The Kyoto Economic Review 74(2): 215–233 (December 2005)

Structural Changes in the Contemporaneous Linear Relation between Returns and Earnings after 1997 Financial Crisis in Korea

Jong-Seo Choi[1] and Ji-Kyung Jang[2]

[1]*Professor of Accounting, College of Business, Pusan National University*
[2]*Ph.D student, Department of Accounting, Graduate School, Pusan National University*

We study the effect of accounting reforms on the quality of accounting information after the 1997 financial crisis in Korea. Using observations of accounting earnings and stock returns over the past 20 years for the companies listed on the Korea Stock Exchange, we find that the contemporaneous linear relation between stock returns and accounting earnings has changed after the accounting reforms in the late 1990s. The association between annual earnings and returns has strengthened since the 1997 crisis. We also find that the changes in the association between annual earnings and returns are partly explained by the changes in asymmetry and lags effect. Annual earnings reflect good and bad news in a more asymmetric fashion and have a stronger association with lagged price changes surrounding the financial crisis.

Keywords: returns-earnings relations, Asian financial crisis, accounting reforms, asymmetry effect, lags effect

JEL Classification Number: M41

1. Introduction

In the wake of the 1997 financial crisis, the Korean economy has undergone swift reforms, which affected her accounting, banking, economic, and financial systems. In particular, the reforms and ensuing changes in the accounting and monitoring system over the following several years have been on an unprecedented scale. This paper studies whether the reforms of the accounting system in Korea have improved the usefulness of accounting information in the sense of improved linear correlations between accounting earnings and stock returns.

Many believe that the deficiency in accounting standards, lack of enforcement, and ineffective monitoring were important factors in triggering the crisis. Although it is difficult to judge whether the poor accounting system and practice was a direct

culprit for the financial crisis, it cannot be denied that fundamental causes of the crisis can be found in the structural problems embedded in the financial sector of the Korean economy. Lack of transparency in corporate management and financial systems, endemic moral hazard, and the absence of market discipline characterized the Korean financial system before the crisis.

The reform process that followed the financial crisis placed a top priority on the reform of the accounting system. Recognizing that lack of transparency was one of the weaknesses that contributed to the crisis, the Korean government proposed major changes in the accounting system. There was a move to make fundamental changes in the Generally Accepted Accounting Principles (GAAP) in Korea by adopting more stringent International Accounting Standards (IAS). There was also a change in the process through which accounting standards were set. It could even be claimed that the Korean accounting system came to become at par with international standards after these institutional changes.

Although the accounting reforms were aimed at improving the quality of information available to investors to monitor corporate managers, and ultimately enhancing the overall accounting environment in Korea, there was some skepticism about the regulatory processes that have been mandated. Some critics argue that many facets of the Korean society are so closely tied together that demanding transparency from accounting sector alone would be meaningless unless the entire society is made transparent. The quality of audits in Korea is still suspect. The lack of accounting transparency in Korea is believed to be the joint product of loose accounting system and unreliable corporate accounting practices. Despite drastic structural changes, many accounting professionals still have doubts about the genuine changes in the accounting culture in Korea (Choi, 2001).

In view of the above skepticism despite the reforms in Korea's accounting system, it would be an interesting research question to investigate whether the reforms of accounting system were indeed successful in enhancing the quality of accounting information. Our paper addresses this question. Specifically, we ask whether accounting earnings have become more informative of firm performance following the major overhaul of the accounting system after the 1997 financial crisis. This research objective is accomplished by using statistical tests for a structural change in contemporaneous linear returns-earnings relation over the past 20 years in Korea. We further investigate time-series changes in the asymmetry and lags effects as two possible explanations for the changes in the return-earnings relations.

The remainder of this paper is structured as follows. Section 2 outlines backgrounds of the study as well as a brief review of related studies. Section 3 describes the research method. Section 4 explains sample composition and provides descriptive statistics. Section 5 presents the results of empirical tests on the structural change and on the trends of returns-earnings association in relation to the lags and asymmetry effects. Section 6 concludes the paper.

2. Background

2.1. The Time Series Trend of the Usefulness of Accounting Information

A number of studies have investigated whether accounting information loses value-relevance over time. There appears to be a widespread impression that historical cost-based financial statements have lost their value-relevance due to the shift from an industrialized economy to a high-tech, service-oriented economy. Consistent with this, Lev (1997) and Ramesh and Thiagarajan (1995) report a steady decline in the value-relevance of earnings over time. Similarly, Amir and Lev (1996) find that earnings, book values, and cash flows are largely irrelevant on a stand-alone basis when valuing firms in the intangibles-intensive industry. In addition, studies by Basu (1997), Elliott and Hanna (1996), and Hayn (1995) suggest that negative earnings and nonrecurring items can adversely affect the value-relevance of earnings. They find that in recent years firms have become increasingly likely to report negative earnings and nonrecurring items, which suggests a decline in the value-relevance of earnings over time. Francis and Schipper (1999), Lev and Zarowin (1999), and Ely and Waymire (1999) estimate regressions of annual returns on the level and/or change in annual earnings deflated by beginning market value, and find that the slope coefficients and R^2s in these regressions decrease strongly over time. Brown et al. (1999), Collins et al. (1997), Givoly and Hayn (2000), Lo and Lys (2000), Landsman and Maydew (2000) also report similar findings.

On the other hand, Barth et al. (1997), Berger et al. (1996), Burgstahler and Dichev (1997), Jan and Ou (1995) suggest that book values have increased importance relative to earnings when earnings are negative or contain nonrecurring items. Two explanations have been given for these findings: (1) book values serve as a better proxy for future earnings when current earnings contain large transitory components, and (2) book values serve as a proxy for the firm's abandonment option. Collins et al. (1997) find that, when earnings and book values are used together, the value-relevance has not declined over the past forty years and, in fact, appears to have increased slightly. They also find that, while the incremental value-relevance of earnings has declined, it has been replaced by increasing value-relevance of book values.

Taken as a whole, empirical findings from prior studies suggest that the explanatory power of earnings has declined over time regardless of the changes in the explanatory power of book values in regression models where stock returns or prices are used as dependent variables. Ryan and Zarowin (2003) went further to investigate two explanations for the declining contemporaneous linear relation between annual stock returns and accounting earnings. They found that annual earnings reflect current positive price changes less strongly and current negative price change more strongly over time, and that asymmetry with respect to lagged price changes is increasingly important over time.

2.2. The Korean Financial Crisis and Accounting Reforms

The accounting environment in Korea has undergone dramatic changes over a relatively short period of time. These changes are evident both in capital market and in accounting infra-structure. The Korean GAAP, formally titled the Accounting Standards for Business Enterprises, was promulgated on 1981, by the Korea Securities and Exchange Commissions (KSEC) with the approval of the Ministry of Finance (MOF). Subsequent revisions to these standards have occurred, the most recent of which took place in December 1998. As discussed earlier, there have been numerous demands for the reform of accounting and auditing practices since the financial crisis in late 1997. The weaknesses in many aspects of the accounting and auditing practices were believed to have been part of the fundamental causes of the crisis. To achieve the reform aiming at the enhancement of accountability, transparency and international comparability in financial information, the Financial Supervisory Commission (FSC) set up in 1998 a new Financial Accounting Standards as being consistent with International Best Practices.

There was also a change in the process through which accounting standards were set. Accounting standards used to be set by the KSEC, which became part of the FSC in April 1998. The FSC took over the supervision of accounting standards setting. A noteworthy progress made under the FSC's leadership was the establishment of an independent private standards-setting organization as of September 1, 1999. The Korea Accounting Institute (KAI) was launched as the first private sector organization in Korea that sets accounting standards, which consists of the General Membership, the Board of Directors, the Korea Accounting Standards Board (KASB), the Korea Accounting Standards Advisory Council (KASAC), and the Research Department. The KASB, in particular, was responsible for setting, revising and interpreting financial accounting standards in Korea so that the standards conform more closely to international norms. As of 2005, the KASB had issued 18 Statements of Korea Accounting Standards (SKAS), from SKAS No. 1 Accounting Changes and Corrections of Errors (March 2001) to SKAS No. 18 Interests in Joint Ventures (February 2005).

Despite the drastic changes, some argue that accounting cultural environment remains qualitatively not very much different from what it used to be before the crisis. Choi (2002) points to the following facets of contemporary Korean accounting environments. The FSC on behalf of the government sector keeps the final say on the setting and amending the Korean GAAP. Being a provider of major share of funds necessary for operating the KASB, it potentially serves as a source of significant influence over the setting and amending of the Korean GAAP by the KASB. The closed nature of ownership structure of major business enterprises largely remains the same, and the incentives for favoring flexibility and secrecy in accounting still remain. The external audit market condition remains dictated basically by demand, so that auditors only play a passive role (p. 90).

Choi (2002) further argues that, while an external influence may bring about an immediate change to an accounting system, the changes in accounting practices

are less immediate. This is because accounting practices are subject to value systems shared by members of the accounting community. This consideration is based on the premise that accounting system and practice do not coincide exactly. The discrepancy between system and practice may go unnoticed or tolerated under a stable environment, but tends to augment during the major transition period as was the case in Korea after the financial crisis. The gap eventually narrows either by the convergence of practice toward the system or by the revision of the controversial system itself. Accounting culture is proposed to play an important role in the process of accounting change. The closer the norms and values inherent in the existing culture to those implied by the new system, the convergence may tend to be expedited (p. 92).

2.3. The Korean Stock Market

The Korean stock market has experienced significant growth during the past decade. Foreign investors did not play an important role until 1992. Futures and options were introduced in 1996 and 1997 respectively. The growth and development of the Korean market has been accompanied by a series of important legislative and structural changes. In 1988 a semi-automated trading system was introduced. In 1988, the automated system accounted for 10% of the total market. After reaching 50% in 1989, 90% in 1993, the fully automatic matching of orders was achieved in July 1997 and the "open-outcry" method was nearly wiped out. The growth of the volume of trading from 5% of market capitalization in 1980 to 55% in 1995 is attributed to the growth of foreign and institutional ownership. There have been several regulations introduced over the years governing foreign ownership. The Korean government allowed foreigners a limited access to its security markets in 1981. It listed Korean funds on the New York Stock Exchange in 1984. It permitted Korean firms to offer foreign investors convertible bonds in 1985, opened Seoul's security markets to direct foreign investment, and allowed foreign financial firms to operate and trade shares under the same rules that apply to Korean financial firms in Korea.

Traditionally, the stock market played a relatively small role in the Korean financial system. The first significant boost to the Korean stock market came in 1976 when the Securities and Exchange Law underwent extensive revision. The main objective of the amendment was to ensure more effective supervision of the securities industry and to reinforce investor protection. Throughout the latter half of the 1970s, the Korean securities market experienced an unprecedented rush of public offerings. The number of listed corporations, which stood at only 66 in 1972, jumped to 356 by the end of 1978. At the end of 1997, the number of listed companies was 776. During the period from 1972 to 1997, the traded value of listed stocks jumped more than two thousandfold from 71 billion won to 162.3 trillion won and the total market capitalization increased from 246 billion won to 71 trillion won.

Even though the absolute amount of both the traded value of stocks and market capitalization has increased over time, the relative magnitude of market capitalization to GDP declined in recent years. In 1994 and 1995, the market value to GDP

ratio was greater than 40 percent, but it declined to 30 percent in 1996 and to 17 percent in 1997. The significance of equity as a source of financing also decreased over the last decade. The proportion of financing from the stock market relative to all sources of external financing declined from 23 percent in 1989 to 7.8 percent in 1997. The KOSPI composite index (100 as of January 4, 1980) rose from 532 on January 1, 1988, to 1007 on April 1, 1989. Many small investors were counting capital gains in excess of 100 percent in a little over a year. However, the 1988–89 upturn in the Korea Stock Exchange was not sustainable. On April 21, 1992, the composite index bottomed out at 460. For political reasons, the government repeatedly intervened to prop up share prices by infusing large inflows of cash from various stabilization funds. Hardly anyone approached the market from a long-term perspective of focusing on the fundamental financial soundness of the company, managerial acumen, or on dividend performance. The Korea Stock Exchange introduced KOSPI 200 stock index futures contracts in May 1996, and KOSPI 200 stock index option contracts in July 1997. As of the end of 1997, the KOSPI index fell to 376.31.

Earning is a measure of periodic corporate performance generated by conventional historical cost accounting system. Supposing that stock price change approximates economic income over a period, the association between returns and earnings reflects the degree in which current accounting system captures true economic income. Given the turbulent changes in the environments surrounding accounting system and capital markets in Korea over the past 20 years, it is not easy to predict whether the contemporaneous linear returns-earnings relation has improved or deteriorated in recent years. Considering the large-scale system reforms after financial crisis on the one hand, and the dramatic shift toward the knowledge-based economy on the other, it is an empirical question whether the returns-earnings relation has increased or decreased over time in Korea.

3. Research Method

This paper conducts two main tests. The first test is designed to investigate potential structural change in the relationship between stock returns and accounting earnings. The second test aims at analyzing whether the structural change strengthened the contemporaneous linear relations between returns and earnings over time. We borrow various earnings-returns specifications from Ryan and Zarowin (2003) as the basis of both tests. We start with the "Basic Forward" version of regression equation which regresses returns on earnings, as in Easton and Harris (1991) (Basic Forward Model: BF).

$$R(t) = a + bX(t)/MV(t-1) + e(t), \qquad \text{(BF)}$$

where $R(t) = \{MV(t) - MV(t-1)\}/MV(t-1), MV(t)$ denotes market value of common shareholders' equity at the end of year t, and $X(t)$ denotes earning for the year t.

Rather than directly running the above model, we run the following modified

Basic Forward regression for getting an insight into the time of structural change. Because the exact timing of possible structural change is not known a priori, modified regression analyses are conducted whereby each sample year is used as the potential time point of structural change (Modified Basic Forward Model: MBF).

$$R(t) = a + bD(t) + cX(t)/MV(t-1) + dX(t)/MV(t-1) \cdot D(t) + e(t), \qquad \text{(MBF)}$$

where $D(t)$ is a dummy variable that takes the value of 1 for the years after the year t and 0 otherwise, t denotes potential year of structural change (from 1985 to 2000).

MBF regressions are run both on yearly sample basis as well as on individual firm basis. Because the MBF model is introduced for the purpose of searching for the unknown time of structural change, regression analyses are run by using all possible years from 1985 to 2000 as the point of structural change. In the MBF model, b is the differential intercept and d is the differential slope coefficient, indicating by how much the slope coefficient of the second period's returns-earnings function differs from the slope coefficient of the first period's returns-earnings function. A statistically significant differential slope coefficient indicates that the returns-earnings relationships for the two periods are different. The test year corresponding to a statistically significant d coefficient is considered to qualify as the time point of structural change.

We next run a set of reverse regressions, where earnings is regressed on returns as done in most of the studies documenting the declining contemporaneous linear returns-earnings relation. As Ryan and Zarowin (2003) states, reverse regressions provide the most straightforward way to determine the reasons for the changing trend of the association between contemporaneous returns and earnings for the following reasons (p. 529). First, the changing trend is much more likely to reflect changes in the nature of earnings as a summary measure of periodic firm performance than in the nature of returns, and so from such measurement perspective earnings is the natural dependent variable. Second, prior research shows that earnings are associated with a number of lagged returns, and these close to uncorrelated returns can be included (or not) as explanatory variables in a reverse regression without substantial effect on the coefficient on any other return. The Basic Reverse regression equation serves as the basis to investigate the changing trends of the linear returns-earnings relation (Basic Reverse Model: BR).

$$X(t)/MV(t-1) = a + bR(t) + e(t). \qquad \text{(BR)}$$

We estimate BR equation for all years to analyze the changing trend of the coefficient b. We also estimate an equation with lags as in Beaver and Ryan (1993), and the slope coefficients on lagged returns indicate the portion of shocks that is recognized in earnings in the years after the shock occurs, i.e., as the effect of lags (Lags Reverse Model: LR).

$$X(t)/MV(t-1) = a + bR(t) + cR(t-1) + dR(t-2) + eR(t-3) + e(t). \qquad \text{(LR)}$$

As in Basu (1997), we also estimate an equation with asymmetry as follows (Asymmetry Reverse Model: AR).

$$X(t)/MV(t-1) = a + anDR(t) + bR(t) + bn\{R(t) * DR(t)\} + e(t), \qquad \text{(AR)}$$

where $DR(t)$ is a dummy variable that equals 1 if $R(t)$ is negative, and 0 otherwise.

In AR model, bn indicates the incremental portion of negative shocks above that of positive shocks that is recognized in earnings in the year t.

Finally, the model incorporating lags as well as asymmetry is estimated to analyze the combined effect of lags and asymmetry (Asymmetry and Lags Reverse Model: ALR).

$$\begin{aligned} X(t)/MV(t-1) \;=\; & a + a0nDR(t) + a1nDR(t-1) + a2nDR(t-2) + a3nDR(t-3) \\ & + b0pR(t) + b1pR(t-1) + b2pR(t-2) + b3pR(t-3) \\ & + b0n\{R(t) * DR(t)\} + b1n\{R(t-1) * DR(t-1)\} \\ & + b2n\{R(t-2) * DR(t-2)\} \\ & + b3n\{R(t-3) * DR(t-3)\} + e(t). \qquad \text{(ALR)} \end{aligned}$$

In this equation, $b0p$ indicates the portion of positive shocks that is recognized in earnings in the year the shock occurs. $b0n$ indicates the incremental portion of negative shocks above that of positive shocks that is recognized in earnings in the year the shock occurs. The estimate $b1p+b2p+b3p$ indicates the portion of positive shocks that is recognized in earnings from one to three years after the shock occurs. The estimate $b1n + b2n + b3n$ indicates the incremental portion of negative shocks above that of positive shocks that is recognized in earnings from one to three years after the shock occurs.

4. Sample and Descriptive Statistics

Our sample consists of Korean firms listed in the Korea Stock Exchange (KSE) that are available on the KIS-FAS and KIS-SMAT database over the 1980–2003 period and that have all the variables necessary to estimate afore-mentioned regression equations. We exclude financial firms because we expect them to exhibit a significantly different association between earnings and returns than do nonfinancial firms. Financial firms apply fair value accounting to a greater extent than nonfinancial firms and are subject to distinct asset impairment rules. They are disproportionately exposed to interest rate and other market risks and exhibit pervasive asset-liability matching issues. The full sample spans the 23-year period from 1981 to 2003. To ensure comparability of the results over time, most of the analyses are conducted on a constant sample of 142 firms that exist for the period from 1981 to 2003 (hereafter the "constant sample"). This data requirement causes survivorship bias that likely overstates the importance of lags and possibly asymmetry. Industry distribution of sample firms is shown in Table 1.

Descriptive statistics for the full sample are provided in Table 2. Panel A provides quartiles and means for $X(t)/MV(t-1)$, $R(t)$, and $DR(t)$ pooled across 1981–

Table 1 Sample distribution

Industry	Frequency	Proportion
Foods & Beverages	17	12%
Textiles, Apparel & Fur Articles	17	12%
Pulp, Paper & Paper Products	6	4%
Chemicals, Petroleum, Rubber & Plastic	28	21%
Non-Metalic Mineral Products	10	7%
Basic Metals	6	4%
Fabricated Metal, Machinery & Equipment	26	18%
Construction	14	10%
Wholesale & Retail	9	6%
Shipping & Transport	9	6%
Total	142	100%

Table 2 Descriptive statistics for the full sample 1981–2003

Panel A: Pooled Sample (3,340 observations from 1981–2003)

Variable	Minimum	Q1	Median	Q3	Maximum	Mean
$X(t)/MV(t-1)$	−6.7572	0.0087	0.0353	0.0905	1.4623	−0.0176
$R(t)$	−0.8653	−0.2386	0.0056	0.2500	0.6514	−0.0131
$DR(t)$	0	0	0	1	1	0.5000

Panel B: Four-Year Periods

Variable	Statistic	81–84	85–88	89–92	93–96	97–00	01–03
$X(t)/MV(t-1)$	Mean	0.0145	0.0274	0.0243	−0.0052	−0.1675	−0.0153
	Median	0.0215	0.0174	0.0545	0.0357	0.0579	0.1352
$R(t)$	Mean	0.1538	−0.0849	0.0094	0.0333	−0.2294	0.0186
	Median	0.1508	0.0202	−0.0192	−0.0110	−0.2835	0.0122
$DR(t)$	Mean	0.2388	0.4807	0.5237	0.5046	0.7363	0.4685
	Median	0	0	1	1	1	0

2003. To reduce the effects of outliers in the regression equation estimations, we delete observations in the top and bottom 1% of each year's distribution of deflated current earnings and each of the current and three lagged returns. Inspection of the quartiles indicates that $X(t)/MV(t-1)$ is skewed left, reflecting a number of firms reporting large losses. $R(t)$ is also skewed left, albeit to a lesser extent. $DR(t)$ has a mean of 0.5, which means exactly 50% of returns are negative. Panel B of Table 2 provides means and medians for the variables for the six four-year periods within 1981–2003. Inspection of differences in means and medians indicates that the left skewness of $X(t)/MV(t-1)$ has increased over time with the excep-

tion of 1985–1988 economic boom. The mean has turned to negative since the early 1990s, reflecting an increasingly large number of large reported losses, while the median has remained positive. The left skewness reaches its peak during the financial crisis. Changes in the means and medians of $R(t)$ and $DR(t)$ also appear to reflect general market conditions. During the financial crisis period, $DR(t)$ exhibits obvious left skewness.

5. Results of Empirical Analyses

5.1. Tests of Structural Change

In this section, we examine changes in linear returns-earnings relation over 1981–2003. First, we run modified basic forward (MBF) regression on the full constant sample, redefining the dummy variable such that cutoff point changes sequentially from 1985 to 2000. We examine statistical significance of differential slope coefficients and the overall explanatory power of the model. The cutoff years corresponding to statistically significant differential slope coefficients are regarded as the years in which structural change in contemporaneous linear returns-earnings relation has taken place. The results of the full sample MBF regression analyses are shown in Table 3.

It is readily seen that the relationship between the returns and earnings experienced structural changes in late 1990s. The differential slope coefficient of the year 1998 for example, is statistically significantly positive at 0.01 level, which indicates that the returns-earnings relationship after 1998 is stronger than prior years. This cutoff point coincides with the financial crisis and subsequent accounting system reforms. Statistically significant coefficients are also obtained in the following years of 1999 and 2000.

The main research question of this test is whether the accounting reforms after the 1997 financial crisis has changed the relationship between stock returns and accounting earnings. The above result confirms that the relationship is different between the two periods of before and after the crisis. A larger slope coefficient corresponding to the period after the crisis implies that the contemporaneous linear returns-earnings relation has improved possibly as a result of changes in accounting environment due to the large-scale system reforms.

We also ran MBF regressions on individual firm level using the returns and earnings time series data from 1981 to 2003 for each firm. The test of structural change has been replicated for 142 individual sample firms exactly the same way as for the entire constant sample. Figure 1 provides the number of firms exhibiting significant differential slope coefficient as well as significant explanatory power of the regression model for each cutoff year. The number of firms experiencing structural changes in contemporaneous linear returns-earnings relation increased in recent years, notably after 1997 financial crisis. The number of structural changes for instance, sharply increases in 1998 and afterwards. This result validates that the financial crisis and subsequent accounting system reforms resulted in the structural

Table 3 Result of the test of structural change (Full Sample)

Model: $R(t) = a + bD(t) + cX(t)/MV(t-1) + dX(t)/MV(t-1) \cdot D(t) + e(t)$

Cutoff year	d coefficient	T statistic ($Pr > \mid t \mid$)	Adjusted R-square	F statistics ($Pr > F$)
1985	0.1326	1.26 (0.2079)	0.0412	44.14 (<0.01)***
1986	0.1281	1.25 (0.2132)	0.0432	46.33 (<0.01)***
1987	0.1309	1.29 (0.1977)	0.0413	44.27 (<0.01)***
1988	−0.0034	−0.05 (0.9630)	0.0400	42.82 (<0.01)***
1989	−0.0074	−0.10 (0.9168)	0.0400	42.85 (<0.01)***
1990	−0.0022	−0.03 (0.9749)	0.0414	44.39 (<0.01)***
1991	−0.0176	−0.26 (0.7934)	0.0439	47.10 (<0.01)***
1992	−0.0239	−0.38 (0.7046)	0.0429	46.03 (<0.01)***
1993	0.0225	0.97 (0.3344)	0.0415	44.44 (<0.01)***
1994	0.0210	0.90 (0.3684)	0.0405	43.36 (<0.01)***
1995	0.0212	0.91 (0.3633)	0.0427	45.77 (<0.01)***
1996	0.0172	0.74 (0.4594)	0.0447	47.94 (<0.01)***
1997	0.0092	0.40 (0.6872)	0.0567	61.32 (<0.01)***
1998	0.0344	4.07 (0.0000)***	0.0558	60.39 (<0.01)***
1999	0.0205	2.54 (0.0110)**	0.0474	51.01 (<0.01)***
2000	0.0186	2.27 (0.0232)**	0.0586	63.48 (<0.01)***

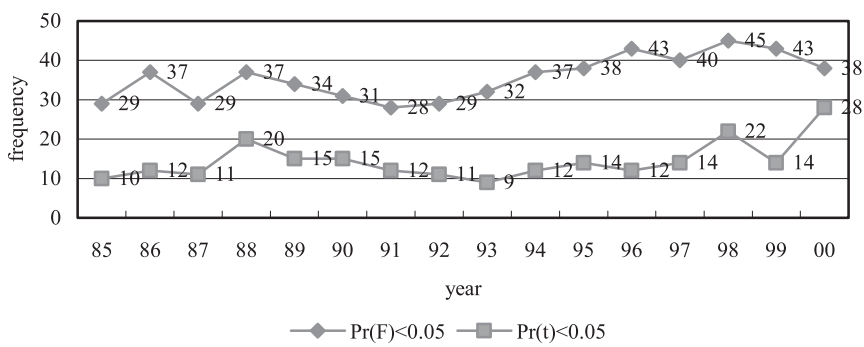

Figure 1 Number of firms experiencing structural changes at year t.
Model: $R(t)= a + b\,D(t) + cX(t)/MV(t-1) + dX(t)/MV(t-1) \cdot D(t) + e(t)$

changes in the quality of accounting earnings of a large number of individual firms.

5.2. Analysis of the Trend of Time Series Properties

In this section, we examine the time series trend of contemporaneous linear returns-earnings relation. We also examine changing lags and asymmetry over time using annual earnings as the dependent variable to determine the association, if any, between changes in returns-earnings relation and changes in lags and asymmetry effects. Tables 4, 5, 6, and 7 report annual OLS estimation of the Basic Forward (BF), Basic Reverse (BR), Lags Reverse (LR), Asymmetry Reverse (AR), Lags

Table 4 Annual OLS estimation of basic regression equations (Full Sample, 1981–2003)

Basic Forward (BF) and Basic Reverse (BR) Models
BF: $R(t) = af + bfX(t)/MV(t-1) + e(t)$
BR: $X(t)/MV(t-1) = ar + brR(t) + e(t)$

Period	Bf	Br	F statistic	R square
1981–1982	0.8513	0.1129	8.8209***	0.0785
1983–1984	1.0484	0.0832	20.4304***	0.1712
1985–1986	0.3147	0.0331	0.8464	0.0259
1987–1988	0.1718	0.0600	1.0201	0.0115
1989–1990	0.1063	0.2349	3.2041*	0.0251
1991–1992	0.1329	0.3823	6.6049**	0.0656
1993–1994	0.1198	0.0944	1.0404	0.0114
1995–1996	0.0403	0.0328	0.1600	0.0030
1997–1998	0.1538	0.6956	10.3041***	0.1057
1999–2000	0.0576	0.8532	4.9729**	0.0846
2001–2002	0.0482	0.1892	1.2100	0.0336
2003	0.1719	0.6231	11.4244***	0.1971
Time Trend	−0.0519 (−3.36)	0.0248 (2.24)		−0.0009 (−0.44)

and Asymmetry Reverse (LAR) equations, respectively. To be able to see intertemporal trends more easily, these tables report average coefficients, t-statistics, R squares, and incremental R squares for each of the 12 two-year periods within 1981–2003. We do not conduct any hypothesis tests based on the mean t-statistics for each two-year period, but they are provided as descriptive statistics. To test for the significance of time trends, this table also reports the results of regressions of the 23 annual coefficients and (incremental) R squares on the year. Incremental R squares are obtained by subtracting the R square of Basic Model from the R squares of other less restricted models.

Table 4 reports the estimations of the Basic Forward and Basic Reverse equations. These results provide a benchmark for less restricted equations and replicate the result of the Modified Basic Forward equation reported in Table 3 without cut-off dummy variables. The average *br* in the Basic Reverse equation falls from 0.1129 in 1981–1982 to 0.0328 in 1995–1996 with a temporary bounce during the early 1990s which coincides with the opening of Korean stock market to foreign investors. The coefficient sharply rises in 1997–1998 and the trend is sustained up to 2003. Overall, this rising trend yields a significant time trend t-statistic. As we shall see shortly, the rise in the *br* coefficient after late 1990s is attributable to increasing asymmetry and lags effect during this period. It appears that the financial crisis and the ensuing institutional arrangements served to magnify not only the linear returns-earnings relationships but also the asymmetry and lags effect of the earnings. The change in average R square is similar to that of *br* coefficient. The value declined from around 10% in the 1980s to below 1% in mid 1990s, and from 1997–1998 it sharply rose above 10%, reaching 19.7% in 2003. This U-shaped

Table 5 Annual OLS estimation of lags regression equation (Full Sample, 1981–2003)

Lags Reverse Model (LR)
LR: $X(t)/MV(t-1) = a + bR(t) + cR(t-1) + dR(t-2) + eR(t-3) + e(t)$

Period	B	C	D	E	R-sq.	Incr. R-sq.
1984	0.0258	0.0161	0.0030	0.0075	0.1200	−0.1114
	(3.71)***	(1.02)	(0.30)	(0.81)		
1985–1986	0.0119	−0.0241	0.0235	0.0675	0.0706	0.0545
	(0.63)	(−0.10)	(0.71)	(1.58)		
1987–1988	−0.0216	0.1191	0.0094	−0.0323	0.0337	0.0222
	(−0.68)	(0.37)	(0.26)	(−0.40)		
1989–1990	0.1404	0.0341	−0.0217	−0.0092	0.0717	0.0466
	(1.21)	(0.10)	(−1.06)	(−0.08)		
1991–1992	0.3982	0.3657	0.3097	0.2361	0.2064	0.1409
	(3.19)***	(2.17)**	(1.66)	(0.93)		
1993–1994	0.0528	0.0642	0.1761	0.1547	0.0998	0.0884
	(1.43)	(1.32)	(2.06)**	(0.49)		
1995–1996	0.0491	0.0530	−0.0116	0.0154	0.0183	0.0153
	(0.95)	(0.72)	(−0.22)	(0.49)		
1997–1998	0.0692	0.5253	−0.1286	0.0425	0.0741	−0.0317
	(0.83)	(2.16)**	(−0.63)	(0.11)		
1999–2000	0.1956	0.2515	0.6257	0.1100	0.1218	0.0372
	(1.34)	(1.88)*	(2.63)**	(0.62)		
2001–2002	0.2120	0.2862	0.1311	0.1017	0.0921	0.0584
	(2.02)**	(1.30)	(1.21)	(1.01)		
2003	0.1701	0.0011	0.0196	0.0371	0.0398	−0.0673
	(2.09)**	(0.01)	(0.27)	(0.37)		
Time Trend	0.0079	0.0164	0.0097	0.0041	−0.0001	−0.0003
	(1.58)	(1.64)	(0.96)	(0.66)	(−0.04)	(−0.11)

path of R square yields an insignificant time trend t-statistic, inconsistent with the researches in the U.S. Since the coefficient *bf* in the Basic Forward equation equals *R-sq./br* and *br* follows the rising path as described above, the changes in R square is the primary reason for declining trend of average *bf* coefficient (time trend t-statistic=−3.36). The average R square was higher relative to *br* during the early periods and the rising pace of br coefficient exceeded that of R square during the recent years.

Table 5 reports the estimation of the Lags equation. The average coefficients *C*, *D*, and *E* on the lagged returns are not consistently positive and nor do they exhibit monotonically rising trend. However, the magnitude of the average coefficient on the first two lagged returns has sharply risen after 1997–1998, implying increased lags subsequent to the crisis. This rise appears short-lived however. After 2001–2002, the statistical significance of these coefficients quickly disappeared. These results imply that a big shock in the economy such as the financial crisis tends to be reflected in earnings with lags. Historical cost based earnings does not seem to accommodate the full impact of the shock contemporaneously. The trend of the

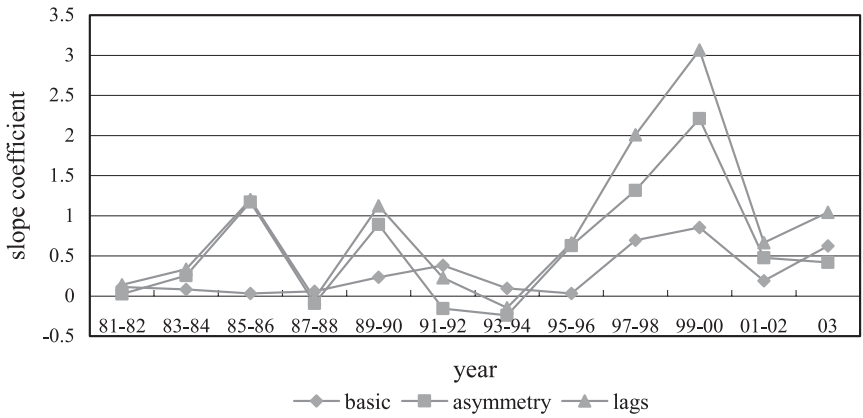

Figure 2 Annual basic, lags, and asymmetry equation coefficients (Full Sample, 1981–2003).

sum of coefficients on the three lagged returns is depicted in Figure 2. The movement of the sum of coefficients aligns with the slope coefficient of Basic Reverse model, particularly after 1997, reflecting the shock of the crisis. The R square and the incremental R square of the Lags equation over the Basic equation are depicted in Figure 3 and Figure 4 respectively. The two measures neither rise nor fall over the overall sample period, with a time trend $t = -0.04$, and -0.01 each. At closer inspection, we find that the trend of the R square of Lags model roughly assimilates with that of Basic model. The incremental R square appears to assimilate the movement of the R square of Basic model with lags, touching the bottom in 1997–1998.

Table 6 reports the estimation of the Asymmetry equation. The Asymmetry Reverse model has been proposed by Basu (1997) to measure the degree in which earnings reflect positive price changes on a less timely basis than negative changes. A positively significant differential slope coefficient on the interaction term of stock return and negative return dummy indicates the presence of asymmetry in recognition of bad news relative to good news. The average coefficient *bn* on $R * DR$ is positive in most of the two-year periods from 1981 to 2003. The coefficient rises sharply from -0.2395 in 1993–1994 to 2.2109 in 1999–2000, indicating dramatically increased asymmetry during this time. While *bn* decreases somewhat in the 2001–2002 period, it remains at an elevated level relative to before the 1997–1996 period, yielding a time trend t =1.35. The R square and the incremental R square over the Basic equation, depicted in Figure 3 and Figure 4 respectively, decline from about 0.3 and 0.2 in 1983–1984 to 0.04 and 0.01 in 2001–2002, yielding time trend $t = -1.30$ and $t = -2.44$. However, the fluctuation in the trend of R square metrics around 1997–1998 coincides with the slope coefficient of Basic equation. Thus, we suggest that the increase in *bn* tends to drive the increase in linear returns-earnings relation after the financial crisis. Note that the *bp* coefficient of Asymmetry

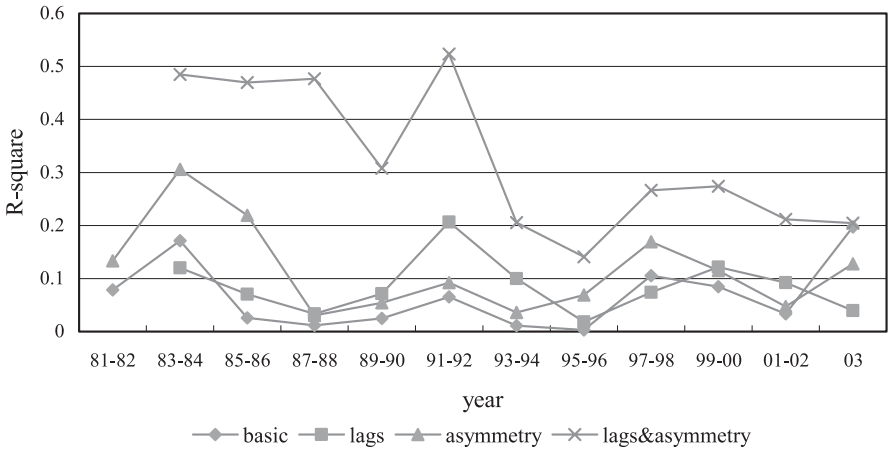

Figure 3 Annual R-squares for regression equations (Full Sample, 1981–2003).

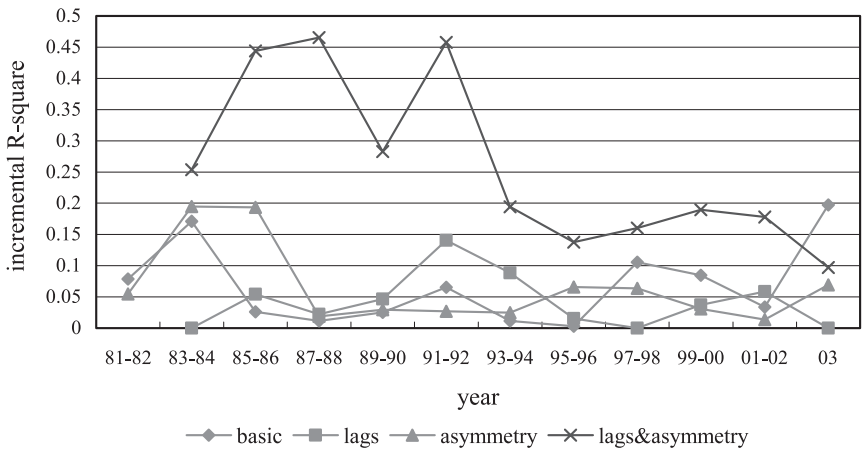

Figure 4 Annual incremental R-squares for regression equations (Full Sample, 1981–2003).

equation during 1997–2000 period is not significantly positive, which implies the increased *b* coefficient of Basic model was largely driven by *bn* coefficients.

Finally, Table 7 reports the estimation of the Lags and Asymmetry equation. Given the number of explanatory variables in this regression equation, for simplicity, only $b0p$, $b0n$, $b1p + b2p + b3p$, $b1n + b2n + b3n$, R square, and incremental R square of the equation over the Basic equation are reported. The trends for the coefficients in the Lags and Asymmetry equation are largely consistent with those for the Lags and Asymmetry equations. The average coefficient on the negative price change is significantly positive around 1997 financial crisis, indicating increased

Table 6 Annual OLS estimation of asymmetry regression equation (Full Sample, 1981–2003)

Asymmetry Reverse Model (AR)
AR: $X(t)/MV(t-1) = a + anDR(t) + bpR(t) + bn\{R(t) * DR(t)\} + e(t)$

Period	Bp	Bn	R-square	Incremental R-square
1981–1982	0.0589 (0.95)	0.0267 (0.68)	0.1332	0.0547
1983–1984	0.0575 (2.27)	0.2527 (3.09)	0.3056	0.1946
1985–1986	−0.0769 (−1.35)	1.1686 (4.39)	0.2192	0.1933
1987–1988	0.2279 (0.02)	−0.0917 (−0.12)	0.0305	0.0190
1989–1990	−0.0898 (−0.04)	0.8894 (1.83)	0.0544	0.0293
1991–1992	0.3708 (1.04)	−0.1564 (−0.51)	0.0925	0.0270
1993–1994	0.0053 (0.09)	−0.2395 (−0.36)	0.0362	0.0248
1995–1996	0.0132 (0.01)	0.6280 (1.35)	0.0688	0.0658
1997–1998	0.7238 (0.89)	1.3134 (1.14)	0.1693	0.0636
1999–2000	−0.5484 (−0.41)	2.2109 (1.68)	0.1152	0.0306
2001–2002	−0.3915 (−0.20)	0.4763 (0.35)	0.0472	0.0135
2003	0.1323 (0.33)	0.4189 (0.70)	0.1277	0.0694
Time Trend	−0.0055 (−0.37)	0.0391 (1.35)	−0.0047 (−1.30)	−0.0667 (−2.44)

Table 7 Annual OLS estimation of lags and asymmetry regression equation (Full Sample, 1981–2003)

Panel D: Lags and Asymmetry Reverse Model (LAR)
LAR: $X(t)/MV(t-1) = a + a0nDR(t) + a1nDR(t-1) + a2nDR(t-2) + a3nDR(t-3)$
$+b0pR(t) + b1pR(t-1) + b2pR(t-2) + b3pR(t-3)$
$+b0n\{R(t) * DR(t)\} + b1n\{R(t-1) * DR(t-1)\} + b2n\{R(t-2) * DR(t-2)\}$
$+b3n\{R(t-3) * DR(t-3)\} + e(t)$

Period	B0p	B0n	B1p+B2p+B3p	B1n+B2n+B3n	R-sq.	Incr. R-sq.
1984	0.0126	0.4598	0.0254	0.1446	0.4849	0.2535
	(2.03)	(6.73)	(1.79)	(1.68)		
1985–1986	0.0154	−0.1213	−0.0295	1.5582	0.4699	0.4440
	(0.74)	(1.77)	(0.59)	(4.52)		
1987–1988	0.0662	0.2442	−0.0901	6.3267	0.4769	0.4654
	(1.28)	(0.92)	(−0.23)	(3.28)		
1989–1990	−0.0229	0.4799	0.2233	1.2025	0.3077	0.2826
	(−0.06)	(0.92)	(0.04)	(1.19)		
1991–1992	0.1482	−0.1340	0.0728	4.2995	0.5233	0.4578
	(3.21)	(−0.19)	(0.83)	(3.15)		
1993–1994	0.0431	−0.1061	−0.0413	1.5959	0.2055	0.1941
	(1.00)	(−0.01)	(−0.00)	(5.45)		
1995–1996	0.0627	0.3052	0.0189	−1.4210	0.1409	0.1379
	(0.73)	(1.64)	(0.32)	(−1.87)		
1997–1998	−0.1830	2.0892	0.0417	2.1714	0.2661	0.1603
	(−1.30)	(3.24)	(1.87)	(2.87)		
1999–2000	−0.1457	1.2660	0.0706	3.1902	0.2740	0.1894
	(−0.06)	(1.57)	(0.40)	(5.13)		
2001–2002	0.1724	0.2790	0.0458	2.5647	0.2115	0.1778
	(1.06)	(0.68)	(1.24)	(3.54)		
2003	−0.0313	0.8938	−0.0132	0.3519	0.2042	0.0971
	(−0.31)	(1.52)	(−0.00)	(0.13)		
Time Trend	0.0027	0.0543	0.0114	−0.0455	−0.0166	−0.0168
	(0.42)	(1.48)	(0.89)	(−0.48)	(−3.15)	(−3.26)

earnings conservatism in the sense of more timely recognition of bad news during this period. The average sum of the coefficients on lagged negative return slope dummies is usually positive, and rises around financial crisis period in particular. This implies that the asymmetry increases during the financial crisis not only with respect to current price change but with lagged price changes as well. As depicted in Figure 3 and Figure 4, the R square and the incremental R square of the Lags and Asymmetry equation over the Basic equation decrease at a rate of about 1.7 percent per year, yielding time trend $t = -3.15$ and $t = -3.26$ respectively. These results suggest that the joint effects of lags and asymmetry exhibit declining trend overall. At closer inspection, however, we observe some association between the path of slope coefficient of Basic equation and the joint effects as shown in Figure 3. The joint effects provide less incremental explanatory powers over time.

The afore-mentioned results illustrate the overall decreasing importance of lags and asymmetry. During the financial crisis in late 1990s however, the lags and asymmetry exhibit trends similar to changes in returns-earnings relation, as is evident in Figure 3. From 1997, the sharp increases in the slope coefficient of Basic model was accompanied by the increases in the coefficient on the lagged returns as well as the differential slope coefficient of negative returns, corroborating an association between the linear returns-earnings relation and lags and asymmetry effects. These results are inconsistent with the prior researches in the U.S., and clearly demonstrate the unique accounting environment caused by the financial crisis, characterized by improved relevance of accounting earnings, improved timeliness in recognizing bad news, and lagged effects with respect to large negative shocks around the crisis years.

6. Conclusions

In this paper we have studied the effect of accounting reforms on the quality of accounting information after the 1997 financial crisis in Korea. Using observations of accounting earnings and stock returns over the past 20 years for the companies listed on the Korea Stock Exchange, we have shown that the contemporaneous linear relation between stock returns and accounting earnings has changed after the accounting reforms in the late 1990s. The association between annual earnings and returns has strengthened since the 1997 crisis. The shocks triggered by the crisis impacted on the accounting earnings in the positive direction as illustrated by the increased association between returns and earnings. We have also found that lags and asymmetry increased somewhat during the financial crisis, implying that the increase in the contemporaneous linear returns-earnings relation may be attributable to timely as well as lagged recognition of large negative shocks caused by the crisis. Other than the seemingly associated co-movements of linear returns-earnings relation, and lags and asymmetry around the late 1990s, the trend of joint effects of lags and asymmetry exhibits a declining trend.

In summary, we conclude that the financial crisis and the ensuing reforms in Korea's accounting system caused a structural change in the contemporaneous

returns-earnings relation toward a positive direction. The crisis also brought about increased lags and asymmetry effects during this period, resulting in improved association between value-relevance and the asymmetry and lags effects.

This paper contributes to the "changes in the value-relevance of earnings" literature by providing non-U.S. based evidence, which is largely inconsistent with the results reported in the U.S. Despite the wide spread impression that historical cost accounting earnings have lost value-relevance due to the shift from industrialized economy toward knowledge based information society, the accounting earnings appear to have gained some merits subsequent to the financial crisis in Korea. Whether the improved association validates the success of accounting system reforms or enhanced awareness of the importance of earnings information among constituents remains to be seen. The evidence from this research provides a partial clue to the debates surrounding the performance evaluation of the recent series of accounting reforms in Korea. The overall evaluation of the various features of the reform warrant further studies both with extended sample and with more detailed research methodology.

References

Basu, S. (1997) "The conservatism principle and the asymmetric timeliness of earnings", *Journal of Accounting and Economics* 24: 3–37.

Beaver, W. and S. Ryan (1993) "Accounting fundamentals of the book-to-market ratio", *Financial Analysts Journal* (November/December): 50–56.

Brown, S., K. Lo and T. Lys (1999) "Use of R squares in accounting research: measuring changes in value relevance over the last four decades", *Journal of Accounting and Economics* 28: 83–115.

Choi, J-S. (2001) "Evaluating the accounting reforms in Korea after the 1997 economic crisis", *The Journal of Korean Economy* 1: 1–20.

Choi, J-S. (2002) "Financial crisis and accounting reform: a cultural perspective", *Journal of Accounting and Finance* 1: 71–93.

Collins, D., E. Maydew and I. Weiss (1997) "Changes in the value-relevance of earnings and book values over the past forty years", *Journal of Accounting and Economics* 27: 39–67.

Easton, P. and T. Harris (1991) "Earnings as an explanatory variable for returns", *Journal of Accounting Research* 29: 19–36.

Ely, K. and G. Waymire (1999) "Accounting standard-setting organizations and earnings relevance: longitudinal evidence from NYSE common stocks, 1927–93", *Journal of Accounting Research* 37: 293–318.

Francis, J. and K. Schipper (1999) "Have financial statements lost their relevance?", *Journal of Accounting Research* 37: 319–352.

Givoly, D. and C. Hayn (2000) The changing time-series properties of earnings, cash flows, and accruals: has financial reporting become more conservative?", *Journal of Accounting and Economics* 29: 287–320.

Liu, J. and J. Thomas (2000) "Stock returns and accounting earnings", *Journal of Accounting*

Research 38: 71–101.

Ryan, S. (1995) "A model of accrual measurement with implications for the evolution of the book-to-market ratio", *Journal of Accounting Research* 33: 95–112.

Ryan, S. and P. Zarowin (1995) "On the ability of the classical errors in variables approach to explain earnings response coefficients and R squares in alternative valuation models", *Journal of Accounting, Auditing, and Finance* 10: 767–786.

Ryan, S. and P. Zarowin (2003) "Why has the contemporaneous linear returns-earnings relation declined?", *The Accounting Review* 78: 523–553.