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THE CASH CONVERSION CYCLE AND PROFITABILITY: A STUDY OF HOSPITALS IN THE STATE OF WASHINGTON

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ABSTRACT

The cash conversion cycle (CCC) is the difference in time between the expenditures for purchases of medical inventory and services provided to patients, and the collection of revenues from those services. Data from hospitals for the State of Washington from 2002-2011 were used to study the relationship between the CCC and hospital profitability. A fixed effects analysis revealed that a 10 day lower than average CCC was associated with an operating margin 0.13 points higher than average. The overall CCC relationship to operating margin is largely attributable to management of inventory. The associations between days accounts receivable and days accounts payable and operating margins were insignificantly different from zero. Days accounts payable was positively related to total profit margin. Managers may increase hospital profitability by decreasing the length of cash conversion.

Introduction

Working capital management is defined as the management of current assets and current liabilities. Typically, working capital is calculated by subtracting total current liabilities from total current assets. It is directly affected by managing the key non-cash components of current accounts, namely, inventory, accounts receivable and accounts payable. The cash conversion cycle (CCC) is the difference in *time* between the expenditures on medical inventory and services provided to patients and the collection of revenues from those services. A shorter number of days in the CCC may mean that the hospital is able to use inventory faster and collect outstanding revenues faster, relative to its payment on accounts. Efficient cash conversion may also imply paying accounts faster, as there may be discounts from vendors associated with early settlement of accounts. Therefore, reduced borrowing costs associated with holding inventories and receivables and reduced direct costs associated with receipt of discounts may signal that a shorter CCC results in higher profitability.

Hospitals may manage working capital with a focus on profitability and/or liquidity. For inventories, a focus on short-run profitability may imply that stocks should be high so that no patients are turned away due to reasons of insufficient medications or supplies. With a focus on liquidity, hospitals may try to keep inventory levels low so that it doesn't tie up much cash. With account receivables, a focus on profitability may imply that hospitals offer lenient credit terms to encourage patient volume. With liquidity in mind, it may offer strict credit terms so that they get paid sooner. With account payables, a focus on profitability may imply that hospitals pay accounts promptly if they get discounts for doing so, whereas with liquidity in mind, they may delay payments for as long as possible. Without

information on the relative benefits of a focus on profitability or liquidity, the association between cash conversion and operating profits is unclear.

In addition to the immediate consequences of working capital management, there may be market opportunities and/or signaling consequences associated with working capital management. Effective working capital management will limit its dependency on outside funds to continue operations by regulating the inflow and outflow of cash. With enough cash, management can decide to either invest long-term or borrow at reduced interest rates. Investors will see such organizations as less risky and would be more willing to work with them. Without information on the signaling benefits of effective cash conversion, the association between cash conversion and total profits is unclear.

This study attempts to fill a gap in existing literature by examining the association between hospital profitability and selected components of working capital management in two ways. First, it focuses solely on hospitals and healthcare systems. Studies in the past have at times included healthcare and manufacturing firms, in addition to firms in other industries. Second, it focuses on how the overall CCC impacts profitability in hospitals. Studies of hospitals have considered only accounts receivable (A/R) and accounts payable (A/P). In a way this study reexamines the relationship between hospitals' working capital management and its profitability from a different perspective. The main hypothesis is that the overall CCC is associated with hospital profitability (hospital operating margin and hospital total margin), though the direction of the association is ambiguous given the conflicting motivations for profitability and liquidity and any signaling effects.

Literature Review

In the most recent contribution to this line of research, Rauscher and Wheeler (2012) indicate that financial pressures on hospitals have increased the need to manage working capital efficiently. Hospitals have to increasingly deal with denied claims and delayed payments. They found that hospitals having days A/R 10 days lower than average was associated with a total margin 0.24 points higher than average, and an operating margin 0.37 points higher. Additionally, hospitals having days A/P 10 days lower than average was associated with a total margin 0.31 points higher than average and an operating margin 0.48 points higher. Their findings suggest that hospitals are managing receivables and payables with a focus on profitability.

In another recent study, Gill, Biger and Mathur (2010) investigated the relationship between working capital management and profitability for 88 firms listed on the New York Stock Exchange from 2005-2007. Their model included regressions of total margin as a function of a component of working capital and three control variables: firm size (natural logarithm of total revenues), debt ratio (debt divided by total assets) and fixed financial ratio (fixed financial assets divided by total assets). They found that days A/R of 10 days lower than average was associated with a total margin 0.03 points higher than average. Days A/P and days

in inventory were not significantly related to profitability. They also found that the CCC was positively related to profitability, with a CCC 10 days higher being associated with a total margin 0.01 points higher. Their conclusion is that A/R is managed with a focus on profitability, and the management focus of A/P and inventory is unclear.

In other studies outside of the healthcare industry, Lazaridis and Tryfonidis (2006) and Shin and Soenen (1998) found a negative relationship between CCC and profits, Sharma and Kumar (2011) and Padachi (2006) found a positive relationship between CCC and profits. A survey of the empirical literature found that A/R and inventory control are generally associated with higher profitability (Knauer and Wöhrmann, 2013). Accounts payable management has been found to be negatively associated with profitability, perhaps due to the direction of causality. Bougheas, Mateut and Mizen (2008) studied manufacturing firms over the period 1993–2003 and found that profitability (as an independent variable) was positively associated with days A/P (as a dependent variable). The suggestion is that trade credit may be offered on more favorable terms to profitable firms, with the result having little to do with management of the component of the cash conversion cycle. Finally, Deloof (2003) and Raheman and Nasr (2007) both found significant negative correlations between profits and number of days in inventories.

In summary, the literature suggests that there might be ambiguity in the relationship between CCC and its components and profitability. The present study seeks to contribute to this body of knowledge by examining the relationships between total margin and operating margin, and components of the cash conversion cycle in State of Washington hospitals.

Methods

Data and Sample

Panel data at the hospital level is used for this study. It is based on the financial information provided by Department of Health, State of Washington, which is available on-line (http://www.doh.wa.gov/). Data from 98 hospitals are available for a period of 10 years, 2002 to 2011. Selected data elements were missing from 20 hospital-year observations. Since data were found to be missing at random, no attempt was made to either remove hospitals' other observations or fill-in missing values, leaving a sample of 960 hospital-year observations.

For the purpose of this analysis, we examine the association between the operating margin as well as total margin and the CCC. Operating margin is calculated as the difference between a hospital's operating revenues and operating expenses (i.e. operating income) divided by operating revenues. Total margin is calculated as the difference between a hospital's total revenues and expenses (or net income) divided by total revenues. Days A/R is calculated as net patients' accounts receivable divided by net patient revenues per day. For current analytical purposes, Days inventory and days A/P were calculated as inventory and accounts

payable, respectively, divided by net patient revenues per day. The managerial calculation of days inventory and days A/P generally divide by cost of goods sold. With small profit margins, patient revenues and cost of goods sold are highly correlated and the use of patient revenues permits a straight-forward summation of the three components of the cash conversion cycle.

Control variables used in the analysis follow the model of Gill, Biger and Mathur (2010) and include size of the hospital (natural logarithm of net patient revenue), revenue growth (percentage change in net patient revenue), the debt ratio (total liabilities divided by total assets) and the ratio of fixed assets to total assets. Fixed assets include property, plant and equipment along with long term investments.

This study employs a fixed effects (FE) regression model. There is a dearth of studies that used a FE model for this line of research and the few that did, didn't explain the rationale behind why FE was used. Hospital level fixed effects take into account unobserved factors that may lead a hospital to select particular A/R, A/P and inventory policies. A fixed effects model would minimize selection bias to properly show the average effectiveness of shorter cash conversion cycles on hospital profitability. A FE model also addresses any baseline time invariant factors (Wooldridge, 2012).

The empirical model for the fixed effects regression for the main explanatory variable, overall cash conversion cycle, is as follows:

$$Operating\ margin_{it} = b_0 + b_1 CCC_{it} + b_2 hospital\ size_{it} + b_3 revenue\ growth^3{}_{it} + b_4 debt\ ratio_{it} + b_5 fixed\ assets\ to\ total\ assets^5 + v_i + u_{it}$$

$$Total\ margin_{it} = b_0 + b_1 CCC_{it} + b_2 hospital\ size_{it} + b_3 revenue\ growth^3{}_{it} + b_4 debt\ ratio_{it} + b_5 fixed\ assets\ to\ total\ assets^5 + v_i + u_{it}$$

Subscripts i and t represent the i^{th} hospital in t^{th} year. To account for repeat observations from the same hospital, standard errors were clustered. Robust standard errors are reported. The model is replicated for days A/R, days A/P and days inventory.

Results

Descriptive statistics on the sample of hospitals are provided in Table 1. The median operating margin is 2.9% and the median total margin is 3.9%. The median cash conversion cycle is 67 days. Hospitals in Washington receive payments after an average of 52 days. Hospitals wait on average 51 days to pay their outstanding trade accounts. It takes on average 65 days to sell inventory. The median hospital size was $53 million in net patient revenues. Median revenue growth is just over 8% during this time period. The median debt ratio is 0.46 and the median fixed asset ratio is 0.99. Without making reference to other specific measures of these variables for other states, all of the median values provide a sense of face validity for this sample from the State of Washington.

Table 1. Descriptive Statistics, State of Washington Hospitals, 2003-2012

	Median	Mean	Std.dev
Profitability			
Operating margin	2.85	2.75	9.33
Total margin	3.90	3.87	9.61
Independent variables			
CCC	66.96	85.66	98.25
Days in A/R	52.48	58.45	40.29
Days A/P	50.96	60.94	52.75
Days inventory	64.78	87.65	85.32
Control variables			
Hospital size	17.71	17.79	1.43
Revenue growth	8.24	9.64	13.60
Debt ratio	0.46	0.53	1.21
Fixed asset ratio	0.99	1.01	0.40

The fixed effects model for CCC, and each of the components, provide adjusted R-squares that are two to three times that of the ordinary least squares regressions using the same variables (45-50% versus 15-20%; ordinary least squares regression results are not reported). Results for the main explanatory variable, overall cash conversion cycle, are presented in Table 2. The model suggests that CCC's ten days lower than average are associated with operating margins 0.13 percentage point higher than average and total margins 0.19 percentage points higher than average. These results are both statistically significantly different from zero.

Models of the association between margins and days A/R and days A/P, presented in Table 3 and Table 4, generally do not exhibit a statistically significant relationship, with the exception of a positive relationship between total margin and days A/P. This latter association is consistent with a profit-focused view of A/P management.

The association between operating margin and days inventory, presented in Table 5, is statistically significant and the same magnitude as the overall CCC. The model suggests that days inventory ten days lower than average is associated with operating margins 0.13 percentage point higher than average and total margins 0.12 percentage points higher than average, though the total margin result is not statistically significant.

Table 2. Fixed Effects Regression Results: Cash Conversion Cycle

	Operating Margin			Total Margin		
Operating Margin	Coef.	Std.Dev	t-Stat	Coef.	Std.Dev	t-Stat
CCC	-0.013	0.006	-2.23*	-0.019	0.004	-4.92**
Hospital size	11.610	3.829	3.03**	9.866	3.477	2.84**
Revenue growth	0.058	0.040	1.46	0.035	0.037	0.95
Debt ratio	-2.746	1.524	-1.80	-2.211	1.278	-1.73
Fixed asset ratio	-3.291	1.662	-1.98*	-5.386	2.308	-2.33*
2004	-0.699	0.779	-0.90	-1.523	0.749	-2.03*
2005	-0.432	1.020	-0.42	-0.951	0.888	-1.07
2006	-1.394	1.280	-1.09	-1.520	1.164	-1.31
2007	-2.533	1.496	-1.69	-2.766	1.405	-1.97
2008	-3.240	1.776	-1.82	-4.859	1.694	-2.87**
2009	-3.399	2.104	-1.62	-4.493	1.956	-2.30*
2010	-4.436	2.315	-1.92	-4.933	2.197	-2.25*
2011	-6.175	2.532	-2.44*	-6.767	2.372	-2.85**
Constant	-196.7	67.5	-2.91**	-161.0	61.2	-2.63**
Adjusted R-Squared	0.556			0.471		

* indicates statistical significance at the 0.05 level, ** at the 0.01 level.

Table 3. Fixed Effects Regression Results: Days Accounts Receivable

	Operating Margin			Total Margin		
Operating Margin	Coef.	Std.Dev	t-Stat	Coef.	Std.Dev	t-Stat
Days A/R	0.046	0.036	1.27	0.037	0.039	0.94
Hospital size	21.136	15.971	1.32	21.653	17.359	1.25
Revenue growth	0.168	0.085	1.98*	0.146	0.085	1.72
Debt ratio	1.148	2.404	0.48	1.813	2.773	0.65
Fixed asset ratio	0.141	2.195	0.06	-1.829	2.677	-0.68
2004	-1.486	1.352	-1.10	-2.619	1.492	-1.75
2005	-2.761	2.835	-0.97	-3.736	3.117	-1.20
2006	-4.019	4.065	-0.99	-4.758	4.419	-1.08
2007	-6.453	5.393	-1.20	-7.478	5.885	-1.27
2008	-8.816	7.568	-1.16	-11.579	8.331	-1.39
2009	-8.466	8.298	-1.02	-10.885	9.035	-1.20
2010	-9.542	9.072	-1.05	-11.244	9.821	-1.14
2011	-11.955	9.893	-1.21	-13.746	10.757	-1.28
Constant	-373.2	283.1	-1.32	-377.5	308.4	-1.22
Adjusted R-Squared	0.480			0.423		

* indicates statistical significance at the 0.05 level, ** at the 0.01 level.

Table 4. Fixed Effects Regression Results: Days Accounts Payable

	Operating Margin			Total Margin		
Operating Margin	Coef.	Std.Dev	t-Stat	Coef.	Std.Dev	t-Stat
Days A/P	0.026	0.017	1.52	0.040	0.016	2.55*
Hospital size	20.936	15.536	1.35	22.475	16.712	1.34
Revenue growth	0.167	0.086	1.94	0.144	0.086	1.68
Debt ratio	0.425	2.191	0.19	0.898	2.364	0.38
Fixed asset ratio	-0.153	2.088	-0.07	-1.837	2.528	-0.73
2004	-1.479	1.426	-1.04	-2.589	1.519	-1.70
2005	-2.898	2.997	-0.97	-3.893	3.237	-1.20
2006	-4.069	4.139	-0.98	-4.934	4.429	-1.11
2007	-6.580	5.519	-1.19	-7.783	5.936	-1.31
2008	-9.163	7.800	-1.17	-12.237	8.474	-1.44
2009	-8.879	8.553	-1.04	-11.616	9.212	-1.26
2010	-9.849	9.174	-1.07	-12.008	9.833	-1.22
2011	-12.362	9.994	-1.24	-14.719	10.752	-1.37
Constant	-367.8	273.4	-1.35	-391.5	294.6	-1.33
Adjusted R-Squared	0.479			0.438		

* indicates statistical significance at the 0.05 level, ** at the 0.01 level.

Table 5. Fixed Effects Regression Results: Days Inventory

	Operating Margin			Total Margin		
Operating Margin	Coef.	Std.Dev	t-Stat	Coef.	Std.Dev	t-Stat
Inventory	-0.013	0.007	-2.00*	-0.012	0.007	-1.63
Hospital size	11.617	3.884	2.99**	9.429	3.552	2.65**
Revenue growth	0.060	0.041	1.46	0.038	0.038	1.00
Debt ratio	-2.472	1.324	-1.87	-1.749	1.114	-1.57
Fixed asset ratio	-3.285	1.628	-2.02*	-5.217	2.309	-2.26*
2004	-0.713	0.763	-0.93	-1.540	0.776	-1.99*
2005	-0.410	1.005	-0.41	-0.875	0.908	-0.96
2006	-1.377	1.268	-1.09	-1.417	1.183	-1.20
2007	-2.515	1.497	-1.68	-2.604	1.413	-1.84
2008	-3.138	1.771	-1.77	-4.468	1.682	-2.66**
2009	-3.290	2.104	-1.56	-4.075	1.964	-2.07*
2010	-4.326	2.326	-1.86	-4.479	2.208	-2.03*
2011	-6.011	2.564	-2.34*	-6.229	2.409	-2.59**
Constant	-197.0	68.5	-2.87**	-154.5	62.6	-2.47*
Adjusted R-Squared	0.549			0.522		

* indicates statistical significance at the 0.05 level, ** at the 0.01 level.

Hospital size, as measured by net patient revenues is uniformly associated with higher margins and statistically significant in the CCC and inventory models. The fixed asset ratio is associated with statistically significant negative relationships in the CCC and inventory models. The debt ratio and revenue growth are not significantly associated with profitability, though the explanatory power of the models is increased due to their inclusion ($t > 1$).

Conclusion

This study provides evidence on how the overall cash conversion cycle and days inventory can have an impact on the profitability of hospitals. A shorter cash conversion cycle and lower days inventory would mean higher profit margins for hospitals. Having a shorter length of cash conversion cycle means that the time lag between the expenditure for purchase of medical inventory and services provided to patients and the collection of revenues from those services has decreased. It also means that the working capital is being managed more effectively. Since healthcare is a non-manufacturing industry, many analyses ignore the carrying cost of holding inventory as a component of the cash conversion cycle. As demonstrated in this study, days in inventory can have a significant impact on the operating margin.

One of the limitations of this study is that it includes a small dataset in which it considers hospitals only in the State of Washington. A larger dataset could possibly have shown a different direction and magnitude of results. Finding no consistently significant relationships between A/R and A/P management and profits was unexpected. While it may be that there is no consistent relationship to be found in Washington hospitals, it may also be the case that some hospitals have a profit focus and others have a liquidity focus, and the control variables and fixed efforts model included in this study were insufficient to differentiate these effects. Future research may explore the same analysis with a larger dataset, data from different locations, and data or methods that permit more detailed analyses of the relationship between the cash conversion cycle and profits.

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