

## Managing C2C to Increase Company Profitability

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### Abstract

*The utilization and control of cash is essential to the survival and success of business operations. This article presents a definition and discussion of the Cash-to-Cash (C2C) metric, provides a brief literature review, examines how C2C can be manipulated, discusses C2C benchmarking, provides C2C benchmarks over time and by industry, and reviews current C2C tools. Companies that fully understand the calculation and manipulations of C2C can be more efficient and thus, more profitable than other companies in their industry. Due to technological advances and as Supply Chain Finance (SCF) continues to gain in popularity, C2C will continue to play a dominant role in business operations as a tool that helps companies improve their cash management and provides them with increased liquidity/solvency.*

### 1. Introduction

The purpose of this article is to present and examine the cash-to-cash (C2C) metric, seek to understand how a company can manipulate it, and provide benchmarks for companies to use for evaluation purposes. Companies that fully understand C2C can use it to assist them in making their business more efficient and profitable. This study will also provide a brief literature review, current C2C benchmarks over time and by industry and explore the ever-changing importance of C2C to business operations as Supply Chain Finance grows in popularity as the next “low hanging fruit” in the on-going development of supply chain management.

### 2. Understanding C2C

#### 2.1. C2C Definition and Calculations

According to Kieso, Weygandt, and Warfield (2013), the *operating cycle* of a business “is the period of time elapsing between the acquisition of goods and services...and the final cash realization resulting from sales and subsequent collection.” Others use terms such as *cash cycle*, *cash conversion cycle*, or *net trade cycle* to reference this same process. Essentially, these terms are synonymous, and thus, the authors prefer to call it C2C. It has been considered to be among the most fundamental ingredients of working capital management (Gitman 1974; Richards and Laughlin 1980; Bodie and Merton 2000; Keown, Martin, Petty, and Scott 2003; Appuhami

2008). Once a company has a full understanding of how the elements involved in C2C work, they can work to reduce the cycle time. This reduction in time may lead to increased financial and operational efficiency and ultimately, increased profitability.

There are three key financial variables from a company's Balance Sheet: Inventory, Accounts Receivable, and Accounts Payable involved in the C2C calculation. Next, these variables are converted into ratios using their complimentary elements from a company's Income Statement: Revenues and Cost of Goods Sold (COGS). Finally, as shown below, the data is standardized by converting the financial variables from dollars to days to produce a common measure for analysis.

$$(1) \text{ Days of Inventory}_{(C2C)} = \frac{\text{Inventory (\$)} \times 365}{\text{Cost of Goods Sold (\$)}}$$

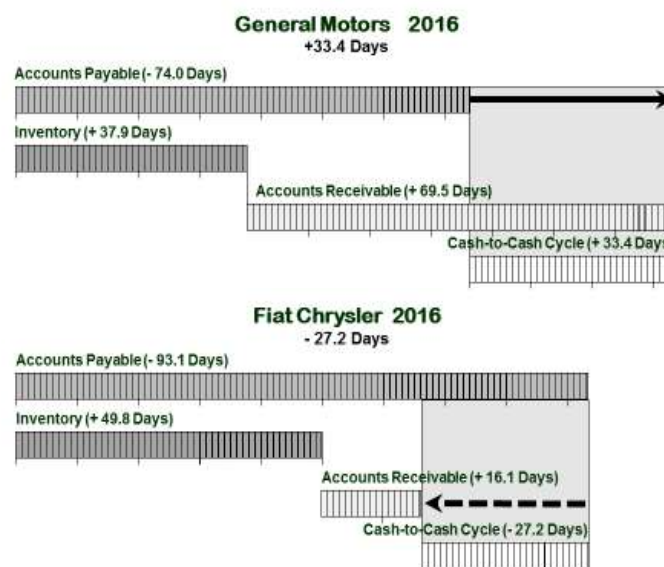
$$(2) \text{ Days of Receivables}_{(C2C)} = \frac{\text{Accounts Receivable (\$)} \times 365}{\text{Net Sales (\%)}}$$

$$(3) \text{ Days of Payables}_{(C2C)} = \frac{\text{Accounts Payable (\$)} \times 365}{\text{Cost of Goods Sold (\%)}}$$

These three ratios represent the *Inventory Conversion Period*, *Receivables Conversion Period*, and *Payables Deferral Period*, respectively (Moss and Stine 1993). *Inventory Conversion Period* represents the average number of days a firm holds its inventory before selling it. Basically, it provides information about how fast/slow a firm is selling its inventory. *Receivables Conversion Period* is the average number of days it takes for a firm to collect a receivable from a customer once the inventory has been sold on credit. It provides information about a firm's credit sales policy and its efficiency in collecting the credit sales. *Payables Deferral Period* is the average number of days that a firm takes to pay its accounts payable to a supplier. This measure provides information about the firm's policy in paying back its accounts payable. Finally, these three ratios are used to calculate C2C:

$$(4) \text{ Cash-to-Cash Cycle} = \text{Inventory}_{(C2C)} + \text{Receivables}_{(C2C)} - \text{Payables}_{(C2C)}$$

The calculated C2C may be either a positive or a negative number of days and indicates the flow of capital with trading partners. A positive number indicates, on average, how many days your capital is unavailable while you are awaiting payment from a customer. From a company perspective, a high number for C2C days is unfavorable as it ties up capital assets and increases opportunity costs or interest charges. In contrast, a negative number indicates how many days you received cash from sales before payment is required to suppliers. Optimally, a company would like to be close to 0 days (or negative days) (see Figure 1).

**Figure 1 Cash-to-Cash Positive or Negative Examples**

## 2.2. Brief Literature Review

In addition to the current and quick ratios, C2C provides a good measure of liquidity and solvency for companies. Further, some of the C2C elements are utilized in both of these ratios. However, the current and quick ratios are static measures since they utilize balance sheet data that represent a point in time. They also fail to adequately incorporate a measure of the nearness to cash for a company. When these ratios are High, they usually suggest a greater commitment of firm resources to less liquid forms of working capital (Gallinger 1997). They also do not account for the time involved to convert current assets to cash, nor the time required to pay current liabilities. Thus, C2C addresses these deficiencies since it is a dynamic metric that looks at cash flows occurring over time and could serve as a useful alternative for liquidity analysis.

In the past, several research studies have examined the relationship between C2C and various firm performance measures. A study by Shin and Soenen (1998) examined the association between a company's C2C and profitability between 1975 and 1994. Their results suggest a negative association between C2C and profitability and risk-adjusted stock returns (i.e., better C2C performance results in higher profitability and stock returns). In another research study, Wang (2002) used a sample of Japanese and Taiwanese firms from 1985 to 1996 to focus upon the relationship between C2C and return on assets (ROA) and return on equity (ROE). Results from this study indicate a negative association between C2C and ROA, and C2C and ROE (i.e., better C2C performance results in higher ROA and higher ROE). Likewise, García-Teruel and Martínez-Solano (2007) used small-to-medium sized enterprises (SMEs) in Spain from 1996 to 2002 in their research and determined a similar relationship (i.e., shorter C2C was again associated with increased profitability as measured by ROA).

Additional research studies with samples from other countries provide some evidence consistent with the empirical results of prior literature. For example, Lazaridis and Tryfonidis (2006) used a sample of companies from Greece; Raheman and Nasr (2007) examined companies from Pakistan; and Charitou, Elfani, and Lois (2010) used firms on the Cyprus Stock Exchange. All three studies found shorter C2C was associated with improved measures of profitability. Additionally, Bhutto, Abbas, Rehman, and Shah (2011) used Pakistani industries to confirm the relationship between C2C and profitability. Their results suggest a negative relationship between the length of C2C and sales revenue, ROE, and firm financing policies, yet a positive relationship for total assets, ROA, and investing policies.

The relationship of C2C and firm profitability is also supported by a theoretical framework developed by Gomm (2010) which showed C2C, as a component of supply chain finance, may possibly improve bottom line results for a company. Given the link between a company's profitability and stock returns, C2C is a useful tool to examine aspects of a firm's cash management over time and to compare a firm's performance within the same industry. Longitudinal analysis of C2C information may also offer insights as to whether there is an increased focus by an industry and how the focus changes over time. Also, strong supply chain collaborations may lead to increased profit and improved competitive advantage (Randall and Farris 2009a).

Finally, Farris and Hutchison (2003) provided benchmark C2C medians in 2001 for various (non-service) industries, while Farris, Hutchison, and Hasty (2005) extended their research by providing C2C benchmark medians for various service industries. Both studies helped to identify key drivers for C2C changes, and suggest that firms have made concerted efforts to manage their C2C variables.

### **2.3. Manipulating C2C**

To minimize C2C days, a company seek to reduce days of Inventory, reduce days of Accounts Receivable, or increase days of Accounts Payable. While all three C2C variables may be examined individually at different times, the optimum approach for a company is to manage a combination of all three variables and seek to reduce overall C2C days.

Historically, firms have focused on inventory reduction by applying improved computer and equipment technology. They have also embraced concepts such as just-in-time and produce-to-order, instead of produce-to-forecast; liquidated excess and obsolete inventory to allow more capacity and free up capital; implemented real-time inventory tracking; synchronized supply/demand planning; and developed trading partner agreements to strategically shift inventory within the supply chain.

To reduce days of Accounts Receivable, a company should regularly review its credit terms with customers. To speed up cash collections, companies may consider requiring full or partial payments up front for purchases or using cash discounting—a percent discount for early cash payment on invoices. A company may identify which customers who are habitually late in their payments, review the frequency of when the firm sends delinquency notices, and periodically assess whether to keep or terminate delinquent customers. (Easton, McAnally,

Sommers, and Zhang 2015). Internally, a firm may delay sales commissions until receivables are paid to incentivize its sales personnel to assist in credit collections. The company may also consider factoring selected accounts receivable to third parties. The purchaser assumes the risk of collectability and absorbs any credit losses.

Accounts Payable days may be increased by taking advantage of supplier terms. Thus, a company may set up pre-established payments to a supplier electronically at the limit of their credit days. This insures that timely payments are made within established credit terms, yet reduces the time that cash is tied in the payment process. Additionally, a firm may consider negotiating terms with suppliers to extend payment times. If a company is a significant customer with a supplier, then they may be in a strong position in the supply chain to influence and extend their payment terms.

## **2.4. C2C Benchmarking**

The C2C metric is easily calculated and offers many managerial implications. To gain insights and understanding of the efficiency of its working capital, Soenen (1993) suggested that C2C might be of interest to any individual firm that wanted to compare itself with other firms in the same industry. Within a company, it serves as a measure of change across time for variables reaching internally across functional silos. It may be used to compare performance between divisions or product lines. Externally, it may be used to benchmark performance by comparing performance against competition within an industry or with non-competing industries with similar performance of C2C variables (Farris and Hutchison 2003; Farris, Hutchison, and Hasty 2005; Hutchison, Farris, and Fleischman 2009; Randall and Farris 2009b).

## **3. C2C Database**

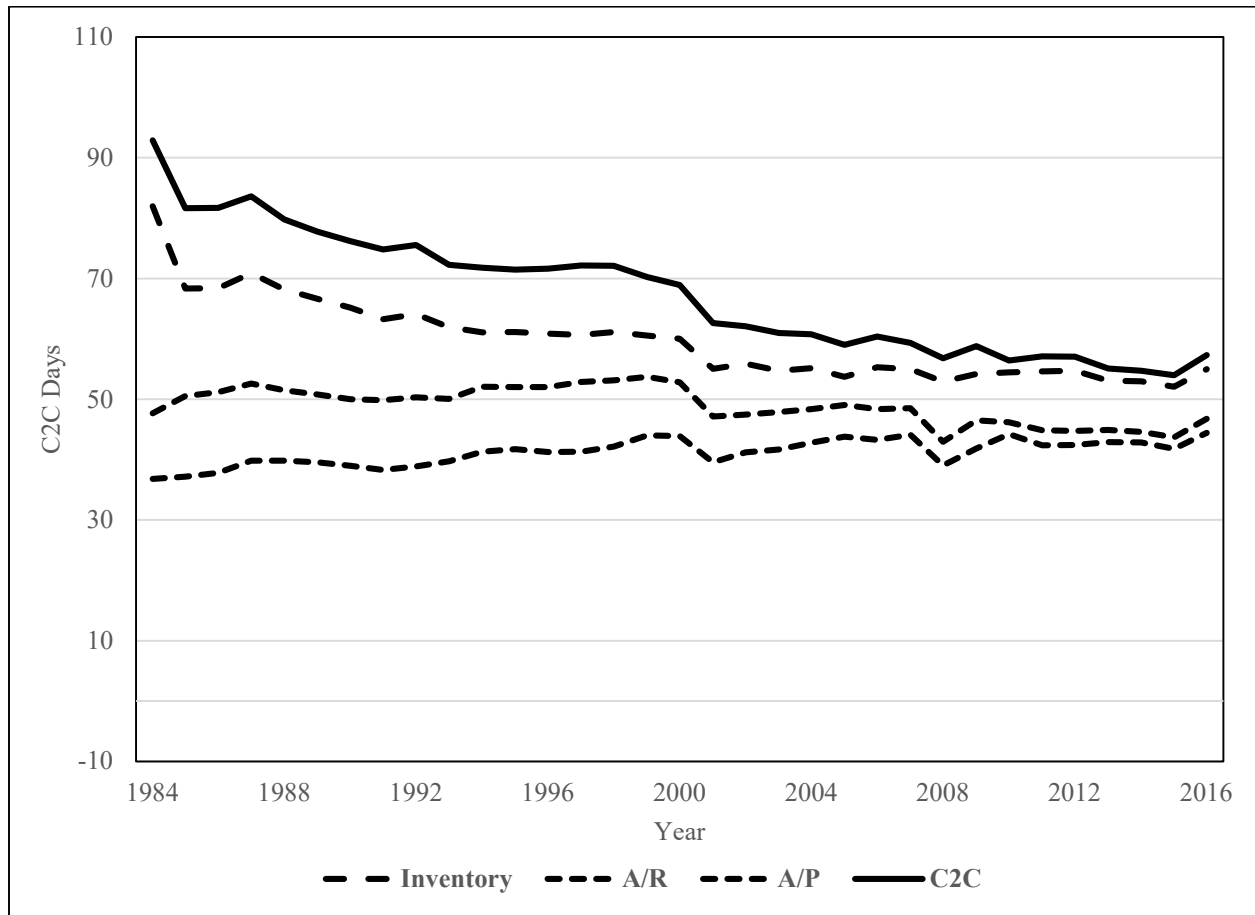
The *Compustat* database (2017) was mined to retrieve historical data for annual inventory, accounts receivable, accounts payable, COGS, and Sales for all companies from 1984 to 2016. (For a full discussion of how the C2C database was developed, please see the Appendix.)

Longitudinally for all industries, C2C has improved over time, trendlines evidence that there has been a reduction in Accounts Receivable days and minor increases in Inventory and Accounts Payable days (see Table 1 and Figure 2). Overall, this suggests that companies are managing all three variables of C2C over time, and that this trend will likely continue into the future.

**Table 1: C2C Overall Median Performance  
1984-2016\***

<b>Year</b>	<b>Inventory +</b>	<b>A/R -</b>	<b>A/P =</b>	<b>C2C</b>
1984	81.9	47.7	36.8	92.8
1985	68.3	50.5	37.2	81.7
1986	68.4	51.1	37.8	81.7
1987	70.9	52.5	39.8	83.6
1988	68.1	51.5	39.8	79.8
1989	66.6	50.7	39.5	77.8
1990	65.1	50.0	39.0	76.2
1991	63.2	49.8	38.3	74.8
1992	64.1	50.3	38.8	75.5
1993	61.9	50.0	39.7	72.3
1994	61.0	52.0	41.3	71.8
1995	61.1	52.0	41.7	71.4
1996	60.9	52.0	41.2	71.6
1997	60.6	52.9	41.3	72.1
1998	61.1	53.1	42.1	72.1
1999	60.5	53.7	44.0	70.2
2000	60.0	52.8	43.9	68.9
2001	55.0	47.1	39.5	62.6
2002	55.9	47.4	41.2	62.1
2003	54.7	47.9	41.7	60.9
2004	55.1	48.3	42.8	60.7
2005	53.7	49.0	43.7	59.0
2006	55.3	48.3	43.2	60.4
2007	54.9	48.5	44.1	59.3
2008	52.9	42.9	39.0	56.8
2009	54.2	46.5	41.8	58.8
2010	54.4	46.2	44.2	56.4
2011	54.6	44.8	42.3	57.1
2012	54.7	44.7	42.4	57.0
2013	53.0	44.9	42.9	55.0
2014	52.9	44.6	42.8	54.7
2015	52.0	43.7	41.7	54.0
2016	55.0	46.7	44.4	57.3

**Figure 2: C2C Overall Machine Performance  
1984-2016\***



Using C2C and classifying by industries helps identify where performance may be benchmarked against non-competing industries. Since medians serve to generalize industry characteristics, all industries were rank ordered based on median performance for the three variables (Inventory, Accounts Receivable, and Accounts Payable), and then split into two groups: HIGH and LOW. A 2 x 2 x 2 matrix was created to classify industries by the characteristics of the three variables. The matrix shown in Table 2 may be used by a company to identify comparable industries for benchmarking their C2C.

**Table 2: C2C Benchmarking Map by SIC Industry 2016\***

	<b>HIGH INVENTORY</b>	<b>LOW INVENTORY</b>
<b>HIGH A/R</b>	<b>HIGH A/P</b> 2600 Paper and Allied Products 2800 Chemicals and Allied Products 3000 Rubber and Miscellaneous Plastic Products 3400 Fabricated Metal Products, Except Machinery and Transportation Equipment 3500 Industrial and Commercial Machinery and Computer Equipment 3600 Electronic and Other Electrical Equipment and Components, Except Computer Equipment 3800 Measuring, Analyzing, and Controlling Instruments; Photographic, Medical 5000 Wholesale Trade-Durable Goods	<b>HIGH A/P</b> 1300 Oil and Gas Extraction 4800 Communications 4900 Electric, Gas, and Sanitary Services 7300 Business Services
	<b>LOW A/P</b> 3700 Transportation Equipment	<b>LOW A/P</b> 1600 Heavy Construction, Except Building Construction-Contractors 2700 Printing, Publishing, and Allied Industries 8000 Health Services 8700 Engineering, Accounting, Research, Management, and Related Services
<b>LOW A/R</b>	<b>HIGH A/P</b> 1000 Metal Mining 2300 Apparel and Other Finished Products Made from Fabrics and Similar Materials 2500 Furniture and Fixtures	<b>HIGH A/P</b> 4920 Gas Production and Distribution 5900 Miscellaneous Retail
	<b>LOW A/P</b> 1500 Building Construction-General Contractors and Operative Builders 2000 Food and Kindred Products 2400 Lumber and Wood Products, Except Furniture 3300 Primary Metal Industries 5500 Automotive Dealers and Gasoline Service Stations	<b>LOW A/P</b> 2900 Petroleum Refining and Related Industries 3200 Stone, Clay, Glass, and Concrete Products 4400 Water Transportation 4500 Transportation by Air 5100 Wholesale Trade-Nondurable Goods 5800 Eating and Drinking Places 7900 Amusement and Recreation Services

For 2016, one of the top C2C industry performers was SIC 5800 Eating and Drinking Places which passes the common sense test when one considers the dining experience. One prefers eating fresh food (which results in low days of inventory), pays using cash or quick to collect credit or debit cards (low days of receivables), and the restaurateur pays suppliers on a traditional 30/60/90 days' cycle (extending days of payables).

The poorest performer was SIC 1500 Building Construction-General Contractors and Operative Builders. This too passes the common sense test, as construction time accounts for a



high number of days of inventory, payment for the finished product occurs rather quickly as financial institutions make a quick payment to convert the accounts payable into a long-term loan with the buyer, and payment to suppliers and employees tends to be rather short.

**Table 3: Best SIC Industry C2C Performance 2016\***

SIC	Category	Inventory	+ A/R	- A/P	= C2C
4500	Transportation by Air	9.3	14.5	34.7	-10.9
4800	Communications	13.2	47.8	66.7	-5.7
7900	Amusement and Recreation Services	5.3	14.6	17.3	2.6
5800	Eating and Drinking Places	3.9	6.6	13.2	2.7
5900	Miscellaneous Retail	36.9	17.9	45.6	9.2
4400	Water Transportation	19.3	16.2	21.2	14.3
4920	Gas Production and Distribution	25.2	38.6	46.7	17.1
4900	Electric, Gas, and Sanitary Services	30.7	41.8	48.5	24.0
1300	Oil and Gas Extraction	19.7	60.8	53.4	27.1
5100	Wholesale Trade-Nondurable Goods	26.5	29.3	26.2	29.6
7300	Business Services	12.4	61.9	41.8	32.5
8000	Health Services	10.7	46.2	23.9	33.0
2900	Petroleum Refining and Related Industries	40.4	29.4	36.0	33.8
2700	Printing, Publishing, and Allied Industries	20.0	50.8	33.9	36.9
1000	Metal Mining	91.1	9.6	56.6	44.1
3200	Stone, Clay, Glass, and Concrete Products	45.4	39.0	39.8	44.6
2000	Food and Kindred Products	55.3	30.8	39.1	47.0
2400	Lumber and Wood Products, Except Furniture	49.0	25.5	21.3	53.2
2600	Paper and Allied Products	59.7	43.7	47.8	55.6
1600	Heavy Construction, Except Building Construction-Contractors	25.9	70.8	36.6	60.1
2500	Furniture and Fixtures	68.6	38.0	46.4	60.2
3700	Transportation Equipment	57.3	51.8	39.1	70.0
3000	Rubber and Miscellaneous Plastic Products	76.0	40.5	43.7	72.8
3300	Primary Metal Industries	72.9	38.5	38.6	72.8
8700	Engineering, Accounting, Research, Management, and Related Services	34.9	73.9	34.7	74.1
5500	Automotive Dealers and Gasoline Service Stations	71.4	12.9	10.1	74.2
5000	Wholesale Trade-Durable Goods	76.0	46.6	40.8	81.8
3600	Electronic and Other Electrical Equipment and Components, Except Computer Equipment	85.6	55.5	59.1	82.0
2800	Chemicals and Allied Products	87.1	53.5	52.4	88.2
3500	Industrial and Commercial Machinery and Computer Equipment	88.1	61.2	48.6	100.7
2300	Apparel and Other Finished Products Made from Fabrics and Similar Materials	119.1	39.1	49.8	108.4
3400	Fabricated Metal Products, Except Machinery and Transportation	104.7	51.2	46.0	109.9
3800	Measuring, Analyzing, and Controlling Instruments; Photographic, Medical	132.6	58.3	49.1	141.8
1500	Building Construction-General Contractors and Operative Builders	399.6	5.0	23.3	381.3

#### 4. Current C2C Tools

With constant improvements in computer technology, companies today are able to obtain data easily to better manage their cash. The following are suggested opportunities that firms could utilize to enhance and improve their C2C days and profitability:

**Dynamic C2C Tracking and Management**—Using computer generated data and a dashboard approach, companies could constantly monitor in real-time their C2C variables (Inventory, Accounts Receivable, and Accounts Payable) as data is updated and transactions occur. This dashboard provides company management the ability to monitor C2C for problems so that they can quickly determine solutions to meet budgeted C2C goals.

**Supply Chain Mapping**—Understanding a company's strength and weakness in the supply chain relative to its trading partners and customers allows a company to develop a graphic map for visualization of all trading partners. This lets a company visualize the strong and weak performers in relation to a company and their associations with other companies. It helps a company visualize its strengths when negotiating receivable and payable terms (Farris 2010).

**Dynamic Discounting**—Most companies are aware of conventional/traditional cash discount terms such as 2/10, net 30 days which are static and all (2% off if payment is received by the 10<sup>th</sup> day) or none (net payment due at day 30). An improvement to these terms is dynamic discounting that provides cash discount for payment to customers on a sliding scale basis from the date and time of a sale. The cash discount is reduced on a periodic time basis until the end of the credit term. This approach to discounting gives the customer a graduated incentive to make earlier payment and improve their payables process for the benefit of both trading partners.

**Reverse Factoring**—As a financing solution for suppliers, reverse factoring occurs when a company, the ordering party, assists their suppliers in financing their receivables at a lower interest rate than what may be obtained in the market (Aberdeen 2011). The goal for a company is to help suppliers manage their cash flows, reduce costs, and decrease default risks in the supply chain by improving their liquidity (Tsai 2008; Tsai 2012).

**Supply Chain Balancing**—Entails a company working in concert with its trading partners to manage inventories, accounts receivable, and accounts payable across the supply chain. The goal with this approach is to lower inventory carrying costs and lower costs of capital. The savings earned could be shared equally among the trading partners and would benefit them with profitability increases (Hutchison, Farris, and Fleischman 2009; Randall and Farris 2009a).

#### 5. Conclusions

This article sought to present and discuss the C2C metric and provide benchmarks to allow companies to draw comparisons. This was accomplished by reviewing the basics of C2C and its manipulations, presenting a brief literature review, plus providing companies with current C2C benchmarking data that shows C2C performance from 1984 to 2016. Also, industry

performance by the three C2C variables (Inventory, Accounts Receivable, and Accounts Payable) and overall best performance by industry were presented for the same time period. Current C2C tools were presented to allow companies to improve their C2C performance and profitability.

In the future, as technology continues to advance rapidly, companies will use the C2C metric as a Supply Chain Finance tool to gain competitive advantage, become more efficient in their operations, and increase their profitability. Overall, C2C will be an important metric for companies in a dynamic and changing environment, and understanding its calculations and manipulations will allow companies to improve their overall liquidity.

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## Appendix

### C2C Data Development

C2C data was extracted from the *Compustat* database (i.e., Capital IQ, North America, Fundamentals Annual) on April 13, 2017 for all firms in the database from January 1, 1984 to December 31, 2016. The key variables obtained were Company Name, Year, Standard Industry Code (SIC), Net Income (Net Loss), Sales (Revenues), Cost of Goods Sold, Inventory, Accounts Receivable, and Accounts Payable. Initially, the dataset had 385,638 company years (or lines) for the 33 years to be examined in this study. While the completeness of *Compustat* data has improved over the years since 1984, the authors sought to groom the data. To allow C2C calculations and comparability, lines with values reported with blanks, negative values, or zero values for Sales (Revenues), Cost of Goods Sold, Inventory, Accounts Receivable, and Accounts Payable were deleted. This reduced the dataset to 172,485 lines (-213,153 lines or 55%). Next, the data was sorted by 4-digit SIC, and the authors standardized it by calculating Inventory Days, Accounts Receivable Days, Accounts Payable Days, and C2C days.

To remove the undue influence of outliers, the authors elected to use 3 times the Median Absolute Deviation (MAD) by 4-digit SIC for Inventory Days, Accounts Receivable Days, and Accounts Payable Days (Leys, Klein, Bernard, and Licata 2013). Miller (1991) suggested that MAD times 3 should be considered “very conservative” for setting negative and positive data limits. This resulted in the removal of 36,657 lines and a final dataset of 135,828 company lines for this study. This is an average of 4,116 companies per year.

<b>Task</b>	<b>Company Years (or lines) of data</b>
Initial data extraction	385,638
Removal of values with blanks, negative values, and zero values	(213,153)
Subtotal	172,485
Removal of 3 times MAD	( 36,657)
<b>TOTAL</b>	<b>135,828</b>