced costs) as their primary FX exposure management performance metric. Comparing these results with Pramborg's[147] results places Finnish companies in between Swedish (61%) and Korean companies (71%) in popularity of using profitability-based evaluation criteria. The results, however, showed that reality is not as straightforward as the presumptions that the survey in this question was based on. 27,8% of the companies chose "Other" with specifications including various company specific metrics and benchmarks. These results made analysis somewhat difficult and they suggest the survey was not structured well enough for this dependant variable. Only one company indicated that they used "Volatility of net exposure in terms of home currency" as their primary metric. Correlation analysis was not applicable to these results.

r. *Secondary metrics (E3)* relate to performance evaluation in three of the components of FX exposure management: position calculation, forecasting future FX rates and hedging. As can be seen from the results a weak positive correlation was present with all explanatory variables. 83,3% of the companies used at least one of these secondary metrics with "hedging performance" being the most popular metric (66,7% used it). No company used all three metrics while only two companies out of 18 used two metrics. The results add to prior observations that performance evaluation is generally underdeveloped. Some interesting results can be deducted: only 5,6% of companies that used future FX

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[147] Pramborg, B., 2002

rate forecasts measured the accuracy of those forecasts and only 15,0% of companies that include forecasted exposures in their position calculations account for errors in those forecasts. Neither of the two companies that purchased their future FX rate forecasts from an external service provider checked the accuracy of the forecasts they paid for. This finding was in contradiction with expectations; thought the small sample here limits generalization dramatically.

s. Policy review (E4) process was conducted in 73,3% of the companies as the need arises. 16,7% on the other hand had a scheduled review process. Kendall's tau value validates the sophistication rank order as presumed by the survey study. Weak correlations for *Size* and *FX exposure* are dominated by one extreme result. By removing it from the analysis the correlations are respectfully 0,529 and 0,527 and the nature of correlation can be seen more clearly. Over all the results are much as expected.

t. Position valuation (E5) showed negative correlations for all explanatory variables. Kendall's tau gave extra support for confirming a negative relationship between *Size* and the rank order of sophistication for this variable. The null hypothesis that *Size* does not influence position valuation was rejected at 95% confidence level. Cell count, however, was partially low and the p-value may have been affected by this. With little further analysis it was possible to improve the results significantly. Firstly all results from the last category of "No schedule / Not applicable" were excluded. Secondly because yet again a single extreme value had a large effect on the correlations it was excluded. After these restrictions correlations were -0,405 for *Size*, -0,465 for *FX exposure* and -0,239 for *Foreign currencies*. 32,6% of all companies marked-to-market their positions monthly and 48,8% at least monthly. 33,7% selected "No schedule / Not applicable" (see Figure 6.9 below).

Figure 6.9 – Position valuation

Position valuation (n=86)
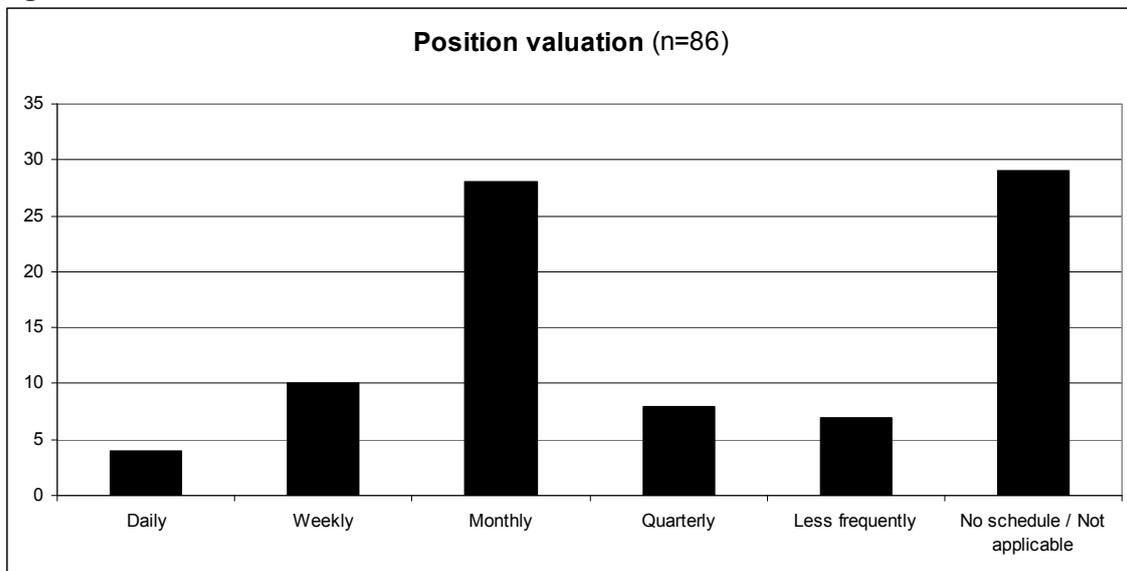
u. *Back office segregation (E6)* needed a change of sophistication rank order prior to analysis. The most sophisticated answer for this question was "No" followed by "Yes" and the least sophisticated answer was "Do not know". All correlations with explanatory factors were positive as expected. The null hypothesis that *Size* does not influence segregating back office functions was rejected with a 95% confidence level with a Chi-squared test for independence[148]. 34,9% of all companies had segregated back office functions, the most sophisticated selection. Five companies were uncertain, thus, leaving traders to various degrees in charge of confirmations, accounting and settling in 59,3% of all companies.

v. *Risk oversight (E6)* needed as well a change of sophistication rank order prior to analysis. In this case "Yes" was considered the most sophisticated answer with "Do not know" the least sophisticated. This gave somewhat stronger positive correlations with each of the explanatory variables. On the other hand only 23,3% of all companies had a risk oversight instance looking over the activities of FX exposure management. Also the number of companies uncertain increased

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[148] "Do not know" responses were excluded from the Chi-squared test for independence.

to eight companies compared with *Back office segregation*. This clearly meant that risk oversight committees and compliance functions were less common than *Back office segregation*. On the other hand the p-value for the null hypothesis that *Size* does not influence having risk oversight was smaller, thus, rejecting the null hypothesis at a higher 99% confidence level[149].

13 companies of 86 had both *Back office segregation* and *Risk oversight* in good order. The theory was also confirmed that companies which allowed speculation were more likely to have better risk oversight and back office segregation. This was shown by a 0,336 correlation between *Speculation* and the combined variables of *Back office segregation* and *Risk oversight*.

w. *Performance compensation (E7 & E8)* results were combined from the two last questions of the survey to form four different combinations (in order of sophistication):

   1) I do not know whether individuals in FX exposure management are compensated based on performance
   2) Individuals are not compensated based on performance in FX exposure management
   3) Yes individuals in FX exposure management are compensated based on performance, however, performance measures are not related to FX exposure management metrics
   4) Yes individuals in FX exposure management are compensated based on performance of FX exposure management performance metrics

Correlations were positive with all explanatory variables. Half of the companies (n=18) used performance based compensation for employees working with FX exposure management. Only two companies, however, based performance compensation on FX exposure management performance metrics. This was

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[149] "Do not know" responses were excluded from the Chi-squared test for independence.

perhaps not a surprise considering that only 20,9% of all companies measured FX exposure management performance by some measure. These findings are complemented by the fact that all companies that used performance compensation of FX exposure management employees belonged in the two largest size categories.

7 A Tool for evaluating FX exposure management practices

This part addresses the last research question set out for this study: *How could FX exposure management practices of different companies be compared?* This study has described how FX exposure management in companies can be divided into five distinct components and they can further be individually assessed. The benefit of evaluating one component at a time is that it simplifies comparison across companies. Compartmentalizing the results also helps identifying the strengths and weaknesses of the prevailing management practices in individual companies. Being able to spot the components requiring attention more easily enables issues to be addressed faster. In order to get comparable results a scoring model is needed for enumerating the results of the survey.

The author's suggested scoring model based on the survey will now be described. The model uses responses to the survey's questions to form a numeric approximation of sophistication for each FX exposure management component. The suggested model gives a benchmarking tool for companies which can be used for self assessment. A number of benchmarks are also provided based on the survey conducted for this study. As any scoring model it is not perfect but an approximation and the results should not be held as scientific truths. However, the practical applications of the model are believed to outweigh its shortcomings in accuracy.

The scoring model is built so that firstly each of the five components is scored separately and in the end the results of all components are converted to an equal scale. Thus each component finally receives values within the same range from 0 to 14[150] with a larger value representing a more sophisticated management practice. Scoring a component starts with setting the relative weights for different aspects and features within that component. These relative weights are shown below for each component separately. Secondly a scoring logic is set for each survey question. The scoring logics are presented under each component below. For questions which a company does not answer due to survey skip logic (see appendix C for details) the score is always set to 0. Also if a company gets a negative score from a component the score is always set to 0^{151}.

Policy

Table 7.1 – Policy scoring

	Relative weights	Score Min	Score Max
A4 - Policy format		0	4
A5 - Policy aim	1/3	0	2
A6 - Centralization		-1	1
A7 - Policy components	2/3	-3	15

The policy component is scored to a maximum of 22 points and a minimum of 0 points. The relative weights were set so that the actual contents of a FX policy bear the highest significance (see Table 7.1). Relatively little points are given to policy aim and centralization which do not on their own indicate sophistication to a significant degree. Instead both of them will be used in combination with some of the following components.

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[150] The conversion to an equal scale of 0 to 14 is conducted by dividing the score a company is awarded on a component by the maximum score of that component and then multiplied by 14.
[151] This scoring logic was adapted primarily to simplify scoring. In a few instances a company could get a negative score for a component. However, it was considered that in these cases a company was equal to those that received no points instead of being even worse off.

Table 7.2 – Policy format and policy aim scoring logics

A4 - Policy format	Score
No policy	0
General guidelines which are not documented	1
General documented guidelines	3
Formalized foreign exchange policy	4

A5 - Policy aim	
Passive, foreign exchange risk is not hedged	1
Active and risk averse	2
Active and profit seeking	2
Not certain	0

The scoring logics for questions A4 and A5 are presented in Table 7.2 above. The scoring of A6 – Centralization was contingent on the result of A4. If a company has a formalized FX policy it is awarded 1 point for A6. If a company does not have a formalized FX policy and it has decentralized its FX exposure management it is awarded -1 point. Other wise it is rewarded 1 point.

The scoring logic for A7 – Policy components is contingent on whether a company has centralized its FX exposure management. In case it is centralized the company is awarded 1 point for each policy component. If it is not centralized points are subtracted based on missing policy components and the size category of the company. If a comprehensive documented policy does not exist it is difficult to see how a large company having decentralized FX exposure management can effectively coordinate its efforts to manage its FX exposure. Thus, the scoring logic reflects the need for a detailed FX policy in a decentralized organization dealing with larger FX amounts. Companies of size categories 1 through 3 get 1 point for each policy component and -0,05 points for each missing policy component[152]. Companies of size categories 4 and 5 get 1 point for each policy component and -0,2 points for each missing policy component. Effectively this raises the bar for larger companies in respect to the extent of the contents of their policy.

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[152] = -0,05 * (15 – number of policy components included in the FX policy)

Position calculation

Table 7.3 – Position calculation scoring

		Score	
	Relative weights	Min	Max
B1 - Position calculation	1/9	0	2
B2 - Position update		0	4
B3 - Time horizon	1/2	-1	3
B4 - Position calculation contents		0	2
B5 - Use of IT	7/18	0	3
B6 - Analysis methods		0	4

The position calculation is scored from 0 to 18 points. Relative weights were set to give highest weight on features of position calculation and practices associated with it (see Table 7.3). Half of the points are given for the basic choices concerning the foundations set for the position calculation (B2, B3 and B4). IT and analysis methods are given almost equal weight compared to the foundations.

Table 7.4 – Scoring logics for position calculation questions

B1 - Position calculation	Score
We manage FX exposure individually	0
We compile our FX exposures into a position calculation	2

B2 - Position update	
Daily	4
Weekly	3
Monthly	3
Quarterly	2
Annually	1
As needed/ No schedule	0

B3 - Time horizon	
0 months	-1
1 - 2 months	0
3 months	1
4 - 6 months	2
over 6 months	3

B4 - Position calculation contents	
Only contractually binding exposures are included	0
Contractually binding exposures and financial hedges are included	1
Contractually binding and forecasted exposures are included	1
Contractually binding exposures, forecasted exposures and hedges are included	2

B5 - Use of IT

No use of IT for position calculation	0
Simple calculations with e.g. Excel	1
Separate software for position calculation	2
Position calculation as a part of a separate treasury or accounting software	3
Position calculations integrated into ERP	3
Not Applicable / Skip the question	0

The scoring logics for questions B1 through B5 are presented in Table 7.4 above. Notable is question B3 – Time horizon for which the value ranges are set based on survey results. Particularly due to possible industry related variations in future exposure forecasting capabilities the lower limit of the most sophisticated choice is set to over 6 months. It is presumed that irrespective of industry it is possible for a company to have a position calculation with a time horizon over 6 months.

For question B6 – Analysis methods the scoring is done based on the number of methods employed by a company. If a company uses none of the methods 0 points are awarded. If one method is used 1 point is awarded. If two methods are used 3 points are awarded. For more than two methods used 4 points are awarded. It is perceived that using more than one method has a significant positive influence on position calculation, hence, the increase of awarded points from 1 to 3.

Future FX rate forecasting

Table 7.5 – Future FX rate forecasting scoring

		Score	
	Relative weights	Min	Max
C1 - Forecast usage	1/4	0	2
C2 - Forecast source	3/4	0	6
C3&C4 - Local knowledge	0/4	0	0

Future FX rate forecasting is scored from 0 to a maximum of 8 points. Relative weights are set so that C2 – Forecast source has the highest influence on scoring (see Table 7.5). C3&C4 – Local knowledge is disregarded completely as the survey study found it to be

inconclusive and thus, the two questions can be removed from the questionnaire. The scoring logics for questions are presented in Table 7.6 below.

Table 7.6 – Forecast usage and forecast source scoring logics

C1 - Forecast usage	Score
No, we do not use any forecasts	0
Yes, but we use only short-term (<6 months) forecasts	1
Yes, but we use only long-term (>6 months) forecasts	1
Yes, we use both short- and long-term forecasts	2

C2 - Forecast source	
Personal opinion	0
We use our bank's forecasts	1
We use other free external sources for forecasts	1
We purchase forecasts from an external forecasting service	2
We use market-based methods (forward rates, interest rate differentials, inflation) to make forecasts	4
We use mainly fundamental analysis to make our own forecasts	5
We use mainly technical analysis to make our own forecasts	5
We use a forecasting model combining fundamental and technical analysis	6

Hedging

Table 7.7 – Hedging scoring

		Score	
	Relative weights	Min	Max
D1 - Internal hedging	2/5	0	63
D2 - External hedging	2/5	0	63
D3 - Speculation	1/5	-18,9	18,9

Hedging is scored from 0 to a maximum of 144,9 points. Relative weights favour hedging methods. They are set to give equal weight for internal and external hedging methods (see Table 7.7). As there are seven internal hedging methods and nine external hedging methods included in the survey, one internal hedging method gives comparatively more points than an external hedging method. This is preferred as the importance of internal methods is somewhat higher than that of external methods.

Because frequent usage of hedging methods correlates better with the explanatory variables the scoring logics favour frequent usage over hedging methods that are used sometimes. For D1 – Internal hedging a company is awarded 9 points for every method that they use frequently and 3 points for every method that they use sometimes. For D2 – External hedging a company is awarded 7 points for every method that they use frequently and 4 points and two-thirds for every method that they use sometimes.

Points awarded for D3 – Speculation are contingent on A5 – Policy aim and D2 – External hedging. The formula that awards the points is:

$$a * 0,3 * (\text{score for D2})$$

a is a multiplier which gets a value of -1, 0 or 1. In the case that rules for speculation in a company have not been determined or are unknown the multiplier a gets a value -1. If a company has an active and profit seeking FX policy (A5) the multiplier a gets a value 1. If a company does not have an active and profit seeking FX policy the multiplier a gets a value of 1 if speculation is not allowed and a value of -1 if speculation is allowed. Thus, the scoring for D3 – Speculation takes into account the number of instruments used as a proxy for the scale of potential profits/losses. On the other hand, getting a negative value for a signifies potential for conflicts of interest within the company towards risk appetite.

Performance evaluation

Table 7.8 – Performance evaluation scoring

	Relative weights	Score Min	Score Max
E1 - Measures of performance evaluation	1/6	0	4
E2 - Primary metrics		-2	0
E3 - Secondary metrics	2/6	0	6
E4 - Policy review		0	2
E5 - Position valuation	1/6	0	4
E6 - Back office segregation & Risk oversight	1/6	-4	4
E8 - Performance compensation	1/6	0	4

Performance evaluation is scored from 0 to 24 points. Relative weights are spread equally to performance evaluation of different components of FX exposure management and to risk management practices (see Table 7.8). The scoring logics are straightforward for E1, E4, E5 and E8 (see Table 7.9 below).

Table 7.9 – Performance evaluation scoring logics

E1 - Measures of performance evaluation	Score
No	0
Yes	4

E4 - Policy review	
Our FX policy hasn't been changed since it was created	0
We update our FX policy as the need arises	1
We have a schedule for periodical reviews of our FX policy	2

E5 - Position valuation	
Daily	4
Weekly	3
Monthly	2
Quarterly	1
Less frequently	0
No schedule / Not applicable	0

E8 - Performance compensation	
No	0
Yes	4

E2 – Primary metrics score is contingent upon A5 – Policy aim. A company with an active and risk averse FX policy that uses profitability to measure its overall performance receives -2 points. A company with an active and profit seeking FX policy that uses volatility as its overall performance measure also receives -2 points. Besides these two cases of contradictory practices companies receive 0 points from this question.

For E3 – Secondary metrics a company is awarded 2 points for each metric that it uses. This totals 6 points for a company that measures all three activities. E6 – Back office segregation & Risk oversight has a bit more complex scoring logic. Its score is

contingent upon A5 – Policy aim and D3 – Speculation. Please refer to Table 7.10 for detailed scoring logic. Question E7 does not influence performance evaluation scoring.

Table 7.10 – Back office segregation & Risk oversight scoring logics

E6 - Back office segregation & Risk oversight			Score
A5 value	**D3 value**	**E6 value[153]**	
Centralized	Speculation not allowed	0	0
Centralized	Speculation not allowed	1	2
Centralized	Speculation not allowed	2	4
Centralized	Speculation allowed or undetermined	0	-2
Centralized	Speculation allowed or undetermined	1	2
Centralized	Speculation allowed or undetermined	2	4
Decentralized or Hybrid	Speculation not allowed	0	-2
Decentralized or Hybrid	Speculation not allowed	1	2
Decentralized or Hybrid	Speculation not allowed	2	4
Decentralized or Hybrid	Speculation allowed or undetermined	0	-4
Decentralized or Hybrid	Speculation allowed or undetermined	1	0
Decentralized or Hybrid	Speculation allowed or undetermined	2	4

7.1. Scoring model fit

To evaluate the fit of the model correlations were calculated for the scores of each FX exposure management component and the explanatory variables of the study. The results are summarized in Table 7.11 below.

Table 7.11 – Scoring model correlations

	Policy	Position calculation	Future FX rate forecasting	Hedging	Performance evaluation	Overall score
i. Size	0,303	0,341	0,015	0,364	0,382	0,333
ii. FX exposure	0,250	0,304	-0,029	0,332	0,329	0,279
iii. Foreign currencies	0,635	0,609	0,450	0,574	0,646	0,710

Overall score correlations have been calculated after the scores of all the other components have been converted to an equal scale.

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[153] E6 value is derived from answers to question E6. If employees that are making FX trades are not making trade confirmations, accounting and settling of trades E6 value gets +1. If a company has a risk oversight committee or a compliance function E6 value gets +1. Thus if both hold true E6 value is 2.

The scores showed positive correlations with the explanatory variables as was expected. An exception was Future FX rate forecasting in general and particularly in the case of *FX exposure*. This anomaly can be traced back to the dependant variable *Forecast usage*. Because Future FX rate forecasting can be considered a more advanced FX exposure management activity it contains a lot of 0 scores which explain the lacking of significant correlation. To explore this issue further correlations were calculated for Future FX rate forecasting and the explanatory variables excluding all observations with 0 score. This raised the correlations significantly: for *Size* the correlation was 0,582, for *FX exposure* it was 0,590 and for *Foreign currencies* it was 0,508 (see Figure 7.1 below).

Figure 7.1 – Future FX rate forecasting scores
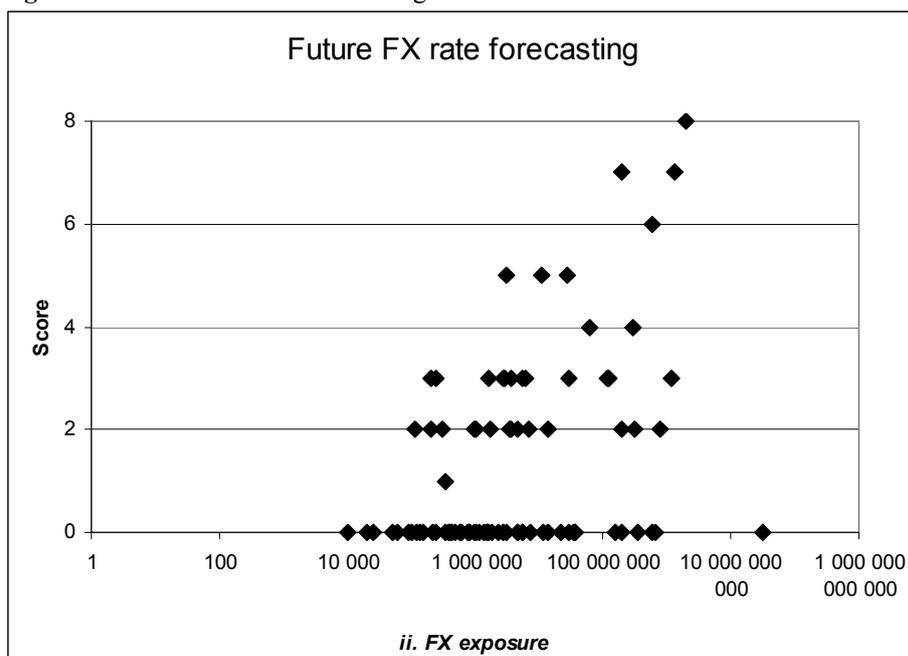
Score presented on the original scale of the Future FX rate forecasting –component from a minimum of 0 to a maximum of 8.

7.2. Benchmarks and analysis

For companies to get a relevant picture of their own FX exposure management practices they need to compare their results to a benchmark. Choosing the right benchmark,

however, can be a challenge. One could consider a best practice comparison but it would not be of much use for a smaller company as the company with the best practice would be far larger than itself. Also focusing on improving FX exposure management practices beyond a small company's needs may not be the best way to use a company's resources. Therefore this study suggests five benchmarks, one for each size category. A company should therefore start by comparing its own scores with the benchmark of its own size category. This will give a relevant starting point for each company to explore and compare its own practices.

For each size category the average of the scores for each component was calculated. The alternative of using the highest scoring company in each category to give a best practice benchmark would not have worked well for the smaller size categories. This was because there was substantial variability in individual companies' scores between FX exposure management components and thus one company would not have represented the best practice in all components. Table 7.12 below shows the benchmark scores for each component and each size category (see also graphical representation of the benchmark score in Figure 7.2 below). Each component has a minimum of 0 points and a maximum of 14 points. Overall score has a minimum of 0 points and maximum of 70 points.

Table 7.12 – Benchmark scores

Size category	Policy	Position Calculation	Forecasting future FX rates	Hedging	Performance evaluation	Overall score
1. <2 M€	1,19	0,61	0,88	1,16	0,67	4,50
2. 2-10 M€	1,95	0,27	1,58	2,16	0,58	6,54
3. 10-50 M€	2,64	2,30	1,67	2,78	0,91	10,30
4. 50-500 M€	6,53	5,44	3,27	4,53	2,49	22,26
5. >500 M€	10,16	7,83	5,13	6,17	5,25	34,54

Figure 7.2 shows graphically the benchmark results and it is useful in pointing out a number of considerations for using the benchmarks. Given that some components of FX exposure management are often neglected by companies the benchmarks do not necessarily mean that companies should be satisfied by matching them. Particularly performance evaluation is generally neglected though its importance is significant.

Secondly when interpreting the scoring of the hedging component one should keep in mind that to a great extent it is a sum of the number of hedging methods a company employs. Using more methods does not always mean a company will be more successful in hedging. Thus in the case of hedging score, and to a large degree contrary to the other scores, a company should perhaps refrain from striving for the full 14 points. None the less having a high hedging score can be interpreted to mean that a company has highly sophisticated FX exposure management practices, though not because it uses many methods but instead because it is capable of using many methods. Capability often means flexibility which in turn may lead to better performance.

In any case a simple numerical comparison of a company's scores with a benchmark should be considered only the first step. Attention should be paid to components in which scores are below those of the benchmark. Also components in which a company receives lower scores than its other components should be taken under further analysis but this does not always indicate an imbalance as pointed out earlier. For these purposes a graphical representation (see Figure 7.2) of the company's score can be useful. After identifying the FX exposure management components which most likely require improvement efforts it is time to see one at a time how the low score was formed. When analysing the low scores it is important to check if any negative points were awarded. They often represent significant short coming or inconsistencies in a company's FX exposure management practices.

When trying to improve the score of a component one should see which choices award the highest points. Better yet a cost reward calculation of implementing an improvement should be done so that the most cost effective improvements are given priority in implementation. Some improvement choices have prerequisites as discussed in this study but the survey skip logic (see appendix C) can be a useful source of information for reminding of them. Some other improvement choices may not suitable for a given company. It is therefore important to consider the organizational fit of any improvement before implementation.

Figure 7.2 – Benchmark scores
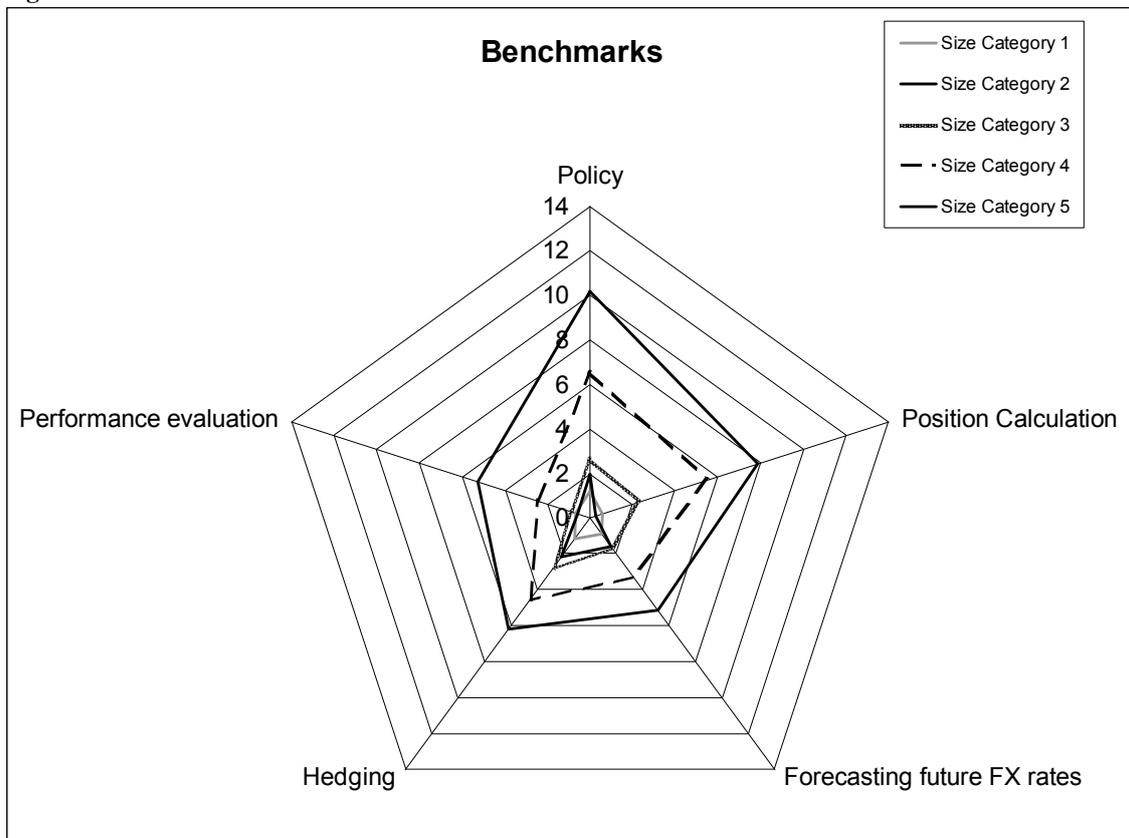
8   Conclusions

This study has addressed the foreign exchange exposure management practices of Finnish non-financial companies. The primary research question was: *how to evaluate the FX exposure management practices of non-financial companies?* To answer this question a review of the management practices was conducted based on literature. The literature review culminated in developing the FX exposure management framework. Following this a survey study was conducted. Its aim was to explore and affirm the existence of developmental paths in FX exposure management practices. Finally for evaluation of the management practices a scoring model was developed to work in conjunction with the survey questionnaire. This enabled benchmarking, comparison and finally evaluation of FX exposure management practices of companies.

The empirical part of this study shows that company size, foreign exchange exposure and the number of foreign currencies a company uses in its operations have significant explanatory relationships with FX exposure management practices that a company employs. On part of company size and foreign exchange exposure findings of this study support the findings of earlier studies including studies by Pramborg[154], Hakkarainen et al.[155] and Harju and Martikainen[156]. On part of the number of foreign currencies a company uses in its operations this study adds to literature, as to the extent of the knowledge of the author earlier studies have not recorded this relationship.

The results of the study support a progressive model of FX exposure management practice development. Common developmental paths were identified in all components of the outlined FX exposure management framework. Overall the framework was supported by the findings from the survey study. Since existing literature has not provided a conceptual framework for FX exposure management the contribution of this study is in this respect valuable.

The framework offers a conceptual model of reference for managers. A comprehensive framework of reference is important for developing FX exposure management capabilities. The scoring model and the benchmarks based on the survey are specifically intended for managers. By using them a relatively quick assessment of the prevailing FX exposure management practices can be conducted in a company. Further more the results can be compared with results from other companies.

The scoring model produces sophistication scores for individual components as well as an overall company score. Their possible applications reach beyond an individual company's interest in self improvement. Some possible beneficiaries may include investors that can use it in the assessment of company risk in respect to FX exposure and financial service providers in segmenting markets for marketing and product

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[154] Pramborg, B., 2002
[155] Hakkarainen, A. et al., 1996
[156] Harju, M. and Marikainen, T., 1997

development purposes. Consultancies could as well benefit from categorizing their clients based on the scores or using the evaluation tool in their service creation process.

The empirical findings of this study showed that in each component of the FX exposure management framework there were practices with significant correlations with the three explanatory factors. All of the practices studied, however, were not fully explained by the results. On their part the results point to a number of issues warranting further research. They include *Centralization, Forecast source, Analytic methods* and *Speculation.* Firstly, the results of this study did not offer a clear reason for the choices made concerning *Centralization.* Secondly, on part of *Forecasting future FX rates*, future research could further explore the reasons for developing internal forecasting capabilities. The sample size of this study was too small in this case and further research is suggested to fully affirm the relationship between *Size* and internalizing forecasting. Thirdly, the use of *Analytic methods* with position calculations showed high positive correlations with the explanatory variables, but statistical significance could not be established at a 95% confidence level. This issue could be revisited by future research to better understand the dynamics behind adopting analytic methods in position calculations. And finally, in hedging the role of *Speculation* remains somewhat unclear. This is possibly related to dynamics concerning selecting between risk averse and profit seeking policies, which could not be affirmed by this study due to the few number of instances of active profit seeking policies. Future research could also consider expanding the scope of FX exposure management practices from those included in this study as some may have been overlooked or new practices may be develop in the future.

There were two distinct sources of limitations for the study. One of them was structuring the survey questionnaire, best exemplified by the question concerning the variable *Primary metrics* in performance evaluation. The question proved to be inadequate in accounting for the diversity of metrics in reality. Also the question concerning *FX exposure* could perhaps have been structured better. Companies with very small percentages of revenues and expenditures denominated in foreign currencies may have been discriminated against by the question setting. The other source of

limitations for the study was sample size. Analysis of the results would have benefited on several accounts from a larger sample. This was reflected for instance in some cases on the low levels of statistical significance. Partially this limitation could possibly have been avoided by improved structuring of the survey questionnaire. However, a higher response rate would surely have contributed significantly. Finally it can be concluded that there is always room for improvement in the scoring model as our understanding of managing FX exposure advances.

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10 Appendices

10.1. Appendix A – Survey

Helsinki School of Economics / Aalto University
Foreign Exchange Exposure Management Survey

Information:
This survey study studies foreign exchange exposure management practices in Finnish companies. The target group consists of Finnish companies doing international business excluding companies from the financial sector. The survey is intended for both small and large companies.

The survey consists of 25 question concerning companies' foreign exchange exposure management practices. The number of questions you need to answer depends on the extent of your business operations. It takes on average 7 minutes to finish the survey.

Please answer all questions. Use the navigation buttons at the bottom of the screen to move forward in the survey or back to correct an incorrect answer. The data provided by you will not be used to identify your company and we guarantee strict confidentiality.

Part A – Foreign exchange exposure management policy

A1   What was your company's consolidated revenue in the year 2010 in millions of €?

Revenue	M €

A2   Approximately what percentage of your consolidated revenues and expenditures were in foreign currency in year 2010?

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Revenues											
Expenditures											

A3   Which of the following foreign currencies does your company use?

RUB – Russia	
SEK – Sweden	
CNY – China	
USD – United States of America	
GBP – United Kingdom	
NOK – Norway	
PLN – Poland	
DKK – Denmark	
JPY – Japan	
BRL – Brazil	
Others	

A4   Do you have a foreign exchange policy? Which of the following statements best describes it?

No policy	
General guidelines which are not documented	
General documented guidelines	
Formalized foreign exchange policy	

A5   Which of the following describes your foreign exchange policy best?

Passive, foreign exchange risk is not hedged	
Active and risk averse	
Active and profit seeking	
Not certain	

A6   Would you describe you foreign exchange (FX) exposure management to be centralized or decentralized?

Centralized: FX exposure management is performed by a single entity within the company, e.g. group treasury	
Decentralized: no central control over FX exposure management, e.g. each business unit manages its own exposure	
Hybrid: some aspects of FX exposure management are centralized some decentralized	

A7   Please mark which of the following items are included in your foreign exchange policy?

Definition of foreign exchange exposure	
Time horizon of exposures	
Aim of foreign exchange exposure management or hedging objective	
Definition of maximum allowed exposure	
Definition of minimum allowed exposure	
Definition of targeted exposure level	
Hedging methods to be used	
Permissible derivatives	
Permissible trading techniques	
Allocation of responsibilities to individuals	
Description of foreign exchange management procedures	
Performance evaluation measures	
Performance compensation	
Internal controls	
Policy approval authority	

Part B – Foreign exchange exposure position calculation

B1   Do you manage each individual foreign exchange exposure (e.g. purchase contract) separately or compile all exposures together into a company wide position calculation?

We manage FX exposure individually	
We compile our FX exposures into a position calculation	

FX = Foreign Exchange

B2   How frequently do you measure your FX exposure position / update your position calculation?

Daily	Weekly	Monthly	Quarterly	Annually	As needed/ No schedule	Other *)

*) Comments …………………………………………………………….

B3   Please indicate the time horizon of your position calculation i.e. how far in the future does your position calculation track FX exposure positions?

	Months

B4   Which of the following statements best describes the contents of your position calculation?

Only contractually binding exposures are included	
Contractually binding exposures and financial hedges are included	
Contractually binding and forecasted exposures are included	
Contractually binding exposures, forecasted exposures and hedges are included	

B5   Which of the following statements best describes the use of information technology (IT) in your company for calculating FX exposure positions?

No use of IT for position calculation	
Simple calculations with e.g. Excel	
Separate software for position calculation	
Position calculation as a part of a separate treasury or accounting software	
Position calculations integrated into ERP	
Not Applicable / Skip the question	

ERP = Enterprise Resource Planning

B6   Please mark if you use some of the following methods with your FX exposure position calculation?

Cross hedging, using cash flows in different currencies to offset each other	
Stress testing or scenarios	
Use of Linear Programming (LP) method	
Use of simulation	
Use of Monte Carlo simulation	
Use of historic simulation	
Use of covariance analysis (e.g. RiskMetrics)	
Use of sensitivity analysis	
Optimization	

Part C – Forecasting future exchange rates

C1   Does your company use forecasts of future exchange rates?

No, we do not use any forecasts	
Yes, but we use only short-term (<6 months) forecasts	
Yes, but we use only long-term (>6 months) forecasts	
Yes, we use both short- and long-term forecasts	

C2   Which of the following ways best describes how your company gets your future FX rate forecasts?

Personal opinion	
We use our bank's forecasts	
We use other free external sources for forecasts	
We purchase forecasts from an external forecasting service	
We use market-based methods (forward rates, interest rate differentials, inflation) to make forecasts	
We use mainly fundamental analysis to make our own forecasts	
We use mainly technical analysis to make our own forecasts	
We use a forecasting model combining fundamental and technical analysis	

C3   Do you have foreign subsidiaries (partially owned and joint ventures included)?

No	
Yes	

C4   Do you use local market information acquired from your foreign subsidiaries to make your future FX rate forecasts?

No, we do not use information from our foreign subsidiaries in making future FX rate forecasts	
Yes, we *sometimes* use local market information acquired from them in FX rate forecasting	
Yes, we *frequently* use local market information acquired from them in FX rate forecasting	

Part D - Hedging

D1   How often does your company use the following internal hedging methods?

	Frequently	Sometimes	Never/ Do not know
Domestic currency invoicing			
Currency rate adjustment clauses in sales or purchase contracts			
Currency portfolio diversification			
Currency portfolio correlation analysis			
Leading and lagging			
Inter-company netting of receipts and payments			
Transfer pricing agreements			

D2   How often does your company use the following external hedging methods?

	Frequently	Sometimes	Never/ Do not know
Currency purchases / foreign currency bank account			
Foreign currency denominated debt			
Forward contracts			
Futures contracts			
Swaps			
Options (OTC)			
Options (Exchange-traded)			
Options on futures			
Non-deliverable forward contracts			

OTC = over-the-counter, i.e. contracts between you and your bank

D3   Are you allowed to use foreign exchange derivatives for speculative purposes, i.e. not to hedge but to profit from an anticipated price movement?

No	Yes	Undetermined/ Do not know

Part E – Performance evaluation

E1   Do you use any measures to evaluate the performance of your foreign exchange exposure management?

No	Yes

E2   Which measure do you use to evaluate the overall performance of your foreign exchange exposure management?

Profitability (or reduced costs)	
Volatility of net exposure in terms of home currency	
Risk-adjusted performance (profits adjusted for volatility)	
Other *)	

*) Comments …………………………………………………….

E3   Please mark if you measure in numerical terms the following aspects of your FX exposure management

Forecasting error of forecasted exposures	
Forecasting accuracy of forecasted future FX rates	
Hedging performance	

E4   Which of the following statements best describes the review process of your FX policy?

Our FX policy hasn't been changed since it was created	
We update our FX policy as the need arises	
We have a schedule for periodical reviews of our FX policy	

E5   At least how often do you mark-to-market (i.e. check the market value of) your FX exposures and their corresponding hedges?

Daily	Weekly	Monthly	Quarterly	Less frequently	No schedule / Not applicable

E6   Please answer the following questions about your company's FX exposure management practices

	No	Yes	Do Not Know
Are the employees that are making FX trades also making trade confirmations, accounting and settling of trades?			
Does your company have a risk oversight committee or a compliance function overseeing FX exposure management activities?			

E7   Are the employees involved in FX exposure management compensated based on performance?

No	Yes	Do not know

E8   Is the performance compensation of employees involved in FX exposure management based on FX exposure management performance metrics?

No	Yes

E9   If you would like to receive results from the survey please provide us with your email address below:

<div style="border:1px solid;"> </div>

Thank you for completing the survey.

If you have further questions or comments, please contact:
Samuli Luostarinen
Email: markus.s.luostarinen@aalto.fi

10.2.   Appendix B – Nokia's position calculation

NOREX							FXCON.HKD						13.3.1996	14:03	
Transaction Exposure Consolidated			13.3.1996												
Company:	All	0,1295	1.000's												
Currency:	HKD	Project:	All												
Base Curr:	DEM	Loc. Curr:	All			TOTAL	This mth	Apr 1996	Mai 1996	Jun 1996	Jul 1996	Aug 1996	Sep 1996	End 1996	1997	1998 >
1IP	Export Receivables (invoices)					72 000	60 000	12 000	0	0	0	0	0	0	0	0
1IL	Loan receivalbes in foreign currencies					0	0	0	0	0	0	0	0	0	0	0
1IX	Other currency inflow					0	0	0	0	0	0	0	0	0	0	0
	Total business inflow					72 000	60 000	12 000	0	0	0	0	0	0	0	0
1IF	Forwards transaction receivables					0	0	0	0	0	0	0	0	0	0	0
	Total currency inflow					72 000	60 000	12 000	0	0	0	0	0	0	0	0
1OP	Import payables (invoices)					-16 000	-13 000	-2 000	-1 000	0	0	0	0	0	0	0
1OL	Payable loans in foreign curencies					0	0	0	0	0	0	0	0	0	0	0
1OX	Other currency outflow					0	0	0	0	0	0	0	0	0	0	0
	Total business outflow					-16 000	-13 000	-2 000	-1 000	0	0	0	0	0	0	0
1OF	Forward transaction debt					-190 000	-35 000	-35 000	0	-50 000	0	-50 000	-20 000	0	0	0
	Total currency outflow					-206 000	-48 000	-37 000	-1 000	-50 000	0	-50 000	-20 000	0	0	0
	NET EXPOSURE I (recorded)					**-134 000**	**12 000**	**-25 000**	**-1 000**	**-50 000**	**0**	**-50 000**	**-20 000**	**0**	**0**	**0**
2IP	Currency inflow (commitment based)					240 000	0	50 000	50 000	60 000	40 000	40 000	0	0	0	0
2OP	Currency outflow (commitment based)					-54 000	-2 000	-10 000	-12 000	-10 000	-10 000	-5 000	-5 000	0	0	0
	NET EXPOSURE II (rec. & comm. Based)					**52 000**	**10 000**	**15 000**	**37 000**	**0**	**30 000**	**-15 000**	**-25 000**	**0**	**0**	**0**
3IP	Currency inflow (price list selling)					300 000	0	0	0	0	0	0	70 000	150 000	80 000	0
3OP	Currency outflow (price list)					-113 000	0	-5 000	-3 000	-5 000	-5 000	-10 000	-10 000	-45 000	-30 000	0
3IO	Call Options bought					0	0	0	0	0	0	0	0	0	0	0
3OO	Put Options bought					0	0	0	0	0	0	0	0	0	0	0
	NET EXPOSURE III (transaction risk+options)					**239 000**	**10 000**	**10 000**	**34 000**	**-5 000**	**25 000**	**-25 000**	**35 000**	**105 000**	**50 000**	**0**
						Comments:										
		NET EXPOSURE III (DEM)														
	NET EXPOSURE I (DEM)					-17 354	1 554	-3 238	-130	-6 475	0	-6 475	-2 590	0	0	0
	NET EXPOSURE II (DEM)					6 734	1 295	1 943	4 792	0	3 885	-1 943	-3 238	0	0	0
	NET EXPOSURE III (DEM)					30 952	1 295	1 295	4 403	-648	3 238	-3 238	4 533	13 598	6 475	0

Source: Isokallio, K., 1996

10.3.   Appendix C – Survey skip logic