Lingnan Journal of Banking, Finance and Economics

Volume 2 *2010/2011 Academic Year Issue* Article 5

January 2010

Analysis on accrual-based models in detecting earnings management

Tianran CHEN
tianranchen@ln.edu.hk

Analysis on Accrual-Based Models in Detecting Earnings Management

Tianran CHEN

Abstract

This paper analyzes the problems with the alternative accrual-based models in detecting earnings management. The researcher will focus on comparing the Jones Model and the Modified Jones Model, which are the two most frequently used model in empirical analysis nowadays. Earnings management is a kind of management which uses accounting techniques to meet the executives' needs for earnings; it is a widely debated topic, hence it is worth looking at. Experts and professionals in this area found many approaches to detect the earnings management; within these approaches are the accrual-based models which include the modified Jones model, which currently is a favourite model to many researchers. Using OLS model, the author found that sometimes using the Jones models alone cannot solve the problems. The samples used in this paper are the China's ST companies (listed companies which made a loss for two years and thus clearly have the motive to manipulate their earnings). This paper also provides some examples of situations which the Jones models cannot handle.

Keywords: Earnings Management, modified Jones Model, ST companies

1. Introduction

1.1 Definition of Earnings Management

Earnings management is said to be a "reasonable and legal management decision making and reporting, intended to achieve and disclose stable and predictable financial results".[1] Most people are aware of the fact that companies' earnings are their "net income" or "net profit". A company's earning is believed to be the most important item in the financial statements. It is what most analysts use when analyzing a company's performance and prospective potential. On top of this, the expected value of a company's share price is the present value of all its future earnings, and therefore the value of a company is closely related to the increase or decrease in the earnings.

1.2 Accrual-based Models

There are many approaches in detecting earnings management but the Accrual-Based Models are the most popular approaches.

Analysis of earnings management often focuses on management's use of discretionary accruals. In these accrual-based models, researchers estimate the discretionary components of reported income.

(1) Healy Model

Healy (1985) assumed that non-discretionary accruals follow the regression of white noise, whose average is zero. So the value of expected non-discretionary accruals is zero. If the value of total accruals (TA), which is the sum of discretionary accruals (DA), and non-discretionary accruals (NDA) is non-zero, it is the result of earnings management.

$DA_{i,t}=TA_{i,t}/A_{i,t-1}$ ①

Where A = total Assets;

(2) DeAngelo Model

DeAngelo (1986) assumed that non-discretionary accruals follow random walk. For a company in a stationary condition, the non-discretionary accrual in period t is equal to the non-discretionary accrual in period t-1. As a result, the difference between the non-discretionary accruals in period t and t-1 is the discretionary accrual which is related to earnings management.

$DA_{i,t}=(TA_{i,t}-TA_{i,t-1})/A_{i,t}$ ②

(3) Jones Model

Jones (1991) believes that the variations of revenue would bring variations on operating capital, causing a change in accruals, and the depreciations on fixed assets would decrease the accruals. Because of this, Jones uses variance of revenue (Δ REV) and fixed asset (PPT), as independent variables to predict the discretionary accruals.

Firstly, equation ③ is used to get the estimates of coefficients, and then the expected DA can be calculated using data in period t.

$TA_{i,p}/A_{i,p-1}=\alpha_1(1/A_{i,p-1})+\beta_1(\Delta REV_{i,p}/A_{i,p-1})+\beta_2(PPT_{i,p}/A_{i,p-1})+\varepsilon_{i,p}$ ③

$DA_{i,t}=TA_{i,t}/A_{i,t-1}-[a_{1,i}(1/A_{i,t-1})+b_{1,i}(\Delta REV_{i,t}/A_{i,t-1})+b_{2,i}(PPT_{i,t}/A_{i,t-1})$ ④

(4) Jones Cross-section Model

Jones uses time-series in the last model, but the data would incur bias. To avoid the bias, DeFond and Jiambalvo (1994) introduced cross-section Jones model which assumes the non-discretionary accruals level in the same industry are the same. Therefore, they first gather the data of the industry to estimate the coefficients in equation ③, then use ④ calculate discretionary accruals.

(5) Modified Jones Model

This is the most famous model to detect earnings management nowadays. In Jones model and cross-section Jones model, the assumption is that all the variances of revenue are non-discretionary. However, managers could use credit sales to manage earnings. To calculate this, Dechow et al. (1995) modified the Jones model, that is, they deduct the variance of receivables (Δ REC).

$DA_{i,t}=TA_{i,t}/A_{i,t-1}-[a_i(1/A_{i,t-1})+b_{1,i}(\Delta REV_{i,t}/A_{i,t-1}-\Delta REC_{i,t}/A_{i,t-1})+b_{2,i}(PPT_{i,t}/A_{i,t-1})]$ ⑤

2. Review of the Literature

The researches have summarized the shortcomings of accrual-based models as follows:

(1) The ability of detecting earnings management is low.

Dechow and Sloan (1995), Guay and Kothari (1996), Young (1999), Thomas and Zhang (2000), Kothari and Wasley (2005), all detect earnings management using different angles, different data, and different methods, and they all neglect some variables and have econometric flaws. Compared with other models, the modified Jones model is the best because Dechow used the data of SEC.

(2) They neglect many factors that will affect accruals.

Some empirical analyses indicated that the achievement, size, growth and debt of a company are all closely related to its accrual level. McNichols (2001) found that the growth of a company has influence but Jones model neglected it.

(3) There are many noises in these models.

3. Research Method and Data Analysis

3.1 Sample

3.1.1 Definition of ST company

To study the application of Jones models, the author chose 77 China's ST companies in the stock market. Recently in mainland China, a new accounting standard came out (Jan 1st, 2007) which changed the methods of managing earnings. Because of this, the author chose to do a cross-sectional analysis on the data of 2007 and 2008 annual reports. All the data are obtained from CSMAR and the analyzing software is Eviews 6.0. ST companies are listed companies which have been at a loss for two

years. In China, these companies get "special treatment" which means they need to have a "ST" hat before their names in stock market to remind investors to be careful. If these companies unfortunately lose for three years they would be warned for delist.

3.1.2 Hypotheses on choosing this sample

According to the definition, ST companies evidently have motive to manage earnings.

In the year before getting a loss, they would choose positive earnings management which would increase reported profit. However, they would prefer a negative earnings management when they suffered loss for the first year in order to increase the profit of the second year, so as to avoid the "Special Treatment".

For the non-discretionary accruals are hard to change, ST companies would think about how to report the discretionary accruals. By this it means ST companies should have non-zero discretionary accruals. Also, if the Jones model and the modified Jones model have no flaws, using this sample would get an evident result, especially for the modified Jones model.

3.2 Making Regression

3.2.1 Jones model and modified Jones model

According to the Jones model and the modified Jones model, we should detect discretionary accruals in the following way.

TA (total accruals) = NI (net income) – CFO (operating cash flow)

$A_{i,t-1}$ is company i' s total asset in year t - 1
$\Delta R\ EV_{i,t}$ is the difference of operating revenue
$P\ P\ E_{i,t}$ is company i' s fixed asset in year t.
$\Delta R\ EC_{i,t}$ is the difference of account receivable.

3.2.2 Detect the accuracy of modified Jones model

The detecting results are as follows:
For the Jones model:
Judging from R-squared (0.87) and P value (Prob. 0, 0.08, 0), these data are evident and appropriate.

However, for the modified Jones model, we get the opposite result:

The P value is far above 10% level which shows the modified Jones model has a flaw here. The author makes a further analysis on this issue as follows.

3.3 Data Analyses and Empirical Results

Theoretically, if the Jones model and the Jones model are applicable, the discretionary accruals (DA) should have a positive relationship with net profit (NP).

$$DA_{i,t} = \alpha + \beta NP_{i,t} + \varepsilon_{i,t}$$

However, the author found that for those companies that did positive earnings management to increase the reported profit there was no relationship between the discretionary accruals and net profit despite the model used. Therefore, those ST companies that had loss for two years, and in danger of delisting, should increase the reported earnings. In other words, they should do a positive earnings management. Surprisingly, the Eviews' results go against reality which is undoubtedly right.

The results in the last chapter made the author doubt the modified Jones model; the results in this upcoming chapter made the author doubt all the Jones models.

For the Jones model:
R-squared is 0.52, which is far below 0.80. Moreover, P value of all the ST companies is above 0.10. These results are not expected. So the author divided all the companies with positive discretionary accruals and negative discretionary accruals into two groups and tested them seperately.

For those ST companies that have positive discretionary accruals:
The R-squared is far below 0.80 and P value is above 10% level. This means that, increase in discretionary accruals has nothing to do with the increase in net profit. This is a fallacy.

On the other hand, for those ST companies who have negative discretionary accruals, the result in table 5 is just what we expected: the net profit has a negative relationship with negative discretionary accruals. However, the author tested the modified Jones model and got the same results as the Jones model.

In analyzing the data, the author found that the amount of total accruals is quite close to discretionary accruals, whereas the amount of non-discretionary accruals is quite small. In addition to this, the modification to Jones models has little impact on the results.

In this specific case, the author found that the modified Jones model could not perform better and may even perform worst in detecting discretionary accruals.

4. Conclusions

Firstly, the modified Jones model is still the best approach to detect earnings management compared to all other methods in the educational circles; there is no need to deny the usefulness of this famous model.

Secondly, the Modified Jones Model is sometimes problematic, as explained above; therefore, it is necessary to use other approaches at the same time to detect the earnings management in other aspects and compare the results to the modified Jones model. In other words, to only use the results deriving from one specific model is not sufficient to prove anything.

Thirdly, the attempt of finding a better method to detect earnings management is still on the way. Though many people conclude that the modified Jones model has problems, there are still no alternatives to replace it.

References:

Thomas E. Mckee. Earnings Management-an executive perspective. Thomson Higher Education, 2005. 1-12

Patricia M. Dechow, Richard G. Sloan, Amy P. Sweeney. Detecting Management Earnings. The Accounting Review, 1995, 193-225.

Paul M. Healy. A Review of the Earnings Management Literature and its Implications for Standard Setting. 1998.

Messod D. Beneish. Incentives and Penalties Related to Earnings Overstatements that Violate GAAP. The Accounting Review. October, 1999. 425-427.

Patricia M. Dechow, Richard G. Sloan, Amy P. Sweeney. Causes and Consequences of Earnings Manipulation: An Analysis of Firms Subject to Enforcement Actions by the SEC. Contemporary Accounting Research. 1996, 1-36.

Appendix I: Original Eviews Output

Table 1: Detecting Jones model

Dependent Variable: TAA
Method: Least Squares
Date: 12/13/09 Time: 12:18
Sample: 1 77
Included observations: 77

Variable	Coefficient	Std. Error	t-Statistic	Prob.
A	1.19E+08	5241146.	22.63836	0.0000
V	0.103245	0.058348	1.769460	0.0809
PPE	-0.469218	0.161285	-2.909246	0.0048

R-squared	0.872652	Mean dependent var	0.186442
Adjusted R-squared	0.869211	S.D. dependent var	1.718575
S.E. of regression	0.621519	Akaike info criterion	1.924883
Sum squared resid	28.58520	Schwarz criterion	2.016200
Log likelihood	-71.10799	Hannan-Quinn criter.	1.961409
Durbin-Watson stat	1.938488		

Table 2: Detecting modified Jones model

Dependent Variable: TAA
Method: Least Squares
Date: 12/13/09 Time: 12:14
Sample: 1 77
Included observations: 77

Variable	Coefficient	Std. Error	t-Statistic	Prob.
A	1.18E+08	5347182.	22.13248	0.0000
VC	0.021554	0.056349	0.382498	0.7032
PPE	-0.366900	0.180281	-2.035153	0.0454

R-squared	0.867526	Mean dependent var	0.186442
Adjusted R-squared	0.863946	S.D. dependent var	1.718575
S.E. of regression	0.633905	Akaike info criterion	1.964348
Sum squared resid	29.73587	Schwarz criterion	2.055665
Log likelihood	-72.62739	Hannan-Quinn criter.	2.000874
Durbin-Watson stat	1.873698		

Table 3: Relationship between discretionary accruals and net profit in Jones model and modified Jones model

Dependent Variable: DA
Method: Least Squares
Date: 12/13/09 Time: 13:13
Sample: 1 77
Included observations: 77

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-58883286	35517752	-1.657855	0.1015
NP	0.619670	0.068958	8.986233	0.0000

R-squared	0.518466	Mean dependent var	-65471832
Adjusted R-squared	0.512046	S.D. dependent var	4.46E+08
S.E. of regression	3.12E+08	Akaike info criterion	41.97797
Sum squared resid	7.28E+18	Schwarz criterion	42.03885
Log likelihood	-1614.152	Hannan-Quinn criter.	42.00232
F-statistic	80.75239	Durbin-Watson stat	2.020593
Prob(F-statistic)	0.000000		

Table 4: ST companies who have positive discretionary accruals (Jones model and modified Jones model)

Dependent Variable: DA
Method: Least Squares
Date: 12/13/09 Time: 13:23
Sample: 1 26
Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.40E+08	68506407	2.050813	0.0514
NP	0.123882	0.117622	1.053216	0.3027

R-squared	0.044177	Mean dependent var	1.64E+08
Adjusted R-squared	0.004351	S.D. dependent var	3.31E+08
S.E. of regression	3.30E+08	Akaike info criterion	42.14194
Sum squared resid	2.62E+18	Schwarz criterion	42.23872
Log likelihood	-545.8452	Hannan-Quinn criter.	42.16981
F-statistic	1.109263	Durbin-Watson stat	2.238988
Prob(F-statistic)	0.302731		

Table 5: ST companies who have negative discretionary accruals

Dependent Variable: DA
Method: Least Squares
Date: 12/13/09 Time: 12:51
Sample: 1 51
Included observations: 51

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-80719192	24625824	-3.277827	0.0019
NP	0.900617	0.051618	17.44774	0.0000

R-squared	0.861356	Mean dependent var	-1.82E+08
Adjusted R-squared	0.858527	S.D. dependent var	4.54E+08
S.E. of regression	1.71E+08	Akaike info criterion	40.78901
Sum squared resid	1.43E+18	Schwarz criterion	40.86477
Log likelihood	-1038.120	Hannan-Quinn criter.	40.81796
F-statistic	304.4236	Durbin-Watson stat	1.986686
Prob(F-statistic)	0.000000		

Appendix II: Data for modified Jones model

$DA_{i,t}$	$NDA_{i,t}$	$TA_{i,t}$	$(dREV_{i,t}-dREC_{i,t})/A_{i,t-1}$	$PPE_{i,t}/A_{i,t-1}$	TAi,t/Ai,t-1
-1.29E+07	6.23E-01	-12912489.67	0.225643409	0.16989302	-0.076035169
1.37E+08	4.20E-02	136553473.5	0.062768785	0.055870003	0.09372082
-1.03E+08	9.12E-02	-103222261.7	0.210149996	0.141871299	-0.140022588
4.37E+04	1.47E+00	43747.75	0.144547743	0.071763592	0.000553157
2.47E+07	3.57E-01	24652567.09	0.176003329	0.117643961	0.08621292
-3.01E+07	4.52E-01	-30097352.75	1.277245322	0.261264601	-0.140391538
-3.97E+07	4.47E-01	-39678762	0.192350672	0.099096255	-0.172928704
2.62E+07	7.31E-02	26184399.72	0.243354141	0.520099398	0.070019807
-2.84E+08	2.73E-01	-283839631.4	0.807346972	0.122253905	-0.864597745
-9.22E+06	2.49E-01	-9224211.93	-0.011861333	0.002716202	-0.019410406
1.32E+08	1.32E+01	131669779.3	0	0.052125055	14.68913103
-1.19E+08	-3.60E-02	-119340262.6	0.807136523	0.317987253	-0.105502912
-2.23E+07	3.10E-02	-22309079.77	0.170938926	0.035648245	-0.013573501
-2.27E+08	6.55E-02	-227374363.2	0.784762679	0.150080875	-0.216276569
-4.65E+07	5.17E-02	-46463943.71	0.231888182	0.526164199	-0.124824951
-1.42E+08	1.93E-02	-142469882.9	0.404183176	0.233590021	-0.170703834
8.01E+06	6.61E-01	8010788.83	0.667138038	0.035204811	0.044697935
-2.69E+08	2.19E-01	-269197256.2	0.073284178	0.184256562	-0.690027288
1.77E+08	-9.47E-01	177042215.8	6.230360224	3.58825194	0.229675557
4.45E+07	5.76E-01	44493690.33	1.388920966	0.561583262	0.251995993
-8.88E+06	6.05E-01	-8883553.34	0.230837673	0.597713102	-0.065606696
4.18E+06	5.24E-02	4180678.53	0.248598957	0.262134701	0.006346048
3.42E+07	2.37E-01	34223060.78	0.000704165	0.039420164	0.074020544
-5.17E+07	1.04E-01	-51663198.36	0.099741304	0.131557385	-0.077856756
-1.56E+08	-1.97E-01	-156206601.9	0.279218184	0.523805149	-0.059948397
-5.36E+07	7.74E-02	-53556285.85	0.492789944	0.218026656	-0.075856893
3.76E+08	6.37E-01	376349238.6	0.185770052	0.092631396	2.083577576
-3.74E+07	9.00E-02	-37369048.53	0.377329456	0.239909712	-0.059764896
-5.96E+07	-2.80E-02	-59603129.7	0.162726705	0.470353584	-0.104789421
8.33E+06	1.00E-01	8334807.94	0.37436279	0.212200714	0.014494502
-4.77E+08	-1.24E-01	-476704959.6	0.724424533	0.424211791	-0.141642922
-9.41E+07	2.04E-02	-94097612.6	1.640029176	0.389608898	-0.130733161
-1.95E+07	-1.84E-01	-19509779.02	0.720660414	0.698745414	-0.021238944
-4.21E+08	-5.51E-02	-420931891.8	0.605014745	0.258998753	-0.326007001
2.10E+08	-1.15E-01	210014997	1.801778076	0.293369672	0.047500422
-8.55E+07	-4.86E-02	-85514848.2	0.712509841	0.22797304	-0.031996211
-1.04E+08	6.29E-02	-103565271.9	0.220221324	0.290392837	-0.220800648
-3.01E+07	4.52E-01	-30097352.75	1.277245322	0.261264601	-0.140391538
-3.97E+07	4.47E-01	-39678762	0.192350672	0.099096255	-0.172928704
2.62E+07	7.31E-02	26184399.72	0.243354141	0.520099398	0.070019807
-8.88E+06	6.05E-01	-8883553.34	0.230837673	0.597713102	-0.065606696
-2.06E+08	-2.67E-01	-205961598.6	0.134344214	0.616669181	-0.042332484
-1.07E+08	9.20E-02	-107091466.8	0.007680427	0.140894716	-0.142631789
-7.61E+08	-8.39E-02	-761254002.8	0.122402756	0.258489493	-0.279835923
-3.74E+07	2.82E-01	-37446065.78	0.389966451	0.469668787	-0.16825207
-5.68E+06	7.19E-01	-5678934.42	0.949829146	0.214959197	-0.037841031
-7.20E+07	-1.14E-01	-71973633.51	0.503333463	0.339211838	-0.023988309
-9.65E+07	-4.09E-02	-96514076.5	0.093587558	0.21611198	-0.057896048
-3.20E+07	9.84E-01	-32045860.42	0.868363031	0.550898643	-0.345984824
-1.28E+07	1.10E-01	-12832131.13	0.700234812	0.119309416	-0.018168857
-1.52E+07	2.97E-02	-15208760.53	0.922107935	0.322594445	-0.028356632
9.91E+07	3.23E-01	99117563.66	0.107736586	0.066680077	0.287119418
-2.71E+08	2.27E-01	-271344064	0.044471629	0.164777208	-0.694009472
2.25E+08	9.92E-01	225045189.3	3.885694462	0.02948794	1.183823588
-9.72E+07	-1.59E-01	-97205767.67	0.345033109	0.632262543	-0.107979557

$DA_{i,t}$	$NDA_{i,t}$	$TA_{i,t}$	$(dREV_{i,t}-dREC_{i,t})/A_{i,t-1}$	$PPE_{i,t}/A_{i,t-1}$	TAi,t/Ai,t-1
3.24E+07	3.42E+00	32391536.06	0.150211937	0.011312617	0.9328212
-5.67E+07	6.29E-02	-56727103.23	0.440101216	0.25793157	-0.09636812
1.53E+09	1.31E-01	1526477749	1.745014837	0.126747673	1.061646276
-1.67E+07	1.98E-01	-16670727.37	0.463762206	0.185462745	-0.040258769
-3.41E+07	6.64E-02	-34133840.41	1.010597737	0.159492166	-0.048598823
-3.37E+07	-3.38E-02	-33727662.08	1.348851601	0.273366322	-0.023559756
-3.99E+06	4.03E-01	-3994785.57	0.407772588	0.048982704	-0.013215364
9.93E+06	1.88E-01	9928323.31	0.045312541	0.242459934	0.02805502
-5.38E+06	1.35E-01	-5379812.2	0.051760279	0.053572762	-0.007247609
-1.50E+09	-7.39E-02	-1500695885	0.257835561	0.287234319	-0.542200109
1.37E+07	1.64E-01	13663449.79	0.256346134	0.388942886	0.041897273
7.31E+07	1.28E+00	73066580.3	11.04166922	0.730730724	0.357609617
1.45E+07	-9.31E-02	14511329.38	0.916356834	0.521861174	0.016929069
8.75E+08	-5.49E-02	875011017.9	0.075143936	0.237352377	0.515357408
-3.37E+07	9.10E-01	-33715054.22	0.078019849	0.093920547	-0.270287836
1.13E+08	2.50E-03	112520349.6	0.051523723	0.137894488	0.062332465
-2.88E+09	-6.74E-02	-2880287078	0.003447375	0.018199463	-0.416831455
-6.69E+06	7.70E-01	-6692079.81	0.248093576	0.039176357	-0.0451453
3.78E+07	9.14E-02	37818339.06	0.777017709	0.091175838	0.039568899
-3.39E+07	1.81E-01	-33935264.03	0.063914661	0.021834934	-0.068628709
3.78E+07	9.14E-02	37818339.06	0.777017709	0.091175838	0.039568899
-3.37E+07	-3.38E-02	-33727662.08	1.348851601	0.273366322	-0.023559756