

An Investigation into Efficiency of Working Capital by Chemical Firms in Pakistan

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Abstract

Financial policy making is deemed essential for achieving higher economic dividends. There is a need to study the neglected area of working capital management with special emphasis on its efficiency. This paper directs attention to study this topic for listed chemical sector of Pakistan. The current practice is examined in light of a nine year panel data from the State Bank of Pakistan. Reviewed literature identifies vacuums that attract attention and invite research openings. The criticism on contemporary method of using ratios towards managing working capital is noticeable. Three indices namely a utilization index, a performance index and an efficiency index are identified and computed for all firms and for industry as a whole to get a broader picture. Regression analysis is used to observe the level of change in these firms towards achieving more efficiency. The study concludes that the chemical sector of Pakistan is managing its working capital only satisfactorily and over the years the efficiency level is disproving. The firms are not taking a fuller advantage of their employed current assets towards value maximization.

Key Words: Corporate finance, working capital management, efficiency

I. Introduction

Pakistan is a developing country. For accelerated growth of its economy the most effective root is through proliferation and growth of commercial firms which is directly dependent on the profitability of these firms. From this point of view reduction in the marginal cost of output of these firms is crucial. There-

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fore one important consideration is to investigate the ingredients of working capital with a view to achieving reduction in their cost of production. According to Pakistan Economic Survey 2008-09 large scale manufacturing contributes 18.4% to the overall GDP of Pakistan. Many regional countries followed the footsteps of Asian Tigers in economic development through expansion of industries and sustainability and profitability through reduction of marginal costs after 1960s. According to the World Bank Malaysia's manufacturing sector accounts for 28 percent of total GDP, Indonesia accounts for 27.1%. Thailand accounts for 34.9%. Taiwan's manufacturing accounts for 27.1% to total GDP. Asian Emerging Markets include: Malaysia, Indonesia, Philippines, Thailand, Singapore and Korea. Collectively the GDP of these countries increased 24.3 times in the last 43 times. Comparatively, Pakistan's GDP increased only 4.3 times. Had Pakistan's GDP per capita increased by the same rate, each Pakistani today would be earning 5.6 times of what he or she is earning today. Business firms have to make decisions both in the long and in the short term. Short term financial decisions are no exception in terms of importance. The importance of working capital management is an undeniable fact in corporate finance. Corporate finance as a branch of knowledge presents three key areas in making financial decisions for corporations i.e. capital budgeting, time value of money and working capital management. (Eugene F. Brigham, 2004) believes that working capital are current assets of a business whereas working capital policy as 'Working capital refers to current assets, and net working capital is defined as current assets minus current liabilities. Working capital policy refers to decisions relating to current assets and their financing.' According to Pakistan Economic Survey 2008-2009 the figures of working capital management of listed manufacturing sector are stated as, 'The position of working capital (net current assets) was Rs.76.45 billion and shows a decrease of 50.65 percent in 2008 from Rs. 154.91 billion in 2007.' According to the latest published report by State Bank of Pakistan there are 35 chemical firms listed on Karachi Stock Exchange employing a total capital of 149,922 million rupees according to official statistics released in year 2008. These companies frequently make choices between making investments in inventories, receivables and operations or in having enough cash to meet current liabilities. A major unresolved issue in finance is keeping the appropriate levels of current assets and current liabilities. This is famously known as the liquidity-profitability trade-off. There are risks associated with this trade-off. All business firms exist to produce an incremental effect in the value of the business and ultimately increase shareholders' wealth. This should suggest that corporate financial managers working in routine on working capital management have different pressures that need to be identified and their effect need to be

estimated. There is a growing need of applied research in the financial corporate affairs of Pakistani listed businesses. This present study has the same motivation and an observation is made to investigate the relationship between managing current assets and free cash flows. Chemical sector is a vibrant and big sector which employs a number of resources to produce output. The short term financial decisions of the sector need a review to further enhance performance and output. This present study has the motivation of building an understanding towards the dynamics of financial performance, resource utilization and efficiency. Using State Bank of Pakistan, a secondary panel data set of all chemical sector firms is included in the analysis as it is available from the published reports titled 'Balance sheet analysis of joint stock companies in Pakistan'. Annual reports of selected companies are also used for some variables. (Shulman & Cox, 1985) introduced a set of ratios towards measuring efficiency in managing working capital. The same are used in this study for chemical firms in Pakistan. The remaining paper is organized as follows; Section II describes the relevant literature, Section III builds a theoretical framework, Section IV informs about methodology, Section V shows data analysis and findings, Section VI derives conclusions.

II. Literature Review

The scope of working capital management is explored in wider dimensions by contemporary researchers in finance and there is vast literature that examines the theory and practice of working capital management. In recent years the topic is more deeply studied and especially the effects of working capital and its determinants have been in focus. Interestingly, most of the writers have identified almost similar determinants for the management of working capital. Similarly more studies have found positive relationship between efficient working capital management and profitability. The authors differ on the subject though and enhance conceptual understanding for this important corporate finance topic which has a routine application for corporations around the world. (Raheman, Afza, Qayyum, & Bodla, 2010) are of the view that manufacturing firms in Pakistan can improve efficiency in working capital management if these firms hire qualified finance individuals and improve their collections from customers. The payment patterns are a problem for these firms and efficiency can be improved if the individual components of working capital are concentrated upon. Using a panel of 204 listed manufacturing firms of Karachi Stock Exchange the authors derive that net operating profits could be improved with improvements in working capital management. They report that net trade cycle, inventory turnover and cash conversion cycle are notably significant factors having an impact on operating profits. (Sen & Oruc, 2009)

takes interest in investigating a relationship between efficiency in managing working capital and the returns they earn on total assets. For this purpose they take panel data from listed 49 production firms of Istanbul Stock Exchange. They find a significant negative relation between indicators of working capital management and the returns these firms generate on their total assets. The indicators used for measuring efficiency in working capital management by authors are the net working capital level, average collections period, average inventory period, current ratio, and cash conversion cycle whereas a standard procedure for calculation of return on assets is used. (Ramachandran & Janakiraman, 2009) conducts a study for investigating a relationship between the efficiency of working capital management with EBIT. The researchers rely on a data taken from the Paper Industry of India from 1997 to 2006 and use different indices as proxies for efficiency in working capital management. They compute indices on performance, utilization, and efficiency of working capital management by associating them with the conventional cash conversion cycle, days receivables days payables and days in inventory, The study introduces the control variables of size of the firm, financial debt ratio and fixed financial assets ratio. The study shows a satisfactory performance of paper industry in India in terms of efficiency of working capital management. Other findings of the study include a negative relationship of days payable with EBIT and delay in payables by less profitable firms and there is a visible decrease in their cash conversion cycle.

(Nazir & Afza, 2009) studies the determining factors of working capital management in Pakistan. This study considers 14 industrial groups and takes 132 manufacturing firms from Karachi Stock Exchange for the period 2004-07. The authors argue in their study that often neglected in traditional finance literature the efficient management of current assets and current liabilities drives heavily the business goals of firms and the methods adopted by contemporary managers are of significance. The study takes a number of micro and macro level factors as determinants of working capital management. By taking operating cycle of the firm, firm's growth, level of economic activity, level of industry activity they make a detailed analysis of sampled firms and find them as important factors determining working capital management of a firm. (Raheman & Nasr, Working Capital Management And Profitability - Case Of Pakistani Firms, 2007) concludes that working capital management is an essential tool for measuring the operational and financial efficiency of a company and involves a great deal of strategic and operational thinking before adopting a particular strategy. This study analyses behavior of 94 Pakistani listed firms on Karachi Stock Exchange for a period of 6 years from 1999 to 2004. It finds a significant negative relationship between liquidity and profit-

ability. It also reports a strong negative relationship between variables of the working capital management and profitability indicators of Pakistani listed firms. According to (Vishnani & Shah, 2007) the inventory holding periods, debtor's collection period and net working capital cycle are the indicators of operational efficiency of a company, hence lower these three figures better is the operational efficiency. They carried out a study by using a sample of 23 Indian listed companies of electronics industry for the period 1994-2005. Results showed that there is negative relation between ROCE and inventory holding periods, debtor's collection period and net working capital cycle; and positive relation between ROCE and creditors payment period. (Michalski, 2007) views maximization of the firm value as the main financial purpose of a business organization. The research work analyses that conventional models of managing current assets are directed towards book profit maximization which shows a limited sense towards optimization of enterprise value which should be built on notions of risk and uncertainty. The research focuses on operating risk that builds due to purchasers' postponement of due bills to the enterprise. This work builds a portfolio management model that ensures the level of accounts receivables deemed as a most significant factor towards efficient working capital management. An increase in the level of accounts receivables is a dangerous proposition as it contributes to cost of holding and managing of an important ingredient of working capital. This is considered as a threat to the value of the firm. The authors suggest that a portfolio management approach in addition with a liberal policy of accounts receivables could enhance value of the firm. This research work shows that free cash flows to a firm reduce as receivables enlarge and a firm if reverts to portfolio management approach and evaluates customers with informed credit risk, it would be able to add more value by determining both an optimal level of receivables and minimizing costs and bad debts.

According to (Sayaduzzaman, 2006) inventory period, receivable period and payable period are the components of working capital and in order to manage working capital efficiently we have to manage these three efficiently. According to him receivables can be managed efficiently by following a good credit and collection policy. He conducted a research on British American Tobacco Bangladesh Company Ltd (BATBCL) in order to find out that whether BATBCL efficiently manage working capital or not. Findings suggest that BATBCL efficiently managed the working capital by managing receivables, inventory and cash balances. Because of the efficient management of these three components of working capital the company experienced higher growth and profitability. The author calls the working capital policy as highly effective and traces ample internal funds for working capital needs at the time of

the study. (Shin & Soenen, 1998) conducts a study to search for the efficiency of working capital management. By taking accounting measures of profitability with net trade cycle they report that firms with shorter trade cycles seem to be more valuable as they have lengthier operating cash flow. The return on investment if firms do invest in short term assets is an implication that remains a question in this study. The efficiency paradigm could be traced back to (Smith, 1973). In his famous article he discusses the nature and importance of working capital management both for practitioners and theorists. The article identifies eight distinct approaches to analyzing working capital management and its efficiency. According to the author 'The first three, aggregate guidelines, constraint set, and cost balancing, are partial models; the next two approaches, probability models and portfolio theory, stress future uncertainty and interdependencies; while the last three approaches, mathematical programming, multiple goals, and financial simulation, have a broader, systematic focus. The eight approaches should be considered as representative of the existing literature rather than as an exhaustive survey.' These approaches are discussed in greater detail in the theoretical framework in the next chapter. In sum the reviewed literature identifies numerous areas of business that has an association with short term financial management revolving around managing current assets and current liabilities.

III. Theoretical Framework

According to (Brealey & Myers, 2003) determining the value of liquidity is one of the ten unresolved problems in finance. They believe that 'adequate' liquidity reserves of a company is too complicated and it is important to investigate the holdings of cash by corporations since liquidity is like blood for the smooth functioning of an organization. Firms' profitability could depend on many factors, when other factors are controlled, research could tell the significance of the tested factors. There is research literature that goes toward establishing relationship of working capital management with financial performance of firms, identifying important determinants of working capital management, modeling working capital management for liquidity and profitability etc. (Gopal, 2008) believes that current ratio for a business should be 2:1 as a rule of thumb and working capital should be a judicious mix of short and long term funds for financing current assets. The book outlines the following formulae for estimating working capital management for a firm.

Inventory conversion period = Raw materials conversion period + work in progress conversion period + finished good conversion period

Raw materials conversion period = Average raw materials held/Total raw material consumption

Work in progress conversion period = Average work in progress/Total cost of production * 365

Finished goods conversion period = Average finished goods/Total costs of goods sold * 365

Debtors conversion period = Average debtors/Total credit sales * 365

Payables deferral period = Average creditors/ Total credit purchases * 365

(Vernimmen, Quiry, Dallochio, Le Fur, & Salvi, 2005) believes that investment is the key to value creation where investment is either creation of new fixed assets or generation of working capital. The book makes enlightening observations regarding the interest of shareholders and debt providers towards a business firm. Shareholders' want to see their companies creating more and more value whereas the debt providers interest differ in the sense that they want a firm to remain liquid enough to pay back their debt along with interest. Another considerable observation is the nature of working capital where the authors argue that though it is liquid and components of working capital vanish in an accounting period; however working capital is a permanency that resurges in every accounting period. The authors describe it as 'Working capital is two-sided. From the point of view of balance sheet value, it is liquid. From a going concern point of view, it is permanent.'

(Gitman, 2005) has shed further light on working capital management. He reports in his book that 'Current assets represent about 40% of total assets, and current liabilities account for 26% of total liabilities in U.S. manufacturing firms.' This information shows the weight of managing current assets and current liabilities. Prepaid expenses and inventory are regarded as less liquid current assets as firms need liquidity to remain in business. In such cases even with high level of a positive net working capital business firms may be facing difficulties in meeting short term payments and may opt for financing working capital with long term funds. Gitman calls it technical insolvency.

(Brigham, 2004) view working capital policy of a business firms as 'Basic policy decisions regarding (1) target levels for each category of current assets and (2) how current assets will be financed.' The authors present the cash conversion cycle model as follows;

Cash conversion cycle = inventory conversion period + receivables collection period - payables deferral period. (Walsh, 2003) presents three ratios for testing the liquidity position of a company, the current ratio, the quick ratio and the working capital to sales percentage.

Current ratio = current assets/current liabilities

Quick ratio = current assets-inventories/current liabilities

Working capital to sales percentage = (Current assets - current liabilities)/
Sales *100

Theoretically it is argued that a current ratio and quick ratio portrays a static picture and provides a room for firms to manipulate figures to portray a more liquid position. Working capital to sales percentage in this respect is believed to be a better indicator of liquidity as it relates net working capital with the indicator of operating cash flow approximated with sales of a firm. (Ross, Westerfield, & Jordan, 2001) generally prescribe the following equations for net working capital.

$$NWC = C + OCA - CL$$

$$OC = IP + ARP$$

$$CC = OC - APP$$

NWC is net working capital, C is cash, OCS is other current assets, CL is current liabilities, OC is operating cycle, IP is inventory period, ARP is accounts receivables period, CC is cash cycle, APP is accounts payable period

-The theoretical framework of working capital management invites a good understanding of cash management, credit and receivables policy, payables management, and inventory management. Since all these factors interplay a good role in devising a sense making working capital policy of a business firm.

Hypotheses

H₀₁: Chemical firms in Pakistan take efficient advantage of different components of current assets in enhancing sales

H₀₂: Chemical firms are efficiently utilizing current assets for generating more sales

H₀₃: Chemical sector is efficiently managing working capital

H₀₄: In the chemical sector of Pakistan there is a significant relationship operating profits and working capital management efficiency

IV. Methodology

A simple methodology is adopted in this paper. Listed chemical firms in

Pakistan are the target population for which efficiency analysis of working capital management is analyzed. This paper uses an applied research methodology using secondary data retrieved from State Bank of Pakistan. Periodical publications of State Bank titled 'Balance sheet analysis of joint stock companies listed on Karachi Stock Exchange' are used to extract some important variables in addition to using annual reports of the companies. These reports provide most of the variables, however they do not provide all, therefore based on the availability of annual reports firms are included in the analysis. Research critics argue the validity of information obtained from secondary sources, as it negatively affects research findings if found incorrect. However utilizing government and authentic sources are encouraged to be used. Our sampling method in the analysis is thus convenience sampling, since the research work will utilize all available financial information about the chemical sector of Pakistan. Following (Shulman & Cox, 1985) this study is going to use his proposed set of ratios for analyzing efficiency in managing working capital. Benchmarking the method three indices are to be computed for each firm in the panel for the chemical sector of Pakistan. These metrics are introduced by these authors and are defined as follows;

$$\text{Performance Index (wcm)} = ((\text{sales}_t / \text{sales}_{t-1}) (\sum (W_{i(t-1)} / W_{it})) / N$$

$$\text{Utilization Index (wcm)} = (\text{current assets}/\text{sales})_{t-1} / (\text{current assets}/\text{sales})_t$$

$$\text{Efficiency Index (wcm)} = \text{Performance Index (wcm)} \times \text{Utilization Index (wcm)}$$

Where W_i is defined as the individual group of current assets, N is the number of current asset groups, wcm is working capital management

A simple decision rule is exercised to monitor performance in these core areas of working capital management efficiency. An index greater than 1 reflects on higher efficiency whereas less than one suggests lower efficiency on part of a business firm or the industry as a whole in a given year. The work capitalizes on standard regression analyses towards model testing which are derived using the posed hypotheses.

The following general model of regression is used in analyses;

$$\hat{y} = \alpha + \beta X_i + e_i \quad \dots\dots\dots (i)$$

Where \hat{y} denotes $I_t - I_{t-1}$ and X_i denotes $IAI_t - I_{t-1}$, I stands for Index, t denotes time, IAI denotes industry average index. The coefficient of regression β measures how quickly a firm improves efficiency in comparison to industry benchmarks. A simple rule is illustrated here as follows;

If $\beta = 1$, this should suggest average efficiency stance by a firm in comparison to the practice in industry

If $\beta > 1$, this should suggest the firm is performing better than the industry in terms of achieving efficiency in working capital management

If $\beta < 1$, this should suggest that the firm is becoming inefficient with the passage of time in comparison to industry practices.

Since the indices are three in number, therefore $I_t - I_{t-1}$ and $IAI_t - I_{t-1}$ would be computed for all the three indices. The model is used for each individual firm for the three indices namely performance, utilization, and efficiency in order to observe the speed of firms towards improving efficiency in working capital management. For the final hypothesis the following model is used.

$$OP = \beta_0 + \beta_1AR + \beta_2AP + \beta_3DI + \beta_4CCC + \beta_5FFAR + \beta_6FDR + \text{Error} \dots\dots (ii)$$

This general model is broken down in four specific models those work towards testing the significance of individual components of working capital. The main components tested are average number of days of accounts receivables, average number of days for accounts payables, average number of days in inventory, and cash conversion cycle. Fixed asset turn over, debt ratio, and size of the firm (log of sales) are taken as control variables.

$$OP = \beta_0 + \beta_1AR + \beta_2FAT + \beta_3DR + \beta_3LS + \text{Error} \dots\dots\dots(iii)$$

$$OP = \beta_0 + \beta_1AP + \beta_2FAT + \beta_3DR + \beta_3LS + \text{Error} \dots\dots\dots(iv)$$

$$OP = \beta_0 + \beta_1DI + \beta_2FAT + \beta_3DR + \beta_3LS + \text{Error} \dots\dots\dots(v)$$

$$OP = \beta_0 + \beta_1CCC + \beta_2FAT + \beta_3DR + \beta_3LS + \text{Error} \dots\dots\dots(vi)$$

Where OP denotes operating profits or earnings before interest and taxes, AR denotes average accounts receivables in days, AP denotes average number of days for accounts payable, DI denotes average number of days in inventory, CCC denotes cash conversion cycle, β s denote the regression coefficients, FAT denotes fixed asset turnover taken as $FAT = \text{net sales}/\text{fixed assets after deducting accumulated depreciation}$, DR denotes debt ratio taken as $DR = \text{total liabilities}/\text{total assets}$, LS denotes log of sales

Data for some firms is not available therefore they are excluded from analysis. A total of 30 chemical firms are included in the efficiency analysis of working capital management. A balanced panel data set covering 2000-2008 (nine years) is used in the analysis.

V. Data Analysis & Findings

This section initially includes calculation of the three proposed indices which (Shulman & Cox, 1985) proposed in response to the limitations of conventional ratios used for efficiency in working capital management. A balanced panel of nine years for thirty listed chemical firms of Pakistan for the period 2000-2008 is analyzed and all relevant calculations are performed using high-tech computer assistance. Table.1 shows key findings of the entire chemical industry. It is visible that the industry as a whole shows average or above average performance in six out of eight years as far as efficiency in working capital management is concerned. Performance index in terms of sales is much better compared to utilization of current assets by the chemical sector. This shows more focus on sales than on management of current assets. Due to significant decline of performance index by the firms in year 2003 there seems a low efficiency of managing working capital towards achievement of business goals. Year 2008 is observed as a year showing much improved efficiency standards towards managing working capital.

Table 1: Efficiency in working capital management by the whole chemical industry

Year	Utilisation Index (average)	Performance Index (average)	Efficiency Index (average)
2001 to 2002	1.13	1.02	1.16
2002 to 2003	0.98	1.06	1.04
2003 to 2004	1.11	0.70	0.78
2004 to 2005	0.99	1.27	1.25
2005 to 2006	1.09	1.14	1.24
2006 to 2007	0.99	1.02	1.02
2007 to 2008	0.97	0.93	0.90
2008 to 2009	1.41	1.94	2.75

After looking at industry findings the analysis is directed towards firms and the indices are computed for them. Table 2 shows main findings in this respect. The table invites discussion on major components like one can see that with most of the firms the performance index is better than the utilization index suggesting less focus on efficient management of current assets from period to period and more focus on enhancing sales performance. This suggests and portrays a better image of decision making by marketing managers than the financial managers working on sales promotion. The firms could be ranked in terms of most efficient, less efficient or average efficient firms which could identify star or sluggish performers in the industry as far as efficiency in managing working capital is concerned.

Table 2: Efficiency in working capital management by individual chemical firms

S. No.	Name of the firm	Utilisation Index (average)	Performance Index (average)	Efficiency Index (average)
1	Abbott Laboratories (Pakistan) Ltd.	0.99	0.92	0.91
2	BOC Pakistan Ltd,	1.01	0.89	0.90
3	Bawany Air Products Ltd.	1.09	0.99	1.09
4	Berger Paints Pakistan Ltd.	1.02	0.91	0.93
5	Biafo Industries Ltd.	1.02	0.81	0.83
6	Buxly Paints Ltd.	1.02	0.89	0.91
7	Clariant Pakistan Ltd.	1.03	0.87	0.90
8	Colgate-Palmolive (Pakistan) Ltd.	0.99	0.76	0.75
9	Data Agro Ltd.	0.87	0.93	0.81
10	Dawood Hercules Chemicals Ltd.	0.95	1.41	1.34
11	Dynea Pakistan Ltd.	0.98	1.41	1.38
12	Engro Chemical Pakistan Ltd.	1.00	1.10	1.10
13	Fauji Fertilizer Bin Qasim Ltd	0.90	1.10	0.98
14	Fauji Fertilizer Company Ltd.	1.21	1.38	1.68
15	Ferozsons Laboratories Ltd.	0.90	0.82	0.73
16	Glaxosmithkline (Pakistan) Ltd.	1.00	0.92	0.93
17	Highnoon Laboratories Ltd.	1.04	0.89	0.92
18	Leiner Pak Gelatine Ltd.	1.03	1.06	1.09
19	Nimir Industrial Chemicals Ltd.	1.36	1.35	1.83
20	Nimir Resins Ltd.	1.06	2.00	2.12
21	Otsuka Pakistan Ltd.	1.03	1.74	1.78
22	Pakistan Gum & Chemicals Ltd.	1.17	1.16	1.36
23	Pakistan PVC Ltd.	1.70	1.23	2.08
24	Sardar Chemical Industries Ltd.	1.01	0.93	0.94
25	Searle Pakistan Ltd.	1.04	0.97	1.01
26	Shaffi Chemical Industries Ltd.	1.98	3.17	6.28
27	Sitara Chemical Industries Ltd.	0.93	0.87	0.81
28	Wah Nobel Chemicals Ltd.	1.05	1.00	1.05
29	Wyeth Pakistan Ltd.	1.05	1.46	1.54
30	ICI Pakistan Ltd.	1.11	0.92	1.02

Any index = 1 denotes average efficient firm, Any index > 1 denotes more efficient firm, Any index <1 denotes less efficient firm (in span of 9 years)

Sixteen out of 30 selected chemical firms showed average or above average efficiency indices meaning that almost 47% of the selected firms showed poor performance in terms of efficiency in managing working capital. This evidence may look contradictory in comparison with findings in Table 3. The regression analysis is based on the premise of the firms' achievement of working capital efficiency in comparison with the industry. The analysis performed is aimed at identifying chemical firms' speed towards bringing in more efficient use of working capital in comparison with the overall industry. As discussed in the methodology section the current performance, utilization, or efficiency index of a firm is compared to its preceding year index and is taken as an explained variable in a regression relationship with the difference of the respective index with its industry average as an explanatory variable. Regression coefficient is used as an indicator towards responsiveness of firms' achievement of efficiency with the industry's overall efficiency level. Table 3 exhibits clear findings towards concentration of the chemical industry either towards enhancing performance or towards improving utilization of current assets. The finding leads to the argument that an integrated strategy of both enhancing performance and optimizing utilization of resources is missing. According to Table 3 some firms have significantly achieved performance benchmarks while others have been taking significant advantage of their current assets through improved utilization, however; it looks that all the firms have failed to make an integrated approach of maintaining or sustainably improving efficiency in managing working capital. The significant negative signs of regression coefficients for efficiency index show an alarming finding that over the study period the selected firms have failed to improve efficiency in managing working capital towards fulfillment of business objectives. The coefficients are mostly significant with high fitting degrees. The next phase in the data analysis includes a regression analyses between earnings before interest and taxes or the operating profits and the individual components of working capital management i.e. cash conversion cycle, average days in inventory, average collection days and average days payables. Four regression models are fitted and the findings are reported in Table 4, 5, 6, and 7. Table 4 shows that cash conversion cycle does not have a significant impact on the operating profits of chemical firms in Pakistan. The negative sign of the coefficient however demonstrates that it moves negatively with operating profits. Longer duration of the cash conversion cycle suggests lower operating profits which supports conventional theory in finance. Fixed asset turnover ratio and size of the firm both have a significant impact on the operating profits whereas debt ratio is insignificant. The model seems a good fit and is better than mere guessing. Table 5 concludes

Table 3: Regression analysis for chemical firms

S. No.	Name of the firm	Performance Index			Utilization Index			Efficiency Index		
		β	p-value	r ²	β	p-value	r ²	β	p-value	r ²
1.	Abbott Laboratories (Pakistan) Ltd.	0.95**	0.01	75%	0.42	0.50	8%	-0.76**	0.00	87%
2.	BOC Pakistan Ltd,	-0.39	0.28	19%	0.71	0.48	8%	-0.81**	0.04	52%
3.	Bawany Air Products Ltd.	1.04	0.06	48%	1.01	0.09	41%	-0.67**	0.02	63%
4.	Berger Paints Pakistan Ltd.	0.13	0.58	5%	0.10	0.86	1%	-0.72**	0.02	61%
5.	Biafo Industries Ltd.	0.14	0.80	1%	0.57	0.39	12%	-0.90**	0.02	65%
6.	Buxly Paints Ltd.	1.11	0.22	24%	0.97	0.36	14%	-0.64**	0.01	70%
7.	Clariant Pakistan Ltd.	0.14	0.61	5%	0.99	0.46	9%	-0.78**	0.03	58%
8.	Colgate-Palmolive (Pakistan) Ltd.	0.31	0.09	40%	-0.37	0.71	2%	-0.75**	0.03	59%
9.	Data Agro Ltd.	1.16	0.08	43%	0.76	0.24	22%	-0.35**	0.00	85%
10.	Dawood Hercules Chemicals Ltd.	1.29**	0.00	89%	1.37	0.09	40%	-0.13**	0.00	91%
11.	Dynea Pakistan Ltd.	1.41**	0.01	67%	0.41	0.59	5%	-0.46**	0.00	77%
12.	Engro Chemical Pakistan Ltd.	1.28*	0.05	51%	-0.32	0.70	3%	-0.47**	0.00	92%
13.	Fauji Fertilizer Bin Qasim Ltd	0.43	0.50	8%	1.62	0.09	41%	-1.17**	0.01	71%
14.	Fauji Fertilizer Company Ltd.	1.44**	0.03	59%	0.86	0.42	11%	-0.34**	0.00	84%
15.	Ferozsons Laboratories Ltd.	0.08	0.85	1%	0.37	0.68	3%	-1.39*	0.09	41%

S. No.	Name of the firm	Performance Index			Utilization Index			Efficiency Index		
		β	p-value	r ²	β	p-value	r ²	β	p-value	r ²
16.	Glaxosmithkline (Pakistan) Ltd.	0.25	0.62	4%	0.09	0.92	0%	-1.37**	0.01	73%
17.	Hignoon Laboratories Ltd.	1.37*	0.05	49%	-0.65	0.31	17%	-0.63	0.25	21%
18.	Leiner Pak Gelatine Ltd.	0.86*	0.05	51%	1.11	0.17	29%	-0.42**	0.01	75%
19.	Nimir Industrial Chemicals Ltd.	1.05	0.11	36%	1.4**	0.03	57%	-0.15**	0.00	85%
20.	Nimir Resins Ltd.	1.21**	0.03	55%	0.00	1.00	0%	-0.13**	0.03	58%
21.	Otsuka Pakistan Ltd.	1.62**	0.00	77%	-0.30	0.62	4%	-0.39**	0.01	71%
22.	Pakistan Gum & Chemicals Ltd.	0.96	0.09	41%	2.05**	0.00	85%	-0.53**	0.01	73%
23.	Pakistan PVC Ltd.	1.33**	0.04	53%	1.27*	0.05	50%	-0.31**	0.03	57%
24.	Sardar Chemical Industries Ltd.	0.45	0.51	7%	0.58	0.59	5%	-1.07**	0.01	70%
25.	Searle Pakistan Ltd.	0.23	0.50	8%	-0.85	0.26	20%	-0.7**	0.01	66%
26.	Shaffi Chemical Industries Ltd.	1.29**	0.00	88%	0.93**	0.00	97%	-0.01**	0.00	100%
27.	Sitara Chemical Industries Ltd.	0.87	0.10	38%	0.93	0.11	38%	-1.66**	0.01	66%
28.	Wah Nobel Chemicals Ltd.	0.24	0.65	4%	0.59	0.40	12%	-0.57**	0.00	85%
29.	Wyeth Pakistan Ltd.	1.27**	0.04	53%	1.75	0.14	32%	-0.35**	0.01	69%
30.	ICI Pakistan Ltd.	-0.33	0.33	16%	-0.29	0.81	1%	-0.92**	0.00	88%

* Coefficient significant at either 5% or 1% level of significance

** Coefficient significant at both 5% and 1% level of significance

findings for any relationship between average receivable days per annum and operating profits of firms. There is no significant relationship. The regression model is significant with fixed asset turnover ratio and sales significantly responsible for influencing operating profits. The negative sign of the coefficient for days receivables is again confirmatory to existing finance theory which clearly shows that reducing days receivables is more profitable for chemical firms in Pakistan. Table 6 shows an insignificant regression relation between operating profits and average annual days in inventory. Again a good model fit is observed with a F-Statistic of 30.333. Fixed asset turnover and size of the firm are significant drivers of operating profits with debt ratio observed as insignificant. The sign of the coefficient is negative for average days in inventory which confirms that operating profits shrink as inventory conversion becomes slow which is an expected result.

Table 4: Regression between operating profit and cash conversion cycle

	Coefficients	Standard Error	t Stat	P-value
Intercept	-2916.301	559.591	-5.211	0.000
Cash conversion cycle	-0.389	0.525	-0.741	0.460
Fixed asset turnover ratio	-60.905	22.002	-2.768	0.006
Size of the firm	587.237	55.540	10.573	0.000
Debt ratio	100.890	551.612	0.183	0.855
Regression Statistics for Table 4				
F-Value	30.482			
Significance of F-Statistic	0.000			
R Square	0.315			
Adjusted R Square	0.305			
Observations	270			

Table 7 exhibits an insignificant regression relationship between operating profits and average annual payable days. A positive sign of the coefficient confirms traditional finance theory that delaying payments to suppliers is beneficial and leads to higher operating profits. Fixed asset turn over and size of the firm again are found to be significant drivers of operating profits with debt ratio an insignificant factor. The model is a good fit as indicated the significance of F-statistic.

Table 5: Regression between operating profits and days receivables

	Coefficients	Standard Error	t Stat	P-value
Intercept	-2844.695	596.887	-4.766	0.000
Days receivables	-1.995	2.763	-0.722	0.471
Fixed asset turnover ratio	-59.737	22.076	-2.706	0.007
Size of the firm	570.553	62.410	9.142	0.000
Debt ratio	347.597	523.053	0.665	0.507
<i>Regression Statistics for Table 5</i>				
F-Statistic	30.472			
Significance of F-Statistic	0.000			
R Square	0.315			
Adjusted R Square	0.305			
Observations	270			

Table 6: Regression between operating profits and days in inventory

	Coefficients	Standard Error	t Stat	P-value
Intercept	-2902.672	639.957	-4.536	0.000
Days inventory	-0.592	1.581	-0.374	0.708
Fixed asset turnover ratio	-60.300	22.106	-2.728	0.007
Size of the firm	583.163	59.619	9.782	0.000
Debt ratio	206.529	527.980	0.391	0.696
<i>Regression Statistics for Table 6</i>				
F-Statistic	30.333			
Significance of F-Statistic	0.000			
R Square	0.314			
Adjusted R Square	0.304			
Observations	270			

Table 7: Regression between operating profits and days payables

	Coefficients	Standard Error	t Stat	P-value
Intercept	-3037.907	537.341	-5.654	0.000
Days payables	0.357	0.626	0.570	0.569
Fixed asset turnover ratio	-61.595	22.032	-2.796	0.006
Size of the firm	596.377	55.912	10.666	0.000
Debt ratio	129.874	556.990	0.233	0.816
<i>Regression Statistics for Table 7</i>				
F-Statistic	30.400			
Significance of F-Statistic	0.000			
R Square	0.315			
Adjusted R Square	0.304			
Observations	270			

VI. Summary & Conclusions

This study had the motivation of studying the efficiency in working capital management practices of chemical sector of Pakistan for which a panel data set of eight years (2000-2009) is used for 30 chemical listed firms. After a considerable literature review some hypotheses were developed for working capital practices of the said chemical firms. The conventional efficiency factors of cash conversion cycle, average days in inventory, average annual collection days, and average annual payment days are often criticized in addition with current ratio and acid test ratios. Some efficiency indices are developed by (Shulman & Cox, 1985) to counter criticism of these ratios for measuring efficiency in working capital management of manufacturing firms. The same are used in the study. Overall it is found that the chemical sector is performing satisfactorily as far as efficiency in working capital management is concerned. There seems more emphasis of these firms on increasing sales than optimizing the use of current assets. With the passage of time the efficiency norms seem to go down as almost all the firms are found to lose efficiency. The study reflects that firms could not efficiently translate current assets towards improving business objectives in the form of increasing operating profits. The efficiency indices portray a different picture though since they are average pictures of the whole industry or the individual firms. Firms are also analyzed in a

regression study by taking operating profits as dependent while the individual components of working capital like cash conversion cycle, average annual payable days, average annual receivable days, average annual days in inventory as independent variables. Fixed asset turn over ratio, size of the firm and debt ratio are introduced as control variables. The regression models run show that none of the individual components seem to significantly impact operating profits, however a noteworthy finding is that fixed asset turnover ratio and size of the firm are having a significant relationship with operating profits. The regression coefficients for cash conversion cycle, average collection days, average payable days and average days in inventory support conventional finance theory for their relation with profits. Their insignificance may be due to limited data availability. The main findings of the study are that chemical firms in Pakistan are not efficiently utilizing different components of current assets towards business objectives. They are found to be less efficient towards enhancing sales and are found inefficient in managing working capital with the passage of time.

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