



ORIGINAL RESEARCH PAPER

Management

DETERMINANTS OF WORKING CAPITAL REQUIREMENTS OF INDIAN BULK DRUG AND FORMULATION DRUG INDUSTRY

KEY WORDS: Working capital, Pharmaceutical, Bulk drug, Formulation drug

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ABSTRACT

Study attempts to determine, analyze and compare the determinants of working capital requirements of Indian bulk drug and formulation drug industries. For the study we have taken Leverage ratio, Operating cash flow, Size, Sales Growth Rate, Return on assets, Inventory turnover ratio, Debtors turnover ratio, Debtors velocity, Creditors velocity, Current ratio and Current liability deflated by total liability as explanatory variables. Dependent variable was WCR_TAI defined as working capital requirements deflated by total assets. For the study we took data of 49 Indian bulk drug firms and 60 formulation drug firms for the period AY: 2004-05 to AY: 2008-09. An econometric analysis was conducted and it was found that the selected explanatory variables are able to explain changes in the dependent variables in case of bulk drug firms but the same was not evident in case of formulation drug firms. There was no incidence of multicollinearity and autocorrelation for the data we collected for the study.

INTRODUCTION

This study scrutinizes factors that impact working capital requirements of Indian pharmaceuticals industry. Previous research shows that company characteristics such as debt ratio, operating cash flow, growth rate, firm performance and firm size may affect working capital management. In this research we have taken into consideration only factors internal to company, factors external to firm like economic conditions, etc. are not incorporated in the current research. The data has been collected from Capitaline database of Indian firms.

Model

$$WCR_{TAi} = \beta_0 + \beta_1 LEVi + \beta_2 OCFTA_i + \beta_3 LNTAi + \beta_4 GROWTHi + \beta_5 ROAi + \beta_6 INVTOi + \beta_7 DEBTOi + \beta_8 DEBVELi + \beta_9 CRVELi + \beta_{10} CRi + \beta_{11} CLTLi + \epsilon$$

Dependent Variable

WCR_TAI: Working capital requirements deflated by total assets for firm I

The paper explores the determinants of working capital requirement of a firm. We have included the Working Capital Requirements WCR_TAI as dependant variable used by Shulman and Cox (1985)⁶ as measure of working capital management measured by (cash and equivalents + marketable securities + inventories + accounts receivables) – (accounts payables + other payables). Working capital requirements is deflated by total assets to control the size effect.

Explanatory Variables

LEVi: Leverage as measured by debt to total assets ratio of firm I
 According to the pecking order theory (Myers, 1984)⁷, every firm follows a preset pattern to match its capital needs, all firms will tend to raise capital inside before issuing new stocks or borrowing money from outside. A higher debt ratio is due to less capital for daily operations. Under such circumstances, the firm may have to raise capital from outside in response to lack of funding, plus exercise caution in working capital management so as not to aggravate the shortage of funds (Chiou and Cheng, 2006)³. Expected debt ratio is negatively related to WCR_TAI. OCF_TAI: Operating cash flows deflated by total assets of firm I

Previous studies demonstrate that more growth opportunities and more fluctuations of future cash flow will increase the cash hold and short-term investment of a company (Kim, Mauer, and Sherman, 1998; Opler et al., 1999; Wu, 2001)¹⁰. Greater cash flow spawned by operating activity implies better working capital management. Terms to pay operation-related liabilities are lengthened and operation-related receivables can be accelerated in collection, causing less demand on working capital. Expected

operating cash flow is negatively related to WCRTA.

LNTAi: Natural log of total assets as proxy for the size for firm I
 Horrigan (1965)⁴ discussed the effect of firm size on financial ratios of a company, showing firm size in negative correlation to short-term liquidity and long-term debt ratio. Previous papers on company financial ratios and working capital management have shown the influence of firm size (Peel and Wilson, 1996; Wu, 2001)¹⁰, mainly because large companies with higher credit grades can get capital from the stock exchange more easily, with cash therefore kept at a low level. The larger companies usually enjoy more growth opportunities, which show positive correlation with working capital requirement. Therefore, we expect firm size is positively related to WCRTA.

GROWTH: Sales Growth of firm I

Firms with a high growth rate pay more attention to management of capital. Operation-related working capital and liabilities are then kept at relatively low levels, causing comparatively low demand on WCR. Expected WCR is thus negatively related to the growth rate.

ROAi: Return on assets for firm I

With regard to working capital management, the company financial crisis model provided by Wu (2001)¹⁰ shows that working capital requirement and firm performance have significant effects on each other. Thus, we expect that companies with better performance will have better working capital management efficiency and keep working capital requirement at a relatively low level.

INV_TOi: Inventory turnover ratio and DEB_TOi: Debtors turnover ratio of firm I

Inventory turnover ratio represents how fast inventory is consumed, Abhishek Ranga (2009)¹ in his research observed that there exists a strong degree of association between inventory turnover ratio and the working capital requirement. Similar observation was made for debtors turnover ratio.

DEBVELi: Debtors velocity and CRVELi: Creditors velocity of firm I
 Abhishek Ranga (2009)¹ in his research observed that there exists a strong degree of association between debtors velocity and the working capital requirement. Similar observation was made for creditors velocity.

CRi: Current ratio as measured by current asset to current liability ratio of firm I

It is a ratio of current asset to current liability of a firm. It represents liquidity position of a firm, higher the ratios better the liquidity position of a firm.

CL_TLi: Current liability deflated by total liability of firm I

It is a ratio of firm's current liability to total liabilities of a firm. It measures the component of short term liabilities from overall liability of a firm

ECONOMETRIC MODELING

Table 1 is a correlation matrix showing correlation between all the variables under study. Correlation analysis between variables is done to check the multicollinearity among the explanatory variables selected. From Table 1 we can observe that there is no problem of multicollinearity in the data for both bulk drug firms as well as for formulation drug firms.

Table 2 (A) and 2 (B) provides a descriptive statistics of all the variables under study for bulk drug firms and formulation drug firms respectively. The main focus of the research was to establish an econometric model for determining working capital requirements of bulk drugs. Tables 3 and 4 provide the summary of model for bulk drug firms and formulation drug firms respectively. The coefficient of determination is 0.83 in case of bulk drug firms, and thus statistically we can say that selected explanatory variables are able to explain 83% of the changes in our dependent variable (NWCTA).

Table 3B provides results of ANOVA analysis, looking into the value of F-statistics we can say it is statistically significant, thus our model is statistically correct and we are confident that explanatory variables can explain 83% of the changes in our dependent variable. Table 3A shows the value of Durbin-Watson Statistic, for 95% confidence level and 48 observations the 1.809 value of Durbin-Watson Statistic is statistically significant, thus there is no problem of autocorrelation in our data. Table 5 provides analysis of coefficients of constant term and all the explanatory variables.

From Table 4 we can analyze that coefficients of constant term, LNTA, CR and CLTL are statistically significant as there t-values are greater than 2. The values of coefficients of remaining variables are statistically insignificant.

FINDINGS AND SUGGESTIONS

1. From our study we have analyzed that the selected explanatory variables, Leverage (LEVi), Operating cash flows (OCFTA), Size (LNTA), Sales Growth Rate (GROWTH), Return on assets (ROAi), Inventory turnover ratio (INVTO), Debtors turnover ratio (DEB_TO), Debtors velocity (DEBVEL), Creditors velocity (CRVEL),
2. Current ratio (CR) and Current liability deflated by total liability (CLTL) are able to explain eighty three percentage changes occurring in dependent variable WCRTA, defined as working capital requirements deflated by total assets. Econometric analysis showed that there is no problem of multicollinearity and autocorrelation in the data of variables under study.
3. Thus the study was successful in determining and analyzing the determinants of requirement of working capital for Indian bulk drug firms.

Table 1 (A): Correlation Matrix: Bulk Drug

	NWCTA	LEV	OCFTA	LNTA	GROWTH	ROA	INVTO	DEBTO	DEBVEL	CRVEL	CR	CLTL
NWCTA	1.00											
LEV	-0.63	1.00										
OCFTA	-0.31	0.13	1.00									
LNTA	0.36	-0.09	0.00	1.00								

GROWTH	0.11	-0.15	-0.40	-0.20	1.00							
ROA	0.31	-0.22	0.27	0.13	0.15	1.00						
INVTO	-0.39	0.32	0.51	-0.35	-0.02	0.13	1.00					
DEBTO	0.07	0.00	-0.11	0.09	-0.02	-0.14	0.16	1.00				
DEBVEL	-0.38	0.34	-0.09	-0.17	-0.10	-0.12	-0.32	1.00				
CRVEL	-0.25	-0.10	0.10	-0.17	-0.15	-0.21	-0.07	0.08	1.00			
CR	0.43	-0.55	-0.11	0.05	0.21	0.11	-0.15	0.07	0.03	1.00		
CLTL	-0.02	0.24	0.21	-0.41	0.12	0.18	0.60	-0.20	-0.14	-0.09	-0.33	1.00

Table 1 (B): Correlation Matrix: Formulation Drug

	NWCTA	LEV	OCFTA	LNTA	GROWTH	ROA	INVTO	DEBTO	DEBVEL	CRVEL	CR	CLTL
NWCTA	1.00											
LEV	-0.16	1.00										
OCFTA	-0.25	-0.08	1.00									
LNTA	0.15	0.17	0.16	1.00								
GROWTH	0.05	-0.12	-0.07	-0.07	1.00							
ROA	0.17	-0.27	0.26	0.37	-0.31	1.00						
INVTO	0.09	-0.33	-0.14	-0.21	0.04	-0.04	1.00					
DEBTO	-0.14	-0.29	-0.15	-0.13	0.02	0.23	0.27	1.00				
DEBVEL	-0.17	0.13	-0.15	-0.13	-0.03	-0.37	-0.08	0.09	1.00			
CRVEL	-0.23	0.06	-0.17	-0.15	-0.05	-0.26	-0.06	0.33	0.86	1.00		
CR	0.14	-0.28	-0.15	-0.11	0.00	-0.11	-0.00	0.21	-0.01	-0.13	1.00	
CLTL	-0.33	0.07	0.03	-0.11	-0.05	0.25	-0.04	0.22	-0.02	0.30	-0.23	1.00

Table 2 (A): Descriptive Statistics: Bulk Drug Firms

Parameters	NWCTA	LEV	OCFTA	LNTA	GROWTH	ROA	INVTO	DEBTO	DEBVEL	CRVEL	CR	CLTL
Mean	0.48	0.44	0.04	0.07	39.13	0.06	7.70	5.69	83.99	114.32	1.74	0.31
Median	0.51	0.43	0.04	0.21	18.22	0.05	5.21	4.90	70.70	66.00	1.52	0.23
Minimum	-0.30	0.00	-0.15	0.89	-20.74	-0.32	0.00	0.56	0.00	13.00	0.55	0.00
Maximum	0.94	1.62	0.72	7.72	600.05	0.22	58.9	19.62	300.60	114.62	4.32	1.04
Sum	22.93	21.34	2.07	195.38	1878.03	2.89	369.67	273.13	403.140	548.740	83.38	14.80
Count	48	48	48	48	48	48	48	48	48	48	48	48

Table 2 (B): Descriptive Statistics: Formulation Drug Firms

Particulars	NWC_TA	LEV	OCF_TA	LNTA	GROWTH	ROA	INV_TO	DEB_TO	DEB_VEL	CRVEL	CR	CLTL
Mean	0.51	0.34	0.05	4.46	158.41	0.06	17.59	8.66	89.25	74.32	3.52	0.28
Median	0.50	0.35	0.06	4.49	14.77	0.06	5.24	4.98	64.20	57.70	1.63	0.22
Minimum	-0.59	0.01	-0.32	-0.69	-45.50	-0.22	0.00	0.00	0.00	0.00	0.26	0.00
Maximum	0.96	1.15	0.27	8.36	818.64	0.33	354.60	113.24	129.40	791.80	76.90	1.18
Sum	30.43	20.54	3.28	267.86	950.45	3.72	105.58	519.68	535.48	445.92	211.17	16.51
Count	60	60	60	60	60	60	60	60	60	60	60	60

Table 3A: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.911a	.830	.777	.1093046	1.809
a. Predictors: (Constant), CL_TL, CR_VEL, GROWTH, DEB_TO, LEV, ROA, DEB_VEL, LNTA, OCF_TA, CR, INV_TO					
b. Dependent Variable: NWC_TA					

Table 3B: ANOVA Results

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	2.093	11	.190	15.928	.000a
Residual	.430	36	.012		
Total	2.523	47			
a. Predictors: (Constant), CL_TL, CR_VEL, GROWTH, DEB_TO, LEV, ROA, DEB_VEL, LNTA, OCF_TA, CR, INV_TO					
b. Dependent Variable: NWC_TA					

Table 4: Coefficient Analysis

Model		Coefficients		T	Sig.
		B	Std. Error		
1	Intercept	0.285	0.097	2.948	0.006
	LEV	-0.217	0.073	-2.976	0.005
	OCF_TA	-1.020	0.326	-3.125	0.004
	LNTA	0.040	0.011	3.602	0.001
	GROWTH	0.000	0.000	-2.613	0.013
	ROA	0.323	0.232	1.394	0.172
	INV_TO	-0.009	0.003	-2.969	0.005
	DEB_TO	-0.010	0.005	-1.865	0.070
	DEB_VEL	0.000	0.000	-2.576	0.014
	CR_VEL	0.000	0.000	-1.883	0.068
	CR	0.119	0.028	4.210	0.000
CL_TL	0.605	0.109	5.568	0.000	
a. Dependent Variable: NWC_TA					

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