Are businesses becoming more efficient through time? Testing the change in working capital requirements across economic sectors

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ABSTRACT

The study examines the efficiency of businesses through time. It tests the change in working capital requirements across economic sectors. The last two decades were earmarked with many changes. With no doubt technological innovations were among the most significant events that impacted almost every aspect of peoples' life and businesses as well. In fact, technology became one of the critical components of survival and success for businesses. A core of business success is efficiency, which is the pledge of using fewer resources along with the commitment of improving quality; technology was the key for both. The study investigates if there had been a significant reduction in the working capital as a result of these changes in the last two decades. The research output of the study showed evidence that over the last twenty years there has been a significant decrease in the working capital requirements across most economic sectors. As a consequence, the efficiency of the market increases as more businesses are capable of entering the market because fewer funds are needed. In addition, consumers enjoy better quality products with cheaper prices as a result of competition.

Keywords: Working capital, technology, current assets, resources, quality, inventory control

INTRODUCTION

From the early 1980's to date, businesses have been exposed to many changes. The majority of these changes were the result technological innovations, which have shaped our business world. Information technology has rapidly become the "backbone of commerce" (Carr, 2003). When at one time, information technology and the related cost were considered a necessary evil; today information is considered the lifeline of practically every business (Swanson & Ramiller, 2004).

Technology has evolved and transformed our lives and society; it has brought tremendous benefit to mankind; it is affecting almost all aspects of our daily life. Examples are plenty where technology provides a great deal of convenience in processing our daily transactions (like paying bills, shopping, and banking) and in communication where the world is made smaller and everyone is able to keep in touch with friends, family at virtually no cost. Furthermore, technology has brought about development in many fields such as business, government, education, transportation, and communication.

In the 1980's, organizations began to understand how to benefit from adopting information technology to enhance their value chain improving relationships between the organization, suppliers, and customers thus providing internal and external competitive advantages. Since the early 1980's, the advancement of information technology has outpaced the innovation of physical processing technologies lowering the cost of information technology. This affordability made the use of information as a competitive advantage more available to all businesses (Porter & Millar, 1985).

This study investigates if there has been a reduction in working capital requirements in the last twenty years as a result of these changes. The next sections of the study deal with the literature review, research methodology, data collection, data analysis, study limitations, conclusions and recommendations.

LITERATURE REVIEW

Technology the Main Driver

The benefits of technology are clearly visible in business. It helps businesses to remain updated and drives them forward. In communication, it brought speed, clarity, and proximity at virtually no cost. In education, it is clearly visible in e-learning. With the help of technology, students are able to take control and manage their own learning process. Students chart courses at their own pace and are provided with immediate feedback, chat platforms, discussion boards and e-libraries. In addition, it is of great help to students with learning disabilities and in remote locations. Technology reshaped healthcare. It allows physicians and patients to interact in a secure environment to discuss sensitive issues. Besides, physicians can follow-up on patients and provide advice using social networks.

Many of the studies to evaluate the effectiveness of technology have been documented. Hitt et al. (2006) highlighted the role of technology as a major source of information, which is essential for business success. Bettis and Hitt (1995) argued that new constructs and approaches are needed to understand the requirements for success in the new competitive landscape. In a study, Makri et al (2010) suggested that the integration of science and technology serves as a

good indicator of firm's synergy, which provides a base for future research and changes in managerial practices.

Pflughoeft et al. (1996) discussed the use of an intelligent knowledge base simulator that reduces mean flow time and tardiness; when compared to the more common scheduling, it proved to be a more useful tool that facilitates good solutions for the decision-maker. Kant and Sridharan (1998) investigated scheduling information in a materials requirement planning that will exploit the capabilities of modern computer technologies. Their results showed that improvements could be accomplished but would be influenced by the operating environment. Parker (1998) pointed out that advanced planning is achieved by technologies. It is clear that scheduling systems have evolved from local stand-alone tools into a more shared environment such as Enterprise Resource Planning systems. Parker (1996) highlighted the dynamics of production scheduling and he argued that it is more complicated than the game of chess. He added that most experts agree that regardless of the level of technological tools, manufacturing resource planning, and materials requirement planning, just-in-time (JIT), total quality management (TQM), Enterprise Resource Planning, the integration of information technologies such as knowledge-based systems, intelligent decision-support systems, and solver technologies are key to managing inventory.

As for Alavi and Leidner (2001), they defined the components of advanced information technologies to include the Internet, intranets, extranets, groupware, data warehousing, data mining, intelligent software agents, and workflow systems; they added that advanced information technologies can be used to acquire, capture, organize, transfer, and apply knowledge. According to Wiig (1999), knowledge management promotes the development and application of tacit, leverage firm's capabilities and intellectual assets to attain the enterprise's ultimate goals i.e. ascertain profitability and ensure long-term viability.

Working Capital

The measure of working capital management includes the Cash Conversion Cycle and its components. Those components are Average Collection Period, Inventory Turnover in Days, and Average Payment Period. Working capital management is a basic function for the survival of firms and it has been for long the subject of studies by many researchers; Deloof (2003) in a study highlighted the momentum effect of managing working capital on firm's profitability. He concluded that managing working capital efficiently reduces the number of days accounts receivable are outstanding as well as inventories, which is positively reflected on the profitability of the firm. He added that an efficient working capital management is very important to create the value for shareholders. While Shin and Soenen (1998) addressed the net trading cycle as a comprehensive measure of managing working capital, they reported significant relationship between net trading cycle and profitability.

Shah and Sana (2006) suggested that managers can generate positive return for the shareholders by managing working capital. McMahon and Holmes (1993) talked about the critical role that working capital management plays in the prosperity and survival of firms, specially small and medium enterprises. Verlyn and Laughlin (1980) addressed the importance of the cash conversion cycle and they said that even though working capital management is not receiving the same attention as long-term investment in financing decisions, it occupies the major portion of a financial manager's time and attention. In an industry wise study performed by

Jose et al (1996), they found that aggressive liquidity management is correlated with higher profitability for several industries.

Similar studies highlighted the importance of short term assets management which falls under the area of working capital management. Padachi K (2006) addressed the manufacturing firms' efficiency of working capital where most of their assets are composed of current assets. They showed evidence that efficient working capital management increases cash flow, which in turn increases the growth opportunities of firms and return to the shareholders. Uyar (2009) explained working capital management as a continuous function which is core to the survival of firms. He added, if working capital management is not given due consideration, firms cannot survive for a long period.

Teruel and Solano (2007) tested the impact of firms' size and working capital on the profitability. Their results suggested that working capital management is very important for small and medium size firms as managers can create value for the shareholders by reducing the inventories level and receivable outstanding days. Afza and Nazir (2008) investigated the factors determining the working capital requirements. In accord with other research, Raheman and Nasr (2007) analyzed the relationship between working capital management and firms' profitability.

Opposite to the traditional belief, certain studies showed evidence that using a conservative approach by investing in working capital might increase firms' profitability. Smith, K (1980) argued that when high inventory is maintained, it reduces the cost of interruptions, decreases supply cost, and protects against price fluctuation and loss of business due to scarcity of products. In a study, Czyzewski and Hicks (1992) concluded that firms with the highest return on assets hold higher cash balances. Samiloglu and Demirgunes (2008) suggested that current assets have a negative impact on firm's profitability and cash conversion cycle. However, size and financial assets do not have a significant effect on firm's profitability

The relationship of corporate profitability and working capital management was investigated by Lazaridis & Tryfonidis, (2006). They reported that there was a significant evidence of a negative relationship between gross profit and cash conversion cycle. They argued that managers can create profit by properly handling the individual components of working capital, which includes accounts receivable, inventory, and accounts payable.

Based on the above, it is clear that key changes played a role in shaping businesses and increasing the efficiencies of using resources. The increase in the efficiency of using resources reflects positively on firms as fewer funds are needed. This study focuses on the efficiencies of using working capital and tests if nowadays less working capital is needed than before and poses the following research question: Are businesses becoming more efficient through time as a result of a decrease in working capital requirements?

RESEARCH METHODOLGY

Procedure

The study tests the efficiency of firms through time in reducing the working capital requirements. It follows a two stage procedure. In the first stage, a summary of the variables in the model is presented to highlight their characteristics i.e. examining the changes of sales, cost of sales, and working capital over a span of 20 years period – starts year 1991 and ends 2010 (Hair et al. 2010) – across economic sectors.

In the second stage, hypothesis testing is done; it employs a controlled experiment (Ryan, 2011) by testing the significance of the relative change of working capital to that of the sales and cost of sales over the span of two decades. The following steps are followed: 1- record the current assets, current liabilities, working capital, sales, and cost of sales of all U.S. public firms with stocks that are traded on national and regional stock exchanges at two separate points; the first point is the beginning period i.e. year 1991 and the second point is the ending period i.e. year 2010; 2- measure the dollar change of these items by subtracting the beginning period balance from the ending period balance of firms in the study; 3- measure the percentage change of each item by dividing the dollar change over beginning balance; 4- measure the difference between the relative change of working capital change to that of sales and cost of sales and that is D = WC-relative change - S-relative change; D = WC-relative change - COS-relative change); 5- compute the mean and the standard deviation of the differences of the firms included in the study; 6- repeat the procedure over the nine economic sectors; and 7- test the significance of the difference of relative change at a level of significance of 5% (Lohr, 2010) by using the following:

$$t = \frac{\overline{d} - d_0}{(s_d/\sqrt{n})},$$

Sample and data collection

Data used is a secondary type and is taken from Compustat. The original number of firms listed is 9,753. Only 1,474 firms remained in the model due to missing data. In order to capture the relative change in the balances (Hair et al, 2010), data of these companies were taken from two time frames i.e. December 31, 1991 and December 31, 2010.

Data analysis

The first stage of the study highlights the characteristics of all variables; table 1 (Appendix) represents data output of sales. In checking the sales figures, the average sales of the 1474 firms in year 1991 was $1,824 million and jumped to $5,438 in year 2010, which represents an average growth of almost three times. In checking the relative average growth in sales among all firms, it was 37.81 times, which is ten times that of the overall average. The highest growth in the relative average sales among firms was for health sector; it increased by 26 times. The lowest increase in the relative average sales among was for utility sector; it increased by 1.7 times during the same period.

In checking the standard deviation of sales (fluctuation) for the same period, the average standard deviation of sales figures of all sectors in year 1991 was $6,689 million and in year 2010 jumped to $18,981, which is three times that of year 1991. In checking the relative change of sales among the 1474 firms, it increased 679 folds, which is an indicator of the huge differences in the level of activities (sales volume) among the firms. The highest increase in relative change in sales (standard deviation) among firms was for the health sector, it increased by 1716 times. As for the lowest increase in relative change in among firms was for the utility sector; it reported an average increase of 2.33 times.

Table 2(Appendix) represents data output of cost of sales. In checking the cost of sales figures, the average sales of the 1474 firms in year 1991 was $1,246 million and jumped to

$3,722 million in year 2010, which represents an average growth of almost three folds. In checking the relative average growth of cost of sales among all firms, it showed a relative average increase of 11 folds. The highest growth in the relative average cost of sales among firms was for health sector; it increased by 87 times. The lowest increase in the relative average cost sales among firms was for utility sector; it increased by 1.96 times during the same period.

In checking the standard deviation of cost of sales for the same period, the average standard deviation of cost of sales figures of all sectors in year 1991 was $4,831 million and in year 2010 jumped to $14,475, which is almost three times that of year 1991. In checking the relative change of cost of sales among the 1474 firms, it increased 70 folds, which is an indicator of the huge differences in the level of activities (cost of sales volume) among the firms. The highest relative change in cost of sales (standard deviation) among firms was for the health sector, it increased by 842 times. As for the lowest relative change in cost of sales among firms was for the utility sector; it reported an average increase of 2.92 times.

Table 3(Appendix) represents data output of working capital. In checking the working capital figures, the average working capital of the 1474 firms in year 1991 was $126 million and jumped to $540 million in year 2010, which represents an average growth of around three folds. In checking the average growth of working capital among all firms, it showed a relative average increase of 6 folds. The maximum increase in the relative average working capital among firms was for health sector; it increased by 41 times. The lowest increase in the relative average working capital among firms was for material sector; it increased by 30% times during the same period.

In checking the standard deviation of working capital for the same period, the average standard deviation of working capital of all sectors in year 1991 was $797 million and in year 2010 jumped to $2,160, which is almost three times that of year 1991. In checking the relative change of working capital among the 1474 firms, it increased by 36 folds, which is an indicator of the huge differences in the level of activities (working capital volume) among the firms. The highest change in the relative change of working capital (standard deviation) among firms was for the health sector, it increased by 378 times. As for the lowest relative change in working capital among firms was for the telecommunication sector; it reported an average relative change of 11 times.

In the second stage, the study focuses on testing the significance of relative change in working capital to that of sales and cost of sales across the nine economic sectors. The following table figures include percentage change of sales, percentage change of WC, difference of percentage changes of WC – sales or cost of sales, sector size, t test computed (or test statistic), and p-value of test statistic .

Table 4(Appendix) represents the summary output of relative change of working capital compared to that of sales across the nine economic sectors. In checking the significance of the results of WC versus sales, the relative mean difference of consumer discretionary was 0.83 times (t = 1.09) and p-value = 13.79), which is highly insignificant; energy was -6.12 times (t = -6.19, p-value = .0000), which is highly significant; financials was 0.48 times (t = 1.55, p-value = 0.066), which is insignificant; health sector was -22.03 times (t = -4.80, p-value = .0000), which is highly significant; industrial was 0.64 times (t = 0.33, p-value = .3721),which is insignificant; information technology was -6.15 times (t = -3.15, p-value = .0009),which is highly significant; material was -3.83 times (t = -7.01, p-value = .0000),which is highly significant; telecommunication services was -3.07 times (t = -8.44, p-value = .0000), which is significant at a level of 5%; utilities was -1.12 times (t = -3, p-value = .016), which is significant at 5% level

of significance; and overall sectors was -3.28 times (t = -2.45, p-value = .0007), which is significant at 5% level of significance.

Table 5(Appendix) represents the summary output of relative change of working capital compared to that of cost of sales across the nine economic sectors. In checking the significance of the results of WC versus cost of sales, the relative mean difference of consumer discretionary was 0.39 times (t = 0.46 and p-value = .3215), which is highly insignificant; energy was -8.26 times (t = -8.30, p-value = .0000), which is highly significant; financials was 21.27 times (t = 9.06, p-value = .01468), which is significant at an alpha of 5%; health sector was -45.74 times (t = -1.87, p-value = .0315), which is significant at an alpha of 5%; industrial was -6.45 times (t = -1.68, p-value .0474),which is significant; information technology was -7.41 times (t = -3.19, p-value = .0008) which is highly significant; material was -3.79 times (t = -6.70, p-value = 0.0000), which is highly significant; telecommunication services was -2.20 times (t = -6.34, p-value .0000), which is highly significant at a level of 5%; utilities was -1.31 times (t = -3.48, p-value = .0003), which is highly significant at an alpha of 5%; and overall sectors was -4.81 times (t = -2.40, p-value = .0082) which is highly significant at an alpha of 5%.

RESULTS OF THIS STUDY

In checking the summary results for the period year 1991 to 2010, it showed that the relative increase in working capital is significantly smaller than that of sales (table 4-Appendix) in most of the economic sectors. As the test statistic value of the difference between the relative change of working capital and that of sales is -2.45 with a p-value of .73%; the result is significant at 5% level of significance. In comparing the working capital relative change to that of cost of sales (table 5-Appendix), it showed a test statistic value of -2.40 with a p-value of 0.82%; this means that the relative increase in working capital is significantly smaller than that of the cost of sales at a level of significance of 5%. Both results support the research hypothesis; during the period 1991 – 2010, even though businesses had increase in sales, cost of sales and working capital, but the increase in working capital is significantly smaller than that of both sales and cost of sales.

CONCLUSIONS

The research output of the study is robust; it showed that there is significant evidence that businesses nowadays need to invest less in working capital to operate than twenty years ago as a result of using technology. The reduction of working capital requirement benefits various stake holders. First, it increases market efficiency as more investors will be capable of entering the market. Second, it decreases the cost of products as the cost of finances decreases with less money needed to finance working capital and manage daily operations. Third, with the increase of number of businesses on the market and the lower cost of finances, consumers enjoy better quality products with lower cost.

LIMITATIONS

The study has two limitations, which are 1- many companies were removed from the study because of lack of information; only 1,474, firms remained in the study out of 9,753; 2- study results showed that variations within the economic sectors were very high.

RECOMMENDATIONS

It is recommended to conducts further studies: 1- investigate the sources of the very high variations within the economic sectors by controlling other variables such as firm's size, sales turnover, and type of business activity; 2- cross validate the model by applying it in different markets.

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Appendix

Table 1 - Sales (In Millions $)

Economic Sector	Measure	S91	S10	Sales %
Consumer Discretionary	Mean	2,747	6,829	466%
	STD	8,672	19,566	1395%
Energy	Mean	4,208	16,172	1313%
	STD	15,338	49,187	2859%
Financials	Mean	279	736	2330%
	STD	552	1,873	8878%
Health Care	Mean	490	3,492	26180%
	STD	1,741	10,921	171689%
Industrials	Mean	1,734	4,243	918%
	STD	4,579	10,349	5174%
Information Technology	Mean	883	3,149	1369%
	STD	4,836	12,261	6577%
Materials	Mean	1,832	3,802	413%
	STD	4,240	7,077	906%
Telecommunication Services	Mean	3,094	19,084	430%
	STD	4,549	38,077	473%
Utilities	Mean	1,515	3,417	177%
	STD	1,795	3,807	233%
All Sectors	**Mean**	**1,824**	**5,438**	**3781%**
	STD	**6,689**	**18,981**	**67960%**

Table 2 - Cost of Sales (In Millions $)

Economic Sector	Measure	COS91	COS10	COS %
Consumer Discretionary	Mean	1,785	4,637	510%
	STD	6,163	14,957	1919%
Energy	Mean	3,275	12,882	1526%
	STD	11,816	40,026	3019%
Financials	Mean	212	573	688%
	STD	427	1,578	2601%
Health Care	Mean	199	1,711	8721%
	STD	620	6,898	84223%
Industrials	Mean	1,347	3,174	1627%
	STD	3,523	7,866	13404%
Information Technology	Mean	440	1,669	1494%
	STD	2,153	7,233	8098%
Materials	Mean	1,323	2,793	409%
	STD	3,006	5,397	768%
Telecommunication Services	Mean	1,602	8,798	343%
	STD	2,431	17,681	409%
Utilities	Mean	1,025	2,511	196%
	STD	1,183	2,774	262%
All Sectors	**Mean**	**1,246**	**3,722**	**1096%**
	STD	**4,831**	**14,475**	**7008%**

Table 3 - Working Capital (In Millions $)

Economic Sector	Measure	WC 91	WC10	WC %
Consumer Discretionary	Mean	377	256	549%
	STD	1,418	1,372	2350%
Energy	Mean	914	113	700%
	STD	2,833	818	4021%
Financials	Mean	130	36	2815%
	STD	251	64	8410%
Health Care	Mean	815	98	4147%
	STD	2,880	399	37842%
Industrials	Mean	409	111	982%
	STD	1,109	504	5277%
Information Technology	Mean	1,014	167	754%
	STD	3,525	687	2833%
Materials	Mean	709	182	30%
	STD	1,447	438	1940%
Telecommunication Services	Mean	(1,083)	(295)	123%
	STD	3,222	1,072	1104%
Utilities	Mean	23	(79)	65%
	STD	510	236	1353%
All Sectors	**Mean**	**126**	**540**	615%
	STD	**797**	**2,160**	3677%

Table 4 - Testing the Significance of working capital versus Sales

Economic Sector	Measure	WC %	Sales %	D-S	n	t	p-value
Consumer Discretionary	Mean	549%	466%	83%	309	1.09	13.79%
	STD	2350%	1395%	2908%			
Energy	Mean	700%	1313%	-612%	112	-6.19	**0.00%**
	STD	4021%	2859%	3800%			
Financials	Mean	2815%	2330%	486%	32	1.55	6.60%
	STD	8410%	8878%	12053%			
Health Care	Mean	4147%	26180%	-22033%	194	-4.80	**0.00%**
	STD	37842%	171689%	176272%			
Industrials	Mean	982%	918%	64%	292	0.33	37.21%
	STD	5277%	5174%	7497%			
Information Technology	Mean	754%	1369%	-615%	216	-3.15	**0.09%**
	STD	2833%	6577%	7480%			
Materials	Mean	30%	413%	-383%	134	-7.01	**0.00%**
	STD	1940%	906%	2098%			
Telecommunication Services	Mean	123%	430%	-307%	20	-8.44	**0.00%**
	STD	1104%	473%	1395%			
Utilities	Mean	65%	177%	-112%	165	-3.00	**0.16%**
	STD	1353%	233%	1434%			
All Sectors	**Mean**	**615%**	**943%**	**-328%**	**1474**	-2.45	**0.73%**
	STD	**3677%**	**67960%**	**5147%**			

Table 5 - Testing the Significance of working capital versus cost of sales

Economic Sector	Measure	WC %	COS %	D-O	n	t	p-value
Consumer Discretionary	Mean	549%	510%	39%	308	0.46	32.15%
	STD	2350%	1919%	3214%			
Energy	Mean	700%	1526%	-826%	111	-8.30	**0.00%**
	STD	4021%	3019%	3817%			
Financials	Mean	2815%	688%	2127%	31	9.06	**0.00%**
	STD	8410%	2601%	9018%			
Health Care	Mean	4147%	8721%	-4574%	193	-1.87	**3.15%**
	STD	37842%	84223%	93888%			
Industrials	Mean	982%	1627%	-645%	291	-1.68	**4.74%**
	STD	5277%	13404%	14763%			
Information Technology	Mean	754%	1494%	-741%	215	-3.19	**0.08%**
	STD	2833%	8098%	8918%			
Materials	Mean	30%	409%	-379%	133	-6.70	**0.00%**
	STD	1940%	768%	2170%			
Telecommunication Services	Mean	123%	343%	-220%	19	-6.34	**0.00%**
	STD	1104%	409%	1332%			
Utilities	Mean	65%	196%	-131%	164	-3.48	**0.03%**
	STD	1353%	262%	1445%			
All Sectors	Mean	615%	1096%	-481%	1474	-2.40	**0.82%**
	STD	3677%	7008%	7685%			