TREASURY MANAGEMENT ORGANISATION: AN EXAMINATION OF CENTRALISED VERSUS DECENTRALISED APPROACHES

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Introduction

Treasury management is a relatively recent phenomenon and was recognised as a separate function from accounting only during the 1960s and 1970s. Its emergence was as a response to major changes in financial markets, including floating exchange rates, increased volatility in inflation and interest rates, increased globalisation, financial innovation and the impact of technological advances relating to computers and telecommunications on financial markets.

Over the past decade many large and expanding multinational corporations (MNCs) have moved or are moving their treasury organisations towards a centralised structure. While a limited number of these MNCs have set up a sophisticated centralised treasury centre responsible for all treasury management (TM) activities, most have chosen to centralise on a world-wide or European basis at least one critical treasury management activity, namely cash management (CM). Empirical research carried out as part of this study focuses on CM organisation only.

The main objective of this study is to establish whether the financial health of MNCs with a centralised CM structure is significantly different to that of MNCs with a decentralised CM structure. Whether 'different' is necessarily better or worse will be discussed. Fifteen US MNCs with a centralised CM structure and fifteen US MNCs with a decentralised CM structure, all in the computer technology sector, will be examined.

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The financial health of the companies involved will be measured by calculating five key ratios constituting a financial health model (FHM). The ratios are chosen on the basis that they are the ones that are likely to capture the impact of an MNC's CM structure. The ratios for the two groups of MNCs will be compared using two statistical techniques, multiple discriminant analysis and the Mann-Whitney test. These tests will be performed on ratios calculated for the time periods 1994, 1995 and 1994/95 jointly.

The paper is structured as follows. A review of the literature is linked with a discussion of issues which form the background to the empirical section of the paper. This is followed by a description of the research methodology and data used. The results of the research are then summarised and discussed. Finally some concluding comments are made including suggestions for further research.

Literature Review and Background Discussion

Elements of Treasury Management

Four core elements of TM are identified in the literature: currency risk management, funds management, cash management and banking relationships. Before cash management is discussed in detail, each of the other elements will be considered briefly.

Currency risk is synonymous with foreign exchange (FX) risk. Foreign exchange exposure is commonly classified into three categories, namely transaction exposure, translation (accounting) exposure and economic exposure. Collier et al. (1989) refer to the importance of seeing currency risk management in the context of the firm's overall strategy. There are a wide variety of strategies available for managing FX exposure, both internal and external, and the multitude of products available on the market designed to accommodate a corporate's specific needs appears to be ever-increasing. The importance of forecasting is emphasised in all the literature on FX exposure management. Recently the forecasting process has become more complex with other techniques available such as neural networks, chaos theory etc.

Funds management involves three distinct activities, namely surplus funds investment, management of financing requirements and interest exposure management. Timely and reliable information systems are essential for effective funds management. In relation to interest rate management, it is very important that four aspects are clear

before any extensive interest rate management can start: policy, organisation, information and methods (Thoren, 1996).

Davis and Collier found that the development and management of *banking relationships* is currently perceived as one of the more important duties of the corporate treasurer (Sheedy, 1993). Shapiro (1989) believes that good banking relationships are central to a company's international TM effort and that the advantages of a good banking relationship stem from the personal nature of the relationship between borrower and lender. He identifies the following problems which often arise in bank relationships: too many relations, high banking costs, inadequate reporting and excessive clearing delays.

A changing competitive environment and market conditions along with significant advances in communication technology have called for changing attitudes to banking relations. Statius-Muller (1995) describes this change as being driven by a variety of factors including 'cyclical economic changes in the supply and demand for finance, capital and technology, as well as declining regulatory hurdles to global banking'.

Cash management (CM) refers to the effective planning, monitoring and management of liquid or near liquid resources. The objectives of a company's CM activities should include the following:

- to maintain the ability to pay obligations when they become due
- to ensure the availability of funds at the right time, in the right place, in the right currency and at an acceptable cost
- to reduce borrowing requirements and interest expense
- to minimise idle balances
- to maximise after-tax earnings on surplus funds
- to keep foreign currency exposure and transaction costs as low as possible
- to improve credit control and reduce customer payment delays, leading to greater cash generation
- to reduce bank charges
- to make possible increased remittances to the parent company from divisions, branches and subsidiaries
- to reduce tax liabilities.

Fundamental to meeting all of these objectives is having a system in place to control and forecast cash on a group basis. This is one reason for many MNCs moving towards the centralisation of CM for the group. The suitability of CM to centralisation and the specific benefits of centralised CM will be dealt with later.

Effective management of the level of a company's stocks, debtors and creditors can reduce the investment in working capital, thereby reducing interest costs and freeing up resources for investment elsewhere in the business (Gray and Barrett, 1995). Companies should fully understand the cash collection cycle, with a view to minimising the time involved in each step. For MNCs operating in a number of countries working capital (WC) management can be complicated by the different financial environments.

While the management of WC in the MNC is similar to its domestic counterpart there are essential differences, namely the impact of currency fluctuations, potential exchange controls and multiple tax jurisdictions. An MNC will also have a wider range of short-term financing and investment opportunities available (Shapiro, 1989).

Collier et al. (1989) believe that WC policy is a function of two decisions: what is the appropriate investment in and mix of current assets, and how should its investment be financed? They go on to explain two CM models which were developed to assist with CM decisions, the better known being the Baumol model developed in 1952, followed by the Miller-Orr model developed in 1966. Another genre of models attempted to build up cash requirements, for example the Archer model (1966), the Monte Carlo model and the Beehler model, all concentrating on different aspects of CM. Explanation of these models is beyond the scope of this paper, but it is worth noting that a survey done in 1980 by Smith and Sells found that only 5% of the *Fortune* top 1000 corporates were using these techniques. While it may be easy to dismiss such models on the basis that they are irrelevant and based on unrealistic assumptions, when the Miller-Orr model was tested it outperformed intuitive CM (Collier et al., 1989). Another argument put forward in favour of using such models is that much of their value arises from their contribution to management's understanding of the behaviour of the variables involved in CM decisions.

Treasury Organisation

This section reviews the literature on the structure of TM activities and provides an insight into how companies are organising their TM activities in practice.

As suggested by Collier et al. (1989), it may be thought that TM is essentially a centralised function whose *raison d'être* is an ability to manage the aggregate of surplus funds, borrowing and currency in a more efficient manner than could be achieved by individual operating unit initiative. However, MNCs vary in the way they organise their TM activities. The two extremes of organisation are as follows:

- A *centralised approach* whereby a fully centralised treasury department will have global responsibility for decision making in all treasury areas and operating units, and subsidiaries will report to the treasury department and will handle transactions in accordance with treasury instructions. Transactions typically undertaken in a centralised treasury department include intragroup loans and deposits, group funding and investment, group cash management, sale and purchase of currency, factoring, reinvoicing, bank relationship management, investment management and risk management (De Caux, 1995).
- A *decentralised approach* whereby responsibility for treasury activities will remain with the operating units. In this scenario there would typically be a group treasury department acting solely in an advisory or monitoring role. Local operating companies would maintain their own operational bank accounts, manage their own short-term cash deficits and surpluses and FX exposures.

There are arguments in favour of *regional centralisation* of TM activities as advocated by Fogarty (1992), who states that 'it can be more efficient to work on a regional basis, striking a good balance between central control and the recognition of local detail, opportunities and special situations'.

The literature presents strong arguments in favour of centralising TM activities. Walton (1995) suggests there are three main driving forces behind the trend towards centralisation of TM activities over the past fifteen years, i.e. *cost savings* by way of a reduction in banking costs, more efficient use of *human resources* and *improved risk management*. Overall he believes that as a result of a centralised TM operation the combination of economies of scale and the implementation of an efficiently integrated support system should eliminate much mundane repetitive work and free staff for 'redeployment into more productive areas of the company's commercial activities'. Shapiro (1989) is of the view that the combination of volatile currency and interest rate fluctuations, questions of capital availability, increasingly complex organisations and operating arrangements, and a growing

emphasis on profitability virtually 'mandates a highly centralised treasury management system'.
The problems associated with centralisation of TM activities are obviously arguments in support of decentralisation. These problems are summarised as follows:

- Success of the centralisation approach necessitates fluency in the legal and tax regulations of each country in which the MNC operates. This may be difficult to have in a small number of personnel in a treasury department.
- Intimate knowledge of the local financial markets is a prerequisite for using these markets as a source of funding. Is it possible for a centralised treasury department located away from such markets to have such knowledge? There may be information transfer problems between subsidiaries making a centralised approach inefficient.
- A centralised approach may lead to demotivation of regional/ subsidiary management as local treasury functions lose autonomy.

The literature suggests there is no generic optimal group treasury structure (Ross, 1990). Collier et al. (1989) identify the following factors which should be involved in deciding on a suitable treasury organisation: group structure, extent of risk, evolution of treasury structure, management philosophy, quality of management and economies of scale.

Whether an MNC has decided to centralise some or all of its TM activities, an important organisational question is: where should the centralised treasury department be located? Locations compete for business on the basis of factors such as corporate tax rate, access to double tax treaties, withholding tax positions on interest and dividend payments, overall cost environment, language, permitted activities and their tax treatments, personal tax concessions for expatriates, social security regulations, time zone and local labour laws.

International taxation issues influence the appropriate organisational approach to TM activities for any MNC. Ross (1990) takes the view that particularly for international companies 'the tax considerations and the treasury issues are closely linked'. Availing of international tax opportunities would be best accomplished through the use of tax experts in a centralised treasury centre (TC).

Research by Price Waterhouse (1995) found that extreme forms of fully decentralised or centralised treasury organisations were rare,

with 5% of the former type and 18% of the latter. In contrast other research found that 26.3% of the respondents centralised treasury over the past few years, while 12.9% saw this as their objective for the year 2000 (The Economist Intelligence Unit, 1995). Interestingly the Price Waterhouse survey found that Germany, The Netherlands, Hong Kong and Sweden apply a higher level of decentralisation. Broader responsibilities are placed on the regional treasury functions of corporates from Belgium, Ireland and Canada. The same survey found activities such as long-term funding, investment management, interest rate exposure management and group bank relation's activities to be largely centralised while working capital management was largely decentralised. The research completed by the Economist Intelligence Unit referred to above came up with some other interesting findings, including identification of 'treasury stressors' which had led MNCs to consider centralisation of TM, namely pressures to cut costs, manage risks, support business growth, enhance controls, improve performance, go global and restructure.

Finally, other research (Stothert, 1993) found a strong relationship between the culture of organisations and whether their treasury operations were centralised or decentralised.

Centralised Cash Management

An MNC that has chosen to centralise its CM, whether on a regional or worldwide basis, typically employs all or some of the CM techniques discussed below.

Netting

This essentially concerns cashflows, intercompany cashflows and the ability to offset them in order to reduce domestic and cross-border cash movements. Often a netting system can be integrated with an inter-company short-term financing system whereby amounts owing to the netting centre by subsidiaries are transferred, say, monthly to a group funding account and monitored accordingly. While it is possible for companies to employ a bank to implement their netting system, this study is concerned only with MNCs which implement netting systems internally, typically co-ordinated by the TC.

There are many advantages of netting, as follows:

- reduction of bank charges, float losses and transfer commissions
- more competitive spreads arising from larger currency deals

- greater certainty for managing transactional exposures and forecasting cash needs
- it improves corporate liquidity controls and makes full use of tax advantages
- an increased chance of achieving and monitoring same-day value transfers
- it facilitates monitoring and control of intra-group trade
- intercompany disputes and reconciliations are minimised and time and resources are freed up to invest in the real external customers (Collier, 1995).

Apart from the cost the major drawbacks of a netting system are regulatory. Central bank approval is required before netting can take place in some countries.

Pooling

Cash pooling is a system which involves the offset of bank account balances of the group companies in order to achieve interest savings. Individual bank account balances are transferred to a dummy account by the bank and interest is paid or received on the net pooled balance. A centralised TC would typically operate the pool which ensures that investments and borrowings are made at the optimal market rates and that funds do not remain idle for any period of time.

The benefits of pooling include interest savings and reduced bank charges; it facilitates central CM, is simple to administer and provides an efficient method of financing short-term deficits.

Cash Concentration Accounts

Often referred to as sweeping accounts, these accounts involve the periodic movement of funds to a central location to facilitate centralised CM. This usually enables the TC to obtain more competitive rates than those obtainable by individual operating units. These accounts are usually held in tax-and interest-efficient locations. The subsidiary accounts may be zero balance accounts, where the total balance is transferred, or target balance accounts, where all funds in excess of an agreed balance are transferred. This system should result in increased returns, it facilitates centralised CM and multiple banking relationships may be maintained.

Managing Surplus Cash within the Group

This involves the TC monitoring the cash position of operating companies on a daily basis with a view to ensuring that surplus cash in one subsidiary is moved to where it is needed elsewhere in the group. This enables the TC to arrange some short-term intercompany financing with priorities in mind such as interest earnings and payment positions from taxable and tax deductible points of view respectively.

Two disadvantages of a centralised CM structure should be noted. Firstly, establishing an acceptable method of allocating interest costs may be difficult and secondly, performance measurement at unit level may be complicated as a level of autonomy is lost.

In conclusion, however, a centralised CM structure should lead to a more effective and efficient management of group-wide liquidity and an improved likelihood of satisfying all the objectives of any CM system as outlined earlier.

Methodology

An important first task in choosing an appropriate methodology in this study was to establish how best the financial health of an MNC and/or the performance of its CM function could be measured. Having examined various performance measurement (PM) techniques available, it was decided to compare the financial health of the MNCs involved in the study by examining five financial ratios for each company for two fiscal years and performing some statistical tests thereon. These ratios constitute what this study calls the financial health model (FHM).

Multiple discriminant analysis (MDA) and the Mann-Whitney test were then applied to the data provided from the FHM. This section provides some background on the financial statement analysis process and describes the FHM. This is followed by an outline of the statistical techniques and related statistical issues.

In addition, a small number of interviews were conducted with corporate treasury personnel working for MNCs. The following matters were discussed during the interviews:

- the overall trend towards centralisation of TM activities
- the trend towards CM centralisation specifically
- what exactly 'centralised CM' means
- how best to obtain a database for the purposes of this study

- how CM is organised in their companies and why
- how to measure the performance of a centralised CM function
- the importance of risk control in the context of TM organisation
- what factors an MNC takes into account when deciding on its TM organisation
- what the future holds for TM organisation.

Financial Statement Analysis

Financial statement analysis can be traced back to the second half of the nineteenth century (Horrigan, 1968). In 1919, the Du Pont Powder Company introduced a 'triangle' ratio system for analysis of corporate operating results. This system is concerned with the separate ideas of profitability and asset utilisation. The British Institute of Management in the late 1950s constructed a ratio model which was a spin-off of the Du Pont system (Horrigan, 1968). More recently Weigel (1996) developed a 'heart of the business' model to highlight 'the importance of the contribution made by the functional operations components of marketing, production or buying for resale and administrative management'. Today international corporations are interested in using any financial analysis or modelling technique which ultimately helps them to remain profitable and competitive.

Ratios have been used in financial analysis since the 1930s and the techniques of traditional ratio analysis are well founded in the literature (Figlewicz and Zeller, 1991). According to Foster (1986), ratio analysis is the most common mode in which financial statement data are analysed. The objective of ratio analysis is the comparative measurement of risk and return, 'facilitating intelligent investment and credit decisions' (White, et al., 1994). Collier et al. (1989) refer to the limited value which a ratio has without a yardstick to compare it against. The two main yardsticks used are ratios for the same company over previous periods (time-series analysis) and ratios of other firms in the same sector (cross-sectional analysis).

More recent literature on financial analysis is making a strong case for using information from the cash flow statement to calculate some meaningful ratios. While acknowledging the value of the information provided by the income statement and the balance sheet, Grossman and Pearl (1988) point out that the former does not indicate the amount of resources provided by activities other than operations and the latter fails to indicate the specific causes of changes in assets, li-

abilities and equities. These two vacuums in terms of information are filled by the 'statement of cash flows (SCF)'. The suitability of the SCF to ratio analysis has been greatly facilitated in the US context by the FASB Statement No. 95 and in the UK and Irish contexts by FRSI. The FASB has standardised the presentation of cash flow statements for US MNCs which makes financial analysis of these statements possible. Grossman and Pearl (1988) believe the SCF is the only financial statement 'providing information about a company's operating, investing and financing activities in a concise, orderly fashion'. Figlewicz and Zeller (1991) also believe that FASB 95 now enables the derivation of several new ratios 'to complement traditional ratio analysis'.

Selecting the appropriate ratios for the analysis in question is crucial, and this is addressed in the next section.

Financial Health Model

The FHM consists of five ratios which are calculated using information from the annual report of each MNC. These ratios were chosen after reviewing the literature on the quantitative benefits anticipated from a centralised CM structure and are most likely to capture these benefits.

It is not possible to capture all of the quantitative benefits of centralisation due to the lack of certain information in the annual report; for example, information on bank charges or transfer commissions is not available. The main benefits which it may be possible to capture using ratio analysis are *improved group liquidity, group tax savings and interest savings,* with interest savings including both improved returns and reduced interest charges.

The ratios which make up the FHM are as follows:

1. Quick Ratio (QR): $\dfrac{\text{Current Assets - Stocks}}{\text{Current Liabilities}}$

This ratio, sometimes referred to as the acid test ratio, is a widely recognised traditional measure of a company's liquidity. It measures the adequacy of the company's cash resources relative to its cash obligations, referred to by White, et al., (1994) as the 'margin of safety provided by the cash resources relative to obligations'.

2. Cash Flow Liquidity Ratio (CFLR):

$$\frac{\text{Net Cash Flows from Operating Activities}}{\text{Current Liabilities}}$$

This is an additional measure of liquidity. It is included here on the basis that sometimes the validity of the quick ratio may be questioned on the grounds that current liabilities are never wholly discharged and current assets are never entirely available to meet currently maturing obligations. Figlewicz and Zeller (1991) believe that this ratio provides a measurement that the quick ratio misses. They argue that the true economic value of current assets may be substantially different from amounts reported on the accrual based financial statements. They believe the 'dynamics of operating cash flows are scaled to meet current liabilities'. A need for cash from non-operating sources to meet critical needs would be indicated by values of less than 1, while the existence of operating cash flows in excess of critical current needs would be indicated by values greater than 1.

3. Interest Management Proficiency Ratio (IMPR):

$$\frac{\text{Profit before Tax}}{\text{Operating Income}}$$

4. Tax Management Proficiency Ratio (TMPR):

$$\frac{\text{Net Income}}{\text{Profit before Tax}}$$

Ratios 3 and 4 are essentially separate components of the interest and tax management proficiency ratio used by Weigel (1996) in the heart of the business model referred to earlier. Weigel usually refers to this ratio as the 'bottom line ratio', and it is defined as follows:

$$\frac{\text{Net Income}}{\text{Operating Income}}$$

Weigel (1997) subsequently split up the bottom line ratio in a manner similar to the above. Because both tax and interest savings are major benefits associated with CM centralisation, it is imperative to analyse the tax and interest positions separately. Weigel (1997) refers to the importance of Ratio 3 above in the context of examining the extent to which a company generates interest income from 'proficient short-term treasury management while concurrently servicing interest expense obligations arising from the financial structure'.

5. Cash Position Ratio (CPR): $\frac{\text{Cash and Marketable Securities}}{\text{Total Assets}}$

Obviously the higher this ratio, the greater the cash resources available to the firm. It should be noted that only securities clearly entitled as marketable securities will be included here. To the extent that a company has included marketable securities in other assets without giving a detailed breakdown of such assets, they will be excluded.

Multiple Discriminant Analysis

MDA is a multivariate statistical technique which can be used to examine the differences between two or more groups of objects with respect to several variables simultaneously. The characteristics used to distinguish between the groups are called discriminating variables. In this study the variables are the five ratios which make up the FHM described above. As noted by Jones (1987), MDA has been used extensively in the area of corporate bankruptcy prediction by various researchers including Altman (1968) and Deakin (1976). All of these researchers used independent financial ratios to create the most efficient discriminant function.

The major difference between MDA and the ordinary least squares (OLS) regression which is often used by financial economists is in the form of the dependent variable. In OLS regression the dependent variable is metric, while with MDA the dependent variable is non-metric.

In applying the MDA model the centralised and decentralised companies constitute the non-metric dependent variables. The metric independent variables are the five financial ratios which make up the FHM. All independent variables are computed concurrently and the Wilks' lambda test is used to test for statistical significance of the discriminant function. Wilks' lambda is a 'multivariate measure of group differences over several variables (the discriminating variables)' (Klecka, 1980). A low Wilks' lambda score indicates high discrimination between the groups, and a score of one means there is no between groups variability. The significance of the Wilks' lambda can be tested by converting it into an approximation of the chi-square distribution. The function's success rate for predicting group membership beyond a 50/50 chance is also examined.

MDA will be conducted in this study in respect of ratios for three different time periods as follows:

- accounting periods ended in 1994

- accounting periods ended in 1995
- accounting periods ended in 1994 and 1995 jointly.

Three different scenarios will be tested for each of the above time periods as follows:

- excluding negative observations
- excluding negative observations and after eliminating one of the ratios from the pair of ratios showing the highest collinearity score
- replacing negative values with the means for the respective ratios.

Mann-Whitney Test (non-parametric)

In contrast to MDA, the Mann-Whitney test is a univariate statistical technique. It tests the hypothesis that two independent samples come from populations having the same distribution. Being a univariate statistical technique it is only capable in this study of comparing companies which have a centralised CM structure with companies which have a decentralised CM structure by examining one variable/ratio at a time. The main reason for using this test in this study is to see whether it will provide any additional interesting information on centralised cash management systems in the context of the FHM chosen.

Ratios – Statistical Analysis Issues

Normal Distribution

Any statistical issues arising from the distribution of the ratios used in this study can impact only on the MDA technique. Although Horrigan (1965) contended that financial ratios are approximately normal, there is more recent evidence to the contrary. According to Ezzamel et al., (1987), the distribution of many ratios departs significantly from normality because of the presence of skewness and extreme outliers. Rees (1990) suggests that this skewness is perhaps to be expected. So (1987), who studied eleven financial ratios of American firms for the period 1970-1979, concluded that all ratios were positively skewed, with and without outliers, except for the current assets/total assets and total debt/total assets ratios. In relation to data transformation there is evidence in support of the decision not to transform data in this study, which comes from prior research where a transformation of data did not result in normally distributed ratios (Deakin, 1976).

Collinearity

Horrigan (1965) contends that some financial ratios are highly correlated. He argues that the existence of collinearity is a double edged sword, meaning that only a small number of ratios are needed to capture most of the information, ratios can provide, but the small number of ratios must be selected carefully. In this study MDA will be conducted using all five ratios in the first instance. The degree of collinearity between the variables will then be examined and the MDA will be run again after eliminating one of the ratios from the pair of ratios with the highest collinearity rating.

Extent of Dispersion

Horrigan (1965) notes that wide dispersion in financial ratio distributions would make it difficult if not impossible to discriminate between firms on the basis of ratios. The literature refers to a number of factors which most often are expected to increase the dispersion of financial ratios, namely industry classification, size of firms, cyclical conditions, seasonal conditions, geographical location and accounting methods.

With regard to industry classification, which Horrigan (1965) contends is the most important factor, this study concentrates on MNCs in the computer technology sector. Such concentration should also serve to minimise any dispersion issues caused by cyclical/seasonal periods. With regard to the size-of-firm factor it is contended here that most size-of-firm effects should be washed out by the ratios themselves as one of the basic functions of financial ratios is to deflate accounting data by size of firm. As regards the geographical location factor, Horrigan (1965) contends that the significance of this factor seems doubtful. Finally, in relation to accounting methods this study is restricted to examining financial ratios of US MNCs that are calculated using group consolidated accounts which have been prepared under US GAAP rules in all cases. This should minimise any possible impact which different accounting methods would have on the dispersion of the ratio distributions involved.

Negative Observations

In this study there are negative numerators and denominators that result in some negative observations/ratios. Foster (1986) outlined a number of possible courses of action to deal with these negative observations. After considering these possibilities, and taking into account the relatively small number of negative observations involved in this study, it was decided in the first instance when conducting both

MDA and the Mann-Whitney test to delete the observations from the sample. Also, a small number of ratios which have a negative numerator and denominator would obviously result in positive ratios. Including such ratios in the analysis would be misleading. In the case of MDA this resulted in eight out of thirty cases in 1994, seven out of thirty being excluded from the analysis in 1995 and fifteen out of sixty from the joint 1994/95 analysis. In addition to this analysis MDA was also conducted for each time period after replacing the missing negative values with the mean values. The latter obviously increased the sample number and made the number of companies in each group equal.

Data

An extensive list of US MNCs for potential inclusion in this study was obtained from a number of sources including the Industrial Development Authority, stock exchange listings etc. On a random basis in excess of 100 US MNCs in the computer technology sector were contacted directly. Thirty of these companies were included in the study, fifteen of which arranged their CM on a centralised basis (as defined earlier) and fifteen of which organised their CM on a decentralised basis over the same period.

There were no specific size criteria which an MNC had to satisfy in order to be included. However, it was important to establish in the case of companies with a decentralised CM structure that the company's revenues were large enough, and that there were a sufficient number of subsidiaries world-wide, to make CM centralisation a realistic and appropriate consideration. The latter was discussed with all of the decentralised companies involved in the study. Only companies which confirmed that centralising CM was a feasible option (in light of such factors as their overall revenues, number of subsidiaries, level of intergroup payments) were included in the study.

A copy of the annual reports for 1994 and 1995 were obtained directly from the thirty companies involved. The financial ratios were then calculated using the financial statement data contained in the annual reports.

The major data limitations in this study arise from the fact that the study is restricted to working with data which is publicly available and comparable between companies. With respect to the former a large number of companies could not be considered on the grounds that it was not possible to obtain financial statement data. This obvi-

ously led to the exclusion of non-public companies and recently quoted companies.

Results

MDA Results

The key results are summarised in Table 1.

TABLE 1: MDA RESULTS

	1994	1995	1994/95
Wilks' Lambda	.722038	.407395	.662428
Significance Level	.3366	.0053	.0051
Classification Success Rate	72.72%	86.96%	77.78%
Highest Contributing Ratio	CFLR	QR	QR
Lowest Contributing Ratio	CPR	IMPR	IMPR

For 1994 the Wilks' lambda score was .722038, which being less than 1 indicates that the mean discriminant scores between the groups are different and there is therefore some between-groups variability. However, the chi-square test producing a significance level of .3366 means the between-groups variability found is not statistically significant. Notwithstanding this, these results do provide valuable information in a business sense, a matter which will be discussed later. The classification results for 1994 indicate an overall success rate of 72.72%, evenly split between the success rate for classifying centralised companies and the success rate for classifying decentralised companies. The discriminant function therefore has improved predictability of centralised and decentralised companies from a 50/50 chance to 72.72%. This is a significant increase.

In 1994 the CFLR contributed most to the discriminant function, with a score of -1.38338, and was closely followed by the QR with a score of 1.25648.

Having tested the function for collinearity, it was noted that the CFLR/QR pairing had the highest collinearity rating with a score of .84718. The QR was eliminated from the function and MDA was run again. This resulted in the Wilks' lambda changing from .722038 to .776309, with the significance level changing from .3366 to .3358. These changes are insignificant and do not impact on the overall out-

come. Overall classification success rate changed from 72.72% to 63.64%.

A third MDA was conducted after replacing missing values (eliminated due to some negative observations) with mean values. This resulted in Wilks' lambda changing from .772038 to .852524, with the significance level changing from .3366 to .5396. These results indicate that a smaller degree of group variability was found and with a weaker significance level. Overall classification success rate changed from 72.72% to 66.67%. Again these results do not impact on the overall outcome for 1994.

For 1995 the Wilks' lambda score was .407395, indicating between-groups variability. This is a much greater variability than was found for 1994. In this case the chi-square test produced a significance level of .0053 which is statistically significant.

The classification results for 1995 indicate an overall success rate of 86.96%, which is a significant improvement on a 50/50 predictability rate. Interestingly this represents a success rate of 100% in the case of centralised companies, with a success rate of 72.7% in the case of decentralised companies. Therefore this discriminant function is more likely to misclassify decentralised companies than centralised companies. Looking at the standardised coefficients, the ratio which contributed the greatest to the 1995 discriminant function was the QR.

The greatest collinearity was found to be in the CPR/QR combination. Having eliminated the CPR from the equation, Wilks' lambda changed from .407395 to .497363, with the significance level changing from .0053 to .01. Overall classification success rate changed from 86.96% to 82.61%.

After replacing missing values with means, the Wilks' lambda score changed from .407395 to .544168, with the significance level changing from .0053 to .0084. This test resulted in a reduced between-groups variability, as for 1994. Overall classification success rate changed from 86.96% to 80%. None of these results change the overall outcome from 1995.

MDA was conducted using the data for 1994/95 together. In this case the Wilks' lambda score was .662428, again indicating between-groups variability. The chi-square test produced a significance level of .0051. This is statistically significant.

The classification results for 1994/95 indicate an overall success rate of 77.78%, which is made up of a success rate of 87% for centralised companies and 68.2% for decentralised companies. As for 1995, this indicates that the discriminant function is more likely to misclassify a decentralised company than a centralised company.

Looking at the standardised coefficients, the financial ratio which contributed most to the discriminant function was the QR, as for 1995.

The collinearity test for 1994/95 resulted in the highest collinearity being between the CPR and the QR. This is similar to 1995. Having eliminated the CPR from the equation the Wilks' lambda changed from .662428 to .685535, with the significance level changing from .0051 to .0038. Overall classification success rate changed from 77.78% to 73.33%. Again these changes are insignificant, and do not impact on the overall outcome for 1994/95.

Having replaced the missing values with the mean values, the Wilks' Lambda score changed from .662428 to .806984 and the significance level changed from .0051 to .0362. While group variability reduced in this case, it remains statistically significant. Overall classification success rate of the discriminant function reduced from 77.78% to 71.67%.

Mann-Whitney Test Results

For 1994 no statistically significant difference was found between the centralised and decentralised groups in respect of any of the five individual financial ratios.

The summary results for 1994 are set out in Table 2.

TABLE 2: MANN-WHITNEY RESULTS 1994

	z Score	**2-Tailed p**	**Mean Rank**
Cash Flow Liquidity Ratio	–0.2573	0.7969	13.14 (14 centralised) 13.92 (12 decentralised)
Cash Position Ratio	–0.8924	0.3722	14.07 (15 centralised) 16.93 (15 decentralised)
Interest Management Proficiency Ratio	–1.833	0.0668	9.64 (11 centralised) 14.92 (13 decentralised)
Quick Ratio	–1.1615	0.2454	13.63 (15 centralised) 17.37 (15 decentralised)
Tax Management Proficiency Ratio	–1.1942	0.2324	10.64 (11 centralised) 14.08 (13 decentralised)

In the above, some ratios have fewer than fifteen cases, which arises due to negative observations being excluded. As all the above p-

values are greater than .05, there is no ratio capable of making a distinction between the two groups which is statistically significant based on this test. The IMPR, however, with a p-value of .0668, is the closest to being statistically significant. The highest p-value is provided by the CFLR.

In the case of the 1995 ratios (Table 3), the results are similar with the exception of the IMPR.

TABLE 3: MANN-WHITNEY RESULTS 1995

	z Score	2-Tailed p	Mean Rank
Cash Flow Liquidity Ratio	–1.7702	0.0767	15.71 (12 centralised) 10.5 (13 decentralised)
Cash Position Ratio	–0.3112	0.7556	15 (15 centralised) 16 (15 decentralised)
Interest Management Proficiency Ratio	–2.3167	0.0205	10.53 (15 centralised) 17.55 (11 decentralised)
Quick Ratio	–1.0992	0.2717	13.73 (15 centralised) 17.27 (15 decentralised)
Tax Management Proficiency Ratio	–0.4176	0.6763	12.97 (15 centralised) 14.23 (11 decentralised)

The above results indicate that in all cases except the IMPR, the p-values are such that there is no refutation of the hypothesis that the two independent samples come from populations having the same distribution. In the case of the IMPR, however, with a p-value of .0205, this test has found that the two independent samples do not come from populations having the same distributions.

Interviews

The findings of the interviews held are summarised in this section under a number of headings which essentially cover the objectives of the interviews as identified earlier.

Overall Trend towards TM/CM Centralisation

All interviewees agreed that there is a definite trend towards TM centralisation among MNCs. Within this, the trend towards CM centralisation is strongest with many MNCs looking at some form of regional centralisation as opposed to world-wide centralisation. TM/CM organisation, however, tends not to be a primary objective of most

MNCs. It is not generally given major priority especially with relatively new firms. One interviewer's opinion was that companies growing rapidly by acquisition and conglomerates are not likely to have centralised CM whereas large MNCs with steady growth rates are likely to have looked at the idea.

What Does Centralised CM mean?

Practitioners believe that centralised CM typically involves some or all of the activities outlined in this study. With regard to pooling the trend is very much to engage in single currency as opposed to multi-currency pooling. Moving cash around the group as it is needed appears to be quite common in centralised CM structures.

How Do MNCs Measure the Performance of a CM Operation?

There are no simple answers to this question. There is no single objective set of criteria being used by MNCs. Each MNC sets its own targets/benchmarks and such details are kept in-house. The strongest point which came across in this area, however, was that a major objective of CM centralisation is not financial, it is in fact risk control. If a centralised CM operation reduces the overall group risk associated with CM activities then it is deemed a success. Obviously risk may be quantifiable in some instances but the interviewees emphasised more the non-quantifiable aspect of risk. One interviewee even said 'I can sleep better at night since our CM was centralised'. Also, having a centralised CM system means the company can act quickly if any unusual cash happening takes place.

Most interviewees agreed that only a limited amount of information could be obtained in the financial statements with respect to PM of CM activities. To make full use of such information, they felt, necessitated access to more detailed background information on the company's activities.

What Does the Future Hold for TM Organisation?

Most interviewees felt that the trend towards centralisation would continue, but possibly on a regional rather than a global basis. PM continues to be a problem, however, and companies will endeavour to search for relevant performance benchmarks as the treasury personnel come under increasing pressure to add to the bottom line of the company.

Discussion

MDA Results

Overall the MDA results in this study are very encouraging, particularly when examined in the context of the objectives. A statistically significant between-groups variability was found in two out of the three time periods looked at, i.e. in 1995 and 1994/95. It should be remembered, however, that this finding means nothing more than the fact that the groups were found to be different. These results do not and could not tell us *why* they are different. Also, these results cannot tell us whether different means better or worse. This point is very important. For example, if one company's QR is 2.5 and another company's QR is 1.5, it would be foolish to conclude immediately that 2.5 is the better ratio to have. It could be argued, for instance, that 2.5 is too high and may indicate poor surplus cash management. However, the fact that the ratios which constitute the FHM used in this study differentiated between companies with a centralised CM structure and companies with a decentralised CM structure means at a minimum that further investigation into why they are different is warranted. Such an investigation would clearly require access to further detailed information (financial and otherwise) on the companies involved. In this context an understanding of the objectives of each company's CM structure would assist in evaluating the results of whatever CM structure is in place.

In relation to 1994 the between-groups variability found was not statistically significant. However, the results for this year are still valuable. The between-groups variability here was found at a 67% confidence level. Many business decisions are made with this confidence level or indeed a lower confidence level. It is certainly high enough to suggest that further investigation into the results along the lines outlined above would be in order.

Overall classification success rates were quite high, being greater than 70% in all cases. The fact that in 1995 and in 1994/95 the discriminant function was more likely to misclassify a decentralised company than a centralised company is interesting. This may suggest a closer link between the FHM and the centralised CM structures. An obvious candidate for further investigation of the classification rates would be to conduct a holdout test, which is beyond the scope of this study. This would clearly help to evaluate the predictability performance of the discriminant functions found.

It was interesting to note than when the MDA was run again after adjusting for collinearity and missing values, the overall outcomes were not changed significantly. This is not, however, very surprising as the ratios chosen were selected very carefully and were few in number. Also the number of missing values was not significant.

In the 1995 and 1994/95 analyses it is interesting to note that the QR was the most significant contributor to the discriminant function. This ratio has been a widely recognised traditional measure of a company's liquidity. While this ratio was important in the context of this study, it would be interesting to ask treasury personnel to what extent they rely on it or monitor it when conducting performance measurement of CM activities. Are companies at all concerned with their QR versus their competitors' QR, or is CM efficiency measured purely on the basis of internal benchmarks which by their nature are not comparable with other companies?

The CFLR did not produce in itself any interesting statistic, even though according to Figlewicz and Zeller (1991) it is a better indicator of a company's liquidity position than the QR. It was somewhat surprising to find that the IMPR and TMPR did not together or separately produce any noticeable result. This may suggest that more detailed information on the tax and interest positions of the companies involved is needed. For example, tax savings which may result from a particular CM system may not be apparent from the accounts. Also, items such as reduced bank charges due to netting or pooling arrangements are not apparent from the accounts.

As there is no other published material of this nature, these MDA results cannot be compared with any others. What is known, however, is that companies are struggling to measure the performance of their CM structures, against the background that companies believe that no objective criteria exist for this purpose. This makes their task all the more difficult. The MDA results of this study throw some light on this matter and suggest that at least it may be possible, particularly with more detailed information, to find some objective measures which companies could apply when assessing the performance of their CM organisation.

Mann-Whitney Test

The results of the Mann-Whitney test could be viewed as disappointing. The IMPR in 1995 was the only ratio for which a statistically significant difference between the two groups was found. It is not surprising in itself that the groups were found to be different with respect

to this ratio, as interest savings are a significant reason for centralising CM in the first place. Having said this, however, it should be remembered that this test cannot tell us that the difference is due to the different companies' CM structures, or indeed that one group is better or worse than the other. Further investigation of the result is warranted.

When the Mann-Whitney results are compared with the MDA results it is somewhat surprising that the QR, which was an important discriminating variable in MDA, did not present itself as a distinguishing variable when looked at in isolation in the Mann-Whitney test. Also, the IMPR ,which was an important distinguishing variable in the Mann-Whitney test, did not feature in any extreme way in the MDA results. The rationale for this inconsistency in findings may well lie in the fundamental differences of the methodologies employed.

The Mann-Whitney test largely produced results which are still valuable in a business sense. For example, in 1994 there is a difference between the two groups in respect of some ratios with reasonable confidence levels as follows:

Ratio	Confidence Level
CPR	63%
IMPR	93%
QR	75%
TMPR	77%

Business decisions are often made with these confidence levels and lower ones, so these results also warrant further investigation.

Interviews

The most interesting and surprising finding of the interviews was that the main reason for centralising CM is risk control, which for the most part is non-quantifiable. This suggests that it is not possible to examine the financial statements with a view to measuring the success/failure of a particular CM structure. Despite this the interviewees were very supportive of what this study was trying to achieve and thought that its results, whatever they might be, could only add value to the whole area of PM in the context of CM/TM activities.

The MDA results conflict with the findings of the interviews. The interviewees largely indicated that they would be surprised to find any significant difference arising between the two groups of companies based on the ratios chosen for the study, which relied purely on

publicly available information. The 1994 and 1994/95 results strongly suggest otherwise. Discussing these results with the interviewees would prove beneficial with a view to progressing the model further. The results of the Mann-Whitney test, on the other hand, were what would have been expected by the interviewees.

Conclusions

The main objective of this study was to establish whether the financial health of multinationals with a centralised cash management structure is significantly different to the financial health of multinationals with a decentralised cash management structure.

The study's principal finding was that in two out of three time periods examined, there was a statistically significant difference between the two groups of companies examined. This result is very encouraging and warrants examination of whether the financial health of the two groups of companies is different because of their different cash management structures. If such a link could be made then it would indicate that the financial health model used in this study does indeed capture the effects of a company's cash management structure. Following on from this, an investigation into whether the financial health of companies with a centralised CM structure is necessarily *better* than the financial health of companies with a decentralised cash management structure could be carried out.

The ultimate objective of such further investigations would be to derive a set of performance measurement criteria which companies could use to evaluate the success/failure of their cash management structure. Obviously such criteria could not be used in isolation. Non-quantifiable factors such as risk control should be taken into account also. Notwithstanding this, companies are struggling to find performance measurement criteria for their cash management activities and indeed their treasury management activities generally, and practitioners would welcome any progress towards developing some objective measurable criteria.

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