AN ANALYSIS OF CASH FLOW: PREDICTIVE MODEL OF FUTURE DYNAMICS

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ABSTRACT

The importance of cash flow forecasting cannot be understated, with this relating to the prediction of future cash surpluses or deficiencies along with general health of the company and more broadly national and global economies. The main aim of this study was to develop predictive models of cash flow forecasting which can be used by businesses in order to build and implement predictive models of future dynamics. This study compiled annual data from the last 10 years of operation of three US corporations in order to build predictive models in which the outcomes of future profit/loss, current ratio, debt to equity ratio, depreciation, interest expense, and cash flow from operations are predicted on the basis of total cash flow. Initial diagnostics determined whether linear regression, fixed-effects panel regression, or random-effects panel regression was used in each individual model conducted. Results found total cash flow to generally have a very high level of predictive power with regard to these outcome measures analyzed. Additionally, the factor of industry was found to be a significant moderator in some cases. These results suggest the high degree of ability to predict these outcomes on the basis of total cash flow.

Keywords: *Cash Flow, Predicting Cash Flow, Profits , Losses.*

1. INTRODUCTION

Cash flow forecasts can be instrumental in predicting future cash surpluses or deficiencies and can allow business leaders to make the correct planning decisions to account for these future changes. It can assist in employee decision-making, as well as planning for present and future purchases, and the opening or closing of retail and factory locations. This may also assist business leaders in issues relating to the use of credit. By utilizing cash flow forecasting, it is possible to foresee the impact of a forthcoming business change or the impact of present or future business practices. If one was thinking of contracting another representative for instance, he or she would include the extra compensation and related expenses into their estimates. The new figures in one's income projections would inform him or her in the case of contracting that the extra representative may put their business in a more grounded position and enable them to choose whether to employ them or not. By considering best-case as well as worst-case scenarios as it relates to cash flow projections, business leaders can estimate how the business will progress in the event that they abruptly encounter extreme circumstances or changing conditions. Knowing how this impacts a businesses' fiscal position enables them to make informed and judicious choices and will sharply increase the likelihood of their business remaining not just solvent, but profitable. This research investigates the ways in which cash flow forecasting can be used in order for businesses to build and implement predictive models of future dynamics.

2. PROBLEM BACKGROUND

The importance of corporate health to the national and global economy cannot be overemphasized. Corporate performance can be the cause of recessions and depressions, and similarly, can also be the cause of unparalleled economic growth. The major factor behind corporate health consists of cash flow, with healthy businesses essentially being defined as those with large positive cash flows which are consistent and reliable. Similarly, corporations that are seen to be in poor health are characterized in that way on the basis of having a low, zero, or negative cash flow, or a cash flow that is unreliable or intermittent. This would suggest the importance of studying cash flow in general, but also determining ways in which cash flow can be reliably predicted. Closely related to cash flow are corporate profits and losses, and due to this close relation, additional research should be conducted in order to predictably model profits and losses in order to provide additional predictive models of corporate health, which could then potentially be used in order to anticipate economic upswings and downturns. Specifically, this study examined, as its problem statement, cash flow transparency in governance.

Being able to better predict cash flow, profits, and losses also serves to assist business owners themselves, as well as individuals responsible for the financial success of the corporation. If the use of predictive models provides a prediction of high or higher cash flow in the future, business leaders can then use this information to plan the next few years of their operation accordingly. An expectation of substantial cash flow could lead business leaders to anticipate expansion, which could involve the purchase of additional machinery, real estate, the opening

of new locations, the hiring of additional employees, or potentially even branching out into new areas. With additional cash flow, businesses in any industry can look to expand and grow. Similarly, if low or reduced cash flow is expected on the basis of these predictive models, business leaders can then take the appropriate steps in order to plan for this eventuality. No business wants to contract, though regardless of managerial expertise, corporate skills, or planning, this will happen due to the boom and bust cycles of the economy. Businesses can best plan for this by taking the appropriate steps early in order to get through these more difficult periods. For example, if low or reduced future cash flow is predicted on the basis of one of these models, then businesses can work to optimize their efficiency, as well as save cash for the future in order to continue their operations during these more difficult time periods. They can also make changes to the operation of their business. For example, by reducing the number of employees that they employ, and potentially closing down certain locations, even if temporarily, if they are not producing a profit. The results of this study could also potentially be used by investors to predict future cash flow, profits, and losses of a business. Such knowledge would enable investors to place their monies with businesses having the greatest chance of turning a profit.

The problem which this study focusedupon was also important in a broader context, as alluded to earlier, with this consisting of the global economy. As mentioned, the national as well as the global economies are characterized by cyclical boom and bust cycles. Specifically, a period of growth and expansion is then followed by a recession or depression, which is characterized by reduced business profits, higher unemployment, GDP growth which is reduced or negative, along with many other negative effects. While this study focusedon a relatively small number of specific businesses over time, the models created for the purposes of this study were predictive models that could be applied to any corporation or any number of corporations. These aimed to be more general predictive models that any company could use in order to predict their future cash flow, as well as their future profits and losses. These predictive models could similarly be used in order to predict, on a more national or global scale, future cash flow, profits, and losses for corporations more generally. This could potentially be applied in this way, as a more general predictive model, in order to determine whether any particular period of economic expansion will continue, and similarly, whether any particular recession or depression will continue for some period of time. Additionally, these models could also potentially be used in order to predict when a period of expansion will end, and similarly, when a recession or depression might end. This would help to solve an important problem relating to the national and global economies which has not yet been solved at this time. Currently, no one is able to accurately predict when a recession or depression will end, or any period of expansion, and similar to how the results of these analyses may be used in order to help business owners as well as individuals responsible for the finances of corporations, such models could help those that lead national economies to appropriately plan ahead for either periods of expansion or periods of contraction.

It is a typical perspective among investors to develop an assumption that when a business enterprise has produced a positive cash flow in the past that there is a high probability that it will continue to do so (Ilmanen, 2011) [7]. Nonetheless, it is not enough to just assume this. Predictive models must be generated in order to predict the future cash flow of one's business, and it appears that this can best be done through the use of financial statements. Financial accounting does not necessarily make predictions regarding the future of businesses; instead, it provides the information necessary to evaluate the health of an organization. While important, simply knowing about the current health of an organization does not serve to assist business leaders in the prediction of future dynamics, including the prediction of future cash flow. Instead, cash flow in and of itself appears to be very unpredictable. The cash-flow statement often represents the positive and/or the negative aggregate fiscal change in one's business every year and incorporates the working, contributing, and financing exercises. These metrics are utilized in order to assess the manageability and long-term productivity of businesses. Immediate or indirect bookkeeping techniques might be utilized for these same purposes. This current technique involves summing all cash receipts from operations and cash payments, with this strategy being broader and depending upon the net salary of the business in question. However, overall, these two techniques should yield a similar outcome. Some investors utilize exchanges in an attempt to predict future cash flows. Money is produced from working, contributing, and financing exchanges. Working incorporates income from the trading of products and ventures for money or credit. Venture exchanges influence non-current records and long haul buys (e.g., hardware or land). Financing exchanges incorporate those that influence proprietorship value and obtaining long-haul obligations. The annual money-related concerns speak to the present market estimation of the business' benefits and liabilities. Additionally, cash flow statements are utilized by leasers to evaluate the business' capacity to meet installment necessities, both in the present as well as in the future (Robinson, Henry, Piriw, & Broihahn, 2015) [11]. This information is also used by banks in order to determine a businesses' capacity to continue meeting its present commitments, as well as its future ones. Investors also use this information in order to predict whether the business is likely going to continue paying its current dividends, or if this amount is expected to decrease or increase in the future.

Potential threats to the business versus returns also play a significant role here. Wealthy investors speculate as to where to invest their cash by dissecting a venture's potential hazard and returns. Expected returns consist of the potential future benefits, while hazard is the level of vulnerability relating to the future manageability of a business, in light of the fact that there are truly no assurances. With respect to the majority of speculative investments such as these, a range of various future returns are conceivable (Subramanyam, 2014) [12]. Partnerships are lawfully required to file public reports relating to their money-related exposures and are also managed by the United States Securities and Exchange Commission that audits all announcements in order to check for and guarantee accuracy. Figure 1 illustrates a sample cash flow statement. This particular cash flow statement is taken from Microsoft for the 2011 through the 2015 tax year (Wikiinvest, n.d.) [12].

Cash Flow Statement (USD) **Annual** | Quarterly

FISCAL YEAR ENDING	30-JUN 2011	30-JUN 2012	30-JUN 2013	30-JUN 2014	30-JUN 2015
Net Income	23.1B	17.0B	21.9B	22.1B	12.2B
Depreciation	2.77B	2.97B	3.75B	5.21B	5.96B
Amortization	0	0	0	0	0
Deferred Taxes	2.00M	954M	-19.0M	-331M	224M
Change In Working Capital	-3.00B	-174M	-1.38B	624M	1.51B
Other Non Cash Operating Items	4.08B	10.9B	4.61B	4.65B	9.19B
Cash From Operations	27.0B	31.6B	28.8B	32.2B	29.1B
Capital Expenditures	-2.35B	-2.31B	-4.26B	-5.49B	-5.94B
Sale of Assets	0	0	0	0	0
Acquisitions	-71.0M	-10.1B	-1.58B	-5.94B	-3.72B
Investments	-13.2B	-12.0B	-17.8B	-12.6B	-12.9B
Other Investing Activities	-1.33B	-2.70B	-4.42B	-300M	-6.41B
Cash from Investing	-14.6B	-24.8B	-23.8B	-18.8B	-23.0B
Dividends Paid	-5.18B	-6.38B	-7.46B	-8.88B	-9.88B
Sale / Purchase of Stock	-9.13B	-3.12B	-4.43B	-6.71B	-13.8B
Net Borrowings	5.96B	0	3.54B	6.96B	9.18B
Other Financing Cash Flows	-23.0M	93.0M	199M	232M	5.43B
Cash From Financing	-8.38B	-9.41B	-8.15B	-8.39B	-9.08B
Foreign Exchange Effect	103M	-104M	-8.00M	-139M	-73.0M
Net Change in Cash	4.11B	-2.67B	-3.13B	4.87B	-3.07B

Figure 1. Microsoft cash flow statement, 2011 through 2015.

Cash flows from working exercises are derived, fundamentally, from the key sources of income relating to the exercises themselves. Along these lines, they for the most part result from the exchanges and different events that are the cause of these profits or losses. The measure of cash flow derived from these working exercises relates strongly to the degree to which the operations create adequate money streams in order to reimburse advances, maintain the working capacity of the element, pay profits, and allow for new ventures without a plan of action requiring outside financing. Data relating to the particular segments of recorded working cash flow arehelpful, in conjunction with other data, in estimating future working cash flow.

Several cases of cash flows derived from working exercises include the following: (a) cash receipts from the offer of products and the rendering of administrations; (b) money receipts from expenses, commissions, and other income; (c) money installments to providers for products and enterprises; (d) money installments to and for the benefit of representatives; (e) money receipts and money installments for premiums and cases, annuities and other arrangement benefits; (f) money installments or discounts of wage charges unless they can be particularly related to financing and contributing exercises; (g) and money receipts and installments from contracts held for managing or exchanging purposes.

3. HYPOTHESES

Hypothesis 01: Current cash flow is not positively associated with future cash flow.
Hypothesis A1: Current cash flow is positively associated with future cash flow.
Hypothesis 02: Current cash flow is not positively associated with future profits and reduced future losses.
Hypothesis A2: Current cash flow is positively associated with future profits and reduced future losses.
Hypothesis 03: The relationship between current and future cash flow does not vary by industry.
Hypothesis A3: The relationship between current and future cash flow varies by industry.

Hypothesis 04: The relationship between current cash flow and future profit/loss does not vary by industry.
Hypothesis A4: The relationship between current cash flow and future profit/loss varies by industry.

4. LITERATURE REVIEW

The theoretical framework which this study is based on is derived from literature focusing upon cash flow transparency. One study, focusing upon the relationship between voluntary disclosure and corporate governance structures, sought to test a theoretical framework which incorporated the corporate governance attributes of the proportion of independent directors to the total number of board directors, whether a voluntary audit committee exists, whether dominant personalities are present, and the percentage of board members who are family members (Ho & Wong, 2001) [6]. These researchers found that voluntary disclosure was significantly more likely in cases where an audit committee is present, while a higher percentage of family members on the board was associated with a significantly reduced likelihood of voluntary disclosure (Ho & Wong, 2001) [6].

A second study examining this issue focused upon the factors that are most important in voluntary disclosure among companies in Italy and the United States (Boesso & Kumar, 1988) [2]. Among the factors analyzed, those found to be important included the information needs of investors, company emphasis on stakeholder management, intangible assets, and market complexity, with these factors being associated with the volume and quantity of voluntary disclosures (Boesso & Kumar, 1988) [2].

4.1 CASH FLOW

Much work has been done previously focusing specifically on the aspect of cash flow in businesses. In any corporation, the importance of positive cash flow cannot be overemphasized. Cash is necessary at certain points within the lifecycle of businesses, and this can relate to business expansion, the necessity of cash in order to fully take advantage of business growth, or in order to make up for previous shortfalls which may be due to the nuances of the corporation's particular industry or larger national or global economic downturns (O'Berry, 2010) [10]. There is a great degree of fundamental financial and economic theory that directly pertains to success in businesses, and more specifically, to positive cash flow. While businesses can be said to have many potential objectives, one of these objectives is to simply generate more cash, or in other words, create and maintain a healthy, positive cash flow (Jury, 2012) [8]. While the conception of profit or gain is more abstract, cash flow can be more easily and discretely defined. For example, the cash flow of a simple trading business can be diagrammed as shown in Figure 1.

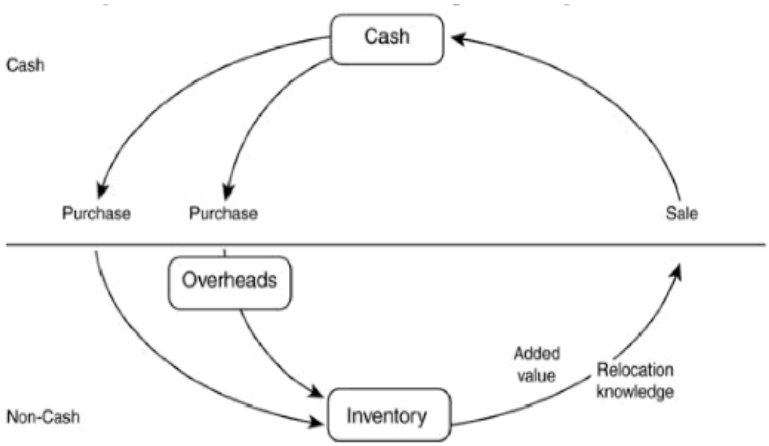

Figure 2. First model of cash flow.

As shown in Figure 2, cash is used for the purpose of purchases, which includes inventory as well as overheads (Jury, 2012) [8]. Value is then added to this inventory, which is then sold, then generating more cash. This is a circular process in which this new cash is then used for the purchase of additional inventory and also to pay for the company's overheads. Of course, this process is generally much more complex. With respect to a simple manufacturing business, for example, value is added when the manufacturer transforms their purchased raw materials into something that has greater value by adding utility. A diagram illustrating cash flow in a manufacturing business is presented in Figure 2. As shown, cash is used for the purchase of overheads and raw materials, and after value is added, the finished goods are then sold in order to generate more cash, and so on. In this type of business, overheads may include costs pertaining to purchasing, manufacturing, the premises, and selling (Jury, 2012) [8].

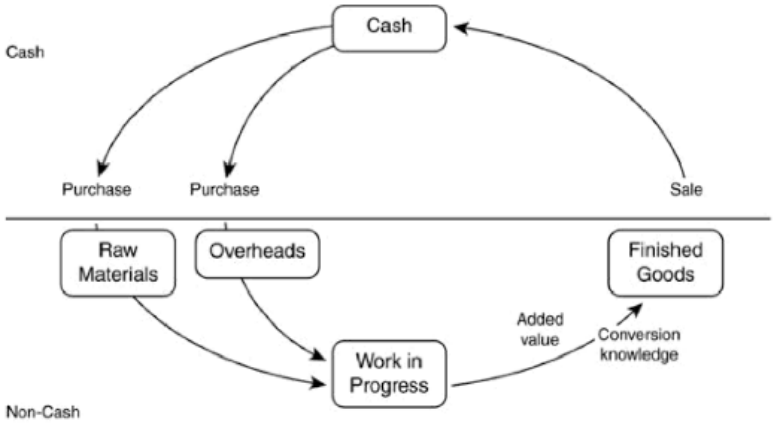

Figure 3. Second model of cash flow.

As a small business begins to grow, the next addition that would be made to this cash flow cycle would consist of adding labor to the business which would serve to increase output and further increase cash flow (Jury, 2012) [8]. This additional cash flow would be obtained by the positive difference between the added value and the additional cost of labor. This would produce a cash flow cycle as shown in Figure 4. Here, the addition to the previous diagram simply consists of labor as a new purchase. In addition to, or instead of labor, machinery may also be purchased in order to help increase cash flow in a new business (Jury, 2012) [8].

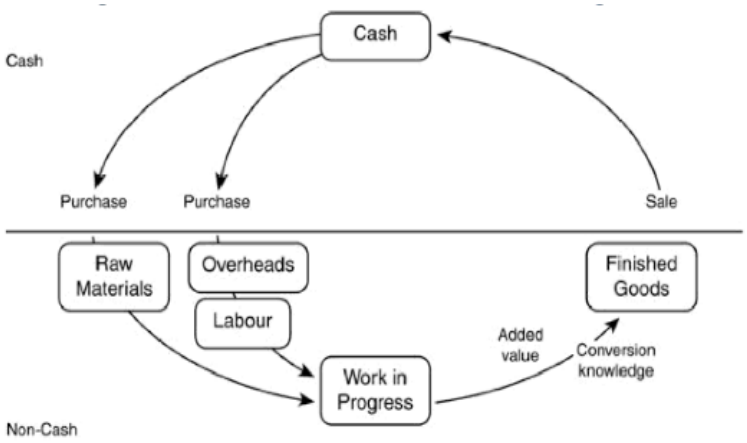

Figure 4. Third model of cash flow.

Following this, fixed assets is added to this cash flow diagram, as shown in Figure 4.

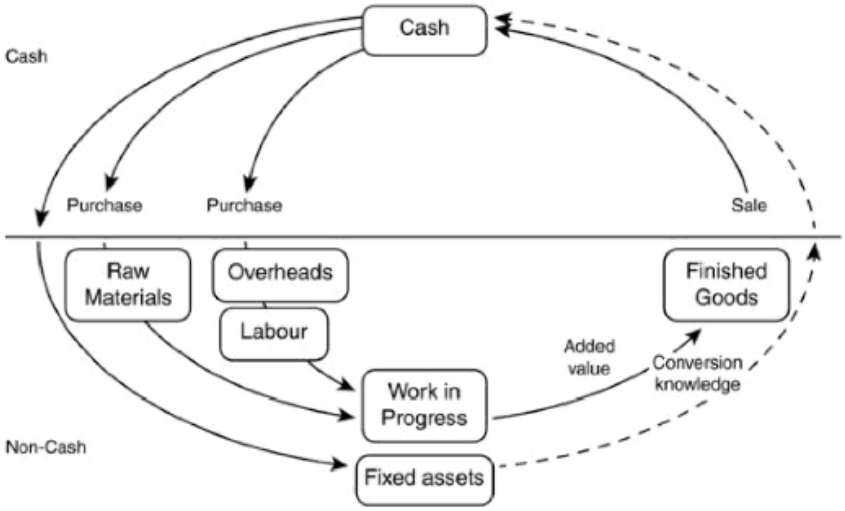

Figure 5. Fourth model of cash flow.

Next, equity and debt become incorporated into the business' cash flow diagram, as shown in Figure 6(Jury, 2012) [8]. At this stage, the ownership of the business is transferred to an independent legal entity, a company that exists as a separate entity from the individual(s) that started the company. The owner's interest in the company is represented as equity, with debt taking the form of loans or leases which may be used to acquire real estate for the business, machinery, and to create additional working capital (Jury, 2012) [8].

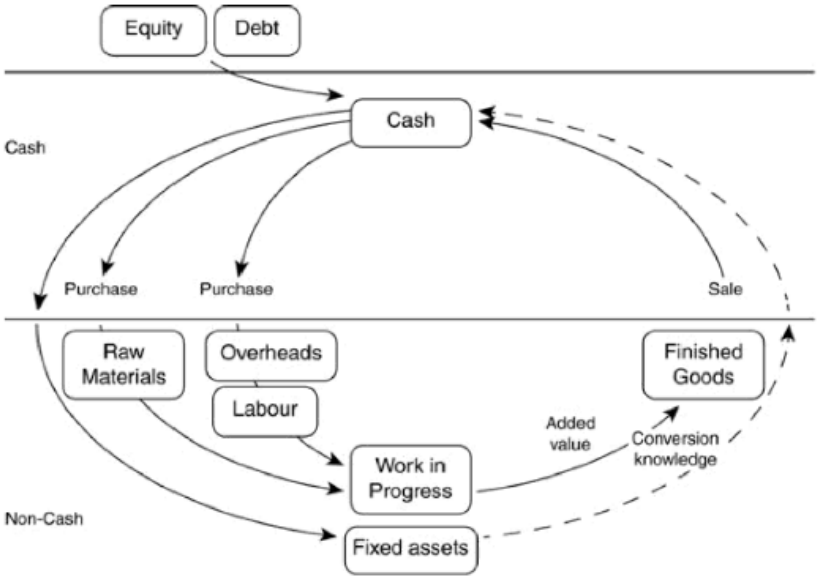

Figure 6. Fifth model of cash flow.

As debt does not come interest-free, interest becomes a new component of this cycle, as well as dividends, which are paid to shareholders, along with taxes levied on any taxable profits generated by the business. These additional components to the cash flow cycle are represented in Figure 7(Jury, 2012) [8].

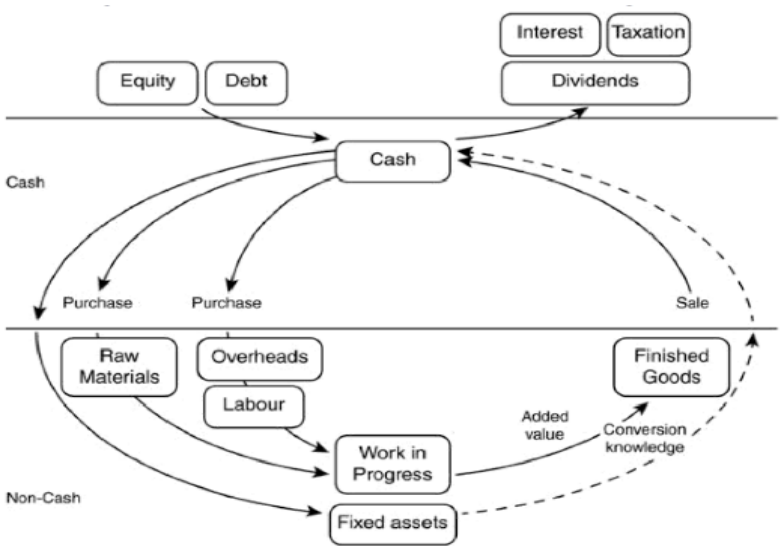

Figure 7. Sixth model of cash flow.

A final addition to the cycle consists of creditors and debtors. In the real world, a large proportion of business transactions are based on credit as opposed to cash transactions (Jury, 2012) [8]. Commonly, it takes time for a purchased item to arrive, while an item that was sold may not be paid for until sometime later. A business may take possession of materials or machinery having not yet paid for it, and in this case, the corporation which sold the business these materials or machinery becomes a creditor within this cycle. Additionally, when an item is sold and not yet paid for, this other business then becomes a debtor within this cycle. The final model, incorporating both creditors and debtors, is presented in Figure 8(Jury, 2012) [8].

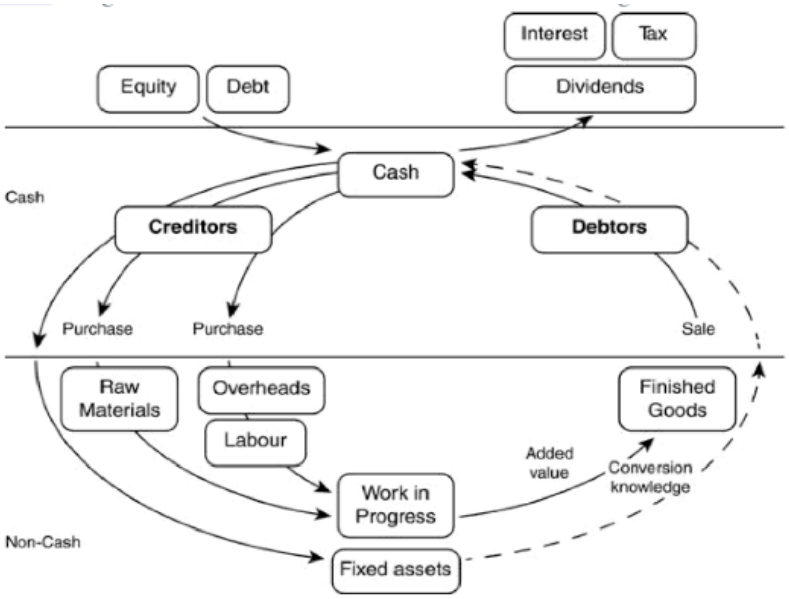

Figure 8. Final model of cash flow.

Overall, this illustrates the working capital cycle associated with any business (Jury, 2012) [8]. In summary, the purpose of the business is to maximize positive cash flow; essentially, its goal is to generate as much cash as possible in the course of going around this cash flow cycle, and this is done by generating more cash when goods or services are sold than is spent on overhead, labor, raw materials, fixed asset investments, as well as in the form of interest, dividends, taxes, debt repayment, and equity buybacks and redemptions. This cash flow is generated from successful trading, also known as the operating cash margin, from owners as equity, from lenders and other providers of cash as debt, and within the working capital cycle itself (Jury, 2012) [8]. This discussion of cash flow serves to emphasize its crucial importance within the function of business throughout the world. It is not

simply a factor or metric that is measured and analyzed among businesses; instead, it relates more closely than anything else to the primary goal and purpose of business: to maximize cash flow. This helps to illustrate the importance of this study, as because this study focuses upon cash flow and the prediction of cash flow, it serves to delve into the most important factor relating to business.

4.2. PROFITS AND LOSSES

With respect to profits, this is defined as the difference between total revenue andthe earnings from sales and total costs (Banerjee, 2014) [1]. With π as profits, *TR* as the total revenue, and *TC* as the total cost, this can be represented in the following way:

$\pi = TR - TC$

Additionally, the total revenue can be represented as p x q, with q representing the units of output, and with q representing the per-unit price. With total cost represented as the following cost function: $c(q)$, the profit can be represented as a function of the output, as shown here: $\pi(q) = pq - c(q)$.

Additionally, a normal profit margin is expected to be contained within the cost function, with this normal profit margin representing the business owner's opportunity cost, or the minimum amount of money that allows the business to continue to operate. When profits are equal to zero, then the revenues are equal to the sum of the operating expenses, overhead, and the business owner's compensation, assuming that this normal profit margin is incorporated into the total costs. Based on these definitions, nominal profits are present when $\pi = 0$, with supernormal profits being present when $\pi > 0$, and losses being present when $\pi < 0$ (Banerjee, 2014) [1].

4.3. PREDICTING CASH FLOW, PROFITS AND LOSSES

Next, a body of literature currently exists which aims to determine how future cash flow, profits, and losses can be predicted, which is in line with this study's research questions and hypotheses. One study by Greenberg, Johnson, and Ramesh (1986) focused upon whether current earnings or current cash flow was a better predictor of future cash flow, focusing on cash flow from one to five years in the future, and incorporating OLS regression models. By comparing the respective coefficients of determination, the results found that current earnings were generally a better predictor of future cash flow than current cash flow (Greenberg et al., 1986) [1]. A similar study, focusing on the ability of current earnings to predict future earnings and cash flow from operations, used time-series methods, focusing on future data from one to eight years ahead of the present data analyzed (Finger, 1994) [4]. This study found varying results. With respect to forecasts of the following year's data, the choice of the model - focusing on whether earnings or cash flow are better at predicting future cash flow - did not make much difference for 30% of the firms studied, with the earnings model being superior for 16% of the firms, and the cash flow model being superior for 54% of the firms. Focusing upon the four and eight year forecasts, the earnings model was superior for 14% of firms in both cases, with the cash flow model being superior to the earnings model for 18% and 16% of the firms, respectively. Overall, these results indicate that cash flow provides superior predictive power in the short-term, while earnings and cash flow models are similar in performance when it comes to longer-term prediction (Finger, 1994) [4].Additional research has been identified further exploring these relationships. A study by Bowen, Burgstahler, and Daley (1986) analyzed the ability of measures relating to earnings and cash flow to predict cash flow data one and two periods in the future. Of these models, predictive power on the basis of the cash flow measures was not found among four of the five measures used. However, prediction was indicated when using the measure of net income plus depreciation and amortization and working capital from operations (Bowen et al., 1986) [3]. Building upon this, some studies have attempted to add additional predictors in an effort to build a more predictive model. One study, by Lorek and Willinger (1996), attempted this through the use of multivariate time-series models. Within this study, earnings, short-term accruals, and cash-flows were used for the purposes of predicting cash-flow data. They found that the incorporation of earnings and accrual accounting data served to improve the predictive power of the model. The predictive power of their model was such that it was found to outperform those found in previous research which used ARIMA models as well as regression models (Lorek & Willinger, 1996) [9]. This study suggests that not only is cash flow predictable, but that additions to the model may serve to further improve the accuracy by which cash flow can be predicted.

5. THE STUDY MODEL

The following conceptual diagram illustrates the main focus of interest within this study. As shown, current cash flow is expected to predict future cash flow as well as profit/loss.

Independent Variable **Dependent Variable**

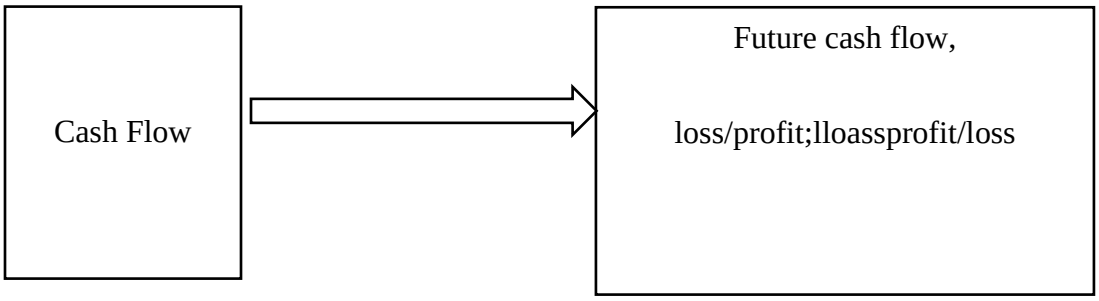

*Figure 9.*Conceptual diagram for this study.

5.1. POPULATION AND SAMPLING PROCEDURES

First, this study incorporated the use of convenience sampling (Gravetter & Forzano, 2011) [5]. Specifically, this relates to companies being chosen for analysis and included in this study on the basis of convenience as opposed to on the basis of an alternate sampling methodology, such as random sampling (Gravetter & Forzano, 2011) [5]. While this limits the external validity and generalizability of the results obtained (Gravetter & Forzano, 2011) [5], this sampling methodology was felt to be appropriate with respect to this current study as it can adequately answer this study's research questions and test its hypotheses, while it was also felt that the use of a random sampling methodology would be beyond the scope of this study, though could potentially be used for a much larger-scale, future study. For the purposes of comparison, companies from three industries were selected. Large companies will be focused upon as these represent a larger proportion of the total market in the United States.The three companies selected for inclusion within this study's sample consisted of Amazon, General Electric, and Tesla.Within each company selected for inclusion within this study, the previous 10 years of data were selected for analysis.

6. STATISTICAL ANALYSIS

6.1. DESCRIPTIVE STATISTICS

Initially, a series of descriptive statistics were conducted on these data. As all variables included in this study were continuous, measures of central tendency and variability were calculated and reported, with the measure of central tendency consisting of the mean, with the measures of variability consisting of the standard deviation, minimum and maximum values, and range. The results of these initial analyses are presented in Table 1. First, with regard to Amazon, this company had a mean operating cash flow of 7568.200 (SD = 5915.400), with a mean free cash flow of 3678.300 (SD = 3051.443). The mean debt to equity ratio was found to be .364 (SD = .314), with current ratio found to have a mean of 1.160 (SD = .116). Accumulated depreciation was found to have a mean of -5678.500 (SD = 6401.054), with interest expense having a mean of 244.300 (SD = 269.073). Next, working capital was found to have a mean of 2384.400 (SD = 621.449), with gross profit having a mean of 15682.300 (SD = 11826.540). Finally, net income from continuing operations was found to have a mean of 932.400 (SD = 1031.279). Next, with regard to General Electric, this company was found to have a mean operating cash flow of 26036.900 (SD = 13646.380), with a mean free cash flow of 14853.600 (SD = 11250.120). Debt to equity ratio was found to have a mean of 3.041 (SD = 1.045), with current ratio found to have a mean of 2.090 (SD = .495). Next, accumulated depreciation had a mean of -41355.000 (SD = 6694.786), with interest expense found to have a mean of 12096.900 (SD = 7090.623). Following this, working capital was found to have a mean of 181638.900 (SD = 110896.700), with gross profit found to have a mean of 64485.400 (SD = 23041.570). Finally, net income from continuing operations had a mean of 10832.700 (SD = 7382.554). With respect to Tesla, this company had a mean operating cash flow of -114.900 (SD = 194.613), with a mean free cash flow of 1003.800 (SD = 1318.048). Debt to equity ratio was found to have a mean of 1.493 (SD = 1.290), with current ratio having a mean of 1.411 (SD = .694). Next, accumulated depreciation had a mean of -387.800 (SD = 571.663), with interest expense found to have a mean of 93.100 (SD = 149.162). Working capital had a mean of 129.300 (SD = 561.985), with gross profit found to have a mean of 621.500 (SD = 780.093). Finally, net income from continuing operations was found to have a mean of -521.400 (SD = 669.854).

Table 1

Descriptive Statistics

Measure	Mean	*SD*	Min	Max	Range
Amazon					
Operating Cash Flow	7568.200	5915.400	1697.000	18434.000	16737.000
Free Cash Flow	3678.300	3051.443	395.000	9706.000	9311.000
Debt to Equity Ratio	.364	.314	.021	.893	0.872
Current Ratio	1.160	.116	1.040	1.330	0.290
Accum. Depreciation	-5678.500	6401.054	-19707.000	-555.000	19152.000
Interest Expense	244.300	269.073	34.000	848.000	814.000
Working Capital	2384.400	621.449	1411.000	3375.000	1964.000
Gross Profit	15682.300	11826.540	4270.000	40683.000	36413.000
Net Inc. from Cont. Op.	932.400	1031.279	-241.000	3033.000	3274.000
General Electric					
Operating Cash Flow	26036.900	13646.380	-244.000	48601.000	48845.000
Free Cash Flow	14853.600	11250.120	-7443.000	32591.000	40034.000
Debt to Equity Ratio	3.041	1.045	1.796	5.004	3.208
Current Ratio	2.090	.495	1.124	2.764	1.640
Accum. Depreciation	-41355.000	6694.786	-47989.000	-28158.000	19831.000
Interest Expense	12096.900	7090.623	3463.000	26209.000	22746.000
Working Capital	181638.900	110896.700	17921.000	316579.000	298658.000
Gross Profit	64485.400	23041.570	30158.000	98743.000	68585.000
Net Inc. from Cont. Op.	10832.700	7382.554	-5748.000	18089.000	23837.000
Tesla					
Operating Cash Flow	-114.900	194.613	-524.000	258.000	782.000
Free Cash Flow	1003.800	1318.048	-4142.000	-6.000	4136.000
Debt to Equity Ratio	1.493	1.290	-.275	3.616	3.891
Current Ratio	1.411	.694	.352	2.744	2.392
Accum. Depreciation	-387.800	571.663	-1724.000	-7.000	1717.000
Interest Expense	93.100	149.162	.000	471.000	471.000
Working Capital	129.300	561.985	-1104.000	1092.000	2196.000
Gross Profit	621.500	780.093	-1.000	2222.000	2223.000
Net Inc. from Cont. Op.	-521.400	669.854	-2241.000	-56.000	2185.000

6.2. REGRESSION MODELS

Initially, a series of random-effects panel regression models were conducted with Breusch and Pagan Lagrangian multiplier tests for random effects. These tests were conducted in order to determine whether there were significant random effects, and therefore that panel regression should be conducted instead of linear regression. The results of these analyses are presented in Table 2. With regard to the measure of operating cash flow, statistical significance was indicated with respect to the models incorporating debt to equity ratio, accumulated depreciation, and interest expense. In these three cases, significant random effects were found, suggesting that panel regression should be used as opposed to linear regression. In the remaining four cases, linear regression was used as no significant random effects were found. Next, with regard to free cash flow, significant random effects were found with respect to debt to equity ratio, accumulated depreciation, interest expense, working capital, and gross profit. In these five cases, panel regression was used as significant random effects were found, while with respect to net income from continuing operations and current ratio, linear regression was used as there were no significant random effects. A series of Hausman tests were then conducted in order to determine whether fixed or random effects panel regression would be more appropriate, if panel regression was in fact indicated on the basis of the Breusch and Pagan Lagrangian multiplier tests for random effects conducted.

Table 2
Breusch and Pagan Lagrangian Multiplier Tests for Random EffectsMeasureOperating Cash FlowFree Cash Flow
χ^2 (*df*)χ^2 (*df*)

Debt to Equity Ratio	21.19*** (1)	19.98*** (1)
Accumulated Depreciation	14.92*** (1)	21.22*** (1)
Interest Expense	5.44** (1)	9.49** (1)
Working Capital	1.50 (1)	4.11* (1)
Gross Profit	1.77 (1)	7.75** (1)
Net Inc. from Continuing Ops.	.02 (1)	.39 (1)
Current Ratio	1.18 (1)	1.77 (1)

Note. *p<.05, **p<.01, ***p<.001.

Table 2 presents the results of the linear and panel regression analyses conducted on these data. First, both operating cash flow as well as free cash flow were found to significantly impact debt to equity ratio, with the corresponding coefficients both found to be positive and very similar in size. Specifically, a one unit increase in operating cash flow was found to increase the debt to equity ratio by $6.010*10^{-5}$ units, while a one unit increase in free cash flow was found to increase the debt to equity ratio by $7.110*10^{-5}$ units. Next, with regard to accumulated depreciation, both operating cash flow and free cash flow were found to have significant and negative effects upon this outcome. Specifically, a one unit increase in operating cash flow was found to be associated with a -.561 unit decrease in accumulated appreciation, while a one unit increase in free cash flow was associated with a .634 unit decrease in accumulated depreciation.

Both measures of cash flow were also found to have significant and positive impacts upon the outcome of interest expense. First, with regard to operating cash flow, a one unit increase in operating cash flow was found to be associated with a .384 unit increase in interest expense, while a one unit increase in free cash flow was found to be associated with a .506 unit increase in interest expense. With respect to working capital, both measures of cash flow were again found to have positive and significant impacts upon this outcome. First, with regard to operating cash flow, a one unit increase in operating cash flow was found to be associated with a 6.149 unit increase in working capital, while a one unit increase in free cash flow was found to be associated with a 5.376 unit increase in working capital. Similar results were found with respect to gross profit, with both operating and free cash flow found to significantly and positively impact the outcome of gross profit. First, with regard to operating cash flow, a one unit increase in operating cash flow was found to be associated with a 2.156 unit increase in the outcome of gross profit, while a one unit increase in free cash flow was associated with a 1.819 unit increase in gross profit. Similar results were also found with respect to the effect of cash flow on net income from continuing operations. In both cases, cash flow was found to have a positive and significant effect upon this outcome. Specifically, a one unit increase in operating cash flow was found to be associated with a .407 unit increase in net income from continuing operations, while a one unit increase in free cash flow was found to be associated with a .567 unit increase in net income from continuing operations. The final set of models focused upon current ratio, with both measures of cash flow found to have a significant and positive impact upon this outcome. First, a one unit increase in operating cash flow was found to be associated with a $2.040*10^{-5}$ unit increase in current ratio, while a one unit increase in free cash flow was found to be associated with a $3.040*10^{-5}$ unit increase in current ratio.

Table 3

Linear and Panel Regression AnalysesMeasureCoef.SEz or t

Debt to Equity Ratio			
Operating Cash Flow[1a]	$6.010*10^{-5}$	$1.800*10^{-5}$	3.34**
Constant	.961	.742	31.30**
Free Cash Flow[1h]	$7.110*10^{-5}$	$2.390*10^{-5}$	2.98**
Constant	1.217	.731	1.66
Accumulated Depreciation			
Operating Cash Flow[1b]	-.561	.082	-6.82***
Constant	-9629.650	4042.220	-2.38*
Free Cash Flow[1i]	-.634	.143	-4.42***
Constant	-12094.190	4215.032	-2.87**
Interest Expense			
Operating Cash Flow[1c]	.384	.055	6.93***
Constant	-139.348	1659.128	-.08
Free Cash Flow[1j]	.506	.071	7.13***
Constant	1188.532	1634.439	.73
Working Capital			
Operating Cash Flow[2d]	6.149	.859	7.16***
Constant	-7264.153	15152.270	-.48
Free Cash Flow[3k]	5.376	1.525	3.53**
Constant	29973.990	13244.410	2.26*
Gross Profit			
Operating Cash Flow[2e]	2.156	.120	17.89***
Constant	2860.540	2126.407	1.35
Free Cash Flow[3l]	1.819	.246	7.40***
Constant	16301.710	2134.034	7.64***
Net Income from Continuing Operations			
Operating Cash Flow[2f]	.407	.046	8.76***
Constant	-797.018	819.760	-.97
Free Cash Flow[2m]	.567	.079	7.22***
Constant	435.590	858.885	.51
Current Ratio			
Operating Cash Flow[2g]	$2.040*10^{-5}$	$7.560*10^{-6}$	2.70*
Constant	1.326	.133	9.94***
Free Cash Flow[2]	$3.040*10^{-5}$	$1.120*10^{-5}$	2.72*
Constant	1.376	.122	11.28***

Note. *p<.05, **p<.01, ***p<.001; [1]Random effects panel regression; [2]Linear Regression; [3]Fixed effects panel regression; [a]Wald $\chi^2(1) = 11.17$, $p< .001$; R^2 within = .2690, R^2 between = .5618, R^2 overall = .4348; [b]Wald $\chi^2(1) = 46.53$, $p< .001$; R^2 within = .6793, R^2 between = .9686, R^2 overall = .7805; [c]Wald $\chi^2(1) = 48.05$, $p< .001$; R^2 within = .5810, R^2 between = .9242, R^2 overall = .7980; [d]$F(1, 28) = 51.30$, $p< .001$; R^2 = .6469, Adjusted R^2 = .6343; [e]$F(1, 28) = 320.20$, $p< .001$; R^2 = .9196, Adjusted R^2 = .9167; [f]$F(1, 28) = 76.82$, $p< .001$; R^2 = .7329, Adjusted R^2 = .7233; [g]$F(1, 28) = 7.27$, $p< .05$; R^2 = .2061, Adjusted R^2 = .1777; [h]Wald $\chi^2(1) = 8.86$, $p< .01$; R^2 within = .2258, R^2 between = .5602, R^2 overall = .3899; [i]Wald $\chi^2(1) = 19.57$, $p< .001$; R^2 within = .4572, R^2 between = .9695, R^2 overall = .6351; [j]Wald $\chi^2(1) = 50.79$, $p< .001$; R^2 within = .6189, R^2 between = .9234, R^2 overall = .7732; [k]$F(1, 26) = 12.43$, $p< .01$; R^2 within = .3234, R^2 between = .9233, R^2 overall = .6273; [l]$F(1, 26) = 54.80$, $p< .001$; R^2 within = .6782, R^2 between = .9959, R^2 overall = .8116; [m]$F(1, 28) = 52.14$, $p< .001$; R^2 = .6506, Adjusted R^2 = .6381.

With regard to the equations associated with these models, the general fixed effects model is as follows:

$$\mathbf{Y_{it} = \beta_0 + \beta_1 X_{it} + \alpha_i + u_{it}}$$

Where:

α_i (i = 1 to n) is the unknown intercept for each entity (with n entity-specific intercepts)

Y_{it} is the dependent variable, where i represents the entity and t represents time

X_{it} is the independent variable

β_1 is the coefficient for the independent variable

u_{it} is the error term

Within these models, fixed-effects analyses were run on the working capital model with free cash flow, as well as the gross profit model with free cash flow. The equations associated with these models consisted of the following:

$\text{Working Capital}_{it} = 29973.990 + 5.376*[\textit{Free Cash Flow}]_{it} + \alpha_i + u_{it}$

$\text{Gross Profit}_{it} = 16301.710 + 1.819*[\textit{Free Cash Flow}]_{it} + \alpha_i + u_{it}$

Next, several of the analyses were conducted using random effects regression. This general model consists of the following:

$$\mathbf{Y_{it} = \beta_0 + \beta X_{it} + \alpha + u_{it} + \varepsilon_{it}}$$

Where:

u_{it}represents the between-entity error, and

ε_{it}represents the within-entity error

These models include the debt to equity ratio models on both operating cash flow and free cash flow, both accumulated depreciation models, and both interest expense models. These models can be represented using the following equations:

$\text{Debt to Equity Ratio}_{it} = .961 + 6.010*10^{-5}*[\textit{Operating Cash Flow}]_{it} + \alpha + u_{it} + \varepsilon_{it}$

$\text{Debt to Equity Ratio}_{it} = 1.217 + 7.110*10^{-5}*[\textit{Free Cash Flow}]_{it} + \alpha + u_{it} + \varepsilon_{it}$

$\text{Accumulated Depreciation}_{it} = -9629.650 + -.561*[\textit{Operating Cash Flow}]_{it} + \alpha + u_{it} + \varepsilon_{it}$

$\text{Accumulated Depreciation}_{it} = -12094.190 + -.634*[\textit{Free Cash Flow}]_{it} + \alpha + u_{it} + \varepsilon_{it}$

$\text{Interest Expense}_{it} = -139.348 + .384*[\textit{Operating Cash Flow}]_{it} + \alpha + u_{it} + \varepsilon_{it}$

$\text{Interest Expense}_{it} = 1188.532 + .506*[\textit{Free Cash Flow}]_{it} + \alpha + u_{it} + \varepsilon_{it}$

Next, several of these models were run using linear regression analysis. These equations consisted of the following:

$\text{Working Capital} = -7264.153 + 6.149*[\text{Operating Cash Flow}] + \varepsilon$

$\text{Gross Profit} = 2860.540 + 2.156*[\text{Operating Cash Flow}] + \varepsilon$

$\text{Net Income from Continuing Operations} = -797.018 + .407*[\text{Operating Cash Flow}] + \varepsilon$

$\text{Net Income from Continuing Operations} = 435.590 + .567*[\text{Free Cash Flow}] + \varepsilon$

$\text{Current Ratio} = 1.326 + 2.040*10^{-5}*[\text{Operating Cash Flow}] + \varepsilon$

$\text{Current Ratio} = 1.376 + 3.040*10^{-5}*[\text{Free Cash Flow}] + \varepsilon$

6.3. MODERATION

A set of additional models were conducted in order to test for the presence of moderation with respect to the effect of industry. Initially, as before, a series of Breusch and Pagan Lagrangian multiplier tests for random effects were conducted in order to determine whether significant random effects were present, which would necessitate the use of panel regression as compared with linear regression. In all tests conducted, a chi-square value of zero was found, along with an associated probability value equal to one. This indicates no significant random effects in any case, and therefore, that linear regression can be conducted as opposed to panel regression. Based on these results, linear regression was conducted in all cases.

Table 4 presents the results of these moderation analyses conducted. Each model incorporated either operating or free cash flow, as well as dummy variables representing the companies of Amazon and Tesla (with General Electric selected as the comparison category and omitted from these analyses), along with interactions between the companies of Amazon and Tesla and the specific measure of cash flow included in the model. First, with regard to debt to equity ratio, a significant interaction was found between both operating cash flow and free cash flow and Tesla. Both of these interactions were found to be negative. With respect to accumulated depreciation, significant interactions were found between Amazon and operating cash flow as well as free cash flow, with these interactions also found to be negative. With regard to interest expense, a significant and negative interaction was found between Amazon and operating cash flow, with no significant interactions found in the analysis conducted with free cash flow. The analyses conducted with working capital failed to find significant interactions. Similar results were found with respect to the models conducted focusing upon gross profit, with no significant interactions indicated. Finally, with regard to net income from continuing operation, no significant interactions were found here either.

Table 4
Moderation AnalysesMeasureCoef.SEt

Debt to Equity Ratio			
Operating Cash Flow[1]	6.34*10-5	1.97*10-5	3.21**
Amazon	-1.317	.716	-1.84
Tesla	-.230	.647	-.36
Amazon * Op. Cash Flow	2.51*10-5	4.96*10-5	-.51
Tesla * Op. Cash Flow	-.003	.001	-2.14*
Constant	1.391	.573	2.43*
Free Cash Flow[2]	7.82*10-5	2.31*10-5	3.38**
Amazon	-1.671	.582	-2.87**
Tesla	-.891	.528	-1.69
Amazon * Free Cash Flow	3.59*10-5	8.83*10-5	-.41
Tesla * Free Cash Flow	-.001	1.99*10-4	-2.92**
Constant	1.880	.423	4.44***
Accumulated Depreciation			
Operating Cash Flow[3]	-.397	.056	-7.09***
Amazon	33572.450	2015.926	16.65***
Tesla	30891.350	1823.324	16.94***
Amazon * Op. Cash Flow	-.660	.140	-4.72***
Tesla * Op. Cash Flow	.658	3.893	.17
Constant	-31249.180	1614.889	-19.35***
Free Cash Flow[4]	-.451	.103	-4.40***
Amazon	35013.620	2595.943	13.49***
Tesla	34746.240	2361.601	14.71***
Amazon * Free Cash Flow	-1.172	.392	-2.99**
Tesla * Free Cash Flow	.862	.881	.98
Constant	-34721.910	1899.405	-18.28***
Interest Expense			
Operating Cash Flow[5]	.424	.061	6.90***
Amazon	-1147.371	2228.719	-.51
Tesla	-969.443	2015.685	-.48
Amazon * Op. Cash Flow	-.380	.154	-2.46*
Tesla * Op. Cash Flow	-.443	4.305	-.10
Constant	1060.314	1785.124	.59
Free Cash Flow[6]	.514	.075	6.90***
Amazon	-4470.219	1874.362	-2.38*
Tesla	-4478.226	1702.740	-2.63*
Amazon * Free Cash Flow	-.446	.285	-1.56
Tesla * Free Cash Flow	-.622	.641	-.97
Constant	4462.882	1363.315	3.27**
Working Capital			
Operating Cash Flow[7]	4.506	1.381	3.26**
Amazon	-61898.350	50118.620	-1.24
Tesla	-64117.840	45327.990	-1.41
Amazon * Op. Cash Flow	-4.511	3.471	-1.30
Tesla * Op. Cash Flow	-3.836	96.814	-.04
Constant	64324.070	40143.220	1.60
Free Cash Flow[8]	5.843	1.621	3.61**
Amazon	-92412.260	40753.200	-2.27*
Tesla	-94462.910	37021.730	-2.55*
Amazon * Free Cash Flow	-5.858	6.191	-.95
Tesla * Free Cash Flow	-5.584	13.927	-.40
Constant	94851.890	29641.790	3.20**
Gross Profit			
Operating Cash Flow[9]	1.496	.163	9.16***
Amazon	-24761.610	5925.819	-4.18***

Tesla	-24938.520	5359.395	-4.65***
Amazon * Op. Cash Flow	.473	.410	1.15
Tesla * Op. Cash Flow	-1.661	11.447	-.15
Constant	255541.010	4746.369	5.38***
Free Cash Flow[10]	1.756	.250	7.02***
Amazon	-34169.460	6294.088	-5.43***
Tesla	-38318.530	5717.785	-6.70***
Amazon * Free Cash Flow	1.357	.956	1.42
Tesla * Free Cash Flow	-2.294	2.151	-1.07
Constant	38400.110	4577.997	8.39***
Net Income from Continuing Operation			
Operating Cash Flow[11]	.360	.084	4.31***
Amazon	-1527.725	3035.185	-.50
Tesla	-1892.376	2745.064	-.69
Amazon * Op. Cash Flow	-.228	.210	-1.08
Tesla * Op. Cash Flow	.402	5.863	.07
Constant	1458.557	2431.074	.60
Free Cash Flow[12]	.382	.110	3.48**
Amazon	-5132.472	2759.736	-1.86
Tesla	-5184.291	2507.047	-2.07
Amazon * Free Cash Flow	-.137	.419	-.33
Tesla * Free Cash Flow	.117	.943	.12
Constant	5163.311	2007.290	2.57*

Note. *p<.05, **p<.01, ***p<.001; [1]$F(5, 24) = 14.17$, p< .001; $R^2 = .7470$, Adjusted $R^2 = .6943$; [2]$F(5, 24) = 15.50$, p< .001; $R^2 = .7636$, Adjusted $R^2 = .7143$; [3]$F(5, 23) = 382.00$, p< .001; $R^2 = .9881$, Adjusted $R^2 = .9855$; [4]$F(5, 23) = 162.16$, p< .001; $R^2 = .9724$, Adjusted $R^2 = .9664$; [5]$F(5, 24) = 39.59$, p< .001; $R^2 = .8919$, Adjusted $R^2 = .8693$; [6]$F(5, 24) = 39.51$, p< .001; $R^2 = .8917$, Adjusted $R^2 = .8691$; [7]$F(5, 24) = 15.71$, p< .001; $R^2 = .7660$, Adjusted $R^2 = .7173$; [8]$F(5, 24) = 17.10$, p< .001; $R^2 = .7808$, Adjusted $R^2 = .7352$; [9]$F(5, 24) = 122.10$, p< .001; $R^2 = .9622$, Adjusted $R^2 = .9543$; [10]$F(5, 24) = 74.61$, p< .001; $R^2 = .9396$, Adjusted $R^2 = .9270$; [11]$F(5, 24) = 16.84$, p< .001; $R^2 = .7782$, Adjusted $R^2 = .7320$; [12]$F(5, 24) = 13.68$, p< .001; $R^2 = .7402$, Adjusted $R^2 = .6861$.

All tests of moderation were conducted using linear regression, with the results of the analyses producing the following regression equations:

Debt to Equity Ratio = 1.391 + $6.34*10^{-5}$*[Operating Cash Flow] + -1.317*Amazon + -.230*Tesla + $2.51*10^{-5}$*[Amazon * Operating Cash Flow] + -.003*[Tesla * Operating Cash Flow] + ε

Debt to Equity Ratio = 1.880 + $7.82*10^{-5}$*[Free Cash Flow] + -1.671*Amazon + -.891*Tesla + $3.59*10^{-5}$*[Amazon * Free Cash Flow] + -.001*[Tesla * Free Cash Flow] + ε

Accumulated Depreciation = -31249.180 + -.397*[Operating Cash Flow] + 33572.450*Amazon + 30891.350*Tesla + -.660*[Amazon * Operating Cash Flow] + .658*[Tesla * Operating Cash Flow] + ε

Accumulated Depreciation = -34721.910 + -.451*[Free Cash Flow] + 35013.620*Amazon + 34746.240*Tesla + -1.172*[Amazon * Free Cash Flow] + .862*[Tesla * Free Cash Flow] + ε

Interest Expense = 1060.314 + .424*[Operating Cash Flow] + -1147.371*Amazon + -969.443*Tesla + -.380*[Amazon * Operating Cash Flow] + -.443*[Tesla * Operating Cash Flow] + ε

Interest Expense = 4462.882 + .514*[Free Cash Flow] + -4470.219*Amazon + -4478.226*Tesla + -.446*[Amazon * Free Cash Flow] + -.622*[Tesla * Free Cash Flow] + ε

Working Capital = 64324.070 + 4.506*[Operating Cash Flow] + -61898.350*Amazon + -64117.840*Tesla + -4.511*[Amazon * Operating Cash Flow] + -3.836*[Tesla * Operating Cash Flow] + ε

Working Capital = 94851.890 + 5.843*[Free Cash Flow] + -92412.260*Amazon + -94462.910*Tesla + -5.858*[Amazon * Free Cash Flow] + -5.584*[Tesla * Free Cash Flow] + ε

Gross Profit = 255541.010 + 1.496*[Operating Cash Flow] + -24761.610*Amazon + -24938.520*Tesla + .473*[Amazon * Operating Cash Flow] + -1.661*[Tesla * Operating Cash Flow] + ε

Gross Profit = 38400.110 + 1.756*[Free Cash Flow] + -34169.460*Amazon + -38318.530*Tesla + 1.357*[Amazon * Free Cash Flow] + -2.294*[Tesla * Free Cash Flow] + ε

Net Income from Continuing Operation = 1458.557 + .360*[Operating Cash Flow] + -1527.725*Amazon + -1892.376*Tesla + -.228*[Amazon * Operating Cash Flow] + .402*[Tesla * Operating Cash Flow] + ε

Net Income from Continuing Operation = 5163.311 + .382*[Free Cash Flow] + -5132.472*Amazon + -5184.291*Tesla + -.137*[Amazon * Free Cash Flow] + .117*[Tesla * Free Cash Flow] + ε

7. CONCLUSION

Overall, the results of the current study indicate the importance of cash flow as a predictor in relation to this study's outcomes, and similarly, that the outcomes included in this study can be fairly easily and reliably predicted from cash flow. In addition, with regard to the outcomes focused upon in the hypotheses pertaining to moderation, no significant differences were found on the basis of industry. This further suggests that the prediction of these outcomes is the same regardless of industry, at least on the basis of the results found in the current study, which are based upon three companies in three different industries. The finding of cash flow as being a significant predictor and positively related to cash flow and profits suggest that within a corporation, things will generally progress in one of two directions. If cash flow is high, this would be suggestive of even higher cash flow in the future, along with higher profits, while similarly, if cash flow is low, this would suggest even lower cash flows in the future along with reduced profits. In other words, this suggests that corporate success leads to even greater corporate success, and with lack of corporate success leading to more substantial problems in the future, which may include bankruptcy.Some previous studies which found varying results with respect to the importance of cash flow as a predictor may have been due to differences between the samples analyzed, which can relate to differences in the time periods analyzed, the companies analyzed, or the industries analyzed. This is discussed in further detail later in this chapter, as discrepancies such as these should be further explored in a future study in order to more definitively determine the reasons behind such differences as found in previous literature conducted in this area.Finally, this study incorporated a series of strengths as well as weaknesses. Strengths included the use of an appropriate quantitative methodology in order to test hypotheses included within this study and to answer its research questions. The examination of three companies in three different industries also provided some variation in the data and allowed for the examination of industry itself is a moderator, with the results finding industry as serving as a significant moderator in some cases, but not others. Additionally, this study's incorporation of 10 years of data served to provide an adequate historical set of measurements which could be analyzed statistically.With regard to weaknesses, first, this study incorporated the use of a convenience sample as opposed to the use of a random sampling methodology. Within convenience sampling, the results found cannot be generalized to the larger population, which limits the external validity of the study. However, random sampling is generally much more time-intensive and can also be costly to incorporate within a study. Another weakness of the current study is the lack of controls in the models conducted. As is discussed in further detail later in this chapter, the omission of important controls can lead to omitted variable bias, in which the impact of these omitted variables is absorbed by the remaining predictors included in the model. If present in the current study, this may have led the results to not be an entirely accurate reflection of the data analyzed, or specifically with regard to the relationships between the predictors and the outcome measures included within the study. An additional weakness consists of the fact that time itself is not analyzed within this study. The relationships found in the analysis conducted for this study may change substantially over time, even potentially reversing in their direction. Further analysis would need to be conducted in order to determine whether this may be the case.

7.1. RECOMMENDATIONS

A number of possibilities for future research exist. First, this study only examined one company per industry, with only three industries and three companies examined in total. This serves to limit the generalizability and external validity of the results, as the relationships between the variables examined in this study may differ widely across companies and industries. This possibility wasn't fully examined in the current study, but can be further explored in future research. The examination of a wide variety of industries, along with several or more companies per industry would serve to determine whether the results found in this current study are applicable to other industries, and also help to determine the level of variability across companies within the same industry. Such a study would also have a much larger sample size, which would serve to increase its level of statistical power, also making it more likely for statistically significant results to be found in the analyses conducted. Additionally, this study also did not incorporate the use of a random sample, instead relying upon convenience sampling. A future study incorporating random sampling would produce results which have greater external validity and can be generalized to the population. Specifically, a future study which took a random sample of US companies and analyzed these data would produce results that could be generalized to the entire population of US companies. This would help to substantially improve the validity of the results obtained. Additionally, future studies could also examine more lengthy time periods, as well as seek to determine whether the results found in the current study hold with regard to other time periods. The inclusion of more lengthy time periods would have the benefit of validating this current study's results in a sample with a longer time horizon. Additionally, this would also increase the statistical power associated with the study, serving to increase the likelihood of finding significant results. Other analyses viewing time as a potential moderator would help illustrate whether the relationships between the variables examined in this

study hold in other time periods. This would provide further information with regard to the validity of the results obtained in the current study.Future studies could also examine additional controls in the models conducted. Specifically, omitted variable bias can be present in cases where important predictors are omitted from the analysis. In this case, any effects associated with those omitted variables are then absorbed by the remaining variables included within the analysis. This then serves to produce results which are not accurate as to the genuine effects of each of the predictors included within the model. Future studies incorporating more expansive literature searches can seek to identify these specific predictors, which can then be incorporated into the models conducted. This would serve to limit the effects of omitted variable bias, producing results which are truer to the data. Such models would also likely have substantially improved levels of predictive power, which would allow individuals implementing the results to more accurately predict the outcomes in question.

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