Effect of Abnormal Earnings on Earnings Persistence: The Case of Shipping and Shipbuilding Industry

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ABSTRACT

Even though shipping and shipbuilding industries have been one of the leading industries in Korea, both industries have been suffered a long dark period since the global financial crisis 2008. In particular, since both industries are more sensitive to economic fluctuations than other industries, stable earnings are an important factor in stakeholders' economic decision-making. This study investigates the difference of earnings persistence between shipping and shipbuilding industry using Ohlson's model. Empirical results show that earnings persistence of shipbuilding industry is significantly higher than that of shipping industry. This result implies that the low earnings persistence of the shipping industry result from the global economic recession after the 2008 global financial crisis and government policies focused on the shipbuilding industry. On the other hand, the high earnings persistence of the shipbuilding industry can be attributed to high added value ship orders, intensive support from the government and economies of scale after the global financial crisis. In the case of the shipbuilding industry, high technology and ship quality are important factors for high earnings creation while in the shipping industry, intangible factors such as cargo service quality, route, and creditworthiness of cargo transportation are important factors for continuous earnings creation. In addition, the balance of government policies on the shipping and shipbuilding industries is expected to bring about shared growth between the two main industries in Korea.

Key words : abnormal earnings, earnings persistence coefficient, shipping and shipbuilding industry

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1. Introduction

The shipping and the shipbuilding industry have been Korea's core industries since the 1970's and have strong relationship between the forward and backward in the value chain. Both industries have been suffered a long dark period since the global financial crisis 2008, and Hanjin Shipping, Korea's largest shipping firm, went bankrupt in 2017. In addition, the two major Korean shipbuilders, Daewoo Shipbuilding & Marine Engineering (DSME) and Hyundai Heavy Industries (HHI), are also pursuing a Merge and Acquisitions (M&As).

This study investigates whether there is a difference in the earnings persistence as a proxy of earnings quality between shipping and shipbuilding industries. After the global financial crisis in 2008, the usefulness of accounting information has greatly increased due to the bankruptcy and M&A of Korean shipping and shipbuilding industries. In addition, as the global economic downturn caused by COVID-19 continues, earnings persistence, which can measure the viability of firms, is recognized as an important indicator for investors. Earnings persistence is an objective indicator that can provide useful information for economic decision-making to stakeholders related to a firm and measure the firm's sustainable growth and management rationalization. This study aims to systematically measure valuation of the firm using the persistence of accounting profits presented in the Ohlson model (1995). The outstanding feature of the Ohlson model is that even though the earnings calculation process and accounting method are different for each firm, it is not affected by the valuation method.

Major users of accounting information in Korea (financial analysts, credit rating agencies, and CPA etc.) consider the earnings quality as most useful factor when evaluating firms (Choi et al., 2019). In particular, financial analysts assess that earnings persistence is the most important indicator of valuation of firm. In addition, many previous studies (Ali et al., 2007; An, 2017; Sloan, 1996) suggest that the higher the earnings persistence, the better the quality of earnings, which is useful for firm's investment decision-making. In addition, the higher the earnings persistence, the greater the share price explanatory power of accounting earnings (Dechow and Dichev, 2002; Francis et al., 2004; Sloan, 1996). In particular, after the introduction of International Financial Reporting Standards (IFRS), it appears that users of accounting information actively use the concept of earnings quality in practice (Park, 2018). This study expects to contribute to literature and practice on shipping and shipbuilding industries in several ways. First, ample previous studies find earnings persistence provides useful information for firm valuation and M&As. Therefore, this study provides a rational investment decision based on the intrinsic value of the shipping and shipbuilding industries. Second, considering the recent rapidly changing global economic environment, stable earnings are very important for a firm's continuous growth and going-concern. In particular, the shipping and shipbuilding industries are sensitive to economic fluctuations, thus earnings persistence is an important indicator for stakeholders. Despite the importance of the

shipping and shipbuilding industries, previous studies have addressed the earnings persistence in manufacturing industry, construction industry (Paek and Yoo, 2012), family firms (Boonlert-U-Thai and Sen, 2019) or financial distress firms (Shin, 2005). Thus, this study expands empirical evidence of earnings persistence for shipping and shipbuilding industries. Finally, this study proposes the implication of government policy for Korean shipping and shipbuilding industry. Although both industries account for an important role in the Korean economy, it is considered that the government's discriminatory policy support is being applied (An, 2020; KMI, 2017). In addition, the shipping industry shows better performances than other industries when the economy improves, but the risk management should be required when the economy deteriorates (Kim, 2014). For the mutual growth of shipping and shipbuilding, it is necessary to consider the consistency and the equity of support of government policies. Therefore, this study provides good implications for the government to reconstruct Korea's shipping and shipbuilding industries as leading industries in the Korean economy.

The reminder of this paper is organized as follows. Chapter 2 outlines previous researches and proposes research questions. In Chapter 3, sample selection procedure and research methodology are explained. The empirical results are presented in Chapter 4. The summary of the research and suggestions of further research appear in Chapter 5.

2. Literature Review

2.1 Earnings Persistence

The purpose of financial statements should provide useful information to users in making economic decision, thereby making a difference to their decisions. Dechow (1994) insists that earnings are very important for a large variety of stakeholders because of providing information of firm performance. Investors and managers use earnings as one of the main guides to identify and evaluate investment opportunities (Bushman and Smith, 2003). Schipper and Vincent (2003) propose that earnings persistence is derived from a decision usefulness perspective.

Jonas and Blanchet (2000) emphasize that earnings persistence is specifically based on the user needs. Financial reporting users view highly persistent earnings as sustainable which means more permanent and less transitory. Richardson et al. (2005, p.20) define earnings quality as earnings persistence, which means "*degree to which earnings performance persists into the next period.*" Benish and Vargus (2002, p.756) state that "*the quality of current earnings is the likelihood that the current earnings are sustainable in the future.*" Accordingly, a highly persistent earnings number is viewed by investors as sustainable, that is, recurring, more permanent and less transitory, and therefore higher quality (Penman and Zhang, 2002; Schipper and Vincent, 2003).

By applying the concept of earnings persistence to the firm valuation model, future earnings affect the firm's valuation, but short-term earnings do not significantly affect the firm value. The most important factor in the decision of analysts selecting investment stocks, determining the transaction price during M&As, and the initial public offering price of new stocks is the rational measurement of firm value. There are many ways to measure a firm's value, but the most common is to predict future earnings and discount them using appropriate discounted ratio. At this time, the most important thing is to analyze past or present earnings to find the elements of earnings that are expected to continue in the future. Therefore, it can be seen that the persistence of earnings plays the most important role in terms of firm valuation.

Lev and Thiagarajan (1993) suggest 12 basic factors necessary for firm valuation. These basic factors are very important in evaluating the persistence of earnings, and the earnings quality is the same concept as earnings persistence. In particular, from the point of view of analysts who are interested in firm valuation, earnings persistence is the most appropriate concept to evaluate firm value. Moreover, when the quality of earnings reflects the persistence or growth potential of earnings, a firm with high earnings quality is considered to have higher earnings persistence in the future.

Bricker et al. (1995) find that analysts emphasize core earnings in analyzing firm's value, and that they recognize predictable earnings that occur repeatedly and consistently as a core earnings. This suggests that the higher the earnings persistence, the higher the predictability of earnings and the lower the volatility of earnings. Dechow and Dichev (2002) argue that the higher the persistence of a firm's earnings, the higher the quality of its earnings. Therefore, firms with high earnings persistence can predict future performance more usefully through current earnings compared to firms with low earnings persistence.

Kim et al. (1998) reported that the earnings persistence coefficient of Korean manufacturing industry ranges from 0.196 to 0.537 by year using Ohlson's model (1995). Paek and Yoo (2012) investigated the earnings persistence in the construction industry using the autocorrelation coefficient of earnings in two consecutive periods. The earnings persistence coefficient of the construction industry was 0.741, which is higher than that of other industries. More recently, Jung and Paek (2016) investigated the earnings persistence of Korean manufacturing industry from 1985 to 2010 in the same way as Paek and Yoo (2012). The earnings persistence coefficient ranged from –0.114 to 1.336, with an average value of 0.574. According to previous studies, although earnings persistence is an important indicator for evaluating firm value, previous studies have been conducted to analyze earnings persistence in the manufacturing industries not shipping and shipbuilding industries. This study investigates the earnings persistence of the shipping and shipbuilding industries, which are affected by environmental factors and economic fluctuations. Instead of establishing explicit hypotheses, this study intends to examine the persistence of earnings by dividing the samples of the two industries in detail.

2.2 Ohlson Model

The Ohlson model (1995) is based on the assumptions about the clean surplus relationship of net assets as follows in equation (1).

$$BV_t = BV_{t-1} - E_t - D_t \tag{1}$$

where, for period t

BV = net assets, E = net income, D = dividend after adjusting paid-in-capital

By connecting the clean surplus relation of BV in equation (1) with the discounted dividend model, the enterprise value (V) can be expressed as a function of BV and excess earnings (XE) as shown in equation (2).

$$V_t = BV_t + \sum_{n=1}^{\infty} (1+r)^{-n} \ E[XE_{t+n}] \tag{2}$$

where, for period t
r = cost of capital, $E[.]$ = sign of expected value, XE_{t+n} = abnormal earnings for year $t+n$

According to Ohlson's model, the value relevance of BV or net income is explained through the earnings persistence coefficient of abnormal earnings. In Ohlson's model, the earnings persistence coefficient (φ) of abnormal earnings is defined as the first autoregressive process of abnormal earnings as follows.

$$XE_{t+1} = \varphi XE_t + O_t - \varepsilon_{1t+1}$$
$$O_{t+1} = \delta O_t + \varepsilon_{2t+1} \tag{3}$$

where, for period t
  O = Other information other than abnormal earnings,

φ and δ is autoregressive coefficients of XE and O, ε_{1t+1} and ε_{2t+1} are error terms.
Since it is assumed that the abnormal earnings (XE_t) gradually decrease due to competition among firms, the stochastic process of the abnormal earnings can be expressed as the following autoregressive process.

$$[0 \leq \varphi \leq 1, E(e1+t+1) = 0] \tag{4}$$

3. Research Methodology

3.1 Sample Selection

This study uses shipping and shipbuilding firms listed on the Korean Stock Exchange (KRX) for sixteen-year (2000–2015). Data Analysis, Retrieval and Transfer System (DART) and KIS-Value databases are used for data required for the estimation of the earnings persistence coefficients.

In order to reduce the effect of outliers, this study winsorizes firms whose mean value differences in *BV*, net income, and persistence coefficient variables exceed three times the standard deviation. The final sample includes 95 firm-year observations of shipping firms and 78 firm-year observations of shipbuilding firms over the sixteen-year periods.

3.2 Empirical Model

As a first stage, this study estimates the earnings persistence coefficient (φ) using the Ohlson model (1995) to measure the persistence of abnormal earnings against *BV* and accounting earnings. The Ohlson model is based on assumptions about the clean surplus relation. For the Ohlson model's abnormal earnings, the earnings persistence coefficient estimated from the firm-specific time series data is used. The autocorrelation coefficient of abnormal earnings over two consecutive periods is estimated for each firm presented in equation (5). In addition, equation (5) is estimated using time series data for the last 16 years for each shipping and shipbuilding firm.

$$E_t - rBV_{t-1} = \varphi E_{t-1} - rBV_{t-2} + \varepsilon_{i,t} \tag{5}$$

where for year *t*,
E is net income *BV* is net asset, $E_t - rBV_{t-1}$ is abnormal earnings

Equation (5) shows that future abnormal earnings ($E_t - rBV_{t-1}$) follow a time series, and earnings persistence coefficient (φ) has several meanings. The earnings persistence coefficient (φ) has generally a value between 0 and 1. When $\varphi = 0$, the firm is in a state of no development while when $0 < \varphi < 1$, the firm's return on equity (*ROE*; return on capital investment) shows a mean reverting tendency that approaches the firm's cost of capital (Bernard, 1994; Freeman et al., 1982). Therefore, for the empirical analysis of this study, it is important to know what the current excess abnormal earnings are and how consistent these excess abnormal earnings are. That is, it is important to estimate the magnitude of φ.

At second stage, this study estimates the autocorrelation relationship between the future earnings and the current earnings to find whether the earnings

persistence coefficient plays a role as a partitioning variable using equation (6). Earnings persistence indicates how much of current earnings will persist into the future and continue from period to period. In equation (6), earnings persistence is measured as the slope-coefficient estimates employed by Ali et al. (2007) and Sloan (1996).

$$Earnings_{t+1} = \alpha_0 + \beta_1 Earnings_t + \varepsilon_t \qquad (6)$$

where for year t, and $Earnings_t$ is earnings per share (*EPS*) in year $t+1$; $Earnings_{t-1}$ is *EPS* in year $t-1$; ε_t is the residual error;

Value of β_1 close to one implies highly persistence earnings, while value of β_1 close to zero indicates highly transitory earnings. High quality earnings are persistent, recognized by financial statement users as sustainable, less transitory, and more permanent (Richardson, 2005; Sloan, 1996). Therefore, large (small) values of the slope-coefficient (β_1) correspond to more (less) persistence.

4. Empirical Results

4.1 Descriptive Statistics

Table 1 shows descriptive statistics for earnings components of both shipping and shipbuilding industry. The mean and median value of *BV* of shipping industry are 831,000 million KRW and 569,000 million KRW, while those of shipbuilding industry are 3,390,000 million KRW and 1,960,000 million KRW, respectively. This shows that the size of the shipbuilding industry is more than three times that of the shipping industry. Average net income (*E*) of shipping industry shows negative (–35,500 million KRW), but that of shipbuilding industry is positive (220,000 million KRW). The average *EPS* of the shipping industry is –2,893 KRW, while the shipbuilding industry is 4,031 KRW, indicating that the profitability of the shipping industry is low.

The mean of *ROE* for both industries is negative, and average leverage ratio (*LEV*) of both industries is similar at 3.838 and 3.463, respectively. The mean (median) value of return on sales (*ROS*) of the shipping industry is 0.007 (0.024), while that of the shipbuilding industry is 0.025 (0.028).

The average *ROS* of the shipping industry is 0.007, meaning that net income accounts for only 0.7% of total sales, suggesting that the shipping industry has low profitability. The average *ROS* of the shipbuilding industry is 0.025, indicating better profitability than the shipping industry. The mean of *LEV* of both shipping and shipbuilding industries is 3.83 and 3.46, indicating that both industries are highly dependent on debt.

Table 1. Descriptive statistics

Shipping industry					
	Mean	Median	Max.	Min.	Std. Dev.
BV (million)	831,000	569,000	3,000,000	−171,000	846,000
E (million)	−35,500	11,700	786,000	−1,910,000	381,000
EPS	−2,893.719	164.00	51,371.00	−228,113.00	29,447.18
ROE	−0.217	0.093	12.098	−26.613	3.158
ROS	0.007	0.024	0.717	−1.547	0.221
LEV	3.835	3.054	68.164	−198.559	24.427
Shipbuilding industry					
	Mean	Median	Max.	Min.	Std. Dev.
BV (million)	3,390,000	1,960,000	19,000,000	120,000	4,480,000
E (million)	220,000	64,600	4,560,000	−3,310,000	957,000
EPS	4,031.325	718.500	75,808.00	−32,296.00	14,992.21
ROE	−0.023	0.108	0.386	−7.567	0.878
ROS	0.025	0.028	0.186	−0.220	0.061
LEV	3.463	2.876	42.658	1.212	4.665

BV, net assets; *E,* net income; *EPS*, earnings per share; *ROE*, E/BV; *ROS*, return on sales; *LEV*, total liability/net assets.

4.2 Core Results

Table 2 compares difference in the estimated abnormal earnings persistence coefficient between the shipping industry and the shipbuilding industry. The abnormal earnings persistence coefficient (φ) of the shipping industry is 0.165. It means that the effect of 100 KRW in excess earnings in year t on excess earnings in year $t+1$ is about 16 KRW in the shipping industry. On the other hand, the estimated abnormal earnings persistence coefficient of the shipbuilding industry is 0.592, which is more than three times the excess earnings of the shipping industry. This result suggests that that the earnings persistence of the shipbuilding industry is higher than that of the shipping industry in the relationship between the earnings of 1 KRW for the current period and the earnings of the next year. In addition, this indicates that the profitability of the shipbuilding industry is more stable than that of the shipping industry.

The low earnings persistence coefficient of the shipping industry indicates that Korea's shipping industry has low added value despite the world's fifth largest volume. The earnings of shipping business occur in various areas, such as ship investment, ship operation, shipping brokerage, and ship management. However, in Korea's shipping industry, most of the earnings mainly depend on ship operating income from shippers but the earnings of other fields are still at a low level (KMI,

Table 2. Estimated abnormal earnings persistence coefficient between shipping and shipbuilding industry

$$E_t - rBV_{t-1} = \varphi E_{t-1} - rBV_{t-2} + \varepsilon_{i,t}$$

Variables	Shipping industry	Shipbuilding industry
	Coefficient (*t*–value)	Coefficient (*t*–value)
Constant	0.0079 (0.333)	0.0058 (0.624)
φ	0.165 (1.923)*	0.592 (3.672)***
Adj R²	0.045*	0.176***
F–Statistics	3.696	13.488

*p ⟨0.10, **p ⟨0.05, ***p ⟨0.01.
BV, net assets; E, net income; r, cost of capital; φ, abnormal earnings persistence coefficients.

2009; MOF, 2016). Moreover, the low earnings persistence of the shipping industry is considered as a result of high *LEV* (Nam and An, 2017) and high sensitivity of freight rate (Kim, 2011).

Meanwhile, the high earnings persistence of the shipbuilding industry can be attributed to high added value ship orders, economies of scale (KIET, 2012) and intensive support from the government (KMI, 2017). After the global financial crisis, Korea's shipbuilding industry has improved its profitability by placing orders for high value-added ships such as LNG carriers, large container ships, and drill-ships (KIET, 2012). Thus, the high earnings persistence coefficient of the shipbuilding industry shows a high value added that matches the world's No. 1 status.

Table 3 provides the autocorrelation between net income in year *t* and net income in year *t*+1 to examine whether the estimated earnings persistence coefficient used in this study serves as an appropriate classification variable.

The autocorrelation coefficient of shipping industry is 0.196, which is 3.8%

Table 3. The relationship between the future earnings of the shipping industry and the shipbuilding industry

$$Earnings_{t+1} = \alpha_0 + \beta_1 Earnings_t + \varepsilon_t$$

Variables	Shipping industry	Shipbuilding industry
	Coefficient (*t*–value)	Coefficient (*t*–value)
Constant	−2,041.7 (−0.644)	406.7 (0.334)
β	0.196 (1.879)*	0.793 (10.072)***
Adj R²	0.038*	0.576***
F–Statistics	3.528	101.442

*p ⟨0.10, **p ⟨0.05, ***p ⟨0.01.
Earnings, earnings per share; β, earnings persistence coefficients.

of the explanatory power of earnings after one year. On the other hand, the auto-correlation coefficient of shipbuilding industry is 0.793, and the explanatory power of net profit after one year is 57.6%. This result shows that the estimate of abnormal earnings persistence coefficient shown in Table 2 properly measures the earnings persistence by industry. It also confirms that the relevance to the future earnings of the shipbuilding industry is significantly higher than that of the shipping industry. However, this phenomenon may be caused by the difference between the contracts of shipbuilding industry and shipping industry: the price of new building ships tends to consider the costs of shipbuilding; the freight rate of shipping industry does not overall the costs of ship operation.

In Table 4, this study classifies the full sample into shipping and shipbuilding industry, and then analyze the univariate test whether there are differences between the earnings persistence coefficients of shipping and shipbuilding industry. The mean value of earnings persistence coefficients (φ and β) in shipbuilding industry are 0.592 and 0.793, respectively while those of shipping industry are 0.165 and 0.196, indicating the degree of centrality in shipbuilding industry is significantly higher than that of a non- shipbuilding industry. These significant differences imply that the shipbuilding industry is more profitable than the shipping industry and has high added value.

In the time series model, whether there is a structural change at a specific time and, if so, when is the structural change point is an important issue. The analysis period of this study includes the global financial crisis period (2007–2008). Thus, there is a likelihood that the model parameters have changed as a result of disruptive events. This study conducts Chow test to examines break point of structural change in earnings persistence of shipping and shipbuilding industries. As a result of the Chow-Test, structural changes of earnings persistence occurred in the shipping and shipbuilding industries in 2010 and 2011, respectively show in Table 5. According to KMI (2011), the shipping market has been improved significantly since 2010 due to the recovery of the global economy after the global financial crisis. Thus, structural changes of the shipping industry in 2010 are presumed to the increase of shipping demand following the global economic recovery. In the shipbuilding industry, structural changes occurred in 2011. This seems to be a result that Korean shipbuilders took up half (48.2%) of the world's orders and regained the world's number one position in 2011 (KIET, 2012).

Table 4. Univariate analysis between shipping and shipbuilding industry

		M	Obs	T	*df*	*P*-value
φ	Shipping	0.165	95	13.219	171	0.000
	Shipbuilding	0.592	78			
β	Shipping	0.196	95	16.1050	171	0.000
	Shipbuilding	0.793	78			

Table 5. The results of Chow-test of shipping and shipbuilding industries

		F-value	Structure changes year
β	Shipping	8.482***	2010
	Shipbuilding	7.856***	2011

*** $p \langle 0.01$.

5. Conclusion and Policy Implications

Earnings persistence as the usefulness of accounting information can be used to compare profitability between industries and industries, and also to compare and evaluate net income for different accounting periods in the same industry. This study investigates the earnings persistence in shipping and shipbuilding industry during 16-year periods (2000–2015) using Ohlson model (1995).

The average of the abnormal earnings persistence coefficient (φ) of the shipping industry is 0.165. This result means that the impact of the abnormal earnings of the current year on the abnormal earnings of the next year is 16.5 KRW whereas that of the shipbuilding industry is 0.592, which is higher than that of the shipping industry. In terms of the relevance of future earnings, the average earnings persistence coefficient (β) of the shipping industry is 0.196, but that of the shipbuilding industry is 0.793, confirming that the profitability of the shipbuilding industry is significantly higher than that of the shipping industry. In addition, structural changes of earnings persistence occurred in the shipping and shipbuilding industries in 2010 and 2011, respectively. This result seems to reflect the years of economic recovery of the two industries.

Overall, this study contributes to the literature and practices which provides important evidence for testing the earnings persistence as a useful proxy of earnings quality in Korean shipping and shipbuilding industry. First, research on the quality of earnings as the usefulness of accounting information is very important in academic and practical fields, but a few researches have been done on the shipping and shipbuilding industries. In particular, earnings persistence acts as the most important factor in firm valuation, including investment stock selection, M&A transaction price determination, and Initial Public Offering (IPO) offering price. Therefore, this study provides useful information to support rational investment decision making in shipping and shipbuilding industries.

To the practice, this study provides the implication of government policy maker for Korean shipping and shipbuilding industry. The results of this study show that the earnings persistence of the shipping industry is significantly lower than that of the shipbuilding industry. The recent crisis in Korea's shipping industry is fundamentally different from past crises such as the International Monetary Fund (IMF) foreign exchange crisis. In the past, it was a crisis for individual companies,

but now it is a crisis for the industry itself. The shipping industry is more sensitive to economic fluctuations than other industries and has high management risks, but the economic ripple effect on the forward and backward industries is very large.

Therefore, government policy for shipping industry should be approached in terms of national industrial competitiveness, not as one industry. In the case of the shipbuilding industry, high technology and ship quality are important factors for high earnings creation while in the shipping industry, intangible factors such as cargo service quality, route, and creditworthiness of cargo transportation are important factors for continuous earnings creation. The balance of government policies on the shipping and shipbuilding industries is expected to bring about shared growth between the two main industries in Korea.

This study remains several related issues which requires further studies. First, the risk-free rate of return applied to calculate abnormal earnings uses the industry average risk-free rate of return in the sample period. This assumption is that the distribution of returns for each year has the same cross-section. However, this assumption is unrealistic and the firm's actual cost of capital will be different. The larger the difference between the two capital costs, the greater the likelihood that the error in measuring earnings persistence coefficients will increase, and the results of the study may be affected. Second, earnings persistence may be affected by factors other than abnormal earnings. Moreover, an indicator of shipping business may be important variable to estimate the earning persistence because the business cycle of shipping industry is more vulnerable to the imbalance between demand and supply. Therefore, different results can be obtained by using a different empirical model with some uncontrolled omitted variables.

Disclosure Statement

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