Real Activities Earnings Management in Pharmaceutical Companies

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Abstract:
This study examines real earnings management in pharmaceutical companies. We develop and test four hypotheses using all pharmaceutical companies listed on the Compustat from 2014 to 2018. Our results support two hypotheses. First, we find that suspected pharmaceutical companies spend less efforts on their research and development activities to increase their earnings. Second, our results support the hypothesis that suspected pharmaceutical companies report higher production levels to increase their inventoriable costs to manage their earnings. However, our results do not support the hypothesis that suspected pharmaceutical companies spend less efforts on their cost of sales. Neither can we conclude that suspected pharmaceutical companies report lower inventory levels at the end of their current fiscal year. We contribute to the literature on earnings management.
Key Words: Real Activities, Earnings Management, Pharmaceutical, and Inventory.

I. Introduction:

The use of accrual earnings management by companies in different industries has been extensively and inconclusively debated in the literature. Prior studies (Healy,1985; Guidry et al.,1991; Defound and Jiambalvo, 1994; Teoh et al.,1993; Kasznik, 1999) address accrual earnings managements activities ,however, fewer studies are done in the area of real activities earnings management (e.g., Baber et al. 1991, Dechow and Sloan 1991, Bartov 1993, Bushee 1998, Bens et al. 2002, and Bens et al. 2003). The driving forces for real activities earnings management are meeting or beating earnings forecasts, compliance with debt covenants, and maximization of management compensation and bonuses (Roychowdhry 2006). Management can manipulate financial statements by decreasing their discretionary expenses such as research and development, reducing the level of their inventories through reduction of their normal purchases, and producing more than what they need to satisfy their demand. Even though real activities earnings management can occur in any industry, we speculate that pharmaceutical companies are more prone to this type of earnings management

due to their complex nature and environment as well as the flexibility of their discretionary expenses. It is argued that some companies by deviating from normal activities can affect their reported earnings (in this study we refer to these companies as suspected companies).

We develop and test four hypotheses using all pharmaceutical companies listed on Compustat from 2014 to 2018. We find that suspected pharmaceutical companies spend less efforts on their research and development activities and report higher production levels to increase their inventoriable costs to manage their earnings. We find no evidence that suspected pharmaceutical companies either spend less efforts on their cost of sales or report lower inventory levels at the end of their current fiscal year. Our results are robust to additional analyses to address potential omitted variables and endogeneity concerns.

We contribute to the literature on real activities earnings management by providing evidence on management abusive actions in pharmaceutical companies to manipulate financial statements. Our results have policy, educational, and research implications.

The remainder of the paper is structured as follows: Section II provides relevant literature whereas Sections III develops our hypotheses. Section IV provides our data collection and research design while Section V presents the results of our empirical tests. The last section concludes and provides suggestions for future research.

II. Literature Review:

Healy (1985), Guidry et al. (1991), Defound and Jiambalvo (1994), Teoh et al. (1993), and Kasznik (1999) show that financial management are involved in manipulation of financial statements. Manipulation of financial statements or earnings management are executed in two main ways: (1) accrual earnings management in which high earnings are not followed by high cash flow generated by operating activities, and (2) real activities earnings management in which management by reducing the non-routine expenditures or by over production attempt to meet or beat target earnings.

The accounting literature in earnings management through accrual is rich, but limited work is allocated to real activities earnings management. Baber et al. (1991), Dechow and Sloan (1991), Bartov (1993), Bushee (1998), Bens et al. (2002), and Bens et al. (2003) are examples of real activities earnings management.

Another line of study in earnings management is introduced by Hayn (1995) and Burgstahler and Dechev (1997) that have documented earnings management by companies that have small and around zero earnings. Examples of other studies in this line of research are those of Degeorge et al. (1999), Burgstahler and Eames (1999), Dechow et al. (2003), Beaver et al. (2003), Beaver et al. (2004), and Durtschi and Easton (2005). In addition, Graham et al. (2005), Roychowdhury (2006) show that financial management put more focus on: (1) meeting earnings targets, and (2) take actions to manipulate real activities to meet these targets.

Real activities earnings management increase current year earnings at the expense of reducing cash flows and earnings in the future periods. Examples of real activities earnings management are giving excessive sales discounts, unnecessary reduction of advertising and marketing expenses, reducing research and development expenses, and cutting required ordinary maintenance expenses. All of these unnecessary saving of expenses will increase current year earnings but will result in more expenses and lower sales revenues in the future.

Bruns and Merchant (1990) and Graham et al. (2005) conducted surveys and showed that financial management apply a combination of accrual and real activities earnings management, but they attach more importance to real activities earnings management even though the future negative consequences of the earning as well as cash flows resulting from real activities earnings management are higher. Roychowdhury (2006) argue that financial management attach more importance to real activities earnings management for two possible reasons. First, auditor can easily detect accrual earnings management while detecting real activities earnings management by auditors usually is more difficult. Second, they argue that relying on only accrual earnings management is very risky.

Bens et al. (2002 and 2003) show that financial management reduce research and development expenditures and use saved money to repurchase their own stocks to boost their earnings per share. Reducing research and development expenses to increase earnings are also previously documented by Dechow and Sloan (1991) and Bushee (1998). Bartov (1993) also shows that companies with negative earnings sell their fixed assets to reduce their negative earnings. In addition, Haribar (2002) and Thomos and Zhang (2002) show that companies with negative or low earnings have incentive to over produce to increase their inventoriable costs and increase their earnings, even though no demand exists for their over production.

Bhavani and Amponsah (2017) compare two forensic accounting tools, the Beneish M-score and Altman Z-score, to determine which one is more effective in detecting fraud in financial statements. They use data of the Toshiba company from 2008 to 2014 and conclude that the Altman Z-score better provides signals of fraudulent financial reporting.

Kapoor and Goel (2018) investigate the characteristics of the earnings management based on motivation of management. They use a mega literature review for gap analysis in emerging economies.

Rahman et al., (2020) investigate the audit failure by reviewing the literature during 1976 – 2019. To analyze audit failure, they classify their study in three groups: a) proxy measures of audit failure, b) causes of audit failure, and c) effects of audit failure. They find three signals of audit failure: non-issuance of going concern opinion, material misstatements in audited financial statements, and violations of codes issued by regulators.

Vishnani (2020) investigates the possibility of earnings management in the Indian banking industry. They documented the existence of earnings management using income smoothing and also found conditional conservatism.

Niresh and Silva (2020) study corporate social responsibility (CSR) and how it influences the achievement of a deliberate strategy. They use data from 2012 to 2014 for their analysis and emphasize the importance of having financial statements, free from misstatements, in achieving the objectives of corporate social responsibility.

Our study is the extension of studies done by Dechow et al. (1996), Dechow et al. (1998), Dechow et al. (2003), and Roychaudhury (2006) that find evidence of excessive price discounts to increase current year sales, over productions to reduce cost of goods sold, and reduction of discretionary expenditures to increase earnings as well as over stocking of inventory and receivables to increase earnings. Roychaudury (2006) use all companies, from all industries, listed on Compustat between 1987 and 2001, but we limit our study to pharmaceutical companies listed on Compustat between 2014 and 2018. The choice of pharmaceutical companies for our study is based on the fact that these companies have complex operations. Pharmaceutical companies are engaged in innovation and creation of intangible assets such as drug pipelines, clinical trial status, and direct to customer advertising, which requires large spending in research and development. Even though, research and development is necessary for these companies to be competitive, the management motivation sometimes encourages management to spend less on research and development to boost the short term earnings to increase their bonuses with the expense of losing their comparative advantage in the long run. As mentioned earlier, the pharmaceutical companies spend large amount of money to search for new products; however, research and development activities are not day to day recurring expenses so they provide more opportunity to management to change their reported earnings simply by reducing these expenses when their operations are not profitable and they cannot meet or beat analysts' earnings forecasts.

III. Hypothesis Development:

In this study we extend the research done by Dechow et al. (1996), Dechow et al. (1998), Dechow et al. (2003), and Roychaudhury (2006) and develop the following hypotheses.

Suspected companies are the ones that report very small positive earnings per share (companies with reported earnings per share of 10 cents or less. Given the flexibility of management in choosing different accounting methods or estimates, we argue that companies that experience small loss per share, have incentive to manipulate their earnings through real activity earnings management as well as using accounting methods or/and understate their expected expenses and losses to change loss per share to earnings per share. In our study, we call this group of companies as suspected companies. Companies that have large loss per share or large earnings per share are less likely commit real activities earnings management. In our study we call this group of companies as non-suspected companies. By choosing cost of goods sold in our first

hypothesis, we focus on manufacturing expenses and exclude administrative and selling expenses. Even though theoretically companies can understate their administrative and selling expenses, manipulation of financial statements through understatement of these expenses in practice is rare. This leads us to our first hypothesis:

H_1: Suspected pharmaceutical companies report lower cost of goods sold compare to non-suspected companies.

Research and development activities have an essential role in pharmaceutical companies. Pharmaceutical companies spend large amount of money to search for new products; however, research and development activities provide more opportunity to management to change their reported earnings simply by reducing these expenses when they are experiencing losses due to their specific or general financial crises. Research and development activities are not among day to day operations of companies and reducing these expenses do not create any interruption in companies continuing and recurring operations. In short, research and development expenses are important part of management discretionary expenses. Employees' payroll expenses or expenses such as rent and utility costs cannot be easily manipulated by management, but research and development expenses can be. Therefore, our second hypothesis is:

H_2: Suspected pharmaceutical companies report lower research and development expenses compare to non-suspected companies.

During economic downturns and decreased demand for companies' products, some companies have incentive to increase the level of their production to reduce their average costs of products and transfer a large portion of their costs to the next year through their inventory balances (product or inventoriable costs). These expenses should be included in income statements (period costs) if the factory stays idle. During economic crises when demand for products is low, normal practice is to decrease production to be in line with existing low demand. In these circumstances, suspected companies increase their production level to transfer a portion of their costs to the next year through reported inventory. This practice is questionable because higher inventory reduces loss or increases earnings for the current period but results in higher loss or lower earnings in the future periods if inventory stays idle and cannot be sold. Higher inventory for the current period decreases cost of goods sold for the current period and increases the beginning inventory of the next year, which results in higher cost of goods sold and lower earnings for the next year. As a result, our third hypothesis is:

H_3: Suspected pharmaceutical companies report higher production level compare to non-suspected companies.

We also argue that suspected companies have incentives to decrease their purchases and inventory in the current period to liquidate their inventory during periods of rising prices. When prices are increasing, it is possible for companies to reduce their current purchases, which cost more, and include older purchases which cost less as part of

their cost of goods manufactured and sold. Given that pharmaceutical companies are manufacturing companies, we use costs of goods manufactured to test this hypothesis. This leads us to our last hypothesis:

H_4: Suspected pharmaceutical companies report lower inventory level compare to non-suspected companies.

IV. Data Collection and Research Design

IV.1 Data Collection:

All financial data used in our study are collected from the Compustat database. We also manually have searched companies' websites for missing data and hand collected these data. In our panel data analyses, we have included data for five consecutive years from fiscal year 2014 to fiscal year 2018 for 219 pharmaceutical companies.

IV.2 Research Design

The following multivariate regression models are used in this study.
To test our first hypothesis, we use the following model:

$$CGS_t = \beta_0 + \beta_1 REVE_t + \beta_2 DEBT_t + \beta_3 MKBK_t + \beta_4 SIZE_t + \beta_5 SUSP + \varepsilon_t \quad \dots (1)$$

Where:

- CGS_t = is cost of goods sold for year t, normalized by net assets in the beginning of year t
- $REVE_t$ = is net sales revenue for year t, normalized by net assets in the beginning of year t
- $DEBT_t$ = is total liabilities at the end of year t, normalized by net assets in the beginning of year t
- $MKBK_t$ = is market value of stockholders' equity divided by the book value of stockholders' equity at the end of year t
- $SIZE_t$ = is natural log of total assets at the end of year t
- SUSP = is a dummy variable which is equal to 1 if the company is suspected and zero otherwise.

In this model, we look at the association between cost of goods sold and revenue holding total liability, growth measured as the ratio of market value to book value of the stockholders' equity, and size unchanged. We look at this relationship to examine whether there is a significant difference between suspected companies and non-suspected ones. A significant negative coefficient for SUSP, which is a dummy variable, supports our first hypothesis.

To test our second hypothesis, we use the following model:

$$R\&D_t = \beta_0 + \beta_1 REVE_t + \beta_2 REVE_{t-1} + \beta_3 REVE_{t-2} + \beta_4 DEBT_t + \beta_5 MKBK_t + \beta_6 \mathbf{SIZE_t} + \beta_7 SUSP + \varepsilon_t \quad \dots (2)$$

Where:

- $R\&D_t$ = is the cost of research and development during year t, normalized by net assets in the beginning of year t
- $REVE_t$ = is net sales revenue for year t, normalized by net assets in the beginning of year t

$REVE_{t-1}$ = is net sales revenue for year t, normalized by net assets in the beginning of year t-1
$REVE_{t-2}$ = is net sales revenue for year t, normalized by net assets in the beginning of year t-2
$DEBT_t$ = is total liabilities at the end of year t, normalized by net assets in the beginning of year t
$MKBK_t$ = is market value of stockholders' equity divided by the book value of stockholders' equity at the end of year t
$SIZE_t$ = is natural log of total assets at the end of year t
SUSP = is a dummy variable which is equal to 1 if the company is suspected and zero otherwise.

In this model, we examine whether suspected companies, companies that are marginally profitable, are spending less in research and development expenses. In this model our control variables are revenue, both for the current period and a year before, liabilities, growth, measured as the ratio of market value to book value of the stockholders' equity, and size. Research and development expense is not based on only current period sales revenues, and it depends on profitability during the last few years. We argue that management of marginally profitable companies have discretion to spend less on research and development without interruption in their day to day operations. A significant negative coefficient for SUSP, which is a dummy variable, supports our second hypothesis.

To test our third hypothesis, we use the following model:

$$PROD_t = \beta_0 + \beta_1 REVE_t + \beta_2 REVE_{t-1} + \beta_3 REVE_{t-2} + \beta_4 DEBT_t + \beta_5 MKBK_t + \beta_6 SIZE_t + \beta_7 SUSP + \varepsilon_t \quad \ldots (3)$$

Where:

$PROD_t$ = is the cost of goods manufactured during year t, normalized by net assets in the beginning of year t
$REVE_t$ = is net sales revenue for year t, normalized by net assets in the beginning of year t
$REVE_{t-1}$ = is net sales revenue for year t, normalized by net assets in the beginning of year t-1
$REVE_{t-2}$ = is net sales revenue for year t, normalized by net assets in the beginning of year t-2
$DEBT_t$ = is total liabilities at the end of year t, normalized by net assets in the beginning of year t
$MKBK_t$ = is market value of stockholders' equity divided by the book value of stockholders' equity at the end of year t
$SIZE_t$ = is natural log of total assets at the end of year t
SUSP = is a dummy variable which is equal to 1 if the company is suspected and zero otherwise.

In this model, we examine whether suspected companies, companies that are marginally profitable, produce more products even though their supply of products is in excess of their exiting demand. In this model our control variables are revenue, both for

the current period and a year before, liabilities, growth measured as the ratio of market value to book value of the stockholders' equity, and size. The same as research and development expense, productions depends not based on only current period sales revenues and it depends on profitability during the last few years. We argue that management of marginally profitable companies have incentive to produce more than demand for their product. A significant positive coefficient for SUSP, which is a dummy variable, supports our third hypothesis.

To test our forth hypothesis, we use the following model:

$$INVE_t = \beta_0 + \beta_1 REVE_t + \beta_2 REVE_{t-1} + \beta_3 REVE_{t-2} + \beta_4 DEBT_t + \beta_5 MKBK_t + \beta_6 SIZE_t + \beta_7 SUSP + \varepsilon_t \quad \ldots (4)$$

Where:

$INVE_t$ = is balance of inventory at the end of year t, normalized by net assets in the beginning of year t

$REVE_t$ = is net sales revenue for year t, normalized by net assets in the beginning of year t

$REVE_{t-1}$ = is net sales revenue for year t, normalized by net assets in the beginning of year t-1

$REVE_{t-2}$ = is net sales revenue for year t, normalized by net assets in the beginning of year t-2

$DEBT_t$ = is total liabilities at the end of year t, normalized by net assets in the beginning of year t

$MKBK_t$ = is market value of stockholders' equity divided by the book value of stockholders' equity at the end of year t

$SIZE_t$ = is natural log of total assets at the end of year t

SUSP = is a dummy variable which is equal to 1 if the company is suspected and zero otherwise.

In this model, we examine whether suspected companies, companies that are marginally profitable, hold higher than usual inventory levels. Higher inventory results in lower cost of goods sold and higher earnings. In this model our control variables are revenue, both for the current period and a year before, liabilities, growth measured as the ratio of market value to book value of the stockholders' equity, and size. The same as research and development expense and production, the level of inventory is not based on only current period sales revenues, and it depends on profitability during the last few years. We argue that management of marginally profitable companies have incentive to overstate their ending inventory. A significant positive coefficient for SUSP, which is a dummy variable, supports our third hypothesis.

V. Results

Table 1, shows descriptive statistics for data items used in this study. The first four data items are dependent variables and the rest are independent variables.

Table 1: Descriptive Statistics for Data Items

Variable	observation	Mean	STD DEV	Minimum	Maximum
CGS	1091	1665.779	13431.51	0	201254
RD	1095	964.1113	8723.611	0	139579
INVE	1095	755.2328	5749.543	0	88123
PROD	1095	1803.838	14703.19	0	275968.8
REVE	1095	5108.68	39370.56	0	600363
DEBT	857	14.12475	343.7505	0	10045
MKBK	861	3.942338	58.14562	-493.0157	1041.484
SIZE	857	4.568989	3.346385	-11.51293	13.86793

All outliers are eliminated, so, as the above table shows, all data are in a reasonable range. The reason for negative sign of minimum values of market to book ratio (growth) and size is the negative sign of stockholders equity for some non-profitable companies. Table 2 shows correlation matrix for variables used in our study. As we mentioned earlier, the first four variables are dependent variables and the rest are control variables.

Table 2: Correlation Matrix

	CGS	RD	INVE	PROD	REVE	DEBT	MKBK	SIZE
CGS	1.0000							
RD	0.9931 0.0000	1.0000						
INVE	0.9943 0.0000	0.9896 0.0000	1.0000					
PROD	0.9848 0.0000	0.9818 0.0000	0.9889 0.0000	1.0000				
REVE	0.9964 0.0000	0.9948 0.0000	0.9952 0.0000	0.9885 0.0000	1.0000			
DEBT	- 0.0056 0.8707	- 0.0050 0.8846	- 0.0059 0.8633	- 0.0055 0.8722	- 0.0058 0.8648	1.0000		
MKBK	0.0002 0.9960	0.0003 0.9923	0.0004 0.9918	0.0001 0.9980	0.0003 0.9925	- 0.0083 0.8080	1.0000	
SIZE	0.3349 0.0000	0.3080 0.0000	0.3541 0.0000	0.3315 0.0000	0.3511 0.0000	- 0.1789 0.0000	0.0347 0.31060	1.0000

Table 2 shows that there is a high correlation between cost of CGS and variables such as research and development expenses, inventory, products, size, and revenues. That is, larger companies (large in size) tend to have larger revenues and larger cost of goods sold. In addition, larger companies produce more products, hold larger inventory, and spend more on research and development. Our results do not show any correlation between company size and debt financing.

Lastly, Table 3 to 6 shows the outputs for running our models mentioned earlier in this paper. Table 3 shows the result of model in which the dependent variable is cost of

goods sold, while Table 4 shows the result of model in which the dependent variable is research and development expenses. Table 5 show the output for model in which the dependent variable is inventory, while Table 6 shows the output for model in which the dependent variable is product, cost of goods manufactured.

Table 3: Output for model in which dependent variable is cost of goods sold

$CGS_t = \beta_0 + \beta_1 REVE_t + \beta_2 DEBT_t + \beta_3 MKBK_t + \beta_4 SIZE_t + \beta_5 SUSP + \varepsilon_t$

	Coefficient	STD Error	Z	P>| Z|	{95% Confidence	Interval)
$REVE_t$	0.3327392	0.0023165	143.64	0.000	0.3291989	0.3372795
$DEBT_t$	- 0.0145998	0.1164073	- 0.13	0.900	- 0.2427539	0.2135542
$MKBK_t$	0.0176425	0.5721913	0.03	0.975	- 1.103832	1.139117
$SIZE_t$	- 16.28093	25.63993	- 0.63	0.525	- 66.53427	33.9724
SUSP	- 188.554	227.2409	- 0.83	0.407	- 633.938	256.83
Intercept	74.44757	143.0517	0.52	0.603	- 205.9287	354.8238

As Table 3 shows, cost of goods sold is significantly associated with revenues (p-value off less than .01; however, coefficients of other variables are not significantly different from zero; p-value of 0.900 for coefficient of debt (total liabilities divided by total assets), p-value of 0.975 for coefficient of growth (market value of equity to book value of equity), p-value of 0.525 for coefficient of size (natural log of total assets). Lastly, the coefficient of SUSP (dummy variables used to distinguish between suspected companies versus non-suspicious companies) is not significant at any reasonable significance level (p-value of 0.407), indicating that we cannot support the first hypothesis of this study. That is, suspected pharmaceutical companies do not spend less on cost of their sales compare to non-suspected companies.

Table 4: Output for model in which dependent variable is research and development expense

$$R\&D_t = \beta_0 + \beta_1 REVE_t + \beta_2 REVE_{t-1} + \beta_3 REVE_{t-2} + \beta_4 DEBT_t + \beta_5 MKBK_t + \beta_6 SIZE_t + \beta_7 EPS_t + \beta_8 SUSP + \varepsilon_t$$

	Coefficient	STD Error	Z	P>| Z|	{95% Confidence	Interval)
$REVE_t$	0.2174732	0.0092812	23.43	0.000	0.1992824	0.235664
$REVE_{t-1}$	0.0641581	0.0100002	6.42	0.000	0.044558	0.0837582
$REVE_{t-2}$	- 0.0553471	0.0094483	- 0.5.86	0.000	- 0.0738654	- 0.0368288
$DEBT_t$	- 0.1774404	0.0791844	- 2.24	0.025	- 0.3326389	- 0.0222418
$MKBK_t$	0.1788967	0.4459266	0.40	0.688	- 0.6951033	1.052897
$SIZE_t$	- 128.0317	11.63232	- 11.01	0.000	-150.8306	- 105.2327
EPS_t	- .0.0253213	0.0653475	- 0.39	0.698	- 0.1534	0.1027574
SUSP	- 183.2302	83.75454	- 2.19	0.029	- 347.3861	- 19.0743
Intercept	394.1797	57.9886	6.80	0.000	280.5241	507.8352

As the above table shows, research and development expense is significantly associated with current period revenues (p-value of less than 0.01), one year lag of revenues (p-value of less than .01), two period lag of revenues (p-value of less than 0.01), debt (p-value of 0,025), and size (p-value of less than 0.01); however, coefficients of growth (market to book value ratio) and earnings per share are not significant, p-values of 0.688 and 0.698, respectively. Lastly, the coefficient of SUSP (dummy variables used to distinguish between suspected companies versus non-suspicious companies) is highly significant at any reasonable significance level (p-value of 0.029), indicating that our data support the second hypothesis of this study. That is, there is significant difference between suspected and non-suspected companies with respect to their research and development spending, with suspected companies spending less on these expenses. That is, suspected pharmaceutical companies report lower research and development expenses compare to non-suspected companies.

Table 5: Output for model in which dependent variable is the cost of goods produced

$$PROD_t = \beta_0 + \beta_1 REVE_t + \beta_2 REVE_{t-1} + \beta_3 REVE_{t-2} + \beta_4 DEBT_t + \beta_5 MKBK_t + \beta_6 SIZE_t + \beta_7 EPS_t + \beta_8 SUSP + \varepsilon_t$$

	Coefficient	STD Error	Z	P>| Z|	{95% Confidence	Interval)
$REVE_t$	0.490582	0.0048236	10.17	0.000	0.0396042	0.0585123
$REVE_{t-1}$	0.128627	0.0051791	24.84	0.000	0.1184762	0.1387779
$REVE_{t-2}$	- 0.0298171	0.0049188	- 06.06	0.000	- 0.0394579	- 0.0201764
$DEBT_t$	0.0014183	0.0463393	0.03	0.976	- 0.089405	0.0922416
$MKBK_t$	0.0042653	0.2394962	0.02	0.986	- 0.4651386	0.4736692
$SIZE_t$	- 0.1963234	8.788666	- 0.02	0.982	-17.42179	17.02914
EPS_t	- .0.0011582	0.0368051	- 0.03	0.975	- 0.0732948	0.0709785
SUSP	154.6818	69.50485	2.23	0.026	18.45477	290.9088
Intercept	-27.01328	45.88809	- 0.59	0.556	- 116.9523	62.92573

As the above table shows, the level of production is significantly associated with current period revenues (p-value of less than 0.01), one year lag of revenues (p-value of less than .01), and two period lag of revenues (p-value of less than 0.01; however, coefficients of debt, growth (market to book value ratio), size, and earnings per share are not significant, p-values of 0.976, 0.986, 0.982. and 0.975, respectively. Lastly, the coefficient of SUSP (dummy variables used to distinguish between suspected companies versus non-suspicious companies) is highly significant at any reasonable significance level (p-value of 0.026), indicating that our data support the third hypothesis of this study. That is, suspected pharmaceutical companies report higher production level compare to non-suspected companies.

Table 6: Output for model in which dependent variable is the level of inventory

$$INVE_t = \beta_0 + \beta_1 REVE_t + \beta_2 REVE_{t-1} + \beta_3 REVE_{t-1} + \beta_4 DEBT_t + \beta_5 MKBK_t + \beta_6 SIZE_t + \beta_7 EPS_t + \beta_8 SUSP + \varepsilon_t$$

	Coefficient	STD Error	Z	P>| Z|	{95% Confidence	Interval)
$REVE_t$	0.2262019	0.0279672	8.09	0.000	0.1713873	0.2810166
$REVE_{t-1}$	- 0.3397775	0.0303182	- 11.21	0.000	- 0.3992002	- 0.2803548
$REVE_{t-2}$	0.4680734	0.0283621	16.50	0.000	0.4124848	0.5236621
$DEBT_t$	-.0616842	0.2213319	- 0.28	0.780	- 0.4954867	0.3721183
$MKBK_t$	0.0550696	1.285551	0.04	0.966	- 2.464565	2.574704
$SIZE_t$	- 36.9564	26.82177	- 1.38	0.168	- 89.52612	15.61331
EPS_t	- 0.0472109	0.1780506	- 0.27	0.791	- 0.3961837	0.3017619
SUSP	- 53.23779	186.2097	- 0.29	0.775	- 418.202	311.7264
Intercept	147.1988	132.0667	1.11	0.265	- 111.6471	406.0447

As the above table shows, the level of inventory is significantly associated with current period revenues (p-value of less than 0.01), one year lag of revenues (p-value of less than .01), and two period lag of revenues (p-value of less than 0.01; however, coefficients of debt, growth (market to book ratio), size, and earnings per share are not significant, p-values of 0.780, 0.966, 0.168, and 0.791, respectively. Lastly, the coefficient of SUSP (dummy variables used to distinguish between suspected companies versus non-suspicious companies) is not significant at any reasonable significance level (p-value of 0.775), indicating that our data do not support the forth hypothesis of this study. That is, suspected pharmaceutical companies do not report lower inventory levels compare to non-suspected companies.

Additional Analyses

VI. Conclusion

The focus of this study is to investigate the use of real activities earnings management in all pharmaceutical companies listed on Compustat from 2014 to 2018. We posit and test four hypotheses that suspected pharmaceutical companies report lower cost of goods sold, spend less on their research and development expenses, report higher production levels and report lower inventory levels at the end of their current year. We use four multivariate regression models to test our hypotheses. Our regression outputs do not support our first hypothesis. That is, we cannot conclude that suspected pharmaceutical companies spend less on their cost of sales. However, our results support our second hypothesis that suspected pharmaceutical companies spend less on their research and development activities. Our results also support our third hypothesis that suspected pharmaceutical companies report higher production levels to increase their product or inventoriable costs to increase their earnings. Lastly, our

regression outputs do not support our fourth hypothesis. That is, we cannot conclude that suspected pharmaceutical companies report lower inventory levels at the end of their current fiscal year.

We contribute to the existing literature by limiting our study to only pharmaceutical companies and using the most recent available data. We speculate that pharmaceutical companies are more prone to real activities earnings management due to their complex nature and environment as well as their flexibility in their discretionary expenses such as research and development expenses.

In addition, this study is expected to contribute to the literature in several ways. First, we investigate the use of real activities earnings management in pharmaceutical companies. To the best of our knowledge our study is the first study addressing this issue. Second, we extends the literature on the relevance of earnings management for pharmaceutical companies. Lastly, all of our regressions models include panel data from 2014 to 2018. To the best of our knowledge, these are the latest years included in the real activities earnings management research.

Our research has implications in different areas. The results of this study can be used by current and potential investors to include the risk of real activities earnings management in their decision model to decide whether to buy, sell, or keep their company stocks. Second, we have introduced a new window of opportunities for research in financial affairs of pharmaceutical companies. We expect more efforts and resources be allotted to this area of research. Third, the findings of our study can be used by educator who teach forensic accounting to better educate their students. Lastly, researchers who are interested in this line of studies, can extend our study to include more years in their panel data analyses.

Results presented in this study should be interpreted with care because of the following potential limitations:

First, as we have discussed earlier, our results support two hypotheses. First, we find that suspected pharmaceutical companies spend less efforts on their research and development activities to increase their earnings. Second, our results support the hypothesis that suspected pharmaceutical companies report higher production levels to increase their inventoriable costs to manage their earnings. We should point out that we have only shown association between suspected pharmaceutical companies and their research and development expenses as well as the association between suspected companies and the size of their inventoriale costs. We have not established any causal relationship between the variables of interest. Second, we have only included five years of data in our panel data analyses. The results may differ when more years of data are becoming available.

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Appendix 1: List of variables used in this paper

CGS_t = is cost of goods sold for year t, normalized by net assets in the beginning of year t

$DEBT_t$ = is total liabilities at the end of year t, normalized by net assets in the beginning of year t

EPS_t = is earning per share at the end of year t.

$INVE_t$ = is balance of inventory at the end of year t, normalized by net assets in the beginning of year t

$MKBK_t$ = is market value of stockholders' equity divided by the book value of stockholders' equity at the end of year t

$PROD_t$ = is the cost of goods manufactured during year t, normalized by net assets in the beginning of year t

$REVE_t$ = is net sales revenue for year t, normalized by net assets in the beginning of year t

$REVE_{t-1}$ = is net sales revenue for year t, normalized by net assets in the beginning of year t-1

$REVE_{t-2}$ = is net sales revenue for year t, normalized by net assets in the beginning of year t-2

$R\&D_t$ = is the cost of research and development during year t, normalized by net assets in the beginning of year t

$SIZE_t$ = is natural log of total assets at the end of year t

SUSP = is a dummy variable which is equal to 1 if the company is suspected and zero otherwise.