Capital Investment and Earnings: International Evidence

Ahmet Can Inci[*], Bong Soo Lee[†], and Jungwon Suh[‡]

Abstract

In this paper, we examine dynamic relations between earnings and capital investment in an international context. Using firm level data from 40 different countries, we examine the causality relationships and cumulative impact of lagged earnings (capital investment) on capital investment (earnings) both for individual countries, and for country groups categorized as G7 vs. non-G7, civil law vs. common law, and financially developed vs. undeveloped. Overall, we find that earnings Granger-cause investment, and there is weaker evidence on the causation in the reverse direction. There are differences between G7 vs. non-G7, financially developed vs. undeveloped, and civil law vs. common law groups. Our results suggest that internal financing is a significant constraint for investment for most countries, and that legal environment (e.g., corporate governance) and financial development are important in the profitability of capital investment. The results are robust to including year dummies, using cash flows in place of earnings, and using changes in the variables in lieu of levels.

EFM Classification: 180, 150

Keywords: Capital investment, Earnings, Corporate governance

[*] Sabanci University, Faculty of Management, Orhanli, Tuzla 34956 Istanbul, Turkey. Tel: +90-216-483-9658, E-mail: acinci@sabanciuniv.edu

[†] KAIST Graduate School of Finance, Seoul, 130-722, South Korea. Tel: +82-2-958-3006, E-mail: blee2@kgsm.kaist.ac.kr

[‡] College of Business Administration, Ewha Womans University, Seoul, 120-750, Korea. Tel: +82-2-3277-4650, Fax: +82-2-3277-2776, E-mail: jungwon_suh@ewha.ac.kr

1. Introduction

Corporate finance models assume that managers make investment decisions in order to maximize firm value. The fundamental 'textbook' investment decision criterion is to accept projects with a positive net present value. McConnell and Muscarella (1985) have presented evidence that managers act as value maximizers when setting investment policy. To draw stronger conclusions with regard to the nature of managerial investment decisions, the dynamic relationship between earnings and capital investment has been examined by Bar-Yosef, Callen, and Livnat (1987) and Lee and Nohel (1997). The former has documented that there is a Granger causality relationship from earnings to investment, but not vice-versa. On the other hand, the Lee and Nohel (1997) study has found that not only earnings Granger cause capital investment, but also capital investment Granger causes earnings[1].

In this study, we examine the issue from an international perspective. We investigate how capital investment influences earnings and how earnings influence capital investment in 40 different countries. Our study is the first to examine the nature of the dynamic linkage between earnings and investment using firm-level data from around the world. The two prior studies on this topic, Bar-Yosef et al. (1987) and Lee and Nohel (1997), examine U.S. firms only. Furthermore, their results are inconsistent. The motivation for studying international data is clear. A study of the dynamic linkage of earnings and investment becomes more meaningful and interesting when we examine firms from many countries around the world. The reason is that the causal relation between earnings and investment may vary depending on the legal and financial environments.

A study of the causality from earnings to capital investment is related to several strands of literature in finance. First, the pecking order theory helps us anticipate that this causality will be strong. To the extent that internal funds - such as earnings - have cost advantage over external funds, firms rely more on internal funds for investment and thus will display a causal relation from earnings to investment. Second, Jensen's free cash flow hypothesis (Jensen, 1986) emphasizes the incentive of managers to build empires for their

[1] Lee and Nohel (1997) use co-integrating regressions after demonstrating that the time series in the investigation are nonstationary. If time series data are non-stationary or have unit roots, then co-integrating regressions are conducted, or the data are normalized or first differenced to eliminate the unit root complications and to extract the true nature of the relationship between the variables of interest.

personal benefits. High levels of earnings available to managers make it less costly for managers to pursue such goals. Thus, to the extent that high levels of earnings allow managers to engage in empire building, firms will display a causal relation from earnings to investment.

Third, several early studies argue that capital investment of firms is more sensitive to internally generated funds such as earnings, if these firms are financially constrained (Fazzari, Hubbard and Petersen, 1988). Many empirical studies tend to use the sensitivity of capital investment to the availability of internal funds as a measure of financial constraints (see, for example, Hoshi, Kashyap and Scharfstein, 1991). These studies suggest that the causality from earnings to investment may reflect the relative difficulty of raising external funds. Financially constrained firms that have difficulty in raising external funds will have to rely more on earnings, and thus, the causality from earnings to investment will tend to be high for these firms. In an international context, it is possible to argue that firms in countries without financially developed markets will have difficulty raising external funds. Therefore, we can anticipate that the extent of causality from earnings to investment will be strongly positive for firms in countries without financially developed markets, compared to firms in countries with financially developed markets.

A study of the causality from investment to earnings is related to the "law and finance" literature. Studies in this area of literature point out that in countries with weak shareholder protection, controlling shareholders can expropriate outside shareholders. La Porta et al. (2002) argue that the valuation of firms across countries is positively correlated with the degree of shareholder protection, since outside investors in countries with strong shareholder protection are willing to pay more for fractional ownership. La Porta et al. (1998) document that shareholder protection is strong in common law countries compared to civil law countries. In this study, we anticipate that investment by firms in common law countries will be profitable, compared to investment by firms in civil law countries. In other words, we anticipate that firms in common law countries will display a stronger and positive causality from investment to earnings, compared to firms in civil law countries.

Additionally, the causality from investment to earnings is related to the degree of financial development. Using industry-level data from around the world, Rajan and Zingales (1998) and Wurgler (2000) document that the degree of financial development, as well as legal regimes, influences the efficiency of capital allocation. To the extent that the efficiency

of capital allocation is positively correlated with financial development as these studies indicate, we can anticipate that the causality from investment to earnings will be strongly positive for firms in countries with developed financial markets, compared to firms in countries without developed financial markets.

We cover all G7 countries and include Australia as part of the developed country group. Whether Australia should be considered as a G7 country is of course open to debate; however, the results and conclusions are not significantly affected by this particular classification. For non-G7 economies, 32 developing countries are examined. We divide the entire sample of countries into civil law and common law country groups to see if the legal systems, ownership structures and traditions in these countries influence dynamic relations between earnings and investment. We also separate countries into financially developed and financially non-developed groups. We address how the level of financial development affects capital investment and earnings (or cash flows) causality. In other words, we examine whether corporate managers' investment decisions are value-increasing as the capital budgeting theory suggests. We also address whether internal financing constraints are significant dynamic constraints.

The major findings can be summarized as follows:

(1) Earnings Granger-cause capital investment in both G7 and non-G7 groups as well as in both civil law and common law country groups. Net cumulative impact of earnings is an increase in subsequent investment. We obtain these findings for most individual countries. This finding suggests that internal financing is a significant constraint for investment for most countries.

(2) Capital investment Granger-causes earnings but the evidence is relatively weak. Net cumulative impact is positive, though not very significant, in G7 and in common law countries; but significantly negative and value decreasing in non-G7 and in civil law countries. This implies, among other things, that corporate managers in G7 and common law countries tend to make better capital investment decisions. This may be due to stronger corporate governance and/or monitoring mechanisms.

(3) There is no significant difference when the dynamic relation from cash flow to capital investment is examined. Internal financing constraint is significant in both G7 and non-G7 groups. As for the capital investment to cash flow dynamics, capital

investment is not really value increasing for about two thirds of non-G7 countries. In financially undeveloped countries, capital investment Granger-causes but *decreases* earnings. In financially developed countries capital investment *increases* earnings, even though the causality is not significant.

(4) The above results are robust to business cycles; in other words, introducing year dummies as additional explanatory variables makes no difference. Using changes in earnings and changes in capital investment in the analysis in lieu of level variables does not alter the previous conclusions either.

The rest of the article is organized as follows. In section 2, we describe the data and the empirical methodology. In section 3, we discuss the causal relations between earnings and capital investment. In section 4, we discuss the causal relations between cash flows and capital investment. In section 5, we investigate the impact of financial development on the relationship between earnings and capital investment. We conclude in section 6.

2. Data

We use earnings, capital investment, and cash flow of individual firms from 40 different countries from 1988 through 2004. We obtain the data from the Worldscope database. When a firm-year observation has a missing value in any of these variables, we remove the observation from the sample construction procedure.

One of the first preliminary analyses with time series data is unit root tests. If a series is non-stationary, then the proper course of action is to use first differences, or to normalize the series in some other way, or to conduct cointegrating regressions. We normalize earnings, capital investment, and cash flow variables by dividing them by the year-end book value of total assets. Using ratio variables such as earnings/total assets, capital investment/total assets, and cash flows/total assets helps remove any potential non-stationarity in the original variables. Therefore, taking ratios of the variables with total assets eliminates the need to use a co-integrated system of variables. In addition, normalizing with total assets takes care of the potential size effect of firms and the need to adjust the variables for inflation.

We group the data from individual countries into the following categories: civil law and common law countries, G7 and non-G7 countries, and financially developed and

undeveloped countries[2]. Table 1 reports augmented Dickey-Fuller unit root tests for the pooled data. As expected, the null of a unit root is rejected for each normalized variable. Furthermore, in Table 2, individual country tests again show that earnings and capital investment data do not contain unit roots when normalized with total assets.

In constructing our data set, each country firm data are stacked very much like panel data analysis. A similar stacking scheme is used in Vuolteenaho (2002), who examines the driver of stock return volatility for U.S. firms. In order to deal with extreme observations and possible mis-reports, we winsorize our variables at the top and bottom one percent in their distribution. For each firm, the data of a variable are arranged as a column; each row representing the value of a particular year. Then three new columns are created representing lags of one to three years[3]. This process is repeated for each firm, and the columns with the same lags are stacked on top of each other. As a result, the first column has the original data of the firms stacked on top of each other. The second column is the first lag, the third column is the second lag, and the fourth column is the third lag, respectively.

Because we are stacking observations from different firms and years in each country, one potential complication is year effects. This might be an important issue in the analyses because unlike prior studies on U.S. firms, some countries have data that cover relatively shorter periods of time. To control for possible business cycle effects, dummy variables for each year are introduced as additional explanatory variables. As the discussion in the robustness sections will show, the dynamic relations are quite robust to year dummies.

While prior studies focus on U.S. firms in examining the earnings-capital investment relationship, one can conceive reasons to believe that the causal relationship between these variables may be different in different countries. For example, as La Porta et al. (1998) argue in their seminal paper, corporate ownership concentration varies in different countries. High corporate ownership may be an outcome of corporate insiders' responding to poor shareholder rights in their countries. Investor protection is strong in common-law countries relative to civil-law countries (La Porta et al., 1999). Thus one can speculate that the explanatory power

[2] A civil law country is one whose commercial law is based on French, German, or Scandinavian Commercial Code. A common law country is one whose commercial law is based on the English Common Law. These classifications have been done rigorously in La Porta et al. (1998, 1999) and Dittmar et al. (2003). Financial development indicators have been developed by Love (2003) and Khurana et al. (2006).

[3] A preliminary analysis about the number of lags based on the Akaike information criterion (AIC) and the Schwarz information criterion (SIC) indicates that the appropriate number to include is three lags (years) in our regressions.

of firm-level factors may be stronger in common-law countries than in civil-law countries. If the degree of investor protection is a dominant factor affecting managerial performance, one can hypothesize that the explanatory power of capital investment in earnings (and vice versa) may differ between common-law and civil-law countries. However, this is an open empirical question; thus, we conduct analyses using common-law and civil-law samples to examine the earnings vs. capital investment causality.

3. Empirical Results with Earnings

3.1. All Individual Countries

3.1.1. From Earnings to Capital Investment

The impact of earnings on capital investment is investigated with the regression of the form

$$C_t = \alpha_c + \sum_{i=1}^{i=3} \beta_{i,c} E_{t-i} + \sum_{j=1}^{j=3} \gamma_{j,c} C_{t-j} + \varepsilon_{c,t}\,, \qquad (1)$$

where C_t is formally defined as capital investment in year t divided by total assets in year t, and E_t stands for earnings in year t divided by total assets in year t. Considering both the Akaike information criterion (AIC) and the Schwarz information criterion (SIC), three lags of the explanatory variables are used throughout to explain earnings, capital investment and cash flow. The main question is, whether an increase in earnings leads to an increase in capital investment. Causality of earnings to capital investment relationship is formally tested with two alternative hypotheses:

H_{e10}: Earnings do not Granger-cause capital investment. If the null hypothesis that each coefficient of lagged earnings is jointly zero is rejected, it implies that internal financing is a significant constraint. When firms generate earnings, they use the proceeds to finance new investment projects. Therefore, earnings Granger-cause capital investment.

H_{e20}: The net cumulative effect of earnings on capital investment is not significantly positive. If the null hypothesis that the sum of the coefficients of lagged earnings is equal to zero in explaining capital expenditure is rejected and the sum is positive, it implies that earnings increase leads to an increase in capital investment.

We test the hypotheses for each of the 40 countries, for G7 and non-G7 categories, and for civil law and common law country groups. The estimates of the coefficients and significance levels are presented in Table 3 for each country. Developing (i.e., G7) country

results are reported first, followed by non-G7 civil law and non-G7 common law country results. We find that the majority of the lagged earnings coefficients are significant. Especially the first lag is highly significant for most countries. Both test results provide similar evidence. The p-values of the first test indicate that earnings Granger-cause capital investment in 82.5% of the countries. Earnings lead to capital investment in all of the developed countries whether they are civil law or common law countries.

In developing countries, the first test shows that earnings Granger-cause capital spending in 80% of common law and 77% of civil law countries. Results of the second hypothesis are reported in the last column. Earnings increase subsequent capital investment in 65% of the 40 countries, and 75% of developed economies, whether those developed economies are governed by civil or common law. Furthermore, 70% of the non-G7 common law countries and 60% of the non-G7 civil law countries experience lagged earnings leading to an increase in investment. Overall, there is not a substantial difference between common law and civil law countries when we examine the impact of earnings on capital investment.

3.1.2. From Capital Investment to Earnings

Next we examine the reverse causality from capital investment to future earnings with

$$E_t = \alpha_e + \sum_{i=1}^{i=3} \beta_{i,e} E_{t-i} + \sum_{j=1}^{j=3} \gamma_{j,e} C_{t-j} + \varepsilon_{e,t}, \qquad (2)$$

where earnings are the dependent variable and lagged capital investment terms are explanatory variables along with lagged earnings, all normalized by the total asset values of the matching year. The purpose of the regression is to answer whether an increase in capital investment leads to an increase in subsequent earnings.

As before we address the issue with two formal hypotheses:

H_{c10}: Capital investment does not Granger-cause earnings. If the null hypothesis that each coefficient of lagged capital investments is jointly zero is rejected, it implies that capital investment Granger-causes earnings.

H_{c20}: The net cumulative effect of capital investment on earnings is not significantly positive. If the null hypothesis that the sum of the coefficients of lagged capital investments is equal to zero in explaining earnings is rejected and the sum is positive, it implies that capital

investment increase leads to an increase in earnings.

The estimated coefficients from both tests in Table 4 indicate that capital investment does not lead to subsequent earnings. From Test 1 results, we find that the causal relation from capital investment to earnings is very weak. Investment decisions may be value-increasing but the relation is not strong in particular for common law countries. Test 2 results show that the net cumulative effect of investment on earnings is not significant. Increases in investment do not lead to increases in earnings, and capital investment decisions are not really value-increasing.

In only about 22% of all countries, capital investment Granger-causes earnings according to Test 1, and in only about 20% of all countries, capital investment increases earnings according to Test 2. None of the common law G7 countries experience investment Granger-causing earnings by either test. However, in Japan, capital investment increases future earnings. Several explanations of this bidirectional causality are possible. Corporate ownership may be more intense and may force managers to scrutinize their investment choices. These may lead to higher subsequent earnings.

The evidence in developing countries is mixed. Capital investment causes earnings according to Test 1 in a higher percentage of civil law countries, but leads to subsequent earnings in more common law developing countries according to Test 2. The net effect is weakly positive for non-G7 common law countries (15% level). On the other hand, the net effect is negative, but not significant for non-G7 civil law countries.

Robustness: Business Cycle Effects with Year Dummies

Because we are stacking observations from different firms and years in each country, one potential complication when we examine various pooled data is a year effect. This might be an important issue because unlike prior studies on U.S. firms, some countries have data that cover relatively shorter periods of time. In this section we control for possible business cycle effects. Dummy variables for each year are introduced as additional explanatory variables to see whether the results are influenced in any way from year effects with

$$C_t = \alpha_c + \sum_{i=1}^{i=3} \beta_{i,c} E_{t-i} + \sum_{j=1}^{j=3} \gamma_{j,c} C_{t-j} + D_{2004} + \ldots + D_{1991} + \varepsilon_{c,t}, \qquad (3)$$

where D_i is '1' if the observation is in year i and '0' if the observation is not in year i. The

three lagged earnings terms and three lagged capital investment terms are used, as before, to explain capital investment (all normalized by total assets of the matching years). The goal is to see whether an increase in earnings leads to an increase in capital investment, and whether the original results change in the presence of year dummies. Similarly, the impact of capital investment on earnings, while accounting for business cycle effects, is examined with

$$E_t = \alpha_e + \sum_{i=1}^{i=3} \beta_{i,e} E_{t-i} + \sum_{j=1}^{j=3} \gamma_{j,e} C_{t-j} + D_{2004} + ... + D_{1991} + \varepsilon_{e,t} . \quad (4)$$

These procedures are applied to both individual country data and pooled data. With year dummies the dynamic relations are quite robust, and overall the results do not substantially change. Therefore, the individual country results are not reported for brevity. Only the results for the pooled data are reported in Table 6 and discussed in Section 3.2.3 below. To summarize, business cycle effects do not influence previous conclusions.

Robustness: Interaction between Changes in Capital Investment and Earnings

The analyses so far have used level variables for earnings and capital investment (normalized by total assets). Since there are no unit roots, the analysis is free from non-stationarity problems. This makes it unnecessary to take first differences. Nevertheless, the dynamic relations are similar when first differences are taken and changes in capital investment and earnings are used: the effect of earnings on capital investment does not change and the effect of capital investment on earnings diminishes slightly for civil law countries. These results are not reported but are available upon request.

3.2. G7 vs. non-G7 and Civil law vs. Common law

The interaction between earnings and capital investment is now examined and summarized for panel data pooled together based on various classifications. First, all data are stacked together and the causality relationship is reported for all countries pooled together. Then G7 countries including Australia are pooled together, followed by the pooled non-G7 country data. Another classification is civil law countries and common law countries pooled separately. Finally, all G7 civil law country data and all G7 common law country data are examined separately, followed by non-G7 civil law country data and non-G7 common law country data. The results are presented in Table 5 and Table 6. We test two hypotheses in the

tables to address the causality between earnings and capital investment:

H_{10}: Capital investment (earnings) does not Granger-cause earnings (capital investment).

H_{20}: The net cumulative effect of capital investment (earnings) on earnings (capital investment) is not significantly positive.

3.2.1. From Earnings to Capital Investment

In Panel A of Table 5, we report the causality relationship from earnings to capital investment. All country data include all firm year observations from every country. The tests clearly show that earnings Granger-cause capital investment. That is, p-values are less than the critical value of 0.05. Internal financing is a significant constraint and it is a worldwide phenomenon. The coefficients of lagged earnings are all positive and significant. The first test rejects earnings coefficients jointly being equal to zero. The second test rejects the sum of lagged earnings being equal to zero. Thus, earnings Granger-cause capital investment and increase capital investment. The model explains about half of the variation in future capital investment from adjusted R-square values.

When we separate the data into G7 and non-G7 samples and repeat the analysis, results are similar for both sub-samples. The first two lagged earnings are highly significant. Earnings Granger-cause capital spending, and increase subsequent investment.

How does the traditional legal system in a country affect causality between earnings and capital investment? To address this question, the pooled data is separated into civil law and common law country sub-samples. Overall, both tests indicate that earnings Granger-cause and increase capital investment regardless of the legal system. Finally we separate the G7 sample into G7 civil law sub-sample, which is composed of Germany, France, Italy, and Japan, and G7 common law sub-sample which is composed of Australia, Canada, the UK and the US. We do the same for the non-G7 country sample as well. Overall, evidence from these sub-samples is consistent with the initial results. Earnings Granger-cause and increase capital investment. There is little difference between common law and civil law countries in this regard.

3.2.2. From Capital Investment to Earnings

Panel B of Table 5 reports causality from the reverse direction, from capital investment to future earnings. There is mixed evidence on causality from this direction, consistent with the previous results on individual countries. In the sample for all countries combined together, two coefficients of lagged capital investment are not significant and do not have consistent signs. The formal tests do not reject either hypothesis. Test 1 examines the null hypothesis that the coefficients of investment are jointly zero. The hypothesis is rejected barely at 10% significance but the second test cannot reject the null that the sum of the coefficients is zero. There is weak evidence that investment causes earnings but no evidence that investment increases earnings. When the sample is divided into G7 and non-G7 sub-samples, there is no evidence of a link from capital investment to earnings for either the developed country group or the developing country group.

There seems to be some difference between civil law and common law countries. Capital investment does Granger-cause earnings in civil law countries according to Test 1 at conventional significance. There is weak evidence for common law countries. G7 countries governed by civil law also experience capital investment Granger-causing earnings. Test 1 is highly significant, while Test 2 implies capital investment leads to increases in future earnings at 10% level. Non-G7 civil law countries provide weak evidence that capital investment increases earnings from Test 2. The other tests for the non-G7 countries do not provide more confirmation on investment impacting earnings. Overall, there is some weak evidence that in civil law countries the causality between earnings and capital investment is bi-directional.

3.2.3. Robustness: Business Cycle Effects with Year Dummies

As discussed at the end of Section 3.1.2, since we are stacking observations from different firms, years, and countries, one potential complication when we examine the pooled data is year effects. To control for possible business cycle effects, dummy variables are introduced for each year as additional explanatory variables [see equations (3) and (4)]. Panel A of Table 6 reports the results of the impact of earnings on capital investment while accounting for business cycle effects. Similarly, Panel B of Table 6 reports the results of the impact of capital investment on earnings while accounting for business cycle effects.

Overall, previous conclusions hold when year effects are considered. Earnings Granger-cause *and* increase subsequent capital investment. On the other hand, causality is

quite weak in the reverse direction. There is some weak evidence that capital investment causes earnings increase. This is more so in civil law countries than in common law countries. Thus, the dynamic relations are quite robust to the introduction of year dummies. While the majority of the coefficients for year dummies are significant (they are not reported for brevity), business cycle effects do not influence the overall conclusions.[4]

4. Robustness: Cash Flows in lieu of Earnings

Some studies in the literature focus on the investment-cash flow relationship, rather than causality between capital investment and earnings. One can make an argument that actual cash flows are more relevant for a company than earnings. After all, accounting rules vary from one country to another; therefore, it might be more appropriate to conduct the analysis using cash flow from operations, rather than earnings. Evidence from this strand of research has been mixed. Fazzari, Hubbard and Petersen (1988) argue that firms facing financial constraints will rely more on internal funds and thus will display higher investment sensitivity to cash flows. On the other hand, evidence from Alti (2003), Kaplan and Zingales (1997) and Cleary (1999) suggests that investment-cash flow sensitivity may not be related to financial constraints. While these studies focus on U.S. firms only, Chay and Suh (2006) investigate if the financial status of a firm affects the cash flow-investment link. We contribute to the literature by looking at the causality between capital investment and cash flows. We focus on G7 countries and report the results for each country, followed by the results for all G7, G7 civil law, and G7 common law country groups. Then, the developing countries are discussed.

4.1. G7 Countries

4.1.1. Cash Flows to Capital Investment

The cash flow to capital investment relationship is examined, as before, with two hypotheses using

$$C_t = \alpha_c + \sum_{i=1}^{i=3} \beta_{i,c} CF_{t-i} + \sum_{j=1}^{j=3} \gamma_{j,c} C_{t-j} + \varepsilon_{c,t}, \qquad (5)$$

where C_t is capital investment divided by the asset value in year t, and CF_t is cash flow

[4] When changes in capital investment and earnings are used instead of level variables, the dynamic relation is similar: the effect of earnings on capital investment does not change. But the effect of capital investment on earnings diminishes somewhat for civil law countries.

instead of earnings, divided by total assets in year *t*.

H_{cf10}: Cash flows do not Granger-cause capital investment.

H_{cf20}: The net cumulative effect of cash flows on capital investment is not significantly positive.

The results of Test 1 reported in Table 7 show that the first hypothesis is rejected; in other words, cash flows Granger-cause capital investment in all 8 countries. This means internal financing is a significant constraint for all G7 countries including Australia. Second, the net cumulative effect of cash flows on capital investment is significantly positive. Only France does not show a significant effect of cash flows on capital investment. Finally, overall, there is no difference between common law and civil law countries in this regard. When we group the observations altogether, or into civil law and common law country groups, the above conclusions are reaffirmed. Cash flows Granger-cause and increase capital investment.

4.1.2. Capital Investment to Cash Flows

The reverse causality relationship from capital investment to cash flows is examined in Panel B of Table 7 with

$$CF_t = \alpha_{cf} + \sum_{i=1}^{i=3} \beta_{i,cf} CF_{t-i} + \sum_{j=1}^{j=3} \gamma_{j,cf} C_{t-j} + \varepsilon_{cf,t}. \quad (6)$$

The first hypothesis is that capital investment does not Granger-cause cash flows. The second hypothesis is that the net cumulative effect of capital investment on cash flows is not significant. In other words, an increase in capital investment does not lead to an increase in cash flows.

Test 1 indicates that overall, capital investment Granger-causes cash flows. However, this causal relation is not significant in France and Italy, both of which are civil law countries. Investment decisions are value-increasing but the relation is weak. Test 2 indicates that the net cumulative effect of capital investment on cash flows is significant and positive. Increases in capital investment lead to increases in cash flows and therefore, capital investment decisions are value-increasing. The net effect is significant for every country except for Italy. There is some difference between common law and civil law countries in this regard. We do not find a significant causal relation for France and Italy. In these two civil law countries, capital

investment decisions are not necessarily value increasing[5].

Compared to the earlier earnings-capital investment results, the causal relation from capital investment to cash flows seems somewhat stronger[6]. However, some civil law countries still show weak relations from capital investment to cash flows.

4.2. Non-G7 Countries

Results for the 32 developing countries are discussed next but they are not formally reported. Pooled data results for civil law, common law, and all countries are presented and analyzed as well.

Overall, cash flow Granger-causes capital investment as seen in Panel C of Table 7. This relationship is found in most non-G7 countries (except for Greece, Portugal, and Turkey). This means internal financing is a significant constraint for these countries. There is not a significant difference between developing common law and civil law countries. We further find that the net cumulative effect of cash flows on capital investment is significantly positive (except for Greece and Turkey, both of which are civil law countries). Therefore, cash flows increase capital investment. Overall, we find the same pattern as in the relationship between earnings and capital investment.

When we examine causality from the reverse direction in Panel D, overall capital investment Granger-causes and affect future cash flows (even though only 11 countries show a significant causal relation from capital investment to cash flows). We also find a causal relation for common law and civil law non-G7 countries. The net cumulative effect of capital investment on cash flows is significant from Test 2 both for common law and for civil law countries except for Greece, India and Portugal. Thus, capital investment leads to increases in cash flows.

When year dummies are included in order to investigate causality from cash flow to capital investment, and vice versa, we find results similar to those reported above in both causality directions. Overall, we do not find any significant differences in the dynamic relationship from cash flow to capital investment between G7 and non-G7 countries: internal

[5] When the explanatory variables are augmented with year dummies, the regression results are qualitatively similar to the earlier ones. These results are not reported here to conserve space.

[6] We have to exercise caution in the interpretation of this finding because the post-investment depreciation is counted as income in cash flows.

financing constraint is significant in both groups. There seems to be some difference in the dynamic relation from capital investment to cash flow between the two groups. Capital investment is not really value increasing for about two thirds of non-G7 countries. This implies, among other things, that corporate managers in G7 countries tend to make better capital investment decisions. This may be due to stronger corporate governance or monitoring mechanisms in developed countries.

5. Financially Developed vs. Non-Developed Countries

The final perspective of the information content in earnings-capital investment relationship is from whether a country is financially developed or not. How is the investment-earnings causality affected by the level of development in financial markets? Financial development of a country has been the subject of several previous papers, and indicators have been developed to measure the level of development in a country. We utilize two such indicators in this part of the analysis.

The first financial development index is based on Love (2003). The index is the sum of two components. The first component is the stock market development index from Demirguc-Kunt and Levine (1996) and is equal to the sum of (standardized indices of) market capitalization of the gross domestic product (GDP), total value traded to the GDP, and turnover (total value traded to market capitalization). The second component is the financial intermediary development index from Demirguc-Kunt and Levine (1996), which is equal to the sum of (standardized indices of) the ratio of liquid liabilities to the GDP and the ratio of domestic credit of the private sector to the GDP.

The second index is based on a more recent study by Khurana, Martin and Pereira (2006) - KMP. It is an average of five standardized indices from the World Bank database: (1) market capitalization over the GDP, (2) total value traded over the GDP, (3) total value traded over market capitalization, (4) the ratio of liquid liabilities to the GDP, and (5) the credit going to the private sector over the GDP. The sum of the first three indices represents the stock market development. The sum of the last two indices represents the financial intermediary development. The KMP financial development index is the sum of the stock market development and the financial intermediary development.

A higher value of financial development index indicates that financial systems rely

relatively more on market-oriented financing and financial intermediaries in a country. Table 2 reports the financial development index values of each country. We rank and separate countries into financially developed and financially developing groups using the median of the ranked group. We also separate the countries into three groups of financially developed, middle, and not developed groups using the 33rd and 66th percentiles. We examine the causality and net cumulative relationships between earnings and capital investment for financially developed countries and financially undeveloped countries.

We report the results in Table 8.[7] First, there is clear evidence that earnings Granger cause capital investment. Earnings have a cumulative impact of increasing capital investment as well. There does not seem to be a difference in this regard between financially developed and undeveloped countries. And the results are consistent both for the Love (2003) index classification and the KMP (2006) index classification. This result is supported by Chay and Suh (2006) who find that there is no negative relation between the sensitivity of investment to cash flows and financial development.

From capital investment to earnings, on the other hand, there is weak evidence of Granger-causality in financially undeveloped countries; however, the cumulative effect reduces earnings. This is an indication that in undeveloped countries, investment decisions of managers are not always correct. They may lead to declines in earnings. Furthermore, the managers of firms in financially undeveloped countries may not be monitored effectively. There do not seem to be useful and preventive corporate governance mechanisms. Independent auditors, and company and stock analysts may not have the means to observe managers' talents and force them to make good managerial decisions.

In financially developed countries, on the other hand, there is not strong evidence of capital investment Granger-causing earnings. The cumulative effect, on the other hand is positive (though not very significant); in other words, capital investment does lead to increased earnings since the point estimates are positive. In financially developed countries, external financing is cheap and easy to obtain (Rajan and Zingales, 1998). Managers may prefer external funding and they are not faced with financing constraints. As a result, capital investment, which originates from internal resources, has inconsequential causality effect on

[7] We also separated the sample into five groups using the 20th, 40th, 60th, and 80th percentiles to extract more specific information. The results are similar.

earnings.

6. Conclusion

This study is the first to examine the nature of the dynamic linkage between earnings and investment using firm-level data from around the world. The analysis of the dynamic relationship between earnings and investment with international data provides meaningful and interesting results because the causal relation between earnings and investment may vary depending on the legal and financial environments.

We find that the causality from earnings to investment is positive and strong in almost all countries in the sample, irrespective of the type of legal system and the degree of financial development. This result is consistent with the pecking order theory and the free cash flow theory. On the other hand, we find no significant difference between financially developed and financially undeveloped countries in the strength of earnings-to-investment causality. This result does not support the hypothesis that the earnings-to-investment causality will be relatively weak in financially undeveloped countries due to the financial constraints faced by the firms in those countries. However, it is consistent with a series of recent studies by Cleary (1999), Kaplan and Zingales (1997), and Chay and Suh (2006). They all report evidence that the sensitivity of investment to earnings is not a measure of financial constraints.

On the causality from investment to earnings, we find that this causality is not positive and strong in many countries. This indicates that managers fail to invest in value-creating projects or that investment decisions involve high levels of uncertainty about future performance. An important observation from our study is that the investment-to-earnings causality is relatively negative for the civil law country firms and the financially undeveloped country firms, compared to the common law country firms and the financially developed country firms, respectively. This suggests that the legal system and financial development are factors in the determination of the profitability of corporate investment. This finding is supported by prior studies in the law and finance literature. La Porta et al. (1998) document that shareholder protection is strong in common law countries compared to civil law countries. La Porta et al. (2002) argue that the valuation of firms across countries is positively correlated with the degree of shareholder protection, since outside investors in countries with

strong shareholder protection are willing to pay more for ownership. Using industry-level data, Rajan and Zingales (1998) and Wurgler (2000) document that the efficiency of capital allocation is positively correlated with legal protection of shareholders and financial development. Our evidence using firm-level data corroborates these studies. Overall, it appears that the monitoring and incentive mechanisms in common law and financially developed countries does a relatively better job in pressuring managers into making investments in value-creating projects.

References

Alti, A., 2003, "How sensitive is investment to cash flow when financing is frictionless?" *The Journal of Finance* 58, 707-722.

Bar-Yosef, S., Callen, J., and J. Livnat, 1987, "Autoregressive modeling of earnings-investment causality," *Journal of Finance* 42, 11-28.

Chay, J.B., and J. Suh, 2006, "What Does Investment-Cash Flow Sensitivity Really Measure?" Working paper, Sungkyungkwan University.

Cleary, S., 1999, "The relationship between firm investment and financial status," *The Journal of Finance* 54, 673-692.

Demirguc-Kunt, A., and R. Levine, 1996, "Stock Market Development and Financial Intermediaries: Stylized Facts," *World Bank Economic Review* 10, 291-321.

Dittmar, A., Mahrt-Smith, J., and H. Servaes, 2003, "International corporate governance and corporate cash holdings," *Journal of Financial and Quantitative Analysis* 38, 111-133.

Fazzari, S., Hubbard, R., and B. Petersen, 1988, "Financing constraints and corporate investment," *Brookings Papers on Economic Activity* 1, 141-195.

Fuller, W.A., 1996, *Introduction to Statistical Time Series*. New York: Wiley.

Hoshi T., A. Kashyap, A. and D. Scharfstein, 1991, "Corporate structure liquidity and investment: Evidence from Japanese panel data," *Quarterly Journal of Economics* 106, 33-60

Jensen, M. C., 1986, "Agency costs of free cash flow, corporate finance, and takeovers," *American Economic Review* 76, 323-329

Kaplan, S. and L. Zingales, 1997, "Do financing constraints explain why investment is correlated with cash flow?" *Quarterly Journal of Economics* 112, 169-215

Khurana, I.K., Martin, X., and R. Pereira, 2006, "Financial development and the cash flow sensitivity of cash," *Journal of Financial and Quantitative Analysis*, forthcoming.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., and R. Vishny, 1998, "Law and finance," *Journal of Political Economy* 106, 1113-1115.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., and R. Vishny, 1999, "Corporate ownership around the world," *The Journal of Finance* 54, 471-517.

La Porta, R., F. Lopez-De-Silanes, A. Shleifer and R. Vishny, 2002, "Investor protection and

corporate valuation," *The Journal of Finance* 57, 1147-1170

Lee, B.S., and T. Nohel, 1997, "Value maximization and the information content of corporate investment with respect to earnings," *Journal of Banking and Finance* 21, 661-683.

Love, I., 2003, "Financial development and financing constraints," *The Review of Financial Studies* 16, 765-791.

McConnell, J., and C. Muscarella, 1985, "Corporate capital expenditure decisions and the market value of the firm," *Journal of Financial Economics* 14, 399-422.

Rajan, R., and L. Zingales, 1998, "Financial dependence and growth," *American Economic Review* 88, 559-586

Vuolteenaho, T., 2002, "What drives firm-level stock returns?" *Journal of Finance* 57, 233-264.

Wurgler, J., 2000, "Financial markets and allocation of capital," *Journal of Financial Economics* 58, 187-214

Table 1. Unit Root Tests

	Number of Observations	E_t	C_t
All Countries	91,089	-153	-131
G7 Countries	61,864	-144	-82
non-G7 Countries	29,225	-95	-103
Civil Law Countries	33,015	-117	-81
Common Law Countries	58,074	-56	-103
Financially Dev. – Love	73,293	-168	-127
Non-Financial - Love	11,857	-69	-53
Financially Dev. – KMP	69,187	-181	-131
Non-Financial – KMP	13,931	-67	-46

Unit root test values (ρ) are reported for earnings (E_t) and capital investment (C_t), both normalized by A_t, the assets of the firm corresponding to the same year, t, and country. The null hypothesis, H_0: ρ = 0 (non-stationarity). Reject the null if |ρ| > |Critical value|. Critical values -2.60, -2.93, and -3.58 for 10%, 5%, and 1% significance, respectively (Fuller, 1996). The augmented Dickey-Fuller regression is of the form $\Delta x_t = \alpha + \rho x_{t-1} + \gamma_1 \Delta x_{t-1} + \gamma_2 \Delta x_{t-2} + \gamma_3 \Delta x_{t-3}$.

Table 2. Descriptive Data on Each Country

Country	G7-nonG7	Legal System	Nobs	Unit Root Tests (ρ)		Financial Dev. Index	
				E_t	C_t	Love	KMP
Germany	G7	Civil	3,391	-28.58	-21.39	1.68	1.11
France	G7	Civil	2,687	-26.56	-18.07	0.1	0.73
Italy	G7	Civil	1,211	-15.51	-13.43	-0.64	0.56
Japan	G7	Civil	8,939	-49.90	-39.31	3.3	1.44
Australia	G7	Common	1,729	-20.27	-17.82	0.42	0.52
Canada	G7	Common	2,296	-19.97	-19.27	0.03	0.54
UK	G7	Common	8,426	-44.65	-32.17	1.68	2.15
US	G7	Common	33,185	-87.93	-66.61	1.35	2.64
Argentina	non-G7	Civil	239	-9.00	-7.79	-1.38	-0.44
Austria	non-G7	Civil	385	-7.50	-7.45	0.42	0.26
Belgium	non-G7	Civil	530	-11.43	-7.08	-0.82	0.82
Brazil	non-G7	Civil	803	-14.80	-11.85	-1.04	-0.42
Switzerland	non-G7	Civil	1,265	-18.51	-13.00	2.2	2.72
Chile	non-G7	Civil	759	-10.47	-12.98	-0.75	-0.2
China	non-G7	Civil	1,866	-15.55	-13.45	-	-
Colombia	non-G7	Civil	167	-4.03	-6.34	-1.6	-0.67
Denmark	non-G7	Civil	952	-15.55	-11.93	-0.49	0.49
Spain	non-G7	Civil	858	-13.82	-10.56	-0.14	1.8
Finland	non-G7	Civil	698	-9.79	-12.61	-0.41	0.95
Greece	non-G7	Civil	42	-3.76	-5.36	-	-
Indonesia	non-G7	Civil	1,226	-16.47	-15.76	-1.17	-0.41
Korea	non-G7	Civil	1,195	-20.14	-18.84	0.84	1.73
Mexico	non-G7	Civil	550	-8.15	-9.37	-0.85	-0.59
Holland	non-G7	Civil	911	-14.04	-12.86	0.66	1.79
Norway	non-G7	Civil	741	-13.19	-9.95	-0.15	0.16
Philippines	non-G7	Civil	672	-12.05	-9.49	-1.15	-0.29
Portugal	non-G7	Civil	237	-7.12	-5.93	-0.67	0.93
Sweden	non-G7	Civil	1,226	-14.06	-14.44	-0.31	0.91
Turkey	non-G7	Civil	400	-8.59	-12.66	-1.2	0.06
Taiwan	non-G7	Civil	1,702	-18.30	-17.42	-	-
Hong Kong	non-G7	Common	2,645	-26.21	-23.96	-	-
Ireland	non-G7	Common	321	-8.59	-6.75	-	-
Israel	non-G7	Common	212	-8.08	-5.38	0.01	-
India	non-G7	Common	1,501	-15.35	-20.42	-0.7	0.44
Malaysia	non-G7	Common	2,930	-24.46	-25.24	1.19	1.01
NewZealand	non-G7	Common	300	-7.14	-6.82	-0.53	0.34
Pakistan	non-G7	Common	386	-7.56	-8.55	-1.28	1.19
Singapore	non-G7	Common	1,478	-18.28	-16.58	1.6	0.93
Thailand	non-G7	Common	1,820	-19.11	-18.76	0.36	0.67
S. Africa	non-G7	Common	845	-14.83	-14.26	0.25	1.09

Augmented Dickey-Fuller unit root tests are for H_0: $\rho = 0$ (non-stationarity). Reject the null if $|\rho| > |$Critical value$|$. Critical values -2.60, -2.93, and -3.58 for 10%, 5%, and 1% significance, respectively (Fuller, 1996). The Dickey-Fuller regression is of the form $\Delta x_t = \alpha + \rho x_{t-1} + \gamma_1 \Delta x_{t-1} + \gamma_2 \Delta x_{t-2} + \gamma_3 \Delta x_{t-3}$. E_t is earnings, C_t is capital investment. The sample is from 1988 through 2004.

Table 3. Earnings to Capital Investment causality

Country	Int.	E_{t-1}	E_{t-2}	E_{t-3}	C_{t-1}	C_{t-2}	C_{t-3}	adjR^2	Test1	Test2
Germany	0.02***	0.03***	0.02*	0.00	0.41***	0.15***	0.06***	0.35	0.00	0.00
France	0.01***	0.04***	-0.04**	0.01	0.41***	0.18***	0.16***	0.50	0.01	0.46
Italy	0.01***	0.05***	0.05**	-0.03	0.38***	0.11***	0.19***	0.48	0.00	0.00
Japan	0.01***	0.08***	0.00	-.04***	0.52***	0.10***	0.14***	0.56	0.00	0.00
Australia	0.02***	0.02***	0.00	-0.01	0.37***	0.24***	0.05**	0.37	0.00	0.43
Canada	0.02***	0.05***	-0.02**	0.00	0.56***	0.04*	0.15***	0.50	0.00	0.00
UK	0.01***	0.02***	0.00	0.00	0.50***	0.11***	0.14***	0.53	0.00	0.00
US	0.01***	0.01***	0.00***	0.00	0.53***	0.09***	0.13***	0.52	0.00	0.00
Argentina	0.02***	0.04	0.15***	-.11***	0.43***	0.10	0.04	0.40	0.00	0.08
Austria	0.02***	0.10**	-0.08	0.00	0.36***	0.18***	0.11**	0.34	0.23	0.70
Belgium	0.01**	0.04	0.02	-0.01	0.30***	0.20***	0.28***	0.47	0.48	0.22
Brazil	0.02***	0.06***	0.00	-0.02	0.47***	0.04	0.09***	0.34	0.00	0.03
Switzer.	0.01***	0.04***	0.00	-0.01	0.59***	-0.06*	0.20***	0.52	0.03	0.16
Chile	0.01***	0.10***	-0.02	0.00	0.49***	0.00	0.11***	0.39	0.00	0.00
China	0.02***	0.09***	0.03	0.01	0.39***	0.06***	0.09***	0.31	0.00	0.00
Colombia	0.01***	0.08*	0.01	0.02	0.41***	-0.13	0.16**	0.27	0.04	0.01
Denmark	0.02***	0.06**	0.01	0.01	0.46***	-0.01	0.20***	0.37	0.00	0.00
Spain	0.01***	0.20***	-.11***	-0.03	0.52***	0.08*	0.09***	0.43	0.00	0.01
Finland	0.04***	0.11***	0.02	-0.08*	0.33***	0.08**	0.01	0.17	0.00	0.18
Greece	0.04**	-0.12	0.11	0.29	0.30*	0.06	-0.21	0.08	0.53	0.30
Indonesia	0.02***	0.05***	0.03***	0.00	0.37***	0.09***	0.05**	0.32	0.00	0.00
Korea	0.02***	0.02***	-0.01	-0.01	0.38***	0.05	0.11***	0.20	0.00	0.82
Mexico	0.01***	0.11***	0.02	-0.06**	0.53***	-0.02	0.09***	0.45	0.00	0.00
Holland	0.02***	0.04**	0.04*	-0.04*	0.47***	-0.01	0.17***	0.32	0.00	0.03
Norway	0.02***	0.03**	0.02	0.01	0.33***	0.20***	0.11***	0.35	0.00	0.00
Philippines	0.01***	0.04**	0.01	-0.01	0.52***	0.05	0.06**	0.47	0.02	0.05
Portugal	0.01*	0.16**	0.06	-0.08	0.51***	0.19***	0.04	0.56	0.06	0.05
Sweden	0.02***	0.02**	0.00	0.00	0.25***	0.16***	0.11***	0.22	0.00	0.00
Turkey	0.01***	0.00	-0.01	0.00	-8.01	-9.15	9.22	0.01	0.45	0.16
Taiwan	0.01***	0.09***	0.00	-0.02	0.48***	0.07***	0.10***	0.48	0.00	0.00
HongKong	0.01***	0.02***	0.01	0.00	0.34***	0.10***	0.10***	0.27	0.00	0.00
Ireland	0.01***	0.04**	0.00	-0.02	0.59***	0.01	0.18***	0.52	0.14	0.41
Israel	0.01**	0.04	0.12***	-0.09**	0.54***	0.20***	0.05	0.63	0.00	0.14
India	0.02***	0.13***	0.01	-0.02	0.37***	0.06***	0.05**	0.26	0.00	0.00
Malaysia	0.01***	0.03***	0.04***	0.01	0.37***	0.08***	0.06***	0.27	0.00	0.00
N. Zealand	0.02***	0.04**	0.03*	0.01	0.31***	0.21***	0.06	0.36	0.00	0.00
Pakistan	0.02***	0.00	0.13***	-0.02	0.48***	-0.03	0.03	0.28	0.00	0.00
Singapore	0.02***	0.03*	0.01	-0.01	0.41***	0.04*	0.12***	0.32	0.17	0.15
Thailand	0.02***	0.04***	0.01	-0.02	0.47***	0.09***	0.02	0.36	0.00	0.00
S. Africa	0.02***	0.05**	0.00	0.01	0.39***	0.19***	0.04	0.31	0.04	0.03

The regression is of the form $C_t = \alpha_c + \sum_{i=1}^{i=3} \beta_{i,c} E_{t-i} + \sum_{j=1}^{j=3} \gamma_{j,c} C_{t-j} + \varepsilon_{c,t}$, where E_t is earnings, C_t is capital investment. *, **, and *** indicate two-tailed significance at 90%, 95% and 99% levels, respectively. Test 1 reports the p-values of the F test (with three degrees of freedom for the numerator) that examines whether all coefficients of lagged earnings are equal to zero. Test 2 reports the p-value of the F-test (with 1 degree of freedom for the numerator) for the cumulative impact of earnings on capital investment. The null hypothesis is that the sum of the three lagged earnings estimates is equal to zero.

Table 4. Capital Investment to Earnings causality

Country	Int.	E_{t-1}	E_{t-2}	E_{t-3}	C_{t-1}	C_{t-2}	C_{t-3}	adjR^2	Test1	Test2
Germany	-.01***	0.42***	0.06**	0.14***	0.03	0.15***	-.17***	0.23	0.00	0.93
France	0.01***	0.62***	-0.02	0.07***	-0.02	-0.01	-0.01	0.39	0.52	0.14
Italy	0.00	0.56***	0.12***	0.08**	-0.02	0.00	0.03	0.44	0.76	0.67
Japan	0.00	0.41***	0.11***	0.13***	-0.01	0.02	0.03**	0.29	0.00	0.00
Australia	-0.01	0.21***	0.16***	0.23***	-0.07	-0.02	0.17**	0.20	0.23	0.40
Canada	-.02***	0.52***	0.08***	0.20***	-0.06	0.18**	-0.06	0.43	0.11	0.27
UK	0.00*	0.38***	0.13***	0.13***	-0.02	0.07	-0.04	0.27	0.52	0.74
US	-.02***	0.50***	0.15***	0.15***	-0.02	0.02	0.05	0.43	0.27	0.12
Argentina	-0.03**	0.04	0.37**	0.11	0.30*	0.02	-0.06	0.12	0.26	0.13
Austria	0.01***	0.32***	0.14**	-0.07	0.00	0.07	-0.06	0.16	0.43	0.67
Belgium	0.01	0.47***	0.12**	0.13**	0.03	0.01	0.00	0.35	0.80	0.37
Brazil	0.01*	0.39***	0.23***	0.22***	-0.08	-0.05	0.04	0.40	0.47	0.25
Switzer.	0.01**	0.51***	-0.04	0.18***	0.12**	-0.13**	0.02	0.29	0.12	0.74
Chile	0.01***	0.53***	0.18***	0.09**	-0.06	0.02	-0.07*	0.54	0.05	0.01
China	-0.01**	0.40***	0.00	0.04	0.12***	0.03	0.00	0.20	0.00	0.00
Colombia	0.01	0.58***	0.12	0.03	-0.11	-0.02	0.10	0.51	0.65	0.89
Denmark	0.01**	0.66***	-.24***	0.21***	0.06	-0.02	-0.05	0.35	0.33	0.68
Spain	0.01***	0.44***	0.00	0.07*	0.09**	-0.01	0.01	0.28	0.08	0.03
Finland	0.01***	0.72***	0.02	-0.07	0.01	-0.03	0.03	0.52	0.80	0.97
Greece	0.01	0.47***	0.19	0.02	0.07	-0.08	0.03	0.31	0.91	0.84
Indonesia	0.01	0.31***	0.21***	0.03	-0.11	0.04	-0.06	0.20	0.27	0.09
Korea	-0.01	0.16***	0.05*	0.13***	-0.07	-0.23	0.25*	0.05	0.16	0.71
Mexico	-0.01	0.54***	0.05	0.12**	0.09	0.16*	-0.07	0.40	0.03	0.03
Holland	0.00	0.52***	0.09**	0.08*	-0.02	0.05	0.04	0.32	0.67	0.33
Norway	-0.02*	0.35***	0.13***	0.07	-0.20**	0.22***	0.03	0.20	0.02	0.58
Philippines	-0.01**	0.45***	0.08*	0.17***	0.15*	-0.04	-0.07	0.35	0.28	0.53
Portugal	0.00	0.41***	0.33***	-0.10	-0.08	0.07	0.02	0.30	0.52	0.80
Sweden	-.03***	0.48***	0.13***	0.07*	0.26***	-0.01	0.06	0.38	0.02	0.00
Turkey	0.03***	0.52***	-0.01	0.09*	2.56	-1.4***	1.1**	0.44	0.04	0.84
Taiwan	0.00	0.52***	0.09***	0.15***	0.02	-0.06*	0.01	0.46	0.28	0.39
HongKong	-.02***	0.34***	0.11***	0.17***	-0.09	0.17*	-0.02	0.20	0.26	0.52
Ireland	0.00	0.51***	0.03	0.00	0.01	0.23	0.03	0.28	0.16	0.05
Israel	0.00	0.43***	-0.17**	0.06	-0.10	0.05	0.13	0.14	0.49	0.39
India	0.01***	0.68***	0.15***	0.03	-0.03	-0.04*	0.00	0.61	0.01	0.00
Malaysia	0.00	0.39***	0.17***	0.23***	-.10***	0.08**	-.08***	0.36	0.00	0.00
N. Zealand	0.02*	0.17***	0.09*	0.26***	0.06	0.04	-0.02	0.21	0.97	0.66
Pakistan	0.02***	0.55***	0.22***	-0.03	-0.01	-0.10	-0.06	0.47	0.15	0.04
Singapore	0.00	0.43***	0.09***	0.18***	-0.05	0.01	-0.03	0.28	0.36	0.10
Thailand	0.01**	0.52***	0.09***	0.01	0.09**	-0.03	-0.03	0.33	0.21	0.46
S. Africa	0.02***	0.32***	0.05	0.21***	0.09	-0.02	0.01	0.17	0.56	0.25

The regression is $E_t = \alpha_e + \sum_{i=1}^{i=3} \beta_{i,e} E_{t-i} + \sum_{j=1}^{j=3} \gamma_{j,e} C_{t-j} + \varepsilon_{e,t}$. *, **, and *** indicate two-tailed significance at 90%, 95% and 99% levels, respectively. Test 1 is about each coefficient of lagged capital investment estimates (The null is that all the coefficients are equal to zero). Test 2 is the F-test for the cumulative impact of capital investment on earnings (The null hypothesis is that the sum of the three lagged capital investment estimates is equal to zero). For both F-tests, p-values are reported.

Table 5. Earnings-Capital Investment causality

Panel A. Earnings to Capital Investment causality

	Int.	E_{t-1}	E_{t-2}	E_{t-3}	C_{t-1}	C_{t-2}	C_{t-3}	adjR^2	Test1	Test2
All Countries	0.01***	0.01***	0.00***	0.00***	0.48***	0.11***	0.11***	0.45	0.00	0.00
G7 Countries	0.01***	0.01***	0.00***	0.00	0.50***	0.11***	0.12***	0.51	0.00	0.00
non-G7 Countries	0.02***	0.04***	0.01***	0.00	0.41***	0.09***	0.09***	0.33	0.00	0.00
Civil Law Countries	0.01***	0.04***	0.01***	-.01***	0.43***	0.12***	0.11***	0.41	0.00	0.00
Com. Law Countries	0.01***	0.01***	0.00***	0.00	0.50***	0.10***	0.11***	0.47	0.00	0.00
G7 Civil	0.01***	0.04***	0.01	0.00	0.44***	0.15***	0.12***	0.48	0.00	0.00
G7 Common	0.01***	0.01***	0.00***	0.00	0.52***	0.10***	0.13***	0.51	0.00	0.00
non-G7 Civil	0.02***	0.04***	0.01**	-0.01**	0.42***	0.10***	0.11***	0.35	0.00	0.00
non-G7 Common	0.02***	0.03***	0.01***	0.00	0.40***	0.09***	0.07***	0.31	0.00	0.00

Panel B. Capital Investment to Earnings causality

	Int.	E_{t-1}	E_{t-2}	E_{t-3}	C_{t-1}	C_{t-2}	C_{t-3}	adjR^2	Test1	Test2
All Countries	-.01***	0.48***	0.15***	0.15***	-0.03	0.04**	0.00	0.41	0.09	0.35
G7 Countries	-.01***	0.48***	0.15***	0.15***	-0.03	0.05*	0.01	0.42	0.15	0.20
non-G7 Countries	0.00	0.38***	0.13***	0.14***	0.01	0.02*	-0.01	0.26	0.15	0.18
Civil Law Countries	0.00	0.40***	0.11***	0.11***	0.01	0.03**	-.03***	0.26	0.00	0.54
Com. Law Countries	-.02***	0.48***	0.15***	0.15***	-0.03	0.05*	0.02	0.42	0.08	0.15
G7 Civil	0.00	0.46***	0.06***	0.13***	0.00	0.07***	-.09***	0.27	0.00	0.09
G7 Common	-.02***	0.48***	0.15***	0.15***	-0.03	0.04	0.03	0.42	0.11	0.08
non-G7 Civil	0.00	0.38***	0.13***	0.11***	0.02	0.01	0.00	0.26	0.30	0.07
non-G7 Common	0.00	0.38***	0.12***	0.17***	-0.01	0.05**	-0.03*	0.27	0.16	0.88

In Panel A, three lagged earnings and lagged capital investment terms are used to explain capital investment for each pooled data group. *, **, and *** indicate two-tailed significance at 90%, 95% and 99% levels, respectively. Test 1 is about each coefficient of lagged earnings estimates (The null is that all the coefficients are equal to zero). Test 2 is the p-values of the F-test for the cumulative impact of earnings on capital investment (The null hypothesis is that the sum of the three lagged earnings estimates is equal to zero). Panel B uses three lags of earnings and capital investment to explain earnings for panel data. *, **, and *** indicate two-tailed significance at 90%, 95% and 99% levels, respectively. Test 1 is about each coefficient of lagged capital investment estimates (The null is that all the coefficients are equal to zero). Test 2 is for the cumulative impact of capital investment on earnings (The null hypothesis is that the sum of the three lagged capital investment estimates is equal to zero). P-values are reported for both tests in both panels.

Table 6. Earnings-Capital Investment with Year Dummies

Panel A. Earnings to Capital Investment causality

	Int.	E_{t-1}	E_{t-2}	E_{t-3}	C_{t-1}	C_{t-2}	C_{t-3}	adjR^2	Test1	Test2
All Countries	0.01***	0.01***	0.00***	0.00***	0.47***	0.11***	0.11***	0.45	0.00	0.00
G7 Countries	0.01***	0.01***	0.00***	0.00	0.50***	0.12***	0.13***	0.51	0.00	0.00
non-G7 Countries	0.02***	0.03***	0.01***	0.00	0.41***	0.09***	0.09***	0.34	0.00	0.00
Civil Law Countries	0.01***	0.04***	0.01**	-.01**	0.43***	0.12***	0.11***	0.41	0.00	0.00
Com. Law Countries	0.01***	0.01***	0.00***	0.00*	0.49***	0.10***	0.11***	0.47	0.00	0.00
G7 Civil	0.01***	0.03***	0.00	0.00	0.44***	0.16***	0.12***	0.49	0.00	0.00
G7 Common	0.01***	0.01***	0.00***	0.00	0.52***	0.10***	0.13***	0.52	0.00	0.00
non-G7 Civil	0.01***	0.04***	0.01**	-0.01**	0.41***	0.10***	0.11***	0.36	0.00	0.00
non-G7 Common	0.02***	0.03***	0.01***	0.00	0.39***	0.09***	0.07***	0.32	0.00	0.00

Panel B. Capital Investment to Earnings causality

	Int.	E_{t-1}	E_{t-2}	E_{t-3}	C_{t-1}	C_{t-2}	C_{t-3}	adjR^2	Test1	Test2
All Countries	0.00	0.47***	0.15***	0.15***	-0.03*	0.03*	0.01	0.42	0.12	0.54
G7 Countries	0.00	0.48***	0.15***	0.15***	-0.04	0.04	0.02	0.43	0.09	0.17
non-G7 Countries	0.01***	0.38***	0.13***	0.13***	0.01	0.02	-0.02	0.27	0.23	0.32
Civil Law Countries	0.01*	0.40***	0.12***	0.11***	0.01	0.02**	-.03***	0.27	0.01	0.96
Com. Law Countries	0.00	0.48***	0.15***	0.15***	-0.04	0.04	0.03	0.42	0.09	0.24
G7 Civil	0.00	0.45***	0.06***	0.12***	0.00	0.06***	-.08***	0.28	0.00	0.05
G7 Common	0.00	0.48***	0.15***	0.15***	-0.04	0.03	0.05*	0.43	0.05	0.06
non-G7 Civil	0.01**	0.37***	0.14***	0.11***	0.02	0.00	0.00	0.27	0.51	0.21
non-G7 Common	0.02**	0.38***	0.13***	0.17***	-0.01	0.05**	-0.03	0.28	0.15	0.47

In Panel A, three lagged earnings and three lagged capital investment terms used to explain capital investment for each pooled data group. *, **, and *** indicate two-tailed significance at 90%, 95% and 99% levels, respectively. Test 1 is about each coefficient of lagged earnings estimates (The null is that all the coefficients are equal to zero). Test 2 is the F-test for the cumulative impact of earnings on capital investment (The null hypothesis is that the sum of the three lagged earnings estimates is equal to zero). Panel B uses three lagged earnings and three lagged capital investment terms to explain earnings for panel data. *, **, and *** indicate two-tailed significance at 90%, 95% and 99% levels, respectively. Test 1 is about each lagged capital investment estimate (The null is that all the coefficients are equal to zero). Test 2 is for the cumulative impact of capital investment on earnings (The null hypothesis is that the sum of the three lagged capital investment estimates is equal to zero). P-values are reported for both tests in both panels.

Table 7. Cash Flow-Capital Investment causality

Panel A. G7 Countries: Cash Flow to Capital Investment causality

Country	Int.	CF_{t-1}	CF_{t-2}	CF_{t-3}	C_{t-1}	C_{t-2}	C_{t-3}	$adjR^2$	Test1	Test2
Germany	0.01***	0.06***	0.02*	0.01	0.38***	0.15***	0.05***	0.36	0.00	0.00
France	0.01***	0.04***	-.05***	0.02	0.40***	0.19***	0.16***	0.50	0.02	0.28
Italy	0.01***	0.04**	0.04*	-0.03	0.39***	0.10***	0.18***	0.48	0.00	0.00
Japan	0.00***	0.09***	0.03***	0.01*	0.47***	0.08***	0.13***	0.57	0.00	0.00
Australia	0.01***	0.05***	0.00	0.00	0.36***	0.24***	0.04**	0.39	0.00	0.00
Canada	0.01***	0.07***	-0.02	-0.01	0.55***	0.03	0.15***	0.50	0.00	0.00
UK	0.01***	0.04***	0.00	0.00	0.49***	0.11***	0.13***	0.53	0.00	0.00
US	0.01***	0.02***	0.00***	0.00	0.52***	0.09***	0.13***	0.52	0.00	0.00
G7	0.01***	0.02***	0.00***	0.00	0.50***	0.11***	0.12***	0.51	0.00	0.00
Civil	0.01***	0.06***	0.01	0.01**	0.42***	0.15***	0.11***	0.49	0.00	0.00
Common	0.01***	0.02***	0.00***	0.00	0.51***	0.10***	0.13***	0.52	0.00	0.00

Panel B. G7 Countries: Capital Investment to Cash Flow causality

Country	Int.	CF_{t-1}	CF_{t-2}	CF_{t-3}	C_{t-1}	C_{t-2}	C_{t-3}	$adjR^2$	Test1	Test2
Germany	0.01***	0.48***	0.05**	0.12***	0.02	0.10***	0.00	0.34	0.00	0.00
France	0.01***	0.63***	0.03	0.08***	0.02	0.03	-0.01	0.52	0.12	0.02
Italy	0.01***	0.50***	0.14***	0.18***	0.02	-0.04	0.07*	0.54	0.21	0.13
Japan	0.01***	0.34***	0.19***	0.18***	0.07***	0.04***	0.06***	0.45	0.00	0.00
Australia	0.01**	0.47***	0.08***	0.12***	0.09*	-0.01	0.14***	0.37	0.00	0.00
Canada	0.00	0.56***	0.14***	0.16***	0.01	0.08	0.01	0.57	0.04	0.01
UK	0.01***	0.53***	0.11***	0.10***	0.02	0.10***	0.01	0.51	0.00	0.00
US	0.00***	0.52***	0.18***	0.10***	-0.05**	0.15***	0.04*	0.49	0.00	0.00
G7	0.00	0.52***	0.17***	0.10***	-0.02*	0.11***	0.03**	0.49	0.00	0.00
Civil	0.01***	0.48***	0.09***	0.13***	0.03**	0.06***	0.01***	0.41	0.00	0.00
Common	0.00	0.53***	0.17***	0.10***	-0.03*	0.12***	0.04**	0.50	0.00	0.00

Panel C. Non-G7 Countries: Cash Flow to Capital Investment causality

Country	Int.	CF_{t-1}	CF_{t-2}	CF_{t-3}	C_{t-1}	C_{t-2}	C_{t-3}	$adjR^2$	Test1	Test2
Non-G7	0.01***	0.07***	0.02***	0.00	0.40***	0.08***	0.08***	0.34	0.00	0.00
Civil	0.01***	0.07***	0.02***	-0.01	0.40***	0.09***	0.10***	0.36	0.00	0.00
Common	0.01***	0.07***	0.02***	0.02***	0.39***	0.08***	0.06***	0.32	0.00	0.00

Panel D. Non-G7 Countries: Capital Investment to Cash Flow Causality

Country	Int.	CF_{t-1}	CF_{t-2}	CF_{t-3}	C_{t-1}	C_{t-2}	C_{t-3}	$adjR^2$	Test1	Test2
Non-G7	0.01***	0.54***	0.09***	0.10***	0.02***	0.03***	0.03***	0.48	0.00	0.00
Civil	0.01***	0.52***	0.10***	0.10***	0.04***	0.02*	0.03***	0.46	0.00	0.00
Common	0.01***	0.57***	0.08***	0.11***	0.00	0.04***	0.02**	0.50	0.00	0.00

CF_t is cash flow, C_t is capital investment. *, **, and *** indicate two-tailed significance at 90%, 95% and 99% levels, respectively. In Panel A and in Panel C, Test 1 represents p-values of all three estimates of lagged cash flow coefficients jointly being zero. Test 2 reports the p-values of the sum of the estimates of the three lagged cash flow coefficients being equal to zero. In Panel B and in Panel D, Test 1 represents p-values of all three estimates of lagged capital investment coefficients jointly being zero. Test 2 reports the p-values of the sum of the estimates of the three lagged capital investment coefficients being equal to zero.

Table 8. Financial Development and Earnings-Capital Investment causality

Panel A. Earnings causality on Capital Investment

	Int.	E_{t-1}	E_{t-2}	E_{t-3}	C_{t-1}	C_{t-2}	C_{t-3}	Test1A	Test2A
Love Not FD	0.02***	0.06***	0.03***	-0.02***	0.42***	0.08***	0.08***	0.00	0.00
Love FD	0.01***	0.01***	0.00***	0.00	0.50***	0.11***	0.11***	0.00	0.00
Love Not FD w/Year	0.02***	0.05***	0.02***	-0.02***	0.41***	0.08***	0.08***	0.00	0.00
Love FD w/Year	0.01***	0.01***	0.00***	0.00*	0.49***	0.11***	0.11***	0.00	0.00
KMP Not FD	0.02***	0.04***	0.02***	-0.01*	0.42***	0.11***	0.08***	0.00	0.00
KMP FD	0.01***	0.01***	0.00***	0.00	0.50***	0.11***	0.12***	0.00	0.00
KMP Not FD w/Year	0.03***	0.04***	0.02***	-0.01	0.41***	0.12***	0.07***	0.00	0.00
KMP FD w/Year	0.01***	0.01***	0.00***	0.00	0.50***	0.11***	0.12***	0.00	0.00

Panel B. Capital Investment causality on Earnings

	Int.	E_{t-1}	E_{t-2}	E_{t-3}	C_{t-1}	C_{t-2}	C_{t-3}	Test1B	Test2B
Love Not FD	.01***	0.40***	0.22***	0.08***	-0.01	0.00	-0.03	0.12	0.02
Love FD	-.01***	0.48***	0.15***	0.15***	-0.03	0.03	0.01	0.30	0.38
Love Not FD w/Year	.02**	0.40***	0.22***	0.08***	-0.01	0.00	-0.03	0.32	0.11
Love FD w/Year	.00	0.48***	0.15***	0.15***	-0.03	0.02	0.02	0.30	0.62
KMP Not FD	.00	0.35***	0.18***	0.10***	-0.07**	0.07**	-0.04	0.03	0.27
KMP FD	-.01***	0.49***	0.15***	0.15***	-0.03	0.04	0.01	0.32	0.36
KMP Not FD w/Year	.02**	0.35***	0.18***	0.10***	-0.06*	0.06**	-0.03	0.08	0.27
KMP FD w/Year	.00	0.48***	0.15***	0.14***	-0.04	0.03	0.02	0.26	0.48

Panel A presents the results of the effect of earnings on capital investment for financially developed and non-developed countries. First, Love (2003) financial development classification results are presented. KMP (2006) classification results follow. *, **, and *** indicate two-tailed significance at 90%, 95% and 99% levels, respectively. Test 1A is about whether earnings coefficients are jointly zero. Test 2A is about whether the sum of earnings coefficients is zero. Panel B presents the results of capital investment on earnings. Test 1B is for capital investment coefficients are jointly zero. Test 2B is about whether cumulative effect of capital investment on earnings is zero. P-values are reported for all tests.