Corporate Liquidity And The Significance Of Earnings Versus Cash Flow: An Examination Of Industry Effects

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Abstract

Prior studies in this journal tested relationships between measures of cash flow, accrual income, and both static and dynamic liquidity. The analysis is extended in this paper to test for industry effects where the relationships are not constant across industry groupings, making it difficult to generalize the findings from a larger sample of firms. The finding in other studies that accrual income has no incremental explanatory power for changes in the cash conversion cycle measure of liquidity can be generalized across industry groupings. But, prior studies find that working capital from operations and cash flow from operations have incremental explanatory power for liquidity measures while we show that this relationship is industry-specific and cannot be generalized across all firms. Also, we find that the incremental explanatory power of accrual income for changes in measures of static liquidity, such as current and quick ratios, is found almost exclusively in the manufacturing industry. Industry effects found in this study suggest the need for more caution in generalizing relationships between accrual income, cash flow, and liquidity measures.

I. Introduction

Prior studies by Wertheim and Robinson (1991) and Lancaster and Stevens (1998) in this journal analyze the incremental explanatory power of cash flow relative to accrual income in explaining differences in measures of liquidity for a large sample of firms. The purpose of this paper is to extend the analysis further by considering industry effects. If industry structures result in distinctive relationships between cash flow, accrual income and liquidity measures, the results obtained from large samples without regard for industry groupings may not be inferred for all companies. We use the same sample and data from the Lancaster and Stevens study (hereafter referred to as L&S) to examine industry effects within the findings for the overall sample of firms.

The controversy over the use of cash flow rather than accrual income has a long history (see Perry, 1982; Kroll, 1985; and McEnroe, 1995/ 1996). Cash flow tends to have significant explanatory power for security returns (see Rayburn, 1986; Wilson, 1986, 1987; and Bowen, Burgstahler and Daley, 1987) but not for bankruptcy (see Casey and Bartczak, 1985; Gentry, Newbold,

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and Whitford, 1985; and Gombola, Haskins, Ketz, and Williams, 1987). Wertheim and Robinson (hereafter W&R) find that accrual income has more explanatory power than cash flow in explaining differences in liquidity measured by current and quick ratios. L&S find that relationships between cash flow, accrual income, and liquidity are sensitive to the sample period and the measure of liquidity. Cash flow has significant incremental explanatory power over accrual income when a more recent period is analyzed and when the cash conversion cycle is used as an alternative measure of liquidity.

Both W&R and L&S implicitly assume that relationships between cash flow, accrual income, and liquidity are invariant within the sample of firms. Other studies find significant differences in financial and accounting relationships across industry groupings. For example, Scott (1972) and Scott and Martin (1975) find cross sectional differences in debt to equity ratios to be significantly related to industry groupings. Firms within the same industry tend to have the same financial structure while significant variation in financial structure occurs between industry groupings. Reilly and Drzycimski (1974), Livingston (1977), Oviatt and Baverschmidt (1991), and Veliyath (1996) find significant variation in business risk and returns across industry groupings. Gombola and Ketz (1983a) find different patterns of financial ratios for manufacturing firms relative to retail firms. Wang and Eichenseher (1998) find that incremental information from cash flow over accrual income may depend on earnings predictability, a factor that would seem to be highly related to industry groupings. Our study focuses on potential industry effects in relationships between liquidity measures, accrual income, and cash flow.

II. Data and Methods

We start by replicating results from the L&S study without subdividing the sample by industry grouping. We use the same data L&S use in their study and replicate their published results exactly. For the period from 1977 through 1994 continuous data are available for 417 firms. The L&S data covers most of the W&R study periods plus more recent observations. Following W&R and L&S we use a pooling of time series and cross sectional data.[1] After replicating the L&S results for the sample as a whole we then divide the sample by industry groupings and conduct the analysis separately for each industry grouping within the overall sample of firms. Seven broad industries are identified in the L&S data by using SIC codes as follows: Natural Resources (0000-1400), Construction (1500-1750), Manufacturing (2000-4000), Services (4001-4999), Retail/Wholesale (5000-6000), Financial Services (6001-6499), and Professional Services (6500-9000).

The sample of 417 firms is not evenly distributed across the industry groupings. Manufacturing is the largest grouping with 253 firms followed by Retail/Wholesale with 55, Services with 45, and Professional Services with 42. Natural Resources has a relatively small number of firms with 15 while only four firms are in Construction and two firms are in Financial Services. Pooled time series and cross sectional results for industries with few firms are primarily due to the time series variation. Results for Natural Resources, Construction, and Financial Services must be interpreted with caution.

Measures of Liquidity, Income, Cash Flow and Industry Groupings

The current ratio (CURR) (current assets/current liabilities) and the quick ratio (QUICK) (current assets minus inventory/current liabilities) are "static" balance sheet measures of liquidity used by W&R. Static measures of liquidity reflect the ability of a firm to liquidate assets to pay short term creditors. L&S extend the W&R study by using the cash conversion cycle (CCC) as an additional measure of liquidity. The cash conversion cycle (CCC) is a dynamic measure of ongoing operating liquidity representing the number of days a firm takes to go from cash outlay back to cash receipt, rather than the ability to cover short term liabilities with liquid assets.

Annual changes in accrual income before

extraordinary items (Δ IBEI), working capital from operations (Δ WCFO), and cash flow from operations (Δ CFFO) are the independent variables used to explain changes in liquidity measures as the dependent variables. WCFO is an accounting flow measure positioned somewhere in the middle of the continuum between pure accrual (IBEI) and pure cash (CFFO). Gombola and Ketz (1983b) find WCFO to be highly correlated with accrual income and suggest that both measures represent profitability while CFFO represents solvency and flexibility. Specific definitions and Compustat items used to measure liquidity, income, and cash flow variables are provided in the Appendix. All measures and definitions match the L&S and W&R studies exactly.

Empirical Models

Empirical models used to test for incremental explanatory power of each income and cash flow measures are taken directly from W&R and L&S. Changes in liquidity are the dependent variables and changes in accounting income and cash flow measures are the independent variables. Specifications of the empirical models are provided below:

(1) $(\Delta \text{ Liquidity})_t = a + b_1 (\Delta \text{ IBEI})_t + (\text{random error})_t$

(2) $(\Delta \text{ Liquidity})_t = a + b_2 (\Delta \text{ WCFO})_t + (\text{random error})_t$

(3) $(\Delta \text{ Liquidity})_t = a + b_3 (\Delta \text{ CFFO})_t + (\text{random error})_t$

(4) $(\Delta \text{ Liquidity})_t = a + b_{14} (\Delta \text{ IBEI})_t + b_{24} (\Delta \text{ WCFO})_t + (\text{random error})_t$

(5) $(\Delta \text{ Liquidity})_t = a + b_{15} (\Delta \text{ IBEI})_t + b_{35} (\Delta \text{ CFFO})_t + (\text{random error})_t$

(6) $(\Delta \text{ Liquidity})_t = a + b_{26} (\Delta \text{ WCFO})_t + b_{36} (\Delta \text{ CFFO})_t + (\text{random error})_t$

where the following variables are used for Δ Liquidity:

Δ CURR $_t$ = annual change in the current ratio in period t,

Δ QUICK $_t$ = annual change in the quick ratio in period t,

Δ CCC$_t$ = annual change in the cash conversion cycle in period t.

The key research question is whether the various measures of income and cash flow provide incremental explanatory power for the various measures of liquidity. To test these hypotheses F-tests are constructed based on the reduction in the sum of squared errors due to adding a given variable to a regression model containing one of the other income or cash flow measures. For example, to test the hypothesis that Δ IBEI has incremental explanatory power beyond Δ WCFO in explaining a change in a liquidity measure, the following F-statistic is constructed:

$$F_{(v1,\, v2)} = \frac{[\text{SSE Equation (2)} - \text{SSE Equation (4)}] \,/\, \#\text{added variables}}{\text{SSE Equation (4)} \,/\, [N - (K+1)]}$$

where:

SSE Equation (2) = sum of squared errors from regression for equation (2)

SSE Equation (4) = sum of squared errors from regression for equation (4)

N = Number of observations

v1 = Number of additional variables tested in Equation (4)

v2 = [N - (K+1)]

K = Number of independent variables in Equation (4)

The null hypothesis is that there is no incremental explanatory power from IBEI over that provided by WCFO. If the null hypothesis is true there would not be a significant reduction in the sum of squared errors for equation (4) compared to equation (2). If the F-statistic is less (greater) than the critical F-statistic value for the given degrees of freedom the hypothesis is accepted (rejected). Our emphasis is on whether findings for the overall sample hold for all industry groupings or whether the overall findings can only be generalized for given industries.

III. Empirical Findings

Table 1 provides results from F-tests for incremental explanatory power of changes in accrual income and cash flow measures in explaining changes in liquidity measures. Test results from the overall sample are the same as the findings in the L&S study. F-test results for each industry grouping within the overall sample allow for comparisons and interpretations of the overall findings. Each column of the table represents a different liquidity measure and each panel of the table represents a different null hypothesis for a measure of accrual income or cash flow.

Results in Panels A and B represent tests of the incremental explanatory power of accrual income (IBEI) over working capital from operations (WCFO) and cash flow from operations (CFFO), respectively. L&S find accrual income (IBEI) to have significant incremental explanatory power over both WCFO and CFFO in explaining changes in static measures of liquidity (CURR and QUICK) but not for a dynamic measure of liquidity (CCC). The finding for CCC is robust across industry groupings, as evidenced by an absence of industry effects in column (3) of Panels A and B. Accrual income does not have significant incremental explanatory power over WCFO or CFFO for any of the industry groupings when liquidity is measured by the CCC. Accrual income does have significant incremental explanatory power over WCFO for both the current ratio and quick ratio in the overall sample, but this result is driven by the manufacturing industry and does not hold for other industries. The results in Panel B follow a similar pattern. Accrual income has significant incremental explanatory power over CFFO in the overall sample for the static liquidity measures, but this finding holds only for the manufacturing and services industries. The results in Panels A and B do not affect the L&S conclusions with respect to the incremental explanatory power of accrual income for dynamic liquidity, but the significance of accrual income for static measures of income is isolated in only a few industries.

Panels C and D provide F-test results for the incremental explanatory power of working capital from operations (WCFO) over IBEI and CFFO, respectively. L&S find WCFO to have significant explanatory power over both IBEI and CFFO when the dynamic measure of liquidity (CCC) is used. This finding cannot be generalized across all industries since it holds only for the construction and retail/wholesale industries in column (3). Natural resources, construction, manufacturing, and retail/wholesale have significant incremental explanatory power of WCFO over CFFO in explaining CCC. The overall findings of L&S for static measures of liquidity are also limited to a subset of industries in the overall sample. WCFO has significant incremental explanatory power over both IBEI and CFFO for manufacturing, services, and retail/wholesale when the current ratio in column (1) is the liquidity measure. The construction industry is added to this list when the quick ratio is the liquidity measure in column (2).

F-test results for the incremental significance of cash flow (CFFO) over WCFO and IBEI in explaining changes in liquidity are provided in Panels E and F of Table 1. Cash flow has significant incremental explanatory power over both WCFO and IBEI in the overall sample of L&S when CCC is the measure of liquidity. This finding holds for natural resources, manufacturing, retail/wholesale, and professional services. When the current ratio is the measure of liquidity, CFFO is significant over both IBEI and WCFO in the overall sample but the result is driven specifically only by the natural resources, services, retail/wholesale, and financial services industries. When the quick ratio is the measure of liquidity, cash flow has incremental explanatory power over both IBEI and WCFO for natural resources, services, and financial services but not for the overall sample.

Findings in Table 1 demonstrate the extent to which the overall findings can be generalized for firms in different industries. Industry effects must be considered in almost every panel. The only case where the findings for the overall sample can be generalized without industry considerations occurs when the CCC is used to measure

Table 1

F-test Results by Industry for Incremental Explanatory Power of Income Before Extraordinary Items (IBEI), Working Capital from Operations (WCFO), and Cash Flow from Operations (CFFO) for Static (Current and Quick Ratios) and Dynamic (Cash Conversion Cycle) Liquidity Measures

Null Hypotheses:	Dependent Variables (1) Current Ratio	(2) Quick Ratio	(3) Cash Conversion Cycle
Panel A: IBEI contains no incremental explanatory power over WCFO - Equation (4) vs. Equation (2)			
L& S Results = All observations	5.12*	6.45*	0.12
Natural Resources (N=789)[1]	0.18	0.03	0.89
Construction (N=67)	0.17	0.11	1.05
Manufacturing (N=4362)	6.10*	10.19**	0.20
Services (N=789)	0.14	0.37	0.92
Retail/Wholesale (N=954)	0.25	0.33	0.08
Financial Services (N=31)	0.10	0.02	0.20
Professional Services (N=700)	1.80	1.89	0.85
Panel B: IBEI contains no incremental explanatory power over CFFO - Equation (5) vs. Equation (3)			
L&S Results = All observations	11.67**	12.55**	0.89
Natural Resources (N=789)	0.11	0.02	0.14
Construction (N=67)	0.08	2.43	1.13
Manufacturing (N=4362)	21.01**	24.47**	3.54
Services (N=789)	4.35*	4.97*	1.52
Retail/Wholesale (N=954)	0.15	1.49	0.36
Financial Services (N=31)	0.25	0.07	0.32
Professional Services (N=700)	2.80	2.99	2.48
Panel C: WCFO contains no incremental explanatory power over IBEI-Equation (4) vs. Equation (1)			
L&S Results =All observations	3.16	3.48	3.80*
Natural Resources (N=789)[1]	1.57	1.76	2.35
Construction (N=67)	1.73	4.47*	14.71**
Manufacturing (N=4362)	18.70**	16.85**	2.81
Services (N=789)	5.08*	4.26*	0.18
Retail/Wholesale (N=954)	9.54**	3.84*	9.59**
Financial Services (N=31)	0.28	0.19	0.09
Professional Services (N=700)	0.23	0.25	0.90

Panel D: WCFO contains no incremental explanatory power over CFFO-Equation (6) vs. Equation (3)			
L&S Results = All observations	10.16**	9.70**	7.33**
Natural Resources (N=789)	0.34	0.44	4.15*
Construction (N=67)	1.62	6.86*	15.78**
Manufacturing (N=4362)	34.08**	30.84**	7.50**
Services (N=789)	19.98**	18.38**	0.79
Retail/Wholesale (N=954)	7.74**	4.85*	8.01**
Financial Services (N=31)	0.39	0.18	0.21
Professional Services (N=700)	1.24	1.37	3.21
Panel E: CFFO contains no incremental explanatory power over IBEI -Equation (5) vs. Equation (1)			
L&S Results =All observations	10.41**	1.11	33.88**
Natural Resources (N=789)[1]	12.53**	11.11**	6.98**
Construction (N=67)	0.05	0.20	0.83
Manufacturing (N=4362)	1.29	2.64	35.20**
Services (N=789)	14.74**	13.84**	0.00
Retail/Wholesale (N=954)	7.66**	0.20	9.12**
Financial Services (N=31)	4.59*	4.33*	2.28
Professional Services (N=700)	0.00	0.04	8.33**
Panel F: CFFO contains no incremental explanatory power over WCFO -Equation (2) vs. Equation (6)			
L&S Results = All observations	10.86**	1.23	36.65**
Natural Resources (N=789)	11.35**	9.79**	9.55**
Construction (N=67)	0.02	0.13	1.63
Manufacturing (N=4362)	1.72	2.33	36.55**
Services (N=789)	25.48**	23.40**	0.00
Retail/Wholesale (N=954)	5.97*	0.05	7.26**
Financial Services (N=31)	4.53*	4.26*	2.28
Professional Services (N=700)	0.00	0.07	9.02**

* Indicates statistical significance of the F-statistic at the 5% level.
** Indicates statistical significance of the F-statistic at the 1% level.
[1]N = Total number of pooled time-series and cross-section observations.

liquidity and IBEI is tested for incremental explanatory power. In this case accrual income does not have incremental explanatory power over either WCFO or CFFO for any of the industry groupings. Table 2 provides a convenient way to summarize the various industry effects found in the tests from Table 1. When we isolate the professional services industry, none of the income or cash flow measures have incremental explanatory power for liquidity measures. Accrual income provides significant incremental explanatory power only for the manufacturing industry and for the services industry when accrual income is compared to cash flow from operations. This finding is in contrast to the findings of W&R where accrual income provides significant incremental explanatory power over cash flow for statistic liquidity ratios. Both WCFO and CFFO provide significant incremental explanatory power for static liquidity ratios only for specific industries making up subsets of the overall sample.

The second panel of Table 2 illustrates how specific industry effects occur when the measure of liquidity is the cash conversion cycle. None of the income or cash flow measures have significant incremental explanatory power for the CCC measure in the financial services and services industry. Accrual income does not have significant incremental explanatory power for CCC in any of the industry groups. Specific industry effects are found for both WCFO and CFFO measures when the CCC measure is used for liquidity. It is interesting to note that the industries where either WCFO or CFFO has incremental explanatory power for CCC are not exactly the same as the industries with incremental explanatory power when the static liquidity ratios are used. This reinforces the finding that specific industry effects are at work both for liquidity measures and measures of income and cash flow.

IV. Conclusion

Both Wertheim and Robinson (1991) and Lancaster and Stevens (1998) make valuable contributions to the literature on relative information content of accrual income versus cash flow. W&R initiated the investigation of incremental information content of accrual income and cash flow in explaining static liquidity measures. L&S extended the analysis to consider dynamic liquidity measures and examined more recent periods. Our study tests for industry effects by using the L&S data and comparing results from the overall sample of firms with the results from subsets of firms grouped by industry affiliation. We find that some of the findings from L&S are robust across industry groupings but industry effects exist in many of the relationships.

The L&S finding that accrual income has no incremental explanatory power for changes in the cash conversion cycle holds across all industry groupings. For the financial services and services industries none of the accrual or cash flow measures have significant incremental explanatory power for the cash conversion cycle. Measures of working capital from operations and cash flow from operations have significant incremental explanatory power for some industries and not others. Both L&S and W&R find that accrual income has significant incremental explanatory power for changes in static liquidity but our results reveal that this finding is driven largely by the manufacturing industry. The incremental significance of working capital from operations and cash flow from operations in explaining static liquidity is industry-specific and cannot be generalized.

Findings from our study suggest that industry differences exist in relationships between liquidity, accrual income, and cash flow. These findings are consistent with other studies where industry effects are found in capital structure, risk, returns, and financial ratio patterns. Our results indicate where caution is required in generalizing about the relative information content of accrual income and cash flow with respect to liquidity measures.

V. Suggestions for Future Research

The existence of industry effects in accounting relationships represents an important direction for additional research. While this study

Table 2
Summary of Industry Effects by Measures of Liquidity and Measures of Income and Cash Flow

A. Industry Effects for Static Liquidity Measures (CURR and QUICK Ratios)

IBEI Significant Incremental Explanatory Power	WCFO Significant Incremental Explanatory Power	CFFO Significant Incremental Explanatory Power	No Significant Incremental Explanatory Power
Manufacturing Services[1]	Manufacturing Services Retail/Wholesale Construction[2]	Natural Resources Services Retail/Wholesale[3] Financial Services	Professional Services

B. Industry Effects for Dynamic Liquidity Measure (CCC)

IBEI Significant Incremental Explanatory Power	WCFO Significant Incremental Explanatory Power	CFFO Significant Incremental Explanatory Power	No Significant Incremental Explanatory Power
No Industries	Manufacturing[1] Nat. Resources[1] Retail/Wholesale Construction	Manufacturing Natural Resources Retail/Wholesale Professional Services	Financial Services Services

[1]only over CFFO; [2]only for the QUICK ratio; [3]only for the CURR ratio. Note: Findings for Construction, Natural Resources, and Financial Services are based on small samples of firms.

examines relationships between liquidity, accrual income, and cash flow the potential for industry effects in other accounting information relationships should also be examined. This line of research is necessary to identify relationships that can be generalized across all firms separate from relationships that are highly industry-specific. Such findings would be especially important with respect to the information content of accrual income versus cash flow in security returns and bankruptcy, two areas where findings from an overall sample have been generalized in other studies.

A number of factors other than industry structure may also cause differences in the relationships between liquidity, accrual income, and cash flow. For example, findings may vary by size or age of the firm or by the extent to which the firm has international operations. A deeper understanding of a firm's structural differences from the overall sample would help identify factors affecting the incremental information content of accrual income relative to cash flow.

Appendix
Summary of COMPUSTAT Data Items and Formulas Used in the Calculation of Accounting Flow Variables and Liquidity Measures

COMPUSTAT Data Items			COMPUSTAT Item No.
IB	=	Income Before Extraordinary Items	18
FOPT	=	Working Capital From Operations	110
IBC	=	Income Before Extraordinary Items (St. of Changes)	123
DPC	=	Depreciation and Amortization (St. of Changes)	125
XIDOC	=	Extraordinary Items and Discontinued Operations	124
TXDC	=	Deferred Taxes	126
ESUBC	=	Equity in Earnings of Unconsolidated Subsidiary	106
SPPIV	=	Gain or Loss From the Sale of Long Term Assets	213
FOPO	=	Funds From Operations - Other	217
OANCF	=	Operating Activities Net Cash Flow	308
LCT	=	Current Liabilities - Total	5
DLC	=	Long Term Debt Listed in Current Liabilities	34
ACT	=	Current Assets - Total	4
CHE	=	Cash and Cash Equivalents	1
RECT	=	Total Current Receivables	2
INVT	=	Inventories - Total	3
COGS	=	Cost of Goods Sold	41
SALE	=	Sales - Net	12
AP	=	Accounts Payable	70

Definitions and Formulas:

1. Income Before Extraordinary Items in period$_t$ = IB_t
1. Working Capital From Operations in period $_t$ = $FOPT_t$ (For firms reporting working capital from operations) = $IBC_t + DPC_t + XIDOC_t + TXDC_t + ESUBC_t + SPPIV_t + FOPO_t$. (For firms reporting a Statement of Cash Flows).
3. Cash Flow From Operations in period $_t$ = $OANCF_t$ (For firms reporting a Statement of Cash Flows) = $WCFO_t + [(LCT_t - DLC_t) - (LCT_{t-1} - DLC_{t-1})] - [(ACT_t - CHE_t) - (ACT_{t-1} - CHE_{t-1})]$. (For firms reporting working capital).
4. Current Ratio in period $_t$ = $[ACT_t / LCT_t]$
5. Quick Ratio in period $_t$ = $[(CHE_t + RECT_t) / LCT_t]$
6. Cash Conversion Cycle in period $_t$ = $[INVT_t / (COGS_t / 365)] + [RECT_t / (SALE_t / 365)] - [AP_t / (COGS_t / 365)]$

Endnotes

1. Following W&R and L&S we use a pooled cross-section and time series estimation procedure. This approach is also employed by Livnat and Zarowin (1990); Bowen, Burgstahler, and Daley (1987); Rayburn (1986); and Wilson (1987). The pooled cross-section and time series procedure assumes stability in the annual cross-sectional coefficients. We use a dummy variable approach to test for stability of the coefficients and find only marginal significance for instability of the coefficients in only a few of the years of the study. Overall, results from the yearly regressions and the pooled regressions are similar so only results from the pooled data are presented here.

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