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The Impact of Working Capital Efficiencies on the Enterprise Value Option: Empirical Analysis from the Energy Sector

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This paper, looking within the energy sector, empirically tests the hypotheses that individual and/or net working capital efficiencies impact a company's enterprise value (EV). The EV metric is unique for it allows an equity investor to assess the firm on the same basis as an acquirer in a merger-acquisition transaction. It represents an option or 'right' to buy a firm's core cash flow or the value of claims on that cash flow. The results show there are significant negative associations between the net working capital efficiencies and enterprise value for large and mid-cap firms. From the perspective of the investor-acquirer, the acquisition cost of a company is directly impacted and it shows why they need to pay attention as to how well firms simultaneously turn over their inventories, collect on trade receivables, and service their trade creditors.

There is a trend in business where firms are starting to switch their focus from the uncertainty of the profit and loss statement onto the balance sheet. This reluctance from moving away from the proverbial 'bottom-line' may be due to companies underestimating the role of the firm's working capital. Working capital is considered to be the excess of current assets over current liabilities and as such is a financial metric measuring operating liquidity. Management should be looking at working capital that 'nets' out cash, allowing them to focus on the operating assets of the firm. The intuition is to determine how cash has changed over the period based upon changes in inventory, accounts receivable, and accounts payable. This paper posits that by effectively managing the components of net working capital, companies can enjoy financial flexibility and influence a company's enterprise value (EV) through a reduction in capital employed and subsequent asset productivity. As discussed later, this approach is reinforced by the fact that the calculation of the enterprise value is dependent upon including the value of all the non-operating assets that have been netted against cash.

The determination of the enterprise value (EV) metric allows investors to assess the firm on the same basis as an acquirer. It can be viewed as a theoretical takeover price where the acquirer accepts the debt of the firm but is also entitled to its cash. This paper argues that in an attempt to place a value on a company, the buyer or seller has to reconcile the purchase price (i.e., enterprise value) to the periodic fluctuations in the working capital investment that is needed to support the operations of the company. Generally, the goal is to minimize the capital earmarked to a company's turnover process by reducing accounts receivable and inventory, while extending accounts payable (Rafuse,1996).

As stated previously, working capital can be seen as a means for evaluating the operating liquidity of a corporation. However, it also can signal its operational efficiency. A positive working capital position implies the ability of the firm to cover its current obligations while an increase in the levels of the working capital accounts can mean that too much money is tied up in the business. An effective management of working capital centers on operational asset positions in inventory, accounts receivable, and accounts payable. Excess cash and non-operational items are excluded. This paper posits that the enterprise value metric for an investment opportunity acts as a real option. It represents the cost of buying the right to a company's core cash flows or the value of the claims on those cash flows. When a buyer assesses a firm on the same basis as that of an acquirer, the enterprise value (EV) is analogous to a call option on the total value of the firm's operations that is measured by taking the market capitalization of the firm and adjusting it for debt, minority interests, preferred stock, and other provisions deemed debt and reducing it by the excess cash of the firm. In other words, it represents an option to buy the debt and other liabilities of a firm after cash flow considerations. Major determinants of this excess cash are the components of the working capital cycle. Cash flows improve when companies utilize the right level of working capital that tends to release funds that are bound up in operating accounts. It is 'found' capital.

The observation of the working capital habits of firms will tell us how well they are approaching this subject and if they are efficiently managing the process. With the latter found capital, companies can invest in future growth, pay down debt, or pay dividends. This would be expected to impact the enterprise value in a positive manner.

LITERATURE REVIEW

The existence and maintenance of working capital is the lifeblood of a corporation. It is the cash flow that revitalizes operations or slows it down to inoperable levels. Regardless of the size of the company, the management of working capital accounts should influence its financial health. Kargar and Blumenthal, (1994) found that small businesses were significantly impacted by management's ability to successfully plan the cash requirements of the firm. Managers need to monitor the ratio of total working capital to total company assets, as a relatively high figure can signal future strains on the operational financial health of the firm. Filbeck and Krueger (2004) report the ordinal rankings of industries across working capital management variables for the period of 1996-1999 as reported by CFO magazine survey. The working capital measures were not static but the specific ratios for different industries were stable over time. The majority of the empirical studies on the management of working capital has centered on the possible link to profitability. Jose et al., (1996) found evidence that U.S. firms following an aggressive working capital policy saw their profits enhanced. There was a significant negative relationship between the cash conversion cycle of a firm and its profitability. Looking at US firms during the period of 1974-1994, Shin and Soenen (1998) found evidence that the reduction of net trade credit increases profitability.

When they focused on individual industries, that connection was not that strong. Deloof (2003) studied a sample of large Belgian public firms between 1992-1996 and found their profits improved as they reduced their days of receivables and inventories. In a sample of 58 small manufacturing firms in Mauritius, over the period of 1998-2003, Padachi (2006), found that the companies with aggressive working capital policies were met with lower profitability. Ganesan (2007) studied a sample of firms from the telecommunication equipment industry and while he found a negative relationship between working capital efficiency and profit margins, the results were not significant for that industry. In a more general study, Raheman and Nasr (2007) analyzed 94 Pakistani public firms from 1999-2004 and found a significant negative relationship between a high investment in liquid assets and profitability. Ramachandran and Janakiraman (2007) found that the operating profit of the firm had a negative relationship with the days of accounts payable. They felt it implied that the less profitable firms waited longer to pay their bills. In a current work, Mohamad and Saad (2010) obtained a sample of 172 firms listed on the Bursa Malaysia exchange over the time period of 2003-2007 and found significant negative associations between working capital variables and a firm's return on assets and return on invested capital.

In a study of the aggregate cash conversion cycle, Moss and Stine (1993) found that a negative relationship existed between the size of the firm and the length of the cycle. Larger firms tend to have shorter conversion cycles. Taking a survey of 78 domestic firms and 58 foreign firms, Maxwell et al., (1998) found that the majority of the sample took advantage of float to control their disbursements and collections but only the foreign firms had significant usage. Some firms took no advantage of float in handling their working capital needs. Looking at a sample of merchandising and manufacturing firms, Uyar (2009) found that the latter group had longer conversion cycles and that there was a negative relationship between the size of the firm and the length of the cycle. The determinants of working capital management were explored by Chiou and Cheng (2006) where factors such as an industry effect, firm performance, and firm size did not provide consistent conclusions. Two factors that did prove to be consistent were operating cash flow and leverage. Padachi (2006) found that there was an increasing trend in the short-term component of working capital financing. In another test of the components of working capital management, Nazir and Talet (2008) looked at the operating cycle, operating cash flow, size, ROA, and leverage and found that the operating cycle, ROA, and leverage were significant. Charitou et al., (2010) empirically investigated the effect of working capital management on the performance of firms

in emerging markets. They find a negative relationship between the cash conversion cycle and profitability. In a study of how efficiently working capital is being managed, Lifland (2011) found that during the six-year period of 2004-2009, three out of five industry samples reported statistically significant declines in their days of the working capital cycle. These firms were able to reduce the number of days that cash had to be earmarked for the support of the firm's working capital. Additionally, within this time frame, all the industries in the study reflected positive changes in their estimated external financing as it related to working capital. The net effect was that as some asset turnovers decreased, the days of working capital increased, placing a burden on the need for external financing.

Smith (1987) echoes the importance of looking at the relationship between working capital management and profitability but also stresses its consequence on value. A critical factor in assessing the success of the management of working capital is the use of the cash conversion cycle (Gitman, 1974). Shin and Soenen (1998) found a strong negative association between a firm's net trade cycle (NTC) and its profitability. They conjectured that by decreasing the NTC to a reasonable minimum, it would result in creating shareholder value. Looking at working capital management routines in small UK firms, Howorth and Westhead (2003) concluded that more research was needed to determine if the working capital routines lead to any superior levels of performance. Teruel and Solano (2007) studied the effects of working capital management on small and medium enterprises (SMEs) between 1996 and 2002 and found that shortening the cash conversion cycle improved the firm's profitability and could also create value (their dependent variable was the return on assets with which they acknowledged endogeneity concerns). Charitou et al., (2010) claim that if the components of the cash conversion cycle are managed efficiently, it should add value to the firm because it increased the profitability of the firm. Mohammed and Saad (2010) perform an empirical study trying to link working capital management to market valuation and profitability. Reviewing 172 firms over the period of 2003 to 2007 in Bursa Malaysia, the cash conversion cycle had a significant negative relationship with Tobin's Q, their proxy for the firm's market value, and profitability. Tobin's Q is the ratio of the firm's market value over the book value of its assets. Market value is defined as just the market capitalization. An increasing conversion cycle led to a reduction in firm value. They also state their findings imply that most of the profitable firms are characterized as having relative shorter cash conversion cycles. This paper extends the literature on the relationship between working capital management efficiencies and firm value by introducing a more robust proxy for firm value, the enterprise value (EV). The EV is a relatively more comprehensive alternative to market capitalization as it measures the entire cost of the firm as if someone were to acquire it. It's a more accurate estimate of the value of a company viewed as a going concern than market capitalization. Enterprise value incorporates critical factors such as debt, preferred stock, minority interests, and cash reserves. It tends to be less impacted by changes in a firm's capital structure because it is the unlevered value of the firm that is being measured.

Sample Data

In order to analyze a company using the Enterprise Value variable, there are two critical things to consider. First, the variable must be constructed in a consistent manner. The market capitalization, total debt, and preferred stock values must be based on the same underlying assets. Second, an appropriate peer group must be chosen. Where the enterprise value (EV) variable is being considered, it is most useful when there are generally small differences in accounting treatment of depreciation among the comparable companies. Choosing a group of industry peers and refining that group to reflect similar views about long-term growth and returns on invested debt and equity is critical. This paper looks at the Energy Sector where the sample is created through the Global Industry Classification Standard (GICS) system developed by Standard & Poor's and Morgan Stanley. Bhojraj, Lee, and Oler (2003) found that GICS classifications were better than the Standard Industrial Code (SIC) in explaining cross-sectional variations in valuation multiples, realized growth rates, expenditures in research and development (R&D), and common financial ratios. Even though peers within an industry may trade at similar EVs, they still can show variation over time. Even as peers are likely to have similar risk profiles, cost structures, and tax

rates, the growth rate in earnings and value can vary within an industry. This data set is further defined according to market capitalization. Firms with market capitalizations greater than $5 billion are deemed to be large–cap stocks, those with markets caps between $1 and $5 billion are termed mid-cap stocks, and companies having market caps below $1 billion are small-cap securities. Covering the time period of 2004 through 2009 for the Energy sector, 504 firms were initially collected from Compustat. Through a filtering process, looking for missing values, the final sample data set resulted in 222 firms. Specifically, the sample contains 72 large-cap, 65 mid-cap, and 85 small-cap companies. The largest attrition of firms occurred in small caps as 304 firms were filtered down to 85 firms. There were 219 companies that either did not report an enterprise value or an inventory figure. This paper, building on the formation of three unique peer groups, tests the enterprise value (EV) as an option on the assets of the firm and its relationship with the management of net working capital efficiencies.

MEASURES OF PERFORMANCE

The Enterprise Value Option

In the area of real options literature, early works looked at how choices of controlled opportunities (i.e., firm shut downs, new constructions) were a significant part of investment decisions (McDonald and Siegel, 1986; Majd and Pindyck, 1987). These latter works were theoretical developments of real option-pricing models; examples of works that examined the empirical implications of these models were Paddick et al., (1988) and Quigg (1993). The area of real options dealing with the relation between balance sheet items and stock prices has received less attention. Foster (1986) stated that a critical area of research needed to be focused on the valuation effects of balance sheet items. Berger et al., (1995) assessed the extent that balance sheet information impacts firm value given the expected cash flows of the firm. While it is beyond the scope of this paper to empirically test an enterprise value option model, this study still contributes to the real options literature.

When a firm encounters an investment opportunity, it's analogous to a call option as the company has the right, but not the obligation, to acquire the operating assets of another company. The enterprise value metric allows an equity investor to assess the firm on the same basis as an acquirer in a merger-acquisition transaction. The ideal situation would be to find a call option that is similar to the investment so that the value of the option would tell the investor something about the value of the opportunity at hand (Luehrman, 1998). The enterprise value can be viewed as a takeover price where the acquirer accepts the debt obligations of the firm but is also entitled to its cash inflows; the net balance of debt or the value of claims on the firm's cash flow becomes the strike price of the EV option. The mapping of the investment opportunity on the call option leads to the following call option value rule. Let S be the value of the firm's assets and X represent the entire cost of the company, the enterprise value (EV). The Call Option Value = (S – X, 0). When the investment opportunity decision can no longer be deferred, the call option value is (S – X) or 0 whichever is greater.

The enterprise value represents the 'right' to buy a firm's core cash flow; it's the acquisition cost of the firm. As such, it must incorporate not just the market capitalization but also the net debt and all claims pertaining to preferred stock and non-controlling minority interests as well. The non-operating assets (i.e., net cash balances) that do not contribute to the day-to-day-operations of the firm need to be deducted. One method of predicting the EV is based upon the projection of expected future after-tax cash flows, after taking into account investments in capital assets and net working capital. It's treated as a perpetuity that grows at a constant growth rate and is discounted at a weighted average cost of capital. However, this paper utilizes a linear operational model that can be expressed as:

Enterprise Value (EV) = Market Capitalization (MC) + Debt (D) + Non-controlling minority interest (MI) + Preferred Shares (PS) – Excess Cash (EC)

These components are examined below:

- The market capitalization (MC) is the number of common diluted shares outstanding multiplied by the share price. The diluted shares reflect any changes from the exercise or conversion of options, warrants, and convertible securities.
- The debt (D) comprises all long-term debt and the current portion of long-term debt. Capital leases are also included. Once a business is acquired, its debt has also been acquired.
- The non-controlling (minority) interest (MI) represents the interest of non-controlling shareholders in the net assets of a company. A parent company has a 70% controlling interest in a consolidated subsidiary, while the remaining 30% non-controlling interest is owned by another company. The non-controlling interest is excluded from the enterprise value.
- The preferred stock (PS) that is not convertible into common stock must be redeemed at a certain date and price and is treated as debt. Its existence represents a claim on the business, a financial liability, and is included in net debt.
- The excess cash (EC) reflects the cash remaining after the firm has met all of its short-term liabilities. It generally is cash and marketable securities. It serves to reduce the debt and hence the acquisition cost.

It is not likely that you would buy an asset without considering the total amount that you have to pay to acquire that asset. This paper considers the enterprise value as a call option on the firm's equity value with the strike price being the core cash flows or the value of claims on that cash flow. The handling of the components of market capitalization, debt, minority interest, preferred stock, and excess cash imply that in maximizing the value of the business, it in turn achieves the overall financial goal of maximizing stockholders' wealth.

Working Capital Efficiencies

The accounting definition of working capital is the difference between current assets and current liabilities. Typical current assets are cash, receivables, inventory, and prepaid expenses while accounts such as trade payables and accrued operating expenses make up current liabilities. For the purposes of valuation, however, working capital excludes cash and interest bearing debt (i.e., short-term portion of long-term debt and line of credit outstanding balances). The reason being is that these items are associated with the firm's capital structure and not the company's normal cash cycle.

In order to optimize working capital analysis, current turnover ratios are converted into a measurement of the number of days that (1) inventory is on hand, (2) it takes to receive payment on trade receivables, and (3) a firm waits until it pays its trade obligations. The net effect of these ratios is an important indicator and measurement parameter (Richards and Laughlin, 1980).

How long is cash tied-up in support of working capital needs? What is the time between cash outlay and cash recovery? Following the works of Farris and Hutchison (2003) and Soenen (1993) a measure for effective working capital management is applied here. It is an operational metric definition where the cash conversion cycle reflects the net days it takes a firm to recover a dollar spent in operations. This net position (translated into days outstanding) shows the number of days that cash is bound in receivables and inventory or financed through payables. This paper extends the works of Lazaridis and Tryfonidis (2005), Padachi (2006), and Truel and Solano (2007), by creating metrics that are all expressed as a percentage of sales. This brings about a balanced comparison across each element of the model, provides true comparisons between industries, and indicates the number of "days sales" the firm has to finance its working capital (Shin and Soenen, 1998). The model used to measure working capital asset efficiency is as follows:

$$DWC = (DIN) + (DAR) - (DAP)$$

The formulas, definitions and expected directional effects of these variables on enterprise value (EV) are presented below:

- (DIN) Days of Inventory = INV/(net sales/365). This ratio is calculated by dividing the year-end inventories by net daily sales. It reflects the average number of days that inventories are held by the company. There is an expected negative directional effect on the enterprise value. When it increases, monies tied up in inventory are not being recycled adequately during the operating period. This constraint on cash flows impacts the firm's ability to manage debt and other non-operational items. A decrease in (DIN) is an improvement in the time that inventory is held and helps to curb stale or obsolete levels of inventory. The improvement in cash inflow from the timely sale of inventory can be used to reduce the net debt position and enhance the enterprise value.
- (DAR) Days of Receivables = A/R/(net sales/365). It's the year-end accounts receivables net of allowance for doubtful accounts divided by average daily sales. In other words, the average number of days that it takes a firm to collect payments from its customers on its credit sales. The expected directional effect on enterprise value is negative. If the days of receivables increase, it represents a lost opportunity of utilizing cash to help reduce the debt burden of a corporation, making it more costly from an enterprise value perspective. Increasing days signal an inefficient use of receivables and related credit policies. A decrease in (DAR) signals acceleration in cash collection that can be put against debt obligations of the firm, improving EV.
- (DAP) Days of Payables = A/P/(Net sales/365). This ratio is calculated by dividing average accounts payables by average daily sales. It reflects the average time that it takes for companies to pay their suppliers and vendors. There is an expected positive directional effect on the enterprise value. As (DAP) increases, it means that the firm takes a relative longer time period to settle their payment commitments. It's interpreted as an improvement as the firm is using the money of others to devote to non-operational obligations. The expectation is that firms will increase this ratio up to a level that reflects that the incentives of purchase discounts are beneficial.
- (DWC) Days of Working Capital = DIN + DAR – DAP. This variable represents the net effect of adding the DIN and DAR and subtracting the DAP. This net figure allows for better benchmarking of operating efficiency for peer firms within and outside a given industry. The directional effect is expected to be negative with respect to enterprise value. Simultaneously optimizing the three components of the operative (DWC) (a net decrease in the total days of the working capital cycle) frees up capital that can subsequently reduce the debt obligation and other non-operational concerns of the investor-acquirer that will improve the enterprise value.

The efficient management of these working capital assets includes maintaining adequate product levels and appropriate credit/payment terms. It involves mitigating any situation where the servicing of the working capital results in cash constraints that would negatively impact the enterprise value.

Methodology

Prior works are extended as this paper examines the impact of the working capital cycle and its components over a six-year period. It relates these components to a 'going concern' value, the enterprise value is its proxy, versus market capitalization. The majority of the literature centers on the relationship between working capital and profitability. The examination by this paper follows a similar empirical framework as used by Deloof (2003), Lazaridis and Tryfonidis (2006), Truel and Solano (2007), Charitou et al (2010) and Mohammad and Saad (2010). In order to determine if there were significant associations between the working capital efficiencies and the enterprise value of firms over the years of 2004 through 2009, this paper creates a Pearson Correlation table and conducts a Panel Data Regression methodology. The hypotheses state that there is an association between the Enterprise Value of the firm and each of the components of the working capital cycle as well as the net days of the Working Capital Cycle.

H1: There is an association between Enterprise Value and Days of Inventory.

H2: There is an association between Enterprise Value and Days of Receivables.

H3: There is an association between Enterprise Value and Days of Payables.

H4: There is an association between Enterprise Value and Net Working Capital Cycle.

In order to test the propositions of the associations between enterprise value and the working capital efficiencies, this paper employs a regression analysis using a panel data methodology (Deloof, 2003), (Padachi, 2006), (Teruel and Solano, 2007). The use of the panel methodology provides more informative data, less collinearity among variables, more degrees of freedom and more efficiency (Baltagi et al., 2003). The following models will be tested:

[1] $EV = \beta_0 + \beta_1(SG) + \beta_2(DA) + \beta_3(DIN) + \varepsilon$
[2] $EV = \beta_0 + \beta_1(SG) + \beta_2(DA) + \beta_3(DAR) + \varepsilon$
[3] $EV = \beta_0 + \beta_1(SG) + \beta_2(DA) + \beta_3(DAP) + \varepsilon$
[4] $EV = \beta_0 + \beta_1(SG) + \beta_2(DA) + \beta_3(DWC) + \varepsilon$

The dependent variable, EV, measures the firm's enterprise value; it's the net of the market capitalization, debt, minority interests, preferred shares and excess cash. DIN represents the number of days that inventory is held while DAR is the number of days it takes to collect on accounts receivable. The directional effect of both are expected to be negative as an increase will extend the number of days that cash is tied-up in working capital. DAP measures the average number of days a firm takes to pay its trade payables. Its hypothesized sign is positive as firms that can further delay their payments to suppliers-creditors can enhance enterprise value. The days of the Working Capital Cycle (DWC) presents the net number of days that capital is constrained in the working capital process. It's calculated as the sum of DIN and DAR less DAP. The expected effect is negative as an increase in the total net days that management has to devote to servicing their working capital needs, will divert funds that could have gone to reducing non-operational accounts and enhancing the enterprise value. Two control variables are introduced into the model (Lazaridis and Tryfonidis, 2006), (Teruel and Solano, 2007), (Charitou et al., 2010). SG is the sales growth and is calculated as the differential between current year sales and prior year sales divided by prior year sales $[(S_1 - S_0)/S_0]$. The expected direction of this variable is negative in that given an increase in the growth of sales, while a good thing, also puts pressure on a firm to have the appropriate mix of working capital accounts to support it. DA is the ratio of debt to total assets. The expected directional effect is negative as an increase can make a firm more costly and can weaken the enterprise value.

Empirical Results

The first step before performing a regression analysis on the four panel data models is to determine if there exists a correlation between the unobservable heterogeneity of each firm and the independent variables of the model. To accomplish this, the Pearson correlation test (Shin and Soenen, 1998), (Deloof, 2003), (Padachi, 2006), (Charitou et al., 2010) for the variables that will be included in the regression model is presented in Exhibit 1 below. The energy sector data sample is broken out into three groups based upon market capitalization. These are the large-cap firms, mid-cap firms, and small-cap firms.

Exhibit 1: Pearson Correlation Coefficients
Energy Sector (Time Period of 2004 through 2009)

Panel A: 72 Large-Cap Corporations and 360 Firm Year Observations

	EV	SG	DA	DIN	DAR	DAP	DWC
EV	1.000	-0.097	-0.275	-0.030	0.022	0.025	-0.055
SG		1.000	-0.020	0.035	0.145	0.144	-0.139
DA			1.000	-0.162	-0.061	-0.058	-0.068
DIN			1.000	0.318	0.302	-0.142	
DAR				1.000	0.997	-0.892	
DAP					1.000	-0.906	
DWC							1.000

Panel B: 65 Mid-Cap Corporations and 315 Firm Year Observations

	EV	SG	DA	DIN	DAR	DAP	DWC
EV	1.000	-0.075	0.156	-0.054	-0.044	0.109	-0.170
SG		1.000	0.071	-0.070	-0.122	0.016	-0.051
DA			1.000	-0.166	-0.179	0.125	-0.246
DIN			1.000	0.190	-0.069	0.441	
DAR				1.000	0.204	0.329	
DAP					1.000	-0.157	
DWC							1.000

Panel C: 85 Small-Cap Corporations and 425 Firm Year Observations

	EV	SG	DA	DIN	DAR	DAP	DWC
EV	1.000	-0.032	0.076	-0.049	0.107	-0.073	0.214
SG		1.000	0.025	-0.080	-0.004	0.036	-0.005
DA			1.000	0.015	0.029	0.071	-0.023
DIN			1.000	0.187	0.918	-0.750	
DAR				1.000	0.169	0.679	
DAP					1.000	0.104	
DWC							1.000

Where:

EV = the enterprise value of the firm.
SG = the yearly sales growth for each firm.
DA = the annual debt to total assets ratio.
DIN = average days that inventory is held.
DAR = average days that takes to collect on trade receivables.
DAP = average days that it takes to pay trade payables.
DWC = average annual days of working capital; It is DIN + DAR – DAP.

The large cap companies (Panel A) in the energy sector show a negative relation between the days of inventory and enterprise value that is consistent with the hypothesized directional effect. An increase in the days of inventory held would decrease cash flow and that would impede the covering of non-operational accounts. The average days-to-collect on trade receivables has a positive sign that is not consistent with the expected direction. It's possible that less profitable firms (DeLoof, 2003) seek to increase their credit sales even if the days' sales outstanding are extended. The average number of days that the large caps take to pay their trade payables has the expected positive sign. The ability to extend their payments to supplier-creditors generates capital to improve the enterprise value. The days of the working capital cycle, the net of the latter three variables, displays the expected hypothesized negative sign. An overall increase in the number of days that capital must be tied up in maintaining working capital does not strengthen the enterprise value. The negative value of sales growth reflects the fact that growing sales place an increasing burden on the working capital of the firm. Maintaining efficiencies become more difficult. The negative sign of the debt control variable is expected because an increase in debt makes the firm more costly to acquire.

The mid-cap stocks of Panel B reflect results as hypothesized; enterprise value has an inverse relationship with two of the components of the days of working capital cycle (DWC): the days of inventory (DIN) and the days of receivables (DAR). It has the expected positive relationship with the days of payables (DAP). The net days of the working capital cycle (DWC) has the expected negative directional effect as well. This result is consistent with the notion that an increase in the net number of days that a corporation must commit its cash to working capital needs hinders its ability to cover non-operational accounts in the enterprise value. The negative value of sales growth has the expected negative direction while the debt ratio shows an unanticipated positive relation.

The small-cap stocks of Panel C have mixed results. The days of inventory (DIN) and the control variable of sales growth (SG) both have the expected hypothesized negative sign. The DAR, DAP, and DA variables reflect positive directions with the enterprise value. The DWC has a positive sign, too. There are possible reasons for this result, however, and they are addressed in the regression analysis that follows.

Regression Analysis

This paper has presented a literature background and data analysis in examining the impact of working capital efficiencies on enterprise value. In order to test the related hypotheses, a panel data regression methodology is used (Padachi, 2006), (Teruel and Solano, 2007), (Charitou et al., 2010) and (Mohammad and Saad, 2010). A scatter plot revealed that the residuals were fairly straight with no extreme values. This allows an assumption of normality. When fitting the line to the data, the estimates of the coefficients were determined using the operating least squares method (OLS). The independent variables are DIN, DAR, DAP, DWC, SG, and DA. The dependent variable is enterprise value (EV). Specifically, the hypotheses state that the components of the working capital cycle and the net cycle itself affect a firm's enterprise value. The total number of observations is 1,100, which represented stacked data for the period 2004 – 2009 for 222 firms in the energy sector. The sample is segmented into three categories: large- cap, mid-cap, and small-cap firms. The results are presented in Exhibit 2 below.

Exhibit 2: Regression Table
Energy Sector Firms Dependent Variable: Enterprise Value Time Period 2004 - 2009

Panel A: 72 Large-Cap Corporations and 360 Firm Year Observations

	[1]	[2]	[3]	[4]
DIN	-198.7 (0.1514)			
DAR		3.82 (0.6846)		
DAP			3.71 (0.6354)	
DWC				-35.43 (0.0789)***
SG	-16,003 (0.0492)**	-16,859 (0.0408)**	-16,939 (0,0398)**	-18,405 (0.0249)**
DA	-139446 (<0.0001)*	-133,142 (<0.0001)*	-133,083 (<0.001)*	-136,810 (<0.001)*
Adjusted R-square	8.39%	7.90%	7.92%	8.65%

Panel B: 65 Mid-Cap Corporations and 315 Firm Year Observations

	[1]	[2]	[3]	[4]
DIN	-2.32 (0.5472)			
DAR		-1.43 (0.6430)		
DAP			6.27 (0.1017)	
DWC				-2.94 (0.0124)**
SG	-201.6 (0.1123)	-203.6 (0.1104)	-198.5 (0.1160)	-208.14 (0.0977)***
DA	1,530.3 (0.005)*	1,539.8 (0.0056)*	1,472.4 (0.0073)*	1,244.8 (0.0246)**
Adjusted R-square	2.38%	2.33%	3.10%	4.20%

Panel C: 85 Small-Cap Corporations and 425 Firm Year Observations

	[1]	[2]	[3]	[4]
DIN	-0.772 (0.2146)			
DAR		-0.306 (0.1818)		
DAP			-0.324 (0.0063)*	
DWC				0.016 (0.4796)
SG	-1.16 (0.5472)	-1.08 (0.5744)	-1.06 (0.5787)	-1.08 (0.5762)
DA	23.38 (0.6458)	22.32 (0.6610)	41.38 (0.4150)	34.97 (0.5033)
Adjusted R-square	.50%	.56%	1.18%	.26%

Notes to Regression Table: The industry is categorized according to the Global Industry Classification Standard (GICS) for the Energy sector.

- p-values (robust for heteroscedasticity) in parentheses.
- (*) = significant at the 99% confidence level
- (**) = significant at the 95% confidence level
- (***) = significant at the 90% confidence level
- OLS regression includes the following variables:
- Number of days inventories (DIN) is (inventories x 365)/sales.
- Number of days of accounts receivable (DAR) is (accounts receivable x 365)/sales.
- Number of days accounts payable (DAP) is (accounts payable x 365)/sales.
- Days of Working Capital (DWC) is (DAR + DIN – DAP).
- Sales Growth (SG) is (current revenues – last year's revenues)/last year's revenues.
- Debt to Total Assets (DA) is (financial debt/total assets).

Within Panel A, the large cap firms show a negative relationship between the days of inventory (DIN) and enterprise value (EV) that is consistent with the hypothesized directional effect. An increase in the days of inventory held reduces cash in-flows that would impede the covering of non-operational accounts. The coefficient is not significant, however. The average days-to-collect on trade receivables (DAR) has a statistically insignificant positive sign that is not consistent with the expected direction. It is possible that the less profitable firms seek to increase their credit sales even if it extends the days' sales outstanding (DeLoof, 2003). The average number of days that the large caps take to pay their trade payables (DAP) has the expected positive sign. The ability to extend their payments to supplier-creditors generates capital to improve the enterprise value. It was not statistically significant. The days of the working capital cycle, the net of DIN, DAR, and DAP, displays the expected hypothesized negative direction and is significant at the 10% level. A net increase in the number of days that funds must be committed to maintaining working capital will cause the core cash flows within the enterprise value to decline. It does not strengthen the enterprise value as there is less cash to apply towards the reduction of debt and other non-operating accounts. The control variable, sales growth, reveals a negative value that is significant at a 5% level. Agreeing with the model expectations, the implication is that growing sales place an increasing burden on the working capital of the firm. Maintaining efficiencies become more difficult and require a redirection of funds. The negative sign of the debt control variable agrees with the hypothesized direction as an increase in debt makes the firm more costly to acquire. It is significant at a 1% level.

Within Panel B, the mid cap companies reflect the hypothesized directional effect for each of the components of the working capital cycle and the net cycle itself. There is a negative relationship between the average days that inventory is held (DIN) and enterprise value (EV) as an increase in this independent variable reduces cash inflows that would impede the covering of non-operational accounts. The coefficient is not significant. The average days-to-collect on trade receivables (DAR) has a statistically insignificant negative sign. This negative direction is consistent with the idea that increasing the number of days that a company allows others to use their money puts a drain on a firm's funds available to cover non-operational items such as debt. The average number of days that the mid-caps take to pay their trade payables (DAP) has the expected positive sign but it is not statistically significant. Their ability to extend their payments to supplier-creditors generates capital to improve the enterprise value. Consistent with the large-cap results, the days of the net working capital cycle (DWC) for the mid-cap firms carries the expected hypothesized negative sign and is significant at a 5% level of confidence. The implication is that firms that allow their working capital cycle to increase, face a situation of having to earmark more of their cash to maintain their working capital needs and that will ultimately reduce their excess cash. Similar to the results for large-cap companies, an increase in the net number of days that a corporation must commit its cash to working capital requirements hinders its ability to cover non-operational accounts in the enterprise value. The sales-growth control variable was negative and statistically significant at the 1% level. As a firm experiences growing sales, it must be accompanied by increasing working capital needs.

This situation puts additional demands on excess cash that could have been part of the enterprise value. The debt control variable has an insignificant positive value. The expected sign was negative.

The regression results for the small-cap companies of the energy sector, found in Panel C, reported none of the components within the four regression models as having any statistical significance. The independent variables of DIN and DAR reported anticipated negative directional effects while the SG control variable had an expected negative sign. The adjusted R-square figures are substantially lower than those found for large-cap and mid-cap firms. This data sample started out with 304 companies and filtered down to 85. The majority of lost firms were due to their lack of inventory and/or an enterprise value. Small-cap firms tend to have limited access to long-term capital markets and experience relatively poor working capital management (Padachi 2006). Internal factors such as skills of management, the workforce, and financial management practices may cause differences within an industry group and are likely to have led to the results seen here (Shin and Soenen, 1998; DeLoof, 2003). Howorth and Westhead (2003) looked at a sample of small companies in the UK and divided it into four types of companies based on their attention to the process of managing their working capital needs. The fourth type were firms that did not follow any working capital management routines. The small-cap firms tend to focus only on the management of working capital that is expected to improve marginal returns.

CONCLUSION

Much of financial literature on working capital management has centered on its relationship with the profitability of the firm. The majority of research finds that there exists a significant negative relationship between the two variables as increases in the components of the working capital cycle reduce the cash flows available to the company and subsequently lead to a reduction in profits. Teruel and Solano (2007) argue that profits are enhanced when firms pay suppliers on time, collect receivables early, and keep inventory in stock for shorter periods of time. The finding of a negative relationship has been consistent given various definitions of profitability. Lazaridis and Tryfonidis (2006) and DeLoof (2003) and Shin and Soenen (1998) measured it through gross operating profit. Uyar (2009) and Padachi (2006) chose the return on assets to test for the correlation with the cash conversion cycle.

Missing from the literature is the focus on whether the efficient management of working capital impacts market value in a significant manner. Mohammed and Saad (2010) proxy firm value with Tobin's Q and found a significant negative relationship with a firm's cash conversion cycle. This paper supports and extends the financial literature by incorporating the components of the net working capital cycle as proxies for working capital efficiencies and interjects the more robust enterprise value (EV) as the market value proxy. While it is beyond the scope of this paper to empirically test an enterprise value option model, this study still contributes to the real options literature. When a firm encounters an investment opportunity, it's analogous to a call option as the company has the right, but not the obligation, to acquire the operating assets of another company. The enterprise value (EV) metric allows an equity investor to assess the firm on the same basis as an acquirer in a merger-acquisition transaction. Unlike the Tobin's Q used by Mohammed and Saad (2010), the enterprise value represents the 'right' to buy a firm's core cash flow. It actually represents the acquisition cost of the firm. As such, it incorporates not just the market capitalization but also the net debt and all claims pertaining to preferred stock and non-controlling minority interests as well.

This paper finds a significant negative relationship between the net working capital cycle and the enterprise value for both large-cap and mid-cap firms within the energy sector. An increase in the length of time that funds are committed to maintaining the net working capital position (cash outlay and cash recovery) can lead to the erosion of the firm's core cash flow and enterprise value. Many companies still underestimate the importance of improving the handling of their working capital accounts as a way to free-up cash. Upon finding optimum efficiencies of working capital, the cash flows improve and result in releasing capital from the balance sheet. Reducing the funds employed in working capital leads to asset productivity. Having this financial flexibility, allows a company to pare down non-operational items such as debt that make a firm more costly and in turn impact a company's enterprise value.

The results of this paper highlight the importance for the management of a company to maintain working capital efficiencies to insure improvement in an enterprise's core cash flow. From the perspective of the investor-acquirer, the acquisition cost of a company is directly impacted and it shows why they need to pay attention as to how well firms simultaneously turn over their inventories, collect on trade receivables, and service their trade creditors. Here, the enterprise value represents an option on the assets of the firm where the value of the claims on a firm's excess cash flows act as the strike price. An investor infers either that the enterprise value option is becoming expensive (out-of-the-money) or the enterprise value option is becoming less expensive (in-the-money) and acts upon this through a short sale or purchase, respectively.

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