

UNIVERSITY OF LJUBLJANA
FACULTY OF ECONOMICS

MASTER'S THESIS

**CASH MANAGEMENT TECHNIQUES: THE CASE OF CASH
FORECASTING IN MERCATOR**

Ljubljana, August 2010

MARIJA ANGELOVSKA

DECLARATION

I, Marija Angelovska, hereby certify to be the author of this Master's thesis, that was written under mentorship of Prof. Dr. Aljoša Valentinčič and in compliance with the Act of Author's and Related Rights – Para 1, Article 21, I herewith agree this thesis to be published on the website pages of the Faculty of Economics, University of Ljubljana, Slovenia.

Date _____

Name and Surname _____

TABLE OF CONTENTS

INTRODUCTION.....	1
1 WHAT IS CASH MANAGEMENT?	2
1.1 Responsibilities of the cash manager	3
1.2 The importance of cash management.....	4
2 DETERMINING THE INVESTMENT IN CASH	5
2.1 Reasons for holding cash	5
2.2 Costs of holding cash	6
2.3 Determining the investment in cash.....	7
2.3.1 The Baumol model.....	7
2.3.2 The Miller – Orr Model.....	9
2.3.3 The Stone model	11
3 CASH MANAGEMENT TECHNIQUES	13
3.1 Cash flow synchronization	15
3.2 Speeding up collections	16
3.2.1 Proposal.....	16
3.2.2 Order and delivery	22
3.2.3 Invoicing.....	23
3.2.4 Receipt of payment	24
3.2.5 Dunning procedures	24
3.3 Controlling payments	26
3.3.1 Proposal.....	28
3.3.2 Order.....	30
3.3.3 Receipt of goods	31
3.3.4 Invoice	32
3.3.5 Due date and payment	33
3.4 Efficient short-term investing of cash surpluses	33
3.5 Economical financing of cash shortages.....	37
3.6 Cash pooling	41
3.7 Cash flow forecasting	44
3.7.1 Cash flow forecasting time horizons	47

3.7.2	Objectives and uses of cash flow forecasts	49
3.7.3	Cash flow forecasting process.....	52
3.7.4	Cash flow forecasting techniques	56
4	CASH FLOW FORECASTING IN MERCATOR D.D.....	72
4.1	Company profile.....	72
4.2	Cash flow forecasting: the case of Mercator d.d.....	73
4.2.1	The distribution method	75
4.2.2	Regression based cash forecast	82
	CONCLUSION.....	89
	REFERENCE LIST.....	90

LIST OF TABLES:

- Figure 1. Cash balances under the Baumol model assumptions
- Figure 2. Two parameter control limit policy
- Figure 3. The Stone model
- Figure 4. The Cash Conversion Cycle
- Figure 5. Procure to pay processes
- Figure 6. Order to pay processes
- Figure 7. Example of zero cash balancing
- Figure 8. Analysis of the level of forecasting accuracy
- Figure 9. The day of the month effect in Mercator d.d.
- Figure 10. The day of the week effect in Mercator d.d.
- Figure 11. Comparison of actual and forecasted daily cash flows

LIST OF FIGURES:

- Table 1. Effective annual interest rates for common discount terms
- Table 2. Notional cash pooling example
- Table 3. Example three-day moving average
- Table 4. Example ten-day moving average
- Table 5. An example of exponential smoothing and moving averages
- Table 6. Daily forecasting format
- Table 7. Receipts and disbursements forecast
- Table 8. Analysis of cheque clearance within the cash distribution method
- Table 9. An example of forecasting within cash distribution method
- Table 10. Profit and loss account as a starting position in the percentage of sales method
- Table 11. Balance sheet a starting position in the percentage of sales method

Table 12. Projected profit and loss account

Table 13. Pro forma balance sheet

Table 14. Sources of liquidity of Mercator Group at December 31st 2009

Table 15. Day of the month multivariate linear regression

Table 16. Day of the week multivariate linear regression

Table 17. Example calculation of the average number of receipts issued each week day

Table 18. Multiple linear regression model for forecasting cash proceeds

Table 19. Pearson correlation coefficients

INTRODUCTION

“Cash is king” is probably the most frequently heard phrase in the business world in the last two years. Moreover, it has never been more appropriate. The recent financial crisis has put cash and its management back in the spotlight, forcing treasurers to focus their efforts on ways to improve their companies’ cash management. When liquidity is scarce efficient cash management is vital for ensuring that every spare cent has been fully utilized. Even in normal times, efficient cash management is crucial for the company, as lack of liquidity may result in inability to pay liabilities, increased costs, and worst case scenario, the company may end up in insolvency.

The objective of this thesis was to present the cash management techniques whose application contributes to achieving efficient and successful cash management. A recent cash management survey, i.e. the Fourth Annual Cash Management survey conducted by Gtnews in association with SEB (2009), revealed that the process with greatest improvement potential within cash management is the management of accounts receivable, whereas improving cash flow forecasting came as second (Gtnews, 2009). In 2006 and 2007 according to the same survey cash forecasting appeared as the cash management process with the highest improvement potential. That is why, I place greater emphasis on managing accounts receivable and improving cash flow forecasting, as processes in the highest need for enhancement. The technique of cash forecasting is further practically applied on the case of a Slovenian trade company, Mercator d.d..

The basics of cash management and its techniques have been largely treated in American literature ever since 1970 (Miller & Orr, 1966; Stone, 1972; Baumol, 1952, Parkinson, 1983, etc.), thus it represents the essential source of literature. The basic terms of cash management, their definitions, models and techniques have been present in the business literature for so long, that they have become an integral part of classical corporate finance textbooks (for example Brigham & Daves, 1999, Pinches, 1994, Fabozzi & Petersen, 2003, Allman-Ward & Sagner, 2003, etc). Unfortunately, literature on cash management techniques which would be applicable in Europe is scarce, especially on cash forecasting. That is why as main source I used articles published on gtnews, an Association for Financial Professionals company, as well as articles of other treasury organizations and associations, such as Treasury Management International, Association for Financial Professionals and Treasury Alliance Group.

This master thesis is organized in four major parts preceded and followed by introduction and conclusion. In the first part I define the cash management function, its scope, goals and importance. The second part is devoted to determining the investment in cash. At the beginning of that chapter I explain the reasons and costs of holding cash in the company, and in continuance I present the basic models for quantifying the investment in cash. In the third part a detailed presentation of the various cash management techniques is provided. Here, a greater emphasis is

put on the accounts receivable and payable management and finally on the various methods for cash forecasting. In the last, fifth part, the cash forecasting technique is practically applied to the case of a real company, Mercator d.d..

1 WHAT IS CASH MANAGEMENT?

In its most simple description, cash management represents “the management of cash inflows and outflows of the firm, as well as the stock of cash on hand” (Fabozzi & Petersen, 2003, p. 630). It consists of taking the necessary actions to maintain adequate levels of cash to meet operational and capital requirements and to obtain the maximum yield on short-term investments of pooled, idle cash.

Cash management can be categorized from different aspects of the firm. From the aspect of financial management, cash management is a part of short-term financial management, also called working capital management. Namely, financial management encompasses all financial decisions made within a company, whose ultimate goal is to maximize shareholder value (Pinches, 1994, p. 4). It is comprised of long- and short term financial management. Long term financial management deals with long term investments, as well as long term financing of the company on the capital markets (Pinches, 1994, p. 635). Short term financial management (also referred to as liquidity management or working capital management) deals with decisions that have a financial impact on the company’s operations in the period of less than one year. It aims at constructing such a combination of short term assets (cash, marketable securities, accounts receivable and inventories) and short term liabilities (short term funds for financing short term assets) that would maximize the shareholder value (Shapiro, 2002, p. 642).

From the aspect of the organization of the firm, cash management is a part of the treasury function. The treasury function is wide in scope and deals with financing, monitoring and controlling the financial resources of the company. The cash management function as part of treasury, handles the cash of the firm, as well as the direct interaction with the market in buying or selling money or currencies. It is again short-term in its view (Foster-Back, 1997, p. 11).

Finally, cash management can be seen as part of risk management, more specifically as a part of managing liquidity, interest rate and foreign currency risk. Liquidity risk is the risk that a company will not be able to timely acquire the funds necessary to meet its obligations as they come due, either by increasing its liabilities or by converting assets without incurring considerable losses (Lam, 2003, p. 182). As one of the main goals of cash management is ensuring that the company has enough cash to perform its everyday operations and to cover unpredicted outflows, one can easily categorize it as a measure for liquidity risk management.

As a conclusion, cash management deals with managing a company's short term resources in order to support and maintain its ongoing activities, mobilize funds and optimize liquidity (Allman-Ward & Sagner, 2003, p. 2). The primary goal of this function is to minimize the amount of cash a firm must hold in order to carry out its normal business activities on one side, and on the other, to obtain sufficient cash funds that would enable the firm to take trade discounts, to maintain its credit rating and to meet unforeseen cash needs (Brigham & Daves, 2004, p. 705). Cash management techniques represent the actual measures undertaken in achieving the goals of cash management.

1.1 Responsibilities of the cash manager

The goals of the cash management function bring out the basic responsibilities of the cash manager, which, broadly speaking, take up planning, monitoring and controlling of the cash flows and the cash position of a company, while maintaining its liquidity (Coyle, 2000, p. 6).

Depending on how many responsibilities it consists of, cash management can be divided into: treasury management (or basic cash management) and advanced cash management. A study of cash management practices in a sample of Spanish firms done by San José et al. (2008, p. 192) confirm previous findings that treasury management in a narrow sense or basic cash management, which encompasses the fundamental functions of cash management, has evolved into treasury management in a broad sense, or advanced cash management. According to San José et al. (2008, p. 193) basic cash management involves developing and undertaking administrative measures aimed at establishing the optimal level of cash, that would allow the company to make and receive payments in such a way that the normal operations of the company are preserved. Such are: short term cash flow forecasting, setting up an optimum cash level, optimizing the liquidity of the company, monitoring and optimizing the cash cycle, monitoring the banking positions at value date, and finally, controlling the banking positions on a daily basis (San José et al., 2008, p. 200).

Advanced cash management on the other hand, expands beyond the mere control of payments and receipts, and includes other responsibilities, such as establishing and managing relationships with financial institutions, and financial risk management. In more detail, the responsibilities contained in advanced cash management are: managing contractual relationships with financial institutions, maximizing the returns on cash surpluses, minimizing the costs of short term borrowing, and covering interest rate risk and exchange rate risk (San José et al., 2008, pp. 193–200).

Seen as a whole, the main elements that make up the cash management function are the following (Coyle, 2000, p. 7; Allman-Ward & Sagner, 2003, p. 3):

- maintaining the ability to pay obligations
- making sure that resources are available at the right time and at an acceptable cost
- speeding up and efficiently collecting cash flows, i.e. optimizing the cash collection
- concentrating collected funds
- managing the timing of cash outflows
- cash flow forecasting
- controlling borrowings and interest costs
- overseeing and minimizing idle cash balances
- investing short-term liquid assets at the highest rate possible without significant risk of losses
- monitoring and managing foreign currency exposures
- monitoring and managing interest rate exposures
- managing finance expenses
- monitoring and improving credit control
- reducing tax liabilities
- collecting timely information
- employing systems and services which would enable the monitoring, managing and controlling of the cash position.

1.2 The importance of cash management

Cash is crucial for every business. Every company has to have cash on hand or at least access to cash in order to be able to pay for the goods and services it uses, and consequently, to stay in business. By ensuring the company with the necessary funds for supporting its everyday operations, cash management becomes a vital function for the company.

Cash flows have an impact on the company's liquidity. Liquidity is the ability of the company to pay its obligations when they come due. It is comprised of: cash on hand, assets readily convertible into cash, as well as ready access to cash from external sources, such as bank loans (Coyle, 2000, p. 3). If cash flows and liquid funds are not effectively and successfully planned and managed, a company may not be able to pay its suppliers and employees in a timely manner. It may be profitable according to its financial statements, but in fact, this company will not be able to pay its obligations when they come due. Moreover, lack of liquidity will incur increased costs in the form of interest charges on loans, late payment penalties and losing supplier discounts for paying obligations on time. Proper cash management can avoid the costs of additional funding and can provide the opportunity for more favorable terms of payment (Dropkin & Hayden, 2001, p. 3). In the worst case scenario, if the liquidity shortage continues for the longer term, the company might face no access to external resources, ending into insolvency (Coyle, 2000, p. 3). Therefore, once again, it follows that cash management has a critical importance for the life of every company.

Another benefit of cash management to the company is that it makes the company financially flexible. Ready access to cash enables the company to undertake expenditure decisions if and whenever it wishes, without the trouble and constraint of finding new financial support (Coyle, 2000, p. 3).

The ultimate goal of every company is maximizing shareholder value, i.e. maximizing the net present value of future cash flows. Cash management contributes to attaining that goal as well. If a firm keeps high levels of cash, it increases its net working capital and the costs of holding cash, both of which decrease the value of the firm. Cash management influences the value of the firm by limiting cash levels so that an optimal balance between the costs of holding cash and the costs of inadequate cash is achieved. “In addition, cash management influences firm value, because its cash investment levels entail the rise of alternative costs, which are affected by net working capital levels. Both the rise and fall of net working capital levels require the balancing of future free cash flows, and in turn, result in firm valuation changes” (Michalski, 2006, p. 180).

2 DETERMINING THE INVESTMENT IN CASH

Every company has to establish the amount of cash that would be optimal for conducting its every day operations and for ensuring sufficient liquidity. Before looking into the concrete models for determining the optimal amount of cash, the reasons as well as the costs of holding cash need to be presented.

2.1 Reasons for holding cash

Cash refers to ready money, that is, banknotes and coins that a company has on hand, as well as money held in a current bank account (Coyle, 2000, p. 2). Together with marketable securities, they comprise the liquid assets of the firm. Marketable securities represent short-term security investments the firm may temporarily hold and convert quickly into cash (Pinches, 1994, p. 665).

Companies hold cash for the following fundamental reasons:

Transaction purposes – Firms need cash balances for their everyday business operations. Hence, they need to hold a minimum amount of cash on hand in order to be able to meet cash payments stemming from their day-to-day business operations. These include usual and standard payments, such as paying monthly bills, paying the suppliers, as well as for settling major items such as tax payments, dividends, wages, as well as interest and/or principal of a loan (Pinches, 1994, p. 666). Keynes (1936, p. 153) defines this transaction motive simply as a “need for cash for the current transaction of business exchanges”. The level of these balances is mostly

determined by the prevailing interest rates and by the costs of investing surplus cash (Gitman et al., 1979, p. 33).

Hedging against uncertainty – Another reason for the firm to hold cash is the intention of protecting itself against uncertain future events. Cash inflows and outflows are unpredictable, which is why the firm needs to put aside some cash as a reserve for random, unexpected fluctuations in inflows and outflows (Ehrhardt, 2006, p. 582). For this purpose companies may employ marketable securities and a line of credit from a bank (Pinches, 1994, p. 666). Keynes (1936, p. 177) names this rationale for holding cash - the precautionary motive. According to him, firms hold cash in order to provide for future eventualities which would require sudden spending, as well as for taking advantage of unpredicted possibilities for profitable purchases (Keynes, 1936, pp. 177-178). The size of these so called precautionary balances depends on the degree of uncertainty, i.e. predictability of the transactions, where less predictable cash flows require holding larger balances, and vice versa (Fabozzi, 2003, p. 631; Ehrhardt 2006, p. 582). Furthermore, their level is also determined by the opportunity cost of funds (Gitman et al., 1979, p. 33). The transaction and precautionary rationales make up the most of the reasons for liquidity preference of firms (Bowlin et al., 1990, p. 248).

Flexibility – Various firms hold considerable amounts of liquid assets with the intention of exploiting unpredicted opportunities. Their idea is to have the necessary resources to finance newly arisen growth options in a fast and easy manner (Pinches, 1994, p. 666). According to Keynes, this motive for holding cash is called the speculative motive and represents keeping cash on hand in order to take advantage of profit making opportunities in the future. It is the least important reason for holding cash in firms (Bowlin et al., 1990, p. 248).

Compensating balance requirement – One of the forms of compensation that banks receive for providing their services to the companies, is maintaining a compensating balance by the firm, the other being direct fees. A compensating balance is a certain amount of cash the firm is required and agrees to hold on deposit on its current account with the bank (Pinches, 1994, p. 666).

An additional reason for firms to keep cash on hand is to take advantage of trade discounts. Suppliers often offer their clients the option of discounts for early payment of obligations, which would be easily obtainable if there was extra cash lying on the corporate account (Ehrhardt, 2006, p. 583).

2.2 Costs of holding cash

As there are reasons and motives for holding cash, there are also costs associated with keeping cash in the company. The two main groups of costs relating to cash are holding costs and

transaction costs. The first cost considered, the holding cost, represents the opportunity cost of lost interest. Cash does not generate any earnings, so by holding on to it, investors forego the interest that they could have earned elsewhere, by investing the cash in some profitable investment (Harford, 2000, p. 7). Another part of the holding cost is the actual interest paid when the cash is borrowed (Coyle, 2000, p. 4). According to Fabozzi (2000, p. 633) one more part of the holding cost is the cost of administration, namely it is the cost of keeping track of the cash.

Transaction costs are connected to the situation when a firm is in a need for cash, in other words they represent the cost of getting more cash. In that situation the firm must either borrow cash from somewhere or sell an asset. Both solutions bring about costs in the form of fees, commissions paid to the bank, as well as some other costs that may arise when selling an asset or borrowing cash (Fabozzi, 2000, p. 632). Baumol (1952, p. 546) defines these costs as all non-interest costs of borrowing or making a cash withdrawal. They include opportunity losses arising from the necessity to dispose of an asset in the particular moment when the cash is needed; losses from the lower resale price, which happens when the asset becomes “secondhand” when sold to a nonprofessional dealer; administrative costs; psychic costs, which represent the trouble in making a withdrawal; and finally the payment made to a broker (Baumol, 1952, p. 546).

2.3 Determining the investment in cash

Several models have been developed as tools for determining the optimal amount of cash a firm must hold. As already mentioned, one of the primary goals of cash management is to determine the minimum amount of cash the firm must hold, with the premise that it would be sufficient to enable the firm to operate efficiently (Brigham & Daves, 2004, p. 777). Furthermore, what is meant by optimal cash holdings is the amount that minimizes the costs associated with keeping the cash on hand within the company. When deciding on the optimal or target cash balance, the cash manager must take into account that cash is an asset that earns no interest, that the cash needs can be financed by either raising debt or equity, and that both debt and equity bring about costs (Brigham & Daves, 2004, p. 777). Most of the models focus on the transactions demand for cash, that is, on the amount of cash a firm must keep in order meeting its everyday obligations.

2.3.1 The Baumol model

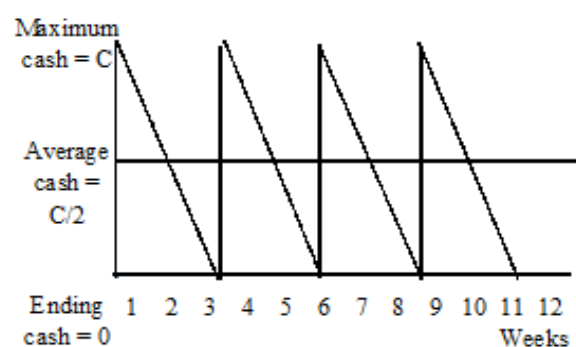
One of the first models for determining the optimal cash balance a firm must hold was developed by William J. Baumol in 1952. His model is intended for determining the cash holdings kept for transaction purposes, that is, cash needed for conducting everyday business. Baumol incorporates the principles of inventory management in his model, more specifically the principles of Economic Order Quantity (EOQ) (Baumol, 1952, p. 545).

When applied to cash management, the EOQ model computes the amount of cash that minimizes the sum of the holding and transaction costs. Holding cost is the combination of the cost of administration, i.e. the costs incurred for keeping track of the cash, and the opportunity cost of cash, which is the cost of not investing the cash elsewhere. The transaction cost is the cost of acquiring more cash, either by withdrawing it from an investment or borrowing. Once again, the economic order quantity is the amount of cash acquired, by withdrawing it from an investment or by borrowing, which minimizes the total costs incurred (Fabozzi & Peterson, 2003, p. 633).

The Baumol model assumes that the net cash flows occur at a constant rate, the cash balance is replenished periodically by selling marketable securities, whereas the broker's fee is fixed for each transaction. The problem comes down to determining the amount of cash that is to be obtained and at what frequency, in order to minimize the total costs. The solution is the square root formula for inventory control (Punter, 1982, p. 331).

In order to explain how this model works, some starting points need to be made. Namely, the model starts with the assumption that during a certain period the company makes payments in a steady stream in the amount of T . The cash is obtained either by borrowing it or by selling an investment at the interest cost of i dollars per dollar per period, which is at the same time the opportunity cost as well. The cash is acquired in lots of C dollars extended evenly throughout the period involved. Whenever this cash infusion is made, a broker's fee of b dollars must be paid. Any amount of C smaller or equal to T will enable the company to meet its obligations equally, under the condition that the withdrawals are made often enough (Baumol, 1952, p. 546). The cash position of the company in this situation resembles the situation shown in Figure 1:

Figure 1. Cash balances under the Baumol model assumptions



Source: E. F. Brigham & P. R. Daves, Intermediate financial management, 2004, p. 779.

Given all above stated, the company will make T/C withdrawals per period, thus the total transaction costs for that period will be (Baumol, 1952, p. 546):

$$\text{Transaction costs} = b (T/C) \quad (1)$$

Furthermore, given that each C amount of cash withdrawn is spent evenly throughout the period in question, and the same amount is again withdrawn the moment the balance hits zero, the average cash holding will amount to $C/2$. Thus, the total holding cost for the period involved is (Baumol, 1952, p. 546):

$$\text{Holding cost} = i (C/2) \quad (2)$$

Therefore, the total costs a company will pay for using that cash to meet its transaction needs, when it borrows C dollars at intervals evenly extended throughout a given period, will be the sum of transaction costs and holding costs, i.e. (Baumol, 1952, p. 546):

$$\text{Total costs} = b (T/C) + i (C/2) \quad (3)$$

The cash manager further needs to determine the optimal amount of cash, i.e. the amount of cash C that will produce lowest total costs of getting cash, which is found by the following equation (Baumol, 1952, p. 547):

$$C = \sqrt{(2bT/i)} \quad (4)$$

From equation (4), it is evident that (Fabozzi & Petersen, 2003, p. 635):

- As the cost per transaction b gets bigger, so will the amount of cash C , withdrawn in a single transaction, be bigger. It is a simple logic – the greater the transaction costs, fewer transactions the company will make.
- As the need for cash T gets larger, so will the amount of cash C , withdrawn in a single transaction, be bigger.
- As the opportunity cost of holding cash, i , gets bigger, the amount of cash C , withdrawn in a single transaction, will get smaller.

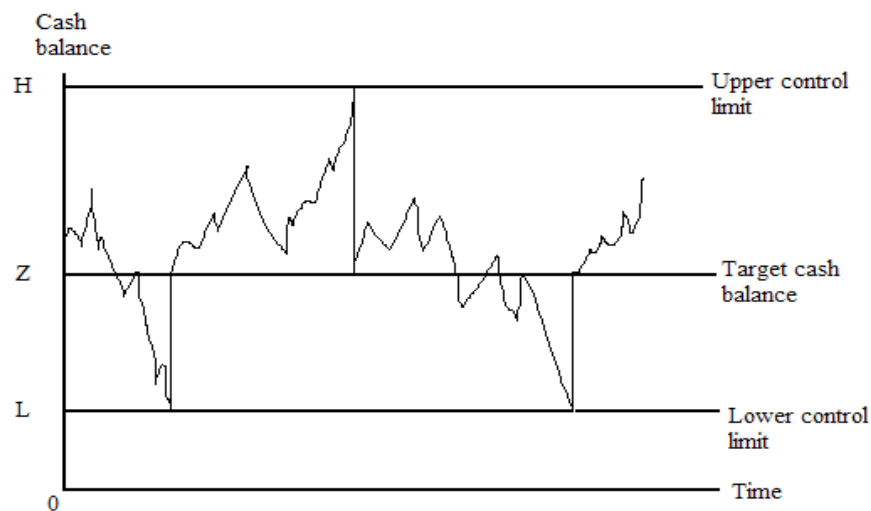
The primary disadvantages of this model are a result of its assumptions, mostly of the assumption for steady and predictable cash flows. Furthermore, it does not consider any seasonal and cyclical trends (Brigham & Daves, 2004, p. 781).

2.3.2 The Miller – Orr Model

The Miller-Orr model builds up on the Baumol model. The assumptions on which this model is based are that net cash flows fluctuate completely randomly, the firms hold two types of assets, and each transaction has a fixed cost (Punter, 1982, p. 331). The assets the firm holds comprise of

the company's cash balance and a separately managed portfolio consisting of liquid assets, i.e. marketable securities, whose marginal and average yield is k per dollar per day (Miller & Orr, 1966, pp. 417-420). Finally, based on a standard practice in inventory theory, Miller and Orr (1966, p. 419) assume that the company's objective function is to "minimize the long-run average cost of managing the cash balance under some policy of simple form". In this case, that policy of simple form is taken to be the two parameter control limit policy presented in figure (2). In this policy, the cash is permitted to move freely between two limits, the upper limit H and the lower limit L , until it reaches one of them. When the cash balance reaches one of these limits, an appropriate action needs to be taken in order to restore the cash balance to the target level Z (Miller & Orr, 1966, p. 419).

Figure 2. Two parameter control limit policy



Source: G. Pinches, *Essentials of financial management*, 1997, p. 681.

The Miller-Orr model works in such a way that when the cash balance hits the upper control limit H , the firm buys marketable securities in the amount of $(H - Z)$, in order to bring the balance back to the target level Z . When the lower control limit L is hit, the company will return the balance to the target level by selling marketable securities or by borrowing in the amount of $(Z - L)$.

The Miller-Orr model determines the target cash balance based on the transaction and opportunity costs. The target cash balance, the upper limit, and the average cash balance are found by the following equations:

$$\text{Target cash balance: } Z = \sqrt[3]{\frac{3F\sigma^2}{4k}} + L \quad (5)$$

$$\text{Upper limit: } H = 3Z - 2L \quad (6)$$

$$\text{Average cash balance} = \frac{4Z - L}{3} = \frac{4}{3} \sqrt[3]{\frac{3F\sigma^2}{4k}} + L \quad (7)$$

Where Z is the target cash balance, H is the upper control limit, L is the lower control limit, F is the fixed cost of buying or selling securities, k is the opportunity cost of holding cash, and σ^2 is the variance of daily cash flows.

When applied in firms, this model gives fairly good results under the conditions that the distribution of daily cash flows is approximately normal, they move randomly and the firm's portfolio contains only one investment (Pinches, 1997, p. 683).

2.3.3 The Stone model

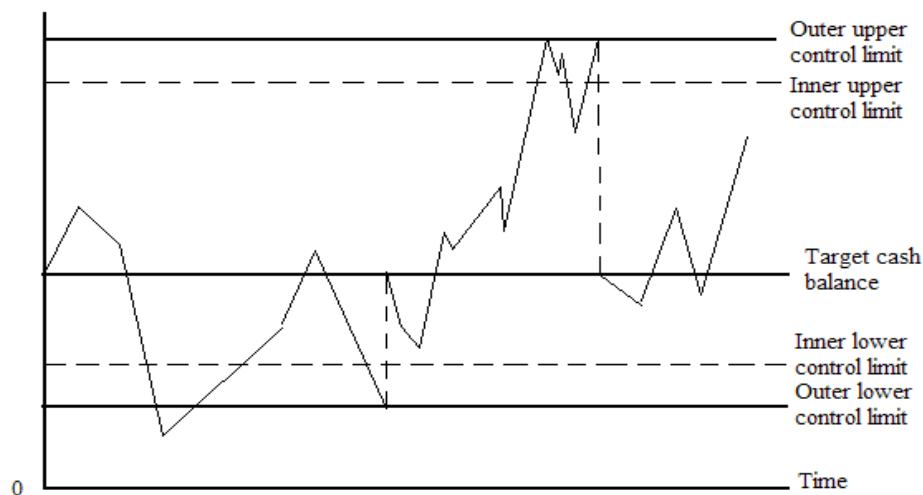
The Stone model is very similar to the Miller-Orr model, with the difference that the Stone model focuses more on managing cash balances, rather than on determining the optimal transaction size. According to this model, hitting the upper or lower control limit does not necessarily trigger a decision for investing (buying marketable securities) or disinvesting (selling marketable securities or borrowing). Instead, the decision depends on the anticipated cash flows for the next couple of days (Pinches, 1997, p. 683). According to Stone (1972, p. 75), "when cash forecasts are available, an automatic and immediate return to a target level of balances after disturbance is generally not optimal".

Building up on the control limit inventory model, the basic assumptions of this model are:

- The company has two assets – cash and an interest bearing security (Stone, 1972, p. 74).
- Transactions to and from the marketable securities portfolio happen immediately (Pinches, 1997, p. 687)
- There is a forecast of future net cash flows for the "look ahead" time period. The cash forecasts are updated each time new information becomes available (Stone, 1972, p. 74)
- The company aims at maintaining a determined level of cash balances, which enables it to meet the average net collected balance requirement which is in accordance with its planned credit and banking needs (Stone, 1972, p. 74).

This model introduces two more control limits besides the upper and lower limit from the Miller-Orr model, namely, the inner upper and inner lower limit. Figure 3 shows how this model works. The outer control limits have the same function as in the Miller-Orr model. In this model however, when the cash balance hits or exceeds the outer limits, the cash manager anticipates a few days ahead, to see whether the cash balance is expected to fall within the inner control limits. If the balance is expected to move back to the area within the inner control limits sometime in the look ahead period, then no action is taken. If the cash balance is not expected to return to a point within the inner limits sometime in the look ahead period, then the company will take an action by selling or purchasing marketable securities (Pinches, 1997, p. 683).

Figure 3. The Stone model



Source: G. Pinches, Essentials of financial management, 1997, p. 685.

As the Stone model does not give any instructions on how to determine the control limits, the Miller-Orr model can be employed to estimate them as well as the target cash balance. The look ahead period is determined according to the cash manager's judgment. This model is an ad-hoc model that relies on judgment and personal experience, which is why it is hard to expect that this model would lead to an optimal policy (Pinches, 1997, p. 686)

All so far devised models for determining the target cash balance have limitations, thus companies find them more useful only as conceptual models rather than for actually determining their target cash balances (Brigham & Daves, 2004, p. 781). In his study of the usefulness of cash optimization models, Daellenbach (1974, pp. 609-623) first puts to question the assumptions of the models, which he finds to be inapplicable. Such is the assumption for the two asset portfolio, comprised of cash and marketable securities. Namely, most firms hold at least three asset portfolios, containing also short term loans outstanding. Furthermore, the assumptions for stationary cash flow distribution and for the transaction costs related to cash management can be

dismissed, as companies reported that their cash flows are highly predictable in the short term and that the transaction costs are negligible and thus not taken into account by the cash manager in making a cash management decision. His analysis establishes that for the case of non stationary cash flows, cash management optimization models cannot bring any improvement compared to the simple decision rules employed by cash managers, as long as fixed transaction costs remain at low level (Daellenbach, 1974, pp. 609–623).

3 CASH MANAGEMENT TECHNIQUES

Cash management techniques are the actual measures undertaken by a company in order to achieve the goals of cash management, i.e. in order to “maximize liquidity and control cash flows, and maximize the value of funds while minimizing the costs of funds” (Caviezel, 2007, p. 93). They represent the measures for attaining the goal of having just about enough, but not too much cash on hand at every point in time (Mramor, 1993, p. 302), as well as to control cash inflows and outflows.

For deciding on the amount of cash that is optimal to hold at any given point, the cash manager can use one of the models previously explained. However, in practice the optimal amount of cash is determined on the basis of a company’s past experience and sound judgment, whereas the quantitative models are generally used as an assisting tool to the cash manager.

The cash management techniques employed for controlling the cash inflows and outflows are grouped in different ways by different authors: speeding the inflows and controlling the outflows (Pinches, 1997, p. 667); improving cash flow forecasts, synchronizing cash inflows and outflows, using float, accelerating collections, getting available funds to where they are needed and controlling disbursements (Brigham, 1999, p. 604); forecasting cash flows, accelerating cash receipts, slowing down disbursements, effective investing of cash surpluses, economical financing of cash shortages (Mramor, 1993, p. 303).

When looking into the cash management techniques, one has to be aware of the differences that exist between the ones that are used in Europe and the ones used in the United States. The differences stem from the use of different payment instruments. Namely, in the United States the majority of all payments, in terms of volume, especially those involving retail transactions, is conducted through the use of paper based instruments, particularly cheques (Committee on Payment and Settlement Systems, 2003, p. 433). In Europe on the other hand, electronic payments are the predominant means of payment, especially direct debits, credit transfers and card payments (ECB, 2008). In paper based systems the float arises as a key concept. Float represents “the length of time between when a cheque is written and when the recipient receives the funds and can draw up on them” (Pinches, 1997, p. 668). The delays in payment settlement

caused by float come from the fact that it takes time for the cheque to arrive at the receiving company through the mail, it takes time to process the cheque in the company and finally to clear the cheque through the banking system (Brigham & Daves, 2004, p. 711). Within the electronic payment systems, funds are transferred in “real time”, meaning without any waiting period. That is why the concept of float is not applicable on the territory of Europe. In the US, the cash management techniques mostly focus on reducing the float in receipts, by speeding up cheque collections, and extending the float in disbursements, by slowing down the collection of cheques a company writes (Brigham & Daves, 2004, p. 711). In Europe this translates as speeding up the collection of accounts receivable and slowing down the payment of accounts payable.

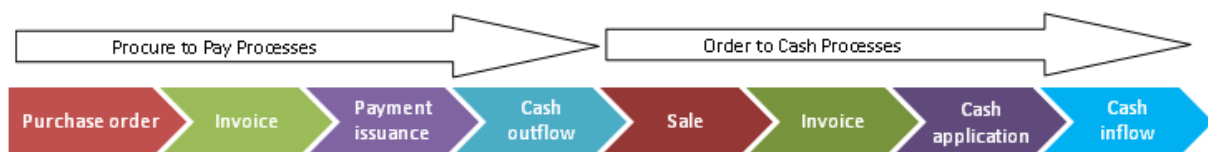
In the following chapters I focus on cash management techniques that are applicable in Europe, with a special emphasis on improving cash flow forecasting, which is further practically applied to the case of the company Mercator d.d.

Cash conversion cycle

Before looking into each cash management technique, the key concept of the cash conversion cycle needs to be defined. The cash conversion cycle represents the net time interval between when an actual cash outlay for purchasing productive resources for the company takes place, and the moment when the final cash receipt from product sales occurs. It is the time required to convert a unit of currency paid as a cash expenditure, back into a unit of currency received as a cash inflow within the regular operations of a company (Richards, & Laughlin, 1980, p. 34).

From the following Figure 4, it is evident that the cash conversion cycle can be divided into two parts: procure to pay processes and order to cash processes.

Figure 4. The Cash Conversion Cycle



Source: Citigroup Global Markets Inc., Putting Working Capital to Work: Releasing Capital by Accelerating the Cash Conversion Cycle, 2009.

Procure to Pay processes pertain to the expenditure side of the business process. They begin with issuing purchase orders to suppliers and end with the payment to these suppliers. Order to cash processes on the other hand, refer to the selling, i.e. revenue side of the business process. They

begin with the execution of a customer order and end with receiving cash and its application to outstanding receivable (Citigroup Global Markets Inc., 2009, pp. 15–16).

Each of the processes can be further divided into more detailed processes, for the purpose of better defining of cash management techniques for each part of the cycle:

Figure 5. Procure to pay processes



Source: M. Dolfe & A. Koritz, European cash management – A guide to best practice, 1999, p. 49.

Figure 6. Order to pay processes



Source: M. Dolfe & A. Koritz, European cash management – A guide to best practice, 1999, p. 23.

Respectively, speeding up collections as a cash management technique, pertains to the Order to cash part of the cash conversion cycle, whereas slowing down payments to the Payment to pay processes. Regarding the inflow of funds, the goal is to maintain the total credit time, i.e. the Order to Cash time as short as possible, in order to release the cash tied up in accounts receivable. However, in the cash disbursement process, the goal is to extend the time of the Purchase to Pay process as much as possible, which means to pay the invoice at the right time, i.e. on the due date (Dolfe & Koritz, 1999, p. 21–49). The means of attaining these goals will be discussed in more detail in the part of cash management techniques for speeding up collections and slowing down payments.

3.1 Cash flow synchronization

Cash flow synchronization represents timing the cash flows in such a way that cash receipts coincide with cash requirements of the company. Imperative here is the improving of cash flow forecasting, so that the company is able to predict when cash receipts and disbursement will occur in the future. By achieving synchronized cash flows, companies can reduce their transaction balances to a minimum. Some companies organize the billing of their customers, as well as the payments of their own bills on regular “billing cycles” throughout the month. The synchronization of cash flows ensures cash when needed and allows for reduction of cash balances needed to maintain the operations of the company (Brigham & Daves, 2004, p. 711).

3.2 Speeding up collections

In light of the recent financial crisis, the focus on the collection cycle has become an imperative one for treasurers. Improving the collection processes and the days sales outstanding performance contribute not only to boosting a company's liquidity through internal sources, but also to bolstering its credit rating and thus gaining an easier and more favorable access to external sources of funds (Cunningham, 2008). Now more than ever, treasurers are striving to reduce their dependence on banks and capital markets by unraveling the capital trapped within the company, by finding ways to release the cash tied in accounts receivable (A/R) and accounts payable (A/P) (Zekkar, 2009).

Even though the management of accounts receivable is as a separate part of working capital management, they are directly linked to a company's cash flow and liquidity position, which is why their management becomes also an integral and related part of cash management. Their effective management contributes to a successful managing of cash, optimization of business processes as well as to a better competitive advantage (Yiu, 2004).

As already mentioned, the technique for speeding up the collections pertains to the Order to cash processes of the cash conversion cycle. When devising measures to shorten this part of the cash conversion cycle, every cash manager must examine and evaluate each piece of the cycle, from order fulfillment to reconciliation of invoices, in order to identify opportunities for its improvement (Yiu, 2004). Each aspect of the collection management processes will be examined more thoroughly in the following chapters.

3.2.1 Proposal

One of the most important prerequisites of a successful cash management is the quality of documentation. This concerns every document, from proposal and order confirmation, to invoice and reminder letters. It is not a rare case that late payment is the fault of the selling company itself, arising as a result of poorly defined credit or payment terms, unclear payment instructions or the like. That is why it is imperative that every document exchanged between the selling company and its customer contains relevant and consistent information. At the very beginning of the selling process exist multiple opportunities to influence the duration of the created credit time. That is why it is very important to focus on every aspect of the proposal stage (Dolfe & Koritz, 1999, p. 23).

3.2.1.1 Credit terms

Accounts receivable are created when a company lets its customers pay for the goods or services bought at a later date than the date of purchase. When allowing payment some time later than the receipt of goods or services by the customer, the company grants credit to its customers (Fabozzi & Peterson, 2003, p. 667).

When establishing its credit policy, every company must take into consideration the costs and benefits of granting credit to customers. On one side, extending trade credit can be used as a marketing and relationship management tool. Namely, it can be used to support sales and business growth. It can be said that credit extending is largely customer focused, because it is used to induce purchase from customers who are frequent buyers with the goal to develop a long term relationship with them. Furthermore, large customers can influence the supplier to extend more credit with their requirements, thus the supplier will differentiate and adjust their terms in order to attract such customers and to achieve certain marketing goals (Summers & Wilson, 2003, p. 454).

On the other, granting credit is associated with costs: the firm extending the credit is incurring an opportunity cost of investing the funds elsewhere, rather than tying them up in accounts receivable, there are also costs associated with administering and collecting the accounts, as well as the risk of bad debts, that is, there is a chance that the customer may not be able to pay what is due when it is due. Finally, there is the cost of cash discounts. All this needs to be considered when devising the credit policy of the firm. When establishing the credit policy, the company considers the tradeoff between the costs and benefits of accounts receivable, i.e. the tradeoff between the opportunity costs of accounts receivable, the cost of administering the accounts and the cost of bad debts on one side, and on the other, the benefits expressed in the increase in profits and the return received from the trade credit (Fabozzi & Peterson, 2003, pp. 652 and 657).

The essential part of managing accounts receivable is establishing the company's credit policy, which is comprised of the following four variables (Brigham, 1999, p. 619):

1. Credit period, the time period given to the customer to pay for the purchase.
2. Credit standards, the required creditworthiness of the customer.
3. Discounts given for early payment, meaning the percent of discount and the time period when this discount can be realized.
4. Collection policy, defined as the strictness or tolerance in attempting to collect the slow-paying accounts.

The **credit period** should not be allowed to be too long, because longer credit terms increase the risk of the company as the creditworthiness of the customer may worsen before the payment is made (Dolfe & Koritz, 1999, p 23). Whether a credit should be extended to a customer or not, as well as the length of the credit period granted, depends on the previously set credit standards.

Credit standards refer to the necessary financial strength and creditworthiness of a customer in order to qualify for a sale on credit. If a customer does not qualify for a sale on credit, then it can still buy from the company, however under stricter payment terms. The credit standards are applied to determine whether a customer qualifies for a credit and how much credit it can obtain (Brigham, 1999, p. 619).

To set the credit standards of a company, an analysis of customers' credit quality needs to be conducted, i.e. the probability of a customer's default needs to be determined (Brigham, 1999, p. 619). For the purpose of credit analysis, information on the creditworthiness and paying potential of the customer is needed. Such information may be obtained from several sources such as: accounting statements of the companies, credit ratings and reports, banks, trade associations, as well as the company's own experience (Pinches, 1997, p. 705). Peterson and Rajan (1997, pp. 633; 688) suggest that suppliers have an advantage in acquiring information about their customers over financial institutions, because of several reasons. Firstly, due to more frequent visits to the buyer's premises and through the transactions with the firm, suppliers obtain information about their customers routinely and at a low cost. Furthermore, the amount and the timing of orders provide an idea of the condition of the buyer's business. Finally, if the buyer is unable to take advantage of early payment discounts, this might serve as a signal for deterioration in the buyer's creditworthiness to the supplier (Peterson & Rajan, 1997, p. 633). That is why, Peterson and Rajan (1997, p. 688) conclude that suppliers gather and utilize different information than financial institutions.

When the necessary information is obtained, the credit decision needs to be made. For that purpose companies usually group their customers into risk classes, where customers in the best group receive credit automatically, customers in the next more risky class will receive credit, but within some limits and with their status checked periodically, whereas customers in the most risky class might have to pay the goods with cash on delivery. To determine the risk classes, some companies employ a credit scoring system, within which, based on statistical or some other method of analysis, companies determine variables which can be used as criteria for assessing a customer's creditworthiness (Pinches, 1997, p. 706).

Cash discounts. A customer will receive a discount from the invoice price if he decides to pay on delivery or within a specified time thereafter. A customer, who pays after this term, will pay the full invoice price (Fabozzi & Peterson, 2003, p. 622). The purpose of introducing cash

discount in the credit term is twofold: on one side it should attract new customers who consider the discount as a price reduction and on the other, the cash discount should effect shorter days sales outstanding, as it should stimulate current customers to pay more promptly in order to get the discount (Brigham, 1999, p. 622). Offsetting these benefits is the dollar cost of the discount. The dollar cost of a cash discount is calculated by the following equation (8):

$$\text{Cost of discount} = \text{Discount percentage} \times \text{Credit sales using discount} \quad (8)$$

However, most companies adjust the invoice price of their goods upwards when introducing the cash discount, to compensate for the time value of money and the risk incurred when extending the credit. Thus, what seems to be the cost of a cash discount does not give the whole picture, as companies will most likely change their contribution margin in order to compensate for the credit granted. This increases the benefits from the credit policy. The optimal discount percentage is set at the point where the marginal costs and benefits of granting the discount are exactly offsetting (Brigham, 1999, p. 622).

Collection policy. Collection policy defines the procedures for collecting past due or delinquent accounts (Fabozzi & Peterson, 2003, p. 659). The goal of the so called dunning procedures is to reduce the net amount of outstanding accounts receivable, by stimulating, demanding and forcing payment from the customer no later than on the due date (Dolfe & Koritz, 1999, p. 39). These procedures usually start with polite reminders that the due date is approaching or has already passed, and continue into more severe steps of inducing payment from the customer, ending with a legal action or a collection agency (Fabozzi & Peterson, 2003, p. 659). Each of these procedures will be discussed in more detail at the end of this part devoted to the Order to cash cycle.

When devising the collection policy the company needs to determine the level of strictness or laxity in its collection practices. A balance must be made between the benefits and costs of a collection process. The benefits of an efficient collection policy are decreased collection period and smaller percentage of bad debts. However, the company must also bear in mind that collection procedures are expensive both from the aspect of out of pocket expenditures, as well as from the aspect of lost goodwill, as aggressive attempts to collect what is owed may result in lost future sales (Brigham, 1999, p. 621). The circumstances of the customer must be taken into consideration as well. For example, if the customer is facing a labor strike, a company might forego the attempts to collect what is due from him, as that would be devastating to the relationship with that customer (Fabozzi & Peterson, 2003, p. 659).

If a firm changes some aspect of its credit policy, some sources of uncertainty may arise. First, the portion of sales paid with a discount may change. For example, if the new credit policy is

3/10, net 30, changed from 2/10, net 30, the timing of the payments may be known, however there may be uncertainty in the share of customers who will opt to pay under the new policy. Second, the timing of payments may change, i.e. the payment pattern. Furthermore, the volume of sales may shift for an uncertain amount, due to the influence the liberalization or tightening of the credit policy might have on the number of units sold. Finally, the changed credit policy might also influence the portion of sales that is never paid, i.e. the portion of bad debts. In case of changing the credit policy, these uncertainties may be handled by the decision maker, either by applying sensitivity analysis in simulating the possible results or by formulating policies that neutralize risk. The latter understands that in the case when uncertainty is associated with the timing of payments, such policy would require adjusting the payments over time so that the company is indifferent to when the payment is made (Sartoris & Hill, 1983, p. 357).

3.2.1.2 Payment terms and instructions

The selling company should include clear instructions on the preferred means of payment in the proposal. It is essential to agree on the payment terms as soon as at the order stage and also to make them very clear. Companies should define and specify the payment terms in writing and preferably obtain a written acceptance, in order to assure that customers' orders do not propose some other payment terms (Bruun-Jensen, 2009).

When deciding on the payment channels, it should be borne in mind that incoming funds should reach the bank account, which brings interest, as soon as possible. That is, the time gap between the moment when the customer makes the payment and the moment when the funds are good, meaning bearing interest on the company's account, should be shortened as much as possible (Dolfe & Koritz, 1999, p. 27). The settlement instruments and collection channels of a company can strongly affect its financial efficiency and cash flow position (Yiu, 2004).

Deciding on the collection channels or payment instruments resides on two opposite sides. On one side the company should offer as many collection channels as possible in order to provide the customers with several different payment options and thus ensure them with ease of payment. For example for a retail company that sells predominantly to individuals and small businesses, it is of essential importance to introduce credit card payment, notwithstanding the high costs of this payment channel. Especially today, when large portion of customers are struggling with their finances, providing the credit card payment option might be the only way to make sure the customers do in fact pay. Hence, adjusting the payment channels offered to customers can help reduce unpaid receivables (Tunon, 2008).

On the other side, some payment methods are less efficient than the others, such as paper based instruments, which take longer time to clear as a result of the float concept explained previously

(Yiu, 2004). Furthermore, accepting and supporting a broad range of payment instruments can cause difficulties in the management of accounts receivable and can present a barrier to the standardization of processes within the firm, as every payment channel has its own characteristics and requires a specific workflow (Cunningham, 2007). Again, a balance must be made between shortening the collection cycle, adjusting to customer needs and streamlining the accounts receivable management process, when choosing the means and channels of payment.

The most efficient means of payment are electronic transfers such as direct debits, credit card acquiring, and real-time gross settlement remittances. If a company can stimulate its customers to switch from paper based to one of the electronic payment channels, it can achieve a shorter clearing and processing cycle, thus accelerating the availability of funds and improving its cash position (Yiu, 2004).

When a customer makes regular payments to a company, it might be beneficial to use the direct debit as payment means, which means that the money is transferred from the customer's account to the company's account on instructions from the selling company (Dolfe & Koritz, 1999, p. 27). Direct debits bring about benefits to both sides of the payment process. To the selling company direct debit presents a cheap collection instrument, which substantially reduces the operational costs and speeds up the collection process, resulting in lower days sales outstanding (Belpaire, 2009). Furthermore, other benefits to the selling company are: payment made on the due date, improved cash flow forecasting, reduction of the credit time overdue, less reminder letters sent out, and simplified reconciliation (Dolfe & Koritz, 1999, p. 27). An important element of direct debits which generates better efficiency is the possibility to set up pre-determined collection dates. Instead of waiting for the customer to pay, the company can send a direct debit instruction to the bank with clearly defined due date. Knowing the precise dates of collections increases the visibility of cash flows, resulting in better liquidity management and lower credit risk (Belpaire, 2009). On the other hand, the benefits to the customer are that he would lose the risk of penalty interest and would not need to make sure that the payment has been made on the correct date (Dolfe & Koritz, 1999, p. 27).

Another payment method that should be sought whenever possible when considering the payment terms, is the advance payment. This goes especially for the case when large transactions are taking place or special orders are carried out for the customer, where capital is used to produce something that could be later on sold only to the customer who ordered it, and also for the cases when the selling company provides consulting services or sells products which are installed at the client's location (Dolfe & Koritz, 1999, p. 28).

3.2.1.3 Penalty interest and reminder fee

Another important aspect of the early stages of the Order to cash cycle is defining the consequences of not paying on the due date. Such is the penalty interest, whose goal is twofold: to prevent the customer from paying late and to compensate for credit overdue. Thus, the penalty interest should be set high enough to put off the customer from making late payments. Penalty interest is regulated by law and its utilization differs from country to country. It should be used in every case where it is generally accepted. When used, the penalty interest should be stated consistently in every document, from proposal, to order confirmation, invoice and possible reminder letters (Dolfe & Koritz, 1999, p. 29).

Reminder fee is the fee aimed at covering the administrative costs of managing the dunning processes. They are also regulated by law and differ among countries. If a company decides to charge reminder fees, they should also be stated in every document, the same as with the penalty interest (Dolfe & Koritz, 1999, p. 29).

3.2.2 Order and delivery

Every day that passes in the order process means that capital is employed those days. One extra day that merchandise spends in a warehouse or a production process, results in a one extra day in the receipt of payment funds from the customer. Also, fast and accurate order management does not only contribute to speeding up the release of capital, but it boosts customer satisfaction and increases sales as well (Dolfe & Koritz, 1999, p. 31).

First of all, the order should be compared in detail with the proposal, in order to make sure that the customer's specifications are in compliance with the terms in the proposal. If the order is different from the proposal in ways that are unacceptable, then the customer should be contacted immediately, because if the customer is not contacted, his silence can be legally interpreted as acceptance of the order (Dolfe & Koritz, 1999, p. 31).

Secondly, the information from the order must be communicated to every department involved in the sale process as soon as the order arrives in the company. Disorganized and inefficient communication procedures within the company can result in delivery delay, delay in invoicing, and consequently in payment delay (Dolfe & Koritz, 1999, p. 31).

One of the most frequent reasons for a customer not to pay the invoice on the due date is wrong product or service delivery. In contrast to timely execution of the order, poor delivery not only increases the capital employed, but it can also worsen customer relationships and affect future sales (Dolfe & Koritz, 1999, p. 32). That is why attention must be paid to the quality, accuracy

and punctuality of the delivery process. It must be determined whether the orders are fulfilled exactly as the purchase order from the customer specified, whether deliveries are timely made, to the correct address and without damage to the goods, and if inefficiencies are detected, actions to eliminate them must be undertaken (Cunningham, 2007). Setting clear time limits for order fulfillment will result in customers receiving their orders faster, reducing the number of disputes as well as lower days sales outstanding (Tunon, 2008).

3.2.3 Invoicing

Delays in payment collections are often the result of delays and errors in invoicing. The quality of the invoicing process is of essential importance, as it can manifest itself in many different ways and have amplified consequences and costly resolutions (Tunon, 2008). For example, ambiguous and incomplete invoice payment instructions can result in payment being sent to a wrong bank or with a wrong payment method, which effectuates late payment and consequently ends with lost interest on those funds (Dolfe & Koritz, 1999, p. 33). There are several aspects of the invoicing activities that need to be considered in order to achieve faster collections:

- **Time and frequency of invoicing** – Invoicing should always be performed on the day the delivery is made and the invoice date should be the same as the delivery date. It should be performed on a daily basis (Dolfe & Koritz, 1999, p. 33). However, when deciding on the frequency on invoicing, the first thing that needs to be considered is the current situation. i.e. how much time passes between shipping and mailing the invoice. Then it needs to be decided whether more frequent issuance of invoicing will be appropriate, and whether the costs incurred thereupon can be outweighed by the gains of receiving the funds sooner (Cunningham, 2007).
- **Invoice accuracy** – improving the accuracy of invoices can provide substantial benefits to a company. Correct and precise invoices are paid relatively quickly, whereas a disputed invoice will not be paid, and it usually takes from 30 to 90 days to resolve the invoice discrepancy and receive payment. Usually, more than 25 percent of invoices will contain discrepancies, so the positive impacts on a company's cash flow from improving invoice accuracy are obvious (Srivastava, 2005). That is why special attention needs to be paid to clearly specifying the goods or services that are subject to invoicing as well as the customer's order number (Bruun-Jensen, 2009).
- **Invoice design and content** – printing the payment terms on an easy-to-understand invoice, together with mailing it on time and clearly stating the penalty of not paying timely, can also help in prompting the debtors (Bruun-Jensen, 2009). Regarding the content of the invoice, it should be made sure that only the necessary information is presented and in a logical and easy to find way, in order to avoid any confusion (Dolfe & Koritz, 1999, pp. 35-36).

Another enhancement which companies are increasingly starting to use is electronic invoicing. Electronic or also called e-invoicing, “is the creation, exchange, receipt, processing and archiving of invoices by electronic means” (Treasury Today, 2009, p. 15). Custom paper invoices are costly and time consuming, as they take up time to process them, they need more time to reach the customer, consequently resulting in payment delays (Tunon, 2008). Electronic invoicing enables the company to electronically present the invoice on the web, where the customers can see the invoice, make an argument, agreement or disagreement, and even settle it online. Furthermore, the information obtained from the electronic platform can be applied for reconciliation, thus reducing the manual endeavor for acquiring data (Yiu, 2004).

Many companies today employ some e-invoicing solution, as they bring numerous benefits such as: accelerating the whole invoicing process; reducing processing costs for both sides of the sale process; reduced manual data entry, which consequently leads to less errors and delays; quicker approval process; enabling staff members to focus on other tasks; easy and instant access to important management information; better visibility of cash flows; improved cash flow forecasting and treasury decision making; strengthened relationships with suppliers, as invoices are settled more quickly and so are enquiry resolutions (Balasubramanian, 2009, pp. 3–4).

3.2.4 Receipt of payment

In a perfect world the selling and buying party should mutually agree on the most cost efficient payment method, taking into account the fees, float and administration. Timely settling of accounts is beneficial to both sides of the selling process, because it reduces the need for reminder letters and the risk of jeopardizing the seller-customer relationship. The data on payment receipts should be regularly analyzed, as statistics on payment behavior and habits of certain customers can be later on used in negotiating payment terms with them (Dolfe & Koritz, 1999, p. 38).

3.2.5 Dunning procedures

As already mentioned, the goal of dunning procedures is to reduce the net outstanding customer debt amount, by prompting the customer, demanding payment, and finally forcing the customer to pay no later than the due date. These procedures are different in different countries, however their sequence can be summarized as follows:

1. When the due date is coming close, and especially for the cases when high amounts are in question, some companies take the habit of contacting their customers, to remind them for the payment and to make sure that the payment is on the way. This could be done by telephone, fax or mail (Dolfe & Koritz, 1999, p. 41).

2. If the payment hasn't arrived even after the due date, then the company should make immediate contact with the customer to ask for payment settlement and to make sure that the customer understands the consequences of not paying (Bruun-Jensen, 2009). When a payment is a few days late, this is done by sending a reminder letter, and if the delay is longer, a phone call should be made (Dolfe & Koritz, 1999, p. 41).
3. Finally, if the payment is not effectuated even after the reminder letters and phone calls, it is paramount to have set up efficient procedures for taking legal action. This is usually outsourced to third party agents, like collection agencies (Dolfe & Koritz, 1999, p. 44).

Every company should have a devised policy on when to start sending reminder letters, when to start calling customers, and finally when and whether to take legal action. The structure of dunning procedures depends on the nature of business the company is in. If a company has only a small number of invoices, the most efficient procedure may be telephone calls. However, if the company deals with a large number of invoices, fully automated procedures are more appropriate. Furthermore, dunning procedures should be done regularly, preferably daily (Dolfe & Koritz, 1999, p. 41).

Centralization of accounts receivable

A shared service center is a unit within the company which serves several other business units. The funding and resources of the unit providing the services are shared among the user units, consequently the unit providing the services in effect transforms into an internal service provider. Even though shared service centers were initially used for account payable processing, companies today realize that concentrating accounts receivable can also bring multiple benefits and efficiencies to the company (Tunon, 2008). Centralizing accounts receivable resides on standardization and rationalization of processes, thus resulting in efficiency increase, economies of scale and cost benefits. The information on the order-to-cash cycle is also centralized, and the company gains a macro view of the whole process (Cunningham, 2007). That way, the treasurer is in the position to monitor the collection process from beginning to end in comparison to the previous situation where collections were managed on a local level and the treasury did not have a good insight into the whole process (Dean, 2006). This macro view enables the treasurer to proactively identify which business lines or subsidiaries are badly performing, to establish and coherently communicate to all units involved, a policy that would bring discipline by defining the payment terms, invoice scheduling (minimizing time between order fulfillment and invoice rendition) and tracking late receipts (Cunningham, 2008). All in all, centralizing accounts receivable reduces costs as a result of the achieved economies of scale and contributes to a significant decrease in days sales outstanding (Tunon, 2008).

3.3 Controlling payments

When devising the cash disbursement system of a company, or the Procure to pay process, the accent is placed on controlling and slowing down the outflow of cash the longest possible without jeopardizing or worsening the relationships with suppliers (Pinches, 1997, p. 673). The basic principle regarding payments is that they should be made at the right time, i.e. on the due date. If the invoice is paid before the due date, that increases the capital employed and causes interest cost or reduces the interest income. On the other side, payment must not be made after the due date as that might incur penalty interest, reminder fees, handling reminder letters, and finally, worsening supplier relations or bad reputation (Dolfe & Koritz, 1999, p. 48). Further consequence is that increased inquiries and complaints from suppliers may negatively affect the productivity of accounts payable staff and it also may result in delayed delivery of goods or services (Sommerville & Maritz-Rakesh, 2009). However, as will be shown later, today the situation is a bit different, as in time of credit crunch companies are urged to pay their invoices early in order to capture the discount from suppliers.

Today, more than ever, companies acknowledge and strive for the benefits of an improved Purchase to pay process. Here, as was the case with the Order to cash cycle, the management procedures that are applied, in effect translate into procedures for managing accounts payable, which is why managing purchase to pay process and managing accounts receivable will be used with the same meaning throughout the rest of the thesis.

The prolonged economic slowdown has made treasurers focus their attention on the efficiency of business operations as a source of potential savings. Improving the accounts payable process is progressively becoming a crucial function for optimizing the cash flow of the company (Quibria, 2009).

The rationalization and improvement of the Purchase to pay process brings numerous benefits at both operational and strategic level. At the operating level such are: lower processing costs for both paper and electronic invoices, better visibility of the entire process and thus better internal controls, lower operational risk of fraudulent invoices, reducing the risk and cost of paying invoices twice. At the strategic level, the rationalization of the Purchase to pay process enables the company to release substantial value from the financial supply chain, because it: speeds up the correct matching and approval of both paper and electronic invoices, it optimizes the management of working capital as a result of increased visibility of the whole process, it enables the company to capture payment discounts, thus incurring lower costs to the buying company, and finally it facilitates improved cash flow for suppliers as well (Bottomline Technologies, 2006).

Before delving into each step of the Purchase to pay process and their related cash management techniques, one important aspect of the accounts payable management needs to be presented, namely the automation of accounts payable. A study done in 2008 by CFO Research Services in collaboration with Ariba, revealed that financial executives perceive technology and process improvements as best ways for achieving higher efficiency in the accounts payable process (Hofler, 2008). Accounts payable automation solutions rationalize and streamline the process from invoice receipt to payment, by making the conversion of paper invoices into digital images possible, by storing them in a web enabled database, out of which they could be easily and quickly retrieved, and also necessary data for better approval processing can be easily and quickly extracted (Buehler, 2008). The potential advantages of increasing the level of automation in the Purchase to pay process depends on how much of the manual element of each sub-process can be removed or de-skilled (Darch, 2004). Accounts payable automation brings very important benefits (Buehler, 2008):

- **Improved efficiency** – the imaging of invoices and their archiving solutions lead to a quicker transaction research, faster resolution of discrepancies, and shorter response time to supplier enquiries, because invoices are easily and quickly retrieved from an electronic warehouse and not from a paper filing cabinet. Furthermore, the efficiency in accounts payable processes is improved by removing paper at the point where it steps into the company. Electronic converted invoices enter the processing line more quickly and thus their approval can also be accelerated.
- **Reduced costs** – first of all, the automation of accounts receivable brings down the costs related to document storage and retrieval, as the invoices are kept in an electronic format, and thus the need for long term storage space is eliminated. Furthermore, it eliminates late payment penalties and enables the capturing of early payment discounts, thus contributing to maximization of working capital as well.
- **Secure storage of invoices** – the web based invoice warehouse represents a safe storage for invoices and it supports company policies and legal requirements for document preservation and disposal. Instantaneous access to invoice images facilitates the reporting and analysis processes, which further translates into an improved speed and accuracy of decision making, backed up by easy-to-access and accurate information.
- **Compliance management** – accounts payable automation permits adherence to regulatory requirements and control over the costs of compliance initiatives at the same time. Companies that need to comply with certain legal requirements on a departmental or project basis are now acknowledging the advantages of a centralized approach, where the information on different compliance requirements is organized, managed and stored centrally.

Thanks to its far reaching benefits, accounts payable automation is expected to develop and grow rapidly in the coming years. More practical views of the automated accounts payable processes will be shown within each step of the Purchase to pay process described in following chapters.

3.3.1 Proposal

Since all the payment conditions are agreed within the proposal stage, this stage represents a very important element of the purchasing process. If something is excluded or forgotten at this point, subsequent stages of the disbursement process may be affected. The most important aspects of the proposal stage are explained in following paragraphs (Dolfe & Koritz, 1999, p. 49).

3.3.1.1 Credit terms

Every company should have an established policy and instructions about which payment and credit conditions should be looked for at different categories of purchase. Furthermore, these should be communicated and should be well known by everyone who is involved in the purchase process. The basic principle in a purchasing negotiation is that the longest credit terms should always be asked for, as long as prices and other conditions remain the same. The initially proposed credit terms by the supplier should never be accepted at first, as there might be room for negotiating more favorable terms. Obviously, it is most important to arrange favorable credit terms with the largest suppliers (Dolfe & Koritz, 1999, p. 49). Furthermore, companies need to make sure that the benefits from ensuring extended credit terms are not outweighed by costs that might be incurred from lost discounts or the risk of losing one's reputation and credibility with suppliers (Bergen, 2006).

The automation of accounts payable can contribute to attaining better credit terms from suppliers without stretching the payments. Namely, paper based processes often end up with unpredictable and late payments, whereas the automated processes provide predictable payment timeframes. If the suppliers are paid on time and accurately, supplier relationships are improved and strengthened. This can eventually result in extended payment terms, enabling the company to hold on to cash longer and take advantage of the improved cash flow (Sommerville & Maritz-Rakesh, 2009).

3.3.1.2 Cash discounts

Early payments or cash discounts give an incentive to companies to pay early and realize an appropriate return depending on the credit terms offered. It is especially emphasized nowadays, in time of restricted credit activity, when companies concentrate on saving every cent. Taking the

early payment credit provides significant cash flow improvements and frees up trade credit limits (Bottomline Technologies, 2006). It also represents a good use of surplus cash (Ellis, 2006).

If the credit terms offered are 2/10 net 30, meaning that the buyer can realize a 2% discount if he pays the invoice within 10 days, then according to the following formula (9) he achieves a massive annualized return of 36.7 %.

$$\text{Effective annual interest rate} = \text{Discounted amount} / (\text{Discounted price}/100) * 360 / N \quad (9)$$

Where 360 = days in the fiscal year and N = number of days between the discount date and the final payment deadline (Sommerille & Maritz-Rakesh, 2009). Following is a list of effective annual interest rates for the most common credit terms:

Table 1. Effective annual interest rates for common discount terms (in %)

1/10 net 30 =	18.2
1/10 net 45 =	10.4
1/10 net 60 =	7.3
2/10 net 30 =	36.7
2/10 net 60 =	14.7
2/20 net 90 =	10.5
3/10 net 30 =	55.7
3/10 net 60 =	22.3
3/20 net 90 =	15.9

Source: G. Sommerville & S. Maritz Rakesh, Unlocking all the cash, 2009.

However, none of those returns is possible if the time for processing invoices is too long or if there is a lack of visibility into accounts payable discounts that are becoming due, whereby both problems are present with paper based invoices (Sommerville & Maritz-Rakesh, 2009). Unfortunately that is the case in many companies, as their accounts payable departments are not adequately structured to make use of the favorable terms and they require more than ten days to process and approve the invoice, resulting in foregone discounts. That is why the urge to unlock the value hidden in cash discount is one of the primary motives for improving the efficacy in processing paper and electronic invoices (Bottomline Technologies, 2006).

The automation of accounts payable can contribute to attaining the favorable credit terms by facilitating better and faster invoice processing. Furthermore, accounts payable automation has the option of prioritizing invoices, so that the parties involved in the invoice processing and approval know which invoices need to be processed by when in order to capture the discount.

Some of the more advanced automation solutions offer the possibility for alerting the approvers of invoices with e-mail reminders to prevent late payments. Also, some solutions have the option for attaching supplier information, including supplier contracts, which helps to determine the contract compliance as the payment terms in the contract can be easily examined for discount information. Such an automation solution that speeds up the invoice processing cycle and on top of that pursues and sends reminder letters for approaching discounts, can provide real value, as every negotiated discount can be used and significant funds can be saved. Finally, the shorter cycle times can produce substantial cash savings as the late payment penalties will be reduced. If the cycle time is shortened, if invoices are prioritized and alerts and reminders are in place, late payments can be virtually eliminated (Sommerville & Maritz-Rakesh, 2009).

Whether the cash discount will be taken or not depends on the need for cash in a company, its need for working capital and the company policies. Whatever the decision, the accounts payable automation and the efficiency in invoice processing and increased visibility it provides, introduces the way for achieving optimized cash flow management (Sommerville & Maritz-Rakesh, 2009).

3.3.1.3 Payment method, invoicing fees and penalty interest

Regarding the payment method, the first thing to do is check whether the supplier has asked for any particular method and if that method is acceptable to the company. If it is not, then the supplier must be contacted immediately and informed about the method the buying company prefers (Dolfé & Koritz, 1999, p. 51).

In order to avoid invoicing fees, administration fees etc., the proposal should be thoroughly examined and if such provisions are stated in the proposal, their removal should be demanded (Dolfé & Koritz, 1999, p. 51).

Also the penalty interest should be checked against the ones that are stated by law and if discrepancy exists, a reduction of the interest rate should be negotiated (Dolfé & Koritz, 1999, p. 51).

3.3.2 Order

When the proposal is accepted, the buying company sends a purchase order to the selling company, after which an order confirmation is received from the selling company. The purchase order has two main functions. First, it gives the buying company information about the details and financial commitment of an authorized purchase in a standardized form. Second, it gives the supplier official instructions for the supply of products or services. The purchase order represents

an authoritative basis for comparing and matching invoices and deliveries. It thus becomes the main controlling factor in the entire Purchase to pay process and in the following supplier payment (Darch, 2004).

As the purchase order has such an important role in controlling payment, its precision, accuracy and punctuality become key factors for improving the efficacy of the entire Purchase to pay process and lowering the processing costs of all following actions. That is why the production of purchase orders must provide detailed, precise and clear information about the purchase. If any of that is omitted, there is a risk that someone in the supply chain will misunderstand what is required, or result in wrong delivery or billing information (Darch, 2004).

Technology and automation can bring improvements here as well. Namely, the purchase order can be sent electronically to the supplier, where the whole document can be directly input in the supplier's enterprise resource planning application. This gives the supplier the possibility to instantly continue with the order fulfillment, without the risk of misquoting or misunderstanding what is required (Darch, 2004).

With the order confirmation or order acknowledgement the supplier affirms that he has received the purchase order and that he can meet the delivery requirements. Once received the order confirmation should be checked whether its information is consistent with the order. A standard procedure should be in place for controlling the order confirmations (Dolfe & Koritz, 1999, p. 51).

Having automated the purchase delivery process, it should be further sought that the supplier too delivers his order confirmation electronically (Darch, 2004). That should further facilitate easy comparison with the purchase order. Furthermore, the supplier should be encouraged to electronically send advance shipment notices, which include the details of an approaching delivery. It is usually sent 24 hours before the actual delivery. Automating the advance shipment notice delivery and its matching against the purchase order accelerates the receipting process and also alerts the supplier if there are some delivery errors (Darch, 2004).

3.3.3 Receipt of goods

When the delivery arrives at the company, that is, when the company has access to the goods, the first thing to do is check whether the delivery is timely, complete and consistent with the purchase order. If any inconsistency regarding quantity and quality of goods is determined, appropriate compensation should be demanded immediately (Dolfe & Koritz, 1999, p. 52).

This element of the Purchase to pay process is the most difficult to automate, as most often a person needs to determine that the goods or services have been delivered, and to determine their quantity and compliance with what was ordered. However, some improvements can be achieved if the suppliers' advance shipment notices have been electronically sent and matched against the purchase order. By delivering high-quality information before the actual delivery, advance shipment notices accelerate the receipting process (Darch, 2004).

3.3.4 Invoice

The next step in the Purchase to pay process is matching and validating invoices. It is important to have established well functioning procedures for invoice management. They should include (Dolfe & Koritz, 1999, pp. 53-54):

- **Receipt of invoice** – upon arrival in the company, the invoice should be stamped with that date and entered into the accounts payable ledger immediately, as it might be important for VAT reclamation.
- **Invoice control** – the received invoice should be matched against the conditions stated in preceding documentation. If any extra fees are added, they should be excluded from payment as they were not previously agreed.
- **Payment authorization** – one of the most common reasons for late invoice payment is their late authorization. Very often invoice authorizers handle invoices once a week or maybe even less frequently. If invoices were authorized on a daily basis, late payments and penalty interests can be significantly reduced.

Here, modern technology and the automation of the accounts receivable process provide opportunities for achieving significant improvements. Namely, whether the invoices are received electronically or in paper format and then converted into an electronic format, at their very entrance into the company, they are automatically matched against the purchase orders at a line level. If the invoices lack a purchase order number or have material differences, they are directly rejected back to the supplier. In that way, by filtering out the evident errors, the buying company handles only invoices that are in compliance with purchase orders or have only minor discrepancies that need to be resolved. Electronically matching invoices against purchase orders provides enormous opportunities to save effort, time, risk and costs from the invoice handling process (Darch, 2004).

3.3.5 Due date and payment

Every company should have a determined rule for calculating the due date of an invoice, as it must be known without any ambiguity. Regarding the timing of the payment the basic rule is to pay the invoice on the due date (Dolfe & Koritz, 1999, pp. 56):

From a cash management perspective it is of high interest to observe which days of the week payments are made. Because, if the payment is supposed to be realized on a Friday, than the company will not earn interest on those funds over the weekend and the beneficiary will only make use of them on the following Monday. In the mean time, the bank will earn interest. That is why it is common to effectuate Friday payments on the following Monday, whereby the funds will receive value on the account of the beneficiary one day later, but the paying company will keep their funds on an interest bearing account for three more days (Dolfe & Koritz, 1999, p. 57).

Regarding the payment method the basic principle is to choose the method which allows the company to keep its funds on an interest bearing account for as long as possible, at the same time taking into account its administrative costs and fees. Most commercial payments will be made as bulk payments, that is, via ACH clearing systems, which have one or several float days. These payments are characterized with high efficiency and moderate bank fees. Payments to suppliers should be made with same day value, which are characterized with higher fees and less automated processes (Dolfe & Koritz, 1999, p. 57).

Technology provides possibilities for improvements in the payment processes as well. Namely, here technology offers the option for an internet based payment platform, which is a secured web-based electronic invoicing and payment information system which provides a centralized location to view all transactions in the purchase-to-pay process. If the company has the option for electronic payments coupled with an internet based payment platform, it can reap significant benefits such as (Bahl, 2008):

- increased ability to arrange, validate, approve and send clear payment instructions to banks,
- increased visibility and control necessary to make efficient and cost effective payments,
- managing all payments from one place, including multicurrency payments,
- increased visibility into payment acknowledgements.

3.4 Efficient short-term investing of cash surpluses

One of the techniques of cash management represents efficient investing of cash surpluses, which are supposed to be predicted within the cash forecasting technique. What is understood by efficient investing depends on the size of the company and the available tax relieves (Mramor,

1993, p. 303). Every company, once in a while, is required to hold and invest surplus funds, which might have arisen from different reasons, either from regular operations (for example from seasonal asynchronization between cash inflows and outflows), or irregularly (a onetime cash injection preceding an investment project) (Punter, 1982, p. 329). If the company has an efficient cash forecasting technique in place, it should be able to provide the cash manager the information on the amount, currency and location of the cash funds which are in excess of the daily requirements and also, on the next point in time when the cash will be needed. Based on that, the cash manager has to make the most appropriate decision for investing those surplus funds (Hughes, 2008, p. 111).

The most fundamental considerations, which need to be taken into account when making the short-term investment decision are the following (Hughes, 2008, p. 111):

- **Security** - meaning that the investment asset should provide low risk that the principal will not be recoverable.
- **Liquidity** - the aspect that the investment assets should be quickly transferrable into cash.
- **Return** - it should also bring appropriate return given the other factors.

While the emphasis placed on each factor depends on the company's attitude towards risk, the most fundamental one in making the investment decision should always be the security factor, followed then by liquidity and return. The treasurer's primary responsibility is to act as a custodian of the company's cash. Thankfully and as a result of the recent financial turmoil, treasurers are again realizing the importance of security, after they lost sight of that objective and placed their short term investments into overly aggressive portfolios in order to gain better returns on their cash (Nygren, 2008, p. 34). In addition, each instrument should be analyzed for its creditworthiness and price stability, interest rate or yield, its maturity, transaction costs, and any penalty fee or reduced interest rate if the fixed term instrument is sold before maturity (Punter, 1982, p. 329).

As already mentioned and as a result of the recent financial turmoil, the composition of today's corporate short term investment portfolios shifts towards being mostly conservative, with bank deposits and sweep off accounts taking up the most part (Nygren, 2008, pp. 36). The most common short term investment instruments, which will be discussed in following paragraphs, can be divided into two broad groups, namely instruments that are issued by banks and money market instruments.

The most important **instruments issued by banks** are: deposits, certificates of deposit, sweep accounts and bankers acceptances.

Bank deposits are a convenient option for the investment of excess cash. They can be overnight or call deposits, or term deposits. Overnight or call deposits are investment accounts at banks which offer investors the possibility to access the funds at any time, thus providing a high degree of flexibility and liquidity (Hughes, 2008, p. 111). Time or term deposits offer a fixed rate over a fixed period of time during which the funds cannot be withdrawn unless a penalty interest is paid (Allman-Ward & Sagner, 2003, p. 104). They offer higher rates than the overnight deposits, however they are less liquid. The rates for deposits, especially for overnight deposits, might not always be optimal (Hughes, 2008, p. 111).

Certificates of deposit are “instruments issued by banks certifying that a certain amount of money has been placed on deposit for a fixed time period” (Parkinson & Kallberg, 1993, p. 273). The certificates provide a fixed coupon rate and they can be also traded on the money market, thus ensuring enhanced liquidity to the investor, because he can realize the investment by selling it on the secondary market (Hughes, 2007, p. 101).

Sweep off accounts have particularly gained attention in the past ten years. They represent a cash management service which automatically connects a corporate demand deposit account with an investment account, and without intervention from the company it adjusts the funds on the depository account to a predetermined target level by transferring funds to and from the investment account (Cantillon & Chrystal, 2009). The most commonly used type of sweep account is the same-day sweep account, where the funds are moved to the investment account on the same day. There is also a next-day account, where the bank determines the amount of funds on the deposit account on the next day and invests those funds (Parkinson & Kallber, 1993, p. 274). The sweep accounts are very convenient to the investor as they provide an easy and automated way to invest the excess cash in a variety of instruments (Cantillon & Chrystal, 2009). Most common users are companies that have surplus cash at the end of the business day, as well as small companies that do not have an active investment program in place (Parkinson & Kallber, 1993, p. 274). The rate earned on sweep accounts is rather low, reflecting the very short term of the investment and the late notice (Allman-Ward & Sagner, 2003, p. 105).

A banker's acceptance represents a bill of exchange or a time draft drawn on and accepted by a bank which arises from a commercial trade transaction. A banker's acceptance arises when a time draft drawn on a bank is accepted by the bank, meaning that the accepting bank takes the obligation to pay the draft holder a stated amount on a specified date (Comptroller's Handbook, 1999). They are usually used to facilitate loans between importers and exporters. The holder of the acceptance can choose to hold on to it until maturity date or he can sell it on the secondary market at a discount plus a commission. The buyer of the instrument then receives the full amount from the accepting bank on the specified date (Parkinson & Kallberg, 1993, p. 274).

Money markets offer a variety of negotiable instruments in addition to the previously mentioned instruments. By placing cash directly with the money markets companies can obtain better rates of return. The fact that money market instruments can be easily and quickly realized on the secondary market makes them flexible and liquid instruments, thus they represent an attractive option for excess cash investing. However, notwithstanding their advantages, when making money market investments, treasurers should thoroughly and carefully analyze the credit quality of the counterparty in the transaction and the instrument issuer (Hughes, 2008, p.111). In addition to the already explained certificates of deposit and banker's acceptances that are traded on the money markets, the most common instruments used for investing the surplus cash are commercial paper, government securities and repos.

Commercial paper is an unsecured short-term promissory note issued by a corporation or a financial institution as evidence that funds have been lent to them. They are issued at a discount and usually have maturities up to 12 months (Hughes, 2007, p. 101).

Treasury bills are instruments issued by governments at a variety of maturities and as such they offer low credit risk and exceptional liquidity as a result of the constant trading. They are issued by auction and after that, they are traded at discount from their face value (Hughes, 2007, p. 101).

Repurchase agreements or repos are transactions between a dealer and an investor, whereby the dealer sells a security to the investor but with the agreement to buy the security back on a specific date in the future and at a predetermined price (Allman-Ward & Sagner, 2003, p. 106). For the case of short term investing companies use reverse repos. Reverse repos represent the situation when a security is bought from a third party with a simultaneous agreement to resell the security to that party at a specified time in the future. That way, this process has the economic effect of lending money to a third party, whereby the loan is secured by the security that is subject to the reverse repo. If the other party defaults, the company has the security at its disposal and it can sell it to recover the loan. That way the credit risk is borne by the issuer rather than to the counterparty in the reverse repo. With the goal to reduce the credit risk, government securities are usually used in this kind of transactions (Hughes, 2007, p. 101).

Liquidity or money market funds represent a further option for short-term investing which has been gaining momentum in Europe in the past years, despite the recent turbulences seen in the crisis, as treasurers increasingly seek diversification and risk mitigation through passive investing (Nygren, 2008, p. 36). They are specialized funds that invest in money market instruments on behalf of their clients. The benefits of using such a fund to the investing company are the following:

- **Security** – money market funds are in the position to diversify the credit and other risks by placing the multiple investments into a large portfolio comprised of different assets, as they have the size and reach to accomplish that (Nygren, 2008, p. 36). By utilizing liquidity funds treasurers gain access to higher credit quality instruments than they can achieve through their in-house cash management (Hughes, 2008, p. 107).
- **Attractive yields** – the largest and most competitive money market funds can offer attractive yields (Nygren, 2008, p. 36).
- **Simplicity** – by utilizing liquidity funds, treasurers outsource their responsibilities regarding managing counterparties and placing and rolling deposits to professional investment manager. Thus, the treasury staff is freed to concentrate on other more value added responsibilities (Hughes, 2008, pp. 107).
- **Convenience** – money funds have become a convenient investment option as they can be accessed easily through both proprietary and nonproprietary online portals. Furthermore, most money funds will offer their clients to make purchases or withdrawals later in the day, when the clients' cash positions will be known with more certainty (Nygren, 2008, p. 36).

When choosing the money market funds, the most important considerations cited by companies are whether they can be accessed through the company's lead bank and also, the underlying instruments of the fund. This arises as a consequence of the financial crisis where securities and funds were not properly understood, so now treasurers are being rigorous in assessing the underlying composition of their investments (Nygren, 2008, p. 37).

3.5 Economical financing of cash shortages

One of the most important responsibilities of the cash manager is to make sure that the company has sufficient unused funding resources at its disposal for the need of covering unanticipated and temporary shortfalls in working capital (Allman-Ward & Sagner, 2003, p. 111). As will be shown, if the cash manager is backed up by efficient cash forecasting system, he would be in position to timely and in advance negotiate favorable terms on financing resources offered by potential financiers, and, when the need arises, to choose the most favorable one (Mramor, 1993, p. 303). The borrowing need will be determined by seasonal factors, timing of cash flows as well as by the general economic conditions. When arranging for adequate borrowing funds, the cash manager has to make sure that their costs are reasonable and that the terms are not burdensome with regard to restrictions and covenants. As there is a large number of choices for funding, choosing the most appropriate one will depend on the concrete requirements and use of the funds (Allman-Ward & Sagner, 2003, p. 111).

The large number of short term borrowing instruments, among which the cash manager can choose, can be classified in three broad groups: bank sources, money market sources and other

(Parkinson-Kallberg, 1993, p. 237). In following paragraphs some of the most commonly used instruments will be presented.

Bank sources represent the means by which banks can provide short term debt to companies. Within the cash management function, mostly used bank sources are lines of credit and overdrafts (Parkinson & Kallberg, 1993, p. 237).

Line of credit is a form of borrowing facility where the borrowing company has access to a specified amount of money over a specific period of time. Its cost is determined by several factors, mostly by the banks assessment of the borrower's credit worthiness, the overall level of interest rates, as well as on the type of credit line (Allman-Ward & Sagner, 2003, p. 112):

- **Committed or uncommitted line of credit.** Committed credit line is an agreement between the bank and the borrower which has a fixed maturity and a commitment from the bank that it will provide the funds on the company's demand up to the prespecified maximum amount and as long as the borrower meets all the terms and conditions from the agreement (Parkinson & Kallberg, 1993, p. 237). Uncommitted credit lines are less formal agreements, where the lender has no obligation for ensuring the funds when requested and the withdrawal can be made any time without prior notification. An uncommitted line is less expensive than the committed one, which usually incorporates a commitment fee payable no matter if the line is used or not (Allman-Ward & Sagner, 2003, p. 112).
- **Unsecured or secured.** If the lender wants to reduce the assessed credit risk of the borrower, and thus the cost of the line of credit, the lender might ask for some form of collateral, for example the company's accounts receivable. Unsecured credit lines are uncollateralized and as such are more expensive (Allman-Ward & Sagner, 2003, p. 112).
- **Revolving line of credit.** Within the revolving line of credit the borrower can repeatedly draw and repay amounts up to the credit limit during the loan duration. (Allman-Ward & Sagner, 2003, p. 112). Here, the bank also has the obligation to provide the funds when requested, for which it collects a commitment fee (Brigham & Daves, 2004, p. 728). This increases the cost of the credit line.

Overdraft is a borrowing facility that is structured like an informal credit line. The company pays interest on the withdrawn amount that exceeds the available balance. The overdraft is a very convenient way of borrowing, largely used in Europe and it is usually more expensive than other more structured sources of financing (Parkinson & Kallberg, 1993, p. 237).

Money market instruments are obtained by accessing the money market directly. However, this direct access is only possible for large and creditworthy companies, whereas other companies can

enter the money markets through special devices such as securitization (Parkinson & Kallberg, 1993, p. 237).

Commercial paper is the most important short-term source of credit obtained on the money market. As already mentioned, commercial paper is a promissory note issued for a specific amount with a specific maturity (ranging from 1 to 270 days). Only companies with sufficiently high credit rating can issue commercial paper. Commercial paper can be publicly traded or privately placed. They are usually sold at discount, and the issuer is obligated to pay the face value of the security on the maturity date. The cost of commercial paper comprises the interest rate paid, broker/dealer fees and the expense for any credit enhancement such as a standby letter of credit (Allman-Ward & Sagner, 2003, p. 113)

Other sources represent an addition to the previously explained sources of financing and they arise from trade credit and different methods of asset based financing (Parkinson & Kallberg, 1993, p. 237).

Trade credit represents a large part of corporate short term debt. It is a spontaneous source of financing as it stems from the ordinary course of business (Brigham, 1999, p. 640). Trade credit arises when the buying company has been offered certain credit terms which include a discount. The nominal cost of trade credit can be calculated by using the formula (8). Usually this is an expensive source of short term funding (Parkinson & Kallberg, 1993, p. 237).

Asset based borrowing is utilized when unsecured lending is not possible. Normally, the lender will finance only a percentage of the assets' value. There are typically two types of asset backed financing: accounts receivable and inventory.

Accounts receivable can be subject to asset backed financing through two types of processes: receivable securitization and factoring.

Receivables securitization is utilized by large companies which have high levels of receivables outstanding and good credit ratings. Within this process, the company sells its receivables to a bank, which will securitize them using a special purpose vehicle and then sells bonds backed by those assets to institutional investors. Thus the company receives a guaranteed amount of money (Dean, 2006). Even though special purpose vehicles were one of the reasons for bursting the credit bubble, analysts expect that securitization as a source of financing is here to stay, even though the markets will significantly shrink as stricter regulation will make the structures more expensive and the capital charge more cumbersome for issuers, investors and originators (Monga, 2010).

Factoring is the process where receivables are sold to a factoring firm, which pays a specific amount for the receivables and then collects them on the company's behalf (Dean, 2006). This could be done with or without recourse.

- **With recourse.** Here the risk of default by the customer is borne by the borrowing company. If the customer defaults, that part of the loan is a liability to the borrowing company. Within this type of factoring the cost is low because the company bears all the risk. The factoring company usually pays ca. 95 % of the value of the receivables, collects the 100% value from the paying company and keeps the difference as a fee for the loan (Allman-Ward & Sagner, 2003, p. 113).
- **Without recourse.** Here, the risk of default is accepted by the factoring company. Thus the effective cost of the loan is significantly higher as the risk for the company is non existing (Allman-Ward & Sagner, 2003, p. 113).

Even though factoring was primarily considered a financing source for small and medium sized companies, it is now also broadly employed by large corporates and is called receivable financing. It is a very convenient and efficient source of financing, as the company is using its own short term assets to obtain financing instead of pledging some other collateral (Zekkar, 2009).

Inventory financing is the case where inventory is pledged as a security for the loan (Allman-Ward & Sagner, 2003, p. 114).

Choosing the source of short term financing

The decision on which source of short term financing should be employed should be based on four factors: matching, availability, flexibility and cost. The matching principle pertains to the risk the company is willing to take in financing its short term assets with short term liabilities. The availability of credit affects the choice of short term financing source in such a way that if unsecured loan or commercial paper issuance is not obtainable, some type of secured means will have to be utilized. Availability pertains to the amount of the loan as well as to the conditions attached to it. Cash managers need to consider both features in order to be able to assess the short term financing sources over time. Flexibility pertains to the ability of the firm to renew or increase the loan, after it has been paid off, as well as to the ease of securing or increasing the financing on short notice. With factoring, bank loans and lines of credit, the company can pay off the borrowed amount when it generates surplus funds. Also, a line of credit can be easily and quickly increased, which is not the case with a negotiated term loan, where this could take longer (Pinches, 1997, p. 750).

The cost of borrowing is determined by several factors, which every cash manager has to take into account when assessing the total cost of the short term debt, namely (Allman-Ward, 2003, p. 111):

- Credit risk – the interest rate offered by the borrower will depend on his assessment of the risk of default of the lender.
- Rate basis – loans are often priced as a certain spread over some index rate, such as LIBOR (London Interbank Rate), Euribor (Euro Interbank Offered Rate)...
- Fixed or variable interest rate – whether the interest rate of the loan will be fixed or variable depends on expected current and future market conditions, as well as on the maturity.
- Tax basis – the interest that is paid on the loan is usually deductible from taxable income, thus in effect the overall cost of debt is reduced.
- Annual basis – the annual basis can be 360 or 365 days, whereby the 365 basis results in higher cost of debt.
- Maturity – within the normal yield curve conditions, longer term debt results in higher costs to the borrower.
- Discount or interest bearing – discount instruments offer less available funds at the beginning of the loan period, but end with an equivalent amount of interest paid over the instrument's life.
- Secured or unsecured – secured borrowing results in lower fees.
- Credit enhancement – if a back up line of credit or a standby letter of credit is added, it would significantly increase the costs of financing.
- Credit rating – the cost of the credit evaluation is borne by the issuing company.
- Other fees and costs – many instruments have additional fees and costs, and also some banks may require from the company to keep an interest free compensating balance at the bank.

In addition to the above stated direct costs, the opportunity cost of borrowing needs to be taken into account when evaluating the sources of financing. For example, if a firm expects a prolonged need for financing, it would be in its interest to maintain good relationship with its banks, even though it sometimes means accepting higher interest rates. Also, if stretching the trade credit occurs continually, supplier relations might be jeopardized and the company's credit rating may suffer (Pinches, 1997, p. 750).

3.6 Cash pooling

Cash pooling is another cash management technique used for optimizing the management of company's various accounts. It generally refers to the offset of deficits with surpluses, regardless of how it is achieved (Treasury Alliance Group, n.d.). Generally there are two types of cash pooling: cash concentration (or zero balancing or physical pooling) and notional cash pooling,

but also numerous other cash pooling products exist, variations of the basic types, such as target balancing, cross currency, cross country and intraday pooling (Rebel, 2005).

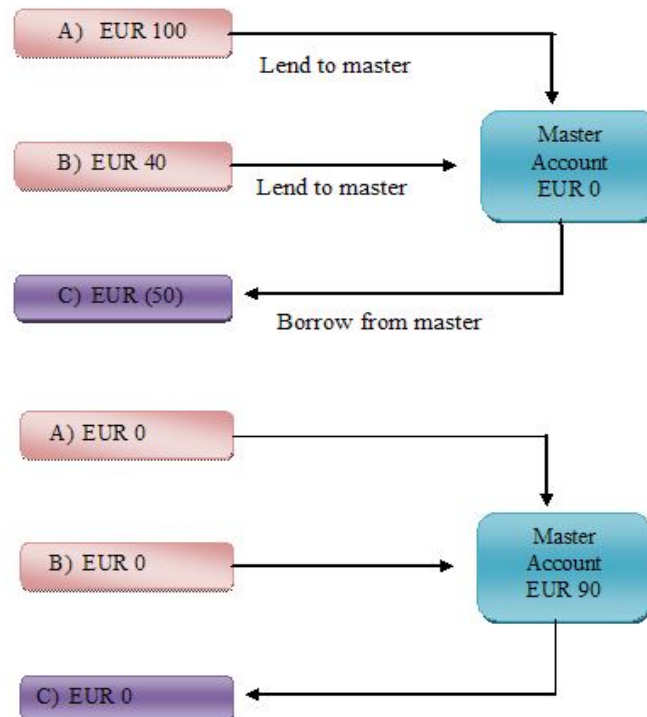
Cash concentration represents an automatic transfer of the balances from clearly specified sub-accounts to a single account, named master or header cash pool account, on a value date basis (Zucknick, 2008). It can be achieved domestically or cross border, depending on the corporate structure, however only currency by currency (Treasury Alliance Group, n.d.).

Within cash concentration, each subsidiary or company division maintains its own bank accounts, through which they conduct their commercial operations, disburse and receive funds. These accounts represent sub-accounts that are linked to a master or header account. At the end of the business day, all funds in the sub-accounts are physically transferred to the master account, which is usually maintained in the name of another legal entity, namely the parent company, a regional subsidiary or a finance company, depending on the practical and tax issues of each option. If the net position on the master account is positive it will be invested and if negative, it will be funded from a centralized credit facility (Treasury Alliance Group, n.d.).

Regarding the sub-accounts, several individual specifications could be in place, such as minimum balance that must be held on the account, minimum amount that could be transferred or fixed days for regular money transfer. When zero balancing exists, the account balances will have a zero balance at the end of the business day, whereby the liquidity position will be obtainable from the master account (Zucknick, 2008).

The following Figure 7 depicts an example of the flow of funds within zero cash balancing.

Figure 7. Example of zero cash balancing



Source: Treasury Alliance Group. Cash pooling: improving the balance sheet, n.d., p. 6.

Another type of cash concentration is target balancing. In this case, a target balance is established, i.e. a minimum level of liquidity which will remain available on the separate sub-accounts. Such cash pooling is used in order to avoid more costly and complicated credit line issues of due to local regulations (Zucknick, 2008).

Notional pooling is the second type of cash concentration. It has the same goal as zero cash balancing, with the difference being that no physical transfer of funds from the sub-accounts to the master account happens (Zucknick, 2008). As with zero balancing, within the notional pooling each subsidiary keeps its own account. The cash surpluses and deficits are offset with each other when they are pooled together or consolidated. The bank creates a so called shadow or notional position from all the participating accounts expressing the consolidated position. This consolidated position achieved through the pooling of cash is the position on which interest is paid or charged (Treasury Alliance Group, n.d., p. 4). That way the difference between high interest paid on debit positions and low interest received on credit positions is reduced. The accrued interest can be either placed on each sub-account or to a separate interest account, where the usual practice is to allocate the interest back to each sub-account depending on each subsidiary's contribution to the process of offsetting (Zucknick, 2008).

The following Table 2 shows an example of notional pooling, where three subsidiaries exist, A, B and C, which earn a 3 % interest on their credit accounts and pay 6 % interest on their overdrafts.

Table 2: Notional cash pooling example

	EUR Position	Interest earned or (paid)
A	100	3
B	40	1.2
C	(50)	(3)
Un-pooled	-	1.2
Pooled	90	2.7

Source: Treasury Alliance Group. Cash pooling: improving the balance sheet, p. 4.

The benefit of notional pooling as evident from table (2) is the higher interest earned. When notional pooling is not in place, the company earned EUR 1.2 on its position, but when pooling is present, the interest earned is higher and amounts to EUR 2.7 (Treasury Alliance Group, p. 4). The same effect applies to the interest earnings in the zero cash balancing example as well.

Pooling is a widespread cash management technique providing significant benefits to the company which can be grouped in three categories:

- *Offsetting interest* – the most evident benefit of cash pooling is the saving of interest spread, achieved by offsetting the debit and credit balances. The saving can be calculated as the interest spread over the overdraft and credit balances on the accounts in the pool (Rebel, 2005).
- *Improved liquidity management* – firstly, the cash manager is relieved from monitoring and managing multiple balances, as he can use only one summary transaction (Rebel, 2005). Furthermore, internal transfers from surplus and deficit accounts become unnecessary. Also, the need to borrow from a third party can be escaped as funds are loaned from within the company.
- *Reduced volatility in balances* – cash pooling reduces the volatility in the overall cash balances managed within the cash pool structure (Rebel, 2005).

3.7 Cash flow forecasting

Forecasting is anticipating, estimating or projecting some event or condition in the future which is out of the organization's direct control (Waddell & Sohal, 1994, p. 42). Therefore, cash flow forecasting represents an attempt to estimate and evaluate the liquidity position of the company.

Forecasting cash flows is one of the most important tasks and tools of cash management. Its purpose is to manage short term liquidity fluctuations optimally and to be able to make sure that sufficient liquidity reserves are available when needed (Dolfe & Koritz, 1999, p. 139). It shows how the cash funds flow within the company and thus it can help predict whether the expected cash will be sufficient to cover the operation costs and to keep the business going or whether new source of cash will be needed (Knowles, 2009). Effective cash flow forecasting makes the future less unpredictable and thus renders the company more adaptive and prepared to any situation that may come up in its everyday activities (Dolfe & Koritz, 1999, p. 139). This function is important to a corporation's short-term stability, as well as its long-term survival.

Before starting with the process of forecasting cash flows, each treasury must set up the basic structure and guidelines for its realization. These will differ according to the type of forecasting employed, however the basic questions to take into consideration are (Coyle, 2000, pp. 22 - 25):

- **The intensity of forecast.**

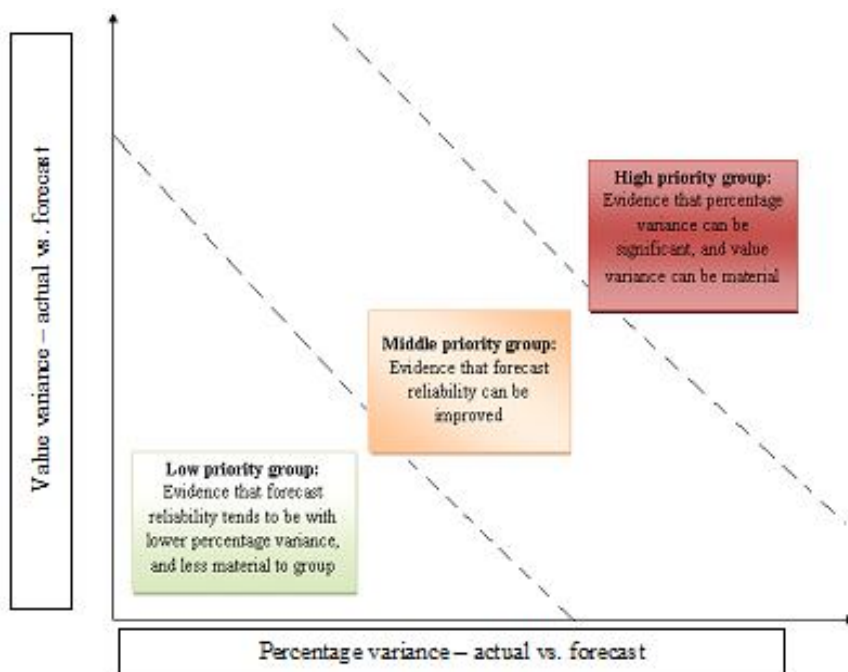
The intensity of forecast refers to the time horizon of the forecast, its frequency (daily, weekly, monthly, etc.) and the number of forecasts (one for each business unit, one on a consolidated level, one for each currency, etc.). The intensity of forecasts depends on the size of the business, the geographic territory it covers, the degree of management centralization, the size of cash flows, and the planning horizons. A basic principle is that cash flow forecast should be generated for the shortest time periods for which data with an acceptable level of accuracy can be collected.

- **The level of accuracy** that is required, as well as the assumptions which are to be used.

The level of accuracy in cash flow forecasting, as well as the capability to accurately forecast cash flows, depend on the time horizon they are prepared for. Namely, they will differ significantly, depending on whether the cash flow forecast has been prepared on a daily, weekly or monthly basis, or if it has been produced for a period covering one or several years. In order to set the parameters for the forecasting accuracy measure, the primary step is to understand how missing the set cash targets over the different time frames might affect the business. For example, in the case when a company has a banking covenant to comply with, realizing only a small amount under its short term cash requirement might have a substantial effect on the business. On the other hand, companies dealing with sophisticated and large projects might encounter large fluctuations in their medium or long term cash flows, without any significant impact on the business. After the parameters have been set, the next step is to evaluate the achieved levels of accuracy across the different time horizon forecasts. One way of doing that, is to compare the percentage variance and the value variance of actual versus forecasted cash flows and group the forecasts into groups according to the size of the variance

(figure 8). Each group will have different priority and will require different measures appropriate for improving the forecasts (Doyle, 2007, p. 44).

Figure 8. Analysis of the level of forecasting accuracy



Source: M. Doyle, *Why it matters*, 2007, p. 44.

From the above stated, one can conclude that an essential part of every forecast is to clearly define the assumptions on which it is based. The postulated assumptions enable the manager to thoroughly test the forecast and if divergence is observed, they help to more easily determine why actual cash flows vary from the forecasted ones (Coyle, 2000, p 24).

- The **structure of forecasting** within a group of companies

The structure of forecasting within a group of companies should be defined by the management group that is responsible for performance and control. Some basic principles are:

- If the cash is controlled centrally, then the central treasury department should generate very short term forecasts.
- Each business unit should prepare its medium term forecast or cash budget, but they should be coordinated and approved by the head treasury.
- Strategic budgets or long term forecasts should be prepared by the strategic planning group.
- As cash flow forecast can be done for each business unit separately, it can also be done for each currency the business unit deals with (Coyle, 2000, pp 24-25).

- The use of **modeling**.

There are a number of cash flow forecasting models or methods a company can choose from, and they will be discussed in more detail in a following chapter. In general, most companies use a computer model to forecast cash flows, whether it is a simple spreadsheet model or sophisticated custom made software. Choosing the right model is crucial for achieving flexibility of the forecast, for testing the assumptions, for studying the divergence of the forecasted cash flows from the actual cash flows, for preparing improved or brand new rolling forecasts (Coyle, 2000, p 25).

When choosing the forecasting method, every cash manager has to take into consideration several factors (Allman-Ward, Sagner, 2003, p. 101):

- **Data availability** – if the cash manager is to work with data that could be easily and speedily collected, then he would be able to produce a timely forecast. However, in most cases data is not stored in formats that could be easily used in statistical analysis.
- **Data reliability** – in preparing the forecast, the cash manager will have to evaluate the probability of being correct about the timing of cash flows, since different cash flows have different levels of predictability, ranging from ones that are certain to ones that are completely unpredictable. In order to assign a probability factor to a particular element in the forecast, the cash manager will make use of his knowledge about the nature of the flow as well as his past experience.
- **Time horizon** – The longer the period, for which the cash forecast is prepared, the less accurate the forecast will be, making it less useful to the manager. Thus, the cash manager must make sure that the time frame, covered with the forecast, is suitable for the intended purpose.
- **Sensitivity** – the cash manager must be prepared to revise, update, improve and adjust the forecast as the circumstances within and outside the company change.

3.7.1 Cash flow forecasting time horizons

As already mentioned, according to the time horizon they pertain to, cash flow forecasts can be short term or operational, medium term or tactical, and long term or strategic.

3.7.1.1 Short term or operational forecasts

Short term forecasts are prepared on a daily basis, usually for one month ahead, but they can also be done for the period of up to three months. They are used within the cash management function, primarily for managing short term liquidity. Namely, the objective of short term

forecasting is to identify cash inflows and outflows with acceptable accuracy in order to assist day-to-day management of bank accounts. It aims at indentifying short term cash shortages, signifying funding requirements or surpluses signifying investment opportunities, in which way operational forecasts help the cash manager in his borrowing and investment decisions. Thus, short term forecasting should be used as the main instrument in making sure that there are no idle balances on non-interest or low-interest bearing accounts (de Caux, 2005, p. 106).

3.7.1.2 Medium term or tactical forecasts

The medium range or tactical forecasts are made for the period from one month up to a year, i.e. for the next 12 months (Matassi, 2008, p. 37). These forecasts are used for managing working capital and financing requirements in the medium term (Allman-Ward, Sagner, 2003, p. 97). They are concentrated on estimating overall averages, rather than producing daily numbers. Consequently, tactical forecasts aim at providing the treasurer with a sense and a feel for the overall funding or investment patterns the company is to face in the forthcoming year.

Usually, companies who use medium term forecasting, make rolling 12 months forecasts. However, in some unstable and unpredictable industries such forecasting has no applicable meaning, which is why those companies can project cash flows only for the upcoming three months. Furthermore, these projections must be regularly updated on a monthly or quarterly basis as the forecasting inputs become more stable and as events change (de Caux, 2005, 106).

Medium term forecasting are largely used for planning actions regarding credit lines, selling or issuing commercial paper, developing an investment programme, as well as for monitoring or regulating credit extensions to customers or for justifying longer credit terms when negotiating with suppliers.

Medium term forecasts are also used by banks as a monitoring tool when extending credit lines, especially overdrafts, to companies. In addition, banks may require from companies that are in difficulty, and thus need to be closely supervised, to submit forecast every month. On the other hand, companies in good financial condition may be required to submit forecasts annually, as a ground based on which, the bank will review the amount of credit facilities extended to that company.

3.7.1.3 Long term or strategic forecasts

Strategic or long term cash forecasts are made for the period between one and five years and are based on accounting projections of revenues, expenses and changes in balance sheet items, and their different scenarios. They are mainly used for evaluating long term financing and operating

policies, for making long term strategic decisions and planning strategic goals. Such are deciding on the required level of liquidity reserves, optimizing the capital structure of the balance sheet, with regard to the leverage and structure of the financing, as well as investing and acquiring decisions (Dolfe & Koritz, 1999, p. 148).

Forecasts become less and less accurate, and thus less reliable, as the time horizon they are produced for becomes longer, regardless of how well they are done. The long term requires conducting sensitivity analysis for these forecasts. The sensitivity applied will depend on the situation that is subject to modeling and will take into account currency fluctuations, movements in interest and inflation rates, economic influences, market changes and competitors' strategies. That is why companies that employ sensitivity analysis will produce several different cash forecasts based on different "what if" scenarios (de Caux, 2005, p. 107).

Cash flow forecasting must be tailor made for each company, in order to meet the different circumstance every company is in. Namely, even companies of similar size and business can differ substantially in terms of transaction sizes, the frequencies of cash flows as well as the method or location the cash flow occurs (Ochs & Parkinson, 2006, pp. 1). Consequently, the type of cash forecasting must relate to each company's business. Its form and application will depend on the type of business, the size of cash flows, the different time horizons employed, and the type and quality of information which it is based on (de Caux, 2005, pp. 107).

3.7.2 Objectives and uses of cash flow forecasts

Generally speaking, companies use their forecasts in planning and modeling their future. The major objectives of cash flow forecasting are the following:

Managing liquidity – Forecasts are vital for liquidity management because they give out an early warning signal for liquidity problems by estimating how much cash will be needed, when, for how long and whether it will be available from planned sources (Coyle, 2000, p. 16). Therefore, within liquidity management, cash flow forecasts are applied in attaining the following objectives:

- Establishing cash management policies – cash flow forecasts are used as an input in devising the cash management practices that would ensure efficient utilization of cash (Matassi, 2008, p. 7).
- Monitoring – cash flow forecasting enables the cash managers to understand the nature of cash flows and how their swings and variations influence the company's overall liquidity, as well as what precautionary measures are to be employed (Parkinson & Kallberg, 1993, p. 133).
- Identifying and avoiding cash shortages and idle excess cash – the forecasting of cash inflows and outflows, generates estimates of cash shortfalls or surpluses, as well as the points in time

when they occur. By knowing when these situations will occur, the company can avoid them by timely undertaking the appropriate measures (Matassi, 2008, p. 7).

- Determining funding requirements – as already mentioned the result of forecasting are anticipated cash shortages or surpluses. By foreseeing cash shortfalls, the company can determine its funding needs (Matassi, 2008, p. 7). Consequently, the cash department will need to either extend their overdraft or approach the bank for additional lines (Back, 1997, pp. 30).
- Minimizing cost of funds and maximizing interest earning – by being aware of the amounts and during which periods the company will need to arrange loans or make investments, it can obtain better conditions (Dolfe & Koritz, 1999, p. 146).

By anticipating borrowing needs, cash flow forecasting provides the company with the necessary “buffer” time to negotiate and arrange for more economical financing (Parkinson & Kallberg, 1993, p. 87). During this time the cash manager can check the available funds or borrowing limits which the company has on its disposal, it can look for surpluses from other divisions of the group, which can be transferred as inter-company loans to cover the shortages, or he can search for the cheapest source of funds on the financial markets. More importantly, if a funding need is anticipated in advance, the management can more easily choose when to borrow and will most likely obtain the funds at a lower interest rate. If on the other hand, the funds are needed at short notice or immediately after the shortage occurs, it often means having to pay a premium (de Caux, 2005, p. 105). One rule of treasury management is that obtaining funds is much harder and more costly if it is done at the moment when they are needed. It is because there may not be enough time to arrange for the most appropriate funding, identify the cheapest source of funds, or because the credit rating of the company at that very moment is lower and banks are willing to commit funds, however at a higher interest rate (de Caux, 2005, p. 105; Coyle, 2000, p. 17).

On the other hand, when cash surplus is forecasted, having an idea of the approximate size of excess cash and the period that it will exist, enables the company to determine the most effective or most profitable investing opportunity for the surplus, and thus, to maximize the interest earned (Coyle, 2000, p. 17). This is realized by first checking internally, whether some parts of the group could make a use of these cheaper funds. There may be divisions in the group which could be in a need for funds for an approximately same period of time to that of the recognized surplus or it can be used to refinance some more expensive external financing resources, like bank borrowings for example. If there isn't any internal need, then the cash manager can concentrate on finding higher yielding instruments in which to invest, in order to maximize returns (de Caux, 2005, p. 105).

Strategically redirecting cash where it is most needed – by forecasting the cash flows of each division or segment of the business, the company can redirect the cash to the parts of the business, which will require it the most (Matassi, 2008, p. 7).

Determining dividend planning – the forecasted net cash position enables the company to identify its dividend distribution capabilities (Matassi, 2008, p. 7).

Monitoring and setting strategic objectives - a range of corporate strategies and objectives can be set forth using cash flow forecasting and they can be monitored and evaluated by comparing the realized cash flows pertaining to specific products, projects or business units, to those planned (de Caux, 2005, p. 106).

Capital budgeting and planning capital investment programs – estimating how much cash the company will produce in the future enables it to ascertain whether it generates enough cash, not only to cover its current operating needs, but also to finance new acquisitions of capital goods or other capital projects (Matassi, 2008, p. 7; de Caux, 2005, p. 106). Thus, it can plan whether a capital investing project should be undertaken or not. Furthermore, cash forecasting can be used in estimating revenues and costs for prospective and current projects, thus it can help in evaluating and determining which particular project to undertake (Parkinson & Kallberg, 1993, p. 87). Also, these forecasts can be used in the case when banks or other finance companies request from companies as their potential borrowers, to show that they are generating enough cash to make the loan and interest payments, without putting other activities of the business in jeopardy (de Caux, 2005, p. 106).

Financial control – cash flow forecasting gives the cash management department assurance that the company's short term assets are protected and that its short term liabilities are managed prudently (Parkinson & Kallberg, 1993, pp. 87; 133). Namely, cash flow forecasting can be used to model payables and receivables against known sales and purchases. Such modeling unravels mismatches between credit periods awarded to customers and the amount of credit actually taken (days sales outstanding). In addition, it enables the comparison of days sales outstanding with days payables outstanding, i.e. the credit taken from suppliers and thus it facilitates the assessment of working capital financing requirements. Such forecasts can be matched against actual values to make sure that company subsidiaries are managing their cash flows in accordance with corporate policies and plans (de Caux, 2005, p. 106). Finally, by calculating the variances between estimated and actual cash flows, forecasting cash can help to identify financing problems or unforeseen developments in the company's financial position (Parkinson & Kallberg, 1993, pp. 87; 133).

Strategic financial planning – cash flow forecasting helps to develop a sense of direction for short term cash and longer term working capital requirements of the company. Furthermore, it assists in assessing how well the company meets its financial plans, for example it can be used in determining how precise the estimated shortfalls or surpluses have been (Parkinson & Kallberg, 1993, pp. 87; 133).

Monitoring various lender and investor ratios – lenders usually require from borrowers to comply with certain covenants, or, the companies themselves impose a set of ratios on themselves or use them as a comparison to their peers. Cash forecasting can be used as a tool for monitoring or even planning certain types of ratios (de Caux, 2005, p. 106).

Foreign exchange risk management – some companies that operate on foreign markets as well, require from their business units to produce cash flow forecasts in both local and foreign currencies. This way, treasury managers can identify the timing and size of different currency flows and based on that, they can make decisions whether to match these flows against opposite ones within the company, or to hedge them in the currency market (de Caux, 2005, p. 105).

3.7.3 Cash flow forecasting process

The cash flow forecasting process is comprised of the following main steps (Matassi, 2008, p. 42):

1. Determining the cash flow component to be forecasted, or structuring
2. Selecting the input data
3. Collecting the input data
4. Determining the relationship between the input variables and the cash flow component to be predicted
5. Performing the forecast by applying the relationship between the dependent variables
6. Evaluating the accuracy of the forecast

Determining the cash flow component to be forecasted

Structuring represents the start of the cash management problem solution, by determining and extracting the desired information for decision making (Chastain, 1986, p. 83). Every cash flow forecast should start by dividing the cash flows into inflows and outflows, and then split them into components, because each component may be driven by different determinants, which can have different effects, and thus may require different forecasting technique (Parkinson & Kallberg, 1993, p. 137). The cash flows of most companies comprise of a certain number of large items and an almost indefinite number of small receipts and payments (Stone & Wood, 1977, p. 40), which is why it is useful to divide them according to this criterion. It is also useful to categorize each component according to its level of predictability. Namely, forecasts include

items that are certain, items that can be forecasted with some degree of certainty, and finally items that are less predictable (de Caux, 2005, p.107). One way to start the forecasting process is by separating the cash receipts or payments into their major and non-major components, and then divide each of them into subcomponents that differ according to their level of predictability. The goal is to achieve statistically pure groups of cash flows (Matassi, 2008, p. 46).

Certain cash flows are those that are known in advance, i.e. their amounts and timing of occurrence are fairly accurately known (Stone & Wood, 1977, p. 41). Thus they do not need to be estimated. Moreover, if they are not isolated from the other less assured flows, it might be difficult to develop a realistic forecast. Examples of certain cash flows are: tax payments, interest on long term debt, dividends, salaries, amortization (Parkinson & Kallberg, 1993, p. 138).

Forecastable cash flows are those that are not certain, but can be predicted with an acceptable range of accuracy based on another variable (Parkinson & Kallberg, 1993, pp. 138). Such cash flows are collections from credit sales, total hourly payroll, and vendor payments (Allman-Ward & Sagner, 2003, p. 101). For example, collections from credit sales to customers who are regular payers can be predicted within narrow ranges. Estimates based on the information about regular collection times and historical credit terms can be used to forecast the actual deposits on company's accounts (Parkinson & Kallberg, 1993, p. 138).

Unpredictable flows are those that are uncertain and cannot be predicted successfully (Parkinson & Kallberg, 1993, p. 138). Their timing and value are extremely difficult to forecast. Examples include: unanticipated receipts or disbursements, such as receipt of payments for work on a government contract, major cash purchase of equipment (Stone & Wood, 1997, p. 41), foreign currency collections, outcome of pending lawsuits, and costs of work stoppages (Allman-Ward & Sagner, 2003, p. 101). The existence of many of these items may represent a huge barrier in developing an effective cash flow forecast. Evidently, the cash manager will need to spend plenty of time and effort working on these items in order to be able to shift them to one of the other groups (Parkinson, Kallberg, 1993, p. 138).

Selecting the input data

The basic ingredient of forecasting is information. Furthermore, information is the basic ingredient that directs changes in previously made forecasts (Back, 1997, p. 23). That is why choosing the appropriate input data as well as the information system disseminating it, is crucial for an effective, successful and accurate cash forecasting process.

When preparing a cash flow forecast the cash manager faces a difficult challenge to select and collect the appropriate information from an abundance of data buckets and formats. There are

many sources from which data can be compiled. These sources may be grouped into internal and external. Internal sources are the ones that are located within the company. For example, from corporate treasury the cash manager can derive information about: taxes, corporate dividends, pension fund and insurance payments, salaries, supplier payments, foreign exchange procurements, interest and principal repayments, maturing investments and finally, information on external financing. From the operating units, the cash manager can obtain data on customer collections, local office deposits, international collections, local payables and salaries, and capital expenditures. From subsidiaries, information on dividend and loan payments can be obtained (Parkinson & Kallberg, 1993, p. 90). Moreover, the cash manager can make use of reports prepared within the management accounting system, such as annual strategic plans, annual budgets, monthly management accounts, and quarterly reviews (Back, 1997, p. 23).

The phrase garbage in, garbage out, applies for cash flow forecasting as well, meaning that bad data input will result in a bad forecast. When developing a cash forecasting model, it is paramount for the cash manager to understand the quality and quantity of data that are at his disposal. He must take into account several aspects about this data: its reliability, availability and sufficiency (Gallanis, 2004, p. 48). The input data must be consistent, accurate and dependable, it must be easily accessible and it must be in sufficient amount in order to be able to support the chosen forecasting methodology.

Furthermore, when deciding on which information to apply in the forecasting process, the forecasting horizon must be taken into consideration. For example, strategic plans can be used as basis in preparing long term or strategic cash forecasts. Strategic plans contain estimates about future projects, setting up new plants or acquisitions, and disposals. Thus, they give indication on the likely amount of funds and facilities that would be needed, or deposits that would be made. Annual budgets are more detailed representations of each aspect of the company and as such they can be utilized in preparation of tactical or medium term forecasts (Back, 1997, p. 24).

As already mentioned, there are also external sources of information that could be used in the forecasting process. Basically, two types of external information exist: one that pertains to the company specifically, and the other to the general conditions on financial and commercial markets. The main source of information pertaining directly to the company is the bank, which reports the company's account positions, whether on daily basis or some other frequency. To find out the current and expected situation on the financial and commercial conditions on markets, the cash manager can take advantage of the information provided by financial daily newspapers, banks, specialist forecasts, government and supra-government bodies, data suppliers, etc. (Back, 1997, pp. 27–29).

Collecting the input data

Even though the process of collecting the input data for the cash forecast is as important as the data itself, it still remains one of the weakest links in cash flow forecasting. The reason for that is the inclusion of a large number of different people from different parts of the company in the collection, pre-processing and sending data (Rebel, 2010).

There are several forms of collecting data processes. They range from computer spreadsheets to which data is manually entered, up to sophisticated enterprise resource planning systems (ERPs), which download the specific data directly into the forecasting model (Gallanis, 2004, p. 49). Today, multiple vendors provide various treasury management system solutions, which among other things, represent an effective and accurate data collection tools. These systems, known under the name treasury workstations, retrieve bank data which contain information on all transactions on a company's bank account. After that, the data is classified, grouped and stored in a data warehouse, available for later use (Gallanis, 2004, p. 49).

Determining the relationship between the input variables and the cash flow component to be predicted, i.e. selecting the cash flow forecasting technique

The relationship between the input variables and the cash flow component to be predicted depends on the cash forecasting technique applied. For example, if regression analysis is used as a forecasting technique, then the regression formula will determine the relationship between the dependent variable, the cash flow to be predicted, and the input variables. If the Percentage-of-Sales Method is used, then the relationship between the variable to be predicted and the input variables will be determined as a percent of forecasted sales. Each forecasting technique will be explained in more detail further on.

The forecasting technique a company will apply depends mostly on the time horizon for which the forecast is produced, as well as on the type of data the cash manager has on hand (Association for Financial Professionals). When deciding on which forecasting technique to use, each forecaster needs to ask himself the following question (Treasury Strategies, 2004):

- What is the goal or the purpose of the forecast?
- What kind of data is obtainable?
- What is the nature of the cash flows?
- What forecasting tools does the forecaster have on disposal?
- What resources will be utilized?

Performing the forecast by applying the relationship between the dependent variables

In this step the actual forecast is performed by applying the selected forecasting technique on the selected data.

Evaluating the accuracy of the forecast

Forecasting is a learning process in which every company should constantly strive to improve. In order to achieve improvement, forecasted cash flows should always be compared to actually realized ones. Furthermore, it should be done on an aggregated level, as well as for each unit (Backlund, 2008). One way of assessing the accuracy of the cash forecast is calculating the percentage variance and the value variance of actual versus forecasted cash flows (Doyle, 2007, p. 44).

3.7.4 Cash flow forecasting techniques

The different cash flow forecasting techniques can be broadly grouped into direct and indirect methods or approaches (QFinance). Within the direct methods a forecast is built by adding and subtracting individual transactions (Eurofinance, 2008, p.54), whereas the indirect methods start to build the forecast from the company's projected income statements and balance sheets (QFinance). Direct methods are cash scheduling, cash distribution and the moving average method. An example of indirect method is the percentage of sales method. The cash forecasting techniques that are most commonly used will be explained on more detail in following paragraphs.

3.7.4.1 Simple moving average

Simple moving average is a purely extrapolative method, because it bases the forecast on calculating the average of most recent cash flow values of the cash flow item that is to be predicted. This method provides a one-step ahead forecast by computing an average of the latest values of generated cash flows or cash flow items (Parkinson & Kallberg, 1993, p. 142). This method does not employ weights in computing the average, i.e. every observation counts equally. In order to adjust the forecast to trends or seasonal variations, more observations need to be used in calculating the average (de Caux, 2005, p. 110). Namely, when the number of observations included is large, for example over 50, then the latest cash flow has only a small influence on the forecast (Parkinson & Kallberg, 1993, p. 142). Table 3 shows an example of this method, using a three day average, whereas in table 4 a ten day moving average calculation is shown:

Table 3. Example three-day moving average

Time t	Actual cash flow on day t	Moving average on day t
1	12	-
2	15	-
3	15	14
4	18	16
5	12	15

Source: G. M. Matassi, *An Integrative Approach to Cash Flow Forecasting*, 2008, p. 64.

Table 4. Example ten-day moving average

Day	Daily amount	10 day Moving Average
1	67.50	
2	66.50	
3	66.44	
4	66.44	
5	66.25	
6	65.88	
7	66.63	
8	66.56	
9	65.63	
10	66.06	66.39
11	63.94	66.03
12	64.13	65.80
13	64.50	65.60
14	62.81	65.24
15	61.88	64.80
16	62.50	64.46
17	61.44	63.95
18	61.13	63.40
19	61.31	62.97
20	61.38	62.50

Source: G. M., *An Integrative Approach to Cash Flow Forecasting*, 2008, p. 64.

The advantage of the simple moving average method is that it is easy to compute, without the need of any specialized knowledge or sophisticated computer programs, also it is efficient in determining trends (Matassi, 2008, p. 66). However, the forecast produced with the simple average method will always rely on past trends, instead on current or expected trends. That is why this method could be appropriate for businesses that generate quite stable cash flows. However, for seasonal businesses or those that have irregular sales patterns, this method would not work well (de Caux, 2005, p. 110). Another drawback of this method is that it takes every observation with an equal weight and thus doesn't identify cyclical patterns (Matasi, 2008, p. 66).

3.7.4.2 Exponential smoothing

Exponential smoothing starts from simple moving averages, but assigns normal weights to them, such that the most recent observation gets a bigger weight in the calculation. Effectively, this discovers recent forecasting error and tries to correct them (de Caux, 2005, p. 110). The basic equation of the exponential smoothing method is the following:

$$F_{t+1} = F_t + x (X_t - F_t) \quad (10)$$

Where F_{t+1} designates the cash forecast for the period (t+1), F_t represents the cash forecast for the period t (the previous period), X_t is the actual cash flow for period t and x is the smoothing constant (de Caux, 2005, p. 110)

Equation 10 indicates that the exponential smoothing forecast for the coming period is equal to the sum between the forecast for the previous period and a correction for the most recent forecast, which is computed as the smoothing constant times the forecast error. A large smoothing constant in the exponential smoothing method gives the same result as a small sample in the simple average method, namely, in both cases the latest observation affects the direction of the forecast the most (Parkinson & Kallberg, 1993, p. 142).

The following Table 5 shows a comparison between the simple moving average and the exponential smoothing method:

Table 5. An example of exponential smoothing and moving averages

Day	Cash flow	Moving average		Exponential smoothing	
		Forecast	Error	Forecast	Error
1	110	-	-	-	-
2	120	-	-	-	-
3	115	-	-	-	-
4	122	-	-	-	-
5	126	-	-	-	-
6	124	118.6	5.4	118.6	5.2
7	129	121.4	7.6	120.8	8.2
8	133	123.2	9.8	124.6	8.4

Source: K. Parkinson & J. Kallberg, *Corporate Liquidity: A guide to working capital management*, 1993, p. 143.

According to the simple moving average method the forecast for day 7 is computed as the average of the cash flows from the previous five days, i.e.:

$$F_7 = (120 + 115 + 122 + 126 + 124) / 5 = 121.4$$

To reach the forecast for day 7 according to the exponential smoothing method, we apply equation 10. If the smoothing constant is 0.4, then the cash flow forecast for day 7 is:

$$F_7 = 124 + 0.4(124 - 118.6) = 120.76$$

As was the case for the simple average method, so does this method lag any trends in the forecast (Parkinson & Kallberg, 1993, p. 143). Purely extrapolative methods, such as these two, in most cases do not work well, as daily cash flows have usually both day-of-week and day-of-month pattern, together with any annual seasonality that can be present (Stone & Miller, 1987, p. 47).

3.7.4.3 Cash scheduling (Receipts and Disbursement method)

Cash scheduling represents an estimation of the company's short term cash position and is typically done for a period of one to six weeks. By estimating the daily net cash position over the forecasting period, it aims at helping the cash manager handle the daily cash position more efficiently (Parkinson & Kallberg, 1993, p.89).

It can be said that scheduling represents a forecast produced from primitive data. For example, the data basis for disbursement forecasting might be invoices, purchase authorizations,

production schedules, and work plans. If the company has an established payment policy for purchases on credit, then it would be relatively easy to develop a schedule of disbursements based on the invoices on hand. The only thing required would be an information system to capture and categorize the invoice data. That is why scheduling can be seen as an information-system-based forecasting (Stone & Wood, 1977, p. 41).

This method starts with creating separate schedules for receipts and disbursements. Their preparation consists of allocating known and expected disbursements and receipts over the forecasting period at the time they are expected to be realized. The net cash position for each day of the forecast is calculated as the difference between the receipts and disbursements (Parkinson, Kallberg, 1993, p. 89). Some companies will add a minimum holding amount of cash to the net cash position for the case of unexpected expenditures, some companies will leave it at zero balance, while others will allow a somewhat overdrawn position (deficit) (de Caux, 2005, p. 107).

Examples of cash flows that can be included in this forecasting method are the following:

Receipts

- Capital flows: stock issuance (Treasury Strategies, 2004, p. 16), funds from the sale of assets (de Caux, 2005, p. 107).
- Operating flows: local and international collections from the sale to customers (Parkinson & Kallberg, 1993, p. 89), any unearned income (de Caux, p. 107).

Disbursements

- Capital flows: capital expenditures, interest and principal payments, dividend payments (Treasury Strategies, 2004, p. 16), external financing such as market and bank debt (Parkinson & Kallberg, 1993, p. 89).
- Operating flows: tax payments, supplier payments, payroll payments, insurance payments, pension fund payments (Parkinson & Kallberg, 1993, p. 89).

Table 6 shows a detailed example of a daily cash forecast prepared according to the cash scheduling method. In this case no minimum cash holding amount is envisaged.

Table 6. Daily forecasting format

	<i>Day 1</i>	<i>Day 2</i>	<i>etc</i>
Cash at beginning of day			
CASH RECEIPTS			
- Cash sales			
- Open account collections			
Vehicles			
Parts			
All other			
- Miscellaneous income			
Interest			
All other			
TOTAL RECEIPTS			
CASH DISBURSEMENTS			
- Payroll			
- Vendor payments			
Materials			
Parts			
Facilities			
Other			
- Taxes			
Income tax			
Sales tax			
- Interest			
- Dividends			
- Debt retirement			
- All other			
TOTAL DISBURSEMENTS			
Cash at end-of-day			

Source: T. de Caux, *Cash Forecasting*, 2005, p. 108.

In Table 7 a simplified forecast is presented, where summarized receipts and payments are used. The forecast is done on a weekly basis. The amounts are expressed in EUR thousands.

Table 7. Receipts and disbursements forecast

In EUR thousand	<i>Week 1</i>	<i>Week 1</i>	<i>Week 1</i>
Cash receipts	2,000	2,200	1,900
Cash payments	(1,740)	(2,900)	(2,000)
Net cash flow	260	(700)	(100)
Cash at beginning	200	460	(240)
Cash at end	460	(240)	(340)
Minimum cash required	(100)	(100)	(100)
Finance needed	-	(340)	(440)
Funds for investment	360		

Source: T. de Caux, Cash Forecasting, 2005, p. 108.

In the first week the cash receipts are expected to amount to EUR 2.000, while payments are expected to amount to EUR 1.740. The difference between them gives the net position of EUR 260 of cash surplus. If the net cash position carried forward from the previous period amounts EUR 200, then the net cash position at the end of the period will be EUR 460. If the company has a policy to keep a minimum cash balance of EUR 100 at the bank, then the sum available to invest will be EUR 360 (de Caux, 2005, p. 108). For the second week a cash shortage of EUR 240 is forecasted. Taking into account the required minimum cash balance of EUR 100, the funds needed, will amount to EUR 340.

The advantage of the cash scheduling method is that it provides an accurate forecast and is suitable for producing daily cash forecasts. However, its disadvantages are that it requires an abundance of historical data which needs to be collected and organized, it requires from the cash manager to have a significant knowledge of the cash flows, and the methodology is complex and time consuming (Treasury Strategies, 2004).

3.7.4.4 The distribution method

The distribution method pertains to spreading an estimated total figure for some time period over the days of a time period. It can be used in two ways: 1) a total amount for some period is distributed to future time periods; 2) a forecasted total amount for a certain time period, is allocated over the sub-periods within that period. The first method is used when a total amount of certain cash flow occurring during a given day or a month is applied in forecasting future daily or monthly cash flows. The second way of applying the distribution method pertains to spreading a forecasted total amount of cash flows obtained from the cash budget, from billing data, or from invoices, over the days within that period (Stone & Miller, 1985, p. 335).

The spread is done based on detected cash flow patterns in the past (Allman-Ward & Sagner, 2003, p 98). Determining the cash flow pattern is a task of statistical assessment, which is why distribution can be counted for as a statistical approach (Stone & Wood, 1977, p. 41), even though some forecasters may use simple averages as a way to spread the proportion of cash flows over the days of the month (de Gidlow & Donovan, 2007, p. 103).

The distribution method includes several activities: preparing the necessary data, estimating the distribution parameters, acquiring information on the total monthly amounts, distributing the non major flows, and finally, combining the major and non-major flows to obtain the forecasted net flows.

This method starts with data preparation, which implies acquiring bank statement data out of which the major items are first subtracted and then the non major items are grouped into different categories of cash flows. For every cash flow category in each month, the daily total amounts are obtained and each of them is expressed as a portion of the monthly total amount for the appropriate non-major item (Stone & Wood, 1977, p. 44). Such prepared data is the input in the following regression analysis.

The second step is to determine the distribution parameters. As already mentioned, a regression analysis of past cash flow data is used to determine and reveal the cash flow pattern within a certain time period. The regression takes as inputs the portion of each cash flow component into the total amount for that period, the day of the week and the day of the month on which the cash flow item has been realized. Stone and Wood (1977, p. 43) use dummy variables to express the day-of-week and day-of-month effect. The regression output in that case, for each component expressing their joint effect is:

$$f_t = \sum_{i=1}^M a_i m_i + \sum_{w=1}^5 b_w d_w \quad (11)$$

In equation 11, f_t is the forecast for a cash flow item on day t ; m_i is the day of month dummy variable, which is one when i equals t , and zero in every other case; d_w is the day of week variable which equals one when the w equals t , and zero otherwise. The regression coefficients $a_1, a_2, a_3, \dots, a_m$ express the day-of-month pattern, whereas the coefficients b_1, b_2, b_3, b_4 and b_5 reflect the day-of-week effect (Stone & Miller, 1977, p. 43).

The next step is acquiring information on total periodical amounts. An assessment of the total amount of cash flows for the period of a month or some other period can be retrieved from a cash budget, from billing data or from invoices (Stone & Miller, 1985, p. 336). After that information

is obtained, the major cash flows are subtracted, leaving the total forecasted monthly amount for every non major cash flow item.

In the following step the actual distribution is performed, where the regression coefficients are applied in allocating the non major flows to the workdays in the month. For example, if we want to calculate a certain non major cash flow for the 10th day in the month, and if that day is Monday, then the forecast for that day would be:

$$CF_{10} = (a_{10} + b_1) \text{ (Forecast of total monthly amount for corresponding cash flow item)} \quad (12)$$

If the corresponding regression coefficients are $a_{10} = 0.03$, $b_1 = 0.01$, and if the projected total monthly amount for that cash flow item is EUR 50 million, then the calculation is the following:

$$CF_{10} = (0.03 + 0.01) (\text{EUR } 50,000,000.00) = \text{EUR } 2,000,000.00$$

After that has been completed, the different forecasted non major items are put together and as such they represent the forecasted net position of non major cash flow items. Finally, the major components are added in order to arrive at the overall forecast of the net daily cash position (Stone & Miller, 1977, p. 43).

The distribution method is most commonly used for the disbursement side of cash flows, especially for the case of cheques clearing. Namely, the analysis of past distributions can reveal the average percentage of cheques that clear each business day. As in the previous example the average value of cleared funds may vary with regard to the day of the week (day-of-week effect). This effect can be established by analyzing past distributions (de Caux, 2005, p. 109). Also, the analysis of past distributions may reveal that the proportion of cheques cleared each day may depend on the number of business days after the cheques have been issued (Parkinson & Kallberg, 1993, p. 139).

Table 8 displays an example of the results of the analysis of past data, where the determined proportions of cheques cleared each day and the day-of-week effect are shown:

Table 8. Analysis of cheque clearance within the cash distribution method

<i>Business day since cheques issued</i>	<i>% of value expected to clear</i>	<i>Day effect</i>	
		<i>Day</i>	<i>% effect</i>
1	11	Monday	2
2	36	Tuesday	-1
3	29	Wednesday	0
4	17	Thursday	1
5	7	Friday	-2

Source: T. de Caux, *Cash Forecasting*, 2005, p. 109.

If the company has issued EUR 100,000 worth of cheques on June 5th, the analysis can be applied to estimate the value of cheques that is expected to be debited from the company's account (table 9):

Table 9. An example of forecasting within cash distribution method

<i>Date</i>	<i>Business day since cheques issued</i>	<i>Day of week</i>	<i>% clearing</i>	<i>Forecast</i>
6 June	1	Wednesday	11 + 0 = 11	11,000
7 June	2	Thursday	36 + 1 = 37	37,000
8 June	3	Friday	29 - 2 = 27	27,000
9 June	4	Monday	17 + 2 = 19	19,000
10 June	5	Tuesday	7 - 1 = 6	6,000

Source: T. de Caux, *Cash Forecasting*, 2005, p. 109.

As already mentioned, the most common use of the distribution method is for the disbursement side of cash flows. However, some companies also use it to forecast the value they will collect from the cheques received. This method is straightforward, relatively easy and economical to use. Furthermore, it is fairly accurate and effective, and also lets seasonality and trend be incorporated in the forecast (Parkinson & Kallberg, 1993, p. 139). It is also usable in combination with other methods in constructing a forecasting model based on past experience (de Caux, 2005, p. 108). However, this technique requires a large amount of past information on cash flows in order to determine the proportions used to distribute the amounts in the forecast (Parkinson & Kallberg, 1993, p. 139).

3.7.4.5 Percentage of Sales method

The percentage of sales method or the balance sheet model is suitable for longer term forecasting. It relies on the simple accounting principle that a company's liabilities plus its equity equal the company's assets (Caviezel, 2007, p. 96). Moreover, it is based on the assumptions that all items or variables are tied directly to sales and that the current levels of the majority of balance sheet items are optimal for the current level of sales (Chastain, 1986, p. 80). The forecast is done by constructing a pro forma balance sheet and a profit and loss statement, by using historical data to extrapolate relationships between different balance sheet and profit and loss items (Caviezel, 2007, p. 96).

This method starts with the preparation of the sales forecast. Then, it needs to be determined which balance sheet and income statement elements can be estimated as a specific percentage of sales. These percentages can be based on historical averages or more sophisticated techniques such as regression analysis. Namely, a number of balance sheet items have distinctive proportional relationships to sales: cash, inventory, accounts receivable, accounts payable, etc (Parkinson & Kallberg, 1993, p. 140).

Next, the items that are not proportional to sales are treated individually. They are either assumed to be constant or they are updated if there is some information available. For example, the level of long-term debt can be determined according to the current amount that is outstanding and the schedule of its repayment. Finally, the net worth is calculated, i.e. the difference between total assets and total liabilities plus equity, taking into account also any additions to retained earnings and planned new issues less dividends. If the assets are less than the liabilities, the company realizes a cash surplus, and if the liabilities are less than the assets, then the company will have a cash shortage. In addition, different forecasts can be produced, under different assumptions, to arrive at a series of possible cash flows (Parkinson & Kallberg, 1993, p. 140).

Tables 10 and 11 show a simplified income statement and balance sheet on which the cash flow forecast example is based:

Table 10. Profit and loss account as a starting position in the percentage of sales method

Profit/loss account (in EUR million)	
Sales	3,000
Cost of goods sold	(2,250)
Selling/administration costs	(300)
Depreciation	(150)
Interest expense	(57)
Income before tax	243
Less tax (34%)	(83)
Net income	160

Source: T. de Caux, *Cash Forecasting*, 2005, p. 109.

Table 11. Balance sheet a starting position in the percentage of sales method

Balance sheet (in EUR million)			
Cash	150	Payables	75
Receivables	450	Equity	900
Inventory	300	Long-term loans (10% interest rate)	300
Net fixed assets	600	Preference shares (12% interest rate)	225
TOTAL ASSETS	1,500	TOTAL LIABILITIES + EQUITY	1,500

Source: T. de Caux, *Cash Forecasting*, 2005, p. 109.

In this example, based on the analysis of past years data, it has been determined that the cost of goods sold, the selling and administration expenses, payables and current assets represent a constant percentage of sales. Certain information on other, non proportional to sales items is available. Namely, it is known that depreciation will amount to EUR 75 million, long term loans will decrease to EUR 200 million at the beginning of the year, as a result of the repayment that has to be made, and dividend payments will amount to EUR 36 million. Next, the pro forma statements need to be produced in order to reach the net cash position at the end of the period (de Caux, 2005, p. 110). Tables 12 and 13 present the projected income statements and balance sheet, according to the information given above:

Table 12. Projected profit and loss account

	<i>In EUR million</i>	
(i)	Sales	3,300
(ii)	Cost of goods sold	(2,475)
(iii)	Selling/administration costs	(330)
(iv)	Depreciation	(75)
(v)	Interest expense	(47)
(vi)	Net income before tax	373
(vii)	Tax (34%)	(127)
(viii)	Net income	246

Source: T. de Caux, *Cash Forecasting*, 2005, p. 110.

- The sales forecast projects a ten percent increase in sales, thus the projected sales are EUR 3,300 million
- The cost of goods sold are determined as 75 % of sales, thus the projected costs are EUR (2,475) million
- Selling and administrative expenses are estimated as 10 % of sales [EUR (330) million]
- Depreciation is EUR 75 million
- Interest expense is calculated as the sum of 10 % interest on long term loan of EUR 200 million and 12 % interest on preference shares [combined EUR (47) million]
- The net income before tax is EUR 373 million
- Tax at 34 % amounts to EUR (127) million
- Finally, the after tax profit is EUR 246 million

The next step is devising the pro forma balance sheet, from which the net cash position will be evident.

Table 13. Pro forma balance sheet

Cash	165 (5% of sales)	Payables (c 2.5% of sales)	82.5
Receivables	495 (15% of sales)	Equity	200
Inventory	330 (10% of sales)	Long-term loans (10% interest rate)	225
Net fixed assets	525 (75 depreciation)	Preference shares (12% interest rate)	1,110
TOTAL ASSETS	1,515	TOTAL LIABILITIES + EQUITY	1,617.5

Source: T. de Caux, *Cash Forecasting*, 2005, p. 110.

The equity is calculated as following:

	900	carried forward
+	246	retained income
-	<u>36</u>	<u>dividend payment</u>
	1,110	equity

In this example, the assets are EUR 102.5 million less than the liabilities, which means that a cash surplus is forecasted. The company might further decide to reduce loans to the level of EUR 97.5 million to balance the situation (de Caux, 2005, p. 110).

As already mentioned, the balance sheet model gives a straightforward estimation of cash flow for the longer term, however it is not suitable for projecting daily cash flows (Caviezel, 2007, p. 96). It is also simple to produce and provides an easy comparison between the forecasted and actual situation (Treasury Strategies, 2004, p. 15). A disadvantage of this method is also that it requires from the forecaster to have significant knowledge of the balance sheet composition and to have an abundance of historical data at his disposal, in order to be able to determine the percentage proportions of specific balance sheet items (Caviezel, 2007, p. 96). Furthermore, it provides a view of “book cash” (Treasury Strategies, 2004, p. 15).

3.7.4.6 Regression analysis

Regression models represent more sophisticated and complex methods for forecasting cash flows. Regression analysis is a computer based statistical technique that establishes a best linear relationship between the cash flow that is the subject of forecasting, i.e. the dependent variable, and one or more independent or explanatory variables. Based on the discovered relationship this method tends to predict the cash flow going forward (Parkinson & Kallberg, 1993, p. 143).

The regression model relies on the assumption that the variable that is subject to forecasting, can be predicted based on the values of one or more explanatory variables. In its most simple form, the simple linear regression, the model tries to find the best linear relationship between two variables. For example, a trend line could be detected by regressing realized cash flow against time using least squares, where the equation will take the following form (McIntosh, 1990, p. 224).

$$CF_t = a + bt \quad (13)$$

Where CF_t is the cash flow realized at time t and b is the constant amount by which cash flows are expected to grow each year. The dependent variables will take on new variables, according to

the changes in the independent variable, i.e. by substituting t in the equation with its future values (McIntosh, 1990, p. 224).

For the cases when the expected growth is more multiplicative than additive, the log-linear regression model can be used, which takes up the following form:

$$\ln CF_t = c + dt \quad (14)$$

Here, d represents the percentage change in cash flows per unit of time. The future, forecasted values of the cash flow are obtained by substituting t in the equation with its future values (McIntosh, 1990, p. 224).

Furthermore, multiple regression analysis can be used, when more than one explanatory variables are included in the model. When multiple explanatory variables are employed, the model exceeds simple time series extrapolations and bases a forecast on a hypothesized causal relationship. The model is presented in the following equation (15):

$$CF_t = a + b_1X_1 + b_2X_2 + \dots + b_nX_n \quad (15)$$

Where:

- CF_t is the cash flow, i.e. the variable that is to be forecasted
- a, b, c, \dots are coefficients which are determined by the analysis
- X_1, X_2, \dots, X_n are the observations of the independent variables in the model.

The regression model is very general and any variables that could explain the movement of the independent variable may be used (Eurofinance, 2004, p. 70). This method is often used in combination with the distribution method for cash flow forecasting (Parkinson & Kallberg, 1993, p. 143). Because of its complexity, the regression analysis is mostly utilized in more sophisticated multinational groups, and is especially popular within some of the larger US groups (de Caux, 2005, p. 110).

Lorek and Willinger (1996, pp. 81-102) develop a multivariate, time-series regression model for one-step-ahead predicting cash flow from operations for a sample of firms, in their attempt to determine the statistical model with the highest predictive ability. For that purpose, they constructed a time series of quarterly cash flows from operations for a sample of 61 firms in the period between 1979 and 1991. Their model employs past values of earnings, short-term accruals and cash flows as independent variables in a time series regression. It can be presented with the following equation (16):

$$CF_t = a + b_1(CF_{t-1}) + b_2(CF_{t-4}) + b_3(OIBD_{t-1}) + b_4(OIBD_{t-4}) + b_5(REC_{t-1}) + b_6(INV_{t-1}) + b_7(PAY_{t-1}) + e_t \quad (16)$$

Where:

CF_t – cash flow from operations at time t

$OIBD_{t-i}$ – operating income before depreciation at time t-i

REC_{t-i} – accounts receivable at time t-1

INV_{t-i} – inventory at time t-1

PAY_{t-i} – accounts payable at time t-1

e_t – current disturbance term

Lorek and Willinger (1996, p. 93) include three sets of independent variables in the model. The first set consists of lagged values of the dependent variable at time t-1 (CF_{t-1}) and t-4 (CF_{t-4}). The variable CF_{t-1} is employed in order to capture adjacent effects, whereas the variable CF_{t-4} is intended to capture seasonal effects in the cash flow series. Furthermore, the inclusion of lagged values is done according to the ARIMA modeling methods that rely on past values of the dependent variable to predict future values.

The second set of independent variables consists of lagged values of accrual-based earnings, where operating income from depreciation is used as a proxy for accrual-based earnings. The results of the model indicate that the operating income before depreciation represents a better predictive fit in the model and thus results in better cash flow prediction than the case when net income is used as a dependent variable. The variable $OIBD_{t-1}$ is employed in order to capture adjacent effects, whereas $OIBD_{t-4}$ to catch the seasonal effects between the cash flows and the proxy for earnings (Lorek & Willinger, 1996, p. 93).

The last set of explanatory variables comprises three variables representing the short-term accruals, namely accounts receivable, inventory and accounts payable, where every variable was lagged one period (Lorek & Willinger, 1996, p. 93).

The predictive results of the analysis suggest that the multivariate time-series model for cash flows provides “significantly more accurate one-step-ahead cash flow predictions than the univariate ARIMA (autoregressive integrated moving average) models or the multivariate cross-sectional regression model” (Lorek & Willinger, 1996, p. 83). Thus, I applied the multivariate time-series regression model as the basis of my analysis and cash flow predictions as well. However, as the subject of the cash flow forecasting for Mercator d.d. is a different type of cash flow and it is done for a different purpose, my model includes different variables suitable for the goals of the cash flow forecasting.

4 CASH FLOW FORECASTING IN MERCATOR D.D.

4.1 Company profile

Poslovni sistem Mercator d.d. is the controlling company of Mercator Group, comprising a group of 26 associated companies. It represents one of the largest retail chains in the region of Southeastern Europe and is the leading retail chain in Slovenia with a market share of approximately 36 %. The Mercator Group spreads its operations on the markets of Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Bulgaria, Albania, planning on further expansion on the markets of the Republic of Macedonia and Republic of Kosovo (Mercator d.d., 2010).

The most important activity of the Mercator Group is retail and wholesale of fast moving consumer goods. In addition to that, Mercator Group's trade operations include specialized programs such as: a textile and beauty program, including clothing program, drugstores and perfumeries; a technical program, comprising hardware and electronics assortment, furniture program as well as home construction program; and a sports program, represented by Intersport stores, where Mercator is the license holder for the largest global chain of sports products for the markets of Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, and Albania. Mercator Group's widely spread retail network is comprised of various store formats such as supermarkets, hypermarkets, neighborhood stores, discount stores, specialized stores, etc. Out of the total number of 1,122 retail units, the parent company Mercator d.d. operates with 777 retail units in Slovenia (Mercator d.d., 2010).

In 2009, Mercator Group generated a total of EUR 2,643 million of net sales revenues, out of which EUR 1,745 million or 66 % were realized by the parent company Mercator d.d. in Slovenia. The majority of net sales revenues of the Mercator Group stems from sales of fast moving consumer goods. In 2009 trade revenues realized from the sales of fast moving consumer goods accounted for 83.3 % of total net sales revenues, whereby revenues from other specialized programs represented 16.7 % of total net sales revenues (Mercator d.d., 2010).

Mercator Group generated 85.4 % of net sales revenues in retail in 2009, while wholesale and other activities accounted for the remaining 14.6 %. Mercator Group generated 99.2 % of net sales revenues with trade operations in 2009, whereby non-trade operations accounted for the remaining 0.8 % of total net revenues from sales (Mercator d.d., 2010).

Efficient cash management is extremely important for the company, as its cash positions can vary widely from day to day, especially during the weekends and holidays when the cash is held up at the stores. Consequently, having an efficient cash forecasting system in place provides solid basis for successful cash management. The Group actively manages its cash holdings by: operating a

centralized cash management system, statistically supported forecasting of cash flows, daily contact with its largest wholesale customers, thereby increasing the predictability of its cash flows, and by operating a centralized cash pooling system. It also constantly monitors customer payment defaults and checks the rating of external customers as well as of Mercator Pika card holders, i.e. the holders of Mercator's customer loyalty card Pika (Mercator, d.d., 2010).

As at December 31st 2009, the companies of the Mercator Group had access to the following sources of liquidity with commercial banks (Table 14):

Table 14. Sources of liquidity of Mercator Group at December 31st 2009

EUR thousand	December 31 st 2009	Percentage of total assets (%)
Cash and cash equivalents	16,844	0.68
Bank deposits	12,983	0.52
Standby revolving credit lines	81,279	3.28
Total	111,106	4.49

Source: Annual report 2009, Mercator d.d., 2010.

Cash and cash equivalents comprise cash balances and call deposits, or more specifically cash in banks, cash in transit (daily proceeds of retail units), cash in hand, and foreign currency letters of credit.

Trade and other receivables amounted to EUR 231,106 thousand as at December 31st 2009, which represents 7.87 % of net sales revenues (the same figure amounts to 3.31 % for Tesco PLC as at February 28th 2010) (Mercator, d.d., 2010; Tesco PLC, 2010). Trade receivables derive from wholesale of goods, material, and services, and sale of goods to individuals, Mercator Pika card holders. They amounted to EUR 202,815 thousand as at December 31st 2009 and represented 7.67 % of net sales revenues.

Trade and other payables amounted to EUR 527,933 thousand as at December 31st 2009, which represents 21.3 % of total equity and liabilities (the same figure equals 15.69 % for Tesco PLC as at February 28th 2010) (Mercator, d.d., 2010; Tesco PLC, 2010). Trade payables only, amounted to EUR 468,996 thousand as at December 31st 2009 (Mercator, d.d., 2010).

4.2 Cash flow forecasting: the case of Mercator d.d.

The current cash flow forecasting system in the Mercator Group is structured on a company level, meaning that each associated company within the group performs its own cash flow forecast.

Regarding the frequency of forecasts, for the purpose of liquidity management within the cash management function, daily cash forecasts are generated.

Subject of this thesis is improving the cash flow forecasting of the parent company Mercator d.d.. For the purpose of cash forecasting, its finance department currently applies a combination of the cash scheduling and distribution method, which is statistically supported in determining certain cash flow patterns. Within the cash scheduling method known and expected cash inflows and outflows, such as payroll, taxes, supplier payments, capital expenditures, interest and principal payments, etc., are allocated to the days when they are expected to be realized. The rest of the cash flows are subject to the distribution method of forecasting, meaning that a forecasted monthly total amount of cash is spread over the days of the month. As already mentioned the distribution of cash to days of the month, is done based on statistically supported detection of cash flow patterns, as well as based on past experience.

For the purpose of my analysis, I obtained data on different categories of cash flows generated in the parent company Mercator d.d., that is, on the territory of Slovenia, from its operating finance department. The database contained daily amounts of different categories of cash flows realized in the period from January 1st 2008 until June 30th 2009. The cash flows were categorized according to several criteria. Firstly, they were divided into cash flows stemming from wholesale activity and cash flows realized in the retail sector. The cash flows realized in the retail sector were further classified into categories depending on the payment type, i.e. whether they have been realized from payment with cash, credit cards, payment with the loyalty card Pika, and finally payment with coupons.

When considering which forecasting technique to employ, I took into account the previously mentioned aspects, namely the purpose of the forecast, the available data, the nature of cash flows and the resources and tools at hand. Taking into account that the cash forecasts are mainly needed for the purpose of liquidity management, that daily data on cash flows is obtainable and that cash flows show daily swings, and finally considering the tools and resources available, my primary choice was using regression analysis as a forecasting tool. However, I used it in a combination with the distribution method, where the daily pattern of cash flows was determined statistically, using again the regression analysis.

Following the outlined procedure of cash forecasting, firstly the different cash flow components were segregated. First of all, the cash flows were divided depending on the activity they arise from, that is, whether they arise from retail or wholesale activity. As retail cash flows manifest greater unpredictability, I further focused on those cash flows. Then, the predictable and expected cash flows such as payroll, taxes, supplier payments etc., were isolated. As the most variability is present in the cash inflows generated from retail sale, they were the choice of my forecasting.

The cash inflows from retail activity are categorized depending on the type of payment made in the store. Namely, in retail activity the following cash inflows are generated: cash proceeds, inflows from card payments, inflows from the loyalty card Pika, and a small portion realized from payments made with coupons. The cash proceeds make up the most of the cash inflows, thus they were chosen as the subject of cash flow forecasting.

Assumptions for the regression analysis were the following:

- A data set of daily cash flows for the period of 18 months, between January 1st 2008 and June 30th 2009, was used.
- The cash proceeds are received on Mercator's account one working day later after they have been realized in the store.
- Cash payments made on a Friday, Saturday and Sunday are jointly received the following Monday.
- Cash payments realized preceding a holiday, or on a holiday, are received the first following working day.
- Weekends and holidays were excluded from the analysis, as it is assumed that no cash proceeds are received on Mercator's account those days.
- The analysis was conducted with the SPSS computer program for statistical analysis.

4.2.1 The distribution method

As already explained, the distribution method represents allocating a forecasted total amount of cash flow for a certain time period, usually a month, over the days within that period in order to demonstrate known intraperiod cash flow patterns (Stone & Wood, 1977, p. 41). As data on projected monthly total amount of cash inflows from retail activity was available for Mercator d.d., I decided to employ the distribution method for cash forecasting. However, as applying this method solely did not provide satisfactory results for the cash forecasting for Mercator d.d., my intention was not to use it as the final forecasting tool, but more as tool for developing an explanatory variable which would be later incorporated into the regression model. This explanatory variable would include planned daily cash forecasts as its observations, obtained by converting the data contained in the monthly budget into daily forecasts. Combining this independent variable with the rest in the regression model was aimed at developing a more complete model.

When applying the distribution method, at first I tried the approach used by Stone and Wood (1977, pp. 42–45), where dummy variable regression is applied in determining the monthly and weekly cash flow patterns, as it provides a simultaneous measurement of monthly and weekly cycles. As previously explained, their model assumes including a dummy variable for each day of

the week, as well as for each day of the month. The resulting regression coefficients are supposed to give the fraction of cash flow from the projected monthly budget that is to be realized on a particular day (Stone & Wood, 1977, p. 42). However, such model did not provide sufficiently good results, as most of the explanatory variables did not satisfy the criterion for statistical significance. That is why I decided to apply a different approach, where two separate regressions would be developed, one showing the day of the week effect and the other the day of the month effect.

Following are two histograms showing the day of the month and the day of the week effect for the cash flows generated in Mercator d.d.. The data series in Figure 9 show the average fraction of the total monthly flow that occurs on a given workday of the month, whereas the data series in Figure 10 show the average fraction of the total weekly cash flow occurring on a given day of the week.

Figure 9: The day of the month effect in Mercator d.d.

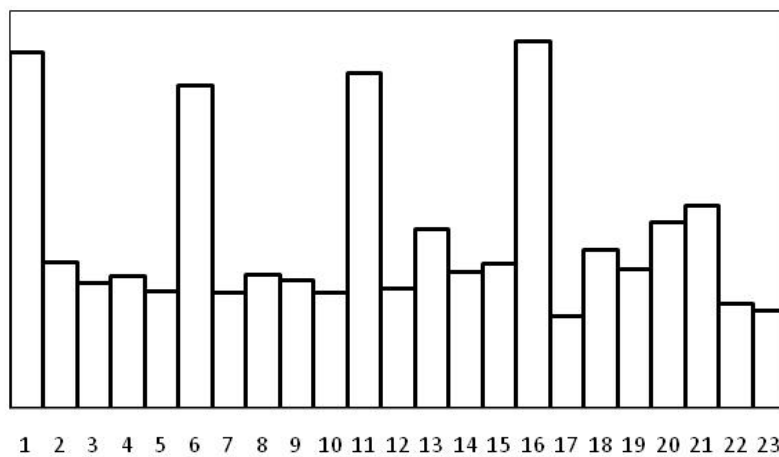
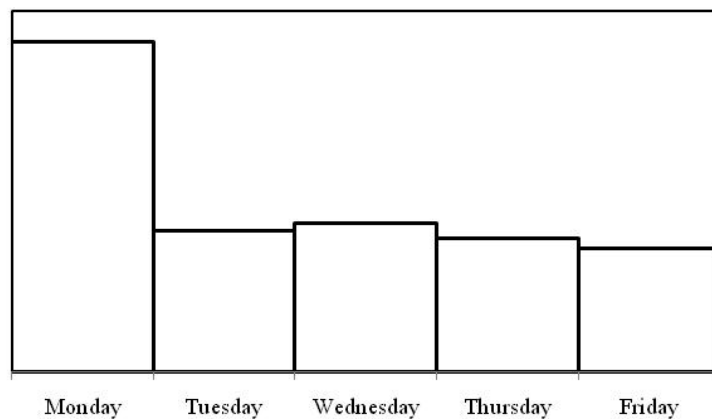


Figure 10: The day of the week effect in Mercator d.d.



In order to develop the necessary data set for both regression analysis (one showing the day of week effect and the other expressing the day of the month effect), used for determining the cash flow patterns, a dependent variable needed to be generated. The amounts of daily cash flows for the period of 18 months, between January 1st 2008 and June 30th 2009, were used as data basis. For the purpose of producing a dependent variable, the daily totals of the cash proceeds were expressed as a portion of the projected monthly total amount of cash inflows from retail activity. That represents the dependent variable in both dummy variable regression analysis.

4.2.1.1 Day of the month regression analysis

In order to detect the intramonth daily pattern of cash flows, a dummy variable was entered into the multivariate linear regression model for every workday of the month, except for one workday which was excluded from the model. For example, if it was the first day of the month, then the dummy variable for the first workday (DWD1) would receive the value one, whereas the rest of the dummy variables would receive the value zero. The same principle applies for the rest of the workdays in the month. The dependent variable is the previously explained variable containing the percentages of daily totals into the monthly cash budget as observations. Finally, the model consisted of one dependent and 22 explanatory variables.

After trying all the combinations of excluding one dummy variable from the model, the regression analysis showed that 19 dummy variables were statistically significant. That means that statistically the means of the dummy variables excluded from the model are about the same, whereas the means of the dummy variables included in the model are statistically significantly different. Thus, the final model included one dependent variable and 19 dummy variables. The results are shown in the following table (Table 15). Please note that for the purpose of limiting disclosure of statistical data, which are considered confidential, the coefficients have been rounded to two decimal places numbers.

Table 15: Day of the month multivariate linear regression

Explanatory variables	Sign	Coefficients for the model (p values in parenthesis)
CONST	+	0.08 (0.000)
DWD2 _t	-	0.03 (0.000)
DWD3 _t	-	0.04 (0.000)

Table continues

Table continued

Explanatory variables	Sign	Coefficients for the model (p values in parenthesis)
DWD4 _t	-	0.04 (0.000)
DWD5 _t	-	0.04 (0.000)
DWD7 _t	-	0.04 (0.000)
DWD8 _t	-	0.04 (0.000)
DWD9 _t	-	0.04 (0.000)
DWD10 _t	-	0.04 (0.000)
DWD12 _t	-	0.04 (0.000)
DWD13 _t	-	0.03 (0.000)
DWD14 _t	-	0.03 (0.000)
DWD15 _t	-	0.03 (0.000)
DWD17 _t	-	0.04 (0.000)
DWD18 _t	-	0.03 (0.000)
DWD19 _t	-	0.03 (0.000)
DWD20 _t	-	0.03 (0.000)
DWD21 _t	-	0.02 (0.001)
DWD22 _t	-	0.04 (0.000)
DWD23 _t	-	0.05 (0.022)
R Square		0.351
F		10.061
Significance		(0.000)

Table continues

Table continued

Notes: The estimated model in the table above is of the form:

$$\text{PERDCH}_t = f(\text{CONST}, \text{DWD2}_t, \text{DWD3}_t, \text{DWD4}_t, \dots, \text{DWD23}_t)$$

Where:

PERDCH_t is the percentage of daily cash flows into the monthly budget on day t

CONST is the constant term in the model

DWD2_t is dummy variable for the second workday in the month, on day t , which equals one for the second workday and zero otherwise

DWD3_t is dummy variable for the third workday in the month, on day t , which equals one for the third workday and zero otherwise

.....

DWD23_t is dummy variable for the twenty third workday in the month, on day t , which equals one for the twenty third workday and zero otherwise

Exact levels of significance are shown below each estimated coefficient.

Sample size contains 374 observations.

From the regression results, we can conclude that the fraction of daily cash flows in the forecasted monthly budget on average amounts to 0.08 for the first, sixth, eleventh and sixteenth workday of the month. The mean fraction of daily cash flows for the second workday is lower by about 0.03, for the third workday is lower by 0.04, etc. In order to obtain the daily amount of cash proceeds realized on a particular day, we need to multiply the estimated parameter for that particular day with the projected monthly total amount of cash flow, according to the following equation (17):

$$\text{Forecasted cash flow}_t = [\text{CONST} + \text{DWD2}_t + \text{DWD3}_t + \text{DWD4}_t + \dots + \text{DWD23}_t] * \text{Projected total monthly amount of cash} \quad (17)$$

For example, if it is the second workday in the month and the projected monthly total amount of cash is EUR 1,000,000, then the planned cash inflows for the above mentioned example would be calculated as follows:

$$\begin{aligned} \text{Forecasted cash flow}_2 &= [0.08 - 1*0.03 - 0*0.04 - 0*0.04 - \dots - 0*0.05] * \text{EUR } 1,000,000 = \\ &= 0.05 * \text{EUR } 1,000,000 = \text{EUR } 50,000 \end{aligned}$$

The same principle is applied for every day of the month, for which regression coefficients have been obtained, whereas for the workdays which have been excluded from the model, the fraction of daily cash flows equals the constant in the model. Such procedure was applied for each observation in the data set and compared to the actual amounts. When compared to the actually realized daily amounts, the deviations of the forecasted amounts from the actual ones were rather significant, which is why, I decided to use the projected cash flows with the distribution method

for the period from January 1st 2008 to June 30th 2009, as an input variable to the regression analysis forecast.

4.2.1.2 Day of the week regression analysis

In order to detect the weekly pattern of cash flows, a dummy variable was entered into the multivariate linear regression model for every weekday, except for one which was excluded from the model. For example, if it was Tuesday, then the dummy variable (DTUE) would receive the value one, whereas the rest of the dummy variables would receive the value zero. The same principle applies for the rest of the weekdays. The dependent variable is the previously explained variable containing the percentages of daily totals into the monthly cash budget as observations. Finally, the model consisted of one dependent and four explanatory variables.

After trying all the combinations of excluding one dummy variable from the model, the regression analysis showed that the dummy variables for Tuesday, Wednesday, Thursday and Friday were statistically significant. Thus, the final model included one dependent variable and 4 dummy variables for the weekdays: Tuesday (DTUE), Wednesday (DWED), Thursday (DTHU) and Friday (DFRI). The results are shown in the following table (table 16). Please note that for the purpose of limiting disclosure of statistical data, which are considered confidential, the coefficients have been rounded to two decimal places numbers.

Table 16: Day of the week multivariate linear regression

Explanatory variables	Sign	Coefficients for the model (p values in parenthesis)
CONST	+	0.09 (0.000)
DTUE _t	-	0.05 (0.000)
DWED _t	-	0.05 (0.000)
DTHU _t	-	0.05 (0.000)
DFRI _t	-	0.06 (0.000)
R Square		0.832
F		456.75
Significance		0.000

Notes: The estimated model in the table above is of the form:

$$\text{PERDCH}_t = f(\text{CONST}, \text{DTUE}_t, \text{DWED}_t, \text{DTHU}_t, \text{DFRI}_t)$$

Where:

PERDCH_t is the percentage of daily cash flows into the monthly budget on day t

CONST is the constant term in the model

DTUE_t is dummy variable for Tuesday on day t, which equals one if it is a Tuesday and zero otherwise

DWED_t is dummy variable for Wednesday on day t, which equals one if it is a Wednesday and zero otherwise

DTHU_t is dummy variable for Thursday on day t, which equals one if it is a Thursday and zero otherwise

DFRI_t is dummy variable for Friday on day t, which equals one if it is a Friday and zero otherwise

Exact levels of significance are shown below each estimated coefficient.

Sample size contains 374 observations.

From the regression results, we can conclude that the fraction of daily cash flows in the forecasted monthly budget on average amounts to 0.09 on Mondays, whereas the mean fraction of daily cash flows on a Tuesday is lower by about 0.05, for a Wednesday is lower by 0.05, etc. In order to obtain the daily amount of cash proceeds realized on a particular weekday, we need to multiply the estimated parameter for that particular weekday with the projected monthly total amount of cash flow, according to the following equation (18):

$$\text{Forecasted cash flow}_t = [\text{CONST} + \text{DTUE}_t + \text{DWED}_t + \text{DTHU}_t + \text{DFRI}_t] * \text{Projected total monthly amount of cash} \quad (18)$$

For example, if it is a Tuesday and the projected monthly total amount of cash is EUR 1,000,000, then the planned cash inflows for the above mentioned example would be calculated as follows:

$$\begin{aligned} \text{Forecasted cash flow}_{\text{Tuesday}} &= [0.09 - 1*0.05 - 0*0.05 - 0*0.05 - 0*0.06] * \text{EUR } 1,000,000 = \\ &= 0.04 * \text{EUR } 1,000,000 = \text{EUR } 40,000 \end{aligned}$$

The same principle is applied for every day of the week, for which regression coefficients have been obtained, whereas for the case when it is a Monday the fraction of daily cash flows equals the constant in the model. Such procedure was applied for each observation in the data set and compared to the actual amounts. When compared to the actually realized daily amounts, the deviations of the forecasted amounts from the actual ones were rather significant, which is why, I decided to use the projected cash flows with the distribution method for the period from January 1st 2008 to June 30th 2009, as an input variable to the regression analysis forecast.

4.2.2 Regression based cash forecast

When conducting a regression based cash forecast, the paramount thing to bear in mind when choosing and developing the explanatory variables is the fact that the observations in the variables must be known up front in order to be able to use them in the regression equation for predicting future values. After conducting numerous regression analyses with different explanatory variables, seven variables were implemented in the final regression, as they were statistically significant. In following paragraphs I explain the nature of each variable, its calculation and what is expected of it in the regression analysis.

D_SPRING is a dummy variable used to express the seasonal effect of spring on cash flows. Its value is one for each day in the spring season, and zero when other seasons are present. Dummy variables for other seasons were also included in the regression analysis, however they were not statistically significant, meaning they do not contribute to explaining the variation in the dependent variable.

D_WED is another dummy variable which is set to one if the observation in the variable is a Wednesday, and equals zero for every other week day. The idea behind this variable was to express the effect of the 10% discount given at Mercator stores every Tuesday. Namely, Mercator has a special marketing action which is supposed to encourage purchases on Tuesdays in such a way that with every purchase above EUR 50 conducted on a Tuesday, the customer receives a 10% discount coupon, which can be realized the next Tuesday at one of Mercator's retail stores.

As the cash proceeds generated on a Tuesday receive value the following Wednesday, the dummy variable was set as Wednesday.

D_PIKA is another dummy variable. Pika is a loyalty card issued by Mercator, whose owners collect points depending on the amount of their purchases and which brings different benefits in the form of special discounts, purchase options and the like. There are certain days in the month when special Pika marketing actions take place, when Pika card owners receive double or triple points for their purchases in Mercator. To express the presence of such marketing actions, the **D_PIKA** variable was entered in the regression analysis. It is set to one on the day following the day when double or triple Pika points are granted, and is set to zero for the rest of the days. These actions are known several months up front, thus they can be used for the cash forecasting purpose.

D_DAH is another dummy variable for the day after a holiday. This variable is used to express the higher amount of cash received the first working day following the holiday. As already mentioned, Mercator does not receive cash on its bank account during holiday days, as the money is kept at the banks during that time. During the holidays cash is accumulated, thus a higher amount is received the first work day following the holiday.

RCPTS (receipts) is a variable that expresses the number of receipts issued each day as a simulation for the number of purchases, i.e. visits in Mercator stores. Namely, daily data was obtainable on the total number of receipts issued in all Mercator stores on the territory of Slovenia. Taking into account that the results of a store visit on a certain day, receives value on the following day, that is, the cash generated through a store visit is received on Mercator's bank account the next working day, each observation on the number of receipts issued was moved one day forward. Also, data about receipts issued on Fridays, Saturdays and Sundays were summed and set as they happen on the following Monday. Furthermore, in order to transform such data into a variable that could be used for future predictions, I calculated the average number of receipts issued each day. After that, the deviations, expressed as percentages, of each actual observation from the average number of issued receipts were calculated. For example if the average number of issued receipts was 100, and the number of receipts issued on a certain day was 105, the deviation from the average is 5 %. Further, I calculated the average deviations for every week day, namely how much actual receipts issued on Mondays, deviate from the average number of issued receipts. After that, by applying the deviations I calculated the average number of receipts issued on a Monday, Tuesday, Wednesday, Thursday and Friday. An example of such calculation is shown in Table 17:

Table 17. Example calculation of the average number of receipts issued each week day

Average number of issued receipts	Average deviation on Mondays (%)	Average deviation on Tuesdays (%)	Average deviation on Wednesdays (%)	Average deviation on Thursdays	Average deviation on Fridays (%)
100	25	-2	18	-12	8
	Average number of receipts on Mondays	Average number of receipts on Tuesdays	Average number of receipts on Wednesdays	Average number of receipts on Thursdays	Average number of receipts on Fridays
	125	98	118	88	108

That way obtained numbers are repeatedly entered as observations in the explanatory variable. The idea behind this variable is to express the day of the week effect on the cash flows.

DOM is the first variable obtained using the previously mentioned distribution method for cash flow forecasting, which represents planned daily cash flows using the day of the month distribution pattern. The forecasted cash proceeds within this variable express the day of the month effect.

DOW is the second variable obtained using the distribution method for forecasting, which represents planned daily cash flows using the day of the week distribution pattern. The forecasted cash proceeds within this variable express the day of the week effect.

The multiple linear regression model includes the dependent variable, which is CASH, and seven independent variables, which are: D_SPRING, D_WED, D_PIKA, D_DAH, RCPTS, DOM and DOW. Table 18 shows the results of the regression analysis. Please note that in order to limit the disclosure of confidential statistical data, the actual numbers of the regression coefficients have been replaced with letters, but their signs have been kept.

Table 18. Multiple linear regression model for forecasting cash proceeds

Explanatory variables	Sign	Coefficients for the model (p values in parenthesis)
CONST	-	<i>a</i> (0.219)
D_SPRING _t	+	<i>b</i> (0.012)
D_WED _t	+	<i>c</i> (0.011)
D_PIKA _t	+	<i>d</i> (0,000)
D_DAH _t	+	<i>e</i> (0.000)
RCPTS _t	+	<i>f</i> (0.002)
DOM _t	+	<i>g</i> (0.017)
DOW _t	+	<i>h</i> (0.000)
R Square		0.922
F		617.80
Significance		0.000

Notes: The estimated model in the table above is of the form:

$$\text{CASH} = f(\text{CONST}, \text{D_SPRING}_t, \text{D_WED}_t, \text{D_PIKA}_t, \text{D_DAH}_t, \text{RCPTS}_t, \text{DOM}_t, \text{DOW}_t)$$

Where:

CASH is the dependent variable showing the amount of cash proceeds realized on day t

D_SPRING_t is dummy variable for the spring season, on day t

D_WED_t is dummy variable for Wednesday, on day t

D_PIKA_t is dummy variable for the Pika marketing actions, on day t

D_DAH_t is dummy variable for the day following a holiday, on day t

RCPTS_t is a variable for the average number of issued receipts on day t

DOM_t is the forecasted daily amount of cash on day t using the day of the month distribution pattern

DOW_t is the forecasted daily amount of cash on day t using the day of the week distribution pattern

Exact levels of significance are shown below each estimated coefficient.

Sample size contains 374 observations.

From Table 18 we can see that the R Square coefficient equals 0.922, which indicates that the regression model explains 92.2 % of the variation in the daily cash proceeds. The regression

model can be presented with the following equation (19), which will be later on applied in forecasting the daily amounts of cash flows realized on each particular day:

$$CASH_t = -a + b*D_SPRING + c*D_WED + d*PIKA + e*DAH + f*RCPTS + g*DOM + h*DOW \quad (19)$$

The coefficients attached to the dummy variables are known as differential intercept coefficient, because they show by how much the value of the intercept that receives the value of 1 differs from the intercept coefficient of the benchmark category, i.e. the category that has been excluded (Gujarati, 2004, p. 302). In equation 19, the coefficient before the variable D_SPRING tells us that in spring on average b currency units are realized more in the daily cash flows, than in the rest of the seasons. Also, the coefficient before the variable D_WED tells us that on Wednesdays are generated on average c currency units more, than on other days of the week. Here, the effect of the discounts on Tuesdays is shown. The same principle applies for the rest of the dummy variables. Namely, equation 19 shows that on days when Pika marketing actions take place, d currency units more are generated, than on the rest of the days when no marketing actions take place. Finally, the coefficient before the D_DAH variable shows that on average, on the day following the holiday, e currency units more are realized, than on days when there is no holiday preceding.

The coefficient before the variable RCPTS, shows that if the number of issued receipts increases by 1 for example, that would increase the cash flow generated by f currency units, ceteris paribus. As this variable is used as an approximation for the number of customers, it could be also interpreted as the effect that the increase in the number of customers would have on the cash flows generated. Further on, if the inflows planned with the day of the month distribution pattern (DOM variable) on a particular day increase by 1 currency unit, the actually realized cash flows would increase by g currency units, ceteris paribus. Finally, if the inflows planned with the day of the week distribution pattern (DOW variable) on a particular day increase by 1 currency unit, the actually realized cash flows would increase by h currency units, ceteris paribus.

Further diagnostics tests were necessary in order to determine whether serious multicollinearity problems exist in the model. In order to detect multicollinearity, the case when two or more explanatory variables in the multiple regression model are highly correlated, several approaches exist. One of them is the case when none of the t-ratios for the individual coefficients is statistically significant, yet the overall F statistic is (Gujarati, 2004, p. 359). If we take a look at table 18, we can see that all t-ratios, except for the intercept, are statistically significant and so is the overall F statistic. According to this criterion we cannot conclude that multicollinearity in this regression model exists.

Further on, I used the approach where pair-wise correlations between the variables are computed, more specifically I used the Pearson correlation coefficient (table 19). A rule of thumb is that the correlation between two variables is high if the correlation coefficient is in excess of 0.8 (Gujarati, 2004, p. 359). Correlations marked with one asterisk (*) are significant at the 0.05 level, and correlations marked with two asterisks (**) are significant at the 0.01 level.

Table 19. Pearson correlation coefficients

		CASH	D_SPRING	D_WED	D_PIKA	D_DAH	RCPTS	DOM	DOW
CASH	Pearson Corr.	1	0.014	-.157**	.554**	.430**	.907**	.588**	.912**
	Sig. (2-tailed)		0.785	0.002	0	0	0	0	0
D_SPRING	Pearson Corr.	0.014	1	0.006	0.021	0.027	-.032	-.025	-.046
	Sig. (2-tailed)	0.785		0.915	0.684	0.599	0.532	0.63	0.38
D_WED	Pearson Corr.	-.157**	0.006	1	-.132*	-.103*	-.235**	-.096	-.167**
	Sig. (2-tailed)	0.002	0.915		0.01	0.046	0	0.06	0.001
PIKA	Pearson Corr.	.554**	0.021	-.132*	1	.169**	.414**	.303**	.424**
	Sig. (2-tailed)	0	0.684	0.01		0.001	0	0	0
D_DAH	Pearson Corr.	.430**	0.027	-.103*	.169**	1	.238**	.189**	.214**
	Sig. (2-tailed)	0	0.599	0.046	0.001		0	0	0
RCPTS	Pearson Corr.	.907**	-.032	-.235**	.414**	.238**	1	.563**	.980**
	Sig. (2-tailed)	0	0.532	0	0	0		0	0
DOM	Pearson Corr.	.588**	-.025	-.096	.303**	.189**	.563**	1	.593**
	Sig. (2-tailed)	0	0.632	0.064	0	0	0		0
DOW	Pearson Correlation	.912**	-.046	-.167**	.424**	.214**	.980**	.593**	1
	Sig. (2-tailed)	0	0.38	0.001	0	0	0	0	

As evident from table 19, very high correlation exists between the variables RCPTS and DOW, significant at the 0.01 level. That is logical to expect, because both of them express the same trend, that is, the day of the week effect. The consequence of multicollinearity is that it produces large standard errors in the related independent variables, which means that the coefficients cannot be estimated with great accuracy (Gujarati, 2004, p. 344). However, one situation when multicollinearity may not pose a serious problem is the case when the R Square coefficient is high and the regression coefficients are individually significant (Gujarati, 2004, p. 370). As that is the case with the regression model at hand, I decided to keep all mentioned variables. Furthermore, as the primary interest of devising the regression model is its predictive ability, the levels of multicollinearity will not adversely affect the regression's predictive power (Lorek & Willinger, 1996, p. 94).

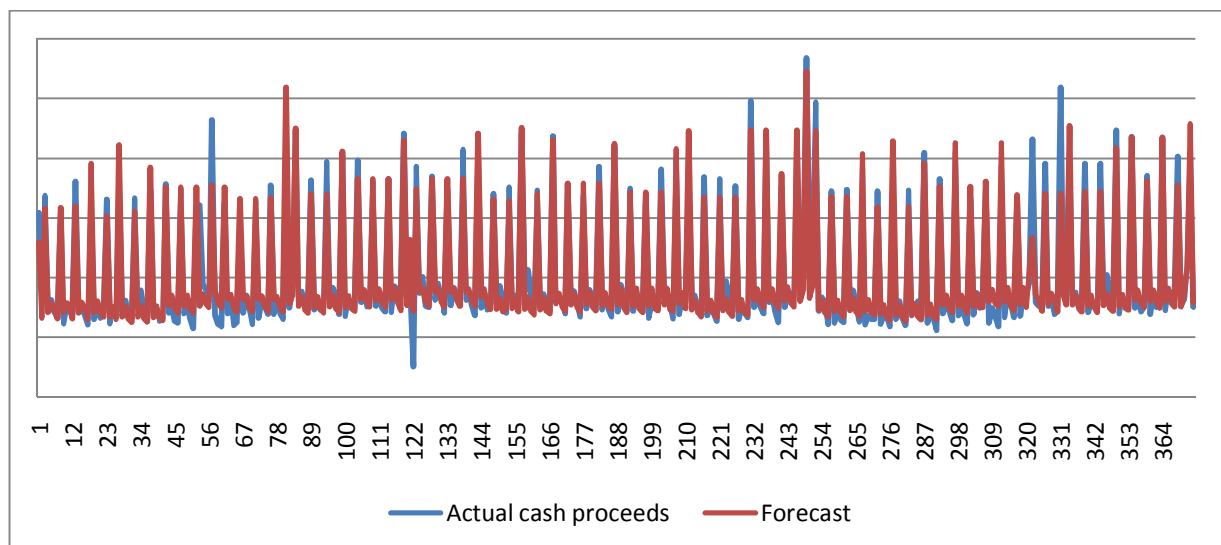
The cash flow forecast for each day is done by substituting the values of the explanatory variables in the equation 19. Based on the coefficients obtained, the forecast for each work day is

done in the following way: suppose it is spring, thus the dummy variable D_SPRING receives value 1; it is Monday, thus D_WED equals zero; there is no Pika marketing action, thus D_PIKA variable equals zero; it is a day after holiday, thus the variable D_DAH equals one; as it is Monday, the average number of issued receipts equals 125 (from table 17); if the planned inflows from the variable DOM for that particular day equal EUR 50,000; and finally if the planned inflows from the variable DOW for that day are EUR 80,000, according to equation 19, the cash flow received on that day will be:

$$Cash\ flow_t = -a + b*1 + c*0 + d*0 + e*1 + f*125 + g*50,000 + h*80,000$$

Such calculation is done for each day in the forecast. When compared to actual results, the cash flow forecast understandably demonstrated some deviations on a daily basis, which were even smaller for the monthly total amounts. The forecast generated with the regression model significantly well follows the daily and monthly swings in cash flows, which is evident from the following graph (figure 11).

Figure 11: Comparison of actual and forecasted daily cash flows



Similar approach can be used for the other elements of cash inflows and outflows. The most important thing is to detect, devise and input variables that contribute to explaining the movement in the cash flow which is subject to forecasting. Furthermore, the observations in those variables must be known in advance in order for them to be applicable for future forecasting. It is crucial that the forecast is regularly assessed, by comparing it to actual results, and revised in order to incorporate eventual changed circumstances, which might influence the generation of

cash flows. Improved cash forecasting becomes an irreplaceable tool in the hand of the cash manager due to the multiple benefits achieved, previously explained.

CONCLUSION

Cash management concentrates on managing cash inflows and outflows, investing cash surpluses and covering cash shortages. Determining the optimal amount of cash is inherently related to the short term investments held at the company and represents a considerable theoretical problem. Many authors have tackled this problem through development of various theoretical models (Baumol, 1952; Miller & Orr, 1966; Stone, 1972), however their results were often deviating from the cash amounts held at companies. Thus, today, the cash investment in most companies is determined based on past experience and operational methods.

The most important role in cash management have the various techniques for cash management, especially the ones aimed at speeding up cash receipts and slowing down payments, as well as the cash forecasting techniques. Here, arise differences between the cash management techniques applied in the US, where they focus on the concept of float, which arises from the dominant use of cheques as means of payment. Given that in Europe, most payments are electronic, cash management techniques focus on speeding the collection of accounts receivable and slowing down the payments of accounts payable.

Regarding the cash forecasting methods, each company will choose such method that corresponds to the purpose it is applied, the industry the company is in, and thus the nature of its cash flows and the resources the company has on hand. Cash forecasting presents an invaluable tool on the hand of the cash manager as it provides him with information of the moment and amount of cash surpluses and shortages which will be realized. Thus the cash manager has the proper basis for making short term investment or borrowing decisions. Furthermore, he is provided the favorable buffer time to find the best and most cost effective solutions for that. In the case of the company Mercator d.d., the regression analysis based forecast was applied, combined with the distribution method. It provided considerably satisfactory results in predicting the flows of cash proceeds from retail sales. Further step is to apply the same logic to the rest of the cash flows. Within cash forecasting a crucial task is the follow up process. Namely, every cash forecast needs to be compared to the actual results in order to determine its accuracy. Also, the forecasts need to be regularly revised and updated.

REFERENCE LIST

1. Allman-Ward M., & Sagner J. (2003). *Essentials of managing corporate cash*. New York: John Wiley & Sons, Inc.
2. Mercator Group. Annual report 2009. (2010). Ljubljana: Mercator Group.
<http://www-en.mercator.si/investors>
3. Association for Financial Professionals. Retrieved on February 11th, 2010, from:
<http://www.afponline.org/pub/store/pubs/00ecff.html>
4. Bahl, V. (2008, 22nd April). Electronic Invoicing + Electronic Payments = Successful A/P Automation. *Gtnews*. Retrieved on April 28th, 2010, from:
<http://www.gtnews.com/article/7241.cfm>
5. Balasubramanian, S. (2009). Efficient Cash Management Through E-Billing. Retrieved July 18th, 2010, from:
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1446029
6. Baumol, J. W. (1952, November). The Transactions Demand For Cash: An Inventory Theoretic Approach. *Quarterly Journal of Economics*, 66(4), 545–556.
7. Belpaire, L. (2009, 24th March). Emerging trends and developments in liquidity management. *Gtnews*. Retrieved on April 17th, 2010, from:
<http://www.gtnews.com/article/7577.cfm>
8. Bergen, J. (2006, 29th August). Cash Management Best Practice: Unlocking Working Capital. *Gtnews*. Retrieved on April 27th, 2010, from:
<http://www.gtnews.com/article/6446.cfm>
9. Bottomline Technologies. (2006, 4th September). Best Practice in Purchase-to-Pay – Part 1: Making Invoice Data Capture More Efficient. *Gtnews*. Retrieved on April 26th, 2010, from:
<http://www.gtnews.com/article/6465.cfm>
10. Bottomline Technologies. (2006, 18th September). Best Practice in Purchase-to-Pay – Part 2: Invoice Approval and Purchase Management. *Gtnews*. Retrieved on April 26th, 2010, from:
<http://www.gtnews.com/article/6482.cfm>
11. Bottomline Technologies. (2006, 16th October). Best Practice in Purchase-to-Pay – Part 4: Optimizing Working Capital Management. *Gtnews*. Retrieved on April 26th, 2010, from:
<http://www.gtnews.com/article/6519.cfm>
12. Bowlin, O.D., Martin, J. D., & Scott, D. F. (1990). *Guide to Financial Analysis*. (2nd ed.). New York: McGraw Hill Publishing Company.
13. Brigham, E. F., & Daves, P. R. (2004). *Intermediate Financial Management* (8th ed.). Mason: Thomson South-Western.
14. Brigham, E. F., Gapenski, C. G. & Daves, P. R. (1999). *Intermediate Financial Management* (6th ed.). Orlando: The Dryden Press.
15. Bruun-Jensen, P. (2009, 2nd June). Six Tips for Successful Credit Management in a Recession. *Gtnews*. Retrieved on April 15th, 2010, from:
<http://www.gtnews.com/article/7643.cfm>

16. Buehler, N. (2008, 22nd April). Accounts Payable: Time to Automate. *Gtnews*. Retrieved on April 26th, 2010, from:
<http://www.gtnews.com/article/7238.cfm>
17. Cantillon, A., & Chrystal, P. F. (2009). Sweep Accounts. *Pratt's Corporate Treasury Management Manual*, Washington D.C.: A.S Pratt and Sons.
18. Caviezel, A. (2007). Cash Management Techniques. *The International Treasurer's Handbook*, Association of Corporate Treasurers
19. Chastain, C.E. (1986, November-December). Integration of cash management. *Business Horizons*, 29(6), 79–84
20. Citigroup Global Markets Inc. (2009, July). *Putting Working Capital to Work: Releasing Capital by Accelerating the Cash Conversion Cycle*. New York: Citigroup Global Markets Inc.
21. Committee on Payment and Settlement Systems (2003). *Payment and settlement systems in selected countries*. Basel: Bank for International Settlements.
22. Comptroller of the Currency Administrator of National Banks (1999, September). Bankers' Acceptances. *Comptroller's Handbook*
23. Coyle, B. (2000). *Cash Flow Management: Cash Flow Forecasting and Liquidity*. Chicago & London: Glenlake Publishing Company, Ltd / Fitzroy Dearborn Publishers.
24. Cunningham, P. (2007, 25th April). Centralization of accounts receivable into a Shared Service Centre. *GTnews*. Retrieved on April 13th, 2010, from:
<http://www.gtnews.com/article/6728.cfm>
25. Cunningham, P. (2008, 11th November). Don't let your collections "Crunch" – Understanding the big picture. *GTnews*. Retrieved on April 7th, 2010, from:
<http://www.gtnews.com/article/7468.cfm>
26. Daellenbach, H. G. (September, 1974). Are cash management optimization models worthwhile? *Journal of Financial and Quantitative Analysis*, 9(4). 607–626
27. Darch, C. M., (2004, 16th March). The Importance of Orders in Automating the Purchase-to Pay Process. *Gtnews*. Retrieved on April 27th, 2010, from:
<http://www.gtnews.com/article/5394.cfm>
28. de Caux, T. (2005). *Cash Forecasting*. The International Treasurer's Handbook, London: Association of Corporate Treasurers.
29. De Gidlow, R. & Donovan, S. (2007). *Cash Forecasting*. The International Treasurer's Handbook, London: Association of Corporate Treasurers.
30. Dean, J. (2006, 4th September). Order-to-cash: The big payback. *Gtnews*. Retrieved on April 20th, 2010, from:
<http://www.gtnews.com/article/6461.cfm>
31. Dolfe, M., & Koritz, A. (1999). *European Cash Management – A Guide to Best Practice*. West Sussex: John Wiley & Sons Ltd.
32. Doyle, M. (2007, May). Why it matters. *Accountancy Magazine*, 44.
33. Dropkin, M., & Hayden, A. (2001) *The Cash Flow Management Book for Nonprofits: A Step-by-Step Guide for Managers and Boards* (1st ed.). San Francisco, CA: Jossey-Bass.

34. Ehrhardt, M. C., & Brigham, E. F. (2006). *Corporate Finance: A Focused Approach*. (2nd ed.). Mason: Thomson South-Western.
35. Electronic invoicing. (2009, May). *Treasury Today*, 10(5), 15.
36. Ellis, S. (2006, 6th June). Optimize Your Working Capital. *Gtnews*. Retrieved on April 27th, 2010, from:
<http://www.gtnews.com/article/6369.cfm>
37. Fabozzi, F. J., & Peterson, P. P. (2003). *Financial Management and Analysis* (2nd ed.). New York: John Wiley & Sons, Inc.
38. Foster-Bach, P. (1997). *Corporate Cash Management: Strategy and Practice* (2nd ed.). Cambridge: Woodhead Publishing Ltd.
39. Gallanis, M. (2004, March). Going with the cash flow. *The Treasurer*, 49.
40. Gitman, L. L., Moses, E. A., & White, T. T. (1979). An Assessment of Corporate Cash Management Practices. *Financial Management*. 8(1), 32–41
41. Gtnews & SEB. (2009, 2nd October). Cash management survey 2009: *Corporates put accounts receivable and centralization in the spotlight*. Retrieved January 15th, 2010, from:
<http://www.gtnews.com/feature/398.cfm>
42. Gujarati, D.N. (2004). *Basic econometrics* (4th ed.). New York: The McGraw-Hill Companies.
43. Harford, J. V. T. (2000). *Corporate Cash Management, Excess Cash and Acquisitions*. New York: Garland Publishing, Inc.
44. Hofler, D. (2008, 22nd April). Look to Accounts Payable to Add Value. *Gtnews*. Retrieved April 26th, 2010, from:
<http://www.gtnews.com/article/7242.cfm>
45. Hughes, K. (2007). *Guide to short term investment*. The International Treasurer's Handbook, London: Association of Corporate Treasurers.
46. Hughes, K. (2008). *Guide to short term investment*. The International Treasurer's Handbook, London: Association of Corporate Treasurers.
47. Hunstad, M. (2004). *Proof that Better Forecasts Equal Better Returns and How to get There*. London: Treasury Strategies Inc.
48. Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money*. San Diego, CA: Harcourt, Brace and Company.
49. Knowles, A. (2009). *The Importance of Forecasting Cash Flows: Failing to Manage Cash Flow Can Lead to Business Failure*. Retrieved on December 20th, 2009, from:
http://business-financial-planning.suite101.com/article.cfm/the_importance_of_forecasting_cash_flow#ixzz0YYmWxJKD
50. Lam, J. (2003). *Enterprise Risk Management: From Incentives to Controls*. New York: John Wiley & Sons.
51. Lorek, S. K., & Willinger, G. L. (1996, January). A Multivariate Time-Series Prediction Model for Cash-Flow Data. *The Accounting Review*, 71(1), 81–102.
52. Matassi, G. M. (2008). *An Integrative Approach to Cash Flow Forecasting*, EuroFinance.

53. McIntosh, W. (1990). Forecasting Cash Flows: Evidence from the Financial Literature. *The Appraisal Journal*, 58 (2). Accounting & Tax Periodicals, 221.
54. Michalski, G. M. (2006, 15th December). Risk-Based Cash Demand in a Firm. *Managing and Modelling Of Financial Risk*, 179–185.
55. Miller, M. H., & Orr, D. (1966). A model of the demand for money by firms. *Quarterly Journal of Economics*, 80(3), 413–415.
56. Monga, V. (2010, 5th March). Whiter securitization? *The Deal Magazine*. Retrieved May 3rd, 2010, from:
<http://www.thedeal.com/newsweekly/features/cover-stories/whither-securitization.php>
57. Mulligan, E. (2001). Treasury management organization: An examination of centralized versus decentralized approaches. *Irish Journal of Management*, 22(1) 7–33.
58. Nygren, J. (2008, November). The new look of liquidity management in Europe. *The FX & MM Magazine*, pp. 34-38.
59. Ochs, J. & Parkinson, K. L. (2006, January 1st). Cash flow forecasting: Do it better and save, *Financial Executive*, Retrieved December 20th, 2009, from:
<http://www.allbusiness.com/accounting-reporting/reports-statements-cash/856172-1.html>
60. Parkinson, K. L., & Kallberg, J. G. (1993). *Corporate liquidity: A guide to managing working capital*. Homewood: Business One Irwin.
61. Peterson, M. A. & Rajan, R. G. (1997). Trade Credit: Theories and Evidence. *The Review of Financial Studies*, 10(3), 661–691.
62. Pinches, G. E. (1997). *Essentials of financial management* (4th ed.). London: Addison-Wesley Educational Publishers, Inc.
63. Punter, A. (1982). Optimal cash management under conditions of uncertainty. *Journal of Business Finance & Accounting*, 9(3), 329–340.
64. QFinance. Preparing a Cash Flow Forecast. Retrieved February 10th, 2010, from:
<http://www.qfinance.com/cash-flow-management-checklists/preparing-a-cash-flow-forecast>
65. Quibria, N. (2009, 18th August). Accounts Payable: A Vehicle to Drive Competitive Advantage. *Gtnews*. Retrieved on April 26th, 2010, from:
<http://www.gtnews.com/article/7734.cfm>
66. Rebel, B. (2005, 26th September). Cash Pooling: Finding a Cost Efficient Equilibrium. *Gtnews*. Retrieved on May 6th, 2010, from:
<http://www.gtnews.com/article/6118.cfm>
67. Rebel, B. (2010, 26th January). A New Approach to Reliable Cash Flow Forecasting. *Gtnews*. Retrieved February 2nd, 2010, from:
<http://www.gtnews.com/article/7882.cfm>
68. Richards, V. D., & Laughlin, E. J. (Spring, 1980). A Cash Conversion Cycle Approach to Liquidity Analysis. *Financial Management*, 9(1), 32–38
69. San José L., Iturralde, T., & Maseda, A. (2008). Treasury Management Versus Cash Management. *International Journal of Finance and Economics*, 1450–2887 (19).
70. Sartoris, W. L., & Hill, N. C. (1983, May). A Generalized Cash Flow Approach to Short-Term Financial Decisions. *The Journal of Finance*. 38(2), 349–360

71. SEPA Direct Debit – Ready or not? (2009, November/December). *Treasury Today*, 10(11), 17.
72. Shapiro, A. C. (2002). *Multinational Financial Management* (7th ed.). New York: John Wiley & Sons.
73. Sommerville, G., & Maritz-Rakesh, S. (2009, 15th August). Unlocking All the Cash. *Gtnews*. Retrieved on April 26th, 2010, from:
<http://www.gtnews.com/article/7735.cfm>
74. Sristava, S. (2005, 15th December). Raising Collections to the Next Level. *Gtnews*. Retrieved on April 18th, 2010, from:
<http://www.gtnews.com/article/6213.cfm>
75. Stone, B. K., & Miller, T. M. (1987). Daily Cash Forecasting with Multiplicative Models of Cash Flow Patterns. *Financial Management*, 16(4), 45–54
76. Stone, B. K., & Wood, R. A. (1977). Daily Cash Forecasting: A Simple Method for Implementing the Distribution Approach. *Financial Management*, 6(3), 40–50
77. Stone B. K., & Miller, T. M. (1985). Daily Cash Forecasting and Seasonal Resolution: Alternative Models and Techniques for Using the Distribution Approach. *Journal of Financial and Quantitative Analysis*, 20(3), 335–351
78. Stone, B. K. (spring, 1972). The Use of Forecasts and Smoothing in Control-Limit Models for Cash Management. *Financial Management*, 1(1), 72–84
79. Summers, B., & Wilson, N. (2003, September-November). Trade Credit and Customer Relationships. *Managerial and Decision Economics*. 24(6/7), 439–455
80. Tesco PLC. Tesco PLC Annual Report and Financial Statements 2009. (2010). Hertfordshire: Tesco PLC. <http://www.tescopl.com/annualreport09/>
81. The European Central Bank. Relative importance of payment instruments: 2008. Retrieved on March 14th, 2010, from:
http://www.ecb.int/stats/payments/paym/html/payments_p_2008.en.html
82. Treasury Alliance Group. Cash Pooling: Improving the balance sheet. Retrieved February 10th, 2010, from:
<http://www.phoenixecht.com/treasuryresources/PDF/pooling.pdf>
83. Treasury Strategies Inc. (2007). Designing a regional liquidity structure for Europe. Retrieved February 10th, 2010, from:
<http://www.treasurystrategies.com/resources/presentations/EuroCashPoolingWC07.pdf>
84. Treasury Strategies, Inc. (2006). Advanced Cash Forecasting. Retrieved February 10th, 2010, from:
<http://www.treasurystrategies.com/resources/presentations/CashForecastWindyCity06.pdf>
85. Tunon, A. (2008, 9th December). Don't let your collections “Crunch” – Getting it done. *Gtnews*. Retrieved on April 11th, 2010, from:
<http://www.gtnews.com/article/7506.cfm>
86. Waddell, D., & Sohal, A. S. (1994). Forecasting: The Key to Managerial Decision Making. *Management Decision*, 32(1), 41–49

87. Yiu, Y. (2004, 1st June). Redesigning the Accounts Receivable Process for Competitive Advantage. *Gtnews*. Retrieved on April 7th, 2010, from:
<http://www.gtnews.com/article/5501.cfm>
88. Zekkar, P., & Osmund, N. (2009, 16th June). Back to basics – Reviving Cash and Working Capital Management. *Gtnews*. Retrieved on April 7th, 2010, from:
<http://www.gtnews.com/article/7656.cfm>
89. Zucknick, M. (2008, 2nd September). Cash Management Techniques. *Gtnews*. Retrieved on May 7th, 2010, from:
<http://www.gtnews.com/article/7381.cfm>