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EFFECTS OF EFFICIENT WORKING CAPITAL MANAGEMENT ON COMPANY PERFORMANCE: CASE SINTROL OY

Bachelor Thesis

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I declare I have written the bachelor thesis independently.

All works and major viewpoints of the other authors, data from other sources of literature and elsewhere used for writing this paper have been referenced.

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ABSTRACT

Working capital, also termed as gross working capital, refers to current assets of the company which includes cash and cash equivalents, marketable securities, inventory and accounts receivable. Working capital can be divided in two parts, net working capital and gross working capital. Companies pursue to minimize their working capital, but yet to maintain it on level that does not have a negative influence on cash flows. There have been multiple studies that have identified positive correlation between working capital management and profitability and negative correlation between cash conversion cycle and profitability. This paper is a case study about working capital management in case company Sintrol Oy. The focus of this paper is on inventory optimization and what consequences it has on the performance of case company. The performance of Sintrol Oy is measured using cash conversion cycle, that is held as the key indicator for working capital management, and profitability is measured using Du Pont identity, which is one of the most complete measures of return on shareholder´s equity.

Keywords: working capital, working capital management, cash conversion cycle, Du Pont identity, inventory management.

INTRODUCTION

The topic of this paper is working capital management which deals with current assets and current liabilities of the company. By properly managing the working capital companies balance the required liquidity to meet its liabilities, but at the same time also to be able to seek for profitable investments. In order to optimize the working capital companies must minimize the length of payment period from customers, maximize the length of payables to creditors and to keep the inventory in minimal level. Inventory management is a significant part of working capital management as it ties up working capital and accumulates various costs. Therefore, this paper more specifically has focus on inventory management and the optimization of inventory levels, which will hypothetically improve working capital efficiency and increase profitability. The inventory is studied in this paper by examining the necessary inventory data with Microsoft Excel and proper financial ratios. The main weight in determining the optimal level of inventory is in analysis of turnovers. Cash conversion cycle and Du Pont identity are used to measure the efficiency and return on equity before and after the optimization.

There have been prior studies on this particular topic of working capital management and profitability. Prior studies have been conducted using quantitative research methods, searching for correlation between working capital management and company profitability (eg. Rehn (2012), García-Teruel & Martínez-Solano (2007), Deloof (2003)). Deloof (2003) studied the link between working capital management and profitability in Belgian companies and Garcia-Teruel and Martinez-Solano (2007) studies focus on working capital management and profitability of SME´s in Spain. Rehn´s (2012) study focuses on cross-national research from publicly listed companies in Finland and Sweden and finding the correlation between working capital management and profitability on 13 different industries. All the studies mentioned found a strong negative correlation between the length of cash conversion cycle and corporate profitability. Study about cash conversion cycle (Moss & Stine, 1993) proposes that especially small business owners can improve their cash flows by shortening the cash conversion period by three different ways: 1) reduce the inventory conversion period 2) reduce the receivables

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conversion period and/or 3) increase the payables deferral period and the relation between cash flows and cash conversion cycle is inverse.

Du Pont identity is held as one of the most practical tool for measuring the corporate performance due to the fact that it consists of multiple financial ratios and therefore makes it easy for management to identify its strengths and weaknesses (Liesz & Maranville, 2008). On general Du Pont identity consists of three ratios but Hawawini and Viallet (1999) introduced a modification that consists of five ratios all measuring different areas. Study by Liesz and Maranville provides proof that changing one factor in each of the ratios has an effect on return on equity, including inventory. In this paper the return on equity is under scope using the traditional three factor identity and with the modified five factor identity provided by Hawawini and Viallet (1999).

Due to the fact that prior research on the topic indicate that managing working capital improves company efficiency and profitability, the hypotheses of this paper are *H1: By managing working capital properly, Sintrol Oy may improve its efficiency* and *H2: Through efficient working capital management Sintrol Oy may improve its profitability.*

The link between the inventory optimization and working capital management lays in the fact that if too much working capital is tied in to inventory, company has to find external sources to finance to its operations, and if company is not liquid enough, it may face severe cost of finance. In this study the focus is more practical as it studies case company and its inventory and other necessary financial data to find the factors behind the burdensome inventory and in which amount the inventory can be reduced. One of the research problems is that company can not reduce the inventory infinitely in order to maintain the sales on current level, so certain determinants have to be indicated. If the inventory is reduced excessively, company will face out of stock situations and it will turn out to be costly both directly and indirectly. The cash conversion cycle and return on equity have been calculated before and after the optimization to visualize the results.

The limitations for the research is that the cash conversion cycle and return on equity and all the components included are very industry sensitive (Rehn. 2012), and Sintrol Oy manufacturing and retailing highly specialized products in highly specialized industry, the benchmarking and comparison to industry averages are not considered in this paper.

In the first part of this thesis the theoretical framework is explained, consisting of working capital, working capital management and its components, cash conversion cycle and

Du Pont identity. In the second part of the paper performance indicators are reviewed. In the third part of the thesis the criteria for the optimization of the inventory is determined and the calculations are made. In the fourth part the results are discussed.

I WORKING CAPITAL

Working capital can be divided in two parts, net working capital and gross working capital. Working capital, also termed as gross working capital, refers to current assets of the company which includes cash and cash equivalents, marketable securities, inventory and accounts receivable (Campsey & Brigham 1985, 240). Net working capital on the other hand is an absolute measure of the company liquidity in monetary terms and is calculated by deducting current liabilities form current assets. Net working capital is used in reporting by internal users, as on the other hand financial analysts tend to talk about current assets as working capital and therefore referring to gross working capital. (Van Horne & Wachowicz 1998, 204.) Working capital policy on the other hand determines the level of financing on each category of company´s current assets (Campsey & Brigham 1985, 240). Net working capital determines the level of investment needed from long-term capital to finance its working capital.

$$NWC = Current\ Assets - Current\ Liabilities$$

In case net working capital is negative, company has more current liabilities than current assets and vice versa.

1.1 Strategies to finance current assets

The way of financing investments and working capital is dependent on the capital structure of the company. To determine the level of financing with current liabilities managerial level have to take in to consideration the trade-off between risk and return. The amount of financing the current assets is dependent on the volume of operations, the higher the amounts rise the higher amounts of invested capital is required. However, the quantities and capital required do not increase linearly because of the fact that producing small quantities has higher

unit cost and the marginal cost decreases when producing more (Van Horne & Wachowicz. 1998, 205). Ideally current assets are financed first by using current liabilities and the rest is financed using shareholders´ equity (Strischek, 2001).

1.1.1 Hedging approach

Campsey & Bringham (1985) suggests that constantly fluctuating, or seasonal level of current assets should be financed with short-term credit and fixed assets with more stable nature should be financed with long-term debt and equity capital, this approach is called hedging or maturity matching. The fundamentals behind hedging approach is that it is more efficient use of capital resources for company to finance its current assets with short-term financing, for example by credit. By short-term financing companies hedge against the risk that they might might have to pay for the interest of the loan during the periods the loan is not needed.

1.1.2 Conservative approach

Using long-term debt to finance short-term current assets is considered as an inefficient use of capital but in addition it also tends to be more expensive. Usually the longer the date to maturity of debt, the more expensive the cost of debt gets. The optimal proportions of each sources of finance should be balanced to find the trade-off between desired risk and profitability. Conservative (longer maturity approach) financing policy suggests that company should use long-term debt to finance the fixed assets completely and also current assets with expected funds needed to create margin of safety, but it excludes the peaks in demand from long-term financing and suggests that those should be covered with short-term financing. If the expected cash flows do not occur, company will have to pay interest on the excess long-term debt. The more company finances current assets with long-term liabilities the more conservative is the approach.

1.1.3 Aggressive approach

A typical feature for aggressive financing policy is negative margin of safety. This means that companies implementing aggressive financing policy generally finance part of their

permanent fixed assets with short-term debt, which includes high level of risk as company has to refinance its fixed assets with new debt at the date of maturity of the former debt. The greater the portion of fixed assets financed with short-term debt, the more aggressive the financing policy. (Van Horne & Wachowicz. 1998, 210.) Table 1. summarizes the different approaches of financing according to their trade-off between risk and profitability.

Table 1. Trade-off between risk and profitability in financing alternatives

FINANCING MATURITY / ASSET MATURITY	SHORT-TERM	LONG-TERM
SHORT-TERM (current assets)	Moderate Risk-Profitability	Low Risk-Profitability
LONG-TERM (fixed assets)	High Risk-Profitability	Moderate Risk-Profitability

1.2 Pros and cons of short-term financing

As an advantage of short-term debt use Campsey and Bringham (1985) propose that companies that need to fund their seasonal or cyclical needs, or in case the need for funds will disappear in near future, should have a short-term debt because of its flexibility and due to the fact that short-term debt has a smaller interest rate comparing to long-term debt. The risk of short-term debt is the fluctuation of interest rates. Long-term debt has generally a fixed rate of interest until the date of maturity, whereas short-term debt has a fluctuating rate of interest. The fluctuation in interest rate may turn out to be costly for the company in case anything unexpected takes place. As an example from 1977 to 1980 short-term rates for large companies suffered a drastic increase from 6.25 percent to 21 percent. Also, when a company raises a short-term loan it has less time to pay back the debt plus interest accrued. This may have severe consequences if the company has a weak financial position at the date of maturity of the loan

and therefore can not meet its obligations to pay back the principle plus interest. As a worst case scenario the lender will not permit an extension for the loan and company will have to declare a bankruptcy.

1.3 Objectives of working capital management

As the main objective of financial management is to gain maximum cash inflow of operations with acceptable level of risk but on the meantime to find the sources to finance those possible operations with minimal cost. The synthesis of those two policies is called shareholders wealth maximization. The different approaches to finance working capital with either on long-term or short-term basis were discussed in the chapter *1.1. Strategies to finance current assets* of this paper. Robert Alan Hill proposes that working capital management decisions do not necessarily same as capital budgeting decision and that there are two factors that distinguish working capital management and capital budgeting decisions:

1) Production cycle

   Different from fixed asset investments, the working capital planning horizon, which defines the period of converting raw materials in to cash receipt arising from the sales, can be measured in months instead of years. Also that working capital can be increased by smaller units physically and monetary. The advantage of this division is that the amounts invested in current assets can be optimized and as a concequence related costs and risk will also decrease.

2) Financing cycle

   As the finance to support working capital input can be measured in months, the funding of inventory, debtors and precautional cash balances is equally flexible. As the working capital may be supported by using long- or short-term financing, financing cycle gives a greater scope for the minimization of capital cost regarding investment in current assets.

Even though there are differences between capital budgeting and working capital management, they should never interfere with each other. Robert Alan Hill summarizes the inter-relation between investment and financing decisions in figure 1.
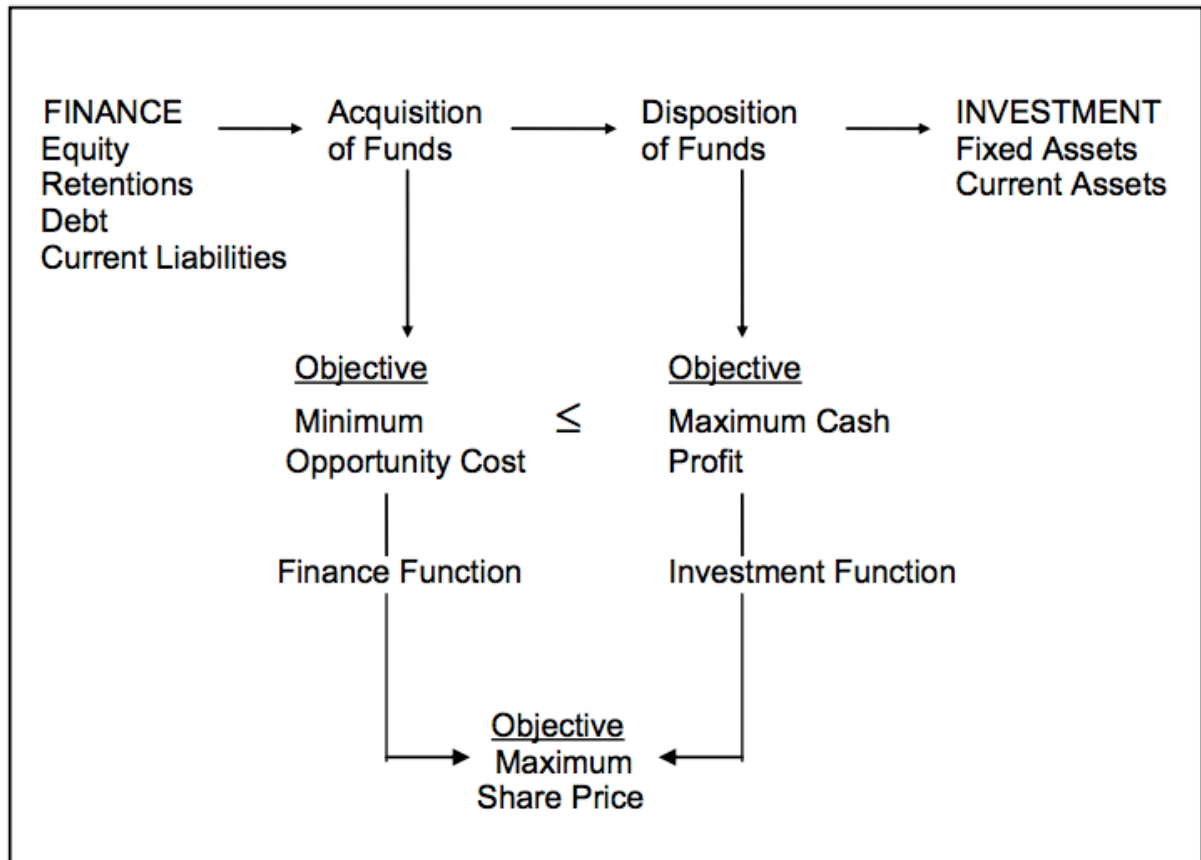
Figure 1. Inter-relation between investment and financing decision
Source: (Hill, 2013, 20)

1.4 Structure of working capital management

The purpose of working capital management is to ensure that the cash transactions arising from operations to support the demand, actually take place (Hill, 2013, 20). Working capital works with current assets, that can be divided in four major components that are introduced in this chapter.

1.4.1 Inventory

All manufacturing and merchandise companies have an inventory. The main idea of the inventory is to store the raw materials, work that has been started but not finished (WIP) and finished goods. Companies that operate in manufacturing business, inventory as an asset may represent up to 20% of the total assets. In the field of wholesales or retailing the figure may attribute up to 50% of the total assets of the company (Lambert, Stock. 1992, 358). Capital tied up in inventory does not yield interest, but on the other hand it generates numerous costs that may attribute up from 25 to 50 percent of the annual value of the inventory (Leenders, Johnson, Flynn & Fearon 2006, 158).

1.4.2 Credit management

When a company practices its operations and generates sales, on general it is not to be expected that those amounts are received in cash immediately at the time of sales. Amounts that are not yet received but the customer is obliged to pay are called trade credit. Accounts receivable consists mainly of trade credit and the rest is in form of customer credit. The main areas of concern in credit management are:

1. The length of time period company is going to give to a customer to pay its payables
2. To determine customers that likely to pay the bills within the payment period
3. The amount of credit to give to a certain customer
4. The way of collecting receivables at the time they are due

1.4.3 Terms of sale

The terms of sale are dependent on the nature of industry and all transactions are not necessarily made on credit. Brealey, Myers and Allen (2015) propose that companies selling goods to irregular customers with high volume should apply cash on delivery (COD) terms,

whereas companies that are offering individual custom made products, should demand customers for pre-payments, or cash before delivery (CBD) (Brealey, Myers & Allen 2015, 782). Companies may shorten the receivables collection period by offering cash discounts to customers if they pay their bills before the due date.

1.4.4 Credit analysis

When company is assessing customer credibility and their ability to meet their obligations to pay, at first management should look through customer´s ability to pay the bills in the past and their financial situation by looking at their financial statements. For large companies an accurate assessment of credibility is provided by specialists such as Moody´s or Standard and Poor´s, and for smaller companies there are multiple databases providing credit ratings, in Finland as an example Bisnode or Asiakastieto. In order to save time and avoid unnecessary workload, credit analysis should not be conducted for every order but orders that are valuable or just doubtful. (Brealey, Myers & Allen 2014, 782)

2 PERFORMANCE INDICATORS

2.1 Cash conversion cycle

The Cash Conversion Cycle is a practical tool for analyzing how company is using its capital and therefore is an essential part of working capital management. Stewart (1995) defines CCC: "A composite metric describing the average days required to turn a dollar invested in raw material into a dollar collected from a customer." Cash conversion cycle can be divided in to three main components which will as a result indicate the number of days company has its funds invested in working capital. Cash conversion cycle consists of three components; days sales outstanding, days payables outstanding and days inventory outstanding. These three components are defined in this section and calculated in later phase for case company. Formula for cash conversion cycle is given below.

$$CCC = DSO + DIO - DPO$$

Days Sales Outstanding (DSO) indicates the average in number of days it takes for company to collect its receivables from credit sales. Companies prefer smaller DSO figure.

$$DSO = \frac{\text{Average accounts receivable}}{\text{Sales}} \times 365$$

Days Payables Outstanding (DPO) measures the average number of days it takes for company to pay its creditors. Longer DSO is desirable for companies.

$$DPO = \frac{\text{Average accounts payable}}{\text{Cost of goods sold}} \times 365$$

Days Inventory Outstanding (DIO) indicates how many days on average it takes for company to turn its inventory into sales. Companies prefer short DIO figure.

$$DIO = \frac{Average\ inventory}{Cost\ of\ goods\ sold} \times 365$$

(Banomyong, 2005)

2.1.1 Cash conversion cycle and corporate liquidity

Liquidity of the company is traditionally measured by Quick ratio and Current ratio that are static measures calculated on the basis of balance sheet. As current ratio and quick ratio indicate the level of liquidity and ability to meet the obligations of payables, cash conversion cycle indicates the overall ability of company to manage cash (Moss, Stine 1993). On general the longer the cash conversion period for the company is, the larger amount of capital is tied up to the conversion process and therefore shorter cash conversion cycle is generally preferred. The length of cash conversion cycle and additional credit financing and capability of short-term borrowing have an inverse relation. Richards and Laughlin (1980) propose that inverse relation exists due to the fact that companies with longer cash conversion cycle have less control over their future cash flows and they have greater possibility to face uncertainty due to excessive inventory and uncollectible receivables, which has a major impact on their ability to meet the obligations in terms of debt repayments. Especially for smaller companies the length of cash conversion period is a crucial factor. Small companies have less external sources available to finance their working capital needs than large companies that operate in more accessible financing environment. If less external financing is available, companies have to hold more assets in liquid form to meet their day-to-day obligations, business transactions plus the emergency requirements.

Prior research of Moss and Stine (1993) suggests that large companies have shorter cash conversion cycle than small companies. Their study proposes that small companies can reduce their cash conversion period by decreasing inventory levels or shortening the receivables period by for example tightening their terms of credit. Also, that traditional liquidity ratios and cash conversion cycle are strongly correlated, but small business owners should notice the difference

arising in the cash flow concept. Generally strong liquidity ratios are preferable, but on the other hand they may indicate excessive investments in working capital.

2.2 Du pont identity

Return on equity (ROE) and return on assets (ROA) are the most used metrics to measure company financial performance. Return on equity measures how much shareholders have earned for their investment. ROE is an end result of structured financial ratio analysis, or Du Pont analysis, and it can be viewed from the point of view of each component included. The components included in Du Pont analysis are profit margin ratio indicating the profitability, asset turnover ratio indicating operating efficiency and equity multiplier indicating the leverage of the company. The reason why DuPont is a practical tool for assessing corporate efficiency is that it measures the rate at which the owner´s wealth is increasing by using different components and gives more comprehensive results than ratios viewed independently. The generic formula for DuPont model is given below:

$$\boldsymbol{ROE} = \underbrace{\frac{Net\ Income}{Sales}}_{(\boldsymbol{Profit\ margin})}\ x\ \underbrace{\frac{Sales}{Average\ Assets}}_{(\boldsymbol{Asset\ turnover})}\ x\ \underbrace{\frac{Average\ Assets}{Average\ Equity}}_{(\boldsymbol{Equity/leverage\ multiplier})}$$

2.2.1 Profit margin

$$Profit\ margin = \frac{Net\ income}{Sales}$$

Profit margin ratio is known as profitability ratio. It measures the percentage of profit after deducting operating expenses, interest expenses, taxes and dividends paid from the sales revenue or to put it another way, it represents the fraction of sales that is left after all relevant expenses have been adjusted. Ratio can be used for comparing the level of profitability with competitors and to determine the profitability of certain industry, but it has to be kept in mind that profit margin varies depending on the nature of the industry as some industries tend to have higher margins than others. The variables involved may be the level of competition, elasticity

in demand and the level of differentiation. Profit margin is mostly used for internal comparison of the company as the number of variables in external comparison makes it difficult to assess and to produce meaningful information. (Kasilingam, Jayabal 2012, 55)

2.2.2 Asset turnover

Turnover ratios are measures of corporates ability to generate sales with given amount of assets. Whereas profitability ratios give important information about the profitability of company, turnovers measure the efficiency of company. Some company may have high sales figures but also high level of assets in use, as on the other hand other company has same number in sales but way less assets available and it indicates it is using its assets more efficiently to generate sales or income. High total asset turnover is preferable for companies as low turnover indicates slow sales. To conduct comparison on asset turnover with other companies or with benchmarks, it has to be noticed that different industries have different amount of assets required to run their business. For instance, company providing smartphone applications and company manufacturing industrial equipment have a significant difference in amount of assets in use. Asset turnover formula is provided below:

$$Asset\ Turnover = \frac{Sales}{Average\ Assets}$$

The total asset turnover considers both current and fixed assets of the company. Fixed assets include for example the equipment and property, whereas current assets represent for instance inventory and accounts receivable. Each component of total assets has an effect on the turnover ratio and therefore also on the return on equity. Factors like holding excess inventory and not selling inventory with sufficient speed are the major concerns of company and that is what is to be analyzed in this study in later phase.

2.2.3 Equity/leverage multiplier

$$Equity\ multiplier = \frac{Average\ Assets}{Average\ Equity}$$

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Leverage ratios generally measure the portion of how much company relies on debt in financing structure. The cost of debt is lower than the cost of equity, which is boosted by the deductibility of taxes in interest payments in contrast to taxable dividend payments and stock repurchases. In case debt proceeds are invested, and the return is more than the actual cost of debt, return on equity is said to be "leveraged up". However, as a downside for employing debt in financing of the business we can notice that the amount required to cover fixed payments increases, and therefore the risk of payments cutting into equity increases. (Isberg 1998)

2.3 The "really" modified Du pont model

As discussed in the earlier chapter, general Du Pont identity consists of three ratios with each of them measuring different performance. However, Hawawini and Viallet (1999) proposed a modification to the existing model that would increase the number of ratios from three to five. The basis for the modification was that they realized that the annual reports companies provide are not the most suitable for internal decision making. As a result, Hawawini and Viallet restructured the balance sheet into a "managerial balance sheet". The restructuring considered total assets, which was replaced with "invested capital", total liabilities and owner´s equity, that were replaced with concept of "capital employed". The major difference is in the consideration of the short-term "working capital" accounts. The modified managerial balance sheet employs a figure called "working capital requirements" (WCR= [Accounts receivable + inventories + prepaid expenses] – [accounts payable + accrued expenses]) as a part of invested capital. Even though the modifications are employed in the "really" modified formula it still measures the impact of profitability, efficiency and leverage in the return on equity, but it pursues to give more deep insight on the factors to improve in order to increase the owners´ wealth. Profitability and efficiency are measured through the acquisition and disposal of fixed assets, inventories and accounts receivables i.e. current assets and accounts payable and accruals i.e. current liabilities. These profitability and efficiency measures are captured in the first two ratios of the "really" modified Du Pont identity:

$$\text{Operating Profit Margin} = \frac{\text{EBIT}}{\text{Sales}}$$

and,

$$\text{Capital Turnover=} \frac{\text{Sales}}{\text{Invested Capital}}$$

The next two ratios in the formula are the ones that determine the mix of debt and equity used in financing the firm´s operations:

$$\text{Financial Cost Ratio=} \frac{\text{Earnings Before Taxes}}{\text{EBIT}}$$

and,

$$\text{Financial Structure Ratio=} \frac{\text{Invested Capital}}{\text{Equity}}$$

The fifth ratio to impact the ROE is the taxation of business,

$$\text{\textit{T}ax Effect Ratio=} \frac{\text{Earnings After Taxes}}{\text{Earnings Before Taxes}}$$

And to put all the individual factors in one formula, the "really" modified Du Pont equation is:

$$\text{ROE=} \frac{\text{EBIT}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Invested Capital}} \times \frac{\text{EBT}}{\text{EBIT}} \times \frac{\text{Invested Capital}}{\text{Equity}} \times \frac{\text{EAT}}{\text{EBT}}$$

Note. (*Invested capital = Cash and Cash Equivalents + Working Capital Requirements + Net Fixed Assets*)

(Hawawini & Viallet. 1999)

The reason why "really" modified Du Pont model of ratio analysis is applied in this paper is that it uncovers the ratios generated through complex financial statement, and allows small business owner to examine how the links between each factor on the financial statement impact on the return on equity and it puts it in a formula that takes relatively little of time to understand. (Liesz & Maranville. 2008, 27)

2.4 Summary of theoretical framework

Management of current assets and current liabilities are the main subjects of working capital management. By properly managing the working capital, companies may find the optimal balance in liquidity to conduct the payments, but also to be able to make investments. There have been several studies with aim to find link between working capital management and firm´s profitability. Prior studies suggest that companies that are able to reach the optimal working capital balance, turn out to be more profitable.

Cash conversion cycle is the most preferred measure of working capital efficiency. It indicates the length of the period company has it´s capital tied in to operation, from purchase of raw material, until the moment cash is collected from customer. Optimal cash conversion cycle is hypothetically reached by maintaining inventory in minimum, receiving cash receipts faster and by deferring the payables period. However, this paper focuses only on optimization of inventory in case company and how it will eventually effect the length of cash conversion cycle.

To measure the profitability, prior studies have applied both ROA and ROE figures. The reason why these so called Du Pont formulas are preferred, is that they are formed of multiple financial ratios. This study uses so called "really modified Du Pont formula" to measure profitability of the case company because it is more working capital oriented than the three component Du Pont. This aspect arises from the fact that it uses "invested capital" which is composed of working capital accounts, instead of total assets.

3 RESEARCH RESULTS AND CONCLUSION

The focus of this paper is to study how the optimization of inventory effects return on equity and the length of cash conversion cycle for case company. In the first part of this chapter the case company is introduced. Up next the optimal level of inventory is determined for the case company, and in the following sections the effect of optimization is put in use. There are multiple opportunities to optimize inventory but in this paper it is mostly studied by analyzing inventory turnovers and setting minimum performance requirements to cut down the inventory levels. The restriction for the optimization is that it will not influence current service level, and thereby revenues and costs. It is highly important to keep in mind that the inventory can´t be reduced infinitely, and therefore couple of meetings with Sintrol Oy were arranged in order to obtain more practical point of view to the study rather than pure statistical view.

As inventory is substantial part of working capital and thereby a great part of working capital management, the inventory it self is anticipated to have on effect on corporate efficiency and profitability. The prior research on the field suggests that there is evidence that optimization of inventory will have a positive effect on the length of cash conversion cycle and thereby efficiency of Sintrol Oy. The first hypothesis based on the fact that optimization of inventory will shorten cash conversion cycle and thereby the period of time Sintrol oy has to finance its operations.

H1: By managing working capital properly, Sintrol Oy may improve its efficiency.

The second hypothesis is based on prior studies on the field. Due to the fact that multiple studies on this particular subject have found strong negative correlation between the length of cash conversion cycle and firm´s profitability, second hypothesis is as follows:

H2: By shortening the length of cash conversion cycle, Sintrol Oy may increase its profitability

3.1 Introduction of the case company

Sintrol Oy is a Finnish company with head office in Helsinki, Finland. Subsidiaries are located in St. Petersburg, Kiev, and in Almaty. In addition, Sintrol Oy operates in New Delhi and in Beijing. Sintrol Oy is leading specialist in process measurement, control and non destructive testing (NDT) in Finland, and leading manufacturer of dust monitors. In 2016 Sintrol Oy´s revenue was € 11,319,055.39 and net income was € 32,599.08. Currently the revenue is generated through two different operations; retailing and project based income.

The fact that Sintrol Oy operates in such specialized market makes it solely hard to compare and benchmark. In addition, due to the fact that the cash flows are generated through two main operations and multiple sub-operations, this study does not include comparison to other companies or industry averages, but only monitoring the performance of Sintrol Oy independently.

3.1.1 Operations of Sintrol Oy

The purpose of this section is to introduce how the revenue of Sintrol Oy is generated and in which proportions. As mentioned earlier, Sintrol Oy generates its sales from two different types of main operations; retailing and projects. From the total sales in 2016, retail contributed 8,149,965€ and project sales constructed the rest 3,169,955€. The sales figures for each operation type for 2013-2016 is presented in following table.

Table 2. Total sales 2013-2016

Sales	2016	2015	2014	2013
Retail	8,149,965€ (72%)	9,032,281€ (71.7%)	9,145,441€ (76.2%)	9,627,543€ (72.3%)
Project sales	3,169,090€ (28%)	3,572,463€ (28.3%)	2,844,021€ (23.8%)	4,276,320€ (27.7%)
Total	11,319,055€	12,604,744€	11,989,462€	13,309,863€

The optimization analysis of this paper focuses on the retail sector due to request of case company. Both main operations can be divided in to four sub-operations. As the table 3 indicates, both retail sales and projects are constructed of 1) merchandising 2) spare parts and services 3) manufacturing and 4) sales to subsidiaries. Table 3 indicates in which proportion each sub-operation generated revenue to the company in 2015 and 2016.

Table 3. Sales by sub-operation in 2015 and 2016 (euro)

	Year	Retail	Project sales	Total	Percentage
Merchandising	2016	4,736,969	1,854,805	6,591,774	58%
	2015	5,912,249	2,273,540	8,185,699	65%
Spare parts and services	2016	641,865	1,019,260	1,661,125	15%
	2015	702,836	1,243,063	1,945,898	15%
Manufacturing	2016	1,733,287	85,661	1,818,948	16%
	2015	1,657,254	3,161	1,660,416	13%
Sales to subsidiaries	2016	1,037,844	221,391	1,259,235	11%
	2015	759,942	52,789	812,731	6%
Total	2016	8,149,965	3,181,117	11,331,082	100%
	2015	9,032,281	3,572,463	12,604,744	100%

In 2016 and 2015, more than half of Sintrol Oy´s operating income was generated through sales of imported goods. The second largest cash flow in retail operation was generated through own manufacturing and retail in 2016. After that came sales to subsidiaries, and at last came the spare part retail and service operation.

3.1.2 Sales from retail operations

This section gives an overview of the retail sales by breaking the sales in to components according to unit price of the product. Upper table presents the absolute sales figure for each component and the bottom part is a vertical analysis for sales figures. Vertical analysis visualizes the changes in proportions of each category to total sales within given year.

Table 4. Sales by unit price 2013-2016 (euro)

Unit price	2016	2015	2014	2013
>10,000	1,427,726.05	1,606,591.55	1,893,451.01	2,406,244.77
5,000-10,000	1,081,984.85	1,289,635.46	1,352,550.47	1,197,757.55
1,000-5,000	2,987,632.72	3,344,153.80	1,254,586.37	3,131,127.73
500-1,000	843,704.67	795,383.72	2,658,626.16	750,413.34
50-500	1,145,845.17	1,361,410.96	687,000.19	1,448,006.59
0.01-50	527,596.03	468,716.93	453,739.03	560,781.45
Total	8,014,489.49	8,865,892.42	8,299,953.23	9,494,331.43
Vertical analysis				
Unit price	2016	2015	2014	2013
>10,000	17.81%	18.12%	22.81%	25.34%
5,000-10,000	13.50%	14.55%	16.30%	12.62%
1,000-5,000	37.28%	37.72%	15.12%	32.98%
500-1,000	10.53%	8.97%	32.03%	7.90%
50-500	14.30%	15.36%	8.28%	15.25%
0.01-50	6.58%	5.29%	5.47%	5.91%
Total	100%	100%	100%	100%

The greatest retail-based income is generated from products with price unit from 1,000€ up to 5,000€, as the contribution to total sales was 37.28% in 2016. The same price range has generated clearly the biggest sales also during 2015 and 2013. The least of the annual revenue has been generated with products priced up to 50€ since the base year.

The total sales from retailing have been declining continually. In 2016, sales were 15.58% lower than they were in 2013. Decrease in sales of products with unit price greater than 10,000€ can be identified as one major reason for significant decrease in total sales. Sales of this particular group have declined up to 40.67% from the base year, which is in monetary terms crucial 978,518.72€. Other significant negative change has occurred in products priced between 50€ and 500€, as the sales have declined 20.87%, or 302,161.42€. The only category that has increased its sales from the base year is the category of products priced between 500€ and 1,000€, with increase of 12.43%. As conclusion, sales of Sintrol Oy have been very volatile. In

2013 Sintrol Oy managed to generate the highest revenue in the sample period, but year after that the retail sales decreased drastically 12.58%. In 2015 sales made a slight recovery, but in 2016 retail based revenue was even less than in 2014.

Proper inventory management hypothetically adjusts the amount of stock held accordingly with the demand in order to use working capital efficiently. As the sales figures prove, there has been major decreases in sales performance of certain groups within the sample period, which should lead to actions to decrease the inventory level. In practice the problem arises from the fact that when sales decrease, more inventory is left on hand due to decrease in inventory out-flow. In later phase the inventory is broken down and analyzed whether the balances have changed simultaneously with the sales.

3.1.3 Import & retail

The scope for the optimization is mainly the retail operation and the inventory used to supply it. Sintrol Oy imports products to be stocked in warehouse, but also directly to the customer. In some cases, imported products are held in the inventory to be adjusted or modified according to customer´s orders, but will be delivered forward in short period of time, and no permanent storage is used. On the other hand, in case the product is being delivered directly to the customer, it will not go through inventory in book keeping at all. The inventory of finished goods for merchandising and spare parts was in 2016 equal to 913,928€, which is discussed in later phase and is the basis for the optimization in this study.

3.1.4 Own manufacturing

Sintrol Oy´s one operation is own manufacturing. Products are put together from different components and the finished goods are sold worldwide. However, due to the fact that the product itself can come in different sizes according to customers orders they are tailored only until the purchase order is received. Therefore, inventory value of finished goods in manufacturing department is minimal and thus the total inventory value of 501,491.1€ is mainly materials.

3.2 Inventory of Sintrol Oy

The inventory of Sintrol Oy consists of two main parts, inventory for own manufacturing purposes and finished goods. In 2016, the total inventory balance was equal to 1,414,056.75€. Out of this figure 501,491.1€ was raw materials and work-in-process in manufacturing department, and the rest 913,928.1€ was formed by imported finished goods and spare parts. However, this paper does not consider the optimization of raw materials or work-in-process inventories for manufacturing department due to following reasons:

1) Manufacturing department tailors the product from components according to customers preferences, and no finished goods is held in inventory.
2) Components (raw materials) are ordered from supplier as tailored, therefore lead-times are long, cost of ordering expensive and quantities ordered large.

Due to reasons mentioned above, the turnover analysis would be useless in this context. Maintaining the hypothetically optimal inventory level is most likely to be costly. Also, determining the economic order quantity (EOQ) is beyond the scope of this paper.

3.2.1 Inventory of Sintrol Oy by turnovers

Inventory turnover is an efficiency ratio and it measures how many times the inventory is being sold at given period, usually during fiscal year. High turnover is preferable for companies as it indicates that they are generating sales efficiently with given amount of goods as on the other hand ratio lower suggests that company is stocking more than needed. High turnover may also indicate of good liquidity for the company but also it might have consequences such as deficient inventory level at times. Inventory turnover is not an absolute measure of performance as it is highly dependent on the industry and on the value of goods. There are two slightly different formulas for calculating the inventory turnover ratio:

$$Inventory\ Turnover = \frac{Cost\ of\ Goods\ Sold}{Average\ Inventory}$$

or,

$$Inventory\ Turnover = \frac{Sales}{Average\ Inventory}$$

The difference of these two formulas can be identified in the numerator as the first formula suggest that the turnover is calculated using the cost of goods sold and the second suggest that sales is divided with average inventory. More accurate ratio can be calculated using cost of goods sold as the numerator as it is also being recorded with the actual cost. The problem of calculating inventory turnover using cost of goods sold arises from the fact that COGS is not always presented in the public financial statements. In this paper the inventory turnover is calculated using more accurate formula with COGS involved because of the availability of preferable data from the case company. The turnover is calculated using the Microsoft Excel datasheets that give the information regarding the inventory value for each product at the end of fiscal year from 2014 to 2016. The data is analyzed by combining the different sheets that represent the revenues and cost of goods sold generated by each product (see appendix 4 and 5).

Inventory turnover can be applied in managerial decisions regarding the holding of stock. By dividing the inventory in to appropriate categories and monitoring the turnovers by each category the optimization is more accurate. The optimization in later phase is made for each given category individually rather than for the whole portfolio simultaneously. Table 5 presents average of turnover´s for each category.

Turnovers of products with unit value more than thousand euros have declined greatly from the last year. For instance, average turnover of products with unit value between 5,000€ and 10,000€ has declined from 2.85 to 1.08. This figure suggests that in 2015 Sintrol Oy had enough inventory to support sales of this category for around 4 months, and in 2016 it had inventory to support sales for nearly a year. Therefore, it is evident that inventory is currently on quite inefficient level and working capital is invested in products that do not have sufficient mobility to create cash flows. Table 5 summarizes average turnovers for each category.

Table 5. Inventory turnovers in 2016 and 2015 with respect to unit value.

Unit value	2016	Δ%	2015
>10,000€	0.66	-31.25%	0.96
5,000-10,000€	1.08	-62.10%	2.85
1,000-5,000€	0.71	-63.02%	1.92
500-1,000€	1.83	+83%	1.00
50-500€	1.26	+7.69%	1.17
0.01-50€	1.00	+2.04%	0.98

3.2.2 Structure of the inventory according to value

The total inventory of Sintrol Oy was equal to 1,414,056.75€ at the end of fiscal year in 30.9.2016. The structure of the inventory varies significantly in terms of the use of the product and in terms of cost. One group of units are stocked in warehouse only to serve the purpose of retail sales, other is kept within reach to be used later on in manufacturing process and one is there to be used as a part of service/maintenance operations. To gain the understanding of the structure of the inventory with respect to the unit values, certain classification was made using Microsoft Excel datasheets and the data is summed up in table 6. The first column in table 6 considers the unit value of each product and the following columns indicate the amount formed in total with given criteria. For example, the first row indicates that products with unit value over 10 000€ equal 158,573.67€ in 2016.

Table 6 presents the vertical analysis made on the basis of value distribution inside the inventory. Some important finding is that even though the sales of Sintrol Oy have declined 18% from year 2013 to 2016, the total inventory has remained almost stable over the period. Hypothetically it management should adjust the level of inventory accordingly with the sales.

Table 6. Structure of inventory by unit value 2013-2016 (euro)

Unit value	Value 2016	Value 2015	Value 2014	Value 2013
>10,000	158,573.67	106,126.59	160,745.13	52,657.08
5,000-10,000	61,583.55	40,260.7	85,265.74	174,905.97
1,000-5,000	179,752.88	175,368.95	231,650.89	280,054.25
500-1,000	96,799.97	103,700.19	112,450.7	124,663.62
50-500	295,029.05	356,643.05	313,526.12	352,666.42
0.01-50	122,158.97	134,358.68	134,048.05	122,108.64
Total	913,898.09	916,458.16	1,037,686.63	1,107,055.98
Unit value	Value 2016	Value 2015	Value 2014	Value 2013
>10,000	17.35%	11.58%	15.49%	4.76%
5,000-10,000	6.74%	4.39%	8.22%	15.80%
1,000-5,000	19.67%	19.14%	22.32%	25.30%
500-1,000	10.59%	11.32%	10.84%	11.26%
50-500	32.28%	38.92%	30.21%	31.86%
0.01-50	13.37%	14.66%	12.92%	11.03%
Total	100%	100%	100%	100.00%

As the vertical analysis for the inventory shows, there has been major changes in the value distribution of inventory in products with unit value of 10,000€ or more. The balance has been on high level since the base year of 2013, and during the latest period of 2016 the proportion to total value was over three times greater than in the base year 2013. Proportion of products with unit value from 5000€ up to 10,000€ however have fell almost into third compared to base year.

The categories were agreed in cooperation with the management of Sintrol Oy in order to find the reasonable and meaningful intervals for the decision making. The purpose of the intervals is to find the total amounts of high valued goods, goods with mediocre consumption value and the ones that are low valued goods, the ones noticed in the last row with value up to 50€. The most important groups to manage are the high valued goods due to the fact that they

do not only tie up significant amount of working capital, but more importantly the sales in the high valued goods has decreased substantially.

3.3 Current performance of Sintrol Oy

3.3.1 Return on Equity

To measure Sintrol Oy´s performance during fiscal year of 1.10.2015- 30.9.2016 using component analysis the components shall be determined. All the figures used in the calculations are based on the financial statements provided in the appendix 1 and 2 (income statement & balance sheet). The required datasets for calculations are the balance sheet and the income statement. The statements have been eased by hiding sub-accounts, but the main account balances remained the same.

As presented in the earlier sections, the three factor DuPont analysis is formulated as follows:

$$\text{ROE} = \underbrace{\frac{\text{Net Income}}{\text{Sales}}}_{\text{(Profit margin)}} \text{ x } \underbrace{\frac{\text{Sales}}{\text{Average Assets}}}_{\text{(Asset turnover)}} \text{ x } \underbrace{\frac{\text{Average Assets}}{\text{Average Equity}}}_{\text{(Equity multiplier)}}$$

To perform the calculations, the required figures are gathered in to the table 7 from the income statement and balance sheet from years 2013-2016.

Table 7. Financial data for three component Du Pont (euro)

	2016	2015	2014	2013
Revenue	11,319,055.39	12,789,719.77	11,867,312.72	13,712,627.45
Net income	32,599.08	238,535.26	113,736.32	574,316.20
Assets	4,158,328.25	4,093,845.74	4,656,083.89	4,840,256.15
Equity	2,499,817.45	2,623,218.37	2,540,683.11	2,826,906.79

$$\text{Profit margin}_{2016}=\frac{32{,}559.08\text{€}}{11{,}319{,}055.39\text{€}}=0.00287=0.29\%$$

$$\text{Asset turnover}_{2016}=\frac{11{,}319{,}055.39\text{€}}{\left(\dfrac{4{,}093{,}845.74\text{€}+4{,}158{,}328.25\text{€}}{2}\right)}=2.74$$

$$\text{Equity multiplier}_{2016}=\frac{\left(\dfrac{4{,}093{,}845.74+4{,}158{,}328.25\text{€}}{2}\right)}{\left(\dfrac{2{,}623{,}218.37\text{€}+2{,}499{,}817.45\text{€}}{2}\right)}=1.61$$

$$\text{ROE}_{2016}=0.29\%\times2.74\times1.61=1.27\%$$

The return on equity of Sintrol Oy according to Du Pont identity equals to 1.27%. The biggest reason for weak performance can be identified from the profit margin that is currently equal to 0.29%. To find the reason for low profit margin, trend- and vertical analyses were conducted (see appendix 1 and 2). The analysis indicates that the profit margin is mostly influenced by the use of external services and increase in proportion of wages and other operating expenses to revenue.

3.3.2 Du Pont Identity According to Hawawini and Viallet

On the other aspect the five component, so called "really" modified Du Pont identity suggests that the return on equity is calculated using formula below.

$$\text{ROE}=\frac{\text{EBIT}}{\text{Sales}}\times\frac{\text{Sales}}{\text{Invested Capital}}\times\frac{\text{EBT}}{\text{EBIT}}\times\frac{\text{Invested Capital}}{\text{Equity}}\times\frac{\text{EAT}}{\text{EBT}}$$

Invested capital = Cash and Cash Equivalents + Working Capital Requirements + Net Fixed Assets)

Table 8 has all the required data gathered from the financial statements to perform the calculations.

Table 8. Financial data for five component Du Pont (euro)

Sales	11,319,055.39
EBIT	49,467.44
EAT	32,559.08
EBT	42,386.91
Cash	391,074.22
Working Capital Requirements *[(Accounts receivable + Inventory + Prepaid expenses) - (Accounts payable + Accrued expenses)]*	1,810,376.25 *[(1,574,806.96+1,414,056.75+0)- (793,178.46+385,309.00)]*
Net Fixed Assets *(Fixed assets – Depreciation)*	164,607.98 *(271,899.80 - 107,291.82)*
Equity	2,499,817.45

$$\text{ROE} = \frac{49{,}467.44€}{11{,}319{,}055.39€} \times \frac{11{,}319{,}055.39€}{2{,}366{,}058.45€} \times \frac{42{,}386.91€}{49{,}467.44€} \times \frac{2{,}366{,}058.45€}{2{,}499{,}817.45€} \times \frac{32{,}559.08€}{42{,}386.91€}$$

$$ROE = 0.0044 \times 4.78 \times 0.91 \times 0.95 \times 0.77 = 0.014 \approx 1.4\%$$

Table 9. Return on equity 2013-2016

	Op. profit	Capital turnover	Financial cost	Financial structure	Tax effect	ROE
2016	0.0044	4.78	0.91	0.95	0.77	1.4%
2015	0.022	5.30	0.94	0.92	0.89	9.09%
2014	0.01	5.14	0.93	0.91	1.0	4.47%
2013	0.05	4.98	0.98	0.97	0.84	20.3%

Table 9 has return on equity calculated for the observation period. According Du Pont identity with five components, the return on equity in 2016 equals to 1.4% which is slightly greater than the figure calculated with the general formula. The difference arises due to the fact

that it uses "invested capital" as one factor, which is more working capital oriented figure than "total assets" used in generic formula. Therefore, five component Du Pont is used in this paper.

3.3.3 Cash conversion cycle

One of the most suitable metrics to measure company working capital management is the cash conversion cycle. The cash conversion cycle of Sintrol Oy for fiscal year of 2016 is calculated below using following formula:

$$CCC = DSO + DIO - DPO$$

$$DSO = \frac{\text{Average accounts receivable}}{\text{Sales}} \times 365$$

The days sales outstanding (DSO) measures the length of the period how long it takes for Sintrol Oy to collect its receivables from credit sales. Short DSO is generally preferable and company may speed up the collection period for example by offering discounts in terms of sale.

$$DSO = \frac{(\frac{1,574,806.96€+1,302,900.80€}{2})}{11,319,055.39€} \times 365 = 46.39 \text{ days}$$

Days payables outstanding (DPO) measures the length how long it takes for Sintrol Oy to pay its payables for example to its suppliers. Sintrol Oy has the DPO equal to 61.93 days which is positive thing due to the fact that the longer the payable period, the more working capital Sintrol Oy has in hand and has time to carry out the credit payments for suppliers.

$$DPO = \frac{\text{Average accounts payable}}{\text{Cost of goods sold}} \times 365$$

$$\frac{(\frac{793,178.46€+724,321.62€}{2})}{4,471,773.92€} \times 365 = 61.93 \text{ days}$$

Days inventory outstanding (DIO) or days sales of inventory (DSI) is a measure of inventory effectiveness. In practice DIO measures the amount of days on average that Sintrol Oy holds the inventory until it is turned into sales, and how long it has capital tied up to

inventory. For Sintrol Oy the DIO is equal to 117.7 days which is considerably long, and also signs of weak inventory management.

$$DIO = \frac{\text{Average inventory}}{\text{Cost of Goods Sold}} \times 365$$

$$DIO = \frac{(\frac{1,414,056.75€ + 1,469,947.26€}{2})}{4,471,773.92€} \times 365 = 117.7 \text{ days}$$

After all the factors have been calculated for Sintrol Oy, the cash conversion cycle is equal to:

$$CCC = 46.39 \text{ days} + 117.7 \text{ days} - 61.39 \text{ days} = 102.7 \text{ days}$$

Table 10. Cash conversion cycle 2013-2016

	DSO	DPO	DIO	CCC
2016	46.39	61.93	117.72	102.7 days
2015	56.16	75.04	100.21	81.33 days
2014	60.57	73.79	96.54	83.32 days
2013	47.27	73.32	93.29	67.24 days

Table 10 has all the components calculated for each year of observation period. Results suggest that Sintrol Oy has improved their collection policies as the collection period is even less than it was in the base year, even though the period has been comparably long in 2015 and 2014. Days payables figure indicates that Sintrol Oy has felt a decrease in length of payables period, that negatively effects the CCC. The days inventory outstanding figure has increased continually from the base year until 2016, which suggests that Sintrol Oy has capital tied to inventory for considerably long period of time. Figure supports the focus of the study to optimize the inventory levels. Overall, cash conversion period has increased from the base year and in 2016 it was 52,7% longer than in 2013.

3.4 OPTIMIZATION

3.4.1 Criteria

After inventory turnovers has been analyzed, the criteria for the optimization were developed in cooperation with managers of Sintrol Oy. Products with low unit value, from 0.01€ up to 50€ are excluded due to the fact that maintaining optimal inventory level in this particular group might turn out to be costly if low value goods are ordered frequently, the cost of ordering may exceed the value of goods ordered. The criteria for optimization are listed below.

1) Goods with unit value greater than 5000€ shall not be held in stock

2) Goods with unit value from 1000€ up to 5000€, the minimum turnover required equals 2.0.

3) Goods with unit value from 50€ up to 1000€, the minimum turnover required equals 3.0.

The first criterion is based on the nature of high valued goods. First of all, the sales of high valued goods are not as frequent as less valuable goods and therefore the stock should not be held on high levels. Especially reductions in inventory should be done due to significant decline in sales of high valued goods. The stocking makes the company vulnerable in case there is lack in demand and the company is left with products in shelf that may be outdated over time and the capital invested to them is depreciated. Also due to the fact that the products are high valued, customers do not expect to receive the orders immediately and that gives also Sintrol Oy time to process the order.

The second criterion considers products with unit value between 1000€ and 5000€. If inventory turnover is equal to 1.0, it means that company has enough inventory to generate sales for one year without ordering more stock. The average inventory turnover for products in

this category for Sintrol Oy is 0.71, which means that they have inventory for well over a year to support sales and therefore the requirement for stock must be put in use.

Currently products with unit value from 500€ up to 1000€ have the average turnover of 1.83, which means that on average there is stock for little over half a year to complete the sales orders if the sales figures remained on current level. The data of unit values in proportion to total value of inventory with average turnovers in 2015 and 2016 is presented below in table 11.

Table 11. Turnovers by unit value 2015 and 2016

Unit Value	Value 2016	Avg. turnover	Value 2015	Avg. turnover
>10 000€	158,573.67€	0.66	106,126.59€	0.96
5000€-10000€	61,583.55€	1.08	40,260.70€	2.85
1000€-5000€	179,752.88€	0.71	175,368.95€	1.92
500€-1000€	96,799.97€	1.83	103,700.19€	1.00
50€-500€	295,029.05€	1.26	356,643.05€	1.17
0.01€-50€	122,158.97€	1.00	134,358.68€	0.98
Total	913,898.09€	1.09	916,458.16€	1.48

3.4.2 Optimal inventory values

The optimal level of inventory with respect to criteria is presented in table 12. The optimal value for each item is calculated with reworked inventory turnover formula presented below.

$$\text{Inventory turnover} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

$$\text{Maximum average inventory} = \frac{\text{Cost of Goods Sold}}{\text{Required turnover}}$$

For instance, in 2016 products with unit value between 1000€ and 5000€ was equal to 179,752.88€ (see table 12). The cost of goods sold for the latest period was equal to 88,042.72€

and the minimum required turnover was equal to 2.0. Therefore, the maximum inventory balance to meet the criterion is equal to:

$$\frac{88,042.72€}{2}=44,021.36€$$

Optimal average inventory equals to 44,021.36€. Maximum average inventory refers to highest value of inventory to match the given criteria and therefore also lower value is suitable and even preferable to obtain, keeping in mind the risk of surplus. Optimal inventory values are calculated in table 12 for each category.

Table 12. Optimal inventory levels by unit value 2016 (euro)

Unit value	Value 2016	Optimal value of inventory	Δ
>10,000	158,573.67	-	-158,573.67
5,000-10,000	61,583.55	-	-61,583.55
1,000-5,000	179,752.88	44,021.36	-135,731.52
50-1000	391,829.02	142,674.28	-249,154.74
0.01-50	122,158.97	122,158.97	-
Total	913,898.09	308,854.61	-605,043.48

In table 12 there are potential deductions for 2016 presented to meet criteria determined, the potential deduction with given criteria would be equal to 605,043.48€, which would stand for total of 42% decrease of the total inventory.

$$\text{Inventory}_{2016} - \text{Potential decrease} = \text{Optimal inventory}_{2016}$$
$$1,414,056.75€ - 605,043.48€= 809,013.27€$$

In table 13 there are potential deductions for year 2015 which are equal to 514,740.66€ in total. Deduction would stand for 35.0% decrease from total inventory.

$$\text{Inventory}_{2015} - \text{Potential decrease} = \text{Optimal inventory}_{2015}$$
$$1,469,947.26€ - 514,740.66€ = 955,206.6€$$

Table 13. Optimal inventory levels by unit value 2015 (euro)

Unit value	Value 2015	Optimal value of inventory	Δ
>10,000	106,126.6	-	-106,126.6
5,000-10,000	40,260.7	-	-40,260.7
1,000-5,000	175,368.95	104,123.36	-71,245.59
50-1,000	460,343.24	163,232.47	-297,110.77
0.01-50,0	134,358.68	134,358.68	-
Total	916,458.16	401,714.51	-514,740.66

3.5 Results

In this chapter the after-optimization values are put in use and tested how the optimization will effect the length of cash conversion cycle and return on shareholder´s equity using the five component Du Pont identity proposed by Hawawini and Viallet (1999).

3.5.1 Return on equity

The limitation for the calculations is that the Du Pont identity will not show any changes in return on equity unless the owner´s equity will decrease the equal amount with the assets to achieve the matching principle. In practice it would mean that owner of the company withdraws the equal amount out of the company as the inventory, or any other asset decreases. The actual values for fiscal year 2016 and values with optimized inventory, hereby referred as "conditional", are presented in table 14.

Table 14. Financial data before and after optimization 2016 (euro)

Account	2016	Conditional
Sales	11,319,055.39	11,319,055.39
EBIT	49,467.44	49,467.44
EAT	32,599.08	32,599.08
EBT	42,386.91	42,386.91

Cash	391,074.22	391,074.22
Working Capital Requirements *[(Accounts receivable + Inventory + Prepaid expenses) - (Accounts payable + Accrued expenses)]*	1,810,376.25 *[(1,574,806.96+1,414,056.75+0)-(793,178.46+385,309.00)]*	1,205,332.77 *[(1,574,806.96+809,013.27+0)-(793,178.46€+385,309.00)]*
Net Fixed Assets *(Fixed assets – Depreciation)*	164,607.98 *(271,899.80 - 107,291.82)*	164,607.98
Equity	2,499,817.45	1,894,773.97 (2,499,817.45-605,043.48)

Table 15. below presents the key ratios for calculating the return on equity. The optimization will only have an influence on capital turnover and financial structure ratios. The capital turnover increased from 4.78 to 6.42 due to decrease in working capital requirements and thereby decrease in invested capital. Financial structure ratio decreased from 0.95 to 0.93 decrease in both owner´s equity and invested capital.

Table 15. Key ratios after optimization 2016

Ratio	2016	Conditional
Operating Profit Margin	0.0044	0.0044
Capital Turnover	4.78	6.42
Financial cost ratio	0.91	0.91
Financial structure ratio	0.95	0.93
Tax effect ratio	0.77	0.77

Return on equity of Sintrol Oy, if the inventory level is optimized will be constructed using the ratios calculated in table 14 and the result is equal to:

$$ROE_{conditional}=0.0044 \times 6.42 \times 0.91 \times 0.93 \times 0.77=0.0184=1.84\%$$

The current return on equity is equal to 1.4% and the conditional return on equity is 1.84% therefore the increase in return on equity is 31.4% if the inventory level is optimized. Still the return remains on very fractional level due to the weak operating profit margin in 2016 and the inventory optimization brings only small comfort to business owner in terms of returns. As operating profit was abnormally low in 2016, the change in return on equity may turn out to be inaccurate. Therefore, calculations were conducted for 2015 as well. In table 16 there are actual and conditional figures to calculate the return on equity with optimal inventory in 2015. Table 17 presents the required ratios for calculating return on equity.

Table 16. Financial data before and after optimization 2015 (euro)

Account	2015	Conditional
Sales	12,798,719.77	12,798,719.77
EBIT	282,638.18	282,638.18
EAT	238,535.26	238,535.26
EBT	266,367.77	266,367.77
Cash	497,789.35	497,789.35
Working Capital Requirements	1,615,764.09	1,101,023.43
Net Fixed Assets *(Fixed assets – Depreciation)*	206,394.18	206,394.18
Equity	2,623,218.37	2,108,477.71

Table 17. Key ratios after optimization 2015

Ratio	2015	Conditional
Operating profit margin	0.022	0.022
Capital turnover	5.30	7.09
Financial cost ratio	0.94	0.91
Financial structure ratio	0.92	0.87
Tax effect ratio	0.89	0.89

Using the data of 2015 with inventory optimization, return on equity would be equal to:

$$ROE_{\text{Conditional}}= 0.022 \times 7.09 \times 0.91 \times 0.87 \times 0.89 = 0.1099 = 10.99\%$$

In 2015 the actual return on equity was equal to 9.09%. Calculation suggests that if Sintrol Oy´s inventory would have been on optimal level, 35% less than the actual inventory, the return on equity would have been 20.9% higher.

3.5.2 Cash conversion cycle

If the working capital management and corporate efficiency is under scope it is rather more important to monitor the length of cash conversion cycle than the owners return on equity. The length of cash conversion cycle for Sintrol Oy was 102.7 days in 2016. Sintrol Oy has DSO of 46.39 days, DIO of 117.7 days and DPO of 61.39 days. The optimization has the purpose to speed up the turnover of inventory and thereby to shorten the DIO period to minimum in order to minimize the amount of capital invested to it.

The restriction for the study was that reduction in inventory level does not have an effect on sales or cost of sales. Also to maintain balancing principle, the decrease in inventory balance must be recorded at some other account. In this case the cash account is credited with amount equal to hypothetical amount reduced from inventory, and therefore the DPO or DSO figures remain unchanged after the optimization. The conditional cash conversion cycle for Sintrol Oy in 2016 equals to:

DSO=46.39 days

DPO=61.93 days

$$\text{DIO}_{\text{conditional}}=\frac{809,013.27€}{4,471,773.92€}\text{x}365=66.03 \text{ days}$$

$$\text{CCC}_{\text{conditional}}=46.39 \text{ days}+66.03 \text{ days}-61.39 \text{ days}=51.03 \text{ days}$$

Table 18. Cash conversion cycle 2013-2016, including conditional

	DSO	DPO	DIO	CCC
Conditional (2016)	46.39	61.93	66.03	51.03 days
Conditional (2015)	56.16	75.04	67.73	48.85 days
2016	46.39	61.93	117.72	102.7 days
2015	56.16	75.04	100.21	81.33 days
2014	60.57	73.79	96.54	83.32 days
2013	47.27	73.32	93.29	67.24 days

Table 18 summarizes cash conversion cycles for observation period, including the conditional cash conversion cycles for 2015 and 2016. As the calculations suggests, with optimized inventory Sintrol Oy´s cash conversion cycle would have been 51.67 days shorter in 2016. In 2015, the length of cash conversion cycle would have been 32.48 days less, if the inventory was on optimal level and met the criteria.

4 DISCUSSION

Evidently Sintrol Oy has burdensome inventory with respect to current sales performance, which ties unnecessary large amounts of working capital. By analyzing the product portfolio, the nature and mobility of the products some significant changes could be suggested. By applying the content of this study in practice, Sintrol Oy could decrease their cash conversion cycle from 102.7 days to 51.03 days and the return on equity would increase 31.4% solely by the decrease. On the other hand, the return on equity can be increased in the future by turning the freed capital in to investments or research and development in order to gain maximum value in the future.

The first hypothesis *"H1: By managing working capital properly, Sintrol Oy may improve its efficiency."* is supported by this study. Length of cash conversion cycle could be decreased by 51.67 days or 50,3% in 2016 and 32.48 days or 40% in 2015, in case the inventory was optimized with amounts determined in this paper.

The second hypothesis *"H2: Through efficient working capital management Sintrol Oy may improve its profitability"* is supported by this study conditionally. In order to increase the return on equity figure by solely decreasing inventory levels, owners´ equity must be reduced simultaneously. The same condition has been mentioned in prior studies by Thomas J. Liesz and Steven J. Maranville (2008. 29.) In this study the reduction of inventory by 42% led to increase in return on equity by 31.4% in 2016, and reduction of 35% led to increase in return on equity by 20.9% in 2015. The result is more based on the fact that return on equity increases as less assets is used to generate sales, or the book value of the company assets and equity is decreased but the sales remain the same. Therefore, cash conversion cycle is rather more important indicator of company performance as it measures the efficiency of the operations, and it shows the results without the condition to shrink the company book value.

The optimization was done mostly by using the inventory data records and inevitably there are exceptional products that can not be deducted from the inventory, even though the study suggests it, so further investigation has to be done at the time of optimization. Also, the

calculations and research has been done using data from 1.10.2013 to 30.9.2016. The time interval between this study and the latest data might have changed the situation as well. This study provides only hypothetical point of view how the optimization would affect Sintrol Oy´s efficiency and return on equity. How the optimization is done in practice was not considered in this paper and neither the future aspect of holding the inventory on optimal level in the future. Also, study from Steinker, Pesch and Hoberg (2016) suggests that companies under financial distress should not seek success from inventory reduction solely, as it will bring only a little of help to the financial survival and they propose that the way out of distress would be exploiting internal cash resources.

As this paper was done using case company and all the research was done applying data provided by Sintrol Oy, it may not be suitable for generalization due to the fact that this study only breaks down the burdensome inventory in Sintrol Oy, and seeks to find the solution for further managerial decisions. It is not granted that all the companies have excess in their inventory and the methods used in this paper are applicable.

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Appendix 1. Income statement of Sintrol Oy with trend analysis

Sintrol Oy									
Income statement trend analysis									
	2016	2015	2014	2013		2016	2015	2014	2013
Revenue	11,319,055.39	12,798,719.77	11,867,312.72	13,712,627.45		82.54%	93.34%	86.54%	100.00%
Other operating income	151,959.00	24,571.50	96,227.00	53,458.63		284.26%	45.96%	180.00%	100.00%
Materials and services									
Raw materials and consumables									
Purchases during the period	-6,481,568.92	-7,755,847.22	-6,919,466.35	-8,427,024.79		76.91%	92.04%	82.11%	100.00%
Variation in stock	-55,890.51	114,784.66	-58,612.60	-90,255.96		61.92%	-127.18%	64.94%	100.00%
External services	-112,467.40	-103,203.74	-41,434.76	-35,951.54		312.83%	287.06%	115.25%	100.00%
Staff expenses									
Wages and salaries	-2,153,267.18	-2,173,353.14	-2,260,813.04	-2,007,195.80		107.28%	108.28%	112.64%	100.00%
Social security expenses									
Pension expenes	-394,597.38	-409,508.22	-403,955.97	-428,621.48		92.06%	95.54%	94.25%	100.00%
Other social security expenses	-121,163.14	-127,770.78	-124,564.89	-114,659.26		105.67%	111.44%	108.64%	100.00%
Depreciation and reduction in value									
Depreciation according to plan	-107,291.82	-94,486.90	-142,885.72	-89,377.50		120.04%	105.72%	159.87%	100.00%
Other operating expenses	-1,995,300.60	-1,991,267.75	-1,890,041.23	-1,879,227.07		106.18%	105.96%	100.58%	100.00%
Operating profit (loss)	49,467.44	282,638.18	121,765.16	693,772.68		7.13%	40.74%	17.55%	100.00%
Financial income and expenses									
Income from group member companies	2,673.77	0	0	0					
Other interest income and other financia	333.29	9014.14	150.85	935.15		35.64%	963.92%	16.13%	100.00%
Interest and other financial expenses	-10,087.59	-25,284.55	-8,360.39	-16,420.22		61.43%	153.98%	50.92%	100.00%
Profit before appropriations and taxes	42,366.91	266,367.77	113,555.62	678,287.61		6.25%	39.27%	16.74%	100.00%
Income taxes	-9,787.83	-27,832.51	180.7	-103,971.41		9.41%	26.77%	-0.17%	100.00%
Profit (loss) of the financial year	32,599.08	238,535.26	113,736.32	574,316.20		5.68%	41.53%	19.80%	100.00%

Appendix 2. Income statement of Sintrol Oy with vertical analysis

	2016	2015	2014	2013		2016	2015	2014	2013
Revenue	11,319,055.39	12,798,719.77	11,867,312.72	13,712,627.45		100.00%	100.00%	100.00%	100.00%
Other operating income	151,959.00	24,571.50	96,227.00	53,458.63		1.34%	0.19%	0.81%	0.39%
Materials and services									
Raw materials and consumables									
Purchases during the period	-6,481,568.92	-7,755,847.22	-6,919,466.35	-8,427,024.79		-57.26%	-60.60%	-58.31%	-61.45%
Variation in stock	-55,890.51	114,784.66	-58,612.60	-90,255.96		-0.49%	0.90%	-0.49%	-0.66%
External services	-112,467.40	-103,203.74	-41,434.76	-35,951.54		-0.99%	-0.81%	-0.35%	-0.26%
Staff expenses									
Wages and salaries	-2,153,267.18	-2,173,353.14	-2,260,813.04	-2,007,195.80		-19.02%	-16.98%	-19.05%	-14.64%
Social security expenses									
Pension expenes	-394,597.38	-409,508.22	-403,955.97	-428,621.48		-3.49%	-3.20%	-3.40%	-3.13%
Other social security expenses	-121,163.14	-127,770.78	-124,564.89	-114,659.26		-1.07%	-1.00%	-1.05%	-0.84%
Depreciation and reduction in value									
Depreciation according to plan	-107,291.82	-94,486.90	-142,885.72	-89,377.50		-0.95%	-0.74%	-1.20%	-0.65%
Other operating expenses	-1,995,300.60	-1,991,267.75	-1,890,041.23	-1,879,227.07		-17.63%	-15.56%	-15.93%	-13.70%
Operating profit (loss)	49,467.44	282,638.18	121,765.16	693,772.68		0.44%	2.21%	1.03%	5.06%
Financial income and expenses									
Income from group member companies	2,673.77	0	0	0					
Other interest income and other financia	333.29	9014.14	150.85	935.15		0.00%	0.07%	0.00%	0.01%
Interest and other financial expenses	-10,087.59	-25,284.55	-8,360.39	-16,420.22		-0.09%	-0.20%	-0.07%	-0.12%
Profit before appropriations and taxes	42,366.91	266,367.77	113,555.62	678,287.61		0.37%	2.08%	0.96%	4.95%
Income taxes	-9,787.83	-27,832.51	180.7	-103,971.41		-0.09%	-0.22%	0.00%	-0.76%
Profit (loss) of the financial year	32,599.08	238,535.26	113,736.32	574,316.20		0.29%	1.86%	0.96%	4.19%

Appendix 3. Balance sheet of Sintrol Oy

Sintrol Oy	2016	2015	2014	2013		2016	2015	2014	2013
Balance sheet trend analysis									
ASSETS									
NON-CURRENT ASSETS									
Intangible assets									
Goodwill	140,000.00	210,000.00	280,000.00	0.00					
Other long-term capitalized expenditures	10,416.02	0	0	35,208.60		29.58%	0.00%	0.00%	100.00%
Tangible assets									
Machinery and equipment	104,063.39	73,460.69	113,031.36	104,572.20		99.51%	70.25%	108.09%	100.00%
Investments									
Holdings in group member companies	17,420.39	17,420.39	16,538.95	16,538.95		105.33%	105.33%	100.00%	100.00%
CURRENT ASSETS									
Inventory									
Finished goods/products	1,414,056.75	1,469,947.26	1,355,162.60	1,413,775.20		100.02%	103.97%	95.85%	100.00%
Receivables									
Long-term receivables									
Securities	53,424.35	53,371.74	53,326.75	54,548.61		97.94%	97.84%	97.76%	100.00%
Short-term receivables									
Trade receivables	1,574,806.96	1,302,900.80	1,844,411.70	2,093,980.57		75.21%	62.22%	88.08%	100.00%
Receivables from group member companies									
Trade receivables	345,307.78	302,873.42	502,503.64	383,280.13		90.09%	79.02%	131.11%	100.00%
Loans receivable	0	68,000.00	80,000.00	71,000.00		0.00%	95.77%	112.68%	100.00%
Other receivables	1,920.26	1,721.38	7,764.21	14,214.99		13.51%	12.11%	54.62%	100.00%
Prepayments and accrued income	105,838.13	96,360.71	146,472.81	124,445.15		85.05%	77.43%	117.70%	100.00%
Investments									
Cash and cash equivalents	391,074.22	497,789.35	256,871.87	528,691.75		73.97%	94.15%	48.59%	100.00%
TOTAL ASSETS	4,158,328.25	4,093,845.74	4,656,083.89	4,840,256.15		85.91%	84.58%	96.19%	100.00%
EQUITY AND LIABILITIES									
EQUITY									
Share capital	50,000.00	50,000.00	50,000.00	50,000.00		100.00%	100.00%	100.00%	100.00%
Invested unrestricted equity	1,767,000.00	1,767,000.00	1,767,000.00	1,767,000.00		100.00%	100.00%	100.00%	100.00%
Retained earning	650,218.37	567,683.11	609,946.79	435,590.59		149.27%	130.32%	140.03%	100.00%
Profit (loss) of the financial year	32,599.08	238,535.26	113,736.32	574,316.20		5.68%	41.53%	19.80%	100.00%
TOTAL EQUITY	2,499,817.45	2,623,218.37	2,540,683.11	2,826,906.79		88.43%	92.79%	89.88%	100.00%
LIABILITIES									
Long-term									
Payables to group member companies	10,877.80	10,877.80	10,877.80	10,877.80		100.00%	100.00%	100.00%	100.00%
Notes payable	31,906.34	68,289.90	26,925.00						
Other debt									
Short-term									
Advance payments			120,625.20	120,625.20		0.00%	0.00%	100.00%	100.00%
Trade payables	793,176.46	724,321.62	1,063,999.98	1,052,507.13		75.36%	68.82%	101.09%	100.00%
Payables to group member companies									
Other payables	156,000.00	0	100,060.00						
Accrued expenses				18,692.73		0.00%	0.00%	0.00%	100.00%
Other payables	281,239.20	234,375.70	295,253.23	393,156.55		71.53%	59.61%	75.10%	100.00%
Accrued expenses	385,309.00	432,762.35	497,659.57	417,489.95		92.29%	103.66%	119.20%	100.00%
TOTAL LIABILITIES	1,658,508.80	1,470,627.37	2,115,400.78	2,002,471.56		82.82%	73.44%	105.64%	100.00%
TOTAL EQUITY AND LIABILITIES	4,158,328.25	4,093,845.74	4,656,083.89	4,840,256.15		85.91%	84.58%	96.19%	100.00%

Appendix 4. Example of inventory data

Product	Total value 2016	Total value 2015	Total value 2014	Total value 2013
2512015	0.00	0.67	0.67	0.67
2512104	0.00	0.63	1.05	1.05
383492	0.00	111.9	111.9	111.90
383494	674.64	674.64	674.64	674.64
383606	4.99	4.99	4.99	4.99
7800071	0.00	117.48	117.48	117.48
7800091	0.00	362	362	362.00
7801184	0.00	821.74	821.74	821.74
7801186	359.71	359.71	359.71	359.71
7801189	1,237.76	0	448.8	448.80
7801194	757.00	390	390	390.00
7801210	0.00	1408	1408	1,408.00
7801379	0.00	800.8	800.8	800.80
7801381	0.00	985.6	985.6	985.60
7803098	0.00	0	0	0.00
7808577	272.90	272.9	272.9	0.00
8200206	0.00	0	0	0.00
8201223	226.30	226.3	226.3	0.00
8201234	509.18	397.88	397.88	397.88
8201235	0.00	535.53	535.53	714.04
8201941	536.36	246.84	246.84	246.84
830 9195	0.00	0	0	0.00
8304949	165.79	165.54	202.65	249.88
8304950	83.10	95.47	58.82	58.35
8304951	375.25	336.6	205.07	203.70
8305452	22.04	36	36	36.00
8305999	161.18	128.47	124.83	61.77

Appendix 5. Example of inventory data 2

Row Labels	Customer invoice quantity - sales unit	Customer invoice quantity - inventory unit	Revenue	Gross profit	Gross Margin	COGS
000.745	24	24	360	231	64%	129.01
000002	2	2	3,033	-2,086	-69%	5,119.69
00008376	4	4	24	24	100%	0.00
001.048	3	3	32	14	45%	17.91
001.245	3	3	41	17	42%	24.21
001.652	2	2	164	84	52%	79.35
001.798	2	2	331	111	34%	219.70
00126224	4	4	553	33	6%	520.00
001-432	1	1	0	-8,183	0%	8,183.15
001Y025	15	15	9,700	3,406	35%	6,294.00
001Y025 Y1	5	5	3,120	1,122	36%	1,997.69
0021	1	1	105	51	49%	53.90
002L156	15	15	175	-323	-184%	497.61
003.991	3	3	39	20	52%	18.58
003290500	1	1	34	4	13%	29.57
004.160	3	3	1,703	886	52%	816.91
004.413	3	3	39	16	42%	22.79
0049B	1	1	172	66	38%	106.50
006.846	2	2	541	181	34%	359.97
006110200	1	1	70	9	12%	61.44
006900100	8	8	52	3	6%	48.63
008A010	10	1	128	89	69%	39.05
008A105	5	5	51	23	45%	28.00
008A252	11623	11623	90,587	40,008	44%	50,578.78
008A253	6097	6097	57,134	29,083	51%	28,051.45
008M001	1	1	89	-1	-1%	90.23
008M005	1	1	137	48	35%	89.00