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Liquidity and profitability: Not a "one size fits all" proposition!

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Abstract

Research Question: What is the relationship between a company's liquidity and profitability?

Motivation: There are two theoretical views in the literature regarding the relationship between liquidity and profitability: one view is that there is a trade-off between the two where too much liquidity decreases profitability, while the other view is that liquidity and profitability are positively correlated. Extant empirical literature, studying larger data sets, does not give a definitive answer to this question as both views have supporting evidence. This research attempts to investigate the reason(s) for such an inconsistent result.

Idea: We use the Cash Conversion Cycle (CCC) as measure of liquidity and the Economic Value Added (EVA) as measure of profitability to assess the relationship.

Data: The present study uses a large dataset of select S&P 500 sectors and their component companies for a period of twenty-two years extracted from Bloomberg.

Tools: We use Python programs to analyze the panel data set with a series of pooled and fixed effects OLS regression models.

Findings: The nature and magnitude of the relationship between liquidity and profitability can be positive or negative, statistically significant, or not - the relationship is company specific.

Contribution: This study examines the relationship between liquidity and profitability for a wide array of S&P sectors and their component companies. It identifies the relationship for the large S&P 500 set, sector sets and individual companies. The research provides empirical evidence that confirms that the relationship between liquidity and profitability could be positive or negative. The result depends on the data set investigated. For the larger S&P 500

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data set it might appear that the relationship is negative. However, at sector and company levels the results are mixed.

Keywords: Cash Conversion Cycle, Economic Value Added, Liquidity, Profitability

JEL codes: C23, G30, M41

1. Introduction

Businesses across the world strive to create sustainable value by being profitable. Business owners, corporate executives, and managers are interested in identifying and managing the key factors contributing to profitability. In academia, researchers have conducted many studies to investigate the determinants of profitability. The extant literature identified working capital management (WCM) as one of the important factors that influences a company's profitability (see for example Ahangar, 2020). WCM refers to the management of a company's current assets and current liabilities to support normal business operations (Dutta, 2013). WCM is essentially the management of liquidity because, in corporate finance, liquidity is a term referring to a company's ability to use its current assets to pay for its short-term liabilities (Saleem and Rehman, 2011).

While many studies have found that WCM, or the level of liquidity, has an impact on a company's profitability, there are two camps in the literature regarding their relationship. Some research considers that there is a trade-off between liquidity and profitability (Dutta, 2013; Smith, 1980) because a higher level of liquidity (meaning more current assets) will lead to a lower amount of resources available for investment in profitable opportunities, thus a lower level of profitability. Other research finds that a high level of liquidity will contribute to the increases in a company's sales and profit. Many empirical studies have been conducted to test the significance and the direction of the relationship between liquidity and profitability. Singh *et al*. (2017) point out that the findings of such studies are often inconsistent, and sometimes contradictory, with regard to the relationship between liquidity and profitability. There are several possible explanations for the observed inconsistency. First, the metrics used for measuring liquidity and profitability are not consistent across the studies. Second, the characteristics of a company, such as its size and the industry sector it belongs to was not considered and controlled in the data analysis. Third, the macro-economic environment (e.g., cost of capital, economic cycles) surrounding the companies may have a moderating effect on the relationship between liquidity and profitability (see Enqvist *et al*., 2014).

In this study, we test the relationship between liquidity and profitability while addressing the three issues mentioned above. Regarding the metrics, we use a dynamic liquidity measure (Cash Conversion Cycle) as the independent variable, and a market-value driven profitability measure (Economic Value Added) as the dependent variable. Knauer and Wöhrmann (2013) in a comprehensive review of extant literature suggest that an improvement in measuring profitability would be to use a market value measure rather than accounting measures. This is the theoretical reason for which the present study is based on EVA as measure of profitability. The control of company size and industries is ensured by the fact that the data for this study are all from large-cap public companies grouped in industry sectors. Thus, we have the flexibility to examine the relationship in individual companies, in pooled sectors or the whole dataset. As for the macro-economic environment, we collect financial data spanning more than two decades, in which several financial crises and economic ups and downs took place. Therefore, the impact of financial and economic volatility is averaged over time.

By analyzing a panel data collected on select companies in Standard & Poor's 500 for a period of twenty-two years, we find that the relationship between profitability and liquidity depends on the size and components of the data set. This is true because the relationship is found to be positive, negative, significant or insignificant at company level. By aggregating companies into sectors, however, some sectors demonstrate a positive relationship, while some show a negative relationship. The prevailing sign of the relationship in a larger set would be the one dominating the aggregation. In other words, depending on which set was analyzed in the extant literature, the relationship could be positive or negative, statistically significant, or not. Establishing that the relationship is company specific, this study provides conclusive empirical evidence pertaining to the relationship between liquidity and profitability.

The rest of paper is organized as follows: section two reviews the concept of liquidity and profitability and their measures, as well as the extant literature about the relationship between them; section three reports the specific procedure of data collection and research method; section four presents the findings of statistical analysis and discusses their implications for both researchers and practitioners. The paper concludes with a summary of the findings and the directions for future research.

2. Related works

Liquidity has different meanings in different contexts. In the present study, we focus on liquidity in non-financial companies, such as manufacturers, utility companies, or retailers. In such context, liquidity means the ability of a company to pay for its current (short-term) liabilities with its current (short-term) assets. The typical current assets include cash, inventory, and account receivables, while the typical current liabilities include short-term liabilities to be paid in one year like account payables, other accruals etc. While the level of liquidity is critical in economic turbulence, it is also important for the smooth business operations in normal time (Smith, 1980). Given its importance in a company, liquidity management has been extensively studied. One critical aspect of such study is its measurement.

2.1 Measuring liquidity

One popular measure of liquidity comes in the form of a financial ratio between current assets and current liability, known as current ratio (CR) (Graham *et al.*, 2009). The higher the CR, the more current assets available to cover the current liabilities. Another financial ratio Quick ratio (QR), also known as acid test ratio, is a similar measure, which is calculated as ratio between current assets without inventory and current liabilities (Graham *et al.*, 2009). Such ratios are considered as the static measure of liquidity (Cagle *et al.*, 2013) since the financial data used for calculating them reflect a company's financial situation at a point in time, typically the end of a reporting period (quarterly or yearly).

Richards and Laughlin (1980) introduce the flow concept of liquidity using Cash Conversion Cycle (CCC), which measures the average days that a company's cash is tied up in operations. Cash is tied up before the inventory is converted to sales and before account receivables from the clients are collected. On the other hand, cash is freed up before account payables to the suppliers are actually paid. In practice, it is difficult to track a large number of individual transactions taking place on an on-going basis. Thus, CCC is often estimated by using data from the financial statements. For example, Hutchison *et al.* (2007) propose the following way to calculate CCC:

Inventory Conversion Days + Receivables Conversion Days – Payables Deferral Days
Where
Inventory conversion days=365 × Inventory ÷ Cost of Goods Sold
Receivables conversion days=365 × Receivables ÷ Sales
Payables deferral days=365 × Payables ÷ Cost of Goods Sold

The flow concept of liquidity explicitly recognizes that some working capital components, including account receivable and inventory turnover, are non-instantaneous and unsynchronized. Cagle *et al.* (2013) point out that the CCC, incorporating time, remedies many of the disadvantages of using static measures of liquidity, such as current ratio or quick ratio. Kolias *et al.* (2020) claim that the different components of CCC interact with each other as they affect the management of working capital. Recognizing the growing demand for help in managing the cash flow cycle, Hutchison *et al.* (2007) propose to use the CCC as a benchmark to investigate improvement opportunities and as a tool in the negotiations with suppliers and customers.

2.2 Measuring profitability

Like the liquidity measures, there are a number of different profitability measures. Some measures use the percentage as the magnitude of profitability. For example, Return on Assets (ROA), Return on Equity (ROE), and Return on Invested Capital (ROIC) are common metrics of profitability (Graham *et al*., 2009). Each of them measures what percent the net income accounts for the resources, be it the total assets, the shareholders' equity, or the invested capital. Profitability can also be measured directly by the numbers on an income statement, for instance, Gross Operating Profit (GOP) and Net Operating Profit (NOP) (Deloof, 2003). In this situation, the magnitude of profitability is in terms of monetary amount.

A way to incorporate the market value of capital with the measurement of profitability was developed by Joel Stern in 1982 (Stern *et al*., 1995), namely Economic Value Added (EVA). Grant (2003) points out two assertions of EVA method: 1) a company's true profit is its return on invested capital net of the opportunity cost of capital; 2) a company's value is created when positive NPV investment decisions are made. Accordingly, the EVA is calculated by the following formula (Grant, 2003):

$$EVA = NOPAT - WACC \times \text{Invested Capital}$$

Where NOPAT is net operating profit after tax, and WACC is the weighted average of the company's cost of all sources of capital.

Unlike other profitability measures, EVA takes the cost of invested capital into consideration when assessing a company's profit. Since the working capital is a part of total invested capital, it is reasonable to assume a linkage between CCC and EVA. In addition, the arguments surrounding the relationship between liquidity and profitability typically consider the cost or opportunity cost of the working capital. Thus, EVA represents a good measure for profitability in this context. Next, we review the existing studies on the impact of liquidity on profitability.

2.3 Liquidity's impact on profitability

In the literature, liquidity and profitability have been studied as independent variables influencing a variety of dependent variables such as firm value (Jihadi *et al*., 2021), financial distress (Dirman, 2020), dividend policy (Pattiruhu & Paais, 2020), etc. In addition, there are studies that examine the relationship between the two variables, in particular, the impact of liquidity on a firm's profitability.

Liquidity has been recognized as an important measure of the short-term financial stability of a company (Dutta, 2013). Many researchers have suggested that a company's liquidity can have a significant impact on its profitability. Ahangar

(2020) point out that the literature on the relationship between liquidity and profitability is divided into two camps. One camp argues that high liquidity lowers the company's profitability, while the other camp asserts the opposite: low liquidity lowers the profitability.

The first camp suggests that liquidity and profitability are trade-offs. For instance, Dutta (2013) argues that a high level of liquidity, in the form of more current assets, will lead to a low amount of resources available for investment in other profitable opportunities, therefore a low profitability. García-Teruel and Martínez-Solano (2007) suggest that managerial decisions focusing on risk reduction, that is to maintain a high liquidity ratio, will tend to reduce the profitability.

The second camp has its own convincing arguments. Researchers in this camp pay attention to the specific aspects of working capital management and articulate their impact on profitability. For example, carrying a large inventory (a component of current assets) can prevent production interruptions and loss in business due to unavailability of products, leading to high sales and profit (Gill *et al*., 2010). Another argument can be found in Deloof (2003) who asserts that a firm's profitability can increase by reducing the number of days in receivable conversion period and inventory conversion period.

Empirical evidence supporting either camp can be found in the existing literature. For instance, (Singh *et al*., 2017) conduct a meta-analysis from a set of 46 research articles. The findings confirm that working capital management is negatively associated with corporate profitability. However, Ahangar (2020) reviews 339 journal articles using a narrative literature review method. He finds the relationship between working capital efficiency and corporate profitability is equivocal. A similar conclusion is arrived by Knauer and Wöhrmann (2013), who claim that "the profitability effects of working capital changes cannot be derived in a straightforward manner but remain an empirical question" (p.78).

One possible cause for such inconsistent empirical findings is that the metrics used for measuring the liquidity and profitability are not consistent across the studies. On the independent variables side, common measures include current ratio, quick ratio, CCC and its components. In assessing the impact of liquidity on profitability, we need to recognize that profitability is a measure for an interval, such as a quarter or a fiscal year. The static liquidity measures such as current ratio and quick ratio reflect the liquidity at a point of time, typically the closing date of a quarter or a fiscal year. On the other hand, the dynamic liquidity measure like CCC reflects the average days of cash being tied up during the same period, be it a quarter or a fiscal year. Therefore, we consider CCC as a more appropriate measure for liquidity (when assessing the relationship between liquidity and profitability) than the others.

Some studies have been done to investigate the impact of CCC on corporate profitability. For instance, Soenen (1993) investigates the impact of the three components of CCC on corporate profitability. Jose *et al*. (1996) conduct a cross-section analysis on 2718 firms for the period of two decades from 1974 to 1993. The findings support that aggressive working capital policies enhance profitability. In the same vein, Shin and Soenen (1998) use a sample of 58,985 firms covering the period 1975-1994 to find a strong negative relation between the length of the firm's cash conversion cycle and its profitability. More recently, Chang (2018) uses a sample of 31,612 companies in 46 countries to assess the relationship between CCC and corporate performance. The empirical results show that longer CCC has a negative impact on a company's profitability, although the effect reduces or reverses at the shorter CCC level.

Country-wide or industry-specific studies on this subject have also been conducted, such as the manufacturing sector in Malaysia (Jakpar *et al*., 2017), the small and medium-sized companies in Italy (Muscettola, 2014), Indian automobile firms (Vijayakumar, 2011), and listed companies in Brazil (Zeidan & Shapir, 2017). While these studies treat the cash conversion cycle as an independent variable, the dependent variables are not the same, resulting in the mixed findings. Table 1 shows a sample of empirical studies investigating the relationship between CCC and profitability (for a more complete review, see Ahangar, 2020). It can be concluded that the results are inconsistent, not only as level of significance, but also as direction.

Table 1. Recent studies on the relationship between CCC and profitability

Reference	Sample	Liquidity measure	Profitability measures	Findings
(Abuzayed, 2012)	52 non-financial firms in Jordan	CCC	Gross Operating Profit, Tobin's Q	CCC->GOP positive and significant CCC->TQ negative and significant
(Chang, 2018)	30k+ companies in 46 countries	CCC	ROA, Tobin's Q	CCC->ROA negative and significant CCC->TQ negative and significant
(Vintilă & Nenu, 2016)	50 companies in Romania	CCC and liquidity ratios	ROA and ROE	CCC->ROE negative and significant CCC->ROA not significant

On the dependent variables side, we consider the EVA as an appropriate measurement of market-based profitability. As pointed out earlier, the EVA takes the cost of capital into account when assessing the profitability. In this way, the macro-economic environment (Enqvist *et al*., 2014) (e.g., cost of capital, economic cycles) surrounding a company is controlled when measuring its profitability. In the existing literature on the relationship between liquidity and profitability, very limited studies used the CCC as the independent variable and the EVA as the dependent variable. For instance, Bolek *et al*. (2012) investigate the WIG index companies in Poland to examine the relationship between the CCC and the EVA. However, it is unclear how the EVA value for each company-year is calculated. Therefore, the findings are inconclusive. Chamaazi (2017) use the data from 118 companies listed on the Tehran’s Stock Exchange to analyze the relationship between the CCC and the EVA. Even though the findings support a statistically significant negative relationship between them, the study’s regression model has EVA as the independent variable and the calculation of EVA values does not use the well-accepted formula.

In summary, there is a need to conduct a rigorous study on the relationship between the CCC as the measurement of liquidity and the EVA as the measurement of profitability where both measures are computed based on reliable data. The following section describes in detail the data collection process and the research methodology.

3. Research methodology

We recognize that the size of a company determines the magnitude of its EVA values. To control for this factor, the companies with similar level of assets or market capitalization should be compared. In the present study, we choose to collect financial data from large-cap public companies. More specifically, we collect the data of select S&P 500 sectors and their component companies. As of March 2022, the market capitalization eligibility criterion for S&P 500 is US $14.6 billion (Standard & Poor’s, 2022). To ensure the reliability of the data used for analysis, we retrieve the financial data from a Bloomberg Terminal. Bloomberg is a well-known financial data provider whose real-time and historical data are widely used by traders, financial analysts, fund managers, as well as researchers.

Table 2 describes how Bloomberg computes the values for CCC, its components, and EVA with the financial data it collects. In the literature, there are a variety of formulas to calculate CCC (Tan & Tuluca, 2019). One notes that Bloomberg computes the turnover ratios in a more precise way than the textbook formulas. For instance, the computation of Accounts Payable Turnover uses Purchases as the denominator rather than the popular Cost of Goods Sold. In other words, the formulas used by Bloomberg can yield a more reliable CCC as a measurement of liquidity.

We retrieve the data from a Bloomberg terminal using its API for Excel. For each company included in the S&P 500 list (by April 2022), we retrieve its CCC and EVA from fiscal year 2000 to 2021 (2000 is the first year Bloomberg computes the EVA measure). We also retrieve each company’s Global Industry Classification Standard (GICS) sector name. Companies in two GICS sectors (Financials and Real Estate) are removed because there is no CCC data. Finally, the companies with less than 15 years of data (CCC and EVA pair) are removed, resulting in a total of 5468 observations. Each observation has the company's financial data (CCC and EVA) in a particular fiscal year. Table 3 summarizes the panel data collected from Bloomberg after removing missing data and outliers.

Table 2. Formulas and inputs used by Bloomberg

Variable	Units	Formula
Cash Conversion Cycle	Days	Inventory Turnover Days + Account Receivable Turnover Days - Accounts Payable Turnover Days Inventory Turnover Days = Number of Days in the Period (365) ÷ Inventory Turnover, where Inventory Turnover = Trailing 12 Month Cost of Goods Sold or Trailing 12 Month Cost of Materials ÷ Average Inventory Account Receivable Turnover Days = Number of Days in the Period (365) ÷ Accounts Receivable Turnover, where Account Receivable Turnover = Trailing 12 Month Sales ÷ Average Account Receivable Accounts Payable Turnover Days = Period Days (365) ÷ Accounts Payable Turnover, where Accounts payable Turnover = (Ending Inventory + Cost of Goods Sold - Beginning Inventory) ÷ Average Accounts Payable
Economic Value Added	Million Dollars	After-tax profits generated in excess of the cost of capital deployed to generate those profits

Source: Bloomberg Terminal

Table 3. The summary of the panel data

Sector	Number of Companies	CCC Mean	CCC range	EVA Mean	EVA Range
Communication Services	8	16.20	-144to 156	372.69	-21702 to 19573
Consumer Discretionary	38	48.20	-267 to 217	60.08	-26469 to 9546
Consumer Staples	28	44.62	-130 to 344	1022.63	-13380 to 13513
Energy	15	4.61	-145 to 176	-987.37	-51333 to 36837
Health Care	48	114.49	-95 to 364	363.35	-18316 to 20363
Industrials	43	78.08	-162 to 329	-152.52	-26130 to 9787
Information Technology	31	74.12	-132 to 267	1236.79	-14740 to 78107
Materials	21	63.39	-36 to 230	18.80	-10478 to 7857
Utilities	26	12.62	-279 to 143	-164.01	-11423 to 8964

The cleaned data file is analyzed through a number of Python programs. In particular, we adopt StatsModels Python module to conduct a series of regression testing, with the CCC as the independent variable and the EVA as the dependent variable. Due to the nature of the time series data, there is a possibility of non-stationarity. All series were subjected to an augmented Dickey–Fuller (ADF) test to make sure that they are stationary so that results would not be spurious. The findings support that all the series were stationary. In the following section, we report the results of regression analyses and discuss the findings.

4. Discussion of results

The first regression model we test, based on the panel data, is a pooled OLS model across sectors and companies. Then, we test a regression model with fixed effects at the sector level. The findings of these two models are summarized in Table 4. An F-test is used to compare the two competing regression models in their ability to explain the variance in the dependent variable (Date, 2021). The null hypothesis for this test is that the fixed effects model is not statistically better than the pooled model.

Table 4. Pooled Model and Model with Fixed Effects at the Sector Level

Model	Observations	Adjusted R^2	CCC Coefficient	P-Value of CCC Coefficient	Significant fixed effects (p<.05)
Pooled Model	5468	0.001	-1.62	0.02	
Model with fixed effects (sector)	5468	0.032	-4.27	0.00	8
F-test of models	F-statistic: 23.23 (Critical value at alpha = .05: 1.94), meaning the fixed effects model is statistically better than the pooled model				

From the results of the model with the pooled data, we can see the relationship between CCC and EVA is significantly negative. This is consistent with the claim that longer CCC lead to a decrease in profitability.

Next, we conduct a series of regression model testing at the sector level. For each sector, we first test the regression model with the data pooled across the companies in the same sector. Then, a model with fixed effects at the company level is tested. Similar to the earlier step, an F-test is used to assess whether the fixed effects model is statistically better than the pooled model in a particular sector. For each sector, we also report the number of companies (fixed factors) that are statistically significant and the number of all companies in the sector. The findings are summarized in a large table shown in Appendix 1.

There are a few interesting findings in this step. First, the CCC does not constantly have a negative impact on the EVA. Looking at the statistically significant (at 95% confidence interval) relationships among the sectors, the sectors that show the negative coefficient either in pooled model or model with fixed effects are consumer staple, energy, healthcare, information technology. However, several sectors including communication services, consumer discretionary, and utilities, show positive relationship between the CCC and the EVA. Second, for models with fixed effects, a large portion of the companies in several sectors, namely communication services, consumer discretionary, and consumer staples, are statistically significant, while in other sectors, the significant fixed factors are minimal.

At 95% confidence interval, the F tests show that the models with fixed effects generally (6 out of 9) outperform the pooled models.

In the end, we conduct a series of regression model testing at the company level. For each company, there are around twenty-two observations. Table 5 summarizes the statistically significant relationship between CCC and EVA found in all the tests, grouped by sectors.

Table 5. The summary of the company-level regression tests

Sector	Number of Companies	companies with significant negative relationship		Number of companies with significant positive relationship	
Communication Services	8	1	12.5%	3	37.5%
Consumer Discretionary	38	9	23.7%	5	13.2%
Consumer Staples	28	8	28.6%	0	0.0%
Energy	15	6	40.0%	2	13.3%
Health Care	48	11	22.9%	8	16.7%
Industrials	43	6	14.0%	4	9.3%
Information Technology	31	8	25.8%	6	19.4%
Materials	21	4	19.0%	2	9.5%
Utilities	26	0	0.0%	3	11.5%

Just like the findings at the sector level, the relationship between the CCC and the EVA is not consistent across the companies. While the negative relationship (53 companies) outnumbers the positive relationship (33 companies), about two thirds of the companies do not show a statistically significant relationship between the CCC and the EVA.

The impact of the varying results on analyzing the management of working capital is not negligible. First, in an industry or sector where CCC has a significant impact on profitability, special attention should be given on the optimal liquidity level.

Secondly, even at the sector level the relationship is not significant, we need to check the relationships for specific companies.

To sum up, a regression model with data pooled from all companies provides evidence confirming the idea that liquidity (measured by the CCC) is negatively related to profitability (measured by the EVA). However, when we go into a specific sector, the results become inconsistent. There are negative relationships, positive relationships, and statistically insignificant relationships in various sectors. Continuing the investigation at the company level, more inconsistent results are obtained. Thus, we confirm that the relationship between liquidity as measured by CCC and profitability as measured by EVA is company specific. Drawing inferences from pooled data either as a collection of various companies in different sectors or at the sector level would be misleading.

The result might be due to the different approaches of managing the working capital. As is well known, companies could have a moderate approach of maturity matching which could be conducive to insignificant relationships. On the other hand, an aggressive approach might lead to negative relationships, where low liquidity leads to higher profitability. Finally, under a conservative approach higher liquidity could lead to higher profitability. Clearly such a policy is company specific and might depend on each company's different access to short- or long-term credit.

Another possible economic interpretation is based on secondary effects of a short CCC, that might cancel each other in a large data set but could show up at a sector or company level. To shorten the CCC a company must either shorten the operating cycle, increase the payable deferral days, or both. There are secondary implications to doing both. Hill *et al*. (2021) give detailed theoretical explanations for what they call "spillover effects." Assume that a company decreases the operating cycle, meaning that it might not have inventory on hand if there is an increase in demand or it might squeeze the customers not offering acceptable terms of credit. In both cases the revenue could decrease and so would profitability. If on the other hand the company tries to increase the payables deferral period suppliers might impede the company supply chain by not prioritizing it and again, profitability would suffer as the company might not have inventory on hand.

To find out what exactly drives the relationship between CCC and EVA at a company level, a very thorough analysis of each sector and company, as well as the nature of supply chain, is needed. Such an analysis is beyond the scope of the current research.

5. Conclusion

In this study, we investigate the impact of liquidity on profitability. Liquidity is measured by a dynamic metric called cash conversion cycle (CCC) while profitability is measured by a market driven measure, economic value added (EVA.) We collect the financial data from Bloomberg on the companies that belong to the nine sectors of S&P 500. The regression models with and without fixed effects were tested at the pooled level and the sector level. In addition, each individual company with about twenty years of financial data is tested with a regression model. When using data pooled from all companies, we find evidence of a negative impact of liquidity on profitability (i.e., longer CCC decreases EVA). However, the relationship becomes inconsistent if we use specific sectors and their companies as samples for regression analysis.

This study makes contributions to research and practice, and also suggests directions for further research. First, the findings provide empirical evidence that the two camps of the research community could both be right. It depends on the level of investigation and possibly on the variable selected to represent profitability and liquidity. Therefore, one extension is to study the same problem with different measures of profitability and liquidity. Second, this study examines the relationship between liquidity and profitability in a wide array of S&P sectors. While the inconsistency in the relationship is apparent in various sectors, it will be interesting to extend the investigation to specific sectors to find the root cause of a negative, positive or no relationship between liquidity and profitability. Such insights will provide practical implications for practitioners in working capital management and corporate executives. Third, since the relationship between liquidity and profitability is company specific and sector specific, the educators and financial analysts need to be cautious when they make recommendations on working capital management to improve profitability.

In summary, the main finding of the study is that the relationship between profitability and liquidity depends on the size and components of the data set. This is true because the relationship could be positive, negative, significant or insignificant at company level. Such inconsistent relationship at the company level, when aggregated in larger data sets, will lead to different results depending on what relationship dominates the aggregation. To conclude, the relationship between liquidity and profitability is not a one size fits all proposition.

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Appendix 1. Pooled Models Without and With Fixed Effects for Each Sector

Sector: Communication Services				
Model	Adjusted R^2	CCC Coefficient	P-Value of CCC Coefficient	Note
Pooled Model	0.0172	13.3351	0.058	
Model with fixed effects (company)	0.2855	64.1826	0.000	8/8 significant
F-test of Fixed Effects model is better: Yes				

Sector: Consumer Discretionary				
Model	Adjusted R^2	CCC Coefficient	P-Value of CCC Coefficient	Note
Pooled Model	0.0036	2.6531	0.050	
Model with fixed effects (company)	0.4499	4.1961	0.052	21/38 significant
F-test of Fixed Effects model is better: Yes				

Sector: Consumer Staples				
Model	Adjusted R^2	CCC Coefficient	P-Value of CCC Coefficient	Note
Pooled Model	0.0281	-7.0896	0.000	
Model with fixed effects (company)	0.4539	-0.6034	0.806	28/28 significant
F-test of Fixed Effects model is better: Yes				

Sector: Energy				
Model	Adjusted R^2	CCC Coefficient	P-Value of CCC Coefficient	Note
Pooled Model	0.0075	-13.5624	0.065	
Model with fixed effects (company)	-0.0114	-27.7843	0.027	0/15 significant
F-test of Fixed Effects model is better: No				

Sector: Health Care				
Model	Adjusted R^2	CCC Coefficient	P-Value of CCC Coefficient	Note
Pooled Model	-0.0007	-0.5389	0.593	
Model with fixed effects (company)	0.1921	-4.7997	0.011	5/48 significant
F-test of Fixed Effects model is better: Yes				

Sector: Industrials

Model	Adjusted R^2	CCC Coefficient	P-Value of CCC Coefficient	Note
Pooled Model	0.0001	1.4954	0.299	
Model with fixed effects (company)	0.5136	-2.3966	0.234	6/43 significant
F-test of Fixed Effects model is better: Yes				
Sector: Information Technology				
Model	Adjusted R^2	CCC Coefficient	P-Value of CCC Coefficient	Note
Pooled Model	0.077	-28.5653	0.000	
Model with fixed effects (company)	0.3296	-8.8698	0.252	4/31 significant
F-test of Fixed Effects model is better: Yes				
Sector: Materials				
Model	Adjusted R^2	CCC Coefficient	P-Value of CCC Coefficient	Note
Pooled Model	0.0002	-1.8013	0.299	
Model with fixed effects (company)	-0.0197	-3.6476	0.269	0/21 significant
F-test of Fixed Effects model is better: No				
Sector: Utilities				
Model	Adjusted R^2	CCC Coefficient	P-Value of CCC Coefficient	Note
Pooled Model	0.0048	2.7915	0.054	
Model with fixed effects (company)	-0.0102	4.3937	0.027	1/26 significant
F-test of Fixed Effects model is better: No				