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INTRODUCTION[1]

In recent years there has been an increased interest in working capital management. The levels of accounts receivable, inventories and short-term debt materially impact the liquidity position of the company. The current and quick ratios have been recognized traditionally as appropriate measures of the liquidity position of a firm. However, since both these ratios are static several authors (for example, Largay-Stickney [10] and Aziz-Lawson [1]) have questioned their appropriateness for liquidity analysis, while other writers have suggested another liquidity measure, the cash conversion cycle. There have been several theoretical [6, 7, 8] and empirical [2, 3, 9] studies on the cash conversion cycle, the latter focussing on large firms. This paper differs from other studies, because it examines the issue of liquidity for very small firms (asset and sales size less than $ 1,000,000).

Small firms have different financial characteristics. Walker and Petty [16] examined the financial characteristics of large and small manufacturing companies based on a discriminant analysis model and discovered that they differ significantly. They addressed two questions: first, whether the financial ratios indicate a difference between large and small firms and second, in case there is a difference, what are the specific variables that account for it. Specifically, they found that current and quick ratios increase as the firm's size becomes larger and that a working capital shortage is a problem for small firms.

This liquidity problem that small companies face might be explained by the difficulty small firms have in gaining access to capital markets, by management's propensity to assume risk and by growth demands placed upon a small company. Therefore, useful information is needed on the relationship between various liquidity indicators and their implications for the working capital management of small businesses. The purpose of this

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study is to examine the cash conversion cycle as an indicator of the company's liquidity, to determine the relationship of the cash conversion cycle with the current and the quick ratios and with its component variables, and to investigate the implications of the cash conversion cycle for small businesses in terms of profitability and firm size.

To accomplish this objective, the paper is divided into five sections. The next section of the paper reviews the literature while the third section describes the testable hypotheses, the data, and the methodology. The fourth section presents the results and the analysis. Finally, there is a summary and conclusion section.

REVIEW OF THE LITERATURE

The issue of a cash conversion cycle was initially presented by Hager [8] in 1976. Richards and Laughlin [13] suggest that a cash conversion cycle analysis should be used to supplement the traditional but static liquidity ratio analysis because it provides dynamic insights. Nordgren [12] introduces a cash cycle analysis, based on the asset conversion cycle and the liability cycle. Gentry, Vaidyanathan and Lee [6] developed a weighted cash conversion cycle. They define the weighted cash conversion cycle as the measure of the weighted number of days funds are tied up in receivables, inventory and payables, less the weighted number of days cash payments are deferred to suppliers. They concluded that the weighted cash conversion cycle can be considered as a more refined liquidity measure.

Miller [11] argues that the traditional definition of working capital can be improved by using the working capital leverage ratio, the ratio of current liabilities to working capital; the ratio of current liabilities to current assets; and the ratio of working capital to current assets. Shulman and Cox [14] point out that current and quick ratios provide good information from a liquidation perspective, but not from a dynamic perspective of the firm's liquidity position. They present a new liquidity indicator, the net liquid balance (NLB), liquid financial assets minus all liquid financial obligations. Their work indicated that the relationship between the NLB to total assets ratio and the current and quick ratio is positive and generally all the ratios give consistent information about the liquidity position of the company.

Emery [4] describes the characteristics that are required of a good liquidity measure and reviews and evaluates the traditional ratios with respect to those characteristics. He suggests a new liquidity measure, lambda, the ratio of cash flow resources to potential cash flow requirements. The larger the value of lambda, the higher the liquidity of the firm.

Gitman and Sachdeva [7] have developed a theoretical model which estimates and analyzes changes in a firm's required working capital investment, by incorporating the concept of value added into the working capital cycle. The working capital cycle indicates the length of time over which working capital will be required.

Kamath [9] has tested empirically the hypothesis of conflicting signals between current and quick ratio analysis and cash conversion cycle analysis. He has also examined whether the net trade cycle is a good approximation of the cash conversion cycle and the relationships between the three above liquidity measures and a measure of firm's profitability. Focussing on large firms in six retail industries for the period 1970-1984 he found that:

1. Current and quick ratios are negatively correlated with the cash conversion cycle;
2. Current and quick ratios were not negatively related to the profitability;
3. The net trade cycle provided the same information as the cash conversion cycle; and
4. Both cycles were found to be negatively correlated with the profitability measure.

Concluding, Kamath says that each measure can provide both useful information and misleading clues regarding the firm's liquidity position. Therefore, it is suggested to use all three measures and get better insight and efficiency of working capital management.

Besley and Meyer [3] have evaluated empirically the interrelationships among the working capital accounts and the cash conversion cycle, the firm's industry classification and the rate of inflation. They found that the cash conversion cycle was most correlated with the average age of inventory and least correlated with the age of spontaneous credit. The cash conversion cycle and its components for the examination period differed from industry to industry, but did not vary from year to year. Finally, the authors found that there was no significant correlation between the value of cash conversion cycle and the rate of inflation.

Belt [2] has examined the trends of cash conversion cycle and its components during the period 1950-1983, for those lines of businesses for which Quarterly Financial Report for Manufacturing, Mining and Trade Corporations (QFR) data exists. He found that retailing and wholesaling firms both had cash conversion cycles shorter than those of manufacturing firms. Mining firms had the shortest cash conversion cycle because this type of industry has the longest payment deferral period of all the major business types. Finally, Belt found that cyclical phenomena are apparent. The cash

conversion cycle increases during periods of recession. The nondurable goods cash conversion cycle has declined persistently, while the durable goods cash conversion cycle has been unstable but declining for the examined time period.

Walker [15] tested a theoretical model of fifteen equations that try to explain the relationships among the different short-term and long-term financial sources available to small firms. The results indicated that:

1. Cash cannot be modeled effectively for the small firms;
2. Sales and the company's credit policies are important determinants of accounts receivable;
3. The growth of fixed assets depended on the retained earnings and notes payable; and
4. The small firms employ bank and trade credit, with the latter being more significant, and whereby higher levels of short-term credit are associated with higher sales.

MODEL, TESTABLE HYPOTHESES, DATA AND METHODOLOGY

The review of the literature suggest that traditionally the main indicators of liquidity are the current (CR) and the quick (QR) ratios. The cash conversion cycle (CCC) is another liquidity indicator. The CCC is defined as the sum of the receivables conversion period (RCP) plus the inventory conversion period (ICP) minus the payment deferral period (PDP), that is:

$$CCC = RCP + ICP - PDP \tag{1a}$$

where:
RCP = receivables conversion period
= 360 / Accounts Receivable Turnover
ICP = inventory conversion period
= 360 / Inventory Turnover
PDP = payment deferral period
= 360 / Payables Turnover

$$CCC = \left(\frac{360AR}{Sales}\right) + \left(\frac{360Inv.}{CGS}\right) - \left(\frac{360CL}{X}\right) \tag{1b}$$

where: $X = CGS + Expenses + Interest + Labor + Advertising + Insurance + Travel + Salaries - Depreciation.$

Therefore, the cash conversion cycle shows that the smaller its value, the quicker the firm can recover its cash from the sales of its products, the more cash the firm will have, hence the more liquid it will be. If the cash conversion cycle is high, it means that the company takes longer to recover cash. Thus, a high cash conversion cycle would indicate a liquidity problem.

A priori, there has to be a relationship between the current and quick ratios and the cash conversion cycle but the relationship may not be positive as Richards-Laughlin [13] argue. A reduction in the cash conversion cycle can be obtained by decreasing the average collection period or the average inventory age or by increasing the payables deferral period. Suppose accounts receivable were to decrease; because accounts receivable appear in the numerator of the current ratio, quick ratio, and cash conversion cycle, all three should fall. For a reduction in inventory the same results occur.

For example, a reduction in either inventory or receivables may also suggest a reduction in short-term financing. If short-term financing is reduced, then current ratio, quick ratio, and cash conversion cycle may or may not fall. Any change must depend on the relative magnitudes of change in short-term asset and liability changes. A change as suggested by Richards-Laughlin [13] could occur only if receivables and inventory were totally financed with long-term funds.

Table 1 summarizes some general conclusions that can be drawn for routine, nondecision changes in current assets and liabilities. For example, suppose an exogenous increase in sales occurred, accounts receivable and inventory should increase. If these increases are financed by an off-setting change in current liabilities, the current ratio and the quick ratio should be unchanged (U), while the cash conversion cycle would change (C). Exogenous increases in sales that produce increases in receivables and inventory that were not off-set by changes in current liabilities would generally produce changes in the CR, QR and CCC.

When managerial decisions about working capital are required, the CR, QR, and CCC will likely change. Management might decide to reduce short-term financing by increasing long-term financing. In this case, the CR, QR, and CCC will rise but different liquidity implications result; the traditional ratios suggests an improvement in liquidity, but the CCC indicates a reduction in the firm's liquidity. Any change in credit standards, or terms of sale, or collection policies and/or inventory variables that change the levels of receivables or inventory require a management decision. Unless an off-setting decision is made to other assets or liabilities, changes in CR, QR, and CCC are not predictable.

Likewise, the relationships between these liquidity ratios and profitability must depend on a careful analysis. As shown in Table 1, there maybe no reason to suspect any changes in liquidity or profitability ratios

Table 1
A Priori Liquidity and Profitability Routine Changes Occuring by Changing Current Assets and Liabilities

			Liquidity			*Profitability*		
Increase in:	CA^a	CL^b	CR^c	QR^d	CCC^e	NPM^f	ROI^g	ROE^h
Receivables	I	I	U	U	C	I	C	I
Inventory	I	I	U	U	C	I	C	I

Notes: [a] CA = Current Assets.
[b] CL = Current Liabilities.
[c] CR = Current Ratio, defined as the ratio of CA divided by CL.
[d] QR = Quick Ratio, defined as the ratio of CA minus inventories, divided by CL.
[e] CCC = Cash Conversion Cycle, defined according to Equations 1a and 1b.
[f] NPM = Net Profit Margin, defined as the ratio of Earnings after Taxes (EAT) to Sales.
[g] ROI = Return on Investment, defined as the ratio of Earnings after Taxes (EAT) to Total Assets.
[h] ROE = Return on Equity, defined as the ratio of Earnings after Taxes to Equity.
An increase is indicated by (I), an unchanged variable is indicated by (U) and a variable that changes, without our *a priori* knowledge of the exact direction, is indicated by (C).

for exogenous changes in sales. If one assumes firms use the optimal order quantity models for assets level determination, then any managerial decision that changes receivables, inventory, and/or current liabilities must decrease profitability ratios, regardless of the impact on liquidity ratios. Optimal order quantity models suggest that for a given change in sales, the optimal level of working capital items will change, but less than in proportion to the change in sales. Profit maximization is still maintained but the CR, QR, and CCC will change in some unpredictable way.

If it is assumed that the current and the quick ratios are such that current assets and liabilities are at the optimal level for the specific firm, then any managerial decision that changes the levels of current assets and liabilities, moves the firm away from the profit maximization levels. Specifically, if the current ratio increases, by either an increase in current assets or a decrease in current liabilities or both, this suggests that current assets move above the optimal level and current liabilities move below it, causing the firm to incur higher costs in its operations, reducing therefore, its profits and finally the value of its shareholders' wealth.

Testable Hypotheses

There are four basic hypotheses that are tested empirically in this study: The "CCC and Current/Quick Ratios" hypothesis, the "CCC and its Component Variables", the "CCC and Profitability" and the "CCC and Size Effect" hypotheses.

The first hypothesis tries to investigate the relationship of CCC and the current and quick ratios. It tests for a positive relationship between the current-quick ratios and the cash conversion cycle of the firm. If this hypothesis is accepted, then there is a contradiction between the traditional current-quick ratios view and the CCC.
That is:

H_{10}: There is no linear relationship between the current ratio and the cash conversion cycle and between the quick ratio and the cash conversion cycle.

or H_{10}: $r_{CR,CCC} = 0$; $r_{QR,CCC} = 0$

H_{1A}: There is a positive relationship between the current ratio and the cash conversion cycle and between the quick ratio and the cash conversion cycle.

or H_{1A}: $r_{CR,CCC} > 1$; $r_{QR,CCC} > 1$

The second hypothesis examines the relationship of the cash conversion cycle with each of its components variables, to see how changes in accounts receivable, or in accounts payable, or in the level of inventory affect the liquidity of the firm. It requires the cash conversion cycle to be positively related to the receivables and inventory conversion periods, and negatively related to the payables deferral period.

That is:

H_{20}: There is no linear relationship between the receivables conversion period and the cash conversion cycle, between the inventory conversion period and the cash conversion cycle, and between the payables deferral period and the cash conversion cycle.

or H_{20}: $r_{RCP,CCC} = 0$; $r_{ICP,CCC} = 0$; $r_{PDP,CCC} = 0$

H_{2A}: There is a positive relationship between the receivables conversion period and the cash conversion cycle, between the inventory conversion period and the cash conversion cycle, and a negative relationship between the payables deferral period and the cash conversion cycle.

or H_{2A}: $r_{RCP,CCC} > 1$; $r_{ICP,CCC} > 1$; $r_{PDP,CCC} < -1$

The third hypothesis investigates the relationship of the three liquidity measures under examination with the company's profitability. It allows a positive relationship between the current-quick ratios and profitability and between the cash conversion cycle and profitability. The results of these tests

will be helpful guides for managers because they will be able to see which variables are affected, if any, by managerial decisions. That is:

H_{30}: There is no linear relationship between the variables: current ratio, quick ratio and the cash conversion cycle, as indicators of liquidity and each of the variables: return on investment (ROI), return on equity (ROE) and net profit margin (NPM), as indicators of profitability.

or H_{30}: $r_{CR,ROI} = 0$; $r_{CR,ROE} = 0$; $r_{CR,NPM} = 0$
$r_{QR,ROI} = 0$; $r_{QR,ROE} = 0$; $r_{QR,NPM} = 0$
$r_{CCC,ROI} = 0$; $r_{CCC,ROE} = 0$; $r_{CCC,NPM} = 0$

H_{3A}: There is a positive relationship between the variables: current ratio, quick ratio and the cash conversion cycle, as indicators of liquidity and each of the variables: return on investment, return on equity and net profit margin, as indicators of profitability.

or H_{3A}: $r_{CR,ROI} > 1$; $r_{CR,ROE} > 1$; $r_{CR,NPM} > 1$
$r_{QR,ROI} > 1$; $r_{QR,ROE} > 1$; $r_{QR,NPM} > 1$
$r_{CCC,ROI} > 1$; $r_{CCC,ROE} > 1$; $r_{CCC,NPM} > 1$

The last hypothesis examines the size effect in terms of liquidity within the sample of small businesses by testing the three liquidity measures of various sale size levels of small firms (see Table 2). It states that there is a positive relationship between the size of the firm, based on sales volume, and the liquidity position of the firm. That is:

H_{40}: There is no significant difference of the following variables' means: current ratio, quick ratio, and the cash conversion cycle, as indicators of liquidity, between the two groups of firms differentiated by sales size, (large versus small).

or H_{40}: $AVG_L(CR) = AVG_S(CR)$; $AVG_L(QR) = AVG_S(QR)$;
$AVG_L(CCC) = AVG_S(CCC)$

H_{4A}: There is a positive significant difference of the following variables' means: current ratio, quick ratio and the cash conversion cycle, as indicators of liquidity, between the two groups of firms differentiated by sales size, (large versus small).

or H_{4A}: $AVG_L(CR) > AVG_S(CR)$; $AVG_L(QR) > AVG_S(QR)$;
$AVG_L(CCC) < AVG_S(CCC)$

This study tests these same hypotheses for subsamples of the data for more insights. The data was divided into retail, wholesale, manufacturing, and service industries. Therefore, we have four industry groups respectively

Table 2
Size Classification of the Data Set

Size Groups	*Asset Size*	*Sales Size*
Group 1	000 but less than $100,000	$ 10,000 but less than $250,000
Group 2	100,000 but less than 250,000	250,000 but less than 500,000
Group 3	250,000 but less than 500,000	500,000 and over

Note: The sales size classification was found to be more predictive.

(see Table 3). It is expected that, based on the particuliarities of each industry category, the results might differ across the four industry groups.

Test Data

To explore liquidity concepts of small firms, a commercial data base was purchased, Financial Studies of the Small Business [5], from Financial Research Associates. This data was collected from over 1,000 Certified Public Accounting firms located throughout the country. Financial Research Associates classify the firm data into 66 industries, found to be the most common for small businesses with capitalization under $1,000,000. The data is divided into asset and sales size for the years 1984-1988 as indicated in Table 2. The data is reported by the Financial Research Associates in aggregate form as industry averages and not by individual company. The industry averages were 30 financial ratios. To obtain the values needed for the empirical tests reported in this paper, these financial ratios were used in recalculations to produce the variables needed.[2] The data set is divided into four industry groups as depicted in Table 3.

Methodology

In this study, the distribution of CCC for all industries was examined by a residual analysis and was found to satisfy the assumption of normality and independence of error. However, based on a regression of the cash conversion cycle against the current and quick ratios, the assumptions of linearity and equality of variance are violated.

Since the assumption of normality holds and our data are numerical data, in order to test the first three hypotheses, the Pearson correlation coefficient (r) was used.

In order to test the fourth hypothesis, parametric tests of two independent sample means were used.[3] T-tests of two sample means were performed between the three size groups as determined based on the sales size, for each of the three liquidity indicators, namely: the cash conversion cycle, the current and the quick ratio.

Table 3
Industry Group Classification of the General Sample

Group 1: Retail Industries

Computer Stores	Jewelry
Drugs	Tire/Battery
Liquor	Fuel Oil
Stereo Equipment & TV	Apparel
Office Supplies	Building Mat'l & Supply
General Merchandise	Food & Bev (grocery)
Furniture & Appliance	Nursery/Garden Supply
Photo Supplies	Shoe
Sporting Goods	Floor Covering
Gift Shops	Farm Equipment
Used Auto	Florist

Group 2: Wholesale Industries	*Group 3: Manufacturing Industries*
Wholesale Bldg Mat'l & Supply	Plastics Manufacturing
Wholesale Food/Bev (grocery)	Furniture Manufacturing
Wholesale Auto Supplies	Electronic Component Mfg.
Wholesale Electrical Supplies	Machine Tools & Equipment Mfg
	Metal Work, Dies, Jigs Mfg.
	Sheet Metal Fabrication
	Apparel Manufacturing
	Wood (non-furniture) Mfg.

Group 4: Service Industries

Accountants	Advertising
Architects	Attorneys
Beauty Salon	Chiropractors
Dentists	Employment Agency
Engineers	Entertainment (lounge)
Funeral	General Contractor
Insurance	Janitorial
Laundry	Leasing
Masonry Contractor	Management Consulting
Motel	Nursing Homes
Optometrists	Painting Contractor
Physician	Real Estate
Restaurant	Restaurant (fast food)
Transportation (hauling)	Travel
Veterinarians	Video Sales or Rental

RESULTS AND ANALYSIS

The Cash Conversion Cycle, Current and Quick Ratios

The results from testing the first hypothesis are discussed in the following paragraphs. Table 4 reports the relationship of the CR-QR ratios and CCC for the general sample. The relationship of the CCC with the current ratio is negative, but not statistically significant, in contrast to Richards-Laughlin [13]. Thus, this study rejects the hypothesis that the CR and CCC are positively correlated.

However, the quick ratio, as shown in Table 4, has the conceptually correct sign and the coefficient is statistically significant. This agrees with Richards-Laughlin [13] but not with Kamath's [9] study. The latter tested the hypothesis that there is no consistent relationship between CCC and QR, that is, the correlation coefficient would not be different than zero. The hypothesis could not be rejected. Because, according to Kamath, "...inventories generally represent the largest component of the current asset, on an a priori basis..." a consistent relationship should not be found.[4] In conclusion, given our discussion about Table 1 empirical results, a consistent relationship should not be expected.

The results from testing the first hypothesis for each of the industry groups are depicted in Tables 4a, 4b, 4c and 4d respectively. Table 4a reports the relationship of the CCC and the CR-QR ratios for the retail industry group. Table 4b reports this relationship for the wholesale industry group, while Table 4c and Table 4d report this relationship for the manufacturing and the service industry group respectively.

For the retail and manufacturing industry groups the results support the first hypothesis for both the current and the quick ratios. For the wholesale industry group the relationship of CCC and the CR-QR is positive as hypothesized, but not statistically significant. Finally, for the services group the CCC and the CR are negatively related, while the CCC and the QR are positively related, but both are not significant. In conclusion, there is a difference among the four industry categories. Specifically between the services group and the retail-wholesale-manufacturing industry groups.

For further examination the means of the CCC, CR, QR and the component variables of the CCC, namely RCP, ICP, and PDP were calculated for two subsets of industry groups: Subset 1 is composed of the retail, wholesale and manufacturing industries and Subset 2 of the service industries. As depicted in Table 5, the means are significantly different between the two subsets according to the t-test statistic of two idependent sample means.

Table 4
The Pearson Correlation Coefficients for the Whole Sample Resulting from the Tests of the First and the Second Testable Hypotheses

	CCC[a]	*CR*[b]	*QR*[c]	*RCP*[d]	*ICP*[e]	*PDP*[f]
CCC	1.0000	−0.0166	0.2536	0.9782	−0.2553	−0.2005
		(0.306)	(0.000)*	(0.000)*	(0.000)*	(0.000)*
CR			0.5556	−0.1158	0.3607	−0.1964
			(0.000)*	(0.000)*	(0.000)*	(0.000)*
QR				0.1617	−0.2686	−0.2959
				(0.000)*	(0.000)*	(0.000)*
RCP					−0.2028	−0.0253
					(0.000)*	(0.177)
ICP						0.3020
						(0.000)*

Notes: The number in parenthesis is the level of significance of the correlation coefficients.
* Denotes statistical significance at the 5% level for a two tail test.
[a] CCC is the cash conversion cycle, defined in Equations 1a and 1b.
[b] CR is the current ratio, defined in Table 1.
[c] QR is the quick ratio, defined in Table 1.
[d] RCP is the receivables conversion period, defined in Equations 1a and 1b.
[e] ICP is the inventory conversion period, defined in Equations 1a and 1b.
[f] PDP is the payables deferral period, defined in Equations 1a and 1b.

Table 4a
The Pearson Correlation coefficients for the Retail Industry Group Resulting from the Tests of the First and the Second Testable Hypotheses

	CCC[a]	*CR*[b]	*QR*[c]	*RCP*[d]	*ICP*[e]	*PDP*[f]
CCC	1.0000	0.2711	0.5135	0.7128	−0.2087	−0.6880
		(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*
CR			0.5267	0.1010	0.2461	0.2387
			(0.000)*	(0.040)	(0.000)*	(0.000)*
QR				0.3601	−0.2184	−0.3413
				(0.000)*	(0.000)*	(0.000)*
RCP					−0.1078	−0.0348
					(0.027)*	(0.273)*
ICP						0.3438
						(0.000)*

Notes: The number in parenthesis is the level of significance of the correlation coefficients.
* Denotes statistical significance at the 5% level for a two tail test.
[a] CCC is the cash conversion cycle, defined in Equations 1a and 1b.
[b] CR is the current ratio, defined in Table 1.
[c] QR is the quick ratio, defined in Table 1.
[d] RCP is the receivables conversion period, defined in Equations 1a and 1b.
[e] ICP is the inventory conversion period, defined in Equations 1a and 1b.
[f] PDP is the payables deferral period, defined in Equations 1a and 1b.

Table 4b
The Pearson Correlation Coefficients for the Wholesale Industry Group Resulting from the Tests of the First and the Second Testable Hypotheses

	CCC	*CR*	*QR*	*RCP*	*ICP*	*PDP*
CCC	1.0000	0.4970	0.2697	0.0506	0.1246	−0.9259
		(0.006)*	(0.096)	(0.405)	(0.276)	(0.000)*
CR			0.8675	−0.0483	0.1570	−0.4863
			(0.000)*	(0.409)	(0.227)	(0.007)*
QR				0.1656	0.1140	−0.1921
				(0.214)	(0.294)	(0.179)
RCP					0.4382	0.3302
					(0.014)	(0.053)
ICP						0.0580
						(0.392)

Notes: The number in parenthesis is the level of significance of the correlation coefficients.
* Denotes statistical significance at the 5% level for a two tail test.

Table 4c
The Pearson Correlation Coefficients for the Manufacturing Industry Group Resulting from the Tests of the First and the Second Testable Hypotheses

	CCC	*CR*	*QR*	*RCP*	*ICP*	*PDP*
CCC	1.0000	0.3677	0.4378	0.6283	0.2903	−0.8237
		(0.000)*	(0.000)*	(0.000)*	(0.002)*	(0.000)*
CR			0.7723	0.0886	0.1562	−0.4054
			(0.000)*	(0.189)	(0.059)	(0.000)*
QR				0.3227	0.0163	−0.3285
				(0.000)*	(0.436)	(0.000)*
RCP					0.1654	−0.0768
					(0.049)	(0.223)
ICP						−0.2300
						(0.010)

Notes: The number in parenthesis is the level of significance of the correlation coefficients.
* Denotes statistical significance at the 5% level for a two tail test.

The Cash Conversion Cycle and Its Components

The results from testing the second hypothesis are discussed in this section. The second hypothesis tries to determine what is the most important variable that affects the cash conversion cycle and therefore the liquidity of the small firm. Since small firms have different financial characteristics than large firms, inventory may or may not be the most crucial variable in working capital management.

Table 4 reports the results of the Pearson correlation coefficients analysis. A positive and significant relationship between the CCC and RCP

Table 4d
The Pearson Correlation Coefficients for the Services Industry Group Resulting from the Tests of the First and the Second Testable Hypotheses

	CCC	*CR*	*QR*	*RCP*	*ICP*	*PDP*
CCC	1.0000	−0.0130	0.0291	0.9955	0.3071	−0.0690
		(0.387)	(0.260)	(0.000)*	(0.000)*	(0.064)
CR			0.9292	−0.0897	0.3350	−0.2681
			(0.000)*	(0.032)	(0.000)*	(0.000)*
QR				−0.0524	0.2829	−0.2223
				(0.140)	(0.000)*	(0.000)*
RCP					0.0494	−0.0008
					(0.297)	(0.494)
ICP						−0.1628
						(0.014)

Notes: The number in parenthesis is the level of significance of the correlation coefficients.
* Denotes statistical significance at the 5% level for a two tail test.

Table 5

	CCC	*CR*	*QR*	*RCP*	*ICP*	*PDP*
Panel A: Means for each Subset of Industries						
Subset 1: Mfg, & other	3.06	30.62	0.761	28.32	2.415	1.229
Subset 2: Services	59.34	104.54	0.638	21.72	1.850	1.572
Panel B: T − Tests between Manufacturing & other and Service Industries						
T-TEST	−5.95	−7.06	1.77	6.09	10.08	−7.00
SIGN. T	(0.000)*	(0.000)*	(0.078)	(0.000)*	(0.000)*	(0.000)*

Note: The liquidity measures were significantly different between the two groups.
* Denotes statistical significance at the 5% level for a two-tail test.

is observed. Surprisingly, there is a significant and negative relationship between the CCC and ICP. Finally, a significant and negative association of CCC with PDP is found as expected.

The RCP is negatively related to the ICP and PCP but the relationship is significant only for the former. The ICP is negatively related to the PCP. The result that the ICP is negatively related to the CCC might be explained by the large number of small-retail firms in our sample where the level of receivables may dominate the amount of inventory.

Partitioning the sample into the four industry groups and testing the second hypothesis for each one, this assumption is supported by the results. Tables 4a 4b 4c and 4d report the results of the Pearson correlation coefficient between the CCC and its components for the retail, wholesale, manufacturing and service industry groups respectively. For the first group

the ICP is significantly negative to the CCC. For the other three groups this relationship is positive as expected. The other two component variables RCP and PDP are related to the CCC as hypothesized.

The negative relationship between the CCC and ICP can be influenced by the negative relationship between the RCP and ICP, since the RCP is the variable that affects the CCC the most in our sample, having a correlation coefficient of 0.9782. The negative relationship between RCP and ICP in the retail group can be explained by the relationship between receivables and inventories, which under certain conditions can be positive and under other conditions can be negative. For example, as sales decrease, the accounts receivable decrease proportionally and the inventory of unsold goods builds up. On the other hand, as sales decrease, receivables and inventory will decrease accordingly, depending on the speed of management's reaction to such changes or the level of inventory the firm holds relative to sales. The retail industry group in our sample had the highest level of inventory compared to the other groups. Since retail industries were dominating our sample, it is logical to assume that this group influences the total sample.

The CCC was most correlated with the receivables conversion period for the general sample of small business, in contrast to the results of prior studies for large firms where inventories were the most important variable. For the Retail and Service industry groups the receivables conversion period had the highest correlation with the CCC ($r=0.7128$ and $r=0.9955$ respectively). For the Wholesale and Manufacturing industry groups, the payables deferral period was most correlated with the CCC ($r= -0.9259$ and -0.8237 respectively). Therefore, it is suggested that small business managers should emphasize more the management of accounts receivable and accounts payable than the management of inventories in order to improve their liquidity position and maximize their company's wealth.

The Cash Conversion Cycle, Liquidity and Profitability

The results from testing the third hypothesis will be a helpful guide for small firm managers, because they will be able to influence better their firm's profitability without hurting anything else, for example, liquidity.

Table 6 reports the Pearson correlation coefficients for the relationship of the three liquidity measures with the profitability ratios, return on investment (ROI), return on equity (ROE) and net profit margin (NPM). The cash conversion cycle and the quick ratio are significantly and positively related to all three profitability ratios. On the other hand, the current ratio is significantly and positively related to the net profit margin and the return on investment but negatively related to the return on equity, though the coefficient is not statistically significant for the latter.

The results for the cash conversion cycle and the three profitability ratios were not consistent with the results of Kamath [9]. In that study the relationship was negative, whereas in this study the relationship is positive and statistically significant. In Kamath's study, as the cash conversion cycle decreases, liquidity improves and the profitability ratios increase indicating higher profits, or that profitability also improves.

The present results indicate that as the cash conversion cycle decreases, so do the profitability ratios, reducing the profitability of the firm as liquidity improves. However, based on the CR and QR, as they increase so do the profitability ratios. There is an inconsistent relationship between the static and dynamic liquidity indicators and profitability.

For more insights the sample was partitioned into the four industry groups mentioned previously. The third hypothesis was tested for each industry group separately. These results are reported in Tables 6a, 6b, 6c, and 6d for the retail, wholesale, manufacturing and service industry groups respectively.

The third hypothesis is partially supported by the results in the retail industry group. The CCC is positively related with all three profitability indicators, while the CR is negatively related with the ROI and the ROE, and the QR is negatively related with the ROE. However, the negative relationships for this group are not statistically significant as shown in Table 6a.

The results for the wholesale group indicate a surprising negative relationship between the CR and QR and the three profitability ratios. The CCC is positively related to the ROE and NPM, and negatively related to the ROI. However, none of these relationships is statistically significant so no inferences are drawn. These conclusions can be verified by inspection of Table 6b.

The results for the manufacturing group support the third hypothesis with one exception: a negative relationship between the QR and ROE. However, the coefficients are not statistically significant for this group also. See Table 6c.

Finally, as shown in Table 6d the data in the services group support the third hypothesis without exceptions.

The Cash Conversion Cycle and the Size Effect

The results from testing the fourth hypothesis are discussed in the following paragraphs. Since large and small businesses have different financial characteristics, Walker and Petty [16], the size effect is examined by testing the current and quick ratios, and the cash conversion cycle of various sales size levels of small firms. The size groups are shown in Table 2.

Table 6
The Pearson Correlation Coefficients for the Whole Sample Resulting from the Tests of the Third Hypothesis

	CCC	*CR*	*QR*	*RCP*	*ICP*	*PDP*
NPM	0.2735	0.1857	0.4328	0.2664	0.0931	−0.1605
	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.010)*	(0.000)*
ROI	0.2250	0.1063	0.3717	0.1730	−0.1308	−0.3166
	(0.000)*	(0.001)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*
ROE	0.1640	−0.0257	0.2331	0.1402	−0.1960	−0.2485
	(0.000)*	(0.214)	(0.000)*	(0.019)*	(0.000)*	(0.000)*

Notes: The numbers in the parentheses indicate the level of significance of the coefficients. The variables are defined in Tables 1 and 4.

* Denotes statistical significance at the 5% level for a two-tail test.

Table 6a
The Pearson Correlation Coefficients for the Retail Industry Group, Resulting from the Tests of the Third Hypothesis

	CCC	*CR*	*QR*	*RCP*	*ICP*	*PDP*
NPM	0.1478	0.2243	0.2081	0.2606	0.2793	−0.0912
	(0.004)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.050)
ROI	0.2127	−0.0093	0.1697	0.0703	−0.2076	−0.3163
	(0.000)*	(0.434)	(0.001)*	(0.111)	(0.000)*	(0.000)*
ROE	0.0918	−0.1795	−0.0094	0.0607	−0.2223	−0.1731
	(0.049)	(0.001)*	(0.433)	(0.146)	(0.000)*	(0.001)*

Notes: The numbers in the parentheses indicate the level of significance of the coefficients. The variables are defined in Tables 1 and 4.

* Denotes statistical significance at the 5% level for a two-tail test.

Table 6b
The Pearson Correlation Coefficients for the Wholesale Industry Group, Resulting from the Tests of the Third Hypothesis

	CCC	*CR*	*QR*	*RCP*	*ICP*	*PDP*
NPM	0.0438	−0.0887	−0.1882	−0.2356	−0.3897	−0.1341
	(0.418)	(0.337)	(0.184)	(0.128)	(0.027)	(0.261)
ROI	−0.1630	−0.3005	−0.4178	−0.3500	−0.6553	0.0156
	(0.218)	(0.072)	(0.019)	(0.043)	(0.000)*	(0.470)
ROE	0.1156	−0.3498	−0.5784	−0.4853	−0.5210	−0.2968
	(0.291)	(0.043)	(0.001)*	(0.007)*	(0.004)*	(0.075)

Notes: The numbers in the parentheses indicate the level of significance of the coefficients. The variables are defined in Tables 1 and 4.

* Denotes statistical significance at the 5% level for a two-tail test.

Table 6c
The Pearson Correlation Coefficients for the Manufacturing Industry Group, Resulting from the Tests of the Third Hypothesis

	CCC	*CR*	*QR*	*RCP*	*ICP*	*PDP*
NPM	0.2459	0.0998	0.1297	0.1952	−0.0064	−0.1747
	(0.007)*	(0.160)	(0.098)	(0.025)	(0.475)	(0.040)
ROI	0.2227	0.0610	0.0261	0.0430	−0.0121	−0.2559
	(0.013)	(0.272)	(0.398)	(0.335)	(0.452)	0.005)*
ROE	0.0943	0.0451	−0.0020	0.0350	−0.1565	−0.0997
	(0.174)	(0.327)	(0.492)	(0.364)	(0.059)	(0.161)

Notes: The numbers in the parentheses indicate the level of significance of the coefficients. The variables are defined in Tables 1 and 4.
* Denotes statistical significance at the 5% level for a two-tail test.

Table 6d
The Pearson Correlation Coefficients for the Service Industry Group, Resulting from the Tests of the Third Hypothesis

	CCC	*CR*	*QR*	*RCP*	*ICP*	*PDP*
NPM	0.2079	0.3368	0.3816	0.1803	0.6610	−0.1086
	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.007)*
ROI	0.0594	0.2783	0.3276	0.0206	0.5942	−0.2791
	(0.095)	(0.000)*	(0.000)*	(0.336)	(0.000)*	(0.000)*
ROE	0.0385	0.1484	0.1801	0.0184	0.3761	−0.2262
	(0.197)	(0.000)*	(0.000)*	(0.352)	(0.000)*	(0.000)*

Notes: The numbers in the parentheses indicate the level of significance of the coefficients. The variables are defined in Tables 1 and 4.
* Denotes statistical significance at the 5% level for a two-tail test.

The comparable groups were Size Group 1 and Size Group 2, Size Group 2 and Size Group 3 and Size Group 1 and Size Group 3, for each of the three liquidity variables. It is expected that the cash conversion cycle for firms of the third group (large size) to be smaller than the one of the first group (small size).

Table 7 refers to the results obtained through t-tests concerning the size effect. The higher the level of sales, the smaller the cash conversion cycle and the higher the current and quick ratios. These results are consistent with the Walker-Petty [16] empirical study that supports the size effect hypothesis.

The size effect hypothesis tests for each group of industries gave consistent results with the whole sample. Tables 7a, 7b, 7c and 7d present the results for each of the four industry groups. Furthermore, the three liquidity measures, CCC, CR and QR, were tested overtime. Based on the

Table 7
The Means of CCC, CR and QR, the t-statistic and its Significance Level for the Whole Sample, Resulting from the Tests of the Fourth Hypothesis

	CCC	*CR*	*QR*
GROUP 1 (SALES < 250,000)	50.2061	2.2192	1.3558
GROUP 2 (250,000 < SALES< 500,000)	20.4768	2.5201	1.5986
T-Statistic	2.78	−1.87	−2.02
Significance level	(0.006)*	(0.063)*	(0.044)
GROUP 1	50.2061	2.2192	1.3558
GROUP 3 (SALES > 500,000)	10.6821	2.1046	1.3790
T-Statistic	3.83	0.82	−0.25
Significance level	(0.000)*	(0.416)	(0.804)
GROUP 2	20.4768	2.5201	1.5986
GROUP 3	10.6821	2.1046	1.3790
T-Statistic	2.25	3.93	2.09
Significance level	(0.025)*	(0.000)*	(0.038)*

Notes: The variables are defined in Table 1. The Results Support the Size Effect Hypothesis
* Denotes statistical significance at the 5% level for a two tail test.

Table 7a
The Means of CCC, CR and QR, the t-statistic and its Significance Level for the Retail Industry Group, Resulting from the Tests of the Fourth Hypothesis

	CCC	*CR*	*QR*
GROUP 1 (SALES < 250,000)	8.7459	2.2148	0.9667
GROUP 2 (250,000 < SALES < 500,000)	−2.0763	2.7692	1.0058
T-Statistic	1.97	1.44	−0.28
Significance level	(0.052)	(0.153)	(0.77)
GROUP 1	8.7459	3.2148	0.9667
GROUP 3 (SALES > 500,000)	−11.3181	2.3697	0.9303
T-Statistic	5.94	3.75	0.34
Significance level	(0.000)*	(0.000)*	(0.73)
GROUP 2	−2.0763	2.7692	1.0058
GROUP 3	−11.3181	2.3697	0.9303
T-Statistic	2.62	3.21	0.93
Significance level	(0.010)	(0.002)*	(0.353)

Notes: The variables are defined in Table 1. The Results Support the Size Effect Hypothesis
* Denotes statistical significance at the 5% level for a two tail test.

statistical results in Table 8, we can conclude the CR, QR, and CCC for all the groups in the sample do not change from year to year. The results are consistent with Besley-Meyer's [3] conclusion that the CCC does not change overtime.

Table 7b
The Means of CCC, CR and QR, the t-statistic and its Significance Level for the Wholesale Industry Group, Resulting from the Tests of the Fourth Hypothesis

	CCC	*CR*	*QR*
GROUP 1 (SALES < 250,000) GROUP 2 (250,000 < SALES < 500,000) T-Statistic Significance level		NOT APPLICABLE	
GROUP 1 GROUP 3 (SALES > 500,000) T-Statistic Significance level		NOT APPLICABLE	
GROUP 2	29.0265	2.4000	1.3000
GROUP 3	1.2079	2.1143	1.2000
T-Statistic	7.6	0.91	0.48
Significance level	(0.000)*	(0.388)	(0.642)

Notes: The variables are defined in Table 1. The Results Support the Size Effect Hypothesis
* Denotes statistical significance at the 5% level for a two tail test.

Table 7c
The Means of CCC, CR and QR, the t-statistic and its Significance Level for the Manufacturing Industry Group, Resulting from the Tests of the Fourth Hypothesis

	CCC	*CR*	*QR*
GROUP 1 (SALES < 250,000)	45.5333	2.2250	1.4250
GROUP 2 (250,000 < SALES < 500,000)	30.0145	2.1111	1.5222
T-Statistic	1.94	0.29	−0.33
Significance level	(0.079)	(0.778)	(0.750)
GROUP 1	45.5333	2.2250	1.4250
GROUP 3 (SALES > 500,000)	8.0867	2.0500	1.3893
T-Statistic	6.37	0.85	0.20
Significance level	(0.000)*	(0.403)	(0.840)
GROUP 2	30.0145	2.1111	1.5222
GROUP 3	8.0867	2.0500	1.3893
T-Statistic	6.04	0.45	1.00
Significance level	(0.000)*	(0.658)	(0.326)

Notes: The variables are defined in Table 1. The Results Support the Size Effect Hypothesis
* Denotes statistical significance at the 5% level for a two tail test.

Table 7d
The Means of CCC, CR and QR, the t-statistic and its Significance Level for the Services Industry Group, Resulting from the Tests of the Fourth Hypothesis

	CCC	*CR*	*QR*
GROUP 1 (SALES < 250,000)	132.4335	1.8427	1.4947
GROUP 2 (250,000 < SALES < 500,000)	30.6650	2.4013	2.0307
T-Statistic	1.83	−3.14	−3.17
Significance level	(0.069)	(0.002)*	(0.002)*
GROUP 1	132.4335	1.8427	1.4947
GROUP 3 (SALES > 500,000)	27.7672	1.9315	1.7037
T-Statistic	2.36	−0.65	−1.60
Significance level	(0.019)	(0.519)	(0.111)
GROUP 2	34.6650	2.4013	2.0307
GROUP 3	27.7672	1.9315	1.7037
T-Statistic	1.02	2.94	2.08
Significance level	(0.310)	(0.004)	(0.039)

Notes: The variables are defined in Table 1. The Results Support the Size Effect Hypothesis
* Denotes statistical significance at the 5% level for a two tail test.

Table 8
The Means of the Cash Conversion Cycle (CCC), the Current (CR) and the Quick Ratio (QR) are Tested Along the Years for All Industries, Using t-tests

Years	*CCC*	*CR*	*QR*
1984-1985	−0.99	0.15	0.71
	(0.325)	(0.884)	(0.481)
1985-1986	1.16	−0.34	0.48
	(0.247)	(0.734)	(0.633)
1986-1987	1.10	−1.05	−1.04
	(0.271)	(0.294)	(0.301)
1987-1988	−1.05	1.58	1.82
	(0.293)	(0.115)	(0.070)

Notes: The results indicated that the means do not change over the years. The first line indicates the T-statistic of a two-tail test and the second line indicates the level of significance.

SUMMARY

This paper examined several studies of liquidity measures, the traditional static measures, the current and quick ratios, and the dynamic measure, the cash conversion cycle. This study suggests that a priori, it is impossible to predict the impact on the current ratio, quick ratio, cash conversion cycle and profits when a change in sales causes a change in working capital

variables. Likewise, a managerial decision that changes components of working capital will cause an unpredictable change in the liquidity and profitability ratios.

Several tests were performed to examine the empirical relationship of the CCC and current-quick ratios; the empirical relationship of CCC and its components; the empirical relationship of CCC, current-quick ratios with the profitability ratios of net profit margin, return on investment and return on equity; and finally, the size effect on the firm's liquidity. These empirical investigations differ from other studies in that the data base was for very small firms.

Overall, the cash conversion cycle was negatively related to the current ratio, although not statistically significant, to the inventory conversion period, and to the payables deferral period, but positively related to the quick ratio and to the receivables conversion period. This study attempted to extend the knowledge on the subject of cash conversion cycle from the perspective of small businesses. The results indicate that there are some differences between the cash conversion cycle of large firms as previous studies have found and for small firms. For example, the CCC is positively related to the ICP for large firms and inventories are the most significant variable.

Additionally, the results indicate that there are differences between the concept of cash conversion cycle in manufacturing, retail, wholesale and service industries. Furthermore, the sample industries were classified into two groups the manufacturing, retail and wholesale industries in one and the service industries in the other. The same tests as before were performed for each group separately and the results indicated that the CCC for services was statistically higher than for the other group. Repeating the same tests as before for the whole sample for each industry category such as retail, wholesale, services and manufacturing it was found that retail industries on average have the smaller cash conversion cycle followed by wholesale, manufacturing and finally by services industries.

NOTES

1. The authors wish to thank Mr. Adonis Tomadakis for his help in decoding the data.
2. For example: The current ratio, quick ratio, and receivables conversion period are given by the data base. To calculate the inventory conversion period, given the ratios of Cost of Goods Sold to Net Sales to Inventories (S/Inv.):

$$CGS/S * S/Inv = CGS/Inv \quad (1)$$
$$ICP = (360\ Inv)/CGS \quad (2)$$
From (1) and (2) we get: $(CGS/Inv)^{-1} * 360 = ICP$

3. Kachigan S.K. *Statistical Analysis: An Interdisciplinary Introduction to Univariate and Multivariate Methods,* Radius Press, New York, 1986, pp. 203-220.
4. Spearman coefficients were also computed. The correlation coefficient for CCC and CR was positive but not significant at the .05 level. The Spearman coefficient for CCC and QR support the results of the Pearson and Spearman coefficients. The signs for the coefficients of CR and QR were negative and positive, respectively. Both were significant at the .05 level.

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