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RESEARCH ARTICLE

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Can Accounting Earnings Predict Future GDP Growth? Evidence from China

Abstract This study investigates whether accounting earnings can predict future Gross Domestic Product (GDP) growth within China's institutional settings. Konchitchki and Patatoukas (2014a) find that accounting earnings is a significant leading indicator of GDP growth for the next three or four quarters. We conjecture, however, that earnings management would weaken such predictive power for accounting earnings because it distorts earnings from real corporate profit. As earnings of Chinese firms are more seriously manipulated than those of US firms, this study finds that earnings of Chinese listed firms can only predict GDP growth for a single quarter. We further decompose accounting earnings into operating cash flow and accrual earnings and find that operating cash flow which is less affected by earnings management has better predictive power for GDP over the longer horizon of the next three quarters, but accrual earnings can only predict GDP growth for the next quarter.

Keywords accounting earnings, GDP forecast, earnings management, China

1 Introduction

Gross Domestic Product (GDP) is a key macroeconomic indicator and plays an important role in analyzing economic growth. Government authorities rely on GDP information in monitoring the economy and implementing macroeconomic control. GDP is essential not only for government macroeconomic decision

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making but also for the decision-making of other microeconomic units and corporations, which extensively utilize GDP data to assist them in making financing and investment decisions. As GDP is so important for economic activities, it would be helpful for economists to be able to accurately predict future GDP and its dynamics. Indeed, a voluminous literature has developed around this issue. For example, Stark (2010) employs an ARIMA-type time-series model to predict GDP. Other studies apply a number of GDP-related indicators such as the Purchase Management Index (PMI), electricity generation, freight tonnages, and retail sales of consumer goods to make predictions. However, most of these methodologies generally ignore information from microeconomic units (Konchitchki and Patatoukas, 2014a).

The United States Bureau of Economic Analysis (2004) points out that corporate profit growth is a leading driver of economic growth, and that accounting earnings growth could predict GDP growth if accounting earnings are used as the index for corporate profit. Konchitchki and Patatoukas (2014a) use US data to conduct empirical research and their results support the above argument. They find that change in accounting earnings has predictive power for GDP growth for the subsequent four quarters. However, we should note that one assumption for Konchitchki and Patatoukas (2014a) is that accounting earnings is an accurate index for corporate profit, as corporate profit rather than accounting earnings is one of the indicators of GDP (BEA, 2004). In this scenario, earnings can predict GDP only when it is a good proxy for profit. However, accounting earnings might deviate from real profit due to earnings manipulation by management. Dechow and Dichev (2002) suggest that accounting earnings cannot reflect the true performance of corporations due to earnings management. We argue that when earnings management activities are present, the power of accounting earnings in predicting GDP growth will be severely weakened.

In this paper, using a dataset of Chinese listed firms, we empirically examine the above conjecture. China's financial markets have undergone rapid growth over the past two decades. However, investors' protection and the legal system are still weaker than some developed markets, such as the US market. An important reason that we have chosen Chinese listed firms as the object of this study is that earnings management is prevalent in Chinese listed firms (Lu and Shen, 2011). In such an institutional setting, we are better able to test whether earnings management affects the association between accounting earnings and

GDP growth.

Quarterly data from the first quarter of 2007 to the last quarter of 2013 are used in this study. Our results diverge significantly from Konchitchki and Patatoukas' (2014a) results for the US market. While Konchitchki and Patatoukas' (2014a) find that change in accounting earnings has predictive power for GDP growth for the subsequent four quarters, we find that with more serious earnings management in China, accounting earnings can only predict GDP growth for the next quarter.

We further decompose accounting earnings into two parts to test whether the predictive power differs between the two components of accounting earnings. Accounting theory argues that earnings are composed of operating cash flow (OCF) and accrual earnings (Dechow and Dichev, 2002). OCF reflects the net cash flow generated from operations and is closely related to firms' marketing and credit policies, and thus is more difficult for managers to manipulate (Lu, 1999). To the contrary, accrual earnings are estimated by managers, who have greater discretion to adjust accruals to pursue private benefit. Therefore, earnings management has more influence on accrual earnings but less impact on OCF (Li, 2009). Following our main argument, we further surmise that because OCF is less seriously affected by earnings management activities, it should have a stronger predictive power than accrual earnings for GDP growth.

Our empirical results confirm our above conjecture. We find OCF can predict GDP growth over the next three quarters but accrual earnings can only forecast GDP growth for the next quarter. These results provide supportive evidence to our conjecture that accounting earnings has weaker predictive power for GDP growth because earnings management activities distort earnings from real profit in China.

This paper differs from prior literature in three important ways. First, prior research ignores certain factors that may affect the predictive power of earnings on GDP growth, such as earnings management. Our results show that earnings management activities of Chinese listed firms significantly weaken earnings' ability to forecast GDP growth. This finding enriches our understanding of how earnings management affects the association between firm-level accounting activities and macroeconomic activities. Second, we decompose accounting earnings into OCF and accrual earnings, which are affected differently by earnings management. We demonstrate that as OCF is less influenced by

earnings management, it has stronger power to forecast GDP growth than accrual earnings. These results enhance the understanding of the different information roles of different earnings components. Third, this research enriches the literature on the issue of forecasting the macro economy with micro accounting data. A growing body of recent research investigates this topic. Kothari, Shivakumar and Urcan (2013) suggest that aggregate earnings surprises are predictive of future inflation. Bonsall, Bozanic and Fischer (2013) show that bellwether firms' management earnings can convey macroeconomic information to the market. Konchitchki and Patatoukas (2014b) find that accounting profitability data of the one hundred largest firms have predictive content for future real GDP growth. Specifically, Konchitchki and Patatoukas (2014a) provide evidence that accounting earnings is a leading indicator of GDP. This study provides complementary evidence on this topic from one of the largest emerging markets to show that accounting earnings of Chinese listed firms have predictive power for future GDP growth.

The remainder of this paper is organized as follows. We describe our research design in Section 2. Empirical results are discussed in Section 3. Section 4 provides robustness checks. Section 5 concludes the paper.

2 Methodology

2.1 Sample and Data

We employ data from listed Chinese non-financial A-share firms from the first quarter of 2007 to the last quarter of 2013. We start our sample from 2007 because China implemented new accounting standards in 2007. Due to this change, accounting activities differ substantially prior to and after 2007 (Shi and Zhang, 2014). Following Konchitchki and Patatoukas (2014a), we winsorize 1% outliers on two tails. We obtained data of listed firms from the *Wind* database and GDP data from the website of the State Statistics Bureau of China.

2.2 Variables

The major dependent variable is the sequential growth rate of nominal GDP for year t, GDP_t and the future growth rate GDP_{t+i} (i = 1, 2, 3, 4). We use nominal GDP growth because accounting data is not adjusted for inflation. The major

independent variable is the change in accounting earnings ($\Delta Earnings_t$). $Earnings_t$ is the total net income of all sample companies divided by the total of assets of all sample companies during period t. Following Dechow and Dichev (2002), we decompose $Earnings_t$ into two components: operating cash flow (OCF_t) and accrual earnings ($Accrue_t$), and the change of OCF and accrual earnings are denoted as ΔOCF_t and $\Delta Accrue_t$, respectively. Table 1 lists the variable definitions.

Table 1 Variable Definitions

Variable	Definition
GDP_t	Sequential growth rate of nominal GDP for year t
GDP_{t+i}	Sequential growth rate of nominal GDP for year $t + i$, i =1, 2, 3, 4
$Earnings_t$	The sum of all sample-companies' net income divided by total sample-companies' assets for year t
OCF_t	The sum of all sample-companies' net operating cash flow divided by total sample-companies' assets for year t
$Accrue_t$	The sum of all sample-companies' accrual earnings divided by total sample-companies' assets for year t
$\Delta Earnings_t$	$Earnings_t$ - $Earnings_{t-1}$
ΔOCF_t	OCF_t - OCF_{t-1}
$\Delta Accrue_t$	$Accrue_t$ - $Accrue_{t-1}$

2.3 Research Design

We utilize the following empirical model (1) to examine our conjectures,

$$GDP_{t+i} = \alpha_0 + \alpha_1 \Delta Earnings_t + \alpha_2 \Delta GDP_{t-4+i} + \varepsilon_t, \quad (1)$$

where GDP_{t+i} is the future GDP growth rate in quarter $t+i$, $\Delta Earnings_t$ is the earnings change in quarter t. If accounting earnings can forecast GDP growth, we expect the coefficient of $\Delta Earnings_t$ should be significantly positive. If such a predictive power is strong and persistent, we expect that α_1 to keep significant for the period of $t+i$, when i=1, 2, 3, 4, indicating that earnings can predict GDP growth for the next one, two, three and four quarters, respectively. If our assumption that earnings management weakens earnings predictive power for GDP growth holds, we should observe that α_1 is only significant for one or two quarters, but not for all quarters.

To test different predictive roles of accounting earnings components, we decompose $\Delta Earnings_t$ into ΔOCF_t and $\Delta Accrue_t$ and include them in the

following regression model (2),

$$GDP_{t+i} = \alpha_0 + \alpha_1 \Delta OCF_t + \alpha_2 \Delta Accrue_t + \alpha_3 \Delta GDP_{t-4+i} + \varepsilon_t, \quad (2)$$

where variables are defined in Table 1 and i = 1, 2, 3, 4. If different components have different predictive powers for GDP growth, we expect the two coefficients of ΔOCF_t and $\Delta Accrue_t$ differ in statistical significance level. For some quarters, if α_1 is significant and α_2 is not significant, it may suggest that OCF has a stronger forecast power of GDP than accrual earnings.

In order to control for possible autocorrelations and heteroscedasticity in the quarterly data, following Konchitchki and Patatoukas (2014a), we use Newey-West (1987) consistent standard errors in calculating the t-values. The lag-order in Newey and West (1987) is an integral part of $T^{0.25}$, and is set 2 in our model.

3 Empirical Results

3.1 Descriptive Statistics

Descriptive statistics of the variables are reported in Table 2. As Table 2 shows, quarterly GDP is volatile due to the seasonal effect, with a mean of 0.056, median of 0.082, and a standard deviation of 0.206. The average of $Earnings_t$ is 0.012, indicating the net income of listed firms is about 1.2% of the total assets quarterly, or 4.8% annually.

Table 2 Descriptive Statistics of the Main Variables

Variable	*N*	Mean	Std. Dev	10%	25%	50%	75%	90%
GDP_t	28	0.056	0.206	–0.280	–0.087	0.082	0.195	0.319
GDP_{t+1}	27	0.066	0.204	–0.280	0.032	0.087	0.267	0.319
GDP_{t+2}	26	0.064	0.207	–0.280	0.032	0.082	0.267	0.319
GDP_{t+3}	25	0.065	0.212	–0.280	0.032	0.087	0.267	0.319
GDP_{t+4}	24	0.053	0.208	–0.280	–0.097	0.082	0.195	0.318
$Earnings_t$	28	0.012	0.004	0.008	0.009	0.013	0.014	0.016
OCF_t	28	0.017	0.008	0.004	0.013	0.018	0.023	0.027
$Accrue_t$	28	–0.006	0.010	–0.016	–0.012	–0.006	0.000	0.007
$\Delta Earnings_t$	28	0.000	0.003	–0.002	–0.001	0.000	0.001	0.004
ΔOCF_t	28	0.000	0.013	–0.020	–0.011	0.004	0.009	0.013
$\Delta Accrue_t$	28	0.000	0.014	–0.012	–0.008	–0.002	0.012	0.023

Notes. All variables are defined in Table 1.

3.2 Multivariate Regression Results

3.2.1 Can Earnings Predict Future GDP Growth?

We examine model (1) in Table 3. We regress one quarter leading GDP growth on change of earnings in column (1) and the results show that the estimated coefficient of $\Delta Earnings_t$ is significantly positive. The results illustrate that accounting earnings change is positively correlated with the next quarter's GDP growth. The positive relationship between accounting earnings change and future GDP growth is not only statistically significant but also economically important. One standard deviation of accounting earnings change ($\Delta Earnings_t$) is associated with 1.5 percentage point changes in the next quarter GDP growth.

Table 3 The Association Between Earnings and Future GDP Growth

	(1)	(2)	(3)	(4)
	GDP_{t+1}	GDP_{t+2}	GDP_{t+3}	GDP_{t+4}
$\Delta Earnings_t$	3.758***	2.494	1.102	–2.020
	(4.90)	(1.70)	(0.62)	(–1.42)
GDP_{t-3}	1.001***			
	(41.38)			
GDP_{t-2}		0.999***		
		(44.09)		
GDP_{t-1}			1.010***	
			(54.75)	
GDP_t				0.995***
				(40.36)
Constant	–0.003	–0.003	–0.005	–0.004
	(–0.56)	(–0.56)	(–0.67)	(–0.58)
N	27	26	25	24
F	1587.639	1530.159	1803.055	866.004
Adj R^2	0.988	0.985	0.984	0.984

Notes. (1) All variables are defined as in Table 1. (2) *T* values are included in parenthesis, calculated with Newey-West (1987) heteroskedasticity and autocorrelation consistent standard errors. (3) Lag length for the Newey-West (1987) procedure is equal to the integer part of $T^{0.25}$, where *T* is the number of sample periods (Greene, 2011). (4) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels (two-tailed), respectively.

We prolong the forecast period to two, three, and four quarters in columns (2), (3), and (4). The results show that accounting earnings lose significance throughout all regressions, suggesting that accounting earnings cannot predict GDP growth for the next two, three and four quarters. Taken together, the multivariate regression results provide evidence that change in accounting earnings ($\Delta Earnings_t$) is a significant leading indicator of future GDP growth, especially for short forecast horizons (i.e., one quarter). These results support our main hypothesis that due to the earnings management of Chinese listed firms, accounting earnings only has weak forecast capacity for GDP growth over a short prediction period.

3.2.2 The Effect of Different Components of Accounting Earnings

As we discuss above, accounting earnings can predict future GDP growth, particularly for a one quarter horizon, but has limited predictive power for long term GDP growth. Our results are different from US evidence described by Konchitchki and Patatoukas (2014a) that accounting earnings is a leading indicator of GDP growth over the next four quarters. We understand such differences to be because earnings management distorts accounting earnings from real corporate profit, and thus weakens earnings' predictive power for GDP growth. As earnings management is more prevalent in Chinese capital markets than in US ones due to systems imperfection, the forecasting power of accounting earnings is weaker in Chinese firms than in US firms.

Accounting theory argues that earnings management has different impacts on different components of accounting earnings. Following our main hypothesis, we expect different components also have various predictive powers for GDP growth. We thus decompose accounting earnings into OCF and accrual earnings. As OCF is less affected by earnings management, we expect cash flow has a stronger forecast power than accrual earnings for GDP growth.

To examine the above argument, we estimate model (2) in Table 4. Results in column (1) show that both coefficients of operating cash flow change (ΔOCF_t) and accrual earnings change ($\Delta Accrue_t$) are significantly positive at 1%, suggesting that both the two earnings components are good leading indicators for the GDP growth of the next quarter. We further extend our prediction period to two, three and four quarters in columns (2), (3) and (4) and find different results

from those in column (1). Our results show that the coefficients of cash flow on two and three quarters' leading GDP growth are still significantly positive, but the coefficients of accrual earnings lose significance for a longer prediction period. These results imply that due to the different impact of earnings management, OCF can forecast two and three quarters of GDP growth but accrual earnings cannot predict GDP growth over a longer period. Results in column (4) indicate that both components have limited power to predict GDP growth, which is similar to the results from Konchitchki and Patatoukas (2014a) that earnings only have marginal significant predictive power for GDP growth over four quarters.

Table 4 Operating Cash Flow, Accrual Earnings and Future GDP Growth

	(1)	(2)	(3)	(4)
	GDP_{t+1}	GDP_{t+2}	GDP_{t+3}	GDP_{t+4}
ΔOCF_t	3.808***	1.781**	3.639**	−0.188
	(4.92)	(1.99)	(2.22)	(−0.13)
$\Delta Accrue_t$	3.778***	2.098	2.466	−1.790
	(4.93)	(1.25)	(1.59)	(−1.64)
GDP_{t-3}	1.002***			
	(38.35)			
GDP_{t-2}		1.008***		
		(41.69)		
GDP_{t-1}			1.073***	
			(27.77)	
GDP_t				0.915***
				(18.83)
Constant	−0.003	−0.004	−0.007	0.001
	(−0.55)	(−0.64)	(−1.08)	(0.11)
N	27	26	25	24
F	1046.176	1091.188	1030.047	943.419
Adj R^2	0.987	0.985	0.985	0.986

Notes. (1) All variables are defined as in Table 1. (2) *T* values are included in parenthesis, calculated with Newey-West (1987) heteroskedasticity and autocorrelation consistent standard errors. (3) Lag length for the Newey-West (1987) procedure is equal to the integer part of $T^{0.25}$, where *T* is the number of the sample period (Greene, 2011). (4) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels (two-tailed), respectively.

In summary, we find that OCF has a stronger ability to predict GDP growth than accrual earnings within China's institutional settings. Accrual earnings can only forecast one quarter of GDP growth, but OCF can predict GDP growth over longer horizons of two and three quarters. As earnings management has different impacts on OCF and accrual earnings, our results show that earnings management of Chinese listed firms affects the capacity of accounting earnings to forecast future GDP growth.

4 Robustness Checks

4.1 Quarter Effect

In the above regressions, we used GDP growth from the same quarter of the previous year to control for seasonal effect. We further used quarterly dummy variables to control for such seasonal effects. We replaced ΔGDP_{t-4+i} in model (1) with quarterly dummy variables ($q1$, $q2$, $q3$) equal to 1 if the observation is in the first, second and third quarter, and 0 otherwise. We re-estimated the basic model with the following model (3). Results in Table 5 are similar to those in Table 3, suggesting that our results are robust with different seasonal effect controls.

$$GDP_{t+i} = \alpha_0 + \alpha_1 \Delta Earnings_t + \alpha_2 q1_t + \alpha_3 q2_t + \alpha_4 q3_t + \varepsilon_t . \quad (3)$$

Similarly, we re-estimated model (2) with a quarter dummy in the following model (4) and results are reported in Table 6. The results are consistent in that operating cash flow still has predictive power for GDP growth over a longer horizon, and has a stronger forecast ability than accrual earnings.

$$GDP_{t+i} = \alpha_0 + \alpha_1 \Delta OCF_t + \alpha_2 \Delta Accrue_t + \alpha_3 q1 + \alpha_4 q2 + \alpha_5 q3 + \varepsilon_t . \quad (4)$$

4.2 The Autocorrelation and Heteroscedasticity Problem

Regressions with quarterly data may have problems with autocorrelation and heteroscedasticity. We follow Newey and West (1987) to estimate heteroskedasticity and autocorrelation consistent standard errors and set the lag length to 2 following Greene (2011). To produce more robust results, we reset the lag length to 1, 3 and 4 and we also employed the methodology proposed by White (1980). Untabulated results show that the results are consistent with those in Table 3 and Table 4, suggesting that our results are robust to different estimation methodologies for addressing the

autocorrelation and heteroscedasticity problem.

Table 5 Robustness Test Results for H1

	(1)	(2)	(3)	(4)
	GDP_{t+1}	GDP_{t+2}	GDP_{t+3}	GDP_{t+4}
$\Delta Earnings_t$	2.297***	0.098	1.405	0.639
	(4.03)	(0.11)	(1.32)	(0.52)
q1	0.364***	–0.056***	0.248***	–0.568***
	(43.35)	(–4.77)	(29.61)	(–46.18)
q2	0.307***	0.198***	–0.323***	–0.197***
	(23.20)	(15.39)	(–25.15)	(–14.43)
q3	0.567***	–0.371***	0.053***	–0.249***
	(50.88)	(–38.92)	(5.15)	(–28.74)
Constant	–0.255***	0.111***	0.060***	0.307***
	(–26.37)	(15.96)	(8.34)	(31.51)
N	27	26	25	24
F	1850.344	1505.172	1612.579	1072.003
Adj R^2	0.993	0.991	0.992	0.992

Notes. (1) All variables are defined as in Table 1. (2) *T* values are included in parentheses, calculated with Newey-West (1987) heteroskedasticity and autocorrelation consistent standard errors. (3) Lag length for the Newey-West (1987) procedure is equal to the integer part of $T^{0.25}$, where *T* is the number of sample period (Greene, 2011). (4) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels (two-tailed), respectively.

Table 6 Robustness Test Results for H2

	(1)	(2)	(3)	(4)
	GDP_{t+1}	GDP_{t+2}	GDP_{t+3}	GDP_{t+4}
ΔOCF_t	1.618***	–0.906	1.447***	2.379**
	(2.59)	(–0.61)	(2.57)	(2.27)
$\Delta Accrue_t$	2.088***	–0.224	1.418	1.247
	(3.49)	(–0.23)	(1.43)	(1.26)
q1	0.352***	–0.074***	0.248***	–0.539***
	(21.27)	(–3.40)	(14.93)	(–26.35)
q2	0.308***	0.200***	–0.323***	–0.201***
	(24.02)	(15.34)	(–25.64)	(–17.28)

(*To be continued*)

(*Continued*)

	(1) GDP_{t+1}	(2) GDP_{t+2}	(3) GDP_{t+3}	(4) GDP_{t+4}
q3	0.563***	–0.378***	0.053***	–0.237***
	(56.93)	(–30.43)	(4.37)	(–20.82)
Constant	–0.251***	0.117***	0.060***	0.298***
	(–24.56)	(19.21)	(6.71)	(24.47)
N	27	26	25	24
F	1621.723	1046.821	1338.939	957.335
Adj R^2	0.992	0.991	0.991	0.992

Notes. (1) All variables are defined as in Table 1. (2) *T* values are included in parenthesis, calculated with Newey-West (1987) heteroskedasticity and autocorrelation consistent standard errors. (3) Lag length for Newey- West (1987) procedure is equal to the integer part of $T^{0.25}$, where *T* is the number of sample period (Greene, 2011). (4) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels(two-tailed), respectively.

5 Conclusion

In this study, we employ the data of listed firms in one of the largest emerging markets, China, to investigate whether microeconomic data can forecast macroeconomic operations. We find that accounting earnings of Chinese listed firms has predictive power for only one quarter of GDP growth. Our results are quite different from US evidence as described by Konchitchki and Patatoukas (2014a) that accounting earnings are good leading indicators for GDP growth over four quarters. We understand these results to be the effect of serious earnings management in Chinese financial markets. This argument is supported by our empirical tests, in which we decomposed accounting earnings into operating cash flow and accrual earnings. As earnings management has a more significant impact on accrual earnings, we find operating cash flow has a stronger predictive power for GDP growth over longer horizons than accrual earnings.

Our study has important implications in the context of the effect of micro accounting data on macroeconomic data. On the one hand, we contribute to this line of literature with a new leading indicator for GDP growth, operating cash flow. On the other hand, prior literature only focuses on the informativeness of

accounting earnings on future GDP growth, but ignores the fact that earnings management distorts accounting earnings from real profit and thus weakens earnings' predictive power for GDP growth. Our results provide evidence for the effect of earnings management on the association between accounting earnings and GDP growth. The implication of the results is the possibility that in order to utilize micro data to forecast macro data, the problem of earnings management should not be neglected.

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