

Abstract

The shared service centre (SSC) is a concept in which a business organisation consolidates all its administrative functions and in-house services in one place. The SSC promises to save a bulk of money, and provide better services to the company's internal customers. The savings are further strengthened by pooling cash in a central account to offset debit and credit balances. A cash pooling system can optimise the use of excess cash and interest yield, reduce interest expense and costly intra-company transactions, and the like. However, the segmental legal and tax regimes and, further, the lagging behind of bank services formulate the periphery of cash pooling in Europe.

The benefits of SSC and cash pool depend on the business environment, especially how the changes of the number of centres affect the quality of support, and how the scale influences the costs. The European integration is likely to lead to increasing centralisation of internal supporting function.

Though it does not affect the expected value of the cash flow, cash pooling will reduce the volatility of the cash flow and improve the liquidity situation of the pooling company. While the bondholders get the same risk-adjusted return, shareholders will benefit greatly from the cash pooling because of the declined interest expenses, and reduced volatility of cash flow which decreases the amount of debt and lowers the hurdle rate.

Key Words

Shared service centre, cash pooling, EMU, notional pooling, zero-balance, cash management, centralisation, clearing system, network bank, overlay structure, bank services, economies of scale, incentive compensation, certainty equivalent, liquidity risk, option pricing theory.

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Chapter 1 Introduction

1.1 New Opportunities and Challenges

When the single currency made its debut on January 1st 1999, it marked the dawn of unprecedented changes for companies domiciled in the countries that comprise the Euro-zone, as well as for companies doing business in those economies. Characterised as integrated and single-currency dominated, the new market is comparable with the size of the market of the United States (OECD 1999). In addition to opening new markets and facilitating a greater degree of cross-border trade and capital movement, EMU will also allow companies to become more efficient, to rationalise costs, to exploit economies of scales, and to streamline operations (City Bank 1998a). The role of the treasurer in corporate planning will be more integral, and the possibility of sharing service and pooling cash within the group and throughout Europe to materialise the benefits of single currency is higher than ever before (Bergen 1998).

On the other hand, the introduction of Euro and the disappearance of national currencies will force myriad changes on most organisations, no matter whether they are taking the most active approach and making all their operations Euro-compliant from Day One. From setting up a single Euro account to facilitate payments in the single currency, to re-engineering and consolidating the treasury process to optimise interest and efficiency, the number of issues treasurers must tackle – and the options they face, *inter alia*, the shared service centre (SSC) and cash pooling – are challenging (City Bank 1999a).

The SSC is a concept in which a business organisation consolidates all its administrative functions and in-house services in one place. In this model, transaction-based activities that may otherwise be distributed throughout an organisation are centralised (Lucenko 1998). The service centre usually operates as an autonomous entity that has its own budget and location, and

is accountable for the efficiency of its own operations. It provides services to the company's various business units and charges them for these services based on their amount of usage. The SSC promises to cut administrative costs, save a bulk of money, employ state-of-the-art technology, eliminate redundancies in many activities and provide better services to the company's internal customers. But it also requires a large initial capital outlay and a great quake of existing organisation (Jarman 1998). Nonetheless, the advantages are enormous and include savings due to economies of scale, greater accountability, and elimination of redundancies (Shah 1998).

The savings are further increased by pooling cash in a central account. The concept of centralised pooling is to offset debit and credit balances within a currency and among different currencies without converting the funds physically. A cross-currency pooling system can optimise the use of excess cash and interest yield, reduce interest expense and costly foreign exchange, swap and intra-company transactions, minimise administrative paperwork, speed information flow, tighten control and improve decision making, and the like (Bergen 1998). However, the segmental legal and tax regimes, and the more or less disappointing bank services formulate the periphery of cash pooling (Bergen 1999a). Centralisation of payment and collections proved to be a bigger issue and has not been achieved to any great extent (Citybank 1999). Despite these setbacks, many companies are eager to grasp the new opportunity to gain their competitive edge.

1.2 Problem Defining

Bankers and consultants advertise the advantages and benefits of the SSC and cash pooling heavily, and many companies that have established an SSC and central cash pool are quoted as having saved millions of dollars and greatly improved the company's competition situation (e.g. Mill 1996, Baliga 1994). The results seem to be quite amazing.

However, when preparing the establishment of the SSC and cash pooling, many practitioners are largely confused by the reality and begin to question the reliability of the reported magnificent effects (Bergen 1998). The most confusing question to them is: How did companies evaluate the costs and benefits of the SSC and cash pooling? So far, the cost and benefit analyses, including those made by well-known consulting firms, are not convincing*.

The attention to SSC and cash pooling has spawned numerous articles from bankers, consultants, treasurers and other practitioners. However, most of those articles are practical-orientated and some even look more like advertisements[†]. We have searched a broad reference database and we seldom found an in-depth theoretical or quantitative analysis of the benefits and costs of the SSC and cash pooling. It seems that European academics did not react as enthusiastically as the practitioners did to the new tide of cash pooling. Many people, including us, are confused about why the theoretical analysis of how to evaluate the benefits and costs is still an almost untouched question in Europe, when the idea of SSC and cash pooling has already been deployed and continues to be implemented. There is a big gap between the practices and theoretical analysis regarding the SSC and cash pooling.

Besides, the current discussions are so biased to convince the top managers that interests of other stakeholders in the company, such as shareholders, employees, and so on, are largely ignored (Jarman 1998). There is no chance for management to carry out the SSC and cash-pooling project by themselves only, though they can initiate the project. The management needs to provide all interest groups with a reliable analysis from the perspectives of different stakeholder groups (Gunders, 1998).

* According to our practices in Mölnlycke Health Care AB and our meeting with several consulting firms and banks.

[†] For instance, see online publishing on <http://www.nfia.com/html/publish>.

Finally, when the business society increasingly respects the power of shareholders and when the corporate world talks about shareholders' value and economic value of the firm very frequently, the available analyses are inclined towards the use of accounting methods (for instance, see Citibank 1998b, General Bank group 1998, Lucenco 1998). Many people firmly believe that the value of a firm and its shareholders is more truthfully reflected by financial and economic analysis.

In short, people are eager to know what are the economic and financial costs and benefits of SSC and cash pooling to different stakeholder groups. To make a reliable theoretical and quantitative analysis of this major problem, one must answer the following questions:

◆ **The Rationales**

First of all, what are the main characteristics of the SSC and cash pooling? Which factors triggered the trend of centralisation in Europe, and what are the rationales behind the philosophy of SSC and cash pooling, especially those factors hidden in the changing macroeconomic surrounding, business environment, and technology innovations? Furthermore, any cautious person will naturally ask what kind of changes this new model will impose on society and the undertaking company.

◆ **Economic Benefits and Costs**

In order to convince themselves and other stakeholder groups, the management must clearly define what are the benefits and costs of the new SSC and cash pooling structure and point out whether the benefits will outweigh the costs. At least from the perspective of shareholders, the benefits and costs ought to be defined as economic and market value rather than the historical accounting value. Furthermore, the economic costs and benefits of the new SSC and cash pooling structure ought to be numbered, because the market cannot evaluate the value of the undertaking company just by guessing. Therefore, a natural question that will arise is what quantitative models can be used to explicitly measure the economic benefits and costs.

◆ **Main Strategic Issues**

The core issue here is the degree of centralisation. Should the cash management function be executed at one location or at several locations? If a central approach is preferred, another issue appears: which tasks will be executed in-house, and which tasks can be outsourced to third parties? A third important issue is the banking relationships. From which and how many banks should a company choose to purchase its cash management services? Will the group choose to operate through a network bank, a group of local banks combined by an overlay bank, or a “banking club”? A fourth important issue is the degree of cash concentration. Is the cash of all the operating companies going to be concentrated in one location, for example with the central treasury, or is cash going to be concentrated at the unit level? Within this area, the group also needs to decide where to concentrate idle funds and a pooling method.

The answers to these questions depend on both internal and external factors (Bergen 1999c). The management needs to define whether those internal factors, for instance the organisational structure, the company’s financial situation, the diversity of business and the geographical presence, etc., or external factors, e.g. local regulations, tax legislation, availability of bank products and technical IT possibilities, etc., will influence the structure of SSC and cash pooling.

◆ **Effects on Stakeholders’ Interests**

1. Incentives to Employees

When implementing the SSC and cash pooling, a company will inevitably encounter the internal resistance to changes (Kurtz *et al.* 1998). The management naturally needs to ask why the employees should be interested in this new project, and whether there is any incentive that will stimulate them to take part, presumably actively, in the process of building up a new SSC structure and cash pooling model. Especially the salesmen and local sales offices who indeed generate the company’s revenues need clear signals that

the new project will not hurt their interests (Milgram *et al.* 1994). That is the problem of incentive compensation. How to carefully optimise the total utility of both sides and keep a delicate balance between the accrued costs and compensations are very challenging topics.

2. Bondholders' Value

Obviously, centralised treasury management will change distribution and risks of the operational cash flow. Whether the bondholders will accept the changes is vital to the firm because the bondholders in fact have the right to veto the changes (Copeland *et al.* 1994). Therefore, how the SSC and cash pooling will influence the bondholders' value is an important question.

3. Shareholders' Value

In most of the cases, the most important stakeholder group in the company is the shareholders, who, theoretically, are the masters of the firm. Whether the shareholders are better off from cash pooling is a key question.

1.3 Purposes

In short, this thesis aims at providing, to both practitioners and researchers, an economic and financial theoretical basis and quantitative models to evaluate the costs and benefits of SSC and cash pooling from different stakeholders' perspectives.

1.3.1 Aims of the Thesis

Firstly, this thesis wishes to provide an in-depth theoretical analysis regarding costs and benefits of SSC and cash pooling to practitioners and researchers. However, we are not going to conduct "pure" theoretical research. We apply the theories to the business reality and create some applicable quantitative models to the real problems closely related to the SSC and cash pooling.

Secondly, this thesis aims at analysing how the SSC and cash pooling will influence the economic and market value of a firm and its different stakeholders.

Thirdly, one could evaluate the SSC and cash pooling from different perspectives, such as organisational effects, strategic consequences and so on. Our analysis concentrates on evaluating costs and benefits, and we especially prefer to use quantitative models.

Finally, we intend to provide a comprehensive, integrated, unbiased and reliable analysis that the management can use to persuade all the interest groups. One of the most important aims of this thesis is to view the SSC and cash pooling from the perspectives of various stakeholders.

1.3.2 Limits of the Purposes

Practitioners might find that numerous legal, economic, and organisational problems are baffling when designing the SSC and cash pooling project. The answer to some questions relies on the expertise on legislation, tax regime, and practical protocols in various European countries. We have to emphasise that we aim to bridge the gap between the practices and theoretical analysis rather than to pile up facts and data. We do not extend our analysis to those questions, to which the answers are primarily depending on practical expertise, though in order to provide the interested readers relevant background knowledge on the SSC and cash pooling, we provide some practical information.

Secondly, though the managerial, legal and technical aspects are highly important, too, we concentrate on economic and financial aspects. We are not going to provide a “user manual.”

Thirdly, we do not plan to create a new theory. Instead, we intend to deploy established theories to the practices by means of building up quantitative models to solve the practical problems closely related to the SSC and cash pooling.

Fourthly, we aim to make a theoretical analysis rather than an experimental test. We do not test the validity or compare the suitability of existing theories and models.

Lastly, this thesis just covers limited problems related to costs and benefits of the SSC and cash pooling. We narrow the topics to fit our selection criteria, which are: whether it affects the most important interests of a stakeholders group, whether it is suitable to be analysed quantitatively, and whether the decision of the company can change the results. Some important problems, such as how the hedging will be carried out after pooling, are omitted to make the thesis more closely structured.

1.3.3 Target Readers

The targeted readers of this thesis are senior practitioners and academic researchers and master or higher level economic and financial students as well. We will not define well-known terminology or explain the basic quantitative methods, as we assume our readers already know them. Thus, a basic knowledge of economic and financial theories, calculus and statistics is essential to understand some parts of our analysis.

Readers who are not familiar with the quantitative analysis are suggested to either skip Chapter 4 to Chapter 6, or to look at the summary in each chapter.

1.4 Methodology and Limitations

We carry out our study, in principle, by means of literature research, practices and independent analyses. The literature research provides us with the relevant information, theoretical framework and references, the independent analyses assist our quantitative analysis, and the practices guide us to define the research problems.

1.4.1 Literature Research and References

Literature research proved to be the most useful method during the investigation stage, and it does provide much help to us, at least to the extent of providing the relevant knowledge of what the SSC and cash pooling are, and what kind of problems are puzzling people in general.

We have searched all available databases at our University. Though there are numerous articles dealing with the SSC from managerial perspectives, there are very few articles discussing cash pooling. For example, we searched database EconLit from January 1969 to August 1999. There are more than 5,000 articles discussing cash but just 15 articles mentioned the word cash pooling; of these three articles are exactly the same, and 11 just mentioned cash pooling without any detailed analysis. We have to use relevant literature available from the Internet. Thus, large proportions of references we used or studied are downloaded from the Internet, and thus, they are more likely to be changed or eliminated than printed material.

We have also searched all English financial and economic journals available in our University's library (about forty journals) for the last six years. There are only two articles relevant, but none of them is concentrating on cash pooling or shared service centre. Because we cannot find an available literature using a quantitative method to analyse cash pooling or shared service centre, there is seldom a reference literature in the quantitative analysis parts, except for those providing the theoretical basis.

In general, the theories we use are all from available literature, especially academic textbooks. There is no difference between the theories presented in the books we use and other books because we just use basic theories, such as mean-variance paradox, option pricing theory, and Capital-Asset-Pricing Model.

As we mentioned, it is hard to find references that are exactly what we need. This might be due to the fact that the SSC and cash pooling are quite new topics in Europe and that the University does not possess many

American journals. The limits of available literature have forced us to conduct the quantitative analysis all by ourselves without the consultation from the research that might have been done by other researches.

Finally, we have spent much time on finding articles with inside and original information from a mass of copycats available on Internet. Frequently, there is not a really noticeable difference between articles written by one banker and other bankers, or one consultant and other consultants. Especially articles studying the shared service centre from management or human resource viewpoints are often mirror each other.

1.4.2 Practices

We have practised at Mölnlycke Health Care AB for about half a year and our experiences confirm the rightness of our collaboration with a company that is carrying on the project as same as the one we are presenting.

We participated in the project from the very beginning and have been involved in most of the process of investigating and designing of the future outlook of the SSC and cash pooling. At the same time, we also carry out our own research on the same topic. Practices gave us the most up-to-date information, allowed us to access to internal information, and provided us with the best way to consult experienced people not at universities. The greatest advantage of the practice is that it enabled us to quickly point out where the problems were and which issues practitioners wanted to know more about. But the practice does not jeopardise us because our analysis largely concerns to the general situation rather than Mölnlycke Health Care AB only.

Nothing is free, so practice is not totally free of charge. Firstly, we need to spend some time on and pay attention to very practical problems that are not covered in our paper. Secondly, because we have been deeply involved in the project, it is hard for us to avoid disclosing confidential information when we write the case study. Thirdly, we have found that some issues, which are regarded by us as quite clear and very basic because we discuss

them frequently, are probably new to some readers. We might need to add more relevant background knowledge in this thesis. Finally, the most important setback of the practice is that, concerning some terminology, readers and our tutors may have a different understanding of our company-specified concepts.

1.4.3 Independent Analysis

In order to make our own observation, thinking and analysis, and integrate them into a well-organised thesis, we firstly consolidate our knowledge learned from various economics, management and finance courses, then adapt them to real problems, and as we hope, make our independent, reasonable and valuable analysis. We try our best to present what we learn and what we do in an understandable and reader-friendly way.

We apply some very common micro-economic theories, such as agent-principle problems, and quantitative evaluation models to analyse the costs and benefits of the SSC and cash pooling and various topics that will arise in the setting up of SSC and cash pooling in Europe. Because we aim to deploy the knowledge of the general textbooks and academic journals to the particular SSC and cash pooling fields, our micro-economic and financial analyses are tailored to the methods widely used in practices and conditions that limit the choices of practitioners.

When conducting independent research, we face a paradox. On the one hand, we feel short of theories and quantitative methods that we can use because there is no available literature pointing out which theory is the right one. On the other hand, we have learned several theories and we know a number of quantitative methods that can be used when conducting our analysis. For instance, to evaluate the shareholders' value, we can use for example state-contingence theory, net present value calculation, option pricing theory and historical time-series analysis. We always need to struggle hard to find out which are the right theories and appropriate approaches.

In order to keep our thesis on the right track, we spend much time on comparing different alternatives and examining every detail, though the comments from our tutors and others have saved us much time. However, we still need to warn the readers that our analysis is definitely not the only right answer. Conducting analysis on the basis of theories other than we used might give the readers different results.

1.4.4 Data Used

Because we primarily conduct theoretical analyses, we do not use much data, except the case study. The correctness of our analysis is not substantially affected by the accuracy of the primary data.

Concerning the numbers directly connected to facts, such as bank services, EMU, and so on, we use the data gathered from various archives and our own investigations from corresponding organisations. We tried our best to make the data as accurate as we could, for instance, every real number presented is cross-checked to make sure that it is identical in at least two reliable sources. Unfortunately, reality is moving fast and changes are taking place from time to time. We have to use secondary data that is available to us. Our resources determined that we could not go to investigate the tax regime, bank protocols, and so on, in 15 European countries.

In addition, all data in the case study are real numbers generated from the Mölnlycke Health Care AB, but some information is intentionally omitted because we are required to keep the specific information in line with confidential requirements set by the company.

We do not use any real number in our quantitative analysis because no such data is available to us so far. Mölnlycke Health Care AB does not have the necessary data because the project is still in the process of being designed. We do not have time to wait for the proceeding of the real numbers due to the time limitation, and, though we tried hard, we cannot achieve a valid channel to collect data from other firms either. The setback is caused by two reasons: one is the sensitivity of the data; another is limitation of refer-

ence companies, because just a few Swedish firms have already built up SSC and cash pooling. Therefore, data used in Chapter 4 to Chapter 6 is mainly computer simulated. Again, the lack of real numbers does not affect the correctness of our analysis because our analysis is basically a theoretical analysis of general situations.

1.4.5 Theoretical Bases

As we all know, a problem can be explained by many theories from different perspectives. For instance, the compensation to sales agent is related to the agent-principal problem, monitoring problem, equal compensation problem, and so on. We just adapt the one that we think is the most relevant to the real problem in practice.

Secondly, we use a number of micro-economic and financial theories. The thread of these theories is the cost and benefit analysis, though the theories may appear in many fields. Other less relevant aspects are left to further research due to time and resources limits.

Finally, during the analysis, we review each theory briefly, but we do not devote much energy to explain a theory or quantitative method in great details. So, relevant economic and financial knowledge of and familiarity with quantitative methods are vital to fully understand our analysis.

1.5 Structure

The total thesis is mainly comprises five parts, namely, brief review of SSC, issues related to cash pooling, benefits of centralised services, incentive compensations to sales agents, and stakeholders' value analysis. In addition, we also study the case of Mölnlycke Health Care AB. Figure 1.1 shows the structure of our thesis.

The introduction has included information like background, problem defining, purposes, methodology and limitations. This chapter is aimed to give the readers a clear idea what they will find.

In the second chapter, we briefly explain the rationales behind the philosophy of SSC, after giving a concise description of what SSC is and what are its main characteristics. We introduce the issues related to the cash pooling in the subsequent chapter.

In Chapter 4, a model that can be used for evaluating the benefits of centralised shared service and to compute the optimal number of service centre is presented and the factors that trigger the trend of centralised in-house service are discussed.

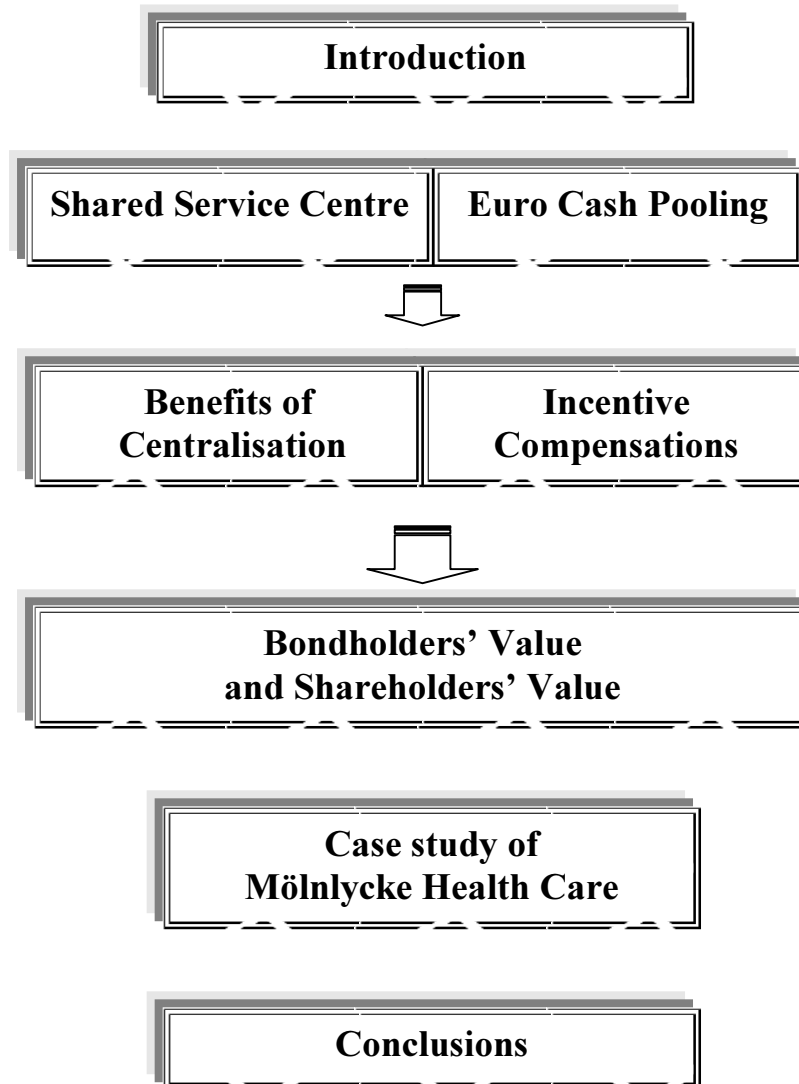
In the fifth chapter, we discuss the incentive compensation to the local salesmen and sales offices. Two approaches, the cost plus and revenue minus, are examined to see which approaches can approach an optimal solution between the undertaking company and its employees.

In Chapter 6, we focus on bondholders' value and shareholders' value. Starting from the analysis of the attributes of cash flow, we closely track the liquidity position of the firm and then we focus on how the cash pooling will affect bondholders' value and shareholders' value. Chapter 5 and Chapter 6 mainly contain theoretical issues and quantitative analyses.

In Chapter 7, we present how Mölnlycke Health Care AB formulates its SSC and cash-pooling project. While other chapters provide a general analysis suitable for many companies, this chapter focuses on the situation of Mölnlycke Health Care AB only.

In order to summarise our research and to give a suggestion as to what questions need to be further studied and what issues need to be investigated more carefully, we finally give our brief conclusions.

Figure 1.1 Structure of the Thesis



Chapter 2 Re-engineering for Euro-Efficiency

This chapter concerns the opportunities to restructure and re-engineer organisations to benefit from the future European business environment. Firstly, we describe the facts surrounding the introduction of the single currency, and what this means to the business environment. We then go on to discuss how the new environment affects the financial administration of companies operating within the EMU area. We specifically identify and describe some ongoing trends such as centralisation of financial activities and the creation of shared service centres.

2.1 EMU and Euroland

The launch of the euro has created the world's second largest single currency area after the United States*. It comprises 11 countries, which account for about 16 percent of global GDP, and has a total population of 290 million (OED 1999). This currency union is not just another system of pegged exchange rates; it is rather a significant step towards increased integration in Europe. It is an effort to create one domestic market for the member countries, the market of "Euroland".

It is inevitable that, despite thorough preparation, there is a fair amount of uncharted territory ahead. On the one hand, a sophisticated institutional framework has been established prior to the adoption of the single currency, co-ordination of economic policies has been strengthened, and there are long-standing initiatives to promote close economic integration. On the other hand, long lasting monetary unions among major sovereign nations, without strong political integration, have never been observed before.

* In terms of economic size

Table 2.1 The EMU Schedule

1998	1999 – 2001	2002 →
PHASE A Launch of EMU	PHASE B Start of EMU	PHASE C Single currency fully introduced
<ul style="list-style-type: none"> • List of participating Member States • Setting up of the ESCB and the ECB 	<ul style="list-style-type: none"> • Fixing of conversion rates • Euro becomes a currency in its own right • ECB conducts single monetary and exchange-rate policy in euros • Inter-bank, monetary, capital, and exchange markets in euros • Wholesale payment systems in euros 	<ul style="list-style-type: none"> • Euro notes and coins introduced • Banks have completed the changeover (retail business payment systems) • Only the euro is used • Notes and coins denominated in national currency are withdrawn • Public and private operators complete the changeover

Source: Information Programme for the European Citizen (1997)

It is obviously difficult to predict with confidence the economic effects of the introduction of the euro, but it seems probable that the consequences, whatever they are, will be significant. In fact, changes on the European marketplace can already be noted, such as the creation of a European corporate bond market and the use of new cross border clearing systems.

2.1.1 The Effects of EMU

Citibank (1999) identifies four key forces at work in Europe as a result of EMU. One such force is *price transparency*. Consumers across Euroland can more easily compare prices, forcing suppliers to ensure that their prices are as low as their competitors' regardless of local impacts (such as wages) on production costs. This, together with increased mobility of products and services across borders, should lead to more harmonised prices. We can also expect the expansion of Internet to add leverage to this force since it makes it easier for customers to 'shop around' across national borders.

Another force is *changing transactional infrastructure*. The new payment systems make cross border payments within Euroland cheaper. Under the old currency regimes, it could take up to five days for money to be transferred from one EU bank to another. Making cross border payments within Europe required a complicated network of correspondent banks, at least one for each currency, each offering different banking terms and cut-off times. The combination of EMU and various technical developments has, however, harmonised euro area payments to some degree. Thanks to several new cross border clearing systems, banks now have more choice regarding how payments are to be made, and transaction times are reduced (Stephens 1999).

A third force is *deepening capital markets*. Financial products and services can be offered across national boundaries because the legal and regulatory barriers are reduced. The European financial market will then be more competitive, resulting in a low interest rate environment with increasing appetite for corporate bonds. We can also expect market liquidity to improve as cross-boarder trade becomes cheaper, and deregulation will enable a larger group of institutions to offer financial services, increasing the competition between banks and other financial institutions. The opportunity for financial institutions to offer cross-border services should increase due to harmonised banking regulations and abolished exchange restrictions.

Also, the need for companies to hold liquidity in different currencies is decreased and thereby also the need to finance this liquidity (Bennet 1998).

European companies will experience a reduced currency risk because a greater portion of their market will be in their base currency. This means that European investment will be more attractive to investors. The development of an equity culture should add to this impetus, and trading is likely to substantially increase within the European equity market (Sear 1998).

The last force is *acceleration of market trends*. A more integrated Europe provides a fertile environment in which other market trends will accelerate. For example, as companies face increasing competition due to price transparency and fewer barriers to trade, it is likely that their willingness to adopt new technology such as ERP systems or E-commerce solutions will increase.

2.1.2 Implications for Companies

The changeover to the euro affects every enterprise across all its business activities. It has direct and tangible impacts on companies and poses significant strategic, marketing, and organisational challenges. The immediate challenge for companies is to make operations functional with the new currency. In addition, companies are also working with adjusting to the new business environment, and they are developing strategies to take advantage of efficiency gains that can be made. It is often argued that acting fast and dealing with the euro at an early stage create competitive advantages. Those who succeed in doing this can start to change their businesses to fit the new business prerequisites. The effects of the euro on companies are therefore of a more structural nature in the longer term.

The potential to significantly upgrade treasury operations is one of the first tangible benefits of the euro, and a strategy to adjust the operations with respect to the new single currency is high on the agenda for all large and mid-size companies (van Alphen 1999). Many companies have also discovered that a large part of the opportunities for increased efficiency lies in

restructuring and reprocessing by centralising treasury activities and liquidity. Although automisation and centralisation of treasury processes and systems have been in focus for several years, the euro is rapidly accelerating these initiatives, prompted by new technology and the search for efficiency.

These new strategic goals are based on a vision of the new business environment, characterised by increased consistency and conformity with money market and interest rate convergence and a rise of an efficient secondary financial market. It is already easier to move money between countries, and cross-border transactions are simplified. This in combination with a concentration of banking relationships will result in better prerequisites for efficient treasury management. But to be able to benefit from this new environment, it is necessary to look over the existing procedures and structure. If the new environment enables substantial improvements in efficiency, it is natural that the new strategic objectives concern how to achieve this efficiency.

2.2 Centralisation of the Finance Function

During the 1980's and 1990's, many companies decentralised their operations by providing greater autonomy to their business units. Each subsidiary of a group had its own support functions, such as accounting, treasury, IT, and other administrative services, and different systems to support these processes. While the benefits of decentralisation are numerous, there are also drawbacks, such as duplication of management effort, ineffectiveness from small-scale operation, non-standard systems, inefficient localised practices with outdated processes, and duplication of infrastructure (Shah 1998). The new trend of centralisation is a response to these inefficiencies by consolidating the support functions within the company. By doing this, some of the problems associated with decentralised companies can be avoided, while the benefits are still there.

2.2.1 Forces for centralisation

The financial functions, such as treasury and accounting, are often the first functions to centralise due to their independence of geographic location. One reason for this is that financial activities are relatively easy to move without disturbing the effectiveness of the rest of the company. Also, since these trends coincide with the introduction of the single currency, it is natural that the financial functions come in focus.

The most evident rationale behind the centralisation of the finance function is the cost savings from consolidation. But in addition to reducing the cost, centralisation initiatives also make it possible to design processes, and the new processes can then be designed to fit the new business environment of a single European marketplace. Such process re-engineering allows for benefits, such as supply chain integration and the consolidation of all invoicing from a single point, centralised warehouse distribution, centralisation of inventory to a single balance sheet and the creation of a single legal vehicle for the European marketplace (Robinson 1998).

There are also other developments on a macro-economic level that strengthen the tendency towards centralisation. Business is becoming increasingly global as relatively smaller companies are increasing their presence in international trade. Global strategies rely on local business units to adapt to local market conditions, and such strategies force companies to focus on “core business”. Downsizing, cost reduction and maximum efficiency have become key words.

The trend towards centralisation of treasury and cash management activities therefore fits with the trend towards globalisation and focus on “core competence”. As a result of the improved technical capabilities, the treasury manager has the opportunity to concentrate on those areas where he/she can generate the highest added value, such as risk management and corporate finance. Those functions require specialised knowledge and experience, and such skills may more likely develop in a centralised environment.

Other forces feeding the centralisation trend are political integration and economic deregulation. The fact that the business environment is similar in different countries makes the treasury function less dependent on local knowledge and contacts, and tax harmonisation makes strategic decisions less complex. Deregulation makes it easier to move funds cross-border and facilitates more sophisticated and efficient pan-European banking services.

2.2.2 Levels of Centralisation

Several alternative strategies for centralisation of financial activities exist. The basic choice is the degree of centralisation, and different levels of centralisation are preferable depending on strategy and opportunities. Also, even if a company wants to gain efficiency as much as possible from centralisation, this may not be achievable at a first stage. The road to a centralised treasury and cash management function can be described as a three-step process (van Alphen 1999).

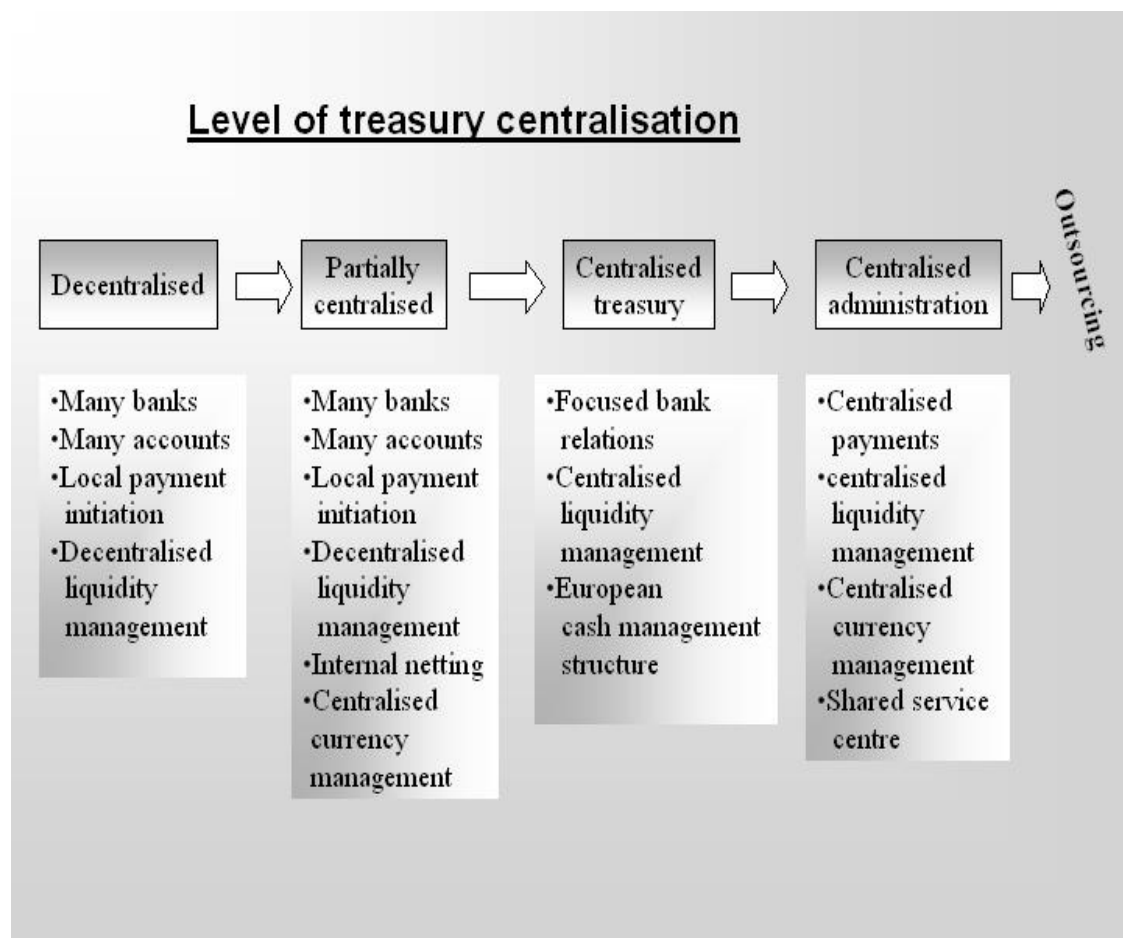
A first step is *partial centralisation*. This is where most companies are today. They have established some centralisation of core treasury functions, even though subsidiaries enjoy considerable financial autonomy, and they maintain multiple local banking relationships in different member states. Financial management functions, such as foreign exchange and interest risk management, are run centrally, but day-to-day liquidity is managed on a decentralised basis.

With the infrastructure of centralisation now being made available by leading banks, European businesses can progress to the next step of treasury centralisation, which is *centralised liquidity management*. This involves reducing the number of banking relationships. Global companies that elsewhere have shown a strong predisposition for multiple relations are moving towards single-bank relationships in Europe. Two distinct banking options for centralising liquidity can be noticed: an overlay account structure and full partnership with a pan-European bank.

A third level of centralisation is *centralised transaction processing*. This is the final transition to a centrally managed treasury, and it is a complex process that can take years to implement. Nevertheless, a handful of leading corporations have already taken this step within Europe.

Different levels of centralisation can be distinguished also within transaction processing. A first transitional stage could be to handle all payments

Figure 2.1 Level of Treasury Centralisation



Source: Davidsson 1999

from the central treasury. Subsidiaries then manage their own accounts receivable and accounts payable administration, but forward all payment instructions to a central point. Because financial administration remains decentralised, the centralisation advantages are relatively modest, but the arrangement increases the group's negotiation strength with the banks that

are providing the transaction services. One step further is to bring all routine transaction processing into a shared service centre. Bringing functions together not only increases the efficiency with which routine tasks are completed, but provides corporate treasurers with much more complete and timely information on which to base their funding decisions. Treasurers will therefore seek to work more closely with shared service centres, and eventually the liquidity management and transaction processing functions will merge into a single operation. The last stage is to move from an in-house document processing at a shared service centre to full outsourcing by a single institution.

Today, most European companies are at the earlier stages of the centralisation process, with cash wholly or partly diffused through their operating subsidiaries. US companies, already aware of the benefits of treasury centralisation within a single currency area, have been in the frontline for the European trend with their subsidiaries operating in the euro zone.

2.2.3 New Technology

New technology facilitates the centralisation of financial activities since it makes it easier to perform tasks from a distance. It allows for automisation and centralisation of a great number of activities, such as payments, reconciliation and registration of bank data, definition of cash and currency positions, forecasting etc.

Many new products have recently become available on the European market. For example, the new enterprise resource planning (ERP) systems provides opportunities to closely integrate underlying business data with treasury information. These systems are capable of collecting, exchanging, consolidating and processing multiple layers of data and business events on just-in-time basis.

Some of the best opportunities for ERP-based savings are in the treasury and cash management area, such as centrally handling outgoing and incoming payments. By routing payments generated by several operational

units through one central point to a single banking partner, substantial volume savings on transaction charges can be achieved, along with an increased control of funds flows and a possible reduction in cross-border funding costs. Also, an ERP interface enables automatic updating of receivable ledgers as the appropriate accounts are credited. Thus, in addition to making businesses more efficient, the ERP systems also force fundamental changes in the way companies are organised (Verschoyle-King 1999). For the treasury activities, this goes hand in hand with how companies change to benefit from the euro.

2.3 Shared Services

The term “shared services” was first introduced by Jim Bryant, who organised shared services at Baxter International, a New Mexico health care supply company (Finanstidningen 1997). The concept is closely connected to the idea of centralisation, and it is reasonable to predict that it will be more common in Europe when companies are restructuring for the euro.

2.3.1 The Concept of Shared Services

The idea of shared services is to gain advantage from decentralised management and less hierarchical structures by sharing resources, such as organisational staff and technology, while providing defined services (Gunn *et. al.* 1993). Shared services provide a way to reduce the drawbacks of a decentralised organisational structure while preserving the autonomy of the local business units. The fundamental difference between shared services and a centralised organisation is that shared services is a type of “internal outsourcing”, focusing on providing services to individual business units. It is not a method of dictating control, a characteristic that is common to centralised organisations (Jarman 1998).

Creating a shared service centre (SSC) is one way to efficiently implement the idea of shared services. It is a move toward managing services across an entire continent from a single location instead of having separate opera-

tions in individual countries. This is achieved by creating an independent organisational entity that provides chosen support services to multiple units in the organisation. By upgrading and consolidating the support staff, give it the technology it needs, and make its services available to all the company's divisions efficiency can be improved throughout the group. The major industries represented by SSCs are financial services, computers and technology, pharmaceutical and health, and consumer products. Most companies using them are large with many divisions (Malachuk 1999). The concept first emerged in areas such as customer service management, telemarketing, and transaction processing. Back office financial services are now following a similar path (Lucenko 1998).

Table 2.2 Financial Related Processes Commonly in Shared Service Centres

<i>Order to cash process</i>	<i>Purchase to pay process</i>	<i>Accounting to reporting process</i>	<i>Fiduciary/compliance</i>
<ul style="list-style-type: none"> • Telemarketing • Telesales • Order entry • Billing • Accounts receivable • Credit & collection • Customer service • Working capital • Cash and treasury • Order fulfilment • Distribution • Warehousing 	<ul style="list-style-type: none"> • Purchasing • Inventory accounting • Contract administration • Fixed assets • Accounts payable 	<ul style="list-style-type: none"> • General ledger accounting • Consolidations • Reconciliation • External reporting • Management reporting • Financial reporting • Cost accounting • Budgeting 	<ul style="list-style-type: none"> • External audit • Internal audit • Tax accounting • Legal • Transfer pricing • Social security

Source: www.treasury-management.com and Shah 1998

The processes likely to be best provided in an SSC framework are those that are not critical to a business unit's strategy and are not unique to any business unit. Whilst these tend to be transaction oriented and volume-sensitive processes, an SSC can also house specialised functional expertise (Arthur Andersen 1999).

The euro implementation has triggered plans for shared service centres in many European corporations. With the introduction of the European single currency, companies in Europe recognise that SSCs now make more sense. The rationale is that SSCs will enhance the competitive advantage in the new European marketplace by utilising an enterprise-wide system to centralise the back office across all European subsidiaries (Jarman 1998).

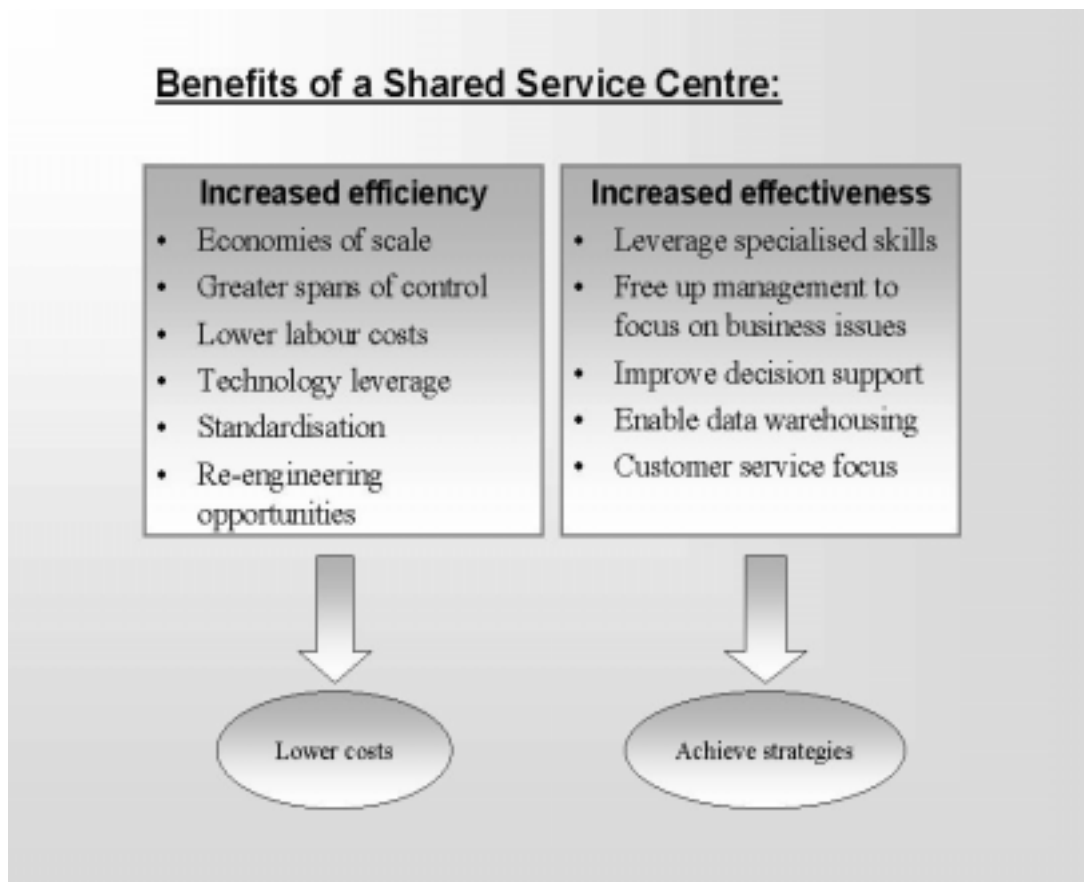
2.3.2 The Benefits

The arguments for financial SSCs are both increased efficiency and increased effectiveness. The main cost savings come from (1) economies of scale in consolidating operations to a single site, (2) standardisation, and (3) re-engineering. Other, more abstract benefits can be increased control and increased effectiveness in achieving business strategies. An additional benefit is the synergy and knowledge transfer that occurs when experts come together in the SSC with a common goal. The expertise gained by individuals at different sites can be combined to create best practice solutions to corporate problems.

Shared services support an overall trend in business: a migration from spending the bulk of the time on transaction processing and reporting, to spending more time on decision support and managing control and risk. It also allows local business units to focus on processes that are more expertise driven versus ones that strive for efficiency. Additionally, since the shared services units exclusively carry out a support function once handled by each business unit, the function is itself insulated from the shocks of corporate reorganisations, mergers, acquisitions, and divestitures.

Implementing a shared service centre is, however, no small undertaking. A large capital outlay is often needed to establish a physical location, install the IT systems, and relocate employees to staff the centre. The cost of consolidating disparate data sources and converting the data into a common format for the central system can also be significant. Another disadvantage is the loss of face-to-face service (Hirschfield 1996).

Figure 2.2 Benefits of a Shared Service Centre



Source: Arthur Andersen (1999)

2.4 Organisational Aspects of the New Financial Function

It is evident that moving towards a re-engineered financial function, such as an SSC and a cash pooling solution, will have organisational consequences. Responsibilities and tasks of different units within the company

are changed. Some units increase their influence on the company's activities, while others have less influence. The changing process may therefore face internal resistance, and co-ordination problems may arise. The legal structure of the group may also have to be changed.

2.4.1 Internal Resistance

Resistance to change is a common phenomenon within organisations. The resistance can be of a cultural as well as a political nature. Cultural resistance may, for example, come from managers if they feel that the philosophy of centralisation is in contrast to their views of commercial decentralisation of business units. They may also have the conviction that a subsidiary can produce the best profit by operating as independently as possible.

The political dimension is also important. The change may be threatening to staff if they fear for their jobs or their status. For example, when it comes to centralising liquidity, it might not be obvious for the local managers that it is good for them to "give up" cash. While treasury staff at cash-poor subsidiaries should be positive to having better funding access, units with large surpluses might be sceptical about surrendering control. Business units cannot be expected to give up power or influence without a fight. The best way to implement an SSC or a cash pool is, therefore, to do it in co-operation with the local managers, and convince them that they benefit from the project (Kurtz and Duncan 1998).

2.4.2 A Problem of Co-ordination

In addition to the problem of resistance to change, moving towards a more centralised structure can also give rise to the classical problem of achieving co-ordination, motivation and specialisation at the same time in an organisation. When financial tasks are decentralised, the units in control of both the costs and the quality of the financial services are also the residual claimants of the value created. If the local units are profit centres, they will be motivated to keep costs down, and at the same time maintain a high

quality level, to create the most value to the company. Changing to a centralised financial service unit may change this balance. The centralised unit controls the outcome of the financial operation, but the local units are still the ones benefiting from a high service level. Then, it is likely to be a conflict of interest between the central and local units. The central unit wants to keep costs down, but the local unit wants as high quality as possible.

It is not likely that this co-ordination problem can be taken care of by having close monitoring and supervision, since the company in its core activities still operates in a decentralised way. Some compensation scheme therefore has to be worked out to co-ordinate the units through incentives. One way of achieving co-ordination in these circumstances is through transfer pricing (Milgrom *et. al.* 1992). Then both the local unit and the financial service unit are profit centres, and the local sales unit has to pay the financial service unit for the services. This solution is common for shared service centres, because it emphasises the role of the SSC to provide services as cost efficiently as possible at the request of the local units (Lucenko 1999). For this to work efficiently, the shared service centre must be exposed to competition. Thus, the local units either have to be able to buy the service from somewhere else, or to do it themselves. If an efficient transfer pricing solution is not possible, for instance if the financial service unit is in a monopoly position to the local units, then some compensation scheme has to be worked out. This will be discussed further in Chapter 5.

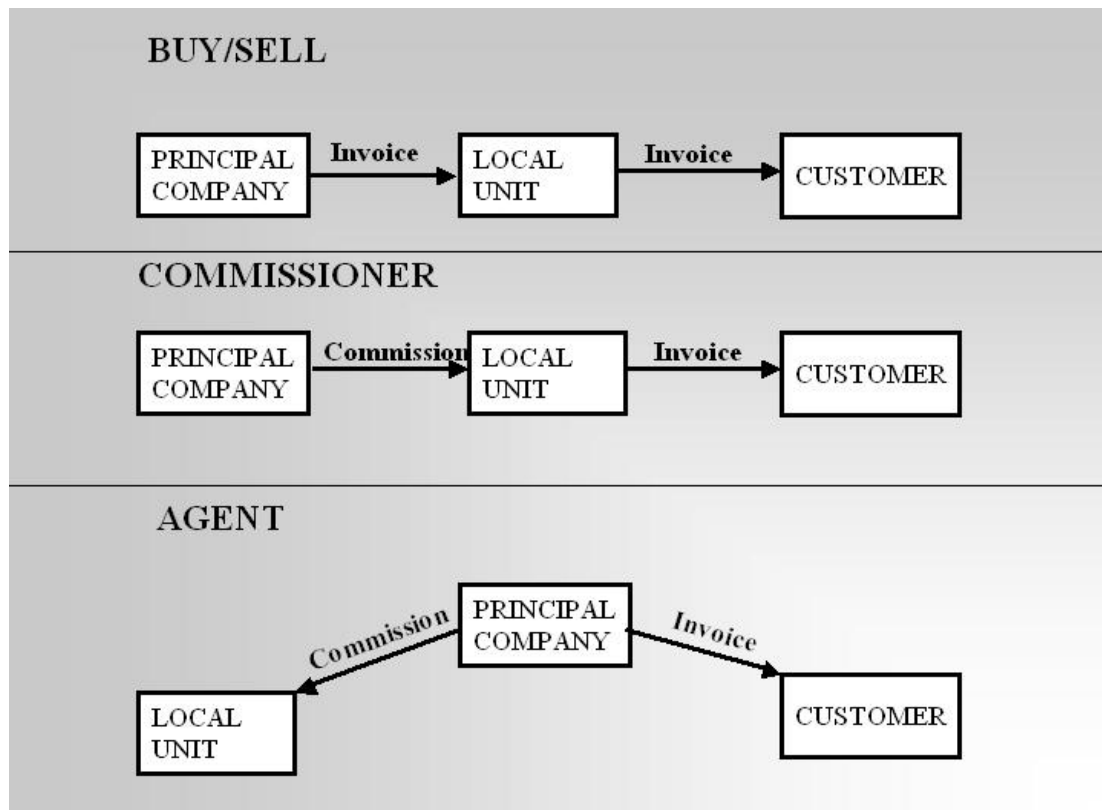
2.4.3 Legal Structure

There may be reason to change the legal set-up, as the financial tasks are reorganised within the company. Before the creation of Euroland, most MNCs operated with a buy/sell structure in which the local sales organisations buy the products from the principal company and sell them to the customers. Each subsidiary operated as independent companies, and they could do so because they performed most of their administrative functions themselves. The goods could be bought from the factory at prices close to

prices of similar goods on the outside market, and the income statement therefore looked like an income statement for an independent company.

The centralised financial function, however, ties the subsidiaries closer together, creating one “Europe-wide” company rather than a group of national companies. This may encourage a change in the legal set-up for two reasons. One is that internal pricing is problematic with financial services, since no competitive outside market for financial services exists to ensure efficient transfer pricing. This problem may force the company to take away the independence of the local units. The other reason is that companies will increase the movement of cash within the group, and a change in the legal structure can facilitate the internal movement of funds. If cash is held by the principal company rather than the local units, no internal loans have to be arranged when cash is moved from one country to another.

Figure 2.3 Different Legal Structures



Source: Mölnlycke Health Care AB

Many companies therefore change the legal structure to either a commissioner structure or an agent structure. In a commissioner structure the principal company is supplying the local unit with products, and the local unit sells the goods to the customer in its own name. The principal company owns the goods until it is sold to the customer. Prices are set locally and the income of the local unit consists of a commission. In the agent structure, the local sales unit acts in the name of the principal company. The customers therefore enter into a contractual relationship with the principal company instead of the local unit. Here too, the income of the local unit is a commission from the principal company.

Since the principal company owns the goods in both the commissioner and the agent structures, it is natural that the principal company receives the payments from the customers. Thus, cash is kept within the principal company and can be moved to a central pool or to a different country without having to arrange internal loans. Also, the activities of the local units can be co-ordinated through the commission since the commission can be based on how much value the local units generate to the principal company.

2.5 Empirical Evidence

Studies of U.S. and multinational corporations have shown some very real benefits resulting from changes made in the finance function. A study in 1995, sponsored by the Hackett Group, covered 300 companies and showed that the average cost of the finance function had declined 32 percent since 1988, and the average cost as a percentage of revenues had dropped from 2.2 percent to 1.5 percent. The average staff size had been cut by one third according to the study (Chapman 1995, Roy 1995). A study of European finance activities at 20 major multinational companies showed that they can save an average of \$10 million or 35-45% of finance function costs by sharing mechanical accounting functions on a regional or pan-European basis, rather than performing it on a country-by-country basis. This study was performed by A.T.Kearney and examined companies

which are considering introducing or have introduced SSCs in Europe for processing accounting transactions, such as accounts payable, billing, accounts receivable, and general ledger accounting. Most of the companies were American-based, but a handful were European. The research found that the highest cost saving in absolute amounts was generated by the reduction in personnel. In terms of the percentage of finance function costs, the greatest savings were achieved through IT/systems support costs. The study also showed that companies with high costs had very decentralised finance and accounting functions (Cash Management News 1994). Another survey from 1994 of 374 U.S. companies with annual sales ranging from approximately one million to ten billion dollars showed that 60 percent of the companies were involved in reengineering the finance function, although most of them were in an early stage of the process (Baliga 1994).

The Phoenix-Hecht 1998 Cash Management Monitor Study showed that companies with sales of \$500 million or more are consolidating the number of cash management banks they use. And over the years 1999-2000, companies with sales of U.S.\$1 million or more are planning even more consolidation (Kroll 1998).

2.6 Summary

The European currency area is the first of its kind, and it is connected with high degrees of uncertainty. Some important forces that are expected to influence the business environment are, however, transparency, changing transactional infrastructure, deepening capital markets, and acceleration of market trends.

The potential to upgrade treasury operations is one of the first tangible benefits of the euro, and a movement towards re-engineering and centralisation can be noticed. The financial functions are often the first parts of the organisation to be centralised because they are not as dependent on geographic location, and the euro simplifies centralisation of these activities.

The road to a centralised operation can be described as a three step process where the first step is partial centralisation, the second step is centralised liquidity management, and the third step is centralised transaction processing.

One way of achieving benefits of centralisation is to set up a shared service centre. This involves a move toward managing services across an entire continent from a single location instead of having separate operations in individual countries, and it is achieved by creating an independent organisational entity that provides chosen support services to multiple units in the organisation. The processes likely to be best provided in an SSC framework are those that are not critical to a business unit's strategy and are not unique to any business unit. The arguments for financial SSCs are both increased efficiency and increased effectiveness.

It is evident that moving towards a re-engineered financial function will have organisational consequences since responsibilities and tasks of different units within the company are changed. The changing process may face internal resistance, and co-ordination problems may arise. The legal structure of the group may also have to be changed. Empirical evidence, however, shows that substantial benefits of re-engineering the finance function are achievable.

Chapter 3 Euro Cash Pooling

The introduction of the euro means that the diversity of currencies and interest rates to a great extent disappears, ruling out costly conversions when transferring money between countries. For a company operating in Europe, it is therefore tempting to move liquidity from a national to a European level and create a “euro pool”; a single European cash pool denominated in euro. In this chapter, we describe how a euro cash pool works and what the rationales are for using it. We also discuss the relationship that a company has to get involved in with one or several banks when using a cash pool, and which alternative forms this might take. Lastly, we discuss other hurdles that have to be considered when implementing a cash pool.

3.1 Benefits of Cash Pooling

A cash pool is an instrument offered by banks to multinational companies. It is an arrangement between the bank and the company, carefully structured and negotiated to fit the specific needs of the company and the business environment. The concept is rather simple. A number of accounts are specified, and, at agreed intervals, the bank pays or charges interest on the net sum rather than on the individual balances. The immediate benefit to the client is that the total interest paid/charged will be higher/lower than the sum of the individual payments/charges for the individual accounts. The cash manager also needs to make only one decision, namely how to invest a surplus or finance a deficit. Thus, the group can make better use of resources and reduce its bank loans.

There are also other, less obvious benefits. For instance, economies of scale can be achieved at a central level, for example when negotiating for interest rates and banking fees. The structure also creates opportunities to cut administrative costs, both by consolidating and specialising tasks and by

making processes more automated. In addition, a cash pool can be an important building block in a new re-engineered treasury department by making it integrated with other treasury and financial processes. On the other hand, legal obstacles as well as banking and tax regulations, all of which vary from country to country, raise the cost and administrative burden involved in pooling.

The main purpose with setting up a cash pool varies from case to case, but some examples of common objectives are (Goeij *et. al.* 1995):

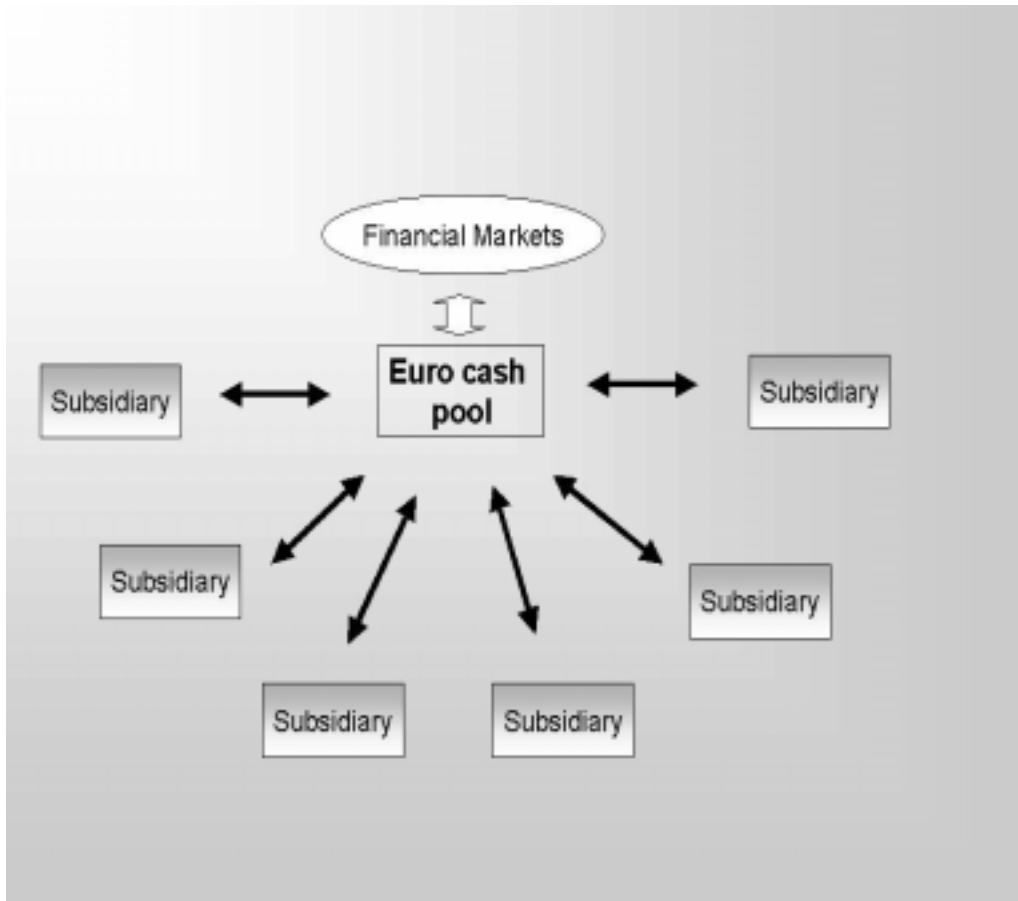
- To maximise return on liquid funds and optimise the use of excess cash.
- To reduce administration by making the payment routines more automated via electronic banking systems.
- To improve banking conditions on an overall basis.
- To achieve tighter control and improved decision making by centralising and speeding information.
- To achieve a specific bank relation strategy.
- To reduce the balance sheet by more efficient offsetting loans and deposits.
- To create tax advantages by centralising the handling of liquidity to one tax efficient location.

The costs involved in cash pooling are mainly the set-up fee, the running fees, and the sweeping fees of the bank (Davidsson 1999). An indirect cost often arises when a cash pooling solution involves a compromise in the choice of bank, as only a few banks can provide the service. Another disadvantage is the risks involved in “putting all the eggs in one basket”, i.e. the risk of being too dependent on the bank that provides the service.

It is obvious that if units in different Euroland countries are included in a pool, the benefits greatly increase with the introduction of the single currency. Since moving funds between countries becomes simpler, faster and

cheaper, and interest calculations become less complicated, the pool becomes both cheaper and more easily managed.

Figure 3.1 Euro Cash Pool



The financial deregulation following the introduction of the euro also makes it possible for banks to operate in many Euroland countries, and this facilitates the set-up of a pool since pooling accounts within one bank is easier than pooling accounts in different banks. By the same reasoning, the merger wave in the European banking industry will also enable more Europe-wide services. In addition, since synergy effects can be obtained by combining a euro pool with a centralised treasury function or a financial shared service centre, we can expect the euro pool to be a widely used tool in European companies in the future.

3.1.1 Notional Pooling vs. Zero Balancing

There are two kinds of cash pooling: notional pooling and zero balancing. With notional pooling, the balances are physically kept at the local accounts but the interest is calculated on the net total of the accumulated balances. To achieve notional pooling, you normally have to have all accounts in the same bank and sign cross indemnity agreements between all participants in the pool. This arrangement ensures that optimal pooling is achieved without having to move funds. Notional pooling is, however, not permitted in all EMU countries (Bergen 1998).

With zero balancing, the balances are swept at the end of each day or week into a master account. A variant of zero balancing is target balancing, with the difference being that the local accounts are kept at a certain balance instead of setting them to zero. Zero balancing or target balancing generally requires more attention from the cash manager because the movement of cash between the accounts has to be supervised. When bank accounts of several legal entities participate in the pool, each flow has to be registered in the form of an internal loan, and fiscal regulations therefore have to be taken into account. Inter-company loans can give rise to withholding tax and stamp duties in certain countries. In addition, through cross-border zero balancing, a loss of value days can occur, meaning that the pool does not perform to its optimum.

Notional pooling has been preferred in pooling arrangement before the introduction of the euro, but zero balancing has become more attractive in the new business environment, since moving of funds is easier (Citibank 1999a).

As zero balancing involves “skimming” the accounts, the individual operating units do not know what their outstanding balance is. Keeping an additional set of records, indicating the current account balance as if there was no cash pooling, can solve this problem. This can be done through the treasury information system, or the bank can provide a “mirror account”

structure, which is a set of additional accounts showing the unpooled balances.

It is also possible to combine notional pooling and zero balancing in the account set-up to customise the structure to fit different regulations in different countries. Where a notional pool is permitted locally, the pool will often be supported by a local bank, because a local bank is usually better able to respond to specific local requirements than a network bank is. A European cash pool can in that case only be managed through careful follow-up of the cash pool manager. However, the integration into a pan-European pool will be easier if a network bank supports the local pool, because then automatic zero balancing technique can be applied (Bergen 1998).

3.1.2 Account Structure

There are a number of different alternatives of how to structure a cash pool. The structure must be adapted to internal requirements of the group as well as local market conditions and the limitations of the banks. A pool can be structured on a country-by-country basis or per legal entity. A variety of combinations of local and cross-border pools and different interest compensation schemes are possible.

Three basic structure alternatives are available: a local bank structure, an overlay structure, and a one-bank solution (Sancho 1999). In the *local bank structure*, the subsidiaries keep their existing banking relations and services. Automatic sweeping of liquidity can be arranged through agreements with the local bank, and it is done via an international transfer to the euro-pool bank. The amount of manual work is rather large with this type of structure, and the efficiency gains are lower than in the other structures.

The *overlay structure* means that all local companies keep at least one of their accounts with their local banks. Bank balances are pooled in each country and moved to an account with an overlay bank account, which is then pooled to a central account with the overlay bank. This structure re-

quires that the pooling bank be represented in all the countries included in the pool.

The *one bank solution* requires a bank that has full service in all pool-member countries. All services, both on a local and a global level, are concentrated to one bank. All accounts are then with one global bank and all group companies use the same electronic banking system.

3.2 Banking Relations

At the core of euro transition initiatives is a fundamental re-appraisal and reduction of banking relationships. With cash pooling, many companies are bringing a new approach to their relationships with bankers, with more focus on quality rather than on quantity. Earlier, most companies preferred to work with many banks. Conventional wisdom held that working with a larger number of banks gave more options if a financial institution, or the company itself, ran into problems. Today, companies find that by fostering strong relationships with a core group of banks, they can obtain customised cash pooling services, streamlined banking processes, and better pricing. Corporations are thus developing relationships with their banks instead of simply buying products and services as commodities (Kroll 1998).

The nature of the SSC and cash pooling concepts also forces end-to-end solutions from banks. For example, cash pooling and new payment models facilitated by ERP-systems require advanced interfaces between the company and the bank. This is a specific investment from both parts, requiring a mutual long-term commitment. Most banks can today offer electronic banking products based on electronic data interchange (EDI). EDI makes it possible to convert conventional commercial transactions to electronic messages, and an EDI link between the bank and the company usually requires a long-term commitment.

The new developments within treasury have also led to an increased interest in using banks as outsourcing partners (Kroll 1998). With a centralised

financial function and with close links between the bank and the treasury department, it is possible to let the bank take over tasks that are not company specific, such as the handling of checks and bills.

When choosing a banking partner, it is also important to pay attention to the consolidation going on within the banking industry (Kroll 1998). Given the large number of banks and branches in many countries in Euroland, there are signs of excess capacity in the system, and the consolidation trend, especially with the advent of the EMU, will continue. There is also increasing evidence that large banks have efficiency advantages over their smaller counterparts. Thus, most of the evidence points to increasing concentration across European banking markets (Molyneux 1999).

Since the new type of banking relationships involves large specific investments, having to depend on only one service provider is connected to significant operational risk. The future development in the European banking industry is very uncertain, and if substantial investments are made with one bank in the form of network links, and that bank does not survive the expected merger wave, it can be a costly experience.

3.2.1 Clearing and Payment Systems

The international clearing/payment infrastructure sets the framework for corporate cash management in Europe. International cash management is currently a complex activity because national payment systems are not linked together and differ in terms of procedures, formats, security control, protocols and account number systems. A good understanding of these mechanisms can be of great help in setting up the correct approach for a European cash management structure and for a third party and inter-company cross-border payment structure.

Every bank offering cash management products is engaged in payments and/or transfers to other banks. For this purpose it will make use of payment systems that build a bridge between its own information system and the system of the other banks.

There are several options for cross-border payments within the EMU. TARGET will provide a truly pan-European clearing system, but it will be an effective solution only for high value payments. Corporations looking for ways to improve their cash management will benefit, because they will have better control over their liquidity positions in different countries. Once most banks have converted their payments and reporting systems to real-time, corporations will be able to manage cash positions and key transactions on a minute-by-minute basis. Ultimately they will use their electronic banking workstations in the same way they currently use market rate and on-line dealing screens. Payment services offered by banks will depend on the infrastructure they use.

Various options will be available for low value payments, but no pan-European clearinghouse exists. Most options will have constraints in terms of execution time, geographic coverage and service quality. European network banks will use their own infrastructures to provide a broad range of transaction services consistently across all EMU countries. Not all transactions will flow through network banks. When a customer instructs his or her local bank to pay in euro to an account in another country, the local bank can also execute the payment using the SWIFT system, EBA, or a correspondent bank in the country of destination. The customer will be required to fill in an international payment form, which is less easy than making a domestic payment. The local bank will charge an international transfer fee, which will not be substantially lower than current international fee levels. The local bank may take one or two float days, and so may the beneficiary bank (Skerritt 1998).

Corporations collecting receivables in different countries may thus receive their funds later if they concentrate their collections from different EMU countries on one single euro account. To avoid excessive transfer costs, most companies are currently using local collection accounts, and this does not change with the introduction of the single currency. Local accounts will continue to provide important benefits, such as minimising transfer fees

and float (especially for the payer), they also confirm the company's local presence and status, and local accounts will be easier to manage within the EMU. When concentrated in a pan-European bank, local accounts can be operated as one account in terms of liquidity management (Kersnar 1998).

Many developments in the field of euro payments in Europe are emerging. These developments give new possibilities not only for international transactions but also with regard to cash management. The creation of a freely accessible pan-European clearing enlarges the spectrum of cash management products. This development creates new opportunities for every cash or treasury manager. The bank will choose the most cost-effective way to settle a payment. Despite developments in the sphere of payments, a European cash management structure involving cash pooling remains a custom-made solution. This is the case because of the remaining differences in legislation and regulation in the different countries that need to be taken into account (Stephens 1999)

Certainly the service level provided to cash managers will increase. Providers and developers of payment networks will undergo an increasing pressure to support smooth and efficient payment flows in the Euro zone.

Another result will be that the number of banks with the capability of providing cross-border payment facilities for companies will be reduced. The level of intense competition between institutions offering cross-border payments will be such that it will force them to reduce both prices and margins for those services (Skerritt 1998).

3.2.2 Three Groups of Banks

The systems available for making payments and collecting funds vary enormously, especially for cross-border transactions. This is still the case even with the introduction of the euro and an increasing regulatory harmonisation. What the banks can provide when it comes to treasury and cash

management services depends largely on the size and the strategy of the bank. Most banks can offer cash pooling services by country. However, the number of banks offering cross-boarder cash pooling services is still limited to the largest European and U.S. banks. We can roughly distinguish three groups of banks in international cash management: Network banks, local banks, and international banks (Bergen 1999b).

Network banks have developed a wide network of branches across the world. Standardisation of information systems, file formats and supporting procedures are designed to provide large companies in as many different countries as possible with a broad range of services in the field of payments and cash management. A company may eventually be able to entrust the entire payment systems to a network bank. Depending on developments in local regulations network banks could also offer a euro cash pool with bank accounts in various countries on a notional basis.

Local banks have offices exclusively in the home market and limit their presence abroad to a strict minimum. They do not aim at further developing their own network of offices abroad, but they participate in co-operatives with other banks. Their co-operation may take different forms, varying from hiring specific services from a local bank to mutual arrangements, so called “banking clubs”, that involve standardised payment systems and cash management products. Banking clubs, however, are mostly limited to the payment system, and competition among banks considerably hampers provision of co-operative multi-banking services.

International banks are characterised by a strong position on the home market combined with branch offices in a number of major countries. Abroad, they mainly provide services to clients from their own country, in combination with development in some niche markets. Only if the volumes are large enough will an international bank join a local clearing. They will co-operate in customised services in the sphere of international cash management on the initiative of important individual clients. For the time be-

ing, most international banks are not able to offer comprehensive global cash management product lines.

3.2.3 Bank Solutions

Any cash pool solution heavily relies on an available bank solution. However, though many banks can provide a cash pooling package on a regional basis, a bank can seldom provide a solution throughout the whole of Europe. A satisfactory and applicable pan-European cash pooling solution is in the process of emerging.

Principally, there are four kinds of bank solutions, namely, separate bank(s) in each participant country, several regional banks, one overall bank and an overlay structure that provides parallel pooling on both the local and pan-Europe levels. Each of these four solutions has its unique merits but shortcomings as well.

In the separate bank solution, each local unit has its bank(s) selected according to its own business requirements. Therefore, the bank services to the local units are the most convenient and quite tailored for local units. However, low efficiency and high costs to pooling outweigh the benefits of better-than-any-other services to local units. Under this kind of solution, a cash pool must be co-ordinated by a number of banks, and money must be transferred back and forth among different banks. There are also onerous tasks for the corporate to negotiate with bankers sitting in different fortresses. Obviously, the complexity of pooling accounts in several banks is high, if not unmanageable, to the firms.

The overlay structure can sometimes hybrid the benefits of local convenience and central pooling, and it is also a practical solution to cash pooling, including participants from Eastern Europe or outside Europe. It is also the most suitable solution to deal with troublesome legal hurdles and organisational inconsistency. Compared to other solutions, this method mitigates the extreme disadvantages by sacrificing the greatest advantages. However,

this solution will inevitably increase the transfer costs, and cannot achieve either notional pooling or, in most of cases, zero-balance pooling.

A bank may well be present in northern Europe but not in the southern parts. Until now, even the most prestigious European banks are not present geographically wide enough across the whole of Europe. The regional bank solution is a compromise to the reality that banks are not always present everywhere the pooling firm prefers. The combination of several banks can well suit the requirements of the firms. However, transferring money between different banks is more costly than transferring within the network of a bank. Furthermore, managing several regional centres requires many resources.

One bank is the ideal solution to pooling and maybe the only way to get a cross-border notional pooling. Though the one-bank solution maximises the interest gains and provides the best service on the group level, firms always find that there is a large gap between what they want and what the banks can provide. It is not rare that the bank office, if it is present at all, is far away from the location of the firm's subsidiaries. None of the European banks has already been geographically comprehensive enough to provide a full service in all European countries. To that extent, one-bank solution is indeed not capable of pooling cash from a large number of participant countries. The inconvenience of domestic payment and high charges in fact prohibit most middle and small size firms from accessing a one-bank solution. In addition, not all the firms would like to engage just one bank, and take the risk of breakdown of the entire bank links due to system errors in the bank.

3.3 Other Considerations of Establishing Cash Pooling

When implementing a European cash pool, a company should pay attention to local differences between countries that have developed in the absence of a real political union. The differences in fiscal and legal legislation will

make European cash pooling a complex matter for many companies. The key questions are, when implementing a pooling system, how a central treasury can reorganise its cash management and what the most important factors are determining the outlook of a cash pooling system. To make sure that a cash pooling system matches a company's particular requirements, the company should consider the following points:

- ◆ **Local Regulations.** The regulations for cash pools have not yet been harmonised. In every country, a different set of laws will prevail and therefore result in another way of implementing them. Legal requirements may, for example, be laid down with respect to the legal structure of the company. The regulations in many European countries either do not permit a notional pool or make a notional pool too expensive to implement. Notional pooling between resident and non-resident accounts is possible in very few European countries. As a result, zero balancing will be used in those cases. But even then, local differences in legislation need to be taken into account.
- ◆ **Tax Considerations.** International tax considerations inevitably play an important role in system design. The Euro-land tax systems are inconsistent. Tax rates differ, the level at which tax is imposed differs and the structures of the tax systems differ, too. The same inconsistency extends to the taxation of treasury operations. Tax incentives have, until now, been the overwhelming determining factor when companies choose where to locate treasury vehicles in Europe (Muray, 1999).
- ◆ **Reporting.** The cash pooling co-ordinator may need comprehensive same-day reports to stay on top of a complicated cash pooling system. The pooling bank should electronically report movements in individual accounts as well as book balances and available balances for each account. In addition, central bank reporting, required for international transactions, will remain an obstacle for cross-border transfers.

- ◆ **Third-party Payments and Collections.** Cash pooling not only facilitates cross-border payments, but also lets corporations direct cross-border receivables to pooled accounts. The ability to make third-party payments from cash pool accounts and to accept customer payments into cash pool accounts can add considerable value to a system. Such transactions can further reduce a company's foreign exchange transaction and swap volumes.
- ◆ **Overdrawing and Funding Cash Pool Accounts.** Central treasury can remove excess cash from the pool by overdrawing its cash pooling account. Similarly, the ability to overdraw other pool accounts provides a vehicle to fund cash-poor participants without a formal currency swap to move funds from lender to borrower. This allows participants to borrow parts of the deposits in other currencies through overdrafts.
- ◆ **Linkage with Netting.** Many corporations will want to couple their cash pooling and netting systems. When these systems are tied, the results of netting can be credited/debited directly to the participant's current pool account to eliminate the need for actual fund transfers.
- ◆ **Same-day Value.** Corporations that operate in multiple time zones must weigh the impact that payment cut-off times and/or value day deposit restrictions may have on its yields. To maximise interest-earning credit balances, the pooling bank should execute movements to and from cash pool accounts on the principle of same-day value. To accomplish this, participants can send an advice one day before a deposit or withdrawal is scheduled. This allows the bank plan to invest incoming amounts and meet cut-off times for payments.
- ◆ **Phased Implementation.** Companies contemplating multi-regional cash pooling systems should consider phased-in implementation for a smooth transition. Various local regulations need to be examined thoroughly when a European cash pool structure is set up so that the company can benefit from the most favourable arrangement. Pooling in

Eastern Europe is still very underdeveloped, although this is expected to change considerably in the coming years. These are the reasons why most pan-European cash pools are set up country-by-country, one step at a time.

3.4 Summary

The euro has, naturally, the most direct impacts on issues related to liquidity, and centralisation of liquidity into a euro-cash pool has become a high priority issue for treasurers. A cash pool is an arrangement between the bank and the company, where the bank pays or charges interest on the net sum of a set of accounts rather than on the individual balances. There are two types: notional pooling and zero balancing.

Cash pooling will also lead to more concentrated banking relationships, characterised by long-term commitment and specific investments in electronic links between the bank and the company.

However, European legislation is still far from harmonised, and pooling of cash is in practice impossible to implement if it is not accompanied by changes in the organisational structure. This is why cash pooling is so closely related to the implementation of a financial shared service centre. The benefits of creating a shared service centre motivate a change in the organisational structure, which in turn facilitates the use of a euro-cash pool.

Chapter 4 Evaluating Financial Support and Centralisation

In this chapter, some quantitative analyses are conducted of problems that are closely related to cash pooling. We will investigate under which circumstances centralisation of the financial support function is beneficial and when it is not. A model is developed to find the optimal level of centralisation and the costs and benefits involved. The model considers whether a changing business environment can trigger changes in the organisation of cash management activities, and if the changes depend on properties of the firm.

4.1 A Model

It is often argued that one of the most evident benefits from centralising the finance function is cost savings from economies of scale (see e.g.. Cash Management News 1994, Sheridian 1998, Robinson 1998, Jarman 1998, Shah 1998, van Alphen 1999). However, if economies of scale exist, why do companies establish a decentralised structure to start with? Nothing is rarely for free in business, so one would think that since the majority of the European companies operate with decentralised financial units, there would be some disadvantages associated with a centralised structure that do not show up in the costs function. And if these disadvantages cannot be traced in the costs, they should influence the revenue side of the Profit & Loss statement.

By sketching a model that takes into account both economies of scale in costs and influence from centralisation on revenues, it is easier to see in which situations centralisation is beneficial and when it is not. Such a model also makes it easier to see why certain changes in the business environment can initialise a centralisation trend. In addition, if the variables in the model can be estimated from empirical data, it can be used to calculate

the optimal level of centralisation for a specific company operating in a certain environment, and to estimate the value of making the changes.

4.1.1 The Cost Function

It is reasonable to assume that costs of providing financial support are positively related to the quantity of services provided. We thus have an increasing function where $\text{cost} = f(\text{quantity})$ and $f'(\text{quantity}) > 0$. If we also assume economies of scale in costs, then the average cost is a decreasing function of quantity, i.e. $AC = f(\text{quantity})$ where $f'(\text{quantity}) < 0$. The decreasing average costs may arise for several reasons. For instance, a larger quantity may make it possible with more efficient procedures and technology, and personnel and equipment can be utilised more efficiently with less idle resources.

If we assume that these properties of the cost function can be captured by a Cobb-Douglas function, we can write

$$E(\text{cost}) = kq^\beta \quad (4.1)$$

where k is a constant, and β is a value between zero and one, indicating the degree of scale economies. A β of 1.0 indicates that no economies of scale exist, and a lower value of β means more significant economies of scale.

But how is this related to the level of centralisation? If economies of scale only apply to services performed at the same location, then the lowest average cost should be achieved by performing the financial services at the fewest feasible numbers of locations. The expected total cost (TC) for the services performed at *all* locations is

$$E(TC) = kN \left(\frac{Q}{N} \right)^\beta \quad (4.2)$$

where N is the number of locations, and $N \geq 1$ since at least one location is required to perform financial service. Q is the total quantity, i.e. $Q = q * N$.

Figure 4.1 Economies of Scale and Beta

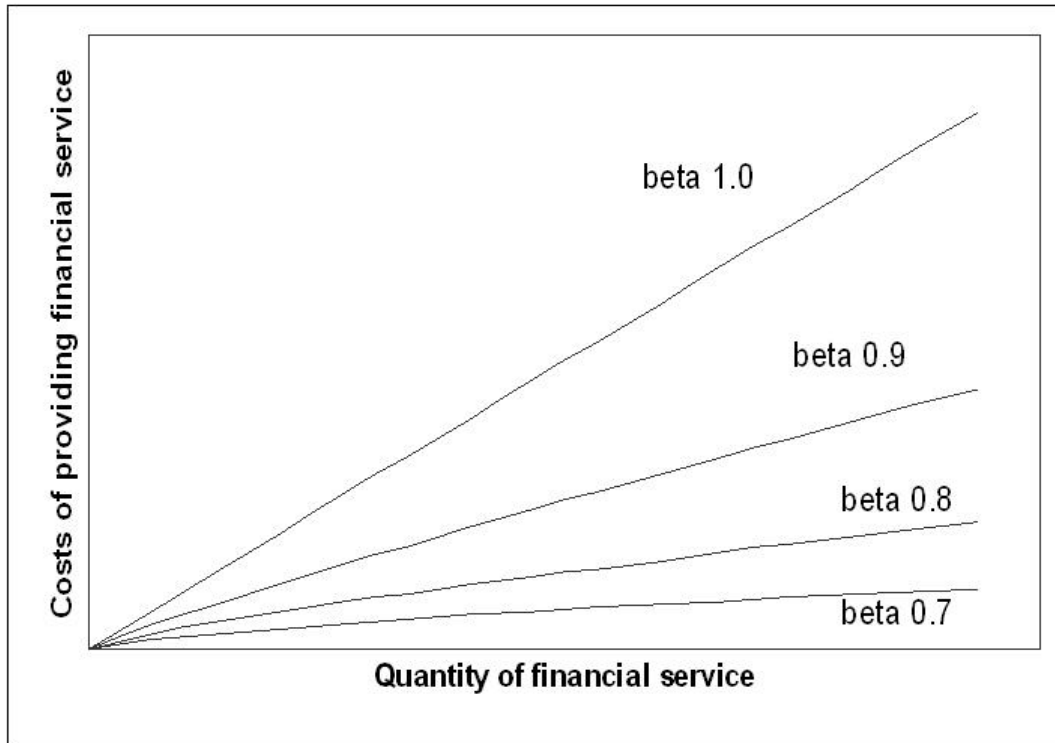
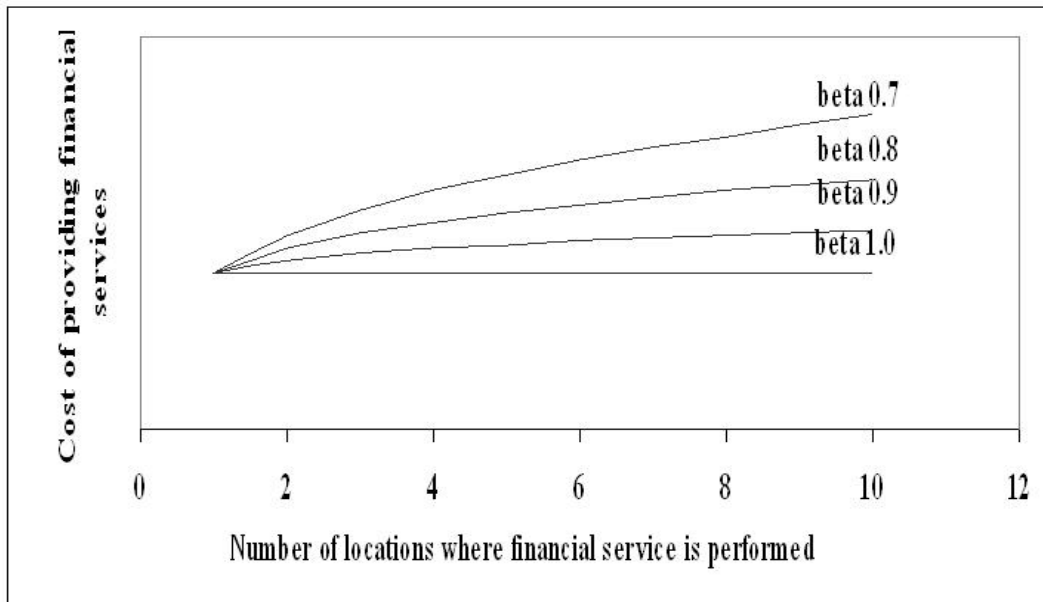


Figure 4.2 Economies of Scale and Number of Locations



The expected average total cost is then

$$E(ATC) = kN \left(\frac{Q}{N} \right)^\beta / Q \quad (4.3)$$

The more significant the economies of scale are, the larger the difference is between having few and many locations. The number of locations does not influence costs if no economies of scale exist ($\beta = 1.0$).

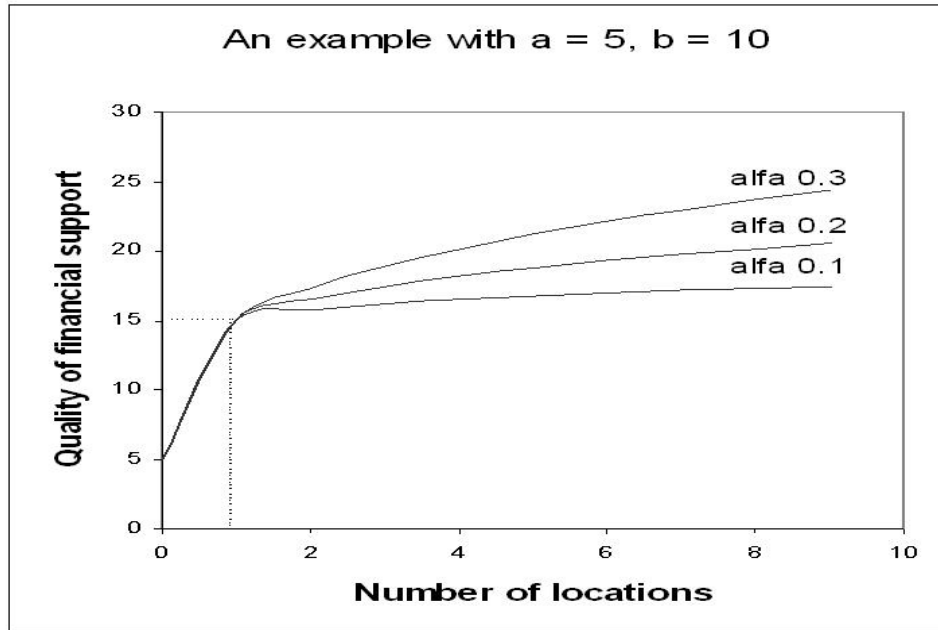
4.1.2 Influence on Revenues

We want the model to show a trade-off between lower average costs and some negative impact on revenues from decreasing the number of locations. Suppose that physical presence on local markets is important when working with financial support. For instance, mistakes may be less likely if the personnel are closer to customers, local banks, and local authorities. The *quality* of the service is then positively correlated with the number of locations, so that $E(\text{quality}) = f(N)$ and $f'(N) > 0$. Assuming that this relationship can be described in a similar way to the economies of scale relationship, we can write

$$E(\text{Quality}) = a + bN^\alpha \quad (4.4) \quad \text{where } \alpha > 0, b > 0,$$

Here a is a constant moving the curve vertically, and b and α show the sensitivity of quality to local presence. The slope of the curve is determined by b and α jointly since the marginal change is $\alpha b N^{\alpha-1}$. The marginal effect of increasing the number of locations is increasing if α is higher than one, but decreasing if α is less than one. Totally centralised operations mean $N = 1$, and the expected quality when totally centralised is $a + b$. The shape of the curve between 0 and 1 can be ignored since only $N \geq 1$ is considered.

Figure 4.3 The Quality Function



The quality is also assumed to be positively correlated with revenues, so that $E(\text{revenues}) = f(\text{quality}, Q, \text{other factors})$ and $\delta(\text{revenues})/\delta(\text{quality}) > 0$. The total expected value of the financial services is then

$$E(\text{Value}) = cQ(a + bN^\alpha) \quad (4.5)$$

where c is the coefficient describing the linear relationship between quality and revenues per unit of financial service. Equation 4.5 shows a linear relationship between value and quantity Q , which at a first glance may seem like an unreasonable assumption, since, if Q can be chosen, the optimal strategy would be to operate with as high Q as possible. However, the variable Q is not a choice variable in this model; it is predetermined and assumed to be set at an optimal level for the company. The parameter Q can be thought of as linearly correlated with revenues when considering a panel of companies, if each company operates at its optimal level of Q .

4.1.3 Contribution

Having defined the cost function and the value function, we can describe the total expected contribution to profits of the financial support. The expected contribution is the expected value minus the expected costs

$$E(TCONTR) = cQ(a + bN^\alpha) - kN\left(\frac{Q}{N}\right)^\beta \quad (4.6)$$

and the expected average contribution is:

$$E(ACONTR) = c(a + bN^\alpha) - \frac{kN(Q/N)^\beta}{Q} \quad (4.7)$$

The marginal effect is:

$$\frac{dE(ACONTR)}{dN} = \alpha cbN^{\alpha-1} - k(1-\beta)Q^{\beta-1}N^{-\beta} \quad (4.8)$$

To maximise contribution with respect to N, we apply the first and second order conditions:

$$\text{f.o.c. } \alpha cbN^{\alpha-1} - k(1-\beta)Q^{\beta-1}N^{-\beta} = 0$$

If the second order condition is fulfilled, the optimal number of locations N^* is *

$$N^* = \left[\frac{k(1-\beta)}{\alpha cbQ^{1-\beta}} \right]^{\frac{1}{\alpha+\beta-1}} \quad (4.9)$$

The second order condition is:

$$\frac{d^2 E(ACONTR)}{dN} = (\alpha-1)\alpha cbN^{\alpha-2} - k(-\beta)(1-\beta)Q^{\beta-1}N^{-\beta-1} < 0$$

$$* \frac{\alpha cbN^{\alpha-1}}{N^{-\beta}} - k(1-\beta)Q^{\beta-1} = 0, N^{\alpha-1+\beta} = \frac{k(1-\beta)Q^{\beta-1}}{\alpha cb}, N = \left[\frac{k(1-\beta)}{\alpha cbQ^{1-\beta}} \right]^{\frac{1}{\alpha+\beta-1}}$$

This can be rearranged to*: $(\alpha^2 - \alpha)N^{\alpha+\beta-1} - \frac{k(\beta^2 - \beta)}{cbQ^{1-\beta}} < 0$

If we then substitute N by equation 4.9 we get:

$$\frac{(\alpha^2 - \alpha)k(1 - \beta)}{\alpha cbQ^{1-\beta}} - \frac{k(\beta^2 - \beta)}{cbQ^{1-\beta}} < 0$$

This can be simplified to:†

$$\alpha + \beta - 1 < 0 \quad (4.10)$$

Thus, the second order condition is fulfilled only if $\alpha + \beta < 1$. If this condition is satisfied, then equation 4.9 can be used to estimate the optimal number of locations. If the calculated N^* is not feasible from a practical point of view, then the feasible solution closest to the calculated N^* is likely to be the optimal solution.

If $\alpha + \beta > 1$, then N^* is the minimum. Hence, if there are scale economies in costs and the decreasing marginal effect of N on quality is not significant (high α and β), then it is likely that equation 4.9 cannot be used to estimate the optimal number of locations. Instead, equation 4.6 must be used to compare the contribution when as many locations as feasible are applied with that when the lowest feasible number of locations is applied. In that case, a business strategy of going “half way” and reduce the number of locations, but not to the lowest level, can never be an optimal solution.

$$*(\alpha^2 - a)cbN^{\alpha-2} - k(\beta^2 - \beta)Q^{\beta-1}N^{-\beta-1} < 0,$$

$$(\alpha^2 - a)N^{\alpha-2} - \frac{k(\beta^2 - \beta)N^{-\beta-1}}{cbQ^{1-\beta}} < 0 \text{ since } cb > 0,$$

$$(\alpha^2 - a)N^{\alpha-2+\beta+1} - \frac{k(\beta^2 - \beta)}{cbQ^{1-\beta}} < 0 \text{ since } N > 0.$$

† Both sides can be multiplied by $cbQ^{1-\beta}$ and divided by k since $cbQ^{1-\beta} > 0$ and $k > 0$.

4.1.4 Using the Model to Calculate Net Present Value

The increased (or decreased) profits due to a centralisation initiative, i.e. a reduction in the number of locations, can be expressed as the difference between the contribution before and after the change. It can be expressed as

$$E(\text{Gain}) = \left[bcQ(a + bN_1^\alpha) - kN_1 \left(\frac{Q}{N_1} \right)^\beta \right] - \left[bcQ(a + bN_0^\alpha) - kN_0 \left(\frac{Q}{N_0} \right)^\beta \right]$$

which can be simplified to*

$$E(\text{Gain}) = bcQ(N_1^\alpha - N_0^\alpha) - kQ^\beta (N_1^{1-\beta} - N_0^{1-\beta}) \quad (4.11)$$

Equation 4.11 can be used to calculate the present value of the change in profits. The initial outlay, such as costs of designing and implementing the new structure, can then be subtracted from the present value to get the net present value of the change. If the company expects to keep the same quantity of financial service in the future, and the implementation costs can be estimated, then it is a rather simple calculation.

$$NPV_{\text{decision}} = \frac{E(\text{gain})}{r} - \text{initial outlay} \quad r = \text{discount rate (cost of capital)}$$

4.2 Interpretations of the Model

The model reveals that the centralisation is influenced by both the external factors, such as business environment, and internal factors, such as size of the company and degree of current centralisation.

* $E(\text{Gain}) = bcQ(N_1^\alpha - N_0^\alpha) - kN_1Q^\beta N_1^{-\beta} + kN_0Q^\beta N_0^{-\beta}$
 $= bcQ(N_1^\alpha - N_0^\alpha) - kQ^\beta (N_1^{1-\beta} - N_0^{1-\beta})$

4.2.1 External Influences of Centralisation

The parameters α , β , b , and k all describe the operating business environment of the firm. If one or more of these variables change, the optimal number of locations for each firm operating in that business environment will be affected.

In equation 4.8 we can see that decreasing the number of locations is beneficial if $k(1 - \beta)Q^{\beta-1}N^{-\beta} > \alpha bcN^{\alpha-1}$, which can be rearranged to:

$$\frac{(1 - \beta)N^{1-\alpha-\beta}}{\alpha Q^{1-\beta}} > \frac{bc}{k} \quad (4.12)$$

Hence, the larger the parameters b and c are, the less likely it is that the centralisation is beneficial, but the opposite is true if k is large. Also, the left hand side of equation 4.12 decreases if α increases, making centralisation less beneficial.

Two changes in the European business environment, which have been claimed to stimulate the centralisation trend, are the European integration with EMU and new information technology (see for example Jarman 1998, Kennedy 1998, Cyganowski 1998, Robinson 1998, van Alphen 1999). The local market conditions in the different European countries have traditionally been very segmented, and this has made local presence by financial staff important. The importance of local presence can be interpreted in the model as a steep slope in the quality function, and thus a high value of α^*b . With the European integration, regulations and procedures will be more unified, and interest rates and currency will be the same in every country. Financial services can therefore be handled cross-border without the same loss in quality as before. This development can then be interpreted as a flattening of the quality function, i.e. a decrease in α^*b . Equation 4.12 thus shows that the European integration has made it more efficient to decrease the number of locations.

The same reasoning can be applied to new technologies. New information technology enables companies to handle their financial services from a distance more easily and without sacrificing quality. New technologies therefore have a decreasing effect on α^*b . However, new technologies normally also make operations more cost efficient. In the model this is associated with a decrease in the parameter k , with the consequence that centralisation is less beneficial. For example, consider a situation where a company can centralise and reduce costs of providing financial services by 30% from \$100M to \$70M, but this will incur a decrease in revenues by \$15M because of worsened quality. They will also incur an initial outlay of \$15M, making the company indifferent to centralisation. A new technology then becomes available that makes it possible to centralise with a decrease in revenues of only \$5M, but this new technology also reduces the costs of providing financial services in general by 50%. The cost savings from centralisation are then 30% of \$50 M, which is \$15M. In our example the new technology does not favour centralisation since $15 - 5 - 15 = -5$. So, new technology does not necessarily make centralisation more beneficial, but international integration does.

It is not obvious from equation 4.12 how the value of β will influence the decision of centralisation. More economies of scale in costs (lower β) do not necessarily favour centralisation. If a company is small (low Q) but operates with many locations (high N), then a decrease in β tends to increase the marginal benefits of centralisation, but the opposite is likely to be true for a very large company that operates with few locations. This is an interesting property of the model, and it has some logic behind it even though it appears strange at first.

It might be helpful to illustrate with an example. Suppose there is a large and a small company, and the large company currently has few locations for financial services while the small company has many locations. Both companies have estimated that their contribution will increase if the existing number of locations can be reduced. The small company needs less fi-

nancial support than the large company, and has therefore less total costs for providing it. The difference is even larger if we compare the *local* costs of the two companies since the already lower total quantity of the small company is shared by a larger number of locations.

Now a new technology, which increases economies of scale (β decreases), enters the market. For the small company, this will not have a large effect on its costs since it operates on a small scale at each location. But the decision to decrease the number of locations now looks even more attractive because large benefits can be achieved from clustering activities together.

For the large company, the new technology is very good news. It is already operating at large local scales, so costs can be decreased substantially just by adopting the new technology. However, the previously so attractive strategy of decreasing the number of locations does not look as attractive anymore because the base for cost cuttings has been reduced. Before the new technology was available, the large company had very high total costs and the reduction in costs from centralising would therefore be large in absolute terms. Now that total costs are lower the same reduction in relative terms is much less in terms of dollars. Since technology always changes, this dimension should be considered in the centralising decision. Since this kind of decision is of a long-term nature, the current technology is perhaps not the best information to base the decision on. A centralisation decision that looks profitable today may turn out to be a complete waste of money if the cost function in the future is totally different. The situation might also be the opposite, depending on the internal properties of the firm.

4.2.2 Internal Influences on Centralisation

Looking at equation 4.12 we can also see that the internal factors Q and N also matter for the centralising decision. If we compare a large company that has a high quantity Q of financial support with a small company with less Q , both of which operate with the same number of locations, then the large company is less likely to benefit from centralisation. If two compa-

nies of the same size operate with different numbers of locations, then the company with the largest number of locations is more likely to benefit from centralisation if $\alpha + \beta < 1$, but the opposite is true if $\alpha + \beta > 1$. Hence, if scale economies in costs and the decreasing marginal effect of N on quality are not significant (high α and β), then the typical company that will centralise is small and operates with few locations. If these properties are significant, then it is most likely that small companies operating with financial services in many locations are the first to centralise.

4.3 Estimating the Parameters

The parameters in the model can be estimated using regression analysis if sufficient data is available. A cross-sectional analysis with a panel of companies observed at one period is advisable rather than a time-series or a pooled cross-sectional time series analysis, since companies seldom operate with different Q and N for different periods of time. The sample data has to cover companies of different sizes and companies that perform financial support at a different number of locations. Totally centralised as well as fully decentralised companies have to be included in the sample, which can make it troublesome since few European companies are already centralised. This problem could be dealt with by including American companies in the sample and use dummy variables to sort out regional disturbances.

Estimating the cost function (equation 4.1) should, however, be straightforward since cost figures for each financial support unit can be used. The cost function can be transformed to a linear model by taking the logarithm of both sides.

$$\ln(\text{cost}) = b_0 + b_1 \ln(Q) + \varepsilon$$

Linear regression with ordinary least square (OLS) can then be used to estimate the parameters b_0 and b_1 . From the result can we get the model parameters k and β since $k = e^{b_0}$ and $\beta = b_1$.

Estimating the value function (equation 4.5) is slightly more complex. One approach is to find a measure of quality (Y) in the financial service, and first estimate the quality function (equation 4.4), which has to be transformed to a linear equation.

$$\ln(Y - a) = b_0 + b_1 \ln(N) + \varepsilon$$

From the estimated b_0 and b_1 we can get the parameters b and α since $b = e^{b_0}$ and $\alpha = b_1$.

One problem here is that the parameters b_0 and b_1 cannot be estimated if the value of a is not known. A way of handling this problem is to start out with $a = 0$, and then repeat the regression with slightly higher a values until the best fit is reached. The second step is then to estimate equation 4.5 by using revenue as a measure of value.

$$Revenue = b_0 + b_1 QY + b_2 X_2 + \dots + b_n X_n + \varepsilon$$

Since many factors besides financial support influence revenues, as many variables as possible with explanatory power (X_2 to X_n) should be included in the regression. A stepwise procedure can be used to find the optimal combination of variables (Tryfos 1998). Since b_1 in the regression above is an estimation of parameter c , all information needed to calculate the optimal number of locations and the dollar gain from centralising is in place.

The major weakness of this approach is that it might be difficult to find an accurate quality measure. An alternative approach is to assume a linear relationship between N and quality, i.e. $E(quality) = a + bN$

With this assumption, N also has a linear relationship with value, and therefore also with revenue. Embedded in this is the assumption that $\alpha = 1$ since there is no exponent term in relation to N .

$$Revenue = b_0 + b_1 QN + b_2 X_2 + \dots + b_n X_n + \varepsilon$$

The estimated coefficient b_1 can then be interpreted as $c*b$ which is all information needed to calculate the contribution. This approach requires less

data than the previous approach, but it has one major limitation. Since α is set to one, then $\alpha + \beta$ has to be more than one, which means that N^* in equation 4.9 is not a maximum. With this approach, the optimal solution always becomes either total centralisation or decentralisation.

4.4 Timing and Flexibility

The model described in this section is static in the sense that it does not incorporate the value of flexibility. One important flexibility aspect of the centralisation decision is the timing option. A trade-off exists between going ahead with re-engineering the finance function now to achieve the benefits as soon as possible, and the possible benefits of applying a "wait-and-see" strategy. The expected benefit of implementing the project now is the net present value of the project, which is described in the model. The value of the "wait-and-see" strategy is the "timing option" that can be quantified by real option theory.

What makes the timing option valuable is the specificity of the investment. An investment is specific if it is inflexible in its uses. Thus, the timing option is really the value of flexibility incorporated in the "wait-and-see" strategy. Say, for instance, that a firm considers a new "state-of-the-art" centralised finance function with a new IT-system, and the new treasury will be designed to fit the attributes of this system. The new design is then specific to the IT system since it will not function as well with a different system. If, some years after the implementation, a new IT-system that can do much more than the old version is available on the market, then the firm might not be able to take advantage of these new attributes since the treasury function is not designed for it. If the company had instead chosen to wait with the implementation they could now design the treasury to gain maximal advantages of the new system. Also, the value of flexibility in the "wait-and-see" strategy is evident if the environment changes so that a centralised finance function becomes inefficient. With the "wait-and-see"

strategy can the project be stopped, and the firm can continue with its decentralised structure. The non-efficient specific investment is then avoided.

The more unpredictable the future is, and the more specific the investments are, the more valuable the time option is (Copeland/Weston 1994). The EMU project is the first of its kind, and no one knows for certain what effects it will have on the European business environment. Technology is also improving at a fast pace, and the future development is hard to predict, even for a few years ahead. The creation of a shared service centre or any rearrangement in the financial administration involves substantial specific investments since it requires a large amount of work in implementation, and because the design is customised to a certain technology and environment. Thus, timing is an important dimension of the centralisation decision, and has to be considered in the evaluation of the project.

4.5 Summary

This model is trying to capture the most fundamental aspects of the centralisation issue. It is extremely simple compared to reality, and many factors that are not captured by the model influence the restructuring decision in reality. However, the model points out some important properties of the centralisation decision. It shows how the benefits of centralisation depend on the business environment. Especially two aspects are of importance. One is the influence of the number of locations on the quality of financial support, and the other is how costs are influenced by scale. The model supports the argument that international integration is likely to lead to an increasing centralisation of support functions, but it raises a warning to the argument that the new technology also triggers centralisation. The last argument would be true if the new technology substantially affects the quality function in the sense that the quality becomes less dependent on local presence, but it does not substantially affect the cost function. Also, if the new technology affects the cost function in the sense that economies of scale become more substantial, it will trigger centralisation for companies

that operate at a low scale at each location, but discourage centralisation for companies already operating locally at a large scale.

The model also shows that internal properties of the firm influence the decision. A large firm is always less likely to benefit from centralisation than a small firm. However, whether a firm with many locations benefits more than a firm with few locations depends on the business environment, especially on the concavity of the quality and the cost functions.

The type of solution to the optimal number of locations problem also depends on the concavity of the functions. If the concavity is large, the optimal solution can be somewhere between fully decentralised and fully centralised, but if the concavity is low, the optimal solution is either fully decentralised or fully centralised.

The parameters of the model can be estimated with regression analysis if sufficient data is available. If data is limited, some further simplifying assumptions may have to be made to be able to perform the regressions. When estimating the model, it is actually good that the model is simple and general because estimating the parameters requires some skills and a large amount of effort. It might not be worth the effort for a single company to try to estimate the parameters by itself, but it only needs to be done once since the business environment parameters can be used by all companies operating in the same market segment. Then the management of different companies can adjust the results to suit their specific needs and help them in restructuring decisions.

The value of flexibility is not included in the model. If the environment is rapidly changing, a “wait-and-see” strategy may be preferred to going ahead with reengineering the finance function, even though the net present value is positive. This is because a reengineering project involves large specific investments, and the value of centralisation is largely influenced by changes in external factors.

Chapter 5 Incentive Compensation to Sales Agents

When setting up a cash pooling system, whether it is a zero-balance or notional-balance one, the central account collects all the claims and pays all the bills instead of the local offices, which really generate revenues and accrue costs. As both the revenues and costs are booked and reflected in the pooling account, there must be a specified way to decide the rewards of the local sales office. The rewards should not only clarify the method(s) of computing the incomes of local unit(s), but also motivate the local units to increase the revenue and save costs. Thus, an incentive compensation package is highly desirable. We use the local salesman as an example to demonstrate our analyses, but in fact, the analyses are suitable to sales office and other units acting as profit centres as well.

The most important reason why we analyse the incentive compensation here is that we believe the cash pooling and shared service center (SSC) ought to benefit all the company's stakeholders, including the employees. The cash pooling and shared service centre should aim to maximise the total benefits of the company by improving efficiency and reducing costs, but not to redistribute incomes from one group of stakeholders to another.

In addition, SSC and cash pooling will inevitably require internal services to be assigned to the central office, and thus costs will be generated in central office and for a group of internal customers. An inappropriate allocation of overhead costs between the central office and a local sales unit or among local units could greatly hamper the zeal of local sales units to promote sales or control costs.

In any of the above cases, the resistance of the employees will complicate the situation and hence increase the costs of setting up a cash pooling system. In addition, if the new system cannot maximise the income of both the shareholders and employees, it is an inadequate system with intrinsic shortcomings and should be redesigned.

5.1 A Model of Incentive Compensation

In many situations, the providing incentives require that the pay depends on the performance of salesmen, especially when the central office cannot easily or accurately observe and measure the salesmen's direct provision of effort, intelligence, honesty, and imagination. Therefore, the pay to salesmen cannot be based on these direct provisions and any financial incentives must come from basing the compensation on performance. In addition, individuals should be insulated against the randomness that would enter their pay by basing it on measured performance (Paul Milgrom *et al*, 1994). In economists' words, the general problem of motivating one person or organisation to act on behalf of another is called as the principal-agent problem. In our case, the principal is the company, who wants the agent, the local sales offices or salesmen, to act on the company's behalf by providing incentives on the basis of the agent's performance. In practices, there are two approaches to determine the commissions of sales person: the revenue minus which sets the agents' income function according to the net income, and the cost plus, a method that accounts the commission in accordance with the total costs.

5.1.1 Assumptions

Before delivering, salesmen need to purchase from suppliers. We use P_1 and P_2 to denote the purchasing and selling price respectively. To make things easier, we assume that both prices are determined by the company and that the sales agent has almost no power to change the price. Therefore, P_1 and P_2 are parameters and P_1 is definitely less than P_2 .

We suppose that the salesman must exert an effort E at personal costs $C(E)$ to serve the interests of the company. The effort E represents any activity that the salesman undertakes on behalf of the company, and the cost $C(E)$ can represent anything that the salesman gives up to serve the company's interests. The cost of efforts, as we assumed, is an increasing linear function with $C'(E) > 0$ and $C''(E) = 0$.

The efforts E_l are assumed to determine the quantity of sales Q . The greater the efforts are, the higher the sales volume is. With respect to E_l , Q has the following attributes: $Q'(E_l) > 0$ and $Q''(E_l) = 0$. At the same time, the total sales volume is also affected by some unpredictable changes, such as changes in general economic conditions, market regulations, competitors' behaviours, and so on. Thus, variable Q is a function of sales agent's effort E_l and unexpected variable X . Mathematically, it can be expressed as $Q=f(E_l, X)$. In our case, X is an exogenous and stochastic variable with mean zero, and variance. Mathematically, $E(X)=0$, and $VAR(X) = \sigma^2 X$.

However, it is almost impossible to observe a salesman's direct effect on sales volume, and the company cares about the total sales. Suppose that the observable indicator of efforts can be written in the form $Z = f(E_l) + X$.

Here we want to introduce a new variable Y , an observable variable that is not affected by the efforts E_l , but statistically related to X , the exogenous variable. Y is indeed the noise between E_l and observed Z . For example, Z might be a measure of total sales for the products, which depend on the efforts, E_l , and random events, X , such as realised demands. Y might measure unexpected changes of total industry demand, which is correlated with the potential demand in the markets where the employee manages and realises sales. We can write that $E(Y) = 0$, $VAR(Y) = \sigma^2 Y$.

In order to keep the formulas simple, in terms of the example, Y indicates the amount that actual industry demand differs from a forecast value, instead of the total industry demand. Because X and Y are each adjusted to have zero mean, then, the expected sales are just the efforts level E_l .

The activities of a sales agent generate some fixed costs FC , referring to any occurring cost that is uncontrollable by the efforts of agent. This kind of costs may include the government charges, rents, costs of other fixed assets, etc. The FC is a non-stochastic variable and can be observed, for instance, from accounting data.

There are also some variable costs VC , which can be controlled by salesmen's efforts. For example, the salesmen can select less expensive transportation when travelling. Thus, VC is a decreasing linear function of agent's efforts of cost controlling E_2 , i.e.,

$$VC = f(E_2), VC'(E_2) < 0 \text{ and } VC''(E_2) = 0$$

FC and VC here are not defined in accounting terms, but as whether the efforts of salesman can influence the results. For instance, in the case of travelling from City A to City B, the salesman spends \$120, but the standard transportation cost is \$100. According to the definition, FC is \$100 and VC is \$20, because the salesman can put his efforts to save this \$20. An easy way for practitioners to clarify the FC is to set a target for fixed costs for a certain period. The differences between the target and actual amount can be regarded as VC .

In addition, we assume that both E_1 and E_2 are non-stochastic variables and entirely determined by the self-interested sales persons. We further assume that the E_1 and E_2 are not correlated and not conflicting to avoid discussing of equal compensation problem in this case.

Finally, similar to other economic analyses, both parties are assumed to be rational and self-interested. The principal is assumed to be risk-neutral while the agent is risk averse. The risk aversion of the agent is denoted by ρ and can be measured by the absolute risk aversion developed by Arrow and Pratt (Varian 1992). Because the risk preference and degree of risk aversion of agents are different from each other and incomparable, what we really care about is the value of the risk premium, which is irrelevant to individual risk propensity. That is the certainty equivalent (denoted by CE). CE can be simply estimated by the formula:

$$CE = E(\text{Income}) - 1/2\rho\text{VAR}(\text{Income}).$$

The following analysis aims to find out whether the incentive compensation can maximise the certain equivalent of the sales agent, the principal

company and their total certainty equivalent TCE , subject to the constraints of agent's selection of efforts level E_1 and E_2 .

5.1.2 The Rationales of Using Exogenous Variable

First, we examine whether the insertion of term φY , the exogenous variable, can help us to reduce the total transaction costs, and hence, increase the total certainty equivalent. Because φY just influences the sales volume, we can ignore the cost saving for a while. In this subsection, we temporarily assume that the costs and agent's efforts to control cost are irrelevant to the compensation. Therefore, the incomes of agent and principal are the same in both cost plus and revenue minus methods. The expected income C_A of agent is: $C_A = \alpha + \beta[(P_2 - P_1)Q(E_1) + X + \varphi Y]$.

Here and in the following analysis, α is the base amount paid by the principal to fulfil the so-called participant constraint. It might represent the lowest level of wage set by legal requirements or collective agreements, or the competitive salary offered by the competitors, and the like. We use β to measure the intensity of the incentive. A higher β indicates a stronger incentive to sales agent, and a negative β means the discouragement. The parameter φ indicates how much relative weight is given to the information variable Y .

The certainty equivalent of sales agent CE_A is:

$$CE_A^* = \alpha + \beta(P_2 - P_1)Q(E_1) - 1/2\rho VAR(C_A) - C(E_1)$$

The certainty equivalent of principal CE_P is:

$$CE_P^\dagger = (1 - \beta)(P_2 - P_1)Q(E_1) - \alpha$$

We know that an agent always acts on behalf of his own interests, so he will try to maximise the certainty equivalent of himself. That is:

* $CE_A = E(C_A) - 1/2\rho VAR(C_A) - C(E_1) = \alpha + \beta(P_2 - P_1)Q(E_1) - 1/2\rho VAR(C_A) - C(E_1)$

† $CE_P = (P_2 - P_1)Q(E_1) - E(C_A) = (P_2 - P_1)Q(E_1) - \alpha - \beta(P_2 - P_1)Q(E_1) = (1 - \beta)(P_2 - P_1)Q(E_1) - \alpha$

$$\frac{\partial CE_A}{\partial E_1} = \beta(P_2 - P_1)Q'(E_1) - C'(E_1) = 0$$

We get that: $\beta = \frac{C'(E_1)}{(P_2 - P_1)Q'(E_1)}$

The total certainty equivalent TCE of both agent and principal is:

$$TCE = CE_A + CE_P = (P_2 - P_1)Q(E_1) - 1/2\rho VAR(C_A) - C(E_1)$$

To maximise the TCE is to minimise the risk premium, the variance of C_A .

The variance of the TCE is:

$$VAR(TCE)^* = VAR(X) + \varphi^2 VAR(Y) + 2\varphi COV(X, Y) \quad (5.1)$$

To minimise the variance of TCE , s.t. the constraint of β ,

$$\frac{\partial VAR(TCE)}{\partial \varphi} = 2\varphi VAR(Y) + 2COV(X, Y) = 0$$

We get that: $\varphi = -\frac{COV(X, Y)}{VAR(Y)}$ (5.2)

Substitute equation 5.2 into 5.1, we can deduce that:

$$VAR(TCE) = VAR(X) + \left[-\frac{COV(X, Y)}{VAR(Y)} \right]^2 + 2 \left[-\frac{COV(X, Y)}{VAR(Y)} \right] \times COV(X, Y)$$

$$VAR(TCE) = VAR(X) - \left[\frac{COV(X, Y)}{VAR(Y)} \right]^2 \quad (5.3)$$

We find that as long as the covariance of X and Y does not equal zero, $VAR(TCE)$ is always less than $VAR(X)$. The less the $VAR(TCE)$ is, the less the risk premium and transaction costs are, and the more the TCE is. So the insertion of term φY in the incentive reward is reasonable because it reduces the transaction costs and increases the total certainty equivalent.

* $VAR(TCE) = VAR(C_A) = VAR\{\alpha + \beta[(P_2 - P_1)Q(E_1) + X + \varphi Y]\} = VAR(X) + \varphi^2 VAR(Y) + 2\varphi COV(X, Y)$

5.2 Two Approaches

Primarily, there are two approaches used in practices to set the compensation rate: one is cost plus and the other is revenue minus. Cost plus is based on actually accrued costs, both purchasing costs and operational costs. According to this method, the salesmen's income is a pre-decided and fixed proportion to the aggregate costs they accumulated, provided that they stand in line with the cost controlling targets. In such a case, however, tightening their bills will in turn reduce the local salesmen's income, and hence, it is keen for central office to properly motivate the local offices to control costs to maximise the benefits of cash pooling. The revenue minus method, on the other hand, leaves much room for local people to make more profits, if they can control costs effectively. However, at the same time, salesmen take much more risks than they will do in the cost plus method. Naturally, they will demand a higher risk premium. The company aims to optimise its utility while keeping the balance between the accrued costs and compensations.

5.2.1 Revenue Minus

In this approach, the incentive compensation of the agent is a function of revenue minus costs. We can write it as:

$$C_A = \alpha + \beta_1[(P_2 - P_1)Q(E_1) - FC + X + \phi Y] - \beta_2 VC(E_2)$$

Here we separate the parameter β into two parts, β_1 and β_2 , to enable the principal to give different incentive intensity to agent's efforts E_1 and E_2 .

The certainty equivalent of sales agent CE_A is:

$$\begin{aligned} CE_A &= E(C_A) - 1/2\rho VAR(C_A) - C(E_1) - C(E_2) \\ &= \alpha + \beta_1[(P_2 - P_1)Q(E_1) - FC] - \beta_2 VC(E_2) - 1/2\rho VAR(C_A) - C(E_1) - C(E_2) \end{aligned}$$

The certainty equivalent of principal CE_P is:

$$CE_P^* = (1 - \beta_1)[(P_2 - P_1)Q(E_1) - FC] + (\beta_2 - 1)VC(E_2) - \alpha$$

Total certainty equivalent TCE is:

$$TCE^\dagger = CE_A + CE_P = (P_2 - P_1)Q(E_1) - FC - VC(E_2) - 1/2\rho VAR(C_A) - C(E_1) - C(E_2)$$

To maximise the certainty equivalent of agent with respect to E_1

$$\frac{\partial CE_A}{\partial E_1} = \beta_1(P_2 - P_1)Q'(E_1) - C'(E_1) = 0$$

$$\text{We get that: } \beta_1 = \frac{C'(E_1)}{(P_2 - P_1)Q'(E_1)} \quad (5.4)$$

To maximise the certainty equivalent of agent w.r.t. E_2 is:

$$\frac{\partial CE_A}{\partial E_2} = -\beta_2 VC'(E_2) - C'(E_2)$$

$$\text{We get that: } \beta_2 = -\frac{C'(E_2)}{VC'(E_2)} \quad (5.5)$$

Maximise the certainty equivalent of the company w.r.t. E_1 and s.t. constraint in equation 4.16,

$$\frac{\partial CE_P}{\partial E_1} = (P_2 - P_1) \left\{ (1 - \beta_1)Q'(E_1) - Q(E_1) \frac{C''(E_1)Q'(E_1) - Q''(E_1)C'(E_1)}{(P_2 - P_1)[Q'(E_1)]^2} \right\} = 0 \quad (5.6)$$

s.t. { β_1 }

Maximise the certainty equivalent of the company w.r.t. E_2 and s.t. constraint in equation 4.17,

$$\frac{\partial CE_P}{\partial E_2} = (\beta_2 - 1)VC'(E_2) - VC(E_2) \frac{C''(E_2)VC'(E_2) - VC''(E_2)C'(E_2)}{[VC'(E_2)]^2} = 0 \quad (5.7)$$

s.t. { β_2 }

As $Q''(E_1)$, $C''(E_1)$, $C''(E_2)$ and $VC''(E_2)$ all equals zero, we can get that either $1 - \beta_1$, or $P_2 - P_1$, or $Q'(E_1)$ equals zero from equation 5.6, and $VC'(E_2) = 0$ or $\beta_2 = 1$ from equation 5.7 respectively.

* $CE_P = [(P_2 - P_1)Q(E_1) - FC - VC(E_2)] - E(C_A) = [(P_2 - P_1)Q(E_1) - FC - VC(E_2)] - \alpha$

$-\beta_1[(P_2 - P_1)Q(E_1) - FC] + \beta_2 VC(E_2) = (1 - \beta_1)[(P_2 - P_1)Q(E_1) - FC] + (\beta_2 - 1)VC(E_2) - \alpha$

† $TCE = \alpha + \beta_1[(P_2 - P_1)Q(E_1) - FC] - \beta_2 VC(E_2) - 1/2\rho VAR(C_A) - C(E_1) - C(E_2) + (1 - \beta_1)[(P_2 - P_1)Q(E_1)$

$- FC] + (\beta_2 - 1)VC(E_2) - \alpha = (P_2 - P_1)Q(E_1) - FC - VC(E_2) - 1/2\rho VAR(C_A) - C(E_1) - C(E_2)$

5.2.2 Interpretations

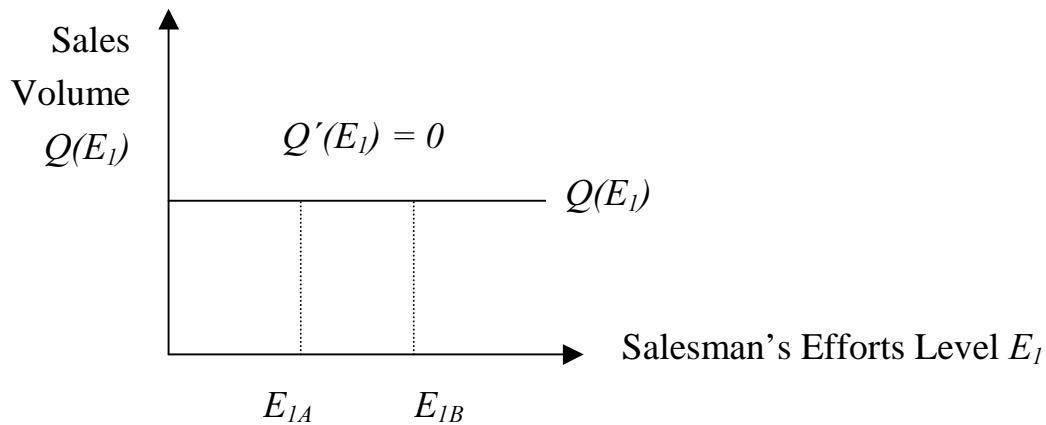
1. $1 - \beta_1 = 0$ means $\beta_1 = 1$. In such a case, because the agent gets all the premium of price difference, the principal is not maximised. When $\beta_1=1$, the certainty equivalent of principal CE_p is:

$$CE_p = -\alpha - (1 - \beta_2)VC(E_2)$$

That means that the principal not only pays for the basis amount of agent but also bears the variable costs while exchanging for nothing. It is not reasonable for the principal to accept such an agreement.

2. $P_2 - P_1 = 0$ indicates that the purchasing price is exactly the same as the selling price. That is not acceptable neither to the principal nor agent, and also goes against our assumption and reality. In such a case, β_1 in equation 5.4 is not mathematically defined and the certainty equivalent of neither the agent nor the principal is maximised.

Figure 5.1 Marginal Sales Volume with regard to Salesman's Efforts E_1 is Zero

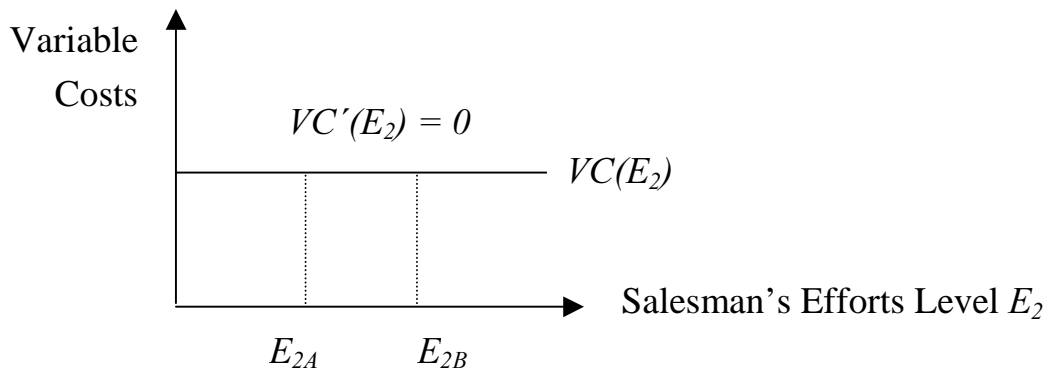


3. $Q'(E_1) = 0$, as shown in Figure 5.1, indicates the slope of the sales volume with regard to the salesmen's efforts E_1 is zero. In such a case, no

matter how many efforts the salesmen make to promote sales, sales will not change at all. This is against the assumption and reality, and incentive compensation is not needed and does not work in such a case.

4. $VC'(E_2) = 0$, as shown in Figure 5.2, means that the efforts of the salesman to control costs have no result on the variable costs at all. Again, it goes against our assumption and reality that the salesmen's efforts have some effects on the variable costs. If $VC'(E_2) = 0$ is true, we do not need to consider the compensation of the efforts of cost controlling and the variable costs will turn out to be zero. Therefore, the principal will not accept the agreement because the company will bear all the variable costs.

Figure 5.2 Marginal Variable Cost with regard to Salesman's Efforts Equal Zero

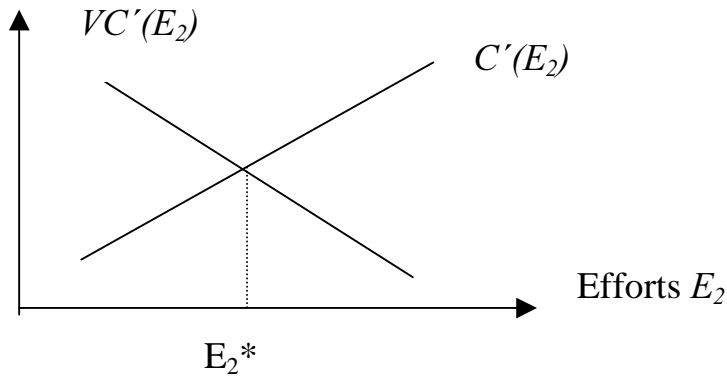


5. If $\beta_2 = 1$, because the principal's co-efficiency of VC is $\beta_2 - 1 = 0$ and that of agent is 1, we find that the agent bears all the variable costs while the principal is not responsible for VC at all.

Furthermore, substitute this principal's optimal β_2 value -1 into that of agent, shown in equation 5.5, we get that $VC'(E_2) = C'(E_2)$. As shown in Figure 5.3, when the $VC'(E_2)$ crosses the $C'(E_2)$ at E_2^* , the marginal cost of efforts $C(E_2^*)$ equals the marginal cost of variable cost $VC(E_2^*)$. The agent

will increase his/her efforts to control cost until the marginal cost saved is as the same as that of his/her efforts.

Figure 5.3 Marginal Variable Cost Equals Marginal Cost of Sales' Efforts E_2



Now we can conclude that because the revenue minus method is set on the basis of how to divide the gross income between the principal and the agent by means of the identical approach, it inevitably leads to conflicting interests. To increase one's share one must reduce the share of another party by the same amount. A vivid description of revenue minus method is that it just concerns how to divide the cake but not how to make a bigger cake. Because this method cannot fix the β_1 , it cannot lead to an optimal solution, neither to the agent nor the principal, at least under reasonable conditions.

5.2.3 Cost Plus

According to the cost plus method, commission of the agent depends on the costs the agent spent. The income C_A of the agent is still related to the efforts that agent made to increase sales and control the variable costs.

$$C_A = \alpha + \beta_1[P_1Q(E_1) + FC + X + \phi Y] + \beta_2VC(E_2)$$

The certainty equivalent CE_A is:

$$CE_A^* = \alpha + \beta_1[P_1Q(E_1)+FC] + \beta_2VC(E_2) - 1/2\rho VAR(C_A) - C(E_1) - C(E_2)$$

The certainty equivalent of principal CE_P is:

$$CE_P^\dagger = [P_2 - (1 + \beta_1)P_1]Q(E_1) - (1 + \beta_1)FC - (1 + \beta_2)VC(E_2) - \alpha$$

Total certainty equivalent TCE is:

$$TCE^\ddagger = (P_2 - P_1)Q(E_1) - FC - VC(E_2) - 1/2\rho VAR(C_A) - C(E_1) - C(E_2)$$

To maximise the certainty equivalent of agent w.r.t. E_1 is:

$$\frac{\partial CE_A}{\partial E_1} = \beta_1 P_1 Q'(E_1) - C'(E_1) = 0$$

It leads to the result that the agent prefers to

$$\beta_1 = \frac{C'(E_1)}{P_1 Q'(E_1)} \quad (5.8)$$

Maximise the certainty equivalent of agent w.r.t. E_2 is to:

$$\frac{\partial CE_A}{\partial E_2} = -\beta_2 VC'(E_2) - C'(E_2) = 0$$

We get another condition of maximising the CE_P that is:

$$\beta = -\frac{C'(E)}{VC'(E)} \quad (5.9)$$

Maximise the certainty equivalent of the principal company w.r.t. E_1 ,

$$^* CE_A = E(C_A) - 1/2\rho VAR(C_A) - C(E_1) - C(E_2) = \alpha + \beta_1[P_1Q(E_1)+FC] + \beta_2VC(E_2) - 1/2\rho VAR(C_A) - C(E_1) - C(E_2)$$

$$^\dagger CE_P = [(P_2 - P_1)Q(E_1) - FC - VC(E_2)] - E(C_A)$$

$$= [(P_2 - P_1)Q(E_1) - FC - \beta_2VC(E_2)] - \alpha - \beta_1[(P_2 - P_1)Q(E_1) - FC] - \beta_2VC(E_2)$$

$$= [P_2 - (1 - \beta_1)P_1]Q(E_1) - (1 + \beta_1)FC - (1 + \beta_2)VC(E_2) - \alpha$$

$$^\ddagger TCE = CE_A + CE_P = \alpha + \beta_1[P_1Q(E_1) + FC] + \beta_2VC(E_2) - 1/2\rho VAR(C_A) - C(E_1) - C(E_2)$$

$$+ [P_2 - (1 - \beta_1)P_1]Q(E_1) - (1 + \beta_1)FC - (1 + \beta_2)VC(E_2) - \alpha$$

$$= (P_2 - P_1)Q(E_1) - FC - VC(E_2) - 1/2\rho VAR(C_A) - C(E_1) - C(E_2)$$

$$\begin{aligned} \frac{\partial CE_P}{\partial E_1} &= [P_2 - (1 + \beta_1)P_1]Q'(E_1) - Q(E_1)P_1(\beta_1)' - \beta_1'FC = 0 \\ \text{s.t. } \{\beta_1\} \\ \therefore \beta_1' &= \frac{C''(E_1)Q'(E_1) - Q''(E_1)C'(E_1)}{P_1[Q'(E_1)]^2} \text{ and } C''(E_1) = 0, C'''(E_1) = 0 \\ \therefore \frac{\partial CE_P}{\partial E_1} &= [P_2 - (1 + \beta_1)P_1]Q'(E_1) = 0 \end{aligned}$$

$$\text{We get } Q'(E_1) \text{ equals zero or } \beta_1 = \frac{P_2 - P_1}{P_1} \quad (5.10)$$

As discussed in the Section 3.2.4 and presented in Figure 5.1, $Q'(E_1)$ equals zero goes against our assumption and reality that the sales increase when salesmen make more efforts, and thus, it is not viable.

Maximise the certainty equivalent of the principal company w.r.t. E_2 ,

$$\begin{aligned} \frac{\partial CE_P}{\partial E_2} &= -(1 + \beta_2)VC'(E_2) + VC(E_2) \frac{C''(E_2)VC'(E_2) - C'(E_2)VC''(E_2)}{[VC'(E_2)]^2} = 0 \\ \text{s.t. } \{\beta_2\} \end{aligned}$$

As $VC''(E_2) = 0$ and $C''(E_2) = 0$, in order to maximise the CE_P by means of increasing the agent's efforts of cost controlling E_2 , the principal company needs to set $VC'(E_2) = 0$, or $1 + \beta_2 = 0$, i.e. $\beta_2 = -1$. As the $VC'(E_2) = 0$ has already been proved not to be suitable (see the above section 5.4 and Figure 5.2), so we just consider that $\beta_2 = -1$. Substitute optimal β_1 value to principal, $\beta_1 = (P_2 - P_1)/P_1$ (3.22) into that of agent stated in equation 4.20,

$$\text{we get that: } \frac{(P_2 - P_1)^2}{P_1} = \frac{C'(E_1)}{Q'(E_1)} \quad (5.11)$$

Substitute principal's optimal β_2 value -1 into that of agent's shown in equation 5.9, we get that: $VC'(E_2) = C'(E_2)$, which is viable and has been interpreted in section 5.4 and shown in Figure 5.3.

As TCE is $(P_2 - P_1)Q(E_1) - FC - VC(E_2) - 1/2\rho VAR(C_A) - C(E_1) - C(E_2)$, if we maximise the TCE w.r.t. E_1 and E_2 respectively, we get that:

$$\frac{\partial TCE}{\partial E_2} = VC'(E_2) - C'(E_2) = 0 \quad (5.12) \text{ and}$$

$$\frac{\partial TCE}{\partial E_1} = Q'(E_1)(P_2 - P_1) - C'(E_1) = 0 \quad (5.13)$$

Solve the above two equations respectively, and we get that $VC'(E_2) = C'(E_2)$, fulfilled when certainty equivalent of agent and principal is maximised, and that

$$P_2 - P_1 = C'(E_1)/Q'(E_1) \quad (5.14)$$

If we combine the equation 5.14 with 5.11, the result will be:

$$(P_2 - P_1)/P_1 = 1, \text{ i.e. } P_2 = 2P_1.$$

It indicates that only if the sales price is twice as high as the purchase price, the solution, which maximises the certainty equivalent of both agent and principal, will maximise the total certainty equivalent. Otherwise, we can only maximise the certainty equivalent of agent and principal but not the total certainty equivalent.

5.3 Summary

Regardless of what kind of method is employed, we find that the agent should bear all the variable costs, and essentially, the marginal cost of cost controlling efforts should equal marginal cost of variable costs that will be saved. The revenue minus method cannot approach an optimal solution that maximises the certainty equivalent of both parties, but the cost plus method can. The principal company can easily set $\beta_1 = (P_2 - P_1)/P_1$ and set β_2 as -1 , to maximise their certainty equivalent and, at the same time, the agent also maximise his/her certainty equivalent. In addition, when the sales price doubles the purchasing price, the cost minus method can lead to an optimal solution that maximises certainty equivalent of both parties and the total.

The critical points here are how to divide costs between the fixed costs and variable costs, and how to set the purchase and sales price. By adjusting the price difference, the principal in fact adjusts the incentive intensity towards agent's efforts of promoting sales.

Chapter 6 Shareholders' Value

In the previous chapter, we suggested that cash pooling can be implemented providing that it can save operational costs due to the benefits of centralisation, and that cash pooling can lead to an acceptable agreement, the incentive compensation scheme, within the company. This chapter will look at whether the implementation of cash pooling can save money and improve the bondholders' and shareholders' value.

One possible way of looking at this problem is to treat the cash-pooling project as an investment opportunity, i.e. see whether the cash pooling has positive net present value. To calculate the net present value of the cash-pooling project, we need to clearly define the costs and benefits.

Peter Davidsson (1999) has concluded that the benefits of the cash pooling will be realised from interest saving, lower cross-border payment costs and improved liquidity management, and the costs of it come from structure fees, running fees and system fees. This classification is narrow and simplistic, but it has its merits because it enables a company to estimate or forecast the so-called fees from data existing in its accounting department. But the estimation or forecast is not an easy task. The so-called fees vary from subsidiary to subsidiary, sometimes even from department to department. Besides, it is very hard to say what the actual benefits of the improved liquidity management will be.

Furthermore, the benefit of lower cross-border payment costs is even more difficult to forecast. We are confident that because the cash pooling concentrates a larger volume of business in a relatively smaller number of banks, the firm can certainly get better payment conditions and lower charges. But the amount of the savings highly depends on the negotiating power of the firm compared with that of the bank(s) it will employ. So the estimation of this kind of saving looks more like an art than science.

The most important setback of Davidsson's conclusion is that its narrow view loses the real picture of the costs and benefits of cash pooling. The centralised financial management and the cash pool involve more costs than he defined. For example, the costs in a cash pooling project will also comprise compensation of redundancy, costs of efforts to overcome the organisational inertia and resistance, etc. The benefits, if we comprehensively treat them, can be defined as the cost saving plus value of reduced risks that the firm will gain. But who can tell how much the costs of compensation of redundancy will be before we conclude the negotiations with all employees? Can we rely on forecasts of costs and benefits as we do in the net present value calculation in other investments? How can we mathematically account the costs of overcoming the inertia and resistance to changes in a particular company? In such a case, the costs and benefits of a company that is going to establish a cash pool are impossible to define even though we have the company's specific data.

Because of the difficulty and complexity, if not impossibility, to define the costs and benefits of cash pooling, in this chapter, we use the option pricing theory to evaluate the shareholders' value instead. The option pricing theory clearly defines which factors and how the changes of these factors will influence the shareholders' value. The greatest advantage of option theory is that we do not need to find out the actual amount of changes of relevant factors, but we just need to point out the direction of changes of those determining factors. In addition, the influence of different factors can be separated from each other in option pricing theory.

In order to analyse the shareholders' value, we need to closely examine the attributes of the cash flows. Therefore, in this chapter we will begin by analysing the expected value and variance of the daily cash flow and total cash flow. Then in section two, we look at the liquidity position of the company and analyse whether the bondholders' value is affected. After the bondholders take their share, the remaining values in the company belong

to the shareholders. Finally, in section three, we will analyse the shareholders' value by using option pricing theory and CAPM.

6.1 Attributes of Cash Flow

In this section, we will analyse the effects of cash pooling on the undertaking company's cash flow. Although there are several different ways to describe the cash flow, we only use mean and variance as the main criteria. Before we discuss the cash flow and the risk, we first define some terms we will use in this chapter. The group indicates the cash-pooling undertaking company, and its cash-pooling-participating subsidiaries and facilitates are called entities or participants. We will analyse mean and variance at two levels: the group level and the single entity level; we will analyse two kinds of cash flow, namely the daily and total cash flow. The daily cash flow means the net cash flow on a particular day, and total cash flow presents the sum of net cash flows for a certain period. In any case, positive values mean cash inflows and negative values indicate cash outflows. Except where specified as expected cash flow, cash flow herein mentioned means net cash flow of the firm, i.e. cash inflow minus cash outflow. Mathematically, we can express the net cash flow as:

$$\mathbf{CF}_t = \mathbf{E}(\mathbf{CF}_t) + \boldsymbol{\varepsilon}_t \quad (6.1)$$

where $E(CF_t)$ denotes the expected value of cash flow on Day t , and $\boldsymbol{\varepsilon}_t$ is the shock, a pure random disturbance with expected value of zero. To simplify our analysis, we assume that the undertaking company has a very stable business and the expected daily cash flow is the same all the time. Therefore, the net cash flows of each entity are normally distributed random variables with mean $E(CF_t)$ and the variance from the shock, $\boldsymbol{\varepsilon}_t$.

In reality, any bad or good macroeconomic news will not just affect one subsidiary, and hence, subsidiaries will be more or less influenced by some common macroeconomic shocks, such as changes of interest rate, inflation,

industrial growth rate, exchange rate, etc. Therefore, the noise of two entities is correlated to each other. We can write that

$$\mathcal{E}_{ti} = \alpha \mathcal{E}_{tj} \quad (6.2)$$

where \mathcal{E}_{ti} and \mathcal{E}_{tj} are the noise of cash flow of entity i and j respectively and α is the correlation coefficient between \mathcal{E}_{ti} and \mathcal{E}_{tj} . A positive α means that a shock will affect two entities in the same direction, while a negative α means a shock that will improve the situation in one entity but worsen the situation in another entity.

The correlation of cash flows between any two cash pooling participants could be very small and even quite close to zero. However, the covariance of the cash flows in two participants is not zero because their correlation, though small, is not zero.

In Section 6.1.1, we will assume that there is no internal purchase and sale in a group company. Then, the expected cash flow of each participant is irrelevant to the expected value of other entities. Of course, in a group company, there could be some internal purchases and sales. According to a company's approach on dealing with its internal purchases and sales, we can categorise those companies with internal transactions into two groups, namely that the group physically moves the cash (Section 6.1.2), and that the group just books the transactions on accounting books (Section 6.1.3).

6.1.1 Pooling of Random Cash Flows

We first analyse a very general case of cash pooling, namely pooling of stochastic cash flows. We assume that the cash pooling is undertaken by a group company, which is either a conglomerate with widely diversified businesses, or has a number of sales offices located in different markets. In this very general case, the expected cash flow of each participant entity is the cash flow of the last day and the net cash flow following a stochastic process. We can rewrite equation 4.1 as:

$$\mathbf{CF}_{ti} = \mathbf{CF}_{(t-1)i} + \boldsymbol{\varepsilon}_{ti} \quad (6.3)$$

where CF_{ti} and $CF_{(t-1)i}$ indicate the cash flow of participant entity i on Day t and Day $t-1$ respectively, and $\boldsymbol{\varepsilon}_{ti}$ is a pure random disturbance in t . Cash pooling that the expected cash flow of two participants have some kind of correlation will be discussed later.

In this section, we will analyse the pooling involving m entities for a period of n days. For convenience, we use an $N \times M$ matrix to express the real daily cash flow of all pooling participants. That is:

$$\begin{pmatrix} \mathbf{CF}_{11} & \mathbf{CF}_{12} & \dots & \mathbf{CF}_{1n} \\ \mathbf{CF}_{21} & \mathbf{CF}_{22} & \dots & \mathbf{CF}_{2n} \\ \dots & \dots & \dots & \dots \\ \mathbf{CF}_{m1} & \mathbf{CF}_{m2} & \dots & \mathbf{CF}_{mn} \end{pmatrix}$$

where CF_{ij} denotes the real daily cash flow of the participant entity i on

day j . For the entity i , its total cash flow is $\sum_{j=1}^N \mathbf{CF}_{ij}$ and its expected daily cash flow $E(CF_i)$ is:

$$\mathbf{E}(\mathbf{CF}_i)_{i=1,2,\dots,m} = \left(\sum_{j=1}^N \mathbf{CF}_{ij} \right) / N \quad (6.4)$$

In case of no cash pooling, the actual total cash flow of the group company

is $\sum_{i=1}^M \sum_{j=1}^N \mathbf{CF}_{ij}$ and its expected daily cash flow is:

$$\mathbf{E}(\mathbf{CF}_{\text{Group}}) = \left(\sum_{i=1}^M \sum_{j=1}^N \mathbf{CF}_{ij} \right) / N \quad (6.5)$$

According to the definition, the variance of cash flow of entity i is:

$$\mathbf{Var}(\mathbf{CF}_i) = \sum_{j=1}^N (\mathbf{CF}_{ij})^2 - N[\mathbf{E}(\mathbf{CF}_i)]^2$$

Before pooling, the expected cash flow of any entity is independent from other participants and the real cash flow between two participants does not interact with each other. If the company now pools the cash flow of all participant entities together, the daily cash flow of the pool is:

$$\left| \sum_{i=1}^M \mathbf{CF}_{i1} \quad \sum_{i=1}^M \mathbf{CF}_{i2} \quad \dots \quad \sum_{i=1}^M \mathbf{CF}_{in} \right|$$

The total cash flow of the pool again is $\sum_{i=1}^M \sum_{j=1}^N \mathbf{CF}_{ij}$, and the expected daily cash flow of the pool is:

$$\mathbf{E}(\mathbf{CF}_{\text{Pool}}) = \left(\sum_{i=1}^M \sum_{j=1}^N \mathbf{CF}_{ij} \right) / N \quad (6.6)$$

The expected value of daily cash flow after cash pooling (equation 6.6) is exactly the same as that before the pooling (equation 6.4). That means the cash pooling will not change the expected value of either daily cash flow or the total cash flow. However, the variance of the pool changes to be:

$$\mathbf{Var}(\mathbf{Pool}) = \sum_{i=1}^M (\mathbf{W}_i)^2 \mathbf{Var}(\mathbf{CF}_i) + \sum_{i=1}^M \sum_{j=1, j \neq i}^M \mathbf{W}_i \mathbf{W}_j \mathbf{Cov}(\mathbf{CF}_i, \mathbf{CF}_j) \quad (6.7)$$

the \mathbf{W}_i and \mathbf{W}_j indicate the weight of corresponding cash flow in the pool.

From equation 6.7 we can find that the variance of the pool comprises of two parts, namely the variance and covariance terms. If we further assume that all participants have the same size, the variance of the pool can be written as:

$$\mathbf{Var}(\mathbf{Pool}) = \left(1/M^2\right) \sum_{i=1}^M \mathbf{Var}(\mathbf{CF}_i) + \left(1/M^2\right) \sum_{i=1}^M \sum_{j=1, j \neq i}^M \mathbf{Cov}(\mathbf{CF}_i, \mathbf{CF}_j)$$

As the number of entities increase, M^2 tends to be infinite and $1/M^2$ close to zero. If we use $\overline{\mathbf{Var}(\mathbf{CF}_i)}$ and $\overline{\mathbf{Cov}(\mathbf{CF}_i, \mathbf{CF}_j)}$ to denote the average variance and covariance respectively, we can rewrite the variance of the pool as:

$$\begin{aligned}\text{Var(Pool)} &= \lim_{M \rightarrow \infty} \left(\frac{M}{M^2} \overline{\text{Var}(\text{CF}_i)} + \frac{M^2}{M^2} \overline{\text{Cov}(\text{CF}_i, \text{CF}_j)} \right) \\ &= \overline{\text{Cov}(\text{CF}_i, \text{CF}_j)}\end{aligned}\quad (6.8)$$

From equation 4.8 we know that the variance of the pool decreases and approaches the average covariance. To the pool, cash pooling converts the risks from a group of participants' variance to the average covariance between two participants. This is similar to the diversification of portfolio investment (Copeland/Weston, 1994).

One way of looking at the risk of a single entity is to evaluate its contribution to the total portfolio. If taking partial derivative of equation 6.7 with respect to W_i , we get that

$$\frac{\partial \text{Var(Pool)}}{\partial W_i} = 2W_i \text{Var}(\text{CF}_i) + 2 \sum_{j=1}^M W_j \text{Cov}(\text{CF}_i, \text{CF}_j) \quad (6.9)$$

Again, consider the pooling of equal size participants, then $W_i = 1/M$. As the number of assets in the portfolio increase, W_j approaches one. Therefore, as equation 6.9 reveals, for a sufficient number of participants, the appropriate measure of the contribution of one entity is its covariance with the other participants. It means that the pooling results in changing the risk of daily and total cash flow of any entity from variance of itself to its covariance with the other pooling participants.

On the other hand, with regard to the weight of cash flow of an entity W_i , equation 6.9 discloses that the variance is a decreasing convex curve with marginal decrease rate $2W_i$ and rate of change of slope 2. We know that when the number of participants increases, the weight W_i of any entity decreases, and the marginal rate of decrease of volatility also decreases. Thus, when the company begins to add the number of pooling participants, the total variance of the pool decreases at a faster speed than that of increase in participants. However, with more and more entities having participated in the cash pooling, the variance of the pool decreases more and more slowly because the marginal rate is decreasing.

The experimental tests done by Fama and by Ibbotson and Sinquefeld have illustrated that most of the benefits of diversification can be achieved with fewer than 15 units, regardless of whether the units are equally weighted or not (Copeland/Weston, 1994, *pp.* 184-185). Our computer simulation of the pooling of 15 sets of random variables also confirms the validity of the experimental tests. The results of computer simulation are shown in Figure 6.1, and its descriptive statistics are presented in Table 6.1.

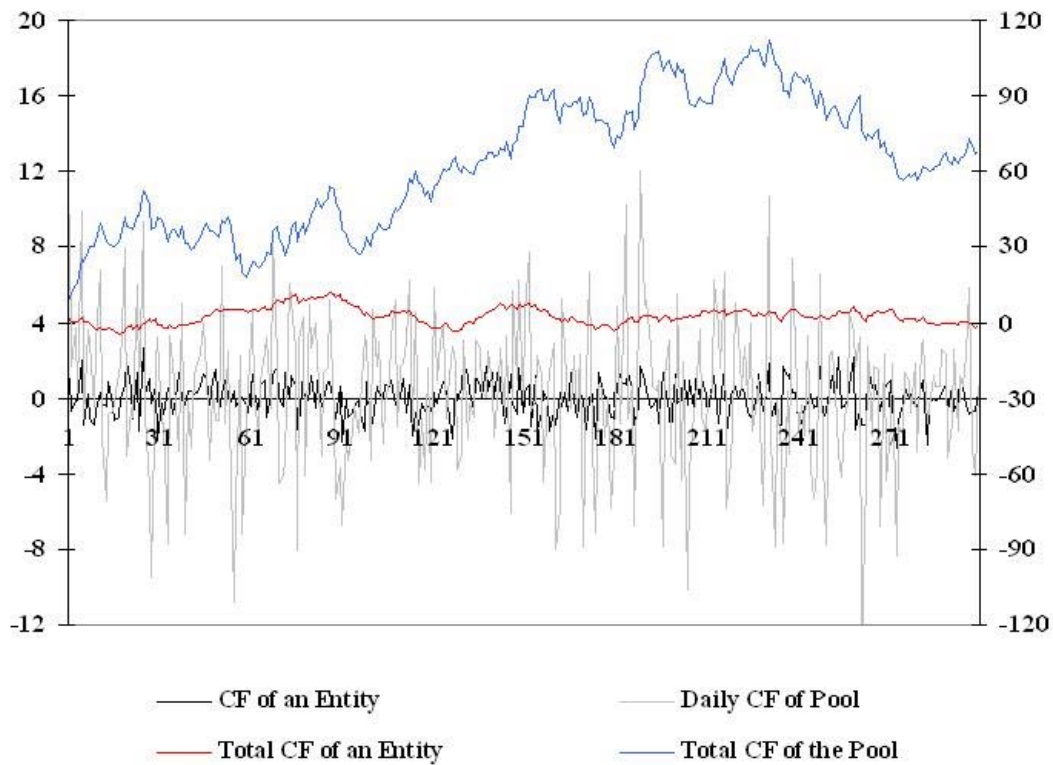
Table 6.1 Descriptive Statistics of Pooling 15 Sets of Random Variables

	CF of an Entity	Daily CF of Pool	Total CF of entity	Total CF of Pool
Mean	-0.0051	0.2248	2.4569	63.2283
Standard Deviation	0.9731	3.9493	3.3696	25.9395
Sample Variance	0.9469	15.5973	11.3541	672.8583
Kurtosis	-0.3362	0.5725	-0.1454	-1.1950
Skewness	-0.1025	-0.1898	0.4244	0.0211
Sum	-1.5374	67.4443	737.0643	18968.49
Count	300	300	300	300
Largest(1)	2.7018	11.9905	11.4514	111.9603
Smallest(1)	-2.5797	-13.5637	-4.7318	9.6667
Confidence Level (95%)	0.1106	0.4487	0.3828	2.9472

Source: Computer simulation by Hong and Wannfors.

As shown in Table 6.1, comparing with the participant's standard deviation that is set to be one, the standard deviation of the daily pool of fifteen equal-size entities decreases dramatically from fifteen to about four. This confirms that the volatility of daily cash flow of the group is reduced after pooling a certain number of entities. The risk of total cash flow is also reduced from about 50 to 26.

Figure 6.1 Simulation of Pooling 15 Sets of Random Cash Flow



Notes:

1. Using 15 sets (300 units per set) of normally-distributed random variables with mean 0 standard deviation 1;
2. “CF of an Entity” is randomly selected from 15 sets;
3. “Daily CF of the Pool” is the one-unit sum of 15 sets;
4. “Total CF of an Entity” is the total of same set of variables;
5. “Total CF of the Pool” is the total of all units of 15 sets;
6. “Total CF of an Entity” and “Total CF of the Pool” subject to the right-hand horizontal axis.

According to the definition, the covariance is the products of correlation and standard deviation of cash flow of entity i and j , that is:

$$\mathbf{COV(CF_i, CF_j) = CORR(CF_i, CF_j) \times SD(CF_i) \times SD(CF_j)} \quad (6.10)$$

Intuitively, if and only if CF_i and CF_j are independent random variables,

i.e. if the correlation between a pair of cash flows is zero, the covariance terms will be zero.

From equation 6.10 we get that, firstly, because the participating entities are more or less influenced by the same shocks, i.e. there is a non-zero correlation between the noise factors (equation 6.2), the correlation between CF_i and CF_j does not equal zero, and hence, the covariance is not zero.

Secondly, as we know, the correlation coefficient is between minus one and one. Thus, the covariance of two uncertain cash flows is always less than the larger variance of the individual entity.

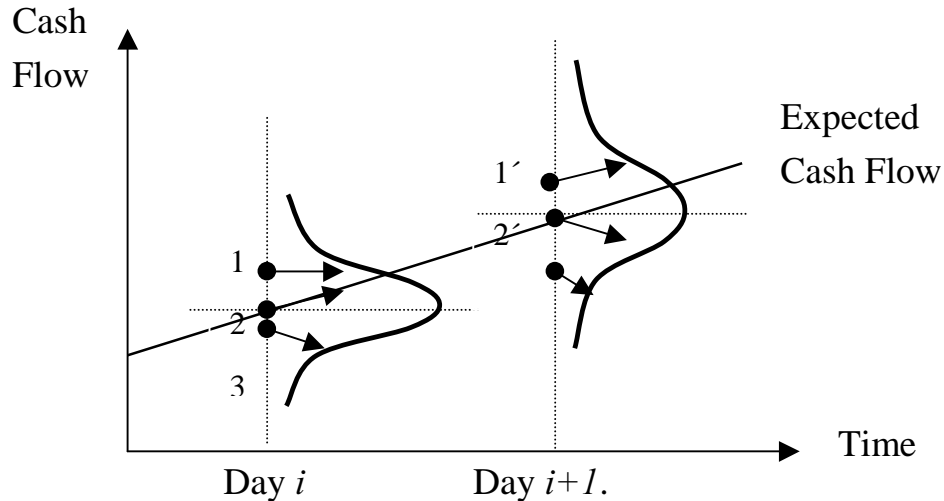
In the case that two entities are very weakly correlated, the covariance will still be lower than the products of two standard deviations. Thirdly, the volatility of an individual entity will influence the variance of the pool. When the correlation of two entities is negative, the higher the volatility of participant entities, the lower the total risk of the pool is. On the other hand, the lower standard deviation of participating entities will benefit the pool, if the cash flow of two entities has a positive correlation.

As we know, daily cash flow of any entity is $CF_t = CF_{(t-1)} + \varepsilon_t$, so the total cash flow is $Total\ CF_t = (t-1)CF_1 + (t-1)\varepsilon_i$; where CF_1 denotes the cash flow on Day 1. Because the daily cash flow since Day 1 is a stochastic process, the total cash flow on Day $i-1$ is uncertain. The total cash flow of the last period is always the starting point of the total cash flow in the next period, so the starting point of the total cash flow on Day i is uncertain. As Figure 6.2 shows, the starting point of total cash flow on Day i could be above (point 1), or equalling (point 2), or below (point 3) the expected value. Furthermore, the changes of cash flow on Day i are also uncertain. The net cash flow could be either positive or negative, and thus, the total cash flow could move close to or parallel to or away from the expected value (three arrows in Figure 6.2).

Therefore, the uncertainty of the total cash flow on Day $i+1$ consists of two parts: one is the uncertainty of total cash flow on the starting moment on

Day i , the other is the uncertainty of the possible movement of cash flows during Day i to Day $i+1$.

Figure 6.2 The Increasing Volatility of Total Cash Flow



Notes: Because the cash flow from Day i to Day $i+1$ is a stochastic process, the starting point of cash flow on Day i could be either point 1 or 2 or 3. The arrows starting from the points present the possible changes of daily cash flow on Day i , and the changes result in the corresponding points 1', 2' and 3' on Day $i+1$. We can see that the dispersion of points 1', 2' and 3' is larger than that of point 1, 2, and 3. The volatility of total cash flow increases with time passing.

As shown in Figure 6.2, the dispersion of cash flow on Day $i+1$ is larger than that on Day i . For example, the spread of corresponding point 1', 2' and 3' is larger than that of point 1, 2, and 3. With time passing, we can expect the volatility of the total cash flow to increase.

6.1.2 Pooling with Internal Physical Cash Movement

In this section, we will analyse the cash flow of two entities with internal purchases and sales relation. The two entities might be the company's two

subsidiaries in up-stream and down-stream industry respectively or a manufacturing entity and a sales office.

Contrary to Section 6.1.1, both in this section and Section 6.1.3, we assume that the correlation between expected cash flow of two participants is not zero. Therefore the cash flow of an entity is a function of its historical cash flow and the cash flow of other entities. The equation 6.1 changes to be:

$$\mathbf{CF}_{ti} = \beta_1 \mathbf{CF}_{(t-1)i} + \beta_2 \mathbf{CF}_{tj} + \varepsilon_{ti} \quad (6.11)$$

where CF_{ti} and $CF_{(t-1)i}$ indicate the cash flow of participant entity i on Day t and Day $t-1$ respectively, and CF_{tj} denotes the cash flow of participant entity j on Day t ; ε_{ti} is a pure random disturbance in t , and again, $\varepsilon_{ti} = \alpha \varepsilon_{tj}$.

We first consider the case that the internal purchases and sales involve physical moves of cash. Assume that the cash outflow of one entity is exactly the cash inflow of another entity, and also assume that the group settles the internal purchases and sales on the same day. We can describe the daily cash flow of two entities as*:

$$\begin{pmatrix} \mathbf{X}_{11} & \dots & \mathbf{X}_{1i-1} & \mathbf{X}_{1i} & \dots & \mathbf{X}_{1m} \\ \mathbf{X}_{12} & \dots & \mathbf{X}_{2i-1} & -\mathbf{X}_{1i} & \dots & -\mathbf{X}_{1m} \end{pmatrix}$$

From term i to m , corresponding terms of entity X_1 and X_2 have exactly the same absolute value but inverse sign. This is the result of internal purchases and sales between the two entities. The expected value, the arithmetic mean, of cash flows of the two entities is:

* Assume that when internal purchase and sales are netted, the transfer of cash can be realised on the same day. In such a case, we can change the place of the cash flow to make those days with internal transactions together without changing the mean and variance of the cash flow, because the calculation of expected value and variance is summation. It is similar to the formula that $A+B+C+D$ equals $C+B+A+D$. If the same day netting and money transfer cannot be achieved, the attributes of cash flow would be like the analysis in Section 6.1.1.

$$\left| \left(\sum_{i=1}^M \mathbf{X}_{1i} \right) / M \quad \left(\sum_{i=1}^M \mathbf{X}_{2i} \right) / M \right| \quad (6.12)$$

At the end of the period, however, the expected total cash flow of the two entities is:

$$\mathbf{E}(\mathbf{TotalCF}) = \sum_{t=1}^{i-1} \sum_{k=1,2} \mathbf{X}_{kt} \quad (6.13)$$

When carrying out internal netting and pooling cash together, the daily cash flow of two entities together can be described as:

$$(\mathbf{X}_{11} + \mathbf{X}_{21} \quad \dots \quad \mathbf{X}_{1,i-1} + \mathbf{X}_{2,i-1} \quad \mathbf{0} \quad \dots \quad \mathbf{0})$$

The expected total cash flow after pooling is still $\sum_{l=1}^{i-1} \sum_{k=1,2} \mathbf{X}_{lk}$ and the expected value of combined daily cash flow is:

$$\mathbf{E}(\mathbf{CF}) = \left(\sum_{l=1}^{i-1} \sum_{k=1,2} \mathbf{X}_{lk} \right) / M \quad (6.14)$$

We can see that though it is lower than the sum of the two entities' individual expected value (equation 6.12), the expected value of daily cash flow after pooling (equation 6.14) is exactly the same as the mean of $E(\mathbf{TotalCF})$ (equation 6.13). The cash pooling does not change the expected value, even with the internal purchases and sales. Again, the variance of the pooling has changed, and now it can be written as:

$$\mathbf{Var}(\mathbf{Pool}) = (\mathbf{W}_1)^2 \mathbf{Var}(\mathbf{CF}_1) + (\mathbf{W}_2)^2 \mathbf{Var}(\mathbf{CF}_2) + 2\mathbf{W}_1\mathbf{W}_2\mathbf{Cov}(\mathbf{CF}_1, \mathbf{CF}_2)$$

where W_1 and W_2 are weight of cash flow of two entities in the pool respectively, and $W_1 + W_2 = 1$. Here, the daily cash flow and total cash flow have the same attributes. As in pooling of random cash flow, the variance of the pool is also affected by three factors, namely the weight of cash flow of participants, the correlation between the participants, and the standard deviation of participants. The influences of the latter two factors are the

same as those pooling with random cash flow (Section 6.1.1). The additional point here is that the larger the weights of lower variance cash flows are, the lower the variance of the pool is.

Because the computation of variance is a summation calculation, we can split the total variance of the pool into two parts: one is variance from Day l to Day $i-1$, the other is from Day i to Day m . From Day l to Day $i-1$, because the real cash flow follows the stochastic process, the attributes of cash flow during this period are exactly the same as those of random cash flows analysed in Section 6.1.1. As the variance of the daily cash flow of the pool shifts from variance risk to covariance risk, the total risk of the pool in this period should decrease.

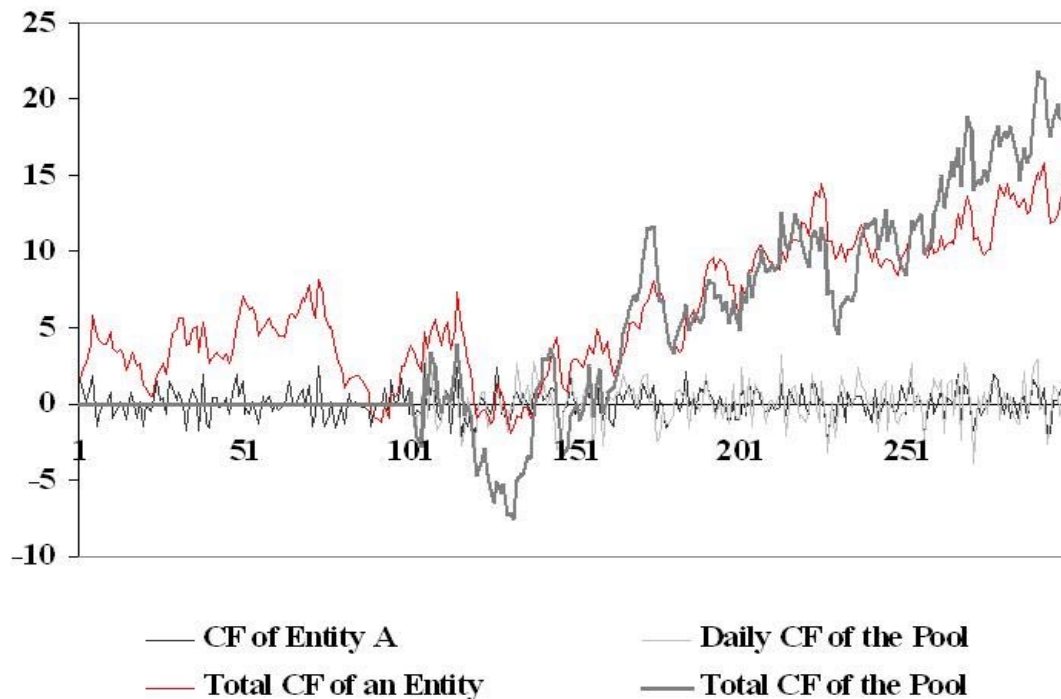
From Day i to Day m , the expected daily cash flows of two participants compensate each other and the change of the pool is expected to be stable. Therefore, because there will be either no variation at all or ignorable variation caused by shocks, the variance of daily cash flow of the pool is expected to be zero. Naturally, the risk of the pool during this time is much lower than the covariance risk. This is quite like investing in two perfect inverse correlated assets, which have the stable real value and zero variance. It is crucial that the internal cash movements are carried out and fulfilled on the same day. Otherwise, the correlation between two entities is not perfectly inverse and the attributes of pooled cash flow will be the same as the stochastic cash flows.

As the risk of both periods from Day l to Day $i-1$, and from Day i to Day m decreases, the total variance of the pool will decline. It is obvious that the more the internal purchases and sales are, the less the variance of total cash flow of the pool is. The computer simulation also shows that volatility decreases when there are internal transactions.

As shown in Figure 6.3, the netting leads to zero total cash flow when there is an internal transaction, and consequently, the variance of cash flow on those days is zero too. In the following period, pooling also reduces the

variance of the pool. The results of our computer simulation are consistent with the analysis that the variance of the pooling will decrease.

Figure 6.3 Computer Simulation of Cash Pooling of Two Entities with Internal Netting



Notes:

1. “CF of Entity A” has 300 units normally-distributed random variables with mean zero standard deviation one;
2. Units 101 to 300 of Entity B is normally-distributed random variables with mean 0 standard deviation 1, while units 1 to 100 have the same absolute value but inverse sign with the corresponding units in Entity A;
3. “Daily CF of the Pool” is the sum of two entities together;
4. “Total CF of the Pool” is the accumulated total of two sets of variables.

Keep in mind that the above case is the ideal situation that two entities have exactly the same absolute value of their expected cash flow, or, the summation of the expected value of cash flow of two participants is zero. The group company maximises the compensation effect and reduces its risk of

cash flow to the bottom level in such a case. It is important to know that the compensation effect relies on the correlation of daily cash flow, and the value of expected cash of all entities and their summation. A necessary condition for allowing compensation to happen is that at least one participant is net cash inflow, and at least another participant entity is net cash outflow. To the pool as a whole, the closer the summation is to zero, the lower the risks of both daily cash flow and total cash flow. In addition, the correlation between two participants also affects the extent of the mitigation. Large and negative correlation between two entities is preferable to small or positive correlation.

6.1.3 Pooling with Booking Internal Transaction

In many cases, it is not necessary to move money back and forth within the group because it can book the internal sales and purchases conducted between its subsidiaries on an accounting basis. In such a case, there will be no actual cash flow taking place except when the internal debt and claims are cleared regularly for a certain period. The Figure 4.2 shows the pattern of cash flows of a company that consists of a factory, which purchases from outside suppliers and sells to the group's own sales offices, and a sales office, which buys only from the internal supplier.

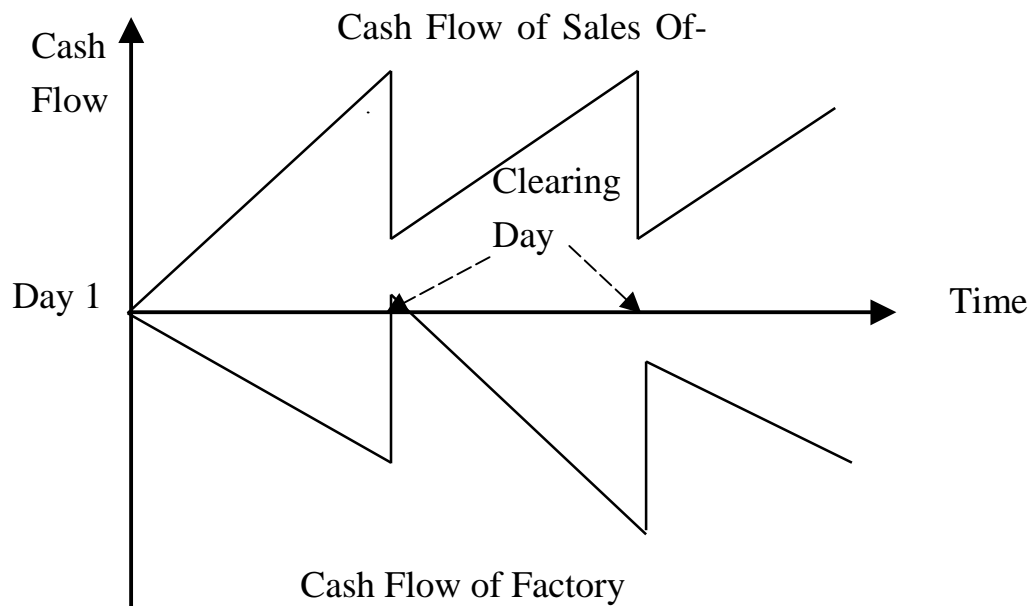
As described in Figure 6.4, in terms of the example, the actual cash flows of sales office are all cash inflow generated from sales to customers, and those of the factory are all cash outflow to suppliers*. Because the internal claims and debts are not settled until the clearing day, there is an accumulation of cash inflow and cash outflow in the sales and factory respectively.

The expected value of the group and subsidiaries does not change because it is not influenced by the booking and clearing. Furthermore, the correla-

* If the daily expenses, taxes, and other expenses are taken into account, the cash flow between two clearing days will not as smooth as the Figure 4.3.1 shows, but it has the same trend and pattern as that in Figure 4.3.

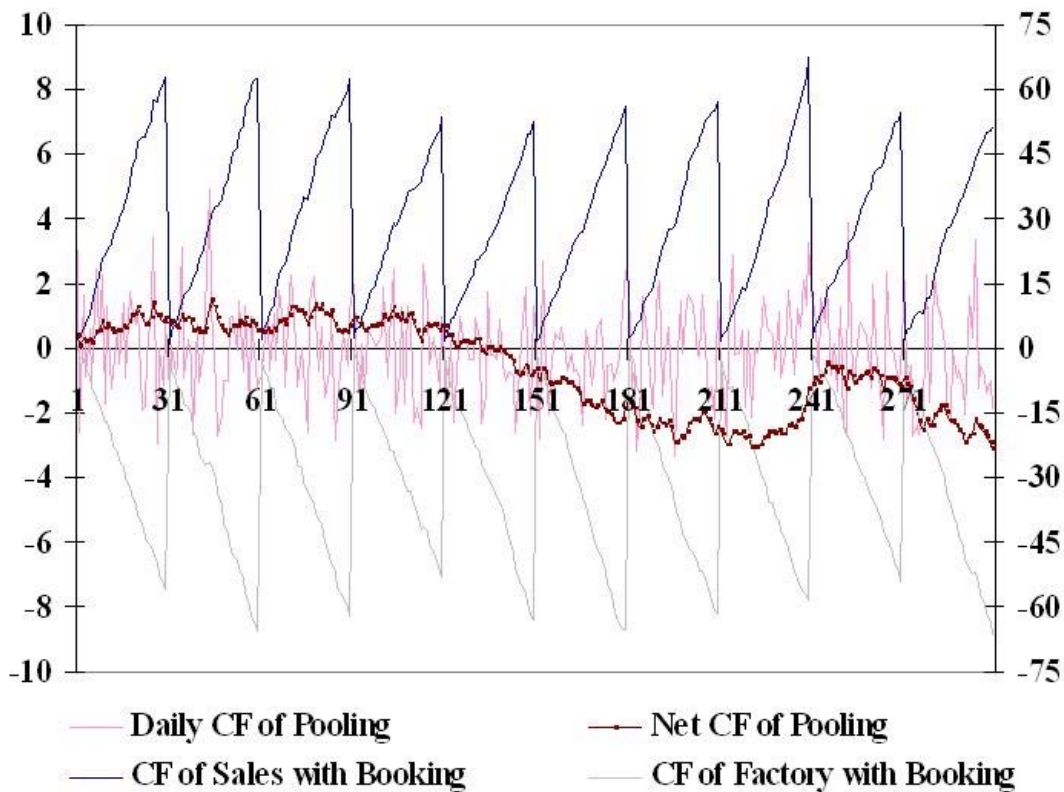
tion between the two participants could be quite high, sometimes close to minus one when the production closely monitors the sales, such as production planned according to the just-in-time system. As we mentioned in Section 6.1.2, the high negative correlation will magnify the compensation effect, and thus reduce the risk of the pool significantly.

Figure 6.4 Cash Pooling with Booking of Internal Transactions



In case of booking the internal transactions, the pattern of cash flow will change substantially. First of all, the peaks of both debit and credit are mitigated and almost erased. This alone can save enormous interests for the pooling company as long as the interest rate of loan is higher than that of deposit. The actual saving of bank interest costs depends on the spread and the amount of internal transaction.

Figure 6.5 Computer Simulation of Pooling with Internal Booking



Notes:

1. CF of factory uses 300 normally distributed data with mean -2 , standard deviation 1, while CF of sales uses 300 normally distributed data with mean 2, standard deviation 1;
3. “With booking” means that the purchasing and selling within the group are just booked in accounting;
4. “Pooling” indicates the adding of two units together;
5. Curves of daily CF are all subjected to the primary axis (the horizontal axis on the left side), while the others are subject to the right-hand secondary horizontal axis.

Besides, the pooling improves the liquidity position of the company and now it only needs a much lower credit line for the whole group. The idle

cash in sales can be used to finance the factory, and hence, both the asset and liability will decrease and the balance sheet will shrink.

6.2 Bondholders' Value

The fact that cash pooling will change the risk from variance to covariance risk reveals that cash pooling for random cash flows will reduce the risk of both daily and total cash flow variations. But the pooling will not increase the total amount of a company's cash flow, as the expected value of cash flow is not affected by the pool.

6.2.1 Reduced Liquidity Risks

As Figure 6.6 shows, the cash pooling reduces the spread of the total cash flow but does not change the mean. This change has some substantial effects on the liquidity position of the firm because the down side liquidity risks, the shade area left to E_I , are reduced. The computer simulation shows that the group may gather a bulk amount of cash to invest. Of course, there is equal opportunity for the group to face a very large debit position if the situation is not favourable.

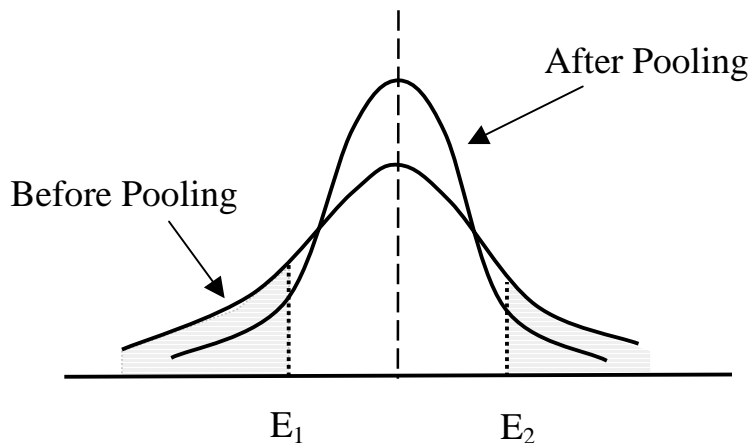
One of the most important practical applications of this is regarding the credit line. If the undertaking company has maintained separate credit line for each individual participant before, the pooling will naturally require a centralised credit line in the group level. The amount of the credit line could be less than the sum of separated credit lines. To what degree the firm can reduce its total credit line depends on both the correlation of cash flow of participant entities and the variance of cash flow of participants. Firstly, the higher the correlation and variance, the higher the credit line is required, and a negative correlation can reduce the credit line the most. Secondly, lower variance of participant will put less pressure on the credit line because the risk of out-of-credit declines with the volatility of participants' cash flow going down.

According to the definition, the variance of the pool is

$$\text{Var}(\text{Pool}) = \sum_{i=1}^M \sum_{j=1, j \neq i}^M [W_i \times W_j \times \text{Corr}(\text{CF}_i, \text{CF}_j) \times \text{SD}(\text{CF}_i) \times \text{SD}(\text{CF}_j)]$$

When the correlation between any entities i and j is zero, the total variance of the pool is zero. In such a case the total variance of the pool is just relevant to the operating and marketing activities, and the pool itself is not at risk any more. The company gets the maximum benefits of diversification. But this can never happen in the real world because it is impossible to have either an infinite number of participants, or zero correlation between any two participants. A possible situation is that the correlation is quite close to zero, and the total variance of the pool is quite low. Hence, cash flow moves together with the macroeconomic changes. That kind of risk of the pool is like the so-called system risk that cannot be diversified in portfolio investment.

Figure 6.6 Liquidity Position before and after Cash Pooling



On the other hand, the higher the absolute value of the correlation, the lower the benefits of the changing of risk from variance to covariance.

Cash pooling of correlation almost close to one does not signify the benefits of cash pooling.

However, when the correlation turns to be close to minus one, we can use the idle money much better. For example, in case of pooling with internally booking the debt and claims (Section 6.1.3), because the correlation closer to minus one than any other cases, the company gets the best use of idle money and debts and claims are mitigated very strikingly after pooling.

6.2.2 Bondholders' Value

In an equilibrium market, when the risk of the cash flow decreases, the expected return on the bond will decrease correspondingly to reflect the lower risk the bond is bearing. Thus, the risk-adjusted return of bondholders does not change. Further, the put-call parity tells us that $S + P = B + C$, where S , B , P and C denote the underlying asset or a share of stock, the risky bond, put and call option respectively.

To introduce the option pricing theory, assume that the stock S equals the market value of the firm V , and B is the risky zero-coupon debt with face value D . If on the maturity date the value of the firm V exceeds the face value of the bonds D , the shareholders will exercise their call option by paying off the bonds and keeping the excess. On the other hand, if the value of the firm is less than the face value of the bonds, the shareholders will default on the debt by failing to exercise their option. Substitute V for S and S for C in put-call parity, we have

$$V = (B - P) + S \tag{4.15}$$

Equation 4.15 tells us that the value of risky asset, the levered firm, can be separated into two parts. The equity position S is a call option, and the risky debt position $B - P$ is equivalent to the present value of the risk free debt, minus the value of P , a European put option. Table 4.2 shows the payoffs to equity and risky debt. The payoffs to stakeholders always add up to equal the value of the firm at maturity.

Table 6.2 Stakeholders' Payoff at Maturity

Stakeholder Positions	Payoffs at Maturity	
	If $V \leq D$	If $V \geq D$
Shareholders' Position:		
Call Option, S	0	$V - D$
Bondholders' Position:		
Default Free bond, B	D	D
Minus a put option, P	$-(D - V)$	0
Value of the firm at maturity	V	V

At maturity, the entire value of the firm is divided between bondholders and shareholders. If the firm is successful, i.e. $V \geq D$, the bondholders receive the face value of the riskless debt D , and their put option is worthless. If the firm is bankrupt, they still receive the face value of the riskless bond but a put option has in effect been exercised against them. The net position of bondholders is the market value of firm V .

According to the option pricing theory, the bondholders in fact write a European put option to the firm. After pooling, the bondholders' value does not change because the risk of the bond is reduced, and thus, the possibility of exercising the put option declines. The net payoff to bondholders $B - P$ does not change because the value of both B and P declines to the same degree when the market is equilibrium. The cash pooling does not affect the benefits of bondholders, though it forces the return and risk of the bondholders to move to a new balance point on the security market line.

6.3 Shareholders' Value

We have shown that the bondholders will not benefit from the cash pooling though the default rate of the their debts declines after pooling. It is now time to discuss the central question of analysing the cash pooling: whether the shareholders will benefit from the cash pooling.

6.3.1 Saving of Bank Interest Costs

As we know, the net position of an entity can be either a positive credit position (in black) to bank, or a negative debit one (in red), or zero. The lending interests that the banks charge to an entity in red are always higher than that paid to an entity in black, and the difference is called spread. When cash is pooled, the debit position of one participant (or participants) can be partially or totally compensated by the credit position of another participant (or other participants), and therefore, the group as a whole saves the interest costs. Even in some extreme cases, for example, when all entities are in a debit position, the interest costs after pooling are exactly the same as that without pooling. That means that the pooling will save or does not affect the interest costs but will never increase the interest payment. The interest saving of cash pooling is certain and the amount of money saved could be very substantial. Table 6.3 gives an example of how the pooling of two entities can save interests.

Table 6.3 The Bank Interests Saving of Cash Pooling

CF of A	Interest*	CF of B	Interest	Total Interests	CF of Pool	Interests after Pooling
300	15	600	30	45	900	45
-100	-10	-200	-20	-30	-300	-30
-100	-10	500	25	15	400	20
700	35	-400	-40	-5	300	15
1,000	50	-700	-70	-20	300	15
-300	-30	100	5	-25	-200	-20
Sum				-20		45

* We assume that bank charges 10% over night rate to loans, while paying 5% to deposits.

From Table 6.3 we can find that, after pooling, the total interests increase from negative 20 to positive 45. In any single day, the interest costs or interest gains with cash pooling are always better or the same as that without

cash pooling. Thus, it is safe to conclude that the cash pooling can reduce the interest payment to banks.

Furthermore, to what degree the company can save bank interest costs depends on two things. One is the spread between the deposit rate and loan rate. When the spread increases, the saving effect of cash pooling is magnified. The other is to what extent the positive bank accounts can compensate the negative accounts. The more the positive accounts can compensate the debit position in other accounts, the more interest costs are saved.

6.3.2 Saving of Debt Costs

In section 6.1 we have demonstrated why and how the cash pooling can reduce the volatility of the total cash flow of the group company. In section 6.2 we have shown that the decreased volatility can improve the liquidity position of the group company and thus reduce the risk of bankruptcy substantially. To bondholders, that means that cash pooling will reduce the default risk of their bonds. If the market is in equilibrium, we can expect the bondholders to charge a lower interest rate on the company.

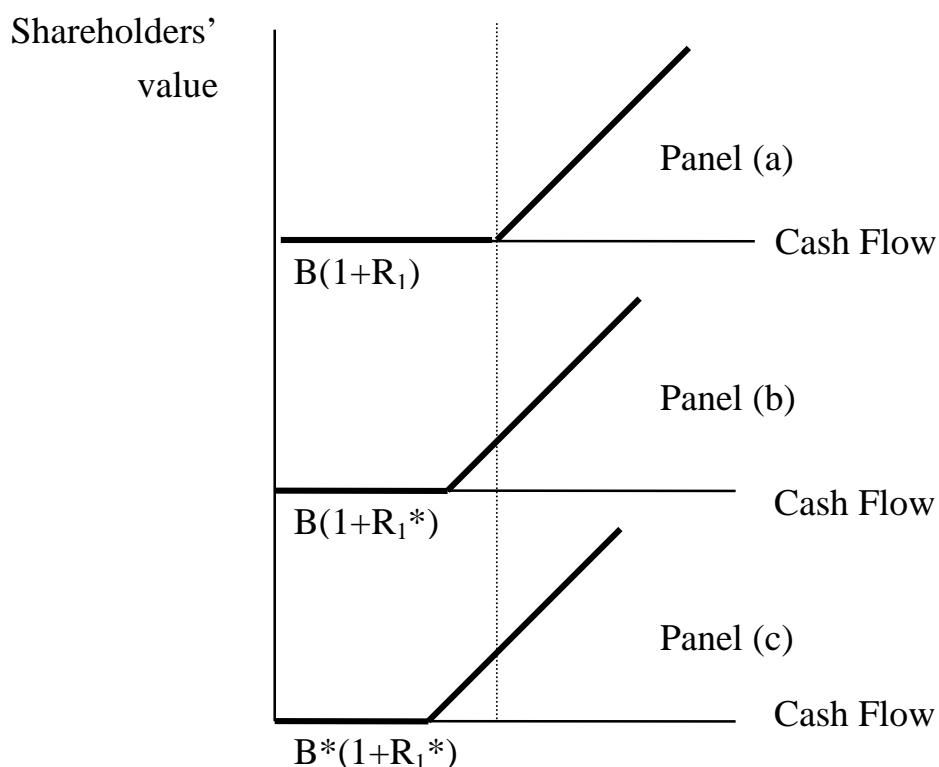
As shown in the Panel (a) of Figure 6.7, before the pooling, the bondholders require the interest rate of R_1 . After pooling, bondholders instead demand a lower interest rate R_1^* , as shown in the Panel (b).

In addition, as we discussed in Section 6.1, because the excess cash flow in other participants can be used to finance the cash outflow of the participants short of cash, the cash pooling will reduce the total debt level of the company. Therefore, the total debt will reduce from B to B^* , as shown in the lower panel of Figure 6.7. According to the option pricing theory, when the interest payment of debt decreases, the shareholders' value increases correspondingly for the striking price of the call option declines.

Implementing the cash pooling gives the company an extra flexibility to decide whether to make a quick return to shareholders. As shown in the Panel (b) and Panel (c) in Figure 6.7, without sacrificing the shareholders'

value at the current stage, the company can use its extra money to invest and pay back to the shareholders in the next period. Obviously, the board and management can also pay the benefits to the shareholders immediately after the benefits of cash pooling have been realised.

Figure 6.7 Shareholders' Value before and after Cash Pooling



There is no free lunch. According to Modigliani and Miller Proposition I (M-M Proposition I), the value of the levered firm is equal to the value of unlevered firm plus the present value of the tax shield on debt. Because the tax shield is positively correlated with the amount of outstanding debt, reducing the level of debt leads to losses on some of the gain from leverage. The reduction in the tax shield from interest deductibility has a negative effect on shareholder value, providing that the company is operating at its optimal capital structure. This loss can be avoided by buying back stock or financing new investment with debts, but both these alternatives are associ-

ated with costs themselves. Buying back stock involves transaction costs, and no one can guarantee that the company can always find new investment opportunities.

Furthermore, if the equity in a levered firm is analogous to a call option, then its value will decrease with the decrease in the variance of the firm's cash flow. Therefore, we have to ask whether the benefits will outweigh the mentioned setbacks.

6.3.3 Increases of Equity's Value

To give an irrefutable answer to the question posed in last sub-section, we need to combine the Capital-Asset-Pricing Model (CAPM) and M-M Propositions. Because the market value of equity is the summation of discounted future return to equity, whether the cash pooling will increase the shareholders' value depends on two factors, namely the future return to equity and the required rate of return on equity.

It is reasonable to assume that cash pooling does not change the operating cash flow. Then, the total return to stakeholders is stable. We know that the net interests, the return to bondholders, will decline because the cash pooling lowers the risk of the debts. Then, the return of equity will increase, providing that the cash pooling will not affect the net operating cash flow.

Further assume that the company maintains the same amount of shares, then the market value of the equity depends on the required rate of return of levered equity. The higher the required rate of return is, the lower the value of equity is. According to the CAPM, the required rate of return of leveraged equity, K_s , can be calculated by the formula

$$K_s = R_f + [E(R_m) - R_f] \beta_L \quad (6.16)$$

where R_f and $E(R_m)$ denote the market risk-free rate and the expected rate of return on the market portfolio respectively, and β_L is the correlation coefficient between the return to the levered company's equity and return to the market portfolio. As the R_f and $E(R_m)$ are determined by the market, a lower

β_L will lead to a lower K_s , and hence, increase the value of equity. Combining the CAPM and M-M Proposition II, we get that

$$\beta_L = \left[1 + (1 - \tau_c) \frac{B}{S} \right] \beta_U \quad (6.17)$$

where β_U is the constant β of the unlevered firm and τ_c is the corporate tax rate. According to equation 6.17, the β_L is positively correlated with the ratio of B , the value of debts, and S , the value of equity. As the cash pooling just reduces the amount of the debt but leaves the equity unchanged, the ratio of B/S will decrease, and then, the β_L will decline correspondingly. As the future return increases but the required rate of return decreases, the market value of equity will definitely increase.

6.4 Summary

Although it does not affect the expected value of either daily cash flow or total cash flow, the cash pooling does improve the financial situation of the undertaking company by decreasing the volatility of the cash flow and by reducing the liquidity risk of the company. Both improvements will increase the shareholders' value. To what extent the cash pool improves the financial situation of the undertaking company depends on four factors, namely, the average cash position, the volatility of the cash flow of participants, the number of participants, and the correlation between the cash flows between participants.

When pooling, the volatility of both the daily cash flow and total cash flow decreases because of the diversification effects. The strength of the diversification also depends on several factors. The less the correlation between the cash flow of participants is, the larger the number of pooling accounts is, the more significant the decrease in volatility is. However, the marginal effect of increasing pooling participants is decreasing. Experimental tests have proved that most of the effect is captured if 15 participants involved.

The liquidity position of the undertaking company is improved. Firstly, the lower risk of total cash flow reduces the possibility of bankruptcy and thus lowers the default rate of bonds. Secondly, the amount of outstanding debts declines, too. The decline of outstanding debt relies on to what extent positive and negative accounts compensate each other. To what extent the positive and negative accounts cancel each other out depends on (1) the correlation between cash flows of participants, (2) the expected total cash flow, and (3) the volatility of cash flows of participants.

The compensation effect is dependent on the correlation of cash flows of participants because the more the cash flows differ from each other, the better they offset each other. If the correlation is one, there will be no effect as cash flow of all participants always moves in the same direction. But as long as the correlation is not perfectly positive, there will be interest savings. The closer the correlation is to minus one, the larger the effect will be. The compensation also lowers the required credit limits for the company.

The improved liquidity position will reduce the effective interest rate for the company's short-term borrowing. However, the risk-adjusted return of bondholders does not change because the mean and variance of the debt is still balanced and on the security market line. In addition, though the lower volatility will reduce the value of European put option that the bondholders sell, the value of bond also decreases. In general, the bondholders are not affected by the cash pooling.

Shareholders' value is affected positively by the reduction in the effective interest, and decline of total loans outstanding, but affected negatively by the reduction in interest tax shield and the decrease of volatility.

With fewer total loans outstanding, the financial risk of the company will decrease, and thus, the shareholders require lower rate of return. Furthermore, the lower effective interest rate also decreases the required rate of return of the shareholder. Any of these factors will increase the value for shareholders.

Chapter 7 Case Study of Mölnlycke Health Care

In this chapter, we provide a real example of how a new European treasury function can be set up with centralised activities in a financial shared service centre and centralised liquidity in a euro cash pool. First we will offer a short description of the company and its current situation. After that follows a discussion of the company's plans regarding the shared service centre, and how they plan to set up the cash pool and banking relationships. Finally, some connections are made to the issues discussed in earlier chapters to illustrate how they can be applied to a real case.

7.1 Mölnlycke Health Care

Mölnlycke Health Care AB (MHC) is a Swedish mid-sized company. This company is in a very unique situation, as they have the opportunity to, within a short period of time, apply many of the concepts discussed in this paper. The company is in the middle of a restructuring program to take advantage of the new European business environment and new technological development. The special circumstances surrounding this company have created a window of opportunity for them, as well as valuable insights to our study. This case gives a hint as to what an important role the financial function will play in European companies in the future.

MHC is one of Europe's leading manufacturers and suppliers of single-use surgical and wound management products. They conduct business all over the world, although they mainly focus on the European market. The company has subsidiaries in 19 countries, of which 17 are in Europe and 15 are in western Europe. The turnover is approximately MSEK 2,000 per year, and they have about 1,800 employees. Production facilities are located in Sweden, Belgium, Finland, Thailand and Ireland, although the factory in Sweden is about to be transferred to Finland and the factory in Ireland will be transferred to Thailand. They also operate a Customer Service Centre

for order handling in Belgium, and warehouses in Belgium, Sweden, Spain, Austria, Italy and Finland.

The company has recently been bought out from SCA Hygiene Products by a private equity/management buyout firm, and is now being restructured. The intention is to turn a low-profitable operation to a profitable one. The investment firm behind the buyout has a strategy of buying mid-sized and large companies with strong market positions and make them profitable in a period of 5-7 years. For MHC they are aiming at an initial public offering (IPO) as early as in 2001.

The company is therefore going through a phase of substantial changes. They must expand and efficiency must improve to attract shareholders by the time of the IPO. To do this, the management has launched an internal efficiency program with several projects for re-engineering of processes and restructuring the organisation. This work started in 1998 and will continue to the end of 2000. The main strategy of the program is to focus on core activities as well as to centralise and achieve efficiency improvements in production and administration. This work will include the instalment of a new SAP R/3 system, a state of the art ERP-system (Enterprise Resource Planning) that will interconnect all the company's units and processes.

To be able to continue operations after the buyout, MHC signed a service agreement with the former parent company. In accordance with the agreement, SCA is providing accounting services, IT-related work, personnel management, office services and customer services. This agreement is, however, only temporary since it is not an optimal solution for either party. SCA is not interested in providing these services as they are not a part of their core operations, and MHC cannot be dependent on its former parent company forever as it has to stand-alone before the IPO. They therefore have to build up their own administration and terminate the agreement over the next few years.

Fortunately, now is not a bad time to build up a new administration. Since the timing of their programme coincides with the introduction of the euro,

there is an opportunity to customise the new structure to the euro environment. In contrast to their competitors that already operate with their own administration MHC does not have an existing administrative operation to change. Therefore they have a head start in designing and implementing new concepts such as a shared service centre and cash pooling.

Figure 7.1 Main Reasons for a New Solution

- To create a cost efficient administration in Euroland
- To make market organisations more focused on their core business
- To be considered an independent company before the IPO
- To be able to continue operations even though SCA is not renewing the service agreement

It is also convenient to build up a new set-up with new processes while simultaneously installing a new ERP system, since the new set-up can then be customised to the abilities and limitations of the system, and all business units and processes can be interconnected.

7.2 The Financial Service Centre Project

MHC has adopted the idea of shared services, and it has decided to establish a “financial service centre” (FSC) that will be located in Gothenburg, Sweden. The FSC project has just recently started, and it is still in the designing phase. The intention is that the FSC will provide services to all their units in Euroland plus Sweden, Norway, and the UK. For the other countries, the service agreement will either continue, or a local administration will be set up, or the services will be outsourced locally.

Four main arguments have convinced MHC that one financial shared service centre is the best solution for their new administration:

- **Size** –economies of scale can be achieved by having one centre instead of multiple centres. The estimated savings in personnel are approximately 30 percent.
- **Competence** – it will be less costly to attain a high competence level with only one centre.
- **Co-ordination** – communication and co-ordination will be easier with one centre than with several centres.
- **IT support efficiency** – it is easier to support IT-solutions if they are concentrated to one location.

The centre can be divided into three different functions: invoicing, treasury activities, and accounting.

Table 7.1 Activities in FSC

Invoicing	Treasury Activities	Accounting
<ul style="list-style-type: none"> ➤ Generate and distribute invoices and credit notes ➤ Issue standard payment reminders 	<ul style="list-style-type: none"> ➤ Receive and match payments ➤ Pay supplier invoices ➤ Plan, monitor and manage liquidity ➤ Foreign exchange and currency risk management ➤ Credit risk policy 	<ul style="list-style-type: none"> ➤ General accounting ➤ Register, account and book supplier invoices ➤ VAT processing and reporting ➤ Ad hoc and management reporting

The idea is that the FSC is going to provide its internal customers with high quality and cost efficient financial services. It will provide systems and standardised processes and procedures. It should thus be thought of as a

service organisation, providing services to the local organisations, rather than a central head office function. The responsibility for the financial results and decisions regarding credit conditions, etc. will still be local, and the FSC will be evaluated on service level and operating efficiency.

The main rationales to locate the centre in Gothenburg are that co-ordination will be easier if the centre is located close to the headquarters, and existing personnel could staff the new centre and train the new staff. Also, existing IT support and IT competence are located in Sweden, and this co-operation can be extended to include the FSC. It will also be easier to control the construction of the new site if it is close to headquarters.

◆ **Centralised Invoicing**

Today invoices are created and distributed at the local level. The procedures and layout of the invoices are different in each country, as no central co-ordination exists. MHC recognises that economies of scale can be achieved if the handling of all invoices is done at one place, since then only one set of equipment is needed to perform the tasks. The intention with the FSC project when it comes to invoicing is therefore to centralise as much as possible, which means standardisation in terms of layout, credit terms, printing, and distribution of invoices.

MHC also recognises that invoicing, printing and distribution are activities well suited for outsourcing, so therefore they are investigating this alternative. If they choose to outsource, they will, however, still benefit from standardising the printing process, since the outsourcing partner will charge a starting fee per run.

The local units will not be involved in the invoicing. The order entry process at the customer service centre will initiate the process, and the invoices will be distributed from the FSC directly to the customer. In addition to creating invoices, the FSC will also be responsible for creating and distributing standard written reminders to customers not paying on time.

◆ **New Payment Model**

The process of receiving and making payments is today handled by each local company and varies between countries from highly automated payment processes and bookings to manual and paper based routines. The matching and booking of payments are today, in all but a few countries, done manually, and a saving potential exists in standardising and automating this work at the FSC. When the centre is in place most of the incoming and outgoing payments are going to be handled centrally. The aim is to centralise as much as possible and standardise the procedures for receiving and making payments, booking payments, and handling liquidity.

In the new structure, payments from customers are made directly to the FSC, which belongs to the principal company. Since the receiver of the payment is not the same as the unit making the sale, the sales companies will sell their external accounts receivable to the FSC via factoring. The FSC will hold local “resident” bank accounts to prevent customers from having to make cross-border payments. The payment details will be sent via file (EDI) to the FSC for direct matching of payment and accounting. The investigation with customers of unmatched and overdue payments will, however, continue to be the responsibility of the local units.

The payment and booking of supplier invoices will also be done by the FSC on behalf of the subsidiaries, although the local organisation continues to be the receiver of the supplier invoices, checking and approving them before payment. All cash flows will thus be concentrated to the bank accounts of the mother company. This simplifies internal transfers between the accounts, since the money is not being transferred between legal units, and no internal loans are needed. This is important because cash will be more actively moved between accounts when the cash pool is in place.

The centralisation of payments will thus have implications for the organisational structure and the roles and responsibilities of the entities. This might lead to a need for creating service level agreements between the different entities as well as a need for new job descriptions.

◆ **New IT-system**

A new ERP system is being installed at MHC. This is a separate project, but it constitutes an important input to the FSC design. It is vital that the company's new IT system can support all the activities and processes of the centre, and the efficiency of the set-up depends on the system's abilities and limitations.

Electronic links with the bank systems and automated bookings in the company's internal computer system are needed. This will require a tight control of the information flow within the systems. At the same time the system needs to be open and transparent for people at different locations. To achieve this, standardisation in terms of payment terms, layout, documentation, etc will be necessary.

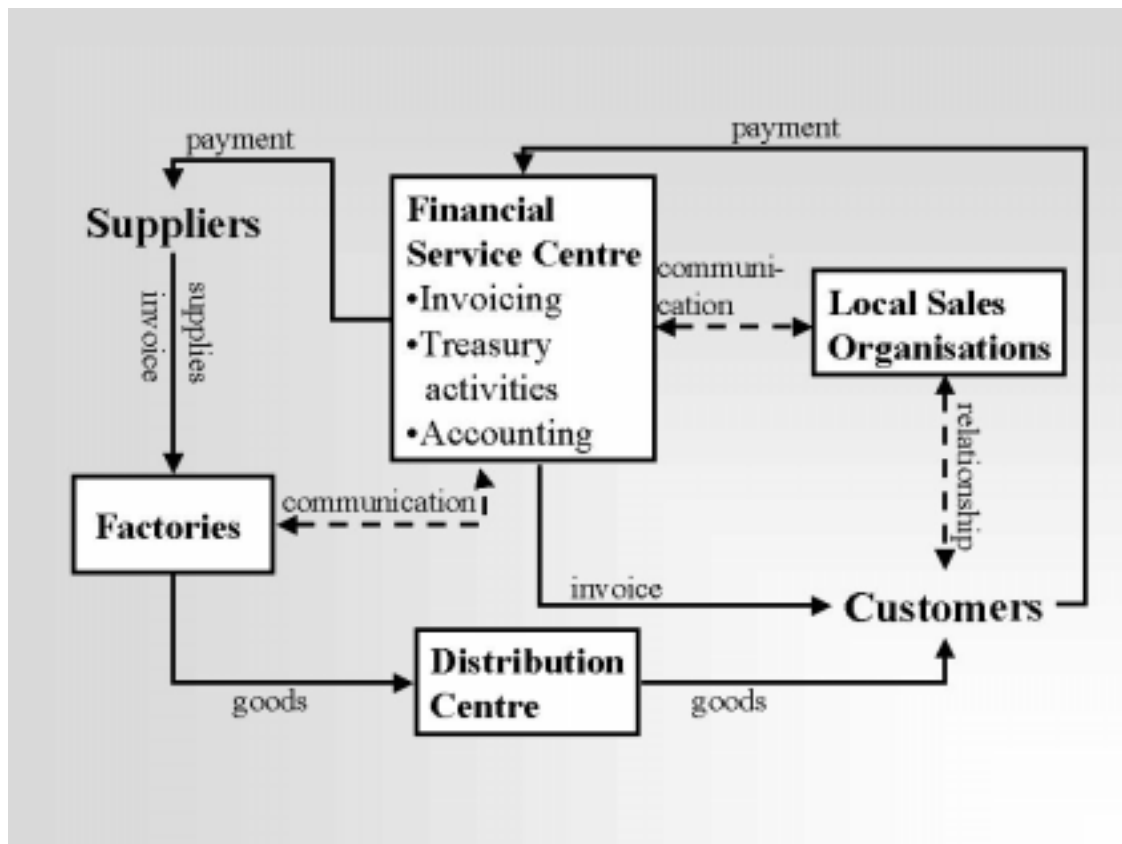
7.2.1 Implementing a new Structure

In the new structure, the responsibility of the business operations is in the hands of the local organisations, and the FSC provides administrative operations. The FSC has no external customer contact, as customer relations are handled by the local organisation and the customer service centre.

The FSC handles all payments and collections except those payments that for practical or legal reasons have to be made by the local organisations. When the factory receives a delivery and an invoice, they are matched to check that the delivery is OK. The invoice is paid by the FSC, on behalf of the factory, from an account in the country of the supplier. The factory delivers the finished goods to a distribution centre, from which deliveries to customers are made. The customers are invoiced directly by the FSC, and the customer pays to a local account held by the FSC.

The implementation of the project will start in the spring of 2000. The timing of the implementation has to be tuned with the instalment of the SAP system, which started in October 1999.

Figure 7.2 The new structure



A pilot study will be done to make sure that the solution is feasible before the whole implementation program is launched. It is not yet decided if the implementation will be on a step-by-step basis or if they will take a radical approach and change systems and processes in all countries at the same time.

7.3 Pooling of Cash

Connected to the FSC design are the plans to improve efficiency in liquidity management by setting up a cash pool. MHC has estimated that interest savings should be approximately 3% of total net interest costs. To be able to achieve this it is necessary to find a cash pooling solution that fits their needs, and decide on how to structure the bank accounts. They also need to look at what cash pooling services the banks can offer, and choose one or several banking partners. MHC has not yet chosen a service provider, but

they have a good idea of how their cash pooling will eventually work. As notional pooling is legally restricted in some of the countries included in the FSC project, MHC has decided to set up a zero-balance cash pool with either a one-bank solution or some kind of overlay structure.

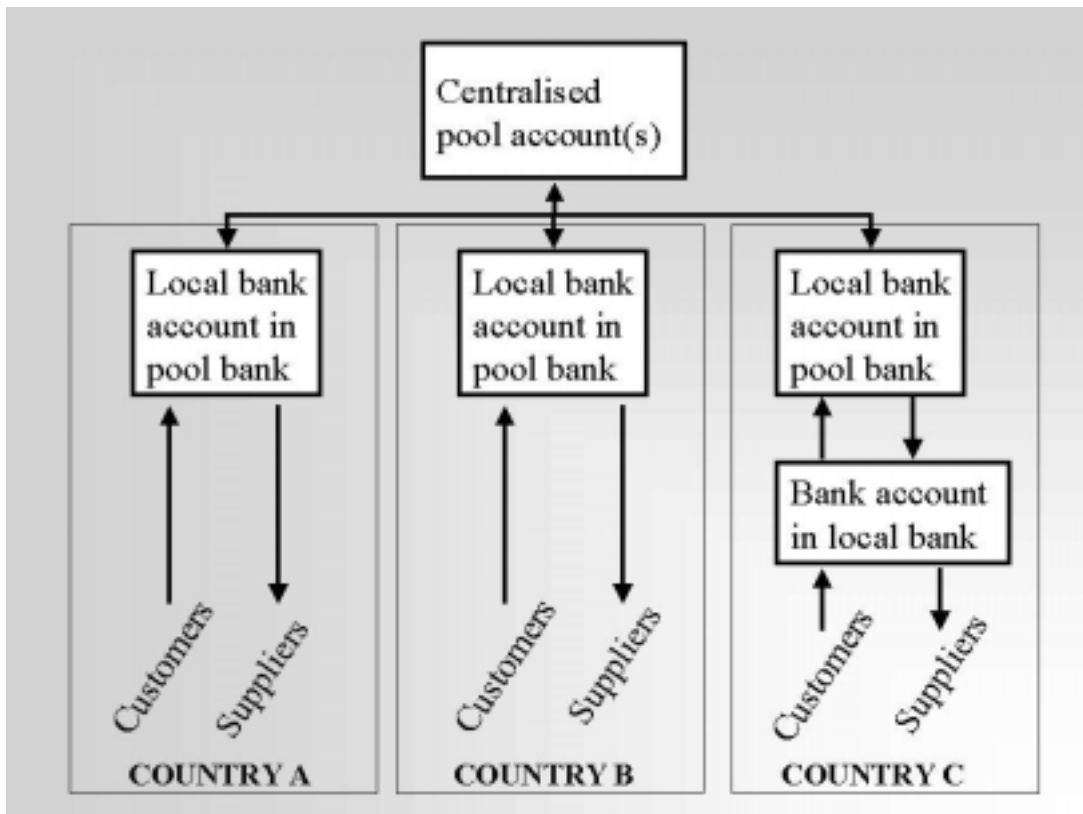
7.3.1 Account Structure

The main objective for MHC when choosing an account structure was to facilitate a simple cash pooling solution. It was evident that the cash pooling would be simpler if the accounts pooled were owned by the same legal entity, as opposed to if accounts from different legal units were pooled. Then complicated arrangements with internal loans and interest rate allocations would be avoided, and banking relations would be simplified. Another requirement was to avoid forcing the customers to make cross-border payments, since it would complicate the procedures and make it more expensive for the customers to pay. The ideal account structure for MHC is therefore to have local accounts, held by the mother company, in each Euroland country. Payments from customers and to suppliers are made to/from the local accounts, and the balance at the end of each day is transferred to a pool account. In this ideal solution, the local subsidiaries do not need to hold accounts since all external payments and collections are made through the parent company. In reality, however, some payments may have to be performed by the local companies, either because of legal restrictions or because some payments are impractical to administer centrally, such as petty cash expenditures.

One important factor that is not considered in this ideal solution is what the banks can actually provide. The structure will most probably have to be adjusted to fit the bank's requirements and limitations, but many issues surrounding cash pooling are not yet clear, because few systems have been implemented and tested. No bank can currently provide sufficient services in all countries that will be included in the FSC. In some countries, the pool bank will be able to provide the services needed to receive the customers'

payments and to make payments to suppliers. In those countries an account with a local bank will not be needed, and there should not be a problem to achieve optimal zero balance or notional pooling, since all accounts are in the same bank. In countries where the pool bank is not as well established, and not able to provide services without decreasing the quality to customers and suppliers, an additional layer of a local bank will be needed. In

Figure 7.3 Account structure and cash flows



those countries a complete zero or target balancing will be difficult to achieve, since transfers of cash between the local bank and the pool bank may have to be done manually. So far, few banks in Europe are sufficiently widespread in the sense that they provide satisfactory payment services in many countries. Therefore MHC most probably has to work with local banks in addition to the pool bank, no matter which service provider they choose. The development within the European banking sector is, however, expected to be significant within the next few years, so that, in a near fu-

ture, this second layer could be excluded and a truly efficient cash pooling structure can be achieved.

7.3.2 Choice of service provider

MHC has concluded that they will need to work closely with just a few banks in order to achieve an efficient solution in the new payment model and the cash pooling. The main reason why they have to concentrate their banking relationships is that the cash pool and the payment model require advanced interfaces between the company and the bank. This is a specific investment from both parts, requiring a mutual long-term commitment.

MHC is early in its search for a euro pooling solution, especially for companies based in the Nordic countries. Only the largest European banks have products that are already in place and operating, which means that evaluating the proposals from the banks is a complex task. It is essential that the cash pool provider has the technical capabilities and is committed to providing good solutions for the company, and is willing to engage in a long term relationship.

Another important issue for MHC when it comes to the choice of bank is the operational risks involved in having to depend on only a few service providers. The future development in the European banking industry is very uncertain, and if substantial investments are made with one bank in the form of network links, and that bank does not survive the expected merger wave, it can be a costly experience. Since the only way for MHC to achieve efficient cash pooling is to trust a large part of its cash management activities to one bank, and that bank may have an agreement with one of the large banks, it has to attempt to predict the development in the banking industry. Which banks and banking networks will be the winners in the battle of Europe? For MHC, this question is as important as the question of what the banks can provide today. They have not yet decided which bank to choose. They will carefully evaluate the proposals from a group of se-

lected banks and make a judgement of what they will be able to provide in the future.

7.3.3 Analysis of the Mölnlycke Case

The case of Mölnlycke Health Care illustrates some key issues to be considered for any European company re-engineering their cash management. It also sheds light on our choice of problems highlighted in this text. We will first discuss whether the company strategy corresponds to our analysis of the organisational aspects, and we will after that examine if the properties of MHC's cash flows make the company suitable for cash pooling.

By applying the model developed in Chapter 4 to the Mölnlycke case, we can more easily understand why they want to centralise their financial function at this particular point in time. When it comes to the *internal* factors of a firm, the model predicts that a large firm is less likely to benefit from centralisation than a small firm, keeping everything else the same. Thus, when MHC became a small independent company, instead of being a part of the larger SCA, the incentives to centralise should have increased. Both SCA and MHC operate in many European countries, so the number of locations (N) is about the same.

When it comes to the *external* factors, we predicted that political and market integration between the European countries will benefit the centralisation decision, because quality of the service becomes less dependent on local presence. For MHC, it is already cheaper to make cross-border payments within Euroland, and it is believed that EMU will bring the member countries closer together. Thus, when the company now builds up its own financial administration, the European market is more suited for a centralised structure than it was before the buyout.

New technology has also recently entered the European market in the form of integrated systems like the SAP. This kind of systems makes it easier to handle financial services from a distance without sacrificing quality, and they are favouring centralisation in that sense. However, the analysis

pointed out that if the new technology makes providing financial services less costly in general, then the benefits of centralisation might disappear. The question when considering the SAP system is then: Which effect is most significant, the increased opportunity to handle financial activities from a distance or the effect on costs of financial services?

Thus, by applying the model developed Chapter 4 we can conclude that, for MHC, both the internal and external conditions have changed in favour of centralising financial activities. Especially the implementation of the euro has provided the rationale for dramatic changes in cash management procedures, although it is more questionable if the implementation of the SAP system favours centralisation. We can also conclude that the internal properties of MHC are especially suitable for centralisation.

The internal properties of MHC also make them especially suitable for cash pooling. The units included in the FSC project and eventually also in the cash pool are both producing units and selling units. This means that there is substantial internal purchasing, and therefore a strong negative correlation between accounts in the pool. The average total cash position will also be close to zero. Thus, according to our analysis in Chapter 6, the pool will lead to interest savings and a significant decrease in total loans outstanding.

In addition, since the volatility of the pool account will be very stable and predictable, it will be possible for MHC to decrease the total credit limit. We discussed that most of the effect on volatility from pooling is captured when 15 units are included in the pool. Since MHC plans to include 14 countries in the FSC and eventually include all these in the cash pool, the pool will be sufficiently large to capture most of the possible diversification effect. This in combination with the significant decrease in total loans outstanding will make it possible to decrease the credit limit.

The decrease in volatility will also decrease the liquidity risk for the units included in the pool, which should make the banks willing to fund the operations at a lower interest rate. The cash flow risk of the company should also be improved. The interest savings, lower credit limit, and lower fund-

ing rates decrease the effective interest rate and required return to shareholders. Our analysis thus shows that MHC can reduce its cost of capital by creating the euro pool, and thereby enhance shareholder value. In addition, since total loans outstanding are substantially reduced, the pool will free capital that can be used for investments. This is important for MHC since they want to expand fast and free more cash.

7.4 Summary

The case study of the financial service centre project at Mölnlycke Health Care provides us with valuable insights into the future of European treasury and cash management. The unique situation the company experiences gives them the opportunity to react to the internal changes they experience as well as changes in the European market environment. They react by creating a state of the art shared service centre for financial activities where processes are highly standardised, automated, and integrated, and by centralising liquidity into a zero-balance euro cash pool. A new structure of the company has been worked out, where the responsibilities of different units are changed in connection to re-location of activities, and cash flows internally between units and to external parties are more directed towards a central unit.

The actions taken by Mölnlycke Health Care fit well with our model developed in Chapter 4. The model can help explain the timing of the financial service centre project and why Mölnlycke Health care is one of the first companies in its market segment to implement these changes. When it comes to the cash pool, the analysis in Chapter 6 shows that the pooling will increase value to the shareholders of MHC through a decreased effective interest rate and freed capital for investments.

Chapter 8 Conclusions

The centralisation of financial activities, shared services, and cash pooling, are concepts closely tied to each other, especially in the prevailing European business environment. A euro cash pool can hardly be set up without a centralised structure as long as the diversity of regulations still exists. Also, establishing a shared service centre to achieve the benefits of centralisation is especially suitable since it allows the company to keep the decentralised structure in its operational activities, a necessity on the diverse European markets.

Our first conclusion is that it will be a new trend that many European businesses will re-engineer their treasury functions, just like Mölnlycke Health Care AB is doing. Centralised structures such as shared service centres and cash pooling will therefore become common set-ups for treasury departments in the next decade. We also believe that the main initiator of these new trends is the introduction of the euro. The rationale behind our conclusion is that substantial efficiency gains can be achieved by some companies. But these efficiency gains are only obtainable in a certain business environment. The euro is predicted to change the business environment in a, for cash pooling and centralisation, favourable way.

Even though little empirical evidence of European companies has confirmed this trend, the arguments for such a development are quite strong. Surveys on U.S. companies have shown that substantial savings can be made, and the theoretical arguments for centralising financial tasks and liquidity are convincing. Now, when the European business environment becomes more integrated, we can expect a development similar to the one that has taken place and continues to take place in the U.S.

It is the debut of the euro that makes this development possible in Europe. The euro is changing the transactional infra-structure, and thereby increasing the opportunities to perform cross-border financial services and making it easier for banks to provide services on a Europe-wide basis to support a

centralised structure. Also, the euro will lead to a more competitive European market, which will force managers to take action and improve efficiency, and trigger great and deep changes in the organisation.

Even if the euro started this development, it will not happen without strong arguments for benefits associated with it. We have found substance behind some of these arguments. One benefit is lower costs achieved through economies of scale and re-engineering. Economies of scale can lead to lower labour costs, technology leverage, better banking terms, cash pooling benefits, etc. Re-engineering opportunities exist in standardisation, improvement of processes, and better information control. Another benefit is increased ability to achieve strategic goals through improved information and knowledge creation in the company.

These are our general impressions obtained from working on these issues, talking to people involved, and researching information. Our impressions are also backed up by our analysis, which shows that it can be beneficial to centralise financial functions if a favourable business environment exists. The same goes for centralisation of liquidity in a cash pool. A favourable business environment can be described as having (1) low costs of cross-border transactions and cross-border movement of funds, (2) harmonised regulations, which make local knowledge and local presence unimportant for providing financial services, (3) large costs in providing financial services, and (4) substantial economies of scale in costs of financial services. For cash pooling it is also favourable if the spread between the borrowing and lending rate is large.

The analysis also shows that if and how much benefits are obtainable to a large extent depend on the internal properties of the firm. For instance, a large firm is always less likely to improve efficiency by centralisation than a small firm. In reality, however, the large companies have been at the forefront of these new trends. This may be explained by the fact that the initial outlays for implementing a centralised structure, which so far are too high for small firms, are relatively smaller for the large firms.

In addition to the initial outlay, the costs of setting up should also include the value of the sacrificed timing option, which is currently high since the future development regarding the European business environment is uncertain. Perhaps the initial costs will decrease in the future as more benchmarking projects exist, the implications of the euro become more certain, and the banks and other outsourcing partners have developed more defined products. If these things do happen, we can expect a wave of mid-size multinational companies to centralise their financial functions.

The Mölnlycke Health Care case shows that mid-size Europe-wide MNCs are willing to centralise if the initial costs are lower. Mölnlycke Health Care is in a special position in that the initial outlay is not incremental to the centralisation decision, since it will be incurred in any structure.

The internal properties are also of vital importance for the size of the benefits of pooling cash. A company with 15 units within Euroland can achieve most of the reduction in volatility of account balances, and ease the liquidity forecasts. This effect is enlarged if correlation between the cash flows of participants is low or negative. The other positive effect that the cash pooling will lead to is the reduction of total loans and idle funds, which are also magnified if correlation between units is strongly negative. It is the latter effect that saves interest costs as idle cash balances are avoided. The two effects together reduce the need for a high credit limit as the average balance and the volatility are all reduced.

All the above is from a management's point of view. But an organisation is never efficient if the incentives of all its stakeholders are not coherent. Moving towards a centralised structure incurs an incentive problem, because the units with residual control and the residual claimants of the financial service are not the same. We have concluded that a transfer pricing system is not an efficient way of dealing with this problem since it is difficult to establish accurate prices when no competitive external market exists. Some form of incentive scheme therefore has to be set up to encourage the sales units to create value for the company. Our analysis shows that this

can be done through commissions, but the formula for calculating the commissions has to be based on the cost plus method, and the formula needs to separate the “fixed” costs that a local unit is unable to influence from the “variable” costs that a local unit can influence by its efforts.

A centralisation project suggested by the managers will not be accepted if the shareholders are not on their side. Shareholders benefit from centralisation of financial tasks through (1) lower costs, leading to higher operating earnings, and (2) increased control and leverage of skills, leading to more effective use of the company’s resources which raise expected future earnings. Shareholders benefit from cash pooling through (1) a lower effective interest rate, lowering the company’s cost of capital, (2) a reduction in the balance sheet, making capital free for more profitable investments, and (3) a decrease in required return on equity because of decreased liquidity risks.

The fact that these concepts can create shareholder value is important when considering the future development. We can expect shareholders to have a larger influence on managers in the future European business environment as capital markets are deepening and competition is increasing. Competition will intensify as prices become more transparent and firms can more easily compete across borders. The fact that shared service centres and cash pooling create shareholder value will therefore be the main driving force behind the initiatives, and it is the reason why we believe that this trend will be more than just a fad.

Another interesting aspect is the relationship between technological development and centralisation. The analysis shows that new and more efficient technology not necessarily favours centralisation. The new information technology makes it possible to have a centralised structure with less sacrifice in quality. However, one should not ignore that the IT-development also facilitates a more efficient *decentralised* structure, since the fast information flow makes it easier to co-ordinate decentralised units. If new technology decreases costs of providing financial services in general, it will reduce the base for cost savings. This means that the quality reduction can

still be large relative to the cost savings, even though the new technology facilitates centralisation without substantial loss in quality.

To understand the role of technological development is vital for making the right decision with regard to centralisation. It is costly not to be able to obtain the full benefits of the new development, because the pace of the development is so fast that a single decision can result in being “left behind”. The development of the European market place has similar characteristics to technological development: it happens fast, it is unpredictable, and the understanding of how to position the company to make the most out of it is vital for success. We hope that the ideas developed in this thesis can contribute to the understanding of how these issues interact, and how treasury and cash management should be organised to take on the integrated and technologically sophisticated European marketplace in the future.

Some issues that we have touched upon definitely need to be investigated more carefully. One such issue is the flexibility. Centralisation means that the company sacrifices some flexibility, but how should this be incorporated into a model, and is a centralised structure enhancing flexibility in other ways? Is cash pooling making liquidity management more flexible, or is it the other way around? How important is flexibility in the financial function with regard to technology? Another important issue that needs further investigation is how incentives are affected in the organisation. Are top managers, local managers and employees, as rational individuals, behaving differently in a centralised structure, and what are the potential efficiency traps with regard to the centralised structure? Will the treasury managers measure up to their new responsibilities, and is it in their interest to provide the local organisations with high quality service?

We suggest further research to be done within these areas, but we also suggest that further analysis is made to test and to improve the ideas presented in this thesis. Within a few years more data will be available to perform empirical studies, and regression analysis can be performed to test the efficiency of the new European cash management.

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