

Discretionary Accrual in the Knowledge-Based Economy

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The modern economy transit from manufacturing to knowledge-based industries that are dependent on investments in R&D, advertising, and employee talents. These investments and much of the value that they generate cannot be capitalized as assets. As these intangible assets are off-balance-sheet, a firm's book value might be low. When book value fails to present a firm's true value, we stipulate that management has incentive to manage its earnings to convey information that is not reflected in the balance sheet. We find that firms with negative book value and in the New Economy use more discretionary accruals.

Keywords: discretionary accrual, knowledge-based economy, negative book value, unreported intangibles

INTRODUCTION

Public firms in the United States are required to file annual 10-K reports with the Security and Exchange Commission that include audited financial statements. The two primary financial statements are the income statement that shows the results of operations and the balance sheet that presents the financial position of the firm. The summary figure of the income statement is net income and, correspondingly, the summary figure of the balance sheet is common equity or book value. Empirical capital market research in accounting has documented the association between share price and earnings, book value, and, more recently, the addition of other financial items such as research and development (R&D) and advertising expenses (related to intangible assets), capital expenditure, and revenue growth (related to growth opportunities).

While both the income statement and the balance sheet are informative, their relative weight in explaining valuation will vary depending on the component's persistence and its predictability. Prior research has shown that when earnings are negative or extremely low, book value is an important indicator of value because it either proxies for the abandonment value for firms that are in distress or provides information about future normal earnings for firms whose earnings are temporarily low. In this study, we focus on the firms that exhibit the opposite book value that is negative or low due to, for example, unreported intangibles. We examine whether these firms use discretionary accruals to signal through earnings management.

LITURATURE REVIEW

Value Relevance of Accounting Information

Literature examining the value relevance of accounting information finds a declining trend in the relation between price and earnings. Studies have attributed this decrease to the shift in value relevance from earnings to book value, most notably in the presence of loss firms (Collins et al., 1997), and the increase in value relevance of other accounting items, particularly those related to the new economy (Barth et al., 2023).

In the framework of Ohlson (1995, 1999), market value of a firm is expressed as the value relevance weight of earnings (transitory and abnormal) and book value of equity. The valuation weight depends on the ability to predict future (abnormal) earnings and the persistence of the component. Barth et al. (1999) find considerable variation in weights based on industry specification and earnings component (accrual or cash). Furthermore, they find a transfer of value relevance from earnings to book value for loss firms, consistent with the perception that negative earnings (losses) are more transitory than positive earnings (Collins et al., 1997). The rationale being that book value is more informative because it may proxy for future earnings or liquidation value in the abandonment option (Barth et al. 1998; Collins et al., 1999).

Another stream in valuation research investigates individual accounting items, notably those items more relevant to “new economy” firms. Core et al. (2003) argues that high technology firms are particularly difficult to value due to their rapid rise in productivity and high stock valuations. Thus, the growth in new economy firms leads to difficulties in applying the valuation models that use traditional financial variables. Their findings indicate that overall explanatory power of valuation models declined during the period 1996 to 1999 compared to earlier periods (1975 to 1995) and attribute these findings to higher price/returns variation of technology stock and omission of variables relevant to the new economy.

A variable that features prominently in this branch of literature is R&D. Although generally accepted accounting principles (GAAP) mandates expensing R&D, Lev and Sougiannis (1996) find R&D is associated with future earnings and argue that its value relevance extends beyond the current period. Furthermore, there has been a significant increase in R&D investment and firms operating in intangible-intensive industries (Collins et al., 1997; Chan et al., 2001; Darrough and Ye, 2007). Barth et al. (2023) examine Compustat firms from 1962 to 2018 and find that accounting items relating to intangibles (R&D, advertising expense, and recognized intangible assets) are increasing in value relevance, while earnings relevance has declined. They suggest that the relation between accounting information and share price is becoming more nuanced as investors’ needs evolve.

Negative Book Value and Unreported Intangibles

While book value normally is expected to be positive, Jan and Ou (2012) showed that the number of negative book value (NegBV) firms has increased significantly since the early 1980s. They found that among all Compustat firms, the frequency of NegBV firms increased three-fold from an annual average of five percent during the period 1976 to 1985 to fifteen percent during the period 1996 to 2005. Furthermore, R&D expenditure, especially R&D accumulated over time, not only contributes to the increasing trend of negative book value but also is a key attribute that impacts market valuation of loss firms. Moreover, not all NegBV firms were operationally distress and many firms were able to survive for several years after first reporting negative equity (Darrough & Yi, 2007; Jan & Ou, 2012). Thus, the abandonment option does not seem to be a satisfactory explanation for these occurrences. Instead, firm specific attributes (i.e. younger start-ups, R&D intensive, higher debt capacity and quality of recorded intangibles) are linked to the longevity of negative value firms (Darrough & Yi, 2007; Ciftci & Darrough, 2015; Luo et al., 2021).

High levels of R&D expenditure can distort financial statements by increasing the amount of unreported intangible assets, potentially leading to stock mispricing. Although R&D projects are inherently risky and more volatile, Chan et al. (2001) find that the average return on firms with R&D is comparable to returns on non-R&D firms. They conclude that the market appropriately prices R&D expenditures and suggest that technology stocks would appear less expensive if their intangible R&D were added to their book values. Gu, Lev, & Zhu (2023) investigate firms with internally generated intangibles and find that intangible-

driven losses are as informative as profitable earnings and that firms with intangible-driven losses outperform other loss firms and profitable firms when investment involves technology or human capital. These studies suggest that investors can untangle the information content of intangible spending in valuating firm performance.

Earnings Management and Discretionary Accruals

Earnings management occurs when management uses judgement in financial reporting and structures transactions that affect financial reporting to mislead users or alter contractual obligations (Schipper, 1989; Healy & Wahlen, 1999). Prior research has provided several motives for firms to be engaged in earnings management, such as meeting analyst forecast (Kasznik, 1999), stock price sensitivity (Abarbanell & Lehavy, 2003), equity offerings (Teoh, et al., 1998), maximizing executive compensation (Dechow & Sloan, 1991), and avoiding violation of debt covenants (DeAngelo et al, 1994). It is worth noting that management considers earnings, not cash flows, as the key metric (Graham et al., 2005).

Earnings can be disaggregated into cash flows and accruals—with the accruals component further separated into discretionary and non-discretionary. While accruals are a necessary adjustment in the computation of earnings, discretionary accruals are susceptible to manipulation that, in the extreme, can lead to loss of information content. Many studies examine the specification and power of discretionary accrual models (Dechow et al., 1995; Kasznik, 1999; Kothari et al., 2005). Kothari et al. (2005) expands the modified-Jones model (Dechow et al., 1995, 2012) by introducing a performance-matched approach that incorporates return on assets (ROA) as an additional control, and consequently controls for occurrences of extreme firm performances that may produce results that do not reflect the actual firm performance.

In summary, prior research has shown that both earnings and book value are value relevant, although the relative weight may vary over time and for different types of firms. Given the importance of earnings in stock valuation and contracting, management may use the flexibility in accounting to manipulate earnings.

RESEARCH DESIGN AND HYPOTHESE DEVELOPMENT

We adopt the Kothari model (2005) to calculate the amounts of discretionary accruals (DAC) reported by each sample firm and in each sample year.

$$TAC/TA_{t-1} = \alpha_0(1/TA_{t-1}) + \alpha_1(\Delta SALES - \Delta AR)/TA_{t-1} + \alpha_2 PPE/TA_{t-1} + \alpha_3 ROA + \varepsilon \quad (1)$$

TAC is income before extraordinary items, less cash flow from operations;

TA_{t-1} is total assets in year t-1, the lag year;

ΔSALES is changes in sales from year t-1 to t;

ΔAR is changes in accounts receivable from year t-1 to year t;

PPE is property, plant and equipment (gross);

ROA is return on assets (=income before extraordinary items, divided by TA_{t-1}).

ε in equation (1) is used to measure the amounts of DAC, actual accruals (TAC/TA_{t-1}), less nondiscretionary accruals (= α₀(1/TA_{t-1}) + α₁(ΔSALES - ΔAR)/TA_{t-1} + α₂PPE/TA_{t-1} + α₃ROA).

We use the absolute value of discretionary accruals (ABS_DAC) to measure the level of earnings manipulation employed by management and develop the following three hypotheses to study the earnings management behavior for firms that are likely to have unreported intangibles such as negative book value (NegBV firms) and firms that are in the new economy (NEW firms).

Hypothesis 1: *NegBV firms will report higher amounts of absolute discretionary accruals than positive book value (PosBV) firms.*

Hypothesis 2: *New economy (NEW) firms will report higher amounts of absolute discretionary accruals than old economy (OLD) firms.*

Hypothesis 3: *The amount of absolute discretionary accruals will be highest for new economy (NEW) firms that report negative book value.*

SAMPLE AND DESCRIPTIVE STATISTICS

Our sample selection starts with 34,509 firms covered in the Compustat North America database from 1995 to 2023. We exclude 10,772 firms (31%) with 2-digit Standard Industry Classification (SIC) codes missing, 3,508 financial firms (10%) with 2-digit SIC codes between 60 and 67. We further drop 6,085 (17%) that do not have enough data needed for our analyses. Our final sample includes 14,144 firms and 109,684 firm/year after winsorizing all the continuous variables at the 1st and 99th percentiles. We used the same set of firms for all of our analyses and therefore the survivorship bias exists for this study because of the strong requirement on financial data not missing from 1995 to 2023.

We define NEW firms as those in the following industries: computer hardware and software, pharmaceuticals, electronic equipment, and telecommunications (SIC codes 283, 357, 360-368, 481, 737, and 873) or firms with IPO in 2019 or later. NegBV firms are those report negative common equity (Compustat item, ceq, less than zero) and positive book value firms as those with zero or positive ceq.

We also separate the sample years to the following five sub-periods: 1995 to 1999, 2000 to 2004, 2005 to 2009, 2010 to 2014, and the years after 2014 to correspond with the significant financial events that occurred from 1995 to 2023. For example, the dot com bubble covered the period 1995 to 2000, Enron and accounting scandals dominated the early 2000s, the financial crises of 2007 to 2008 triggered the most recent financial crisis, and the COVID pandemic commencing in late 2019 with the recovery in 2021.

Off-Balance-Sheet Intangible Assets

We use data from WRDS contributed by Peters and Taylor to approximate two types of unreported intangible capital: knowledge (R&D) and organizational (Selling, general, and administrative expenses). Table 1 shows the average proportion of unreported intangible assets (“K_int_offBS”) over total reported and unreported total assets (total assets, at, and “K_int_offBS”) for all firms, PosBV firms, and NegBV.

The data in Table 1, Panel A, show that NegBV firms have more unreported intangibles than PosBV firms, consistent with the conjecture that NegBV firms have accounting attributes that support their longevity. Overall, the average proportion of unreported intangible assets for NegBV firms, 0.416, is statistically significantly higher than PosBV firms’ 0.241 at the 1% level. Further, the statistically significantly higher proportion of unreported intangible assets for NegBV firms is present in all five sub-sample periods with the highest in 2005 to 2009 that includes the 2007 financial crisis.

TABLE 1
PROPORTION OF OFF-BALANCE-SHEET INTANGIBLE (1995 to 2021)

	Panel A: PosBV Firms versus NegBV Firms					
	All Firms		PosBV Firms		NegBV Firms	
	No. of Obs.	Mean	No. of Obs.	Mean	No. of Obs.	Mean
1995 – 1999	25,016	0.257	23,099	0.243	1,917	0.428***
2000 – 2004	22,385	0.283	19,948	0.259	2,439	0.478***
2005 – 2009	17,858	0.270	15,996	0.243	1,862	0.506***
2010 – 2014	15,295	0.250	13,939	0.226	1,356	0.489***
2015 – 2021	21,778	0.251	19,562	0.231	2,216	0.418***
All Years	102,332	0.262	92,544	0.241	9,788	0.416***

Panel B: Old Firms versus New Firms						
	All Firms		OLD Firms		NEW Firms	
	No. of Obs.	Mean	No. of Obs.	Mean	No. of Obs.	Mean
1995 – 1999	25,016	0.257	20,864	0.233	4,152	0.374***
2000 – 2004	22,385	0.283	17,372	0.250	5,013	0.398***
2005 – 2009	17,858	0.270	14,270	0.233	3,588	0.417***
2010 – 2014	15,295	0.250	12,486	0.218	2,809	0.390***
2015 – 2021	21,778	0.251	16,592	0.211	5,186	0.377***
All Years	102,332	0.262	81,584	0.230	20,748	0.390***

***, ** and * indicate statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

Table 1, Panel B, reports the proportion of unreported intangibles for firms in the old economy and in the new economy. Consistent with how we define NEW firms, these firms have an overall proportion of 0.390 unreported intangibles to total reported and unreported assets that is statistically significantly higher than the overall 0.230 for old economy firms at the 1% level. This statistically significantly higher proportion of unreported intangibles for NEW firms is present in all five sub-sample periods with the highest proportion reaching 0.417 during 2005-2009 period. Table 2 reports the comparison of firm characteristics.

TABLE 2
SUMMARY STATISTICSTICS (1995 TO 2023)

	All Firms		NegBV Firms		NEW Firms	
	Mean	Median	Mean	Median	Mean	Median
ABS_DAC	0.231	0.082	0.426	0.146	0.211	0.077
Size	6.046	6.138	3.857	3.727	6.278	6.307
Leverage	0.640	0.340	-2.584	-1.102	0.982	0.422
MB	2.663	1.840	-8.850	-1.886	3.883	2.044
Sales	0.232	0.073	0.241	0.002	0.232	0.078
ΔSales	1.035	0.841	1.340	1.033	1.003	0.828
ΔDebt	1.588	-0.013	1.977	-0.022	1.547	-0.012
ΔEquity	0.096	0.054	-0.353	-0.125	0.143	0.059
Big4	0.686	1.000	0.471	0.000	0.709	1.000
R&D	0.476	0.000	1.032	0.000	0.417	0.000

Our sample includes 109,336 observations for all firms, 10,477 observations for negative book value firms, and 22,851 observations for firms in the new economy. ABS_DAC is the absolute dollar amount of discretionary accruals, the residual value from equation (1). Size is the natural logarithm of total assets. Leverage is the ratio of long-term debt to common equity. MB is the ratio of market value to book value of common equity. Sales is the dollar amount of sales, divided by total assets. ΔSales is changes in sales from year t-1 to year t, divided by sales in year t-1. ΔDebt is changes in long-term debt, divided by long-term debt in prior year. ΔEquity is changes in common equity, divided by common equity in year t-1. Big4 is coded as 1 for Big Four auditors and 0 otherwise. R&D is the R&D expense, divided by sales.

The results in Table 2 show that compared to all firms and NEW firms, NegBV firms have the highest amount of ABS_DAC, 0.426 mean and 0.146 median, smallest firm size (natural logarithm of total assets),

highest average change in sales, average change in long-term debt, and average amount of R&D. NegBV firms are least likely to be audited by Big Four. For NEW firms, the statistics presented in Table 2 show that NEW firms are similar to all firms with the exception of higher leverage and market to book (MB) ratio. The higher MB ratio reflects market's placing a higher valuation for each dollar of reported book value, consistent with the value of unreported intangible assets being reflected in the stock price.

EMPIRICAL RESULTS

Univariate Analysis: Negative Book Value Firms Versus Positive Book Value Firms

We compare the amount of absolute value of discretionary accruals and report the results in Table 3: Panel A for NegBV firms versus PosBV firms and Panel B for NEW firms versus OLD firms.

TABLE 3
COMPARISON OF ABSOLUTE VALUE OF DISCRETIONARY ACCRUALS

Panel A: Negative Book Value Firms vs Positive Book Value Firms						
	ABS_DAC			t-Stat		
	All Firms	NegBV Firms	PosBV Firms	NegBV vs All	PosBV vs All	NegBV vs PosBV
1995 – 1999	0.122	0.205	0.115	18.42***	-4.25***	20.86***
2000 – 2004	0.220	0.384	0.200	19.91***	-6.10***	24.28***
2005 – 2009	0.270	0.581	0.234	14.84***	-4.43***	17.83***
2010 – 2014	0.305	0.600	0.276	12.78***	-3.28***	14.81***
2015 – 2023	0.270	0.424	0.253	14.92***	-4.12***	17.38***
All	0.231	0.425	0.210	32.73***	-9.09***	38.86***
Panel B: New Economy Firms vs Old Economy Firms						
	ABS_DAC			t-Stat		
	All Firms	NEW Firms	OLD Firms	NEW vs All	OLD vs All	NEW vs OLD
1995 – 1999	0.122	0.228	0.100	31.25***	-13.50***	42.19***
2000 – 2004	0.220	0.359	0.180	23.74***	-11.65***	31.96***
2005 – 2009	0.270	0.579	0.194	18.41***	-9.40***	25.76***
2010 – 2014	0.305	0.596	0.239	17.01***	-7.49***	22.43***
2015 – 2023	0.270	0.479	0.201	29.75***	-16.24***	41.68***
All	0.231	0.436	0.177	47.79***	-23.68***	65.47***

***, ** and * indicate statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

We find that ABS_DAC is statistically significantly different from zero for all firms and for each classification of firms and for all years, as well as, for every sub-sample period. (Significance results are not reported.) Comparing to all firms and PosBV firms, the results reported in Table 3, Panel A, show that ABS_DAC for NegBV firms is significantly higher than all firms and PosBV firms at the 1% level for all years and for each sub-sample period, consistent with our first hypothesis. ABS_DAC for NEW firms and OLD firms are reported in Panel B. Similar to NegBV firms, ABS_DAC for NEW firms is statistically higher than all firms and OLD firms at the 1% level for every sub-sample period. Result in Panel B is consistent with our first hypothesis.

In combination with our results from Table 1, our findings suggest that higher proportion of unreported intangible assets create more incentives for management of NegBV and NEW firms to engage in earnings management than for PosBV firms and OLD firms as relevance shifts from the balance sheet to the income statement.

Although the results from the univariate analysis (Table 3) are consistent with our first and second hypotheses, there might be confounding variables that drive the results. Therefore, we conduct a regression analysis to include other control variables that might affect the amount of ABS_DAC and report the result in the following section.

Difference-in-Difference Regression Analyses

To analyze the amount of discretionary accruals used by firms reporting negative book value and firms in the new economy, we regress absolute value of discretionary accruals (ABS_DAC) on NegBV (dummy for NegBV firms) and NEW (dummy for firms in the new economy), along with the firm characteristics that have been documented to be associated with discretionary accruals in prior literature. This regression includes all firms in our sample.

$$ABS_DAC = \beta_0 + \beta_2 NegBV + \beta_3 NEW + \beta_3 NegBV * NEW + \text{Control variables} + \varepsilon \quad (2)$$

TABLE 4
REGRESSION ANALYSIS (1995 to 2023)

Absolute value of Discretionary Accruals			
	(a)	(b)	(c)
Intercept	0.037***	0.016*	0.017**
NegBV	0.140***		0.107***
NEW		0.023*	0.007
NegBV*NEW			0.116***
Size	-0.020***	-0.016***	-0.016***
Leverage	0.002***	0.007***	0.007***
MB	-0.001**	0.000	0.000
ΔSales	0.029***	0.029***	0.030***
Sales	0.011***	0.006*	0.005*
ΔDebt	0.001***	0.000***	0.001***
ΔEquity	0.001	0.002**	0.002**
Big4	-0.024***	-0.024***	-0.024***
R&D	0.001***	0.001**	0.001**
ABS_DAC_lag	0.160***	0.155***	0.154***
No. of Observations	109,336	109,336	109,336
Adjusted R2	0.188	0.191	0.192

NegBV is a dummy variable coded as 1 for NegBV firms and 0 otherwise NEW is also a dummy variable coded as 1 for firms and 0 otherwise. All the other variables are defined in Table 2. Year and Industry dummies are included. ***, ** and * indicate statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

Results in Table 4 show that, in general, the amount of ABS_DAC is larger, i.e. firms are more likely to engage in earnings management, when the firm size is smaller, leverage is used more, changes in sales, debt, and equity are larger, sales are higher, and more R&D expenditures are reported. The results also suggest that earnings management is less when the firm is audited by the Big Four.

Results in regression (a) support our finding reported in Table 3, Panel A and is consistent with our first hypothesis: NegBV firms engage in more earnings manipulation and therefore are shown to higher amount of ABS_DAC. The regression coefficient for NegBV, 0.140, is positive and is statistically significant different from zero at the 1% level. Regression coefficient for NEW (firms in the new economy) in model (b) is also positive, 0.023. This result supports our hypothesis 2: firms in the new economy engage in more earnings manipulation. However, the result is not as significant as for NegBV firms in model (a). The regression coefficient for NEW is statistically significant different from zero at 10% level.

Finally, in model (c) where we include both NegBV, NEW, and the product of these two, the results show that the coefficient for NegBV, 0.107, is still significantly positive at the 1% level. However, the coefficient for NEW, dummy for firms in the new economy, is a positive 0.007, but it is not statistically significant. The coefficient for the product of NegBV and NEW is 0.116, it is statistically significant at 1% level and the magnitude is higher than the coefficient for NegBV. This result supports our third hypothesis where we propose that firms in the new economy that report negative book value are most likely to engage in earnings management by using discretionary accruals.

CONCLUSION

Motivated by the shift in value relevance of accounting information and the paradox of negative book value firms, this study examines the differences in discretionary accruals in firms when the book value reported in the balance sheet is less relevant. Our evidence supports the hypotheses that firms with negative book value and new economy firms use more discretionary accruals than firms with positive book value and old economy firms, respectively. We find a high proportion of unrecorded intangible assets in these firms and argue that management has greater incentive to manage earnings when value relevance of the balance sheet is limited when GAAP do not allow some intangible assets to be reported. Consistent with prior research, we do not suggest that bottom-line net income is necessarily the focal point but leave open the possibility that management have incentive to use other means to convey the future outlook of the firm.

Given the higher likelihood of earning management in negative book value firms and new economy firms, our findings have implications for regulators and accounting bodies. We suggest regulators and accounting fields to put more emphasis be placed on appropriate disclosure of unreported intangible assets.

One caveat of our research is that our discretionary accruals variable is a broad measure of earnings management. Future research may develop better models of earnings management that shed more light.

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