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Essays on Capital Markets

by

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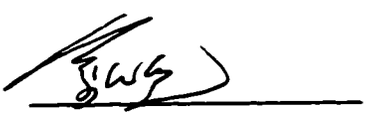

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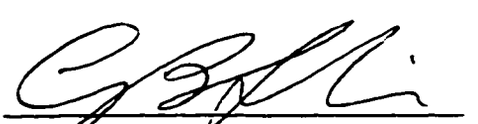

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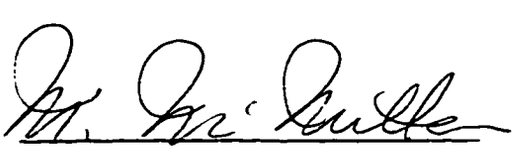

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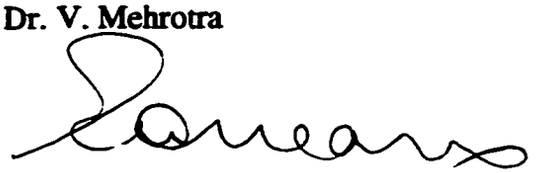

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Date August 12, 1997

Dedication

To my wife, Lynn, and my children, Geoffrey and Olivia

Abstract

The first essay of the thesis is an empirical investigation of international stock markets in forty countries to gauge their abilities in processing information about market-wide and firm-specific events. The proposed information content measures for national stock markets are based on the ratio of firm-specific risk to market risk. Therefore, the information content measures should be higher when stock pricing is more based on firm specific information than on market-wide information. We find consistent evidence that stock markets in industrialized economies have higher information content measures than do markets in emerging economies. More specifically, we find that stock markets are more efficient in allocating capital resources in countries that better protect shareholdersə rights, accord greater weight to rule of law, have more efficient judicial systems, and less corrupt government.

The second essay examines the systematic variation of stock price reactions to announcements of changes in corporate capital budget. We find that, on average, stock prices neither rise nor fall when firms announce either increases or decreases in their capital budgets. However, we find that stock price reactions for both types of announcements are positively correlated with average q ratios and management ownership. Cash flow appears uncorrelated with stock price reactions. We therefore argue that the market conditions its response on managementəs track record (as measured by average q ratios) and the degree of alignment of interest between insiders and

shareholders.

The final essay investigates the effect of changes in management ownership on stock price reactions to seasoned equity offerings. Consistent with earlier studies, we find that, on average, stock prices fall when firms announce seasoned equity offerings. This is usually interpreted as evidence of signaling: managers tend to issue new shares when they believe current stock price is over-valued; and investors will consequently view a seasoned equity offering as a signal that a firmσ stock price should be lower. We find, however, that equity offerings typically result in much lower management ownership. Therefore, the share price declines can also be explained by an agency argument. We conduct several tests to distinguish signaling explanations from agency explanations, and conclude that both effects are present in our sample.

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Chapter 1

Introduction

This document presents three essays on capital markets. The first essay examines international stock markets in forty countries to gauge their abilities in processing information about market-wide and firm-specific events. The second essay is a study of market reactions to corporate investment announcements and provides evidence on the factors the market values in analyzing the decisions made by managers. The final essay is a study of the effect of changes in management ownership on market reactions to seasoned equity offerings. Brief overviews of each chapter are given below.

The second chapter, *The Information Content of Stock Markets*, is motivated by the observation that stock prices in emerging markets tend to move up or down together, whereas stock prices in developed markets tend to move relatively independently of each other. When stock pricing is more based on market-wide information than on firm-specific information, stock prices should be more correlated with the market. We therefore propose *information content measures* for national stock markets based on the ratio of firm-specific risk to market risk in a typical stock. We find that the proposed information content measures are higher in countries that better protect shareholders' rights against corporate insiders, accord greater weight to rule of law, have more efficient judicial systems, and less corrupt government. This finding therefore sheds light on the

important factors that are critical to stock market efficiency in allocating capital resources.

The third chapter, *A Study of Cross Sectional Variation in the Stock Market's Reaction to Corporate Investment Decisions,* is an investigation into the systematic variation of stock price reactions to corporate capital budget announcements. This chapter is motivated by the lack of existing empirical work on corporate investment and the factors that the market considers in evaluating investment decisions. Within this chapter we use an event study methodology to measure the market's reaction to capital investment announcements. These reactions are then regressed upon measures of agency problems and measures of intangible assets. We find that, on average, the market's reaction to both capital budget increases and decreases is statistically insignificant. We also find that there is support for the idea that agency problems affect the market's valuation of investment decisions. Furthermore, there is support for the hypothesis of managerial entrenchment. We also find support for the notion that investment decisions made by managers with strong reputations are more highly valued than those made by other managers. We find no support for the notions that the stock market is myopic or that managers behave myopically. There is also no support for the idea that firms with high levels of cash flow invest inefficiently.

The fourth chapter, *Changes in Management Ownership and the Valuation Effects of Equity Offerings,* is a study of the effect of changes in management ownership on market reactions to seasoned equity offerings. Seasoned equity offerings typically trigger share price declines, and this is usually interpreted as evidence of signaling. That

is, managers tend to issue new shares when current stock price is over-valued; and investors understand this and will consequently interpret an equity offering as signal that a firm's stock price should be lower. We find that equity offerings typically result in much lower management ownership. Therefore, the share price declines can also be explained by an agency argument. Jensen and Meckling (1976) predict a share price decline when management ownership falls. In this chapter we conduct several tests to distinguish agency explanations from signaling explanations, and conclude that both effects are present.

Chapter 2

The Information Content of Stock Markets[1]

1. Introduction

Hayek (1945) sets forth a fundamental principle of modern economics; the fundamental role of markets is to process information. The effectiveness of capital markets in this role may be particularly important, as a) capital prices direct an economy's capital flows, and hence determine the directions of its long-term growth and b) capital prices provide managers with feedback about how investors evaluate their performance.

Our empirical analysis, based on cross-sectional international stock market data, has two components: First, we propose *information content measures* for national stock markets based on the ratio of firm-specific risk to market risk in a typical stock. This proposal is motivated by the observation that stock prices in emerging markets tend to move up or down "as one", whereas stock prices in developed economies tend to move relatively independently of each other. We find that our information content indices to be low in countries known to have poorly behaved stock markets (e.g. China, Taiwan, Mexico, India, Turkey, and Japan). Information content is positively correlated with *per capita* GDP. Also, the index for the US shows a time trend consistent with the argument that its stock markets have become more

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[1]Co-authored with Randall Morck of the University of Alberta and Bernard Yeung of the University of Michigan.

informative over time.

Second, following La Porta *et al.* (1997), we relate such stock market information content measures for different countries to indices reflecting their legal and economic institutional structures. La Porta *et al.* carefully develop such indices and highlight their relationships to the functioning of stock markets. Using multiple regression analysis, we find our information content measures to be closely related to indicators of sophisticated and trustworthy institutions. In particular, information content is higher in markets where shareholders rights against directors are stronger, rule of law is more respected, the legal system more efficient, and government corruption is rarer. Sophisticated accounting standards *per se* are uncorrelated with information content, but appear to augment the correlations of rule of law, legal efficiency and good government indices with information content.

In the next section, we review the stylized facts that motivated this research. In section three, we develop our information content measures. In section four, we present regression results consistent with that stock markets with better legal and institutional environment have higher information content. Section five concludes.

2. Some Stylized Facts

2.1 Why Do Emerging Markets Have So Little Firm-Specific Risk?

Table 2-1 compares the solidarity of stock returns across some representative stock markets during the first 26 weeks of 1995. Note that in emerging markets like China, Malaysia, Poland, and Taiwan, most stock prices routinely move in the same direction during a given week. In these markets, it is not atypical for well above 80% of all the stocks move in the same direction in a given week. In Poland, 100% of traded stocks move in the same direction during three of the twenty six weeks. In contrast, in the United States, there are no instances of more than 57% of the stocks moving in the same direction during any one week in this period despite an ongoing "bull market".

Figure 2-1 graphs weekly data for the whole of 1995. Again, in the US, a typical week has roughly 50% of stocks moving up and 50% moving down. In contrast, the emerging markets are all characterized by most or all stocks moving either up or down "as one".

Of course, the United States has many more stocks in its markets than do the emerging economies, and the Law of Large Numbers dictates that the aggregate behavior in the US market should be less subject to random fluctuations. However, the contrast between the US market and emerging markets is too stark to be a statistical artifact. Using the data in Figure 2-1, 57% of US stocks move together in an average week vs. 79% for China, 77% for Taiwan, 81% for Poland and 77% for Malaysia. These differences are all over 20%! In 1995, the fraction of stocks moving together in the US is less than that in China in 49 out of 52 weeks. The same is true for Malaysia in 49 out of 52 weeks, for Taiwan in 44, and for

Poland in 50 out of 52 weeks. The null hypothesis that the fraction of stocks moving together in the US is the same as in the merging markets can be rejected in 44 out of 52 weeks for China, 37 for Taiwan, 36 for Poland and 45 for Malaysia.[2]

These observations lead us to wonder whether stocks in emerging markets tend to move "as one" because firm specific information in those economies is scarce and/or unreliable relative to macro-economic information.

2.2 The United States as an Emerging Economy?

Figure 2-2 plots the fraction of stock in the United States market that move together against time. The implication of our hypothesis is that, as the US stock market became more informed, co-movement should decrease over time. This is clearly observed.

The number of stocks traded in the US has increased over time, so the relative importance of a typical stock in any broad market index has declined. This could create a bias. Figure 2-2 addresses this problem by graphing the fraction of 400 randomly selected stocks that move together each year. The same decline remains apparent. The decline in

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[2] We calculate $f_{jt} = \dfrac{\max[n_{jt}^{up}, n_{jt}^{down}]}{n_{jt}^{up} + n_{jt}^{down}}$ where n_{jt}^{up} is the number of stocks in country j whose prices rise in week t and n_{jt}^{down} is the number of stocks whose prices fall. For each country j we calculate $(f_{US} - f_j)$. The variance of the estimate is approximately $\dfrac{f_{US}(1 - f_{US})}{n_{US}} + \dfrac{f_j(1 - f_j)}{n_j}$, assuming that f_{US} and f_j are uncorrelated. By the Central Limit Theorem, the statistic $(f_{US} - f_j)\left[\dfrac{f_{US}(1 - f_{US})}{n_{US}} + \dfrac{f_j(1 - f_j)}{n_j}\right]^{-1/2}$ is approximately normal for sample sizes n_{US} and n_j sufficiently large.

co-movement in US stock prices does not seem to be an empirical artifact caused by the increase in the number of traded stocks.

As a robustness check, we develop an alternative measurer of the extent of co-movement of stock prices using a linear regression of the form

$$r_{i,t} = \alpha_i + \beta_t r_{m,t} + \epsilon_{i,t} \qquad (1)$$

where $r_{i,t}$ is stock i's return in week t and $r_{m,t}$ is a market index. A high R^2 in such a regression indicates a high degree of stock price co-movement. Figure 2-3 graphs the average R^2 across stocks based on monthly returns for each non-overlapping 5-year period from 1926 to 1995 using all available stocks, and then the average R^2 constructed using the largest 300 stocks ranked at the beginning of each 5-year period and an equally-weighted market index based on those stocks only. A decline in both R^2s is apparent.

We suggested that a high degree of stock price co-movement in emerging markets might be due to a dearth of firm specific information. It is plausible that the decline in the degree of co-movement of US stocks over time might similarly be due to more firm-specific information moving stock prices there. However, an alternative interpretation might be that the US market has grown worse through time at incorporating macroeconomic information into stock prices. Figure 2-4 addresses this issue by displaying the average unexplained variation (SSE) and the explained variation (SSR) (explained by market return) in stock returns from 1926 to 1995. Each bar represents a 3 year average. It is apparent from Figure 2-4 that declines in R^2s in the post-war period are due to markets incorporating more firm-

specific information, not less macroeconomic information.

3. Stock Market Information Content

3.1 Background Thoughts

According to finance theory (Grossman, 1976), public investors who accumulate information can gain by trading against less informed investors. This trading moves prices, and consequently informed traders' information is capitalized into stock prices.

In theory, investors should value stocks using both macroeconomic and firm-specific information. Macroeconomic information (e.g. inflation forecasts, new international trade rules, new tax rules, etc.) affects many firms' prices simultaneously[3]. In contrast, firm-specific information (e.g. signs of better management, an impending lawsuit, a competitor's innovation, etc.) affect the stock price of only one, or at most a few, firms.

When investors obtain new information, they project its impact on a firm's expected future cash flows and their present values. This rapid capitalization of information, especially firm-specific information, is the basis of the widely used *event study methodology* in the empirical financial economics literature (MacKinlay, 1997).

The idea behind event studies is that a stock's return can be decomposed into two orthogonal components: one, $P[r_{it} \mid r_{mt}]$, a projection of r_{it} on the market return and the other,

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[3] The impact of macroeconomic information on firm prices varies according to industry and firm specific characteristics, however. For instances, the opening up of trade conceivably increases the stock prices of firms in exporting sector and does the opposite to firms in import substitute sectors. The more investors know about firm specific characteristics, the more the impact varies across firms.

ε_{it}, independent of it.

$$r_{it} = \mathrm{P}[r_{it} \mid r_{mt}] + \varepsilon_{it} \tag{2}$$

Thus, investors' projections of a firm's returns due to firm-specific factors is ε_{it}. Reliable firm-specific knowledge lets investors precisely infer the impact of a piece of news on a firm's value and on how the impact varies across different firms.

The extent to which firm-specific information determines stock price movements can be measured by comparing the variances of the two components of r_{it}. If the variance of $\mathrm{P}[r_{it} \mid r_{mt}]$, denoted σ_m^2, is large relative to the variance of ε_{it}, denoted σ_ϵ^2, this means the stock price is primarily moving due to market-wide information.

This variance decomposition is itself important information for investors. Consider a public investor inferring the firm specific component, ε_{it}, from r_{it}. A simple signal extraction calculation shows that the projection $\mathrm{P}[\varepsilon_{it} \mid r_{it}]$ is

$$\mathrm{P}[\varepsilon_{it} \mid r_{it}] = \left(\frac{\sigma_\epsilon^2}{\sigma_m^2 + \sigma_\epsilon^2} \right) r_{it} \tag{3}$$

Hence, the greater is $\frac{\sigma_\epsilon^2}{\sigma_m^2 + \sigma_\epsilon^2}$, the more r_{it} reflects firm-specific information. In general, we propose that the lower the proportion of variations in stock returns accounted for by variations in market returns, the more information content there is in a stock market.

The incorporation of information into stock prices depends on the ability of outside

investors first to acquire it and second to benefit from it. The latter depends on the extent to which investors' property rights are protected. LaPorta *et al.* (1997a) show that widespread corruption compromises public investors' property rights. This suggests that a country's legal and institutional environment might affect its stock prices' information content.

Investors accumulate information until the marginal cost of an additional unit exceeds its marginal return (Grossman, 1976). In an economy where investors' property rights are poorly protected, the marginal return from information is depressed. Knowing that a firm has profitable economic opportunities may be of scant benefit to public shareholders if insiders, bureaucrats, and politicians routinely skim off any positive net present value, either from the firm itself or from the investor directly. Poor accounting standards, an inefficient legal system that tolerates fraud and other adverse institutional flaws potentially raise the cost of gathering valid information. Thus, the findings of LaPorta *et al.* (1997a, b) imply that a country's institutional, legal, and regulatory environment might also affect the type of information that finds its way into stock prices.

The stylized facts in the previous section raise the possibility that, in many economies, especially emerging markets, it may be unprofitable to expend significant resources gathering and analyzing detailed firm-specific information. Consequently, firm-specific stock price movements might be relatively rare in these markets compared to stock markets in advanced economies. Following this reasoning, we develop measures of the relative importance of firm-specific vs. market-wide stock price movements for different economies. We then correlate these with measures of the sophistication of an economy's institutions from LaPorta *et al.* (1997) that reflect the protection of investors' rights, the

integrity of the legal system and government, and information disclosure standards.

3.2 Distinguishing Firm-Specific from Market Risk

The most direct measure of the extent to which the stocks in a given country move in tandem is to formalize the discussion surrounding Table 2-1. We therefore construct a possible information content measure for country j denoted f_j based on the fraction of stocks in each market that have returns of the same sign as the local market in a given week. Define

$$f_{jt} = \frac{\max[n_{jt}^{up}, n_{jt}^{down}]}{n_{jt}^{up} + n_{jt}^{down}} \tag{4}$$

where n_{jt}^{up} is the number of stocks in country j whose prices rise in week t and n_{jt}^{down} is the number of stocks whose prices fall. We then call f_j the average value of f_{jt} across all relevant weeks. The values of f_j must lie between 0.5 and 1, and are listed in the first panel of Table 2-2 in ascending order. For reference, logarithms of *per capital* GDP in constant US dollar from 1992 to 1994 are also shown.[4] Note that OECD countries tend to have low f_js while emerging markets have high f_js. Figure 2-5a illustrates these rankings with their respective countries labeled. Figure 2-6a graphs, each country's f_j versus the average logarithm of its *per capita* GDP, illustrating a clear negative correlation. The correlation is -0.509 with a prob-value of 0.001.

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[4] By averaging over several years, we reduce the transitory noise. Our GDP per capita variable is averaged over 1992 to 1994 instead of 1993 to 1995 because we do not have a complete set of 1995 GDP data.

A more statistically sophisticated way to distinguish firm-specific stock price movements from market-wide price movements is to run the following regression:

$$r_{ijt}^{T} = \alpha_{i}^{T} + \beta_{1,i}^{T} r_{m,jt}^{T} + \beta_{2,i}^{T}[r_{US,t}^{T} + e_{jt}^{T}] \qquad (5)$$

where i is a firm index, j a country index, and t a week index. T is a year superscript, $r_{m,jt}$ is a domestic market index, and $r_{US,t}$ is the US market return. The change in the exchange rate per US dollar is e_{jt}.

We incorporate US stock market returns because many investors are diversified across countries. The expression $r_{US,t}^{T} + e_{jt}^{T}$ translates US stock market returns into local currency units. For stock markets in the Eastern hemisphere, we lag US market returns by one day to account for time zone differences.. Thus, if the weekly stock return in Japan used data from May 7 1994 to May 14 1994, the contemporaneous US market return uses data from May 6 1994 to May 13 1994. When we look at the US, we set $\beta_{2,i}^{T}$ to zero. We use weekly data to overcome thin markets problems.[5]

We use daily *cum dividend* stock returns for all companies listed in Datastream as of January 1997. This gives us a cross section of 15,920 firms in 40 countries. Datastream returns are unavailable until the 1990s for most countries, so we focus on 1993 through 1995,

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[5] We include only stocks which are actively traded at least 30 out of 52 weeks. We need to have sufficient observations to reliably assess the market returns' explanatory power on each stock. Thus, we are losing information on newly traded stocks which have been traded for roughly less than five months in a year and stocks which are about to be delisted. When trading of a stock is suspended, the returns data during the suspension period are coded as missing and excluded from our regressions.

and use only 1995 data in our international cross-sectional analysis.

Datastream claims that its stock returns are adjusted for splits and other unusual events, but our data do contain some very large stock returns. If these reflect coding errors, they may induce a bias in our data: extreme outlying stock returns may decrease the R^2 estimates more in thin markets. On the assumption that coding errors are over-represented in extreme observations, we trim our data by dropping weekly observations where a stock's return exceeds 25% in absolute value.[6]

The R^2 of regression (5), R_{ij}^{2T}, measures the percent of the variation in the weekly returns of stock i in country j in year T explained by variations in country j's market returns and the US stock market's returns.

Given this, we define

$$R_j^{2T} = \frac{\sum_i R_{ij}^{2T} \times SST_{ij}^{T}}{\sum_i SST_{ij}^{T}} \tag{6}$$

where SST_{ij} is the sum of squared total variations. R_j^{2T} is the fraction of the variation in the stock returns in country j in year T explained by the local and US market returns, and 1- R_j^{2T} is an estimate of $\sigma_\epsilon^2/(\sigma_m^2 + \sigma_\epsilon^2)$ in equation (3). We then calculate an average of these estimates over the period from 1993 to 1995,

$$R_j^2 = \frac{1}{T}\sum_T R_j^{2T} \tag{7}$$

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[6] A 25% return in weekly data translates to 1300% annualized return.

The second panel of Table 2-2 ranks countries by their R_j^2 estimates and again reports the average of the logarithm of each country's *per capita* GDP. Figure 2-5b graphs this ranking by R^2s. Figure 2-6a graphs each country's R^2 versus the average logarithm of its *per capita* GDP, again making a clear negative correlation evident.

3.3 Idiosyncratic Price Movements and Economic Development

These tables and figures point to a relationship between economic development and a heightened importance of idiosyncratic price movements relative to market-wide risk.

First, Table 2-2 and Figure 2-5b show that R^2 estimates tend to be lowest for advanced market economies. The five lowest R^2s are for the US, Canada, Australia, France, and the United Kingdom. OECD countries' R^2s tend to be below the median. The only advance countries with notably high R^2s are Italy, which Zingales (1994) shows to have an extraordinarily poorly functioning stock market, and Japan, whose stock market is regarded by many practitioners as notoriously bubble-prone.

Second, stock markets in emerging economies, and less advanced economies generally, have much higher R^2s. The five highest are for Poland, China, Malaysia, Taiwan and Turkey. The empirical pictures emerged in Figures 5a and 5b are very similar.

Third, Figure 2-6b, like Figure 2-6a, shows a clear negative correlation between R^2s and *ln*(*per capita* GDP). The correlation is -0.415, and its p-value is 0.01.

4. Information Content and Institutional Structure

In this section, we relate our proposed information content measures to indexes of the

sophistication and effectiveness of countries' legal and economic institutions. Our premises are:

PREMISE A: The relative importance of firm-specific price movements to market-wide price movements measures the information content of a stock market.

PREMISE B: Legal and economic institutions that (i) protect shareholders from corporate insiders, (ii) promote an efficient and honest legal system, (iii) discourage government corruption, and (iv) force truthful disclosure to investors together encourage the capitalization of firm-specific information into stock prices.

IMPLICATION C: $(A \wedge B \Longrightarrow C)$ A clear relationship should exist between our information content measures and indexes that capture the legal and economic institutional structure of an economy. Specifically, shareholder rights, an honest legal system, clean government, and good accounting standards should correlate positively with high information content in stock markets.

4.1 Methodology

Since the fraction of stocks in a given country's stock market that move together is always between 0.5 and 1, f_j is not suitable as a dependent variable in regression analysis. We therefore define a first measure of the *information content* of country j's stock markets, denoted Ψ_j, by

$$\Psi_j = \log\left(\frac{2 - 2f_j}{2f_j - 1}\right) \tag{8}$$

which ranges from plus infinity when there is no market-wide price movement at all (i.e. $f_j = 0.5$), to minus infinity when all stock prices move in tandem (i.e. $f_j = 1$).

Since R^2s are similarly bounded by zero and one, we also need to transform them to obtain a measure that is suitable for linear regression analysis. We therefore propose a second *information content* measure across countries, Υ_j, as

$$\Upsilon_j = \log\left(\frac{1 - R_j^2}{R_j^2}\right) \tag{9}$$

The monotonic transformation Υ_j maps a zero R_j^2 to positive infinity and an R_j^2 of one to negative infinity.

According to our hypothesis, Ψ_j and Υ_j should both be positively correlated with measures of the sophistication of a country's institutional structure. To test this, we regress these potential information content measures on a set of such measures constructed in La Porta *et al.* (1997a) and listed below.

First, investors must be protected from rapacious insiders. If outside investors' property rights to corporate cash flows are poorly protected, its fortunes may have little to do with their dividend stream and their return from gathering information about the firm may be small. Our *Anti-director Rights Index* is the score card of shareholders' rights against directors in various countries compiled by La Porta *et al.* (1997a). It takes values from zero

to five according to whether or not shareholders (i) can vote by mail, (ii) are barred from selling stock for a few days prior to meetings, (iii) can use cumulative voting for directors, (iv) have legal standing to sue directors or to force the company to buy back their shares, (v) call extraordinary shareholder meetings relatively easily.

Second, to be sure their property rights in their investments are protected, shareholders must have access to a functional legal system. We use two alternate variables, again taken from La Porta *et al.* (1997a) to capture this. *Rule of Law*, a mark ranging from zero to six, is based on International Credit Rating's assessment of country risk averaged from 1982 to 1995, with higher marks indicating a more firmly embedded tradition of law and order. *Judicial Efficiency* is a score from zero to ten, with high scores indicating an efficient judicial system. It is based on Business International Corporation's assessment of country risk from 1980 to 1993.

Good Government is the sum of three indexes from La Porta *et al.* (1997a), each ranging from zero to ten, and measuring (i) government corruption, (ii) the risk of expropriation by the government, and (iii) the risk of the government repudiating contracts. Higher values of this composite index indicate "good government". All three indices are based on International Credit Rating's assessments between 1982 and 1995.

Accounting Standards ranges from 36 to 83, with lower scores for indicating less useful or trustworthy disclosure and reporting standards. This index was created by La Porta *et al.* (1997a) based on 1990 data from International Accounting and Auditing Trends, Center for International Financial Analysis and Research Inc.

Our independent variables are based on information prior to 1995. To avoid having

common contemporaneous noise in both the left and right hand side variables, we use only 1995 data to construct our dependent variables, Ψ_j and Υ_j.

The legal and institutional environment data are available for all our countries except Poland, Czech, and China. Accounting standards data are unavailable for Indonesia, Ireland, and Pakistan. When we re-do our analyses without the Accounting Standards variable (so as to include Indonesia, Ireland, and Pakistan in the sample), our basic results are not changed.

4.2 Univariate and Bivariate Statistics

Table 2-3 reports simple correlation between our proposed information content indices, Ψ_j and Υ_j and these institutional structure variables. The correlations are positive and significant, consistent with our hypothesis. Under our hypothesis, these correlations are consistent with better protection of shareholder rights, respect for law and order, an efficient judiciary, and good government fostering well informed stock markets. Note, however, that the *accounting standards* variable is not significantly correlated with either information content measure.

4.3 Multivariate Regression Analysis

La Porta *et al.* (1997a) find their institutional structure variables to be significantly correlated with *per capita* GDP. Since log (*per capita* GDP) is, in turn, correlated with our proposed information content measures, we need a multiple regression framework to test for the marginal importance of the institutional structure measures in explaining them.

We run regressions of the form

$$[^{information}_{content}] = b_0 + b_1[^{antidirector}_{rights}] + b_2[^{rule}_{of\ law}] + b_3[^{good}_{government}] + b_4[^{accounting}_{standards}] + b_5 \ln[^{per\ capita}_{GDP}] \qquad (10)$$

with the variables as defined above and with information content measured by either Ψ_j or Υ_j. In alternate regressions, we also substitute *judicial efficiency* for *rule of law* since these two measures are highly correlated ($\rho = 0.727$, p-value = 0.0001) and would create multicollinearity problems in the same regression. Although this eliminates our worst collinearity bias, the other institutional variables also generate some multicollinearity. Only the *anti-director rights* index is statistically uncorrelated with the other right-hand side variables. Spanos (1986) suggests overcoming such problems by using raw collinear independent variables to build orthogonal regressors. Thus, Table 2-4 contains regressions with each independent variable, x_k, except *anti-director rights*, replaced by $x_k - P[x_k \mid x_n, n \neq k]$, where P indicates projection. We use both information content indexes. Ψ_j and Υ_j first constructed using all available firms in each country, and then using equal, randomly selected subsamples of firms for each country.

Table 2-4 shows results based on all available firms in each country. The left panel shows regressions with Ψ_j as the dependent variable. The right panel uses Υ_j. The first two columns of each panel show that all the institutional structure measures except accounting standards are highly statistically significant in explaining the proposed information content measures over and above any effect *via* GDP. The key institutional variables, *anti-director* rights, *rule of law*, *judicial efficiency*, and *good government* are consistently significantly

positive at better than the 5% level.

The surprise is that *accounting standards* appears unrelated to our proposed information content efficiency measure. While the coefficient of *accounting standards* is positive, it is very insignificant. Mandated accounting standards do not appear to affect stock markets' information content once corporate laws to protect shareholders' rights, other aspects of the legal environment, government characteristics, and income level are controlled for. Perhaps, "good" accounting standards have no real teeth unless there is integrity in the government and the legal system. In other words, while *accounting standards* itself may not increase information content, cross terms of *accounting standards* with *rule of law* or *judicial efficiency* and *good government* might.

To investigate this possibility, we consider regressions of the form of (10), but with varying coefficients. Thus, we model one or the other of the following specifications:

$$\tilde{b}_4 = \gamma_0 + \gamma_2[{}^{rule}_{of\ law}] + \gamma_3[{}^{good}_{government}] \qquad (11)$$

$$\hat{b}_4 = \delta_0 + \delta_2[{}^{judicial}_{efficiency}] + \delta_3[{}^{good}_{government}] \qquad (12)$$

The results of regressions of the form of (10) with parameter substitutions (11) or (12) are shown in the second two columns of each panel in Table 2-4. Good accounting standards alone again appear unimportant, however, they do appear to matter in strengthening the importance of good government and a sound legal system. In the last two columns of the left panel, using information measure Ψ_j, the cross term with rule of law shows that γ_2 has a t-

ratio of 3.53. The cross term with δ_2 is less significant, but still has a high t-ratio of 2.42. The estimates of γ_3 and δ_3 are both significant at conventional levels, with t-ratios of 2.95 and 2.90 respectively. In the other panel, which uses the alternate information measure, all the cross terms remain highly statistically significant.

One criticism of the dependent variables in Table 2-4 is that they may be correlated with the number of securities in a country's stock market by construction. If the sign of stock return is random, the law of large number would make the f_j in Ψ_j closer to 0.5 and thus make Ψ_j larger. Also, countries with more stocks would have lower R_j^2 and thus greater Υ_j. This is because the market index on the right hand side of (5) is a weighted average of the individual stock returns used as dependent variables. In a market with few securities, each individual security is a more important part of the market index. This implies that, even if all securities' price movements were independent, regression (5) should have a higher R^2 in countries with fewer listed stocks. In fact, the simple correlation coefficient of the logarithm of the number of listed stocks in a country's market with its Ψ information content measure is 0.381 (p-value = 0.02) and that with its Υ information measure is 0.307 (p-value = 0.06). These correlations may partly reflect the intuition that better functioning stock markets should have more listings, but may also be partly due to the arithmetic linkage discussed above[7]. To insure that this artifact is not driving our results, Table 2-5 repeats the regressions in Table 2-4, but includes the *logarithm of the number of listed stocks* in each

[7] Still, we note that some countries with a large number of stocks, e.g., Japan, do not have low R^2 and f while some countries with a small number of stocks, e.g., New Zealand, do.

country's stock market as an additional control variable. This increases the R-squares of the country level regressions, but the general pattern of point estimates and significance levels for other variables (except the constant) changes little. It is thus unlikely that our results are an artifact of market size.

Another way to overcome the influence of number of stocks is to constrain the number of stocks we use to construct our information indices. The median number of stocks in the stock markets in our sample is 300. For countries with less than 300 stocks, we use all stocks to construct the information content measures. For countries with more than 300, we randomly select 300 stocks. We then run the regressions as in Table 2-4. We repeat the procedure twenty times. Table 2-6 reports the average of the twenty sets of results. They are very similar to those reported in Table 2-4. Indeed, in every trial, we obtain results qualitatively similar to those reported in Table 2-4.

We find significant and robust results indicating that sensible measures of the sophistication of a country's institutional environment are correlated with our proposed indices of a stock market's information content, Ψ_j and Υ_j, above and beyond any effect due to GDP or the number of stocks listed in each country.

5. Conclusions

The fundamental function of stock markets is to process information about market-wide and firm-specific events, and thereby guide capital towards its best use. Gauging stock markets' abilities in this function is therefore a central issue in finance. We propose measures of stock markets' information content, i.e. of the nimbleness of Adam Smith's

invisible hand.

Our underlying idea is that when stock pricing is more based on firm-specific information, stock price movements should be less correlated with the market. We therefore propose measures of the extent to which typical stocks do not move with the market as indicators that a stock market has a high information content. We find that stocks in emerging markets tend to move together to a much greater extent than do stocks in the advanced industrial economies. Moreover, our proposed stock market information content measures are higher in countries that better protect shareholders' rights against corporate insiders, accord greater weight to the rule of law, have more efficient judicial systems, and less corrupt government. We also find that better accounting standards are only of value when these same institutional foundations are in place.

Our research results address a fundamental intellectual and policy question: What does it take to make a stock market process information as it should? We find that laws protecting public investors, a general respect for law and order, and an honest government are critical.

Table 2-1. Typical Stock Return Movements in Selected Emerging Markets Compared to the United States.

	CHINA(N=308)			MALAYSIA(N=349)			POLAND(N=38)			TAIWAN(N=339)			US(N=6889)		
Week	%Up	%Down	%Same	%Up	%Down	%Same	%Up	%Down	%Same	%Up	%Down	%Same	%Up	%Down	%Same
1	0.32	0.61	0.07	0.18	0.73	0.09	0.97	0.03	0.00	0.72	0.20	0.08	0.47	0.29	0.24
2	0.04	0.89	0.06	0.08	0.86	0.06	0.05	0.95	0.00	0.09	0.83	0.08	0.47	0.38	0.15
3	0.06	0.88	0.07	0.22	0.69	0.09	0.59	0.31	0.10	0.15	0.79	0.06	0.49	0.37	0.13
4	0.07	0.88	0.05	0.01	0.95	0.03	0.03	0.92	0.05	0.12	0.82	0.06	0.54	0.32	0.14
5	0.84	0.08	0.07	0.80	0.11	0.09	0.03	0.97	0.00	0.70	0.14	0.16	0.33	0.53	0.15
6	0.07	0.50	0.42	0.92	0.02	0.06	1.00	0.00	0.00	0.87	0.07	0.06	0.44	0.43	0.14
7	0.59	0.31	0.10	0.77	0.14	0.10	0.15	0.77	0.08	0.41	0.47	0.12	0.57	0.30	0.13
8	0.18	0.73	0.09	0.47	0.39	0.13	0.10	0.90	0.00	0.70	0.19	0.11	0.48	0.38	0.14
9	0.71	0.22	0.07	0.28	0.60	0.12	0.82	0.13	0.05	0.19	0.71	0.09	0.42	0.43	0.15
10	0.93	0.04	0.04	0.13	0.77	0.11	0.95	0.05	0.00	0.31	0.58	0.11	0.44	0.42	0.14
11	0.09	0.88	0.03	0.12	0.78	0.09	0.03	0.95	0.03	0 47	0.43	0.11	0.33	0.52	0.15
12	0.41	0.51	0.07	0.66	0.23	0.11	0.00	0.92	0.08	0.40	0.45	0.15	0.50	0.37	0.13
13	0.89	0.07	0.04	0.53	0.34	0.13	0.15	0.67	0.18	0.35	0.56	0.10	0.41	0.44	0.15
14	0.84	0.09	0.06	0.41	0.50	0.08	1.00	0.00	0.00	0.49	0.36	0.15	0.50	0.35	0.15
15	0.21	0.73	0.05	0.15	0.73	0.12	1.00	0.00	0.00	0.37	0.48	0.15	0.47	0.37	0.15
16	0.18	0.75	0.07	0.23	0.66	0.11	0.56	0.38	0.05	0.05	0.90	0.05	0.45	0.40	0.15
17	0.29	0.63	0.08	0.56	0.25	0.19	0.90	0.10	0.00	0.16	0.78	0.06	0.41	0.44	0.15
18	0.05	0.92	0.03	0.06	0.87	0.06	0.08	0.92	0.00	0.31	0.60	0.09	0.50	0.35	0.15
19	0.35	0.56	0.09	0.33	0.57	0.10	0.41	0.49	0.10	0.41	0.48	0.11	0.46	0.40	0.14
20	0.29	0.60	0.11	0.94	0.03	0.03	0.87	0.10	0.03	0.43	0.45	0.12	0.49	0.37	0.14
21	0.89	0.08	0.03	0.21	0.72	0.07	0.00	1.00	0.00	0.24	0.65	0.11	0.42	0.44	0.14
22	0.21	0.76	0.04	0.51	0.42	0.07	0.92	0.05	0.03	0.20	0.69	0.11	0.46	0.39	0.15
23	0.16	0.79	0.05	0.78	0.17	0.05	0.74	0.23	0.03	0.39	0.52	0.10	0.47	0.39	0.14
24	0.55	0.37	0.08	0.16	0.77	0.07	0.36	0.51	0.13	0.09	0.85	0.06	0.44	0.41	0.15
25	0.04	0.84	0.12	0.72	0.18	0.09	0.41	0.49	0.10	0.12	0.82	0.06	0.52	0.34	0.14
26	0.73	0.20	0.07	0.30	0.60	0.09	0.82	0.05	0.13	0.75	0.18	0.07	0.47	0.39	0.14

Based on Datastream daily cum *dividend stock returns.*

Figure 2-1: The Fraction of Stocks Moving Up in Price in Each Week of 1995

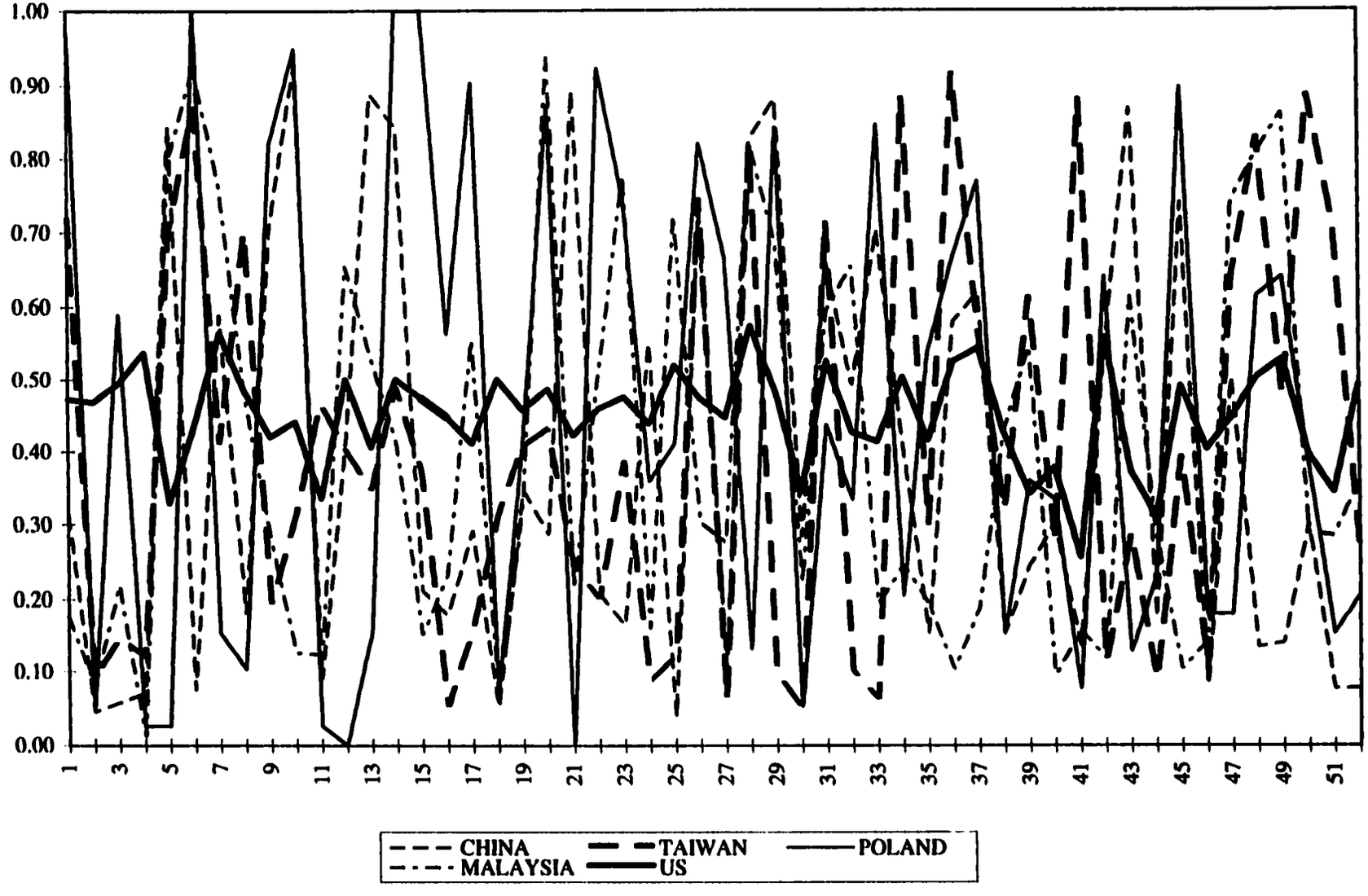


Figure 2-2: The fraction of US Stock Prices Moving Together from 1926 to 1995

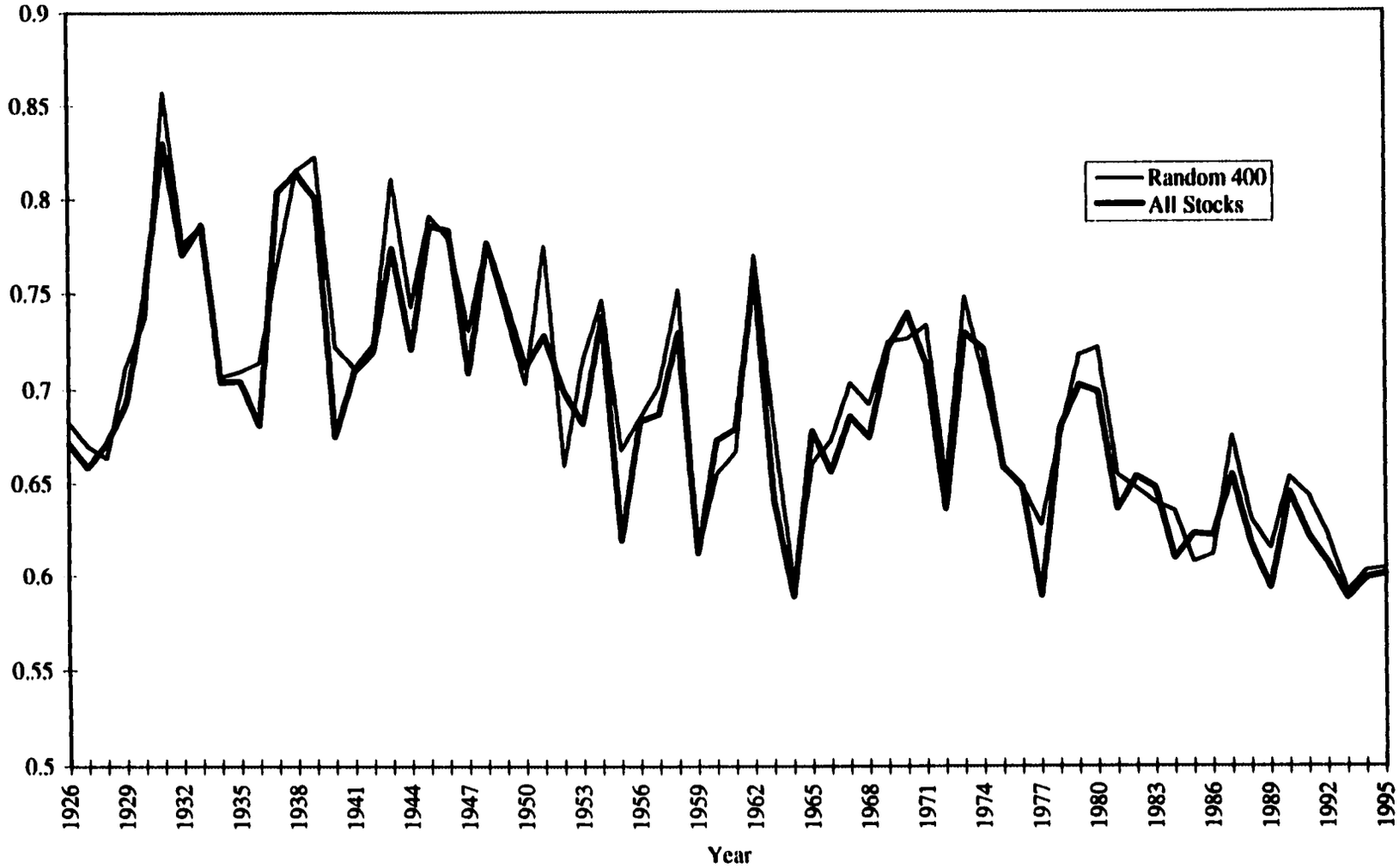


Figure 2-3: Average R2 Across Stocks Based on Monthly Returns from 1926 to 1995

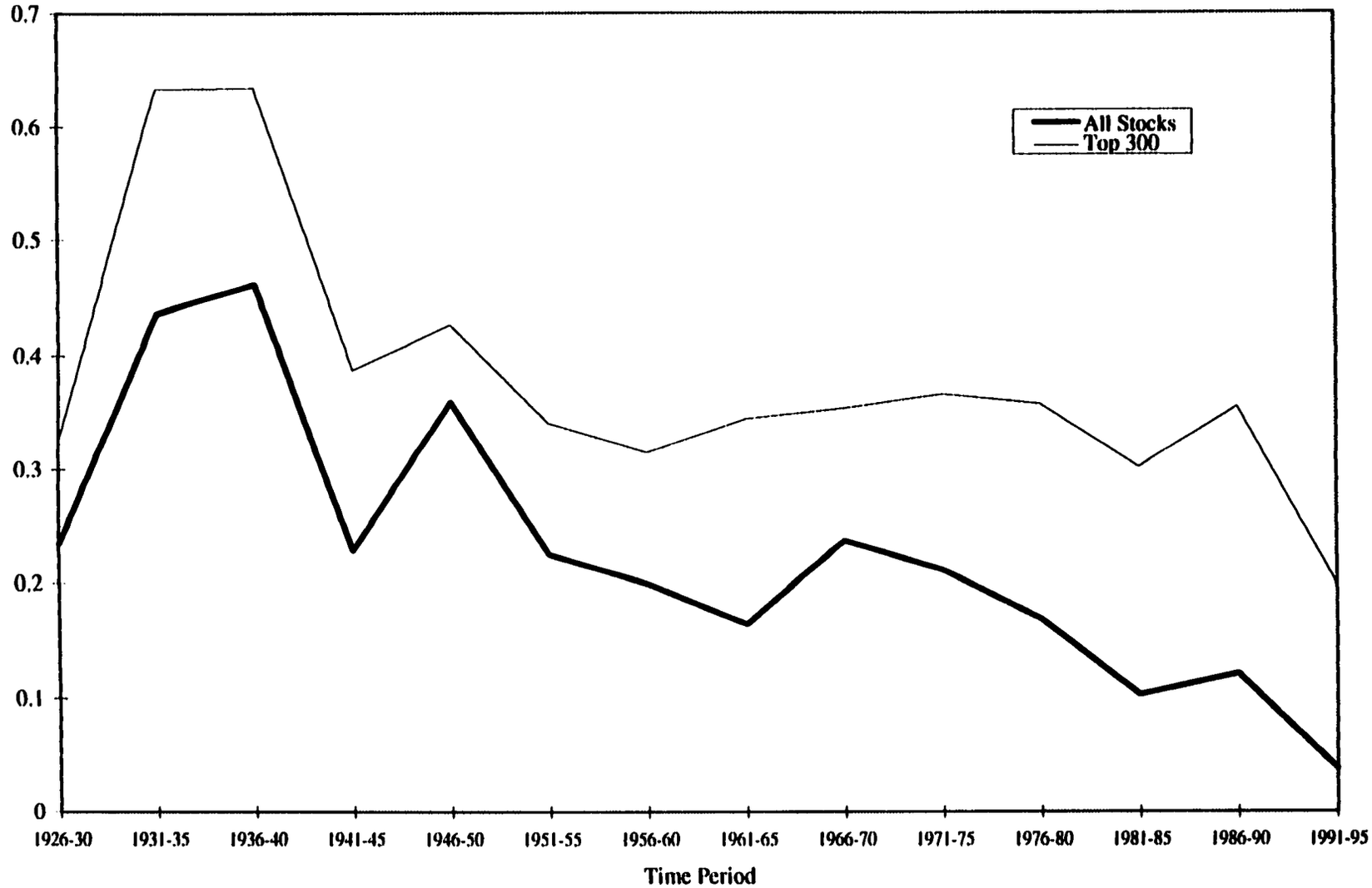


Figure 2-4: Variations Unexplained (SSE) and Explained (SSR) by Market Returns

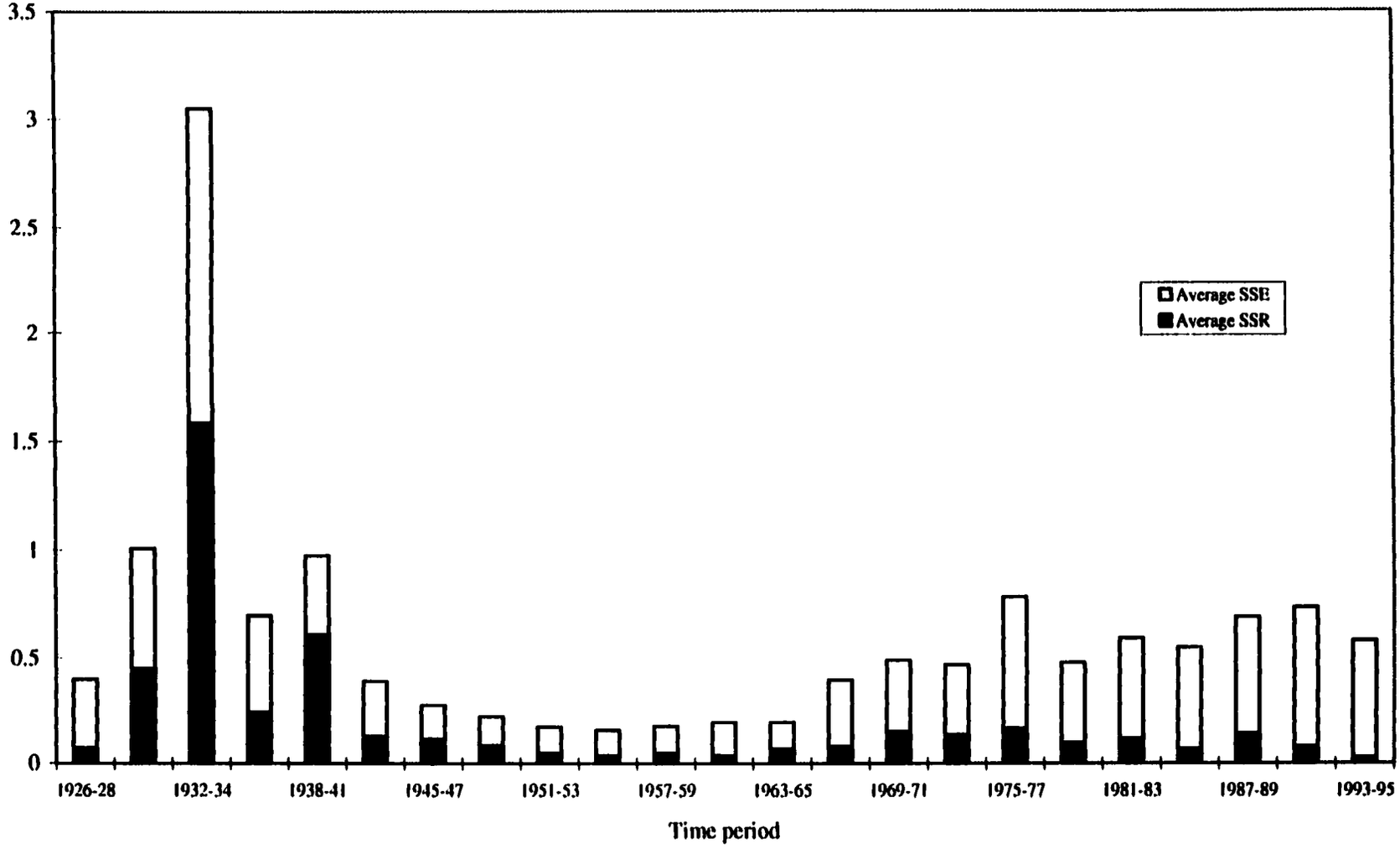


Table 2-2: Fraction of stock prices moving together (f) and market model R^2s, averaged over 1993 through 1995, and logarithms of *per capita* GDP in US dollars, averaged over 1992 through 1994. The left panel of the table is sorted in ascending order of the f value and the right panel is sorted in ascending order of the R^2 value.

Rank	Country	log *per capita* GDP	f	Country	log *per capita* GDP	R^2
1	United States	10.10	0.579	United States	10.10	0.022
2	Canada	9.86	0.583	Canada	9.86	0.065
3	France	10.05	0.592	France	10.05	0.075
4	Germany	10.10	0.611	Australia	9.76	0.076
5	Portugal	9.11	0.612	U.K.	9.75	0.081
6	Australia	9.76	0.614	Denmark	10.21	0.087
7	U.K.	9.75	0.631	Ireland	9.56	0.092
8	Denmark	10.21	0.631	New Zealand	9.47	0.093
9	Brazil	8.05	0.632	Germany	10.10	0.102
10	New Zealand	9.47	0.646	Holland	9.95	0.104
11	Holland	9.95	0.647	Portugal	9.11	0.118
12	Belgium	9.98	0.650	Belgium	9.98	0.131
13	Ireland	9.56	0.657	Korea	8.93	0.137
14	Pakistan	6.05	0.661	Austria	10.08	0.139
15	Sweden	10.08	0.661	Norway	10.14	0.145
16	Austria	10.08	0.662	Indonesia	6.60	0.145
17	Chile	8.12	0.662	Philippines	6.78	0.154
18	Norway	10.14	0.666	Pakistan	6.05	0.156
19	Italy	9.84	0.666	Sweden	10.08	0.161
20	Japan	10.41	0.666	Brazil	8.05	0.161
21	Spain	9.47	0.670	Chile	8.12	0.177
22	Indonesia	6.60	0.671	Hong Kong	9.90	0.182
23	South Africa	7.96	0.672	Spain	9.47	0.199
24	Thailand	7.69	0.674	South Africa	7.96	0.201
25	Hong Kong	9.90	0.678	Finland	9.84	0.203
26	Philippines	6.78	0.688	India	5.71	0.204
27	Finland	9.84	0.689	Singapore	9.91	0.212
28	Czech	8.03	0.691	Italy	9.84	0.221
29	India	5.71	0.695	Peru	7.56	0.221
30	Singapore	9.91	0.697	Japan	10.41	0.223
31	Greece	8.90	0.697	Colombia	7.32	0.225
32	Peru	7.56	0.701	Thailand	7.69	0.232
33	Korea	8.93	0.703	Czech	8.03	0.242
34	Columbia	7.32	0.707	Greece	8.90	0.258
35	Mexico	8.28	0.710	Mexico	8.28	0.281
36	Turkey	7.87	0.744	Turkey	7.87	0.305
37	Malaysia	8.11	0.754	Taiwan	9.28	0.355
38	Taiwan	9.28	0.763	Malaysia	8.11	0.359
39	China	6.12	0.800	China	6.12	0.465
40	Poland	7.75	0.809	Poland	7.75	0.569

Stock market data is un-available in 1993 and 1994 for Poland and Brazil, and in 1993 for the Czech Republic.

Table 2-3: Univariate Statistics and Simple Correlation Coefficients Between Information Content Indices, Ψ_j and Υ_j, and Legal and Institutional Environment Variables

variables	*mean*	*standard deviation*	*minimum*	*maximum*	*correlation with* Ψ	*correlation with* Υ_j	*correlation with ln(Y)*
Information Content Measures							
Average Fraction of Stocks Moving the Same Direction as the Market (f_j)	.659	.052	.569	.772	-.993 (.00)	-.900 (.00)	-.509 (.00)
Information Content Index based on the f_j for country j (Ψ_j)	.808	.501	-.180	1.837	1.00 (.00)	.909 (.00)	.512 (.00)
R square of market model based on weekly data for country j	.169	.099	.0211	.429	-.888 (.00)	-.949 (.00)	-.415 (.01)
Information Content Index based on the R_j^2 for country j (Υ_j)	1.764	.758	.285	3.838	.909 (.00)	1.00 (.00)	.457 (.00)
Institutional Structure Indices							
Logarithm of Per Capital GDP (ln(Y))	8.940	1.295	5.705	10.410	.512 (.00)	.457 (.00)	1.000 (.00)
Anti-director Rights Index	2.541	1.238	0	5	.280 (.09)	.351 (.03)	-.008 (.96)
Rule of Law Index	7.433	2.540	2.08	10	.589 (.00)	.525 (.00)	.899 (.00)
Judicial Efficiency	7.777	2.213	2.5	10	.413 (.01)	.460 (.00)	.722 (.00)
Good Government Index	23.920	4.982	12.94	29.59	.552 (.00)	.527 (.00)	.919 (.00)
Accounting Standards Index	63.735	10.869	36.0	83	.237 (.18)	.230 (.19)	.442 (.01)

Sample = 37 countries. The Accounting Standards Index is available for 34 countries (The Index is not available for Ireland, Pakistan, and Indonesia). Numbers in parenthesis are probability levels at which the null hypothesis of zero correlation can be rejected.

Table 2-4: Regressions of stock market information content indices, constructed using all available firms for each country, on variables capturing legal protection to shareholders' rights, as well as legal, governmental, and institutional environment, controlling for per capita GDP.

The dependent variables are our proposed measures of information content, Ψ_j in the left panel and Υ in right panel, all estimated using 1995 data. The independent variables are indexes of the sophistication and effectiveness of each country's institutional structure averaged over 1992 to 1994[a].

Dependent Variable	Ψ is an inverse logistic transformation of the fraction of stocks moving together				Υ is an inverse logistic transformation of the R_j^2s of regressions of stock returns on market indices			
	(4a.1)	(4a.2)	(4a.3)	(4a.4)	(4c.1)	(4c.2)	(4c.3)	(4c.4)
Intercept	0.504	0.504	0.504	0.504	1.182	1.182	1.182	1.182
	(3.22)	(3.05)	(3.00)	(3.06)	(5.07)	(5.12)	(4.98)	(4.94)
Anti-director Rights Index	0.118	0.118	0.118	0.118	0.223	0.223	0.223	0.223
	(2.11)	(2.08)	(2.04)	(2.01)	(2.66)	(2.69)	(2.62)	(2.60)
Rule of Law Index	1.001	-	33.589	-	1.300	-	43.613	-
	(4.35)		(4.20)		(3.79)		(3.72)	
Judicial Efficiency Index	-	0.253	-	7.383	-	0.415	-	12.099
		(2.90)		(2.80)		(3.27)		(3.16)
Good Government Index	0.619	0.467	21.573	3.589	0.851	0.642	29.660	4.934
	(4.19)	(4.13)	(4.04)	(3.98)	(3.87)	(3.90)	(3.80)	(3.77)
Accounting Standards Index	0.010	0.010	0.431	0.233	0.010	0.010	0.425	0.229
	(0.95)	(0.94)	(0.92)	(0.90)	(0.63)	(0.64)	(0.62)	(0.61)
Accounting Std. × Rule of Law Indices	-	-	0.599	-	-	-	0.770	-
			(3.53)				(3.10)	
Accounting Std. × Judic. Ef. Indices	-	-	-	0.149	-	-	-	0.228
				(2.42)				(2.54)
Accounting Std. × Good Govt. Indices	-	-	0.400	0.074	-	-	0.524	0.097
			(2.95)	(2.90)			(2.64)	(2.62)
log(per capita GDP)	1.472	1.294	1.504	1.308	1.920	1.387	1.961	1.706
	(4.09)	(4.03)	(3.95)	(3.89)	(3.58)	(3.62)	(3.52)	(3.49)
R^2	0.480	0.465	0.481	0.466	0.476	0.486	0.496	0.489

Sample size is 34 counties, due to missing data for China, Czech Republic, Indonesia, Ireland, Pakistan, and Poland. Numbers in parenthesis are t-ratios.

a. To avoid multicollinearity, we enter the independent variables as components uncorrelated with all other independent variables; that is $x_i - P[x_i | x_k\ k \neq i]$. Anti-director rights, which is uncorrelated to the other independent variables, is not orthogonalized in this way.

Table 2-5: Regressions of stock market information content indices, constructed using all available firms for each country, on variables capturing legal protection to shareholders' rights, as well as legal, governmental, and institutional environment, controlling for per capita GDP and the number of stocks listed in each country's stock markets.

The dependent variables are our proposed measures of information content, Ψ_j in the left panel and Υ_j in right panel, all estimated using 1995 data. The independent variables are indexes of the sophistication and effectiveness of each country's institutional structure averaged over 1992 to 1994[a].

Dependent Variable	*Ψ is an inverse logistic transformation of the fraction of stocks moving together*				*Υ is an inverse logistic transformation of the R_j^2s of regressions of stock returns on market indices*			
	(5a.1)	*(5a.2)*	*(5a.3)*	*(5a.4)*	*(5b.1)*	*(5b.2)*	*(5b.3)*	*(5b.4)*
Intercept	-0.051	-0.084	-0.072	-0.113	0.536	0.550	0.556	0.543
	(0.12)	(0.20)	(0.17)	(0.26)	(0.86)	(0.89)	(0.86)	(0.84)
Anti-director Rights Index	0.086	0.084	0.085	0.083	0.185	0.186	0.186	0.186
	(1.45)	(1.41)	(1.38)	(1.33)	(2.06)	(2.09)	(2.03)	(2.01)
Rule of Law Index	0.873	-	29.148	-	1.151	-	38.784	-
	(3.60)		(3.46)		(3.14)		(3.09)	
Judicial Efficiency Index	-	0.210	-	6.065	-	0.369	-	10.733
		(2.34)		(2.23)		(2.77)		(2.66)
Good Government Index	0.543	0.407	18.845	3.103	0.763	0.578	26.695	4.430
	(3.53)	(3.46)	(3.39)	(3.31)	(3.28)	(3.32)	(3.22)	(3.19)
Accounting Standards Index	0.004	0.004	.182	0.089	0.003	0.004	0.155	0.081
	(0.40)	(0.37)	(0.37)	(0.33)	(0.20)	(0.21)	(0.21)	(0.20)
Accounting Std. × Rule of Law Indices	-	-	0.496	-	-	-	0.658	-
			(2.73)				(2.43)	
Accounting Std. × Judic. Ef. Indices	-	-	-	0.114	-	-	-	0.191
				(1.76)				(1.99)
Accounting Std. × Good Govt. Indices	-	-	0.322	0.059	-	-	0.440	0.081
			(2.25)	(2.18)			(2.06)	(2.04)
log(per capita GDP)	1.255	1.091	1.274	1.093	1.667	1.469	1.710	1.483
	(3.27)	(3.20)	(3.13)	(3.06)	(2.87)	(2.91)	(2.82)	(2.79)
log(number of listed stocks)	0.112	0.118	0.116	0.124	0.130	0.127	0.126	0.129
	(1.44)	(1.52)	(1.43)	(1.51)	(1.11)	(1.10)	(1.05)	(1.06)
R^2	0.518	0.507	0.521	0.510	0.499	0.508	0.517	0.511

Sample size is 34 counties, due to missing data for China, Czech Republic, Indonesia, Ireland, Pakistan, and Poland.. Numbers in parenthesis are t-ratios.

a. To avoid multicollinearity, we enter the independent variables as components uncorrelated with all other independent variables; that is $x_i - P[x_i | x_k\ k \neq i]$. Anti-director rights, which is uncorrelated to the other independent variables, is not orthogonalized in this way.

Table 2-6: Bootstrap analysis of regressions of stock market information content indices, constructed using 300 randomly selected firms from each country, on variables capturing legal protection to shareholders' rights, as well as legal, governmental, and institutional environment.[a]

The dependent variables are our proposed measures of information content, Ψ_j in the left panel and Υ_j in the right panel, all estimated using 1995 data. The independent variables are indexes of the sophistication and effectiveness of each country's institutional structure averaged over 1992 to 1994.[b]

Dependent Variable	Ψ is an inverse logistic transformation of the fraction of stocks moving together				Υ is an inverse logistic transformation of the R_j^2 s of regressions of stock returns on market indices			
	(6a.1)	(6a.2)	(6a.3)	(6a.4)	(6b.1)	(6b.2)	(6b.3)	(6b.4)
Intercept	0.485	0.485	0.485	0.485	1.200	1.200	1.200	1.200
	(2.99)	(2.95)	(2.89)	(2.84)	(5.29)	(5.29)	(5.17)	(5.11)
Anti-director Rights Index	0.125	0.125	0.125	0.125	0.210	0.210	0.210	0.210
	(2.16)	(2.13)	(2.09)	(2.05)	(2.58)	(2.58)	(2.52)	(2.49)
Rule of Law Index	1.029	-	34.526	-	1.196	-	40.139	-
	(4.31)		(4.17)		(3.58)		(3.50)	
Judicial Efficiency Index	-	0.260	-	7.575	-	0.353	-	10.282
		(2.87)		(2.77)		(2.83)		(2.73)
Good Government Index	0.639	0.482	22.273	3.705	0.771	0.582	26.876	4.471
	(4.17)	(4.11)	(4.03)	(3.97)	(3.60)	(3.60)	(3.52)	(3.48)
Accounting Standards Index	0.012	0.012	0.501	0.271	0.005	0.005	0.207	0.112
	(1.06)	(1.05)	(1.03)	(1.01)	(0.31)	(0.31)	(0.31)	(0.30)
Accounting Std. × Rule of Law Indices	-	-	0.626	-	-	-	0.676	-
			(3.56)				(2.78)	
Accounting Std. × Judic. Ef. Indices	-	-	-	0.156	-	-	-	0.185
				(2.44)				(2.10)
Accounting Std. × Good Govt. Indices	-	-	0.422	0.079	-	-	0.445	0.083
			(3.01)	(2.96)			(2.29)	(2.27)
log(per capita GDP)	1.502	1.320	1.534	1.334	1.710	1.503	1.747	1.520
	(4.02)	(3.97)	(3.89)	(3.83)	(3.28)	(3.28)	(3.20)	(3.17)
R^2	0.476	0.460	0.478	0.461	0.460	0.461	0.476	0.464

Sample size is 34 counties, due to missing data for China, Czech Republic, Indonesia, Ireland, Pakistan, and Poland.

a. We conducted 20 trials. Numbers in parenthesis are t-ratios. The t-statistics are averaged over 20 regressions. It turns out that the significance level is uniform across all twenty trials.

b. To avoid multicollinearity, we enter the independent variables as components uncorrelated with all other independent variables; that is x_i - $P[x_i | x_k\ k \neq i]$. Anti-director rights, which is uncorrelated to the other independent variables, is not orthogonalized in this way.

Figure 2-5a: The Harmony in Stock Price Movements in Various Countries

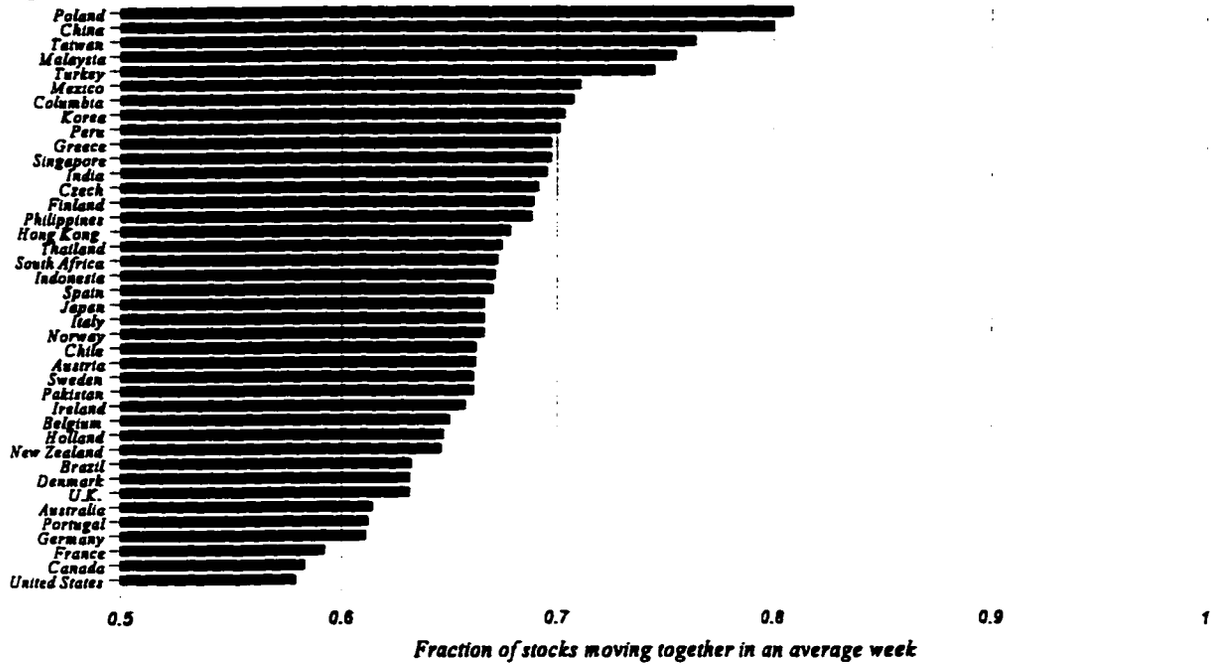


Figure 2-5b: Average Fraction of Stock Price Variation Explained by the Market

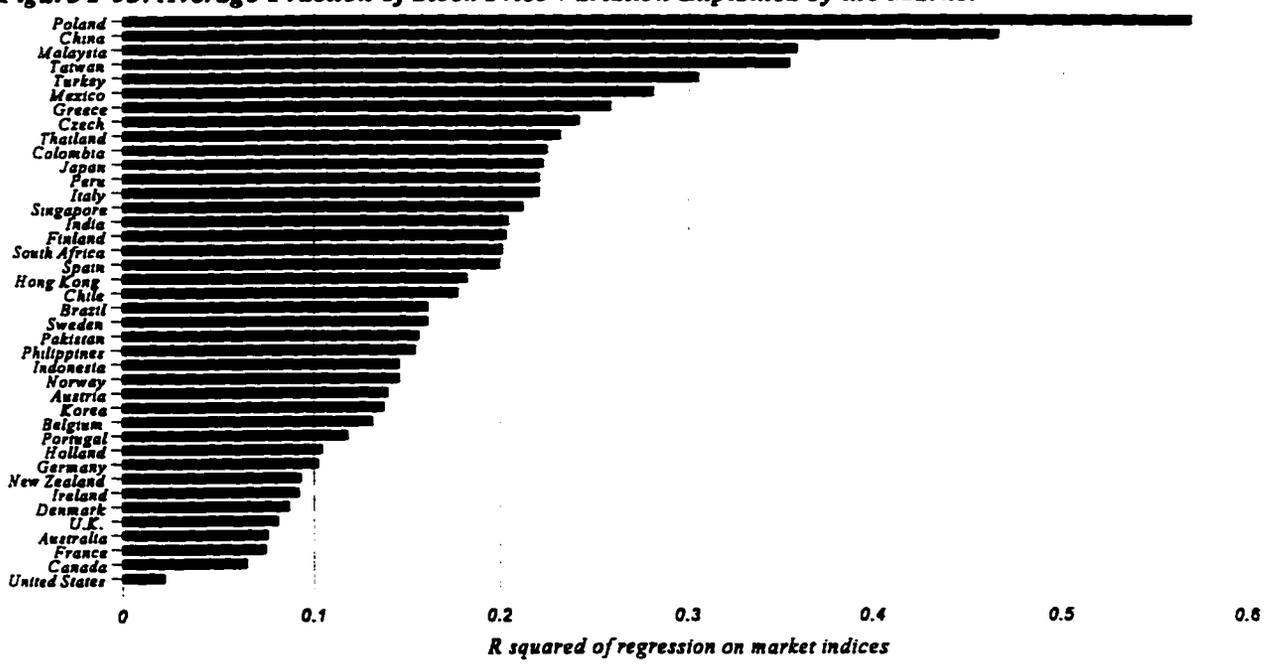


Figure 2-6a: Harmony in Stock Markets vs. Per Capita GDP

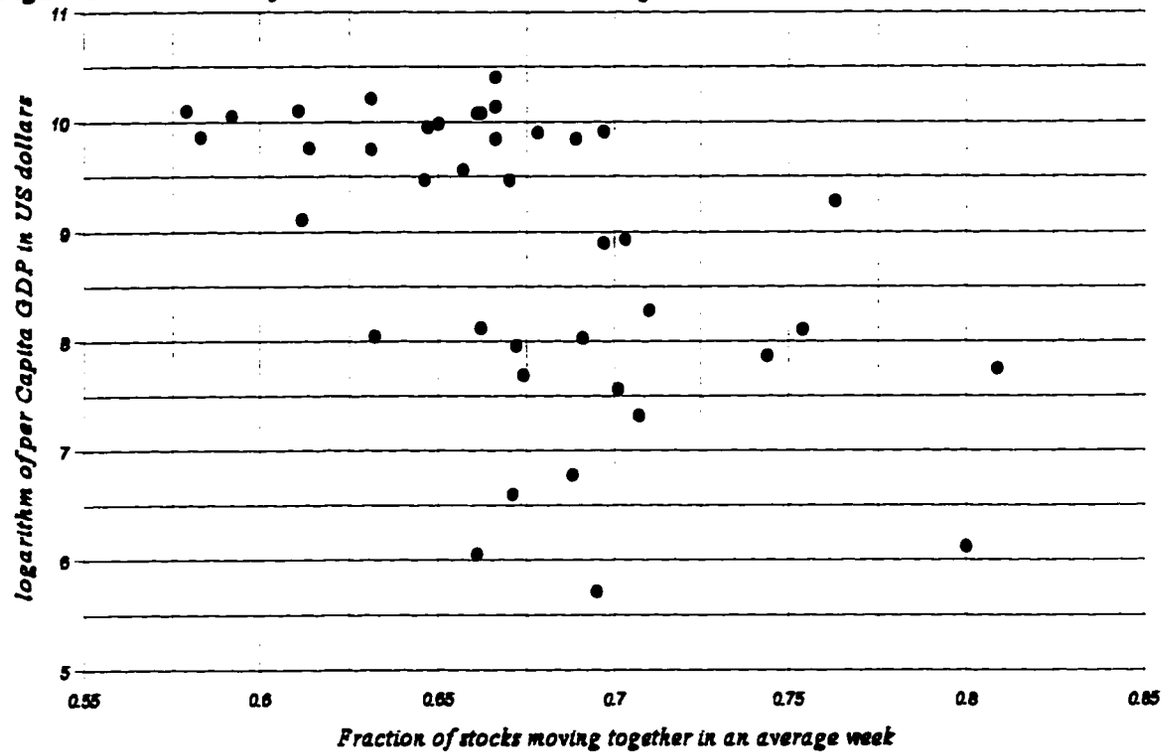
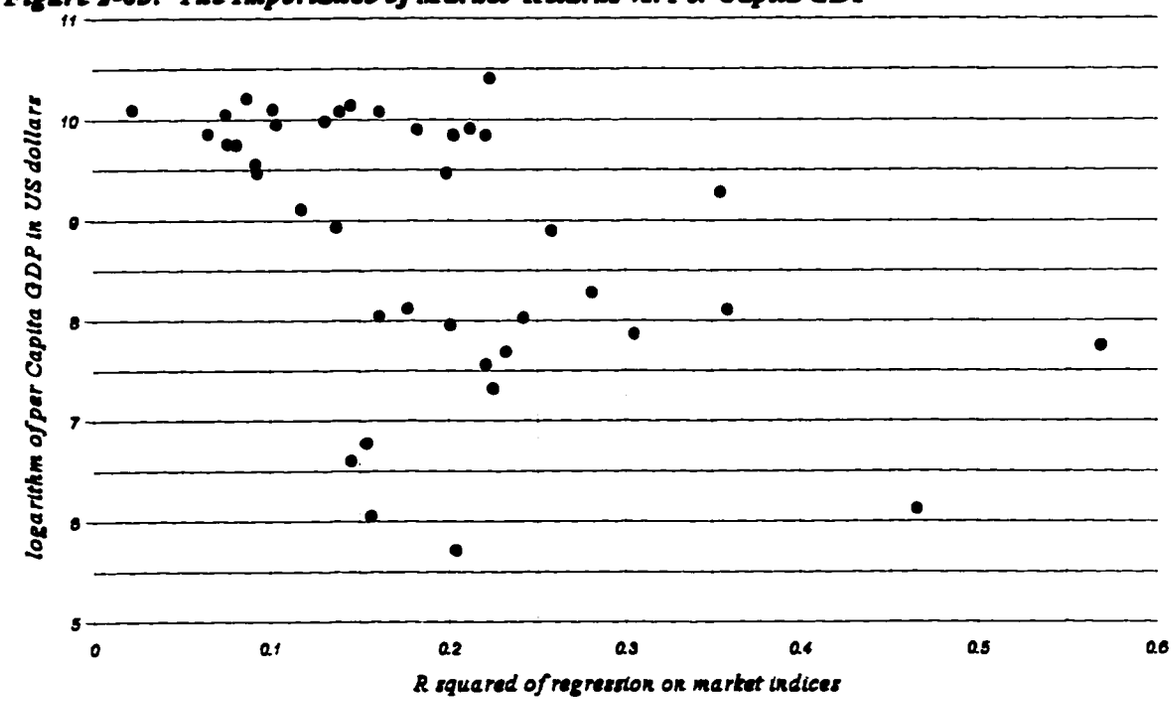


Figure 2-6b: The Importance of Market Returns vs. Per Capita GDP



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Chapter 3

A Study of Cross Sectional Variation in the Stock Market's Reaction to Corporate Investment Decisions[1]

1. Introduction

Normative corporate finance theory argues that a firm should undertake capital investment projects only if they have positive net present values. However, a large body of theoretical work, mainly stemming from Jensen and Meckling (1976), argues that agency problems cause some firms to undertake negative net present value projects that benefit insiders, and considerable empirical evidence supports this position. However, empirical studies have found that when firms announce increases in their capital budgets, their stock prices tend to rise (McConnell and Muscarella, 1985; Chen *et al.* 1988). In this paper, we construct a sample of such announcements using the criteria developed by McConnell and Muscarella (1985) and examine closely the cross sectional variation in such stock price reactions. We find evidence that the shareholders of firms likely to have agency problems do not welcome news of increased capital budgets.

In our sample, the average unconditional stock price reaction to both capital budget increases and decreases is zero. This differs from those of McConnell and Muscarella (1985) who report positive significant abnormal returns for firms announcing investment increases and negative significant returns for firms announcing decreases.

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1 This chapter was co-authored with Mark Huson and Randall Morck, both of the University of Alberta, and Gary Smith of Alberta Treasury.

Our finding of no significant market reactions also appears inconsistent with stock market myopia, as argued by Porter (1990), and managerial myopia, as proposed by Stein (1989).

We use insider ownership variables to proxy for possible agency problems, and average Tobin's q to proxy for the quality of past managerial decisions, and find positive relationships between both and abnormal returns in regressions controlling for firm size and past capital budget growth. Average q is a general measure of the presence of intangible assets, and these may derive from superior investment opportunities, management, technology, marketing, etc., and we therefore consider alternative interpretations of our results. However, we argue that the positive relationship between abnormal returns and average q for both firms announcing capital budgeting increases and those announcing decreases suggests that average q is more appropriately viewed as a measure of intangible assets related to management reputation.

We also test for a relationship between cash flow levels and stock price reactions to changes in capital investment, and find no evidence of such a link. This fails to bolster arguments about the importance of free cash flow misinvestment as a pervasive agency problem, but mainly underscores the fact that free cash flow, as defined by Jensen (1986) and accounting cash flow are different, and that free cash flow is very difficult to measure.

2. Background and Literature Review

2.1 Theory

An economically efficient capital investment process should result in the maximization of shareholders' wealth. Elementary financial theory states that wealth will increase as long as the net present value (NPV) of the projects undertaken is positive where future cash flows are discounted at the appropriate risk adjusted discount rate. Thus, the optimal capital investment decision rule, as stated by Copeland and Weston (1988, p. 41), is that "managers should take projects with positive NPVs down to the point where the NPV of the last acceptable project is zero." There are two assumed conditions for this rule to lead to optimal investment: 1) managers and owners have the same information regarding investment opportunities and 2) shareholders are able to monitor managers to ensure that their actions are consistent with wealth maximization. It is unclear if either of these conditions holds in reality.

Porter (1992) addresses how the investment process might be affected by violations of the first condition. He describes investors as having short holding periods and lacking access to the proprietary information necessary for making informed decisions. They are thus driven "to focus on easily measurable company attributes, such as current earnings or patent approvals, as proxies of a company's value on which to base market timing choices" (p. 70). As current earnings are negatively affected by increased capital investment, shareholders will behave myopically, reacting positively to

decreases in capital investment outlays and negatively to increases. In this environment, managers have incentive to invest less than the amount they believe is optimal.

Like Porter, Stein (1989) proposes that the information asymmetry between the market and managers causes the shareholders to use current earnings as a signal of the firm's long term prospects; however, in a different approach to the issue, Stein argues that information asymmetries between shareholders and managers can induce managers to behave myopically. To signal their firms' health, managers of profitable firms must maintain high earnings. This leads them to forego positive NPV projects. When managers do undertake a project in this model, its NPV must be well above zero to justify the earnings cut required to finance it. We thus interpret Stein as predicting a positive share price reaction to capital budget increases.

Violations of the second condition of the optimal investment rule result from the separation of corporate ownership from corporate control. Berle and Means (1932) indicate that for firms in which ownership is dispersed and managers own little equity, managers have the incentive to direct the firm's resources to undertakings that benefit themselves as opposed to the shareholders. Jensen and Meckling (1976) present a model that demonstrates that the smaller the proportion of management ownership, the more likely it is that corporate resources will be allocated to benefit the managers. This follows because the managers, with only a fraction of the ownership, bear only a fraction of the cost of these misallocations, but receive all the benefits. As their proportion ownership increases, so too does the cost they pay for misallocating the firm's resources; therefore, the likelihood of such misallocation declines. Under this framework, the stock market

should find investment decisions made by managers with large shareholdings more valuable than those made by managers with smaller stock positions as their interests will converge with those of outside shareholders.

Jensen and Meckling do not specify that the misallocation of resources they anticipate will take the form of overinvestment. Jensen (1986) offers a more specific notion of how the violation of the second condition for the optimal investment rule will affect corporate investment. He proposes that managers have incentives to overinvest as larger firms lead to more power for managers and more opportunities for the advancement of middle-managers within the firm. He posits that the degree to which they overinvest is an increasing function of the financial resources they have at their disposal. Jensen calls such resources *free cash flow*. Specifically, free cash flow is defined as "cash flow in excess of that required to fund all projects that have positive net present values when discounted at the relevant cost of capital" (p. 323).

A difficulty with empirically testing free cash flow theory is that the level of free cash flow is unobservable. Stulz (1990) addresses this problem. The Stulz model demonstrates that levels of cash flow are not in themselves sufficient indicators of the presence of a free cash flow problem. If the firm has a high quality investment opportunity set (i.e. high marginal product from corporate investment) then there may not be a free cash flow problem even though there is high cash flow; however, when high cash flow is accompanied by a low quality investment opportunity set, there is a high probability that management will invest resources in negative net present value projects.

Thus, the requirements for a free cash flow problem are both high cash flow and a poor investment opportunity set.

2.2 Relevant empirical work

To date, the most direct test of the market's reaction to corporate capital budget announcements is provided by McConnell and Muscarella (1985). They find that, on average, capital spending increase announcements are accompanied by abnormally high stock returns while capital spending decrease announcements are greeted by abnormally low stock returns.[2] Their results are consistent with the notion that the market views capital investment as wealth-enhancing. In other words the market is not myopic in the sense of Porter (1992). We cannot, however, conclude that management is investing efficiently. Stein (1989) argues that the acceptance of projects by myopic managers signal that the projects have expected returns at least as great as a myopia-induced artificially high hurdle rate; therefore, the market will respond positively to a capital budget increase announcement. Similarly, a capital budget decrease may signal the elimination of a project because its expected return has dropped below the myopia-induced hurdle rate even though the expected return remains above the true cost of capital. Such an elimination will lead to a decrease in share price in an efficient market. Thus the McConnell and Muscarella results are consistent with the notion of managerial myopia.

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2 An exception to this general result occurs with firms in the oil industry. Here, capital spending increase announcements are greeted by abnormally low returns, a result consistent with the predictions of the free cash flow hypothesis of Jensen (1986).

A test of the convergence-of-interest hypothesis is performed by Morck, Shleifer, and Vishny (1988). They find that for low levels of board ownership (0 to 5%) average q increases with board ownership, while intermediate levels of board ownership (5% to 25%) display a decreasing relationship. The increasing relationship resumes at levels of ownership greater than 25%. The authors' interpretation of this is that there is convergence-of-interest effect at work although it may be overshadowed by the entrenchment effect at intermediate levels of ownership. McConnell and Servaes (1990) confirm the existence of a nonlinear relationship of this type, but find evidence of entrenchment only at levels of managerial ownership in the 40% to 50% range, depending on the sample period examined.

A number of empirical tests of the free cash flow hypothesis have been undertaken in various contexts with mixed results. Lang and Litzenberger (1989) investigate the effect of significant dividend changes on market valuation. Using average q to differentiate between value-maximizing firms and suspected overinvestors, they find that dividend increases result in significantly higher returns among the suspected overinvestors than among value-maximizers, and conclude that the reaction is consistent with the free cash flow hypothesis. Lehn and Poulsen (1989) examine the relationship between levels of cash flow and going private transactions. Their results indicate the existence of a significant relationship between the level of undistributed cash flow and a firm's decision to go private. Furthermore, they show that premiums paid in the going private transactions are significantly related to the level of undistributed cash flow. They do not, however, use any measure of the corporate investment opportunity set in their

analysis. Notwithstanding the omission of a direct test of the relationship between abnormal returns and cash flows in the Lang and Litzenberger paper and the lack of a measure of the investment opportunity set in the Lehn and Poulsen work, the results of both of these papers are consistent with the free cash flow theory.

Howe, He, and Kao (1992) follow a very similar methodology to that of Lang and Litzenberger (1989) with the principal difference being that the events analyzed in their paper are one-time cash flow announcements, namely share repurchases and special dividends. While the events are, in present value terms, similar to the Lang and Litzenberger event of dividend changes, the results are substantially different. Howe, He, and Kao find that the market's reaction to the one-time cash flow announcements is approximately the same for both high and low average q firms. Further, when the high cash flow-low average q sample is compared to the low cash flow-high average q sample, the comparison in which free cash flow effects should be most evident, there is still no significant difference in abnormal returns. Thus, the reaction to changing the cash flows of the firm through one-time cash flow announcements is, on average, invariant to both the level of average q and the level of cash flow, a result that runs counter to the free cash flow theory.

Lang, Stulz, and Walkling (1991) examine the free cash flow hypothesis in the context of bidder returns in tender offers. Following Stulz (1990), they condition the level of cash flow on average q, their measure of the quality of the firm's investment opportunity set. They partition their sample of tender offers into four groups: low cash flow-high average q, low cash flow-low average q, high cash flow-high average q, and

high cash flow-low average q. Stulz's version of the free cash flow hypothesis predicts that the last of the four groups has the free cash flow problem. Consequently, this group should have the lowest average return. This is, in fact, what was discovered. They also find that the levels of returns are inversely related to levels of cash flow for firms with low average q values. Thus, there is more evidence consistent with the existence of an adjustment for free cash flow problems in tender offer situations.

It should be noted that the interpretation of average q varies across the studies. The Lang and Litzenberger study, for example, uses average q as a sorting variable to distinguish managers who invest inefficiently from efficient investors. This use of average q is consistent with the view of Veblen (1904) that "the value of any given block of capital...turns on its earning-capacity" (p. 152). Firms with high levels of average q have assets in place with values greater than their cost. That is, the investments made in the past by that firm's managers are good ones. Under this view, then, average q can be viewed as a measure of managerial "track record". Lang, Stulz, and Walkling (1991) take the view that average q is a measure of the quality of the firm's investment opportunities. While it is certainly true that Tobin's q is a measure the economic viability of investment opportunities, it is questionable if average q does so[3].

Overall, the studies referenced above provide some evidence consistent with the notion that managers, on average, invest in projects that have positive NPV. The studies also furnish some results consistent with agency problems in the sense of Jensen and

3 Our empirical results indicate that it is not appropriate to interpret average q as Tobin's q for our sample.

Meckling (1976) and some contradictory results regarding the empirical validity of Jensen's free cash flow theory.

The next section provides a description of the sample and the variables used in the analysis.

3. The Data

3.1 The sample

Our sample of announcements of changes in corporate capital budgets is constructed using the *Dow Jones News Retrieval Service* for the years 1984 through 1989 and the *Wall Street Journal* on CD-ROM for the years 1990 through 1993. The criteria we use to select observations follow those developed by McConnell and Muscarella (1985), namely:

1. The announcement must be about a change in the firm's total capital investment budget. Announcements about the undertaking or elimination of specific investment projects are not included. Announcements of a level of capital investment equal to that of the previous year are excluded. Also, announcements of mergers and acquisitions are excluded. This criterion avoids possible double counting, as specific announcements might be included in more general announcements.

2. The announcement must not include any other information, such as income or dividend announcements. Furthermore, the *Wall Street Journal Index* (hard-copy

version) must refer to no other significant announcements about the firm from one week prior to the event date to three days after it. The purpose of this restriction is to ensure that any abnormal stock returns occurring on the event date are due to the capital budget announcement.

3. The firm must be on the Centre for Research in Securities Prices (CRSP) daily returns tape. The firm's financial statements must be available from COMPUSTAT.

4. The firm must not be a regulated public utility. With this, we attempt to ensure that the market's reaction to the announcement is not colored by the prospect of public regulation. To eliminate such firms, we exclude firms whose two digit Standard Industrial Classification (SIC) code numbers are 48 (Communication industries) or 49 (Other utilities).

A total of ninety-six increase announcements and forty-seven decrease announcements meet our criteria.

The top panel of Table 3-1 shows a frequency distribution of events through time. Increase announcements are concentrated in 1988 through 1990, and decrease announcements are rare in these years. Decrease announcements are heavily concentrated in 1986, a year when increase announcements are at their lowest density.

The lower panel of Table 3-1 is a frequency distribution of increase and decrease events by two digit SIC codes. Both samples have heavy concentrations in oil and gas extraction (SIC 13) and petroleum refining (SIC 29). Increase announcements come from a broader range of industries than decrease announcements.

3.2 Abnormal Returns and Net Present Values

We begin by conducting a standard event study methodology, and examine stock returns for day -1 and day 0, where day 0 is the date of the announcement. Abnormal returns are calculated using the numeraire portfolio methodology of Long (1990). The cumulative abnormal return for firm i is

$$CAR_i = \sum_{t=-1}^{0} \left(\frac{1+R_{it}}{1+R_{mt}} - 1\right)$$

where R_{it} is the return on stock i on date t and R_{mt} is the return on the CRSP value-weighted index on date t.

Comparing the market response to capital expenditure announcements by comparing abnormal stock returns may introduce a bias related to firm size, and therefore may not be entirely legitimate. For example, consider a project with an initial cost of \$10 and a net present value of +\$2. A firm with outstanding equity worth \$100 that announces it is undertaking this project should see its stock price rise of \$2/\$100 or 2%, whereas a firm with equity worth \$20 that announces the same project should experience a stock price rise of \$2/\$20 or 10%. To compensate for this, we calculate the market's expectation of the capital expenditure's net present value

$$E(NPV) = CAR \times V_E$$

where V_E is the market value of the firm's outstanding common equity on day zero. To make this comparable across firms, we scale by the dollar value of the announced change in the firm's capital budget, C_0. We define the ***profitability index***, *PI*, as:

$$\Pi = \frac{E(NPV)}{C_0} = \frac{CAR \times V_E}{C_0}$$

The profitability indices of both $10 projects are 20%. The size of the firm undertaking it does not directly affect the project's profitability index.

3.3 Independent variables

Our basic methodology is to determine what variables are related to abnormal returns upon announcements of capital budget changes. The variables, the use of which we motivate below, are:

Firm Size: Our proxy here is the natural logarithm of the book value of net property plant and equipment.[4] This variable, *SIZE*, is included because it is harder for insiders to own a large stake in a larger firm. This creates a negative correlation between *SIZE* and α. Large firms may have more agency problems than small firms, however we need to distinguish size effects from ownership effects. Firm size may also be related to intangible assets.

4.The natural log of COMPUSTAT item #8.

Past Capital Expenditure Levels: This variable, *CAPEX*, is the average value of capital expenditures (net of acquisitions) per dollar of existing net property plant and equipment over the prior three years. We include it as a way of conditioning on past capital investment levels. Capital budget changes may signal different things in rapidly growing vs. stagnant firms.

Past Growth in Capital Expenditure Levels: This variable, $\Delta CAPEX$ is the annual fractional change in capital expenditures (net of acquisitions) averaged over the previous 3 years.

Average q: To proxy for this variable, we use the market value of equity plus the book value of debt (including short term liabilities) divided by the book value of net property plant and equipment and short term assets.[5] We call this variable q, and follow Tobin (1978) in interpreting it as a measure of the firm's intangible assets.

Research and Development Spending: This variable, *RD*, is the firm's annual R&D spending as a fraction of net property plant and equipment, averaged over the prior three years. We use this variable as a second proxy for intangible assets.

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5 COMPUSTAT items [(#24*#25/1000) + #19/(medium preferred stock dividend yield) + #9 + #5] / (#8+#4).

Advertising Spending: This variable, *ADV*, is the firm's annual advertising spending as a fraction of net property plant and equipment, averaged over the prior three years. We use this variable as a third proxy for intangible assets.

Cash Flow: We use the measure developed by Lang, Stulz, and Walkling (1991), total cash flows normalized by the book value of total assets.[6] We call this variable *CF*.

Insider ownership: This comes from proxy statements filed with the Securities and Exchange Commission (SEC) for the years 1984 through 1988, and from *US Disclosure CD-ROM* for 1989 through 1993.[7] We define "insiders" as officers and directors. We follow Jensen and Meckling (1976), and call this variable α. We interpret α as measuring the separation of ownership from control, and therefore as proxying for agency problems.

3.4 Univariate statistics for the independent variables

Table 3-2 presents descriptive statistics for the independent variables in the capital expenditure increase and decrease samples. On average, companies that increase their capital budgets have more intangible assets, as measured by *q*, *R&D spending*, and *advertising spending*; and are smaller than those undertaking capital budget decreases.

6 COMPUSTAT items (#13-#15-#16-#19-#21+change in #35)/#6.

7 The primary source of information for the US Disclosure CD-ROM is SEC proxy statements.

The cash flow and insider ownership levels of the two groups are statistically similar. This picture is robust to non-normality: equality of means is rejected wherever nonparametric tests also reject equality of medians.

4. Results

4.1 Unconditional and conditional abnormal returns

Table 3-3 shows that firms announcing increases in their capital budgets see their share prices fall insignificantly, while firms announcing capital budget decreases see their share prices rise insignificantly. Adjusting these numbers to reflect profitability indices rather than stock returns does not alter their lack of significance.

McConnell and Muscarella (1985), studying a sample of similarly defined events in the period from 1975 to 1981, find that increase announcements associated with positive unconditional abnormal returns and decrease announcements associated with negative unconditional abnormal returns. These findings are consistent with the market viewing capital investment as wealth-enhancing, and inconsistent with claims by Porter (1992) and others that shareholders are myopic, and react negatively to long-term corporate investments. The apparent change in the market's reaction to corporate capital investment announcements revealed in our data bears closer investigation.

A simple comparison of univariate statistics may not take adequate account of how investors form their expectations about firms' investment plans. An announcement of a capital budget increase from a firm whose capital budget has been growing recently

might convey less information than one from a firm with constant or shrinking past capital budgets. The absolute level of the capital budget might be important too, as a change in a small capital budget might convey more news than a change in a larger one. Firm size may also be important, above and beyond the size of prior years' capital budgets. Small firms, all else equal, can grow at higher rates than large firms.

To control for these factors, we use regressions containing these three variables:

$$\Pi = -0.921 + 12.847 CAPEX + 0.098 \Delta CAPEX - 0.21 SIZE + \varepsilon$$

(n=96, R^2=0.0542, p-value=0.1609)

for the increase subsample, and

$$\Pi = -0.516 - 1.367 CAPEX + 0.587 \Delta CAPEX + 0.106 SIZE + \varepsilon$$

(n=47, R^2=0.0414, p-value=0.6064)

for the decrease subsample.

Although the relatively high values of R^2 suggest that investors' expectations may be influenced by these variables as a group, the relationship lacks statistical power. The coefficient on previous levels of capital expenditure (*CAPEX*) in the increase sample is the only one that is statistically significant with a p-value of 0.0588. However, for reasons cited above, we include these control variables in all the regression models that we discuss in the next three sections. It is worthwhile to point out that our results are robust to the exclusion of these control variables.

4.2 Blurring or clearing vision?

Is the prevalence of myopia changing? Our insignificant results also fail to support the prediction by Porter's market myopia of a negative price reaction. Recall that Stein's managerial myopia predicts a positive reaction to capital budget increases and a negative reaction to decreases, as in McConnell and Muscarella. In this context, our negligible share price reactions point to less myopia, not more.[8] Does the marginal corporate capital investment now have a net present value closer to zero?

Stein's myopia should be more important in firms that are harder to value. We thus regress abnormal returns on indicators of intangible assets - q ratios, R&D spending, and advertising spending. These regressions are displayed in Table 3-4.

In the capital budget increase subsample, the positive coefficients on q and a dummy variable for a q ratio greater than one suggest that firms with substantial intangible assets make marginal investments with higher NPVs, as Stein (1989) predicts. However, a high q ratio can reflect other things, such as good corporate governance or an attractive investment opportunity set. R&D spending and advertising spending, arguably more direct indicators of intangible assets, are insignificant. In the decrease subsample, q is insignificant, but low R&D spending predicts a stock price rise when capital budgets are cut. Although a decrease in managerial myopia is an *a priori* attractive hypothesis, our data do not speak clearly in its support.

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8 Although new information, innovations, indivisibilities, and various market imperfections may keep the NPV of the marginal capital investment project away from zero, marginal NPVs closer to zero are arguably consistent with a more Pareto efficient economy.

4.3 Managerial glaucoma?

Recall that Jensen (1986) argues that managers of firms with excess liquidity like to have big capital budgets, even if this means investing in value-decreasing projects. In his paper, Jensen singles out oil companies as especially susceptible. This view is supported by McConnell and Muscarella (1985): contrary to their evidence from other industries, they report that in the oil and gas industry, capital budget increases trigger share price declines.

Are free cash flow problems more important now than in previous years? A difficulty with empirically testing free cash flow arguments is that free cash flow as defined by Jensen is unobservable. Stulz (1990) points out that high cash flow must exist in conjunction with a dearth of positive NPV projects for a free cash flow problem to exist. Lang, Stulz, and Walkling (1991) operationalize this by studying high cash flow firms with low average q ratios, arguing that a component of the intangible assets average q measures is an attractive set of investment opportunities.

Table 3-5 contains regressions of abnormal returns on cash flow, a q dummy (=1 if $q<1$, 0 otherwise) and their product. The logic of Lang, Stulz, and Walkling (1991) suggests that the coefficient of the interaction term should be negative. It is not.

To check if oil firms are more likely to suffer the free cash flow problem in our samples, we ran the regressions again including a dummy variable equal to one for oil companies and an interaction of it with the *Cash flow* variable. Neither is significant. Coefficients of these two variables are insignificant in every model, indicating there is no

systematic difference in terms of market reactions between oil and non-oil firms. Furthermore, the inclusion of the variables does not qualitatively alter other coefficients in the models.

4.4 Willful blindness?

There is substantial evidence in the corporate finance literature that managers often do not act in the interests of shareholders, as normative finance theory proscribes. Jensen and Meckling (1976) argue that such behavior is more likely when managers own little stock in the firm they run. Accordingly, Table 3-6 contains regressions of abnormal returns on managerial ownership and managerial ownership squared. We include the squared term in alternate regressions because Morck et al (1988) and McConnell and Servaes (1990) find that managers also appear to act suboptimally from public shareholders' perspective in very closely held firms. Stulz (1988) models managers in such firms as entrenched, and therefore subject to reduced shareholder pressure. The inclusion of firm size as a control variable incidentally insures that we are not accidentally using low insider ownership to proxy for large firm size, as the two are correlated.

Table 3-6 shows that abnormal returns are higher for firms with higher insider ownership up to a point, but that very high insider ownership is associated with lower abnormal returns. This suggests that misinvestment due to agency problems may be important in our sample.

To gauge the economic significance of our results, for a median sized firm with a median capital expenditure budget and change in past budget, if managerial ownership is between 4.9% and 71.3%, we predict a positive price reaction for the increase sample, indicating that investors view these firms as on average making positive NPV investments. Our results suggest that investors view firms with insider ownership below 4.9% or above 71.3% as typically making negative NPV investments.

4.5 Robustness

Our basic results are quite robust. Replacing q, *RD*, *ADV*, α, and *CF* by rank transformations gives similar results. Including industry and time dummies does not change the basic qualitative results. Heteroscedasticity is not significant in any regressions. Adding additional variables like leverage, and growth changes nothing.

5. Conclusion

We find that firms' stock prices neither rise nor fall significantly when they announce changes in their capital budgets. This suggests that the markets reaction to such announcements has changed since the late 1970s, when such events are known to have triggered price increases.

We reject the hypothesis that this is due to myopia, as we can detect no significant negative stock price reaction either. We find that high market to book ratios predict positive price reactions to capital budget increases. Our results do not appear to

be due to increased difficulty valuing firms, as investors react similarly to capital expenditure increases by firms with intangible assets related to R&D and by firms without such assets. Free cash flow problems are also an inadequate explanation, as investors react similarly to announcements by low market to book ratio firms with high cash flows as to those by other firms.

We do find that very low or very high managerial ownership does robustly predict negative price reactions, while median levels of insider ownership predict positive price reactions. We conclude that agency problems, stemming from a divergence of managers' interests form shareholders' interests in widely held firms (Jensen and Meckling, 1976), and from managerial entrenchment in closely held firms (Stulz, 1988; and others), may explain investors' lack of enthusiasm for some firm's investment plans.

Table 3-1: Frequency distribution of capital budget announcements

YEAR	Increase Sample		Decrease Sample	
	Frequency	Percent	Frequency	Percent
1984	10	10.4	3	6.4
1985	9	9.4	3	6.4
1986	6	6.3	16	34.0
1987	8	8.3	2	4.3
1988	10	10.4	1	2.1
1989	14	14.6	2	4.3
1990	19	19.8	3	6.4
1991	6	6.3	7	14.9
1992	7	7.3	8	17.0
1993	7	7.3	2	4.3
Total	96	100	47	100

Two-digit SIC	Industry	Increase Sample		Decrease Sample	
		Frequency	Percent	Frequency	Percent
13	Oil and gas extraction	36	37.5	19	40.4
24	Lumber and wood products			2	4.3
26	Paper and allied products	1	1.0	2	4.3
28	Chemicals and allied products	1	1.0		
29	Petroleum refining	16	16.7	13	27.7
30	Rubber and plastics	3	3.1	1	2.1
31	Leather and leather goods	1	1.0		
33	Primary metal industries	4	4.2	3	6.4
34	Fabricated metal products	4	4.2		
35	Machinery and computer equip.	3	3.1		
36	Electronic and electrical equip.	2	2.1		
37	Transportation equipment	3	3.1		
38	Measuring instruments	3	3.1		
40	Railroad transportation	1	1.0		
42	Motor freight transportation	1	1.0		
45	Transportation by air			1	2.1
50	Durable goods wholesale	1	1.0		
51	Non-durable goods wholesale	2	2.1	1	2.1
53	General merchandise stores	9	9.4	2	4.3
54	Food stores	1	1.0	1	2.1
56	Apparel and accessory stores	1	1.0		
58	Eating and drinking places	1	1.0		
75	Automotive repairs	1	1.0		
87	Professional services	1	1.0	2	4.3

Table 3-2: Descriptive statistics of the sample

q is the ratio of a firm's market value over its book value: q=[Market value of the firm's common shares + (face value of preferred stocks)/(average medium-risk bond yield) + long-term debt] / [(net property plant and equipment) + (inventory)]; ***Cash flow*** is the cash that the firm has normalized by total assets: ***Cash flow***=(Operating income before depreciation - interest payments - income taxes - common dividends - preferred dividends + changes in deferred taxes) / (Total assets); **α** is the level of common stocks owned by a firm's officers and directors; ***Capex*** is the average value of capital expenditures (net of acquisitions) per dollar of existing net property plant and equipment over the prior three years; ***ΔCapex*** is the annual fractional change in capital expenditures (net of acquisitions) averaged over the previous three years; ***RD*** is the annual R&D spending as a fraction of net property plant and equipment averaged over the prior three years; ***ADV*** is the annual advertising spending as a fraction of net property plant and equipment averaged over the prior three years: ***Size*** is the natural logarithm of net property plant and equipment (in $ millions); ***%ΔCAPBUD*** is the announced % change in capital budget from its previous level. The number in square brackets is the p-value for the two-tailed significance test for the mean and is the p-value for the Signed-Rank test for the median. The number in round brackets is the p-value for the Wilcoxon test of equal medians.

	q	*Cash flow*	*α*	*RD*	*ADV*	*Capex*	*ΔCapex*	*Size*	*%ΔCAPBUD*
Increase sample									
Mean	1.611	0.071	0.074	0.028	0.032	0.172	0.058	7.594	24.64
Median	1.216	0.075	0.011	0	0	0.162	0.042	7.474	15.5
Std. dev.	1.326	0.048	0.170	0.052	0.068	0.068	0.194	1.376	27.45
Min.	0.690	-0.064	0.000	0	0	0	-0.378	3.946	1.1
Max	10.685	0.303	0.642	0.199	0.428	0.352	0.671	10.886	163.6
Decrease sample									
Mean	1.173	0.049	0.039	0.011	0.008	0.186	0.066	8.354	22.71
Median	1.098	0.067	0.008	0	0.012	0.177	0.053	8.380	23.00
Std. dev.	0.370	0.128	0.105	0.040	0.007	0.055	0.156	1.292	11.00
Min.	0.6443	-0.769	0.000	0	0	0.105	-0.204	5.732	50.00
Max	4.1724	0.170	0.631	0.217	0.077	0.355	0.448	10.784	3.00
Mean difference	**0.438** **[0.0279]**	-0.021 [0.1553]	0.035 [0.1969]	**0.016** **[0.0589]**	**0.024** **[0.0186]**	-0.014 [0.2179]	-0.008 [0.8087]	**-0.759** **[0.0019]**	
Median difference	**0.118** **(0.0525)**	0.008 (0.4082)	0.003 (0.2633)	**0.017** **(0.0224)**	-0.007 (0.7970)	-0.015 (0.1877)	-0.011 (0.5512)	**-0.906** **(0.0019)**	

Table 3-3: Descriptive statistics for CAR and PI and test of significance of means and medians.

CAR is the two-day (day -1 and day 0) cumulative abnormal returns in excess of the CRSP value-weighted market index returns. ***PI*** is defined as (***CAR*MKTCAP***) / |***ΔCAPBUD***|, where ***MKTCAP*** is the firm's equity market capitalization two days before the announcement, and ***ΔCAPBUD*** is the announced dollar change in capital budget from its previous level. The number in square brackets is the p-value for the two-tailed significance test for the mean and is the p-value for the Signed-Rank test for the median. The number in round brackets is the p-value for the Wilcoxon test of equal medians

	Mean	Median	Standard Deviation	Minimum	Maximum
PANEL A: *CAR*					
Increase Sample	-0.003 [0.3082]	-0.002 [0.5065]	0.024	-0.085	0.089
Decrease Sample	0.004 [0.7971]	0.002 [0.5108]	0.030	-0.089	0.079
Sample Differences	-0.007 [0.1990]	-0.004 (0.2854)			
PANEL B: *PI*					
Increase Sample	-0.309 [0.4820]	-0.042 [0.5469]	4.289	-30.294	21.609
Decrease Sample	0.156 [0.2518]	0.028 [0.2757]	0.919	-2.111	3.810
Sample Differences	-0.465 [0.4647]	-0.070 (0.2418)			

Table 3-4: Regression estimates of profitability index on average *q*, R&D Spending, and Advertising Spending

The dependent variable, *PI*, is defined as (*CAR*MKTCAP*) / |*ΔCAPBUD*|, where *CAR* is the two-day (day -1 and day 0) cumulative abnormal returns in excess of the CRSP value-weighted market index returns, *MKTCAP* is the firm's equity market capitalization two days before the announcement, and *ΔCAPBUD* is the announced dollar change in capital budget from its previous level; *q* is the ratio of a firm's market value over its book value: *q*=[Market value of the firm's common shares + (face value of preferred stocks)/(average medium-risk bond yield) + long-term debt] / [(net property plant and equipment) + (inventory)]; *High q* takes the value of 1 if *q* is greater than unity and the value of 0 otherwise; *RD* is the annual R&D spending as a fraction of net property plant and equipment averaged over the prior three years; *ADV* is the annual advertising spending as a fraction of net property plant and equipment averaged over the prior three years; *High RD* takes the value of 1 if the annual R&D spending as a fraction of net property plant and equipment averaged over the prior three years is greater than the sample median, and 0 otherwise; *High ADV* takes the value of 1 if the annual advertising spending as a fraction of net property plant and equipment averaged over the prior three years is greater than the sample median, and 0 otherwise; *Capex* is the average value of capital expenditures (net of acquisitions) per dollar of existing net property plant and equipment over the prior three years; *ΔCapex* is the annual fractional change in capital expenditures (net of acquisitions) averaged over the previous three years; *Size* is the natural logarithm of net property plant and equipment (in $ millions). The number in square brackets is the p-value for the two-tailed significance test.

	Increase sample				Decrease sample			
	(4.1)	(4.2)	(4.3)	(4.4)	(4.5)	(4.6)	(4.7)	(4.8)
Intercept	-2.346 [0.4745]	-3.035 [0.3664]	-0.872 [0.7941]	-0.483 [0.8913]	-1.463 [0.2928]	-1.057 [0.3808]	-0.310 [0.7984]	-1.264 [0.3558]
q	**0.785** **[0.0304]**				0.546 [0.2168]			
High *q*		**2.217** **[0.0306]**				0.462 [0.1384]		
RD			-2.789 [0.7557]				**-9.563** **[0.0054]**	
ADV			-2.933 [0.6640]				-3.830 [0.7582]	
High RD				-0.443 [0.6751]				**-1.076** **[0.0276]**
High ADV				0.288 [0.7794]				-0.324 [0.4227]
CAPEX	9.008 [0.1890]	**10.642** **[0.1132]**	**14.124** **[0.0516]**	**13.618** **[0.0603]**	-2.062 [0.4370]	-1.982 [0.4466]	-1.363 [0.5956]	-0.062 [0.9808]
ΔCAPEX	-1.274 [0.5981]	-1.163 [0.6287]	0.156 [0.9482]	-0.141 [0.9543]	0.241 [0.7957]	0.219 [0.8103]	1.062 [0.2469]	1.205 [0.1941]
SIZE	-0.092 [0.7901]	-0.079 [0.8189]	-0.223 [0.5317]	-0.286 [0.4894]	0.161 [0.1795]	0.153 [0.1825]	0.094 [0.4233]	0.197 [0.2111]
Adj. R^2	0.0624	0.0624	0.0051	0.0044	-0.0120	0.0042	0.1128	0.046
p-value	**0.0424**	**0.0425**	0.3679	0.3743	0.4936	0.3938	**0.0762**	0.2292

Table 3-5: Regression estimates of profitability index on average *q* and cash flows

The dependent variable, *PI*, is defined as (*CAR*MKTCAP*) / |*ΔCAPBUD*|, where *CAR* is the two-day (day -1 and day 0) cumulative abnormal returns in excess of the CRSP value-weighted market index returns, *MKTCAP* is the firm's equity market capitalization two days before the announcement, and *ΔCAPBUD* is the announced dollar change in capital budget from its previous level: *q* is the ratio of a firm's market value over its book value: *q*=[Market value of the firm's common shares + (face value of preferred stocks)/(average medium-risk bond yield) + long-term debt] / [(net property plant and equipment) + (inventory)]; *Low q* takes the value of 1 if *q* is less than unity and 0 otherwise; *Cash flow*=(Operating income before depreciation - interest payments - income taxes - common dividends - preferred dividends + changes in deferred taxes) / (Total assets); *High CF* takes the value of 1 if *Cash flow* is greater than the sample median and 0 otherwise; *Capex* is the average value of capital expenditures (net of acquisitions) per dollar of existing net property plant and equipment over the prior three years: *ΔCapex* is the annual fractional change in capital expenditures (net of acquisitions) averaged over the previous three years: *Size* is the natural logarithm of net property plant and equipment (in $ millions). The number in square brackets is the p-value for the two-tailed significance test.

	increase subsample (5.1)	decrease subsample (5.3)
Intercept	-1.136 [0.7252]	-0.332 [0.7881]
Low *q*	**-2.372** **[0.0786]**	-0.349 [0.4225]
High CF	1.180 [0.2591]	-0.368 [0.3069]
Low *q* ×High CF	0.477 [0.8007]	-0.084 [0.8861]
CAPEX	8.387 [0.2224]	-1.919 [0.4619]
ΔCAPEX	-1.135 [0.6373]	0.102 [0.9119]
SIZE	-0.066 [0.8482]	0.141 [0.2395]
Adj. R^2	0.0657	0.0082
p-value	**0.0593**	0.4005

Table 3-6: Regression estimates of profitability index on management ownership

The dependent variable, *PI*, is defined as (*CAR*MKTCAP*) / |*ΔCAPBUD*|, where *CAR* is the two-day (day -1 and day 0) cumulative abnormal returns in excess of the CRSP value-weighted market index returns, *MKTCAP* is the firm's equity market capitalization two days before the announcement, and *ΔCAPBUD* is the announced dollar change in capital budget from its previous level; a is the level of common stocks owned by a firm's officers and directors: *High* α takes the value of 1 if α is greater than the sample median and 0 otherwise: *Very High* α takes the value of 1 if α is greater than 0.381 (0.318) for the increase (decrease) sample and 0 otherwise [These points are chosen for respective samples because PI in models (6.3) and (6.7) as a function of α and α^2 is respectively maximized at those values]; *Capex* is the average value of capital expenditures (net of acquisitions) per dollar of existing net property plant and equipment over the prior three years; *ΔCapex* is the annual fractional change in capital expenditures (net of acquisitions) averaged over the previous three years; *Size* is the natural logarithm of net property plant and equipment (in $ millions). The number in square brackets is the p-value for the two-tailed significance test for the mean and is the p-value for the signed-rank test for the median.

	Increase Sample				**Decrease Sample**			
	(6.1)	(6.2)	(6.3)	(6.4)	(6.5)	(6.6)	(6.7)	(6.8)
Intercept	-3.807 [0.2779]	-3.227 [0.3757]	-5.691 [0.1167]	-3.709 [0.3068]	-0.776 [0.5430]	-2.447 [0.2222]	-1.327 [0.3131]	-2.947 [0.1618]
α	**5.751** **[0.0375]**		**30.823** **[0.0293]**		0.783 [0.6023]		8.603 [0.1183]	
α^2			**-40.442** **[0.0696]**				-13.517 [0.1394]	
High α		1.321 [0.1545]		1.138 [0.2350]		0.546 [0.2361]		0.581 [0.2111]
Very High α				1.458 [0.4375]				0.620 [0.4043]
CAPEX	**17.128** **[0.0148]**	**13.883** **[0.0415]**	**15.211** **[0.0297]**	**15.738** **[0.0300]**	-1.245 [0.6369]	-0.505 [0.8509]	-2.304 [0.3938]	-0.083 [0.9758]
ΔCAPEX	1.463 [0.5468]	0.533 [0.8234]	1.510 [0.5289]	1.033 [0.6768]	0.768 [0.4280]	0.926 [0.3237]	0.966 [0.3176]	1.182 [0.2342]
SIZE	0.006 [0.9854]	-0.022 [0.9522]	0.234 [0.5322]	0.007 [0.9840]	0.130 [0.2859]	0.283 [0.1306]	0.201 [0.1223]	**0.327** **[0.0956]**
Adj. R^2	0.0587	0.0345	0.0826	0.0303	-0.0430	-0.0150	-0.0124	-0.0220
p-value	**0.0493**	0.1264	**0.0250**	0.1698	0.7175	0.5135	0.4983	0.5550

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Chapter 4

Changes in Management Ownership and the Valuation Effects of Equity Offerings[1]

1. Introduction

Stock prices fall when firms issue more equity to the public. See e.g., Asquith and Mullins (1986), Masulis and Korwar (1986), and Mikkelson and Partch (1986). A widely accepted explanation of this is Myers and Majluf (1984) "lemons" argument. Shareholders know they do not always estimate stock prices correctly, and know managers have better information than they have. Rational managers should tend to issue more shares when the current price is too high, that way the firm (i.e. the existing shareholders) gets more money per share issued. Investors understand this, and consequently interpret an equity issue as signal that a firm's stock price should be lower.

Earlier research does not measure management ownership prior to and following equity offerings. In this paper, we find that average management ownership declines substantially around seasoned equity offerings. Therefore, the issuing firms' managers do not subscribe proportionately to the new issues. In fact, we find that managers tend to actively sell their shares prior to and following equity offerings. We find that the decline in management ownership is inversely related to announcement period stock price revisions.

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[1]Co-authored with Marco Bigelli of the University of Bologna, Vikas Mehrotra and Randall Morck, both of the University of Alberta.

While this is consistent with the signalling hypothesis, it also can be explained by an agency argument. Jensen and Meckling (1976) point out that the less stock managers own, the less their interests correspond to shareholders' interests. Since equity offerings reduce managerial ownership, investors might infer a worsening agency problem, and bid down the issuing firm's stock price.

To distinguish the signalling hypothesis from the agency hypothesis, we exploit theoretical and empirical studies that suggest Jensen and Meckling's argument is part of a more complex nonlinear relationship between managerial holdings and agency problems. See Stulz (1988), Morck et al. (1988), and McConnell and Servaes (1990). These studies argue that firm performance rises with managerial ownership in widely held firms for the reasons Jensen and Meckling cite. But they conclude that firm performance falls with higher managerial ownership in more closely held firms because it protects managers from takeovers, institutional shareholder pressure, and other corporate governance checks and balances that constrain managers in widely held firms.

In subsamples of firms with similar changes in management ownership, we find a significant nonlinear relationship between share price changes in reaction to seasoned equity issues and levels of managerial ownership. This finding is consistent with previous nonlinear cross sectional results using firm performance levels. Since a signalling story does not predict such a relationship, we conclude that part of the stock price decline around seasoned equity offerings is due to investors' expectations of increased agency problems in the issuing firms.

The rest of the paper is organized as follows: Section 2 describes the sample and methodology. Section 3 presents descriptive statistics and our empirical results. Section 4 concludes.

2. Sample and Methodology

2.1 Sample

We use the *Wall Street Journal* (WSJ) CD-ROM database to find announcements of public seasoned equity offerings between September 1991 to December 1992.[2] The WSJ CD-ROM database lets us search for the headline NEW SECURITIES ISSUES from September 1991 on. The headline precedes a list of seasoned and initial public offerings. We consider only seasoned offerings.

There are three types of seasoned equity offerings: a *primary offering* is the sale of new shares that are added to shares outstanding; a *secondary offering* is the sale of shares already included in shares outstanding by a third party block-holder, and a *combination offering* is a simultaneous sale of both new shares by the firm and shares already issued by existing shareholders. We drop purely secondary offerings from our sample.

We cross-check the announcements with the *Wall Street Journal Index*, and if there is any significant confounding event within five days prior to and one day after an equity offering announcement, we drop the observation.

Our final sample of 81 events satisfy the following criteria:

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[2]We believe that our 16-month sampling period is not unusual in any way, and our abnormal returns surrounding these events is consistent with earlier studies.

a) Daily returns for the firms must be available on the Centre for Research in Security Prices tapes for a period starting 360 trading days prior to and including the announcement date. This results in our losing young firms that are issuing more shares shortly after their initial public offerings.

b) The firm's proxy statements are in the microfiches produced by Q Data Corporation.

c) The firm is not in a regulated industry. We drop firms with SIC codes in the 4,000s from the sample.

2.1.1 Abnormal Returns and Managerial Ownership Data

We use a standard event study methodology. A company's announcement period abnormal return is

$$CAR_i \equiv \sum_{t=-1}^{0} (r_{it} - r_{mt}) \qquad (1)$$

where the seasoned offering announcement in the *Wall Street Journal* is on day is t = 0, r_{it} is company i's return on day t, and r_{mt} is the market return the same day. We use the CRSP equal weighted index for r_{mt} because our sample contains relatively small firms. Using the value weighted index gives qualitatively similar results. Adjusting for β risk also has no significant effect.

We examine the proxy statement most immediately prior to and most immediately following each announcement to obtain management share ownership. Management is defined as officers and directors. We use both because we want to gauge insider participation in the share issue, and officers and directors are both clearly insiders for this purpose.

The change in management ownership around a seasoned equity offering is defined as:

$$\Delta\alpha = \alpha_0 - \alpha_1 \qquad (2)$$

where α_0 is managers' fractional ownership before the issue and α_1 is their fractional ownership afterwards.

2.1.2 Other Variables

We calculate a "stock price run up variable", RUNUP, the fractional increase in a firm's stock price from day -360 to day -10, where the offering announcement is on day zero. We measure firm size by the natural log of total assets of the previous year.

2.1.3 *Univariate Statistics*

Table 4-1 reports descriptive statistics of our sample. The mean two-day announcement period abnormal return is -1.8%, and this is significantly different from zero (p=.001). The median is -2.2%, also significantly different from zero (p=.00001 in a rank sign-test). Seventy percent of the firms in our sample have negative abnormal returns. This result is comparable to earlier studies such as Asquith and Mullins (1986).

The mean and median pre-announcement management ownership levels are 22.9% and 18.7%. Compared to Morck, Shleifer and Vishny (1988), who document a mean management ownership of 10.6% for Fortune 500 companies, our numbers are higher. Since

our sample includes NASDAQ firms, which are generally smaller than Fortune 500 firms, this is reasonable.

The mean and median ratio of shares issued to pre-announcement number of shares outstanding, δ, are 23.3% and 18.5%. This is comparable to the primary equity offering sample in Masulis and Korwar (1986), where the analogous numbers are a 14.8% mean and 12.5% median.

Post-announcement management ownership is significantly lower than pre-announcement ownership. The mean decreases from 22.9% to 16.1%, a statistically significant drop of 6.8% (p=0.0001). Of our 81 firms, 77 or 95% of the sample show a decline in management ownership. The decline in management ownership is not solely due to dilution. Had management neither bought nor sold during the equity offerings, the mean post-announcement management ownership level, α_1 would have been 19%. The actual value of 16.1% is significantly different from this (p= .0001). In 62 firms of the 81 firms, managers sell shares around the offering date.

The mean and median cumulative excess stock price run-ups from day -360 to day -10 are 15.9% (p=.006) and 2.6% (p=0.05). Offering firms tend to out-perform the market before equity offering announcements, consistent with Masulis and Korwar (1986).

2.2 Methodology

2.2.1 Signals vs. Scoundrels

We propose two ways of distinguishing a signalling reaction to the securities issue, as in Myers and Majluf (1984), from an agency costs reaction as in Jensen and Meckling

(1976). Both involve relating the change in managerial stock ownership around the issue to the contemporaneous stock price movement.

2.2.2 Louder and Softer Signals

First, we hypothesize that any negative signalling effect of the offering should be heightened if managers simultaneously dump their companies' shares.

It is useful to decompose $\Delta\alpha$ into two components. We define α_d as what managerial ownership would have been after the issue if managers had neither bought nor sold any stock, that is

$$\alpha_d = \frac{1}{1 + \delta}\,\alpha_0 \tag{3}$$

The d subscript indicates that this is what α would be if the only effect were the dilution due to the equity offering, which increases outstanding equity by the fraction δ.

$$\delta \equiv \frac{\textit{number of additional shares issued}}{\textit{number of shares outstanding before offering}} \tag{4}$$

The first component of $\Delta\alpha$ is the change that would have occurred had managers neither bought nor sold any shares,

$$\Delta\alpha_d = \alpha_0 - \alpha_d. \tag{5}$$

The second is the change in management ownership due to active buying or selling of stocks around the offering,

$$\Delta\alpha_t = \alpha_d - \alpha_1 \qquad (6)$$

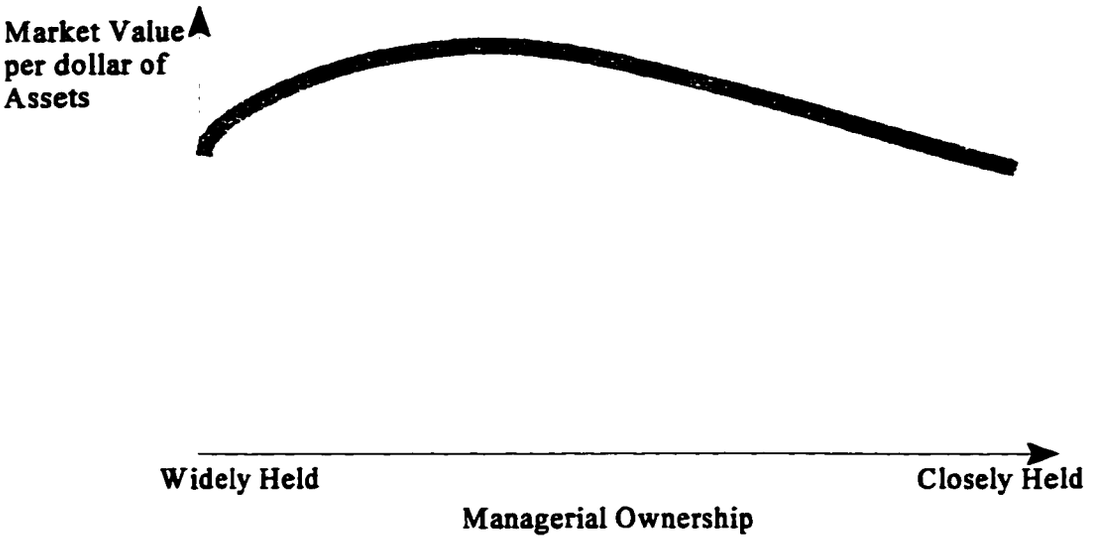
If $\Delta\alpha_t$ is negative, managers have bought shares in their own company around the offering, if $\Delta\alpha_t$ is positive, they have sold.

If signalling is the important determinant of stock price changes around seasoned equity issues, we expect the decomposition into $\Delta\alpha = \Delta\alpha_t + \Delta\alpha_d$ to explain abnormal returns better than $\Delta\alpha$. A positive $\Delta\alpha_t$, indicating that managers are dumping stock around the issue date, reenforces the interpretation that managers view the stock as overvalued.

2.2.3 Larger and Smaller Scoundrels

Jensen and Meckling (1976) suggest that agency conflicts increase as managerial stock ownership decreases. However, Stulz (1988) modifies their model in plausible ways to derive a non-linear relationship. The modification is to recognize that takeovers are an important constraint on agency conflicts, and that freedom from any threat of a takeover might lead to increased opportunistic behaviour by managers. When managerial ownership is high, a hostile takeover is impossible. Stulz therefore suggests that low and high levels of managerial ownership should be associated with severe agency conflicts, while median levels should be associated with fewer such conflicts. Morck et al. (1988), McConnell and Servaes (1990) and others have found empirical evidence of such a non-linear relationship, although the exact functional form of the relationship appears to depend on the definition of managerial ownership and on factors related to firm size. Figure 4-1 illustrates.

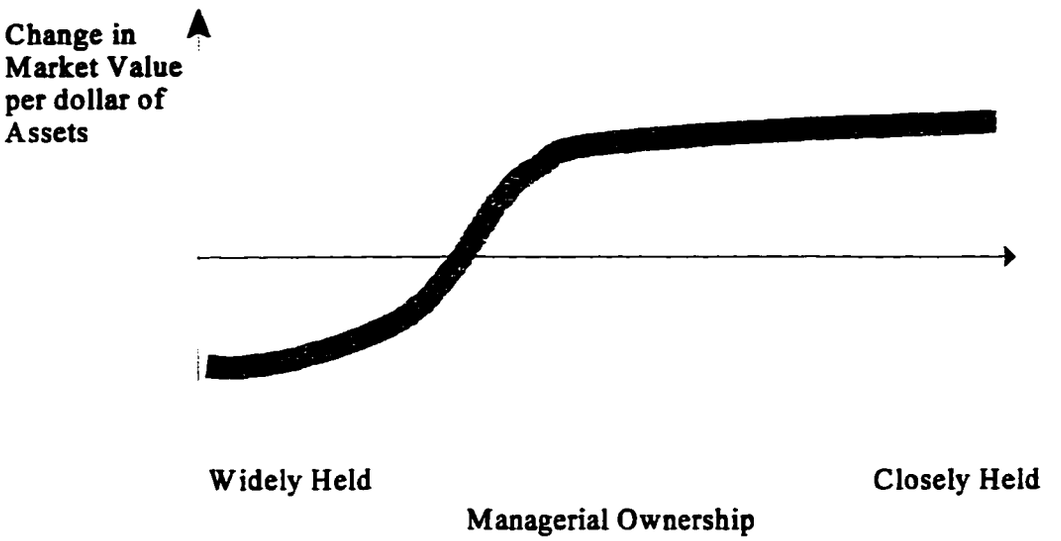
Figure 4-1: Firm Value vs. Managerial Ownership



Since the changes in managerial ownership around seasoned equity offerings are large, if an agency conflict interpretation is more important than signalling, we should detect different changes in share value for falls in managerial ownership from above a certain initial level. If initial ownership is high enough to block a takeover and post offering ownership is not, value should rise. If initial managerial ownership is insufficient to block a takeover, a further decrease due to the offering should reduce firm value. In this study, we are

examining events that decrease α. Figure 4-2 illustrates what Figure 4-1 implies about the relationship between unit decreases in α and CARs.

Figure 4-2: Abnormal Return Due to A Unit Decrease in Managerial Ownership As A Function of Initial Managerial Ownership



To investigate such an effect, we relate α_0^2 to our abnormal returns. We also run piecewise linear regressions of abnormal returns on the following variables,

$$\pi_1 \equiv \begin{cases} \alpha_0 & \text{if } \alpha_0 < \alpha_{low} \\ \alpha_{low} & \text{if } \alpha_0 \geq \alpha_{low} \end{cases}$$

$$\pi_2 \equiv \begin{cases} 0 & \text{if } \alpha_0 < \alpha_{low} \\ \alpha_0 - \alpha_{low} & \text{if } \alpha_{low} \leq \alpha_0 < \alpha_{hi} \\ \alpha_{hi} & \text{if } \alpha_0 \geq \alpha_{hi} \end{cases} \qquad (7)$$

$$\pi_3 \equiv \begin{cases} 0 & \text{if } \alpha_0 < \alpha_{hi} \\ \alpha_0 - \alpha_{hi} & \text{if } \alpha_0 \geq \alpha_{hi} \end{cases}$$

We allow the data to choose α_{low} and α_{hi}. A nonlinear effect should exist only if expected changes in agency conflicts are the main determinant of share price changes around seasoned offerings. If signalling is important, this nonlinear relationship should be absent.

3. Statistical Analysis

3.1 Market reactions to changes in management ownership

Table 4-2 reports means and median two-day abnormal returns for various sub-samples, stratified according to the extent of the decline in management ownership and the extent of management participation in the equity offering.

Panel A in Table 4-2 compares abnormal returns for sub-samples with above vs. below median management ownership declines. The mean and median abnormal return are -3.2% and -2.8% and significantly different from zero only for the sub-sample where management ownership declines by more than the median decline. Test for equal means and the Wilcoxon signed-ranks test for equal medians both indicate that the returns in the two subsamples are significantly different from each other.

Panel B in Table 4-2, divides the sample into the 62 firms whose managers sell stock around the offering date, and the 19 firms whose managers buy or hold. The mean and median abnormal returns for the sub-sample where managers sell are -2.2% and -2.3%; both are statistically significant. For the sub-sample of firms where management does not sell, the mean and median abnormal returns are not statistically different from zero. However, neither the means test nor the Wilcoxon signed-rank test can reject the null hypothesis of equal mean or median abnormal returns across the two sub-samples. The tests lack power because the buy or hold subsample is small.

Regression 4.1 of Table 4-4 shows that the R^2 of a regression of abnormal return on the decomposition of $\Delta\alpha$ into $\Delta\alpha_d$ and $\Delta\alpha_t$, 8.2%, is statistically significantly higher than the R^2 of a similar regression with $\Delta\alpha$ alone, 6.2%. Including controls for the size of the run up, firm size, and initial managerial ownership does not affect this finding.

3.2 Changes in management ownership and stock price run-up

Table 4-3 divides the sample into two using the sample median cumulative excess stock price run-up from 360 to 10 trading days prior to the equity offering. The mean and median declines in management ownership are 8.7% and 5.3% for the steep run-up firms, but are only 4.9% and 3.7% for the flat run-up firms. The difference in the average decline in management ownership between the two sub-samples is mostly due to active selling by managers. The mean and median values of $\Delta\alpha_t$, the change in management ownership due to active trading are 4.3% and 2.6% for the steep run-up sub-sample, but only 1.4% and 1.3% for the flat run up sub-sample.

3.3 Management Entrenchment and Seasoned Equity Offerings.

Table 4-4 shows regressions of abnormal returns on the three piecewise linear measures of ownership defined above, π_1, π_2, π_3.[3] We use only 77 of our 81 observations to estimate the regression, as management ownership increases around the equity offering in 4 firms. The significant negative coefficient on π_2 in regression 4.2 implies that a fall in

[3]We do not adjust for heteroscedasticity since White tests fail to reject homoscedastic residuals at conventional significance levels for all regressions in Table 4-4.

management ownership decreases shareholder value when initial ownership is low, consistent with Jensen and Meckling (1976). The significant positive coefficient on π_3 means decreases in management ownership increase shareholder value when it is initially high, consistent with Stulz (1988). Recall that $\Delta\alpha$ is always negative.

Regression 4.3 repeats this finding using initial managerial ownership and its square to capture the nonlinearity. Initial managerial ownership, α_0, has a negative significant coefficient, while α_0^2 has a positive and significant coefficient. Again, decreasing managerial ownership costs shareholders money when managerial ownership is initially low, but adds value when it is initially high.

The coefficients of regression 4.3 imply that at any level of initial managerial ownership above 68% the CAR should be positive. This corresponds to the level of managerial ownership that maximizes firm value in the context of McConnell and Servaes (1990) or Morck, Shleifer and Vishny (1988).

Regressions 4.4 and 4.5 repeat 4.2 and 4.3, but include $\Delta\alpha_t$ and $\Delta\alpha_d$. Active trading by managers, as measured by $\Delta\alpha_t$ is significant, consistent with signalling playing a role. Including $\Delta\alpha_t$ and $\Delta\alpha_d$ renders π_2 and α_0 insignificant. This may be due to collinearity between α_0 and $\Delta\alpha_d = \alpha_d - \alpha_0$. Regressions 4.6 and 4.7 repeat 4.4 and 4.5, but including $\Delta\alpha_t$ as the only additional variable. The coefficients on π_2 and α_0 are now insignificant. The R^2s of regressions 4.5 and 4.7 are both significantly greater than that of 4.1. Those of 4.6 and 4.4 are significantly greater than the R^2 of regression 4.2.

Earlier research indicates that the issue size and the previous run up are sometimes significantly related to abnormal returns.[4] When we include the size of the issue as a fraction of initial stock outstanding, δ, the price run up from day -360 to day -10, RUNUP, and firm size in any of the regressions in Table 4-4, the parameter estimates and their significance levels do not change greatly. When δ and RUNUP alone are included, they are insignificant.

4. Conclusions

Managers tend to sell stock in their own firms around the times seasoned equity is issued. Such issues also follow substantial pre-offering price run ups. Active selling by managers, as opposed to reductions in their stakes due to dilution, is correlated with negative price reactions. We view this evidence as consistent with the lemons and signalling hypothesis of Myers and Majluf (1984), that these firms' shares are overvalued.

However, we also find managerial ownership generally falls when seasoned equity is issued. In a subsample of firms where it does so, seasoned equity issues reduce share prices in firms with low initial managerial ownership, but increase share prices when initial managerial ownership is high. We view this as consistent with the corporate control

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[4]While Asquith and Mullens (1986) and Masulis and Korwar (1986) both find large issues correlated with more negative price reactions, Hess and Bhagat (1986) find no significant relationship between issue size and CARs. Evidence on the effect of stock price run-ups prior to equity offering announcements is also mixed. Asquith and Mullins (1986) find that price reactions significantly and positively related to the 11-month prior run up. However, Masulis and Korwar (1986) find a abnormal returns significantly negatively related to the 60-day prior run up.

literature (Jensen and Meckling 1976; Morck, Shleifer and Vishny 1988; McConnel and Servaes 1990) that relates firm value to managerial ownership, and therefore changes in firm value to changes in managerial ownership.

We conclude that share price changes around seasoned equity offerings are partly due to lemons and signalling, but also partly due to changes in managerial ownership that have corporate governance implications.

Table 4-1

Descriptive statistics for the sample of 81 seasoned equity offerings from September 1991 through December 1992

CAR is the two-day announcement period excess return over the CRISP equally-weighted index return. α_0 and α_1 are the pre- and post-announcement management ownership levels, respectively. $\Delta\alpha = \alpha_0 - \alpha_1$ is thus the decline in management ownership induced by the equity issue. α_d is the level of management ownership had managers remained totally passive during the equity offering, $\Delta\alpha_d = \alpha_0 - \alpha_d$ measures the dilution effect and $\Delta\alpha_t = \alpha_d - \alpha_1$ measures the management participation effect. δ is the relative size of the equity issue to the number of outstanding shares before the issue. RUNUP is a firm's cumulated excess return over the period of 360 to 10 trading days before the announcement date. SIZE is the natural logarithm of a firm's total assets (in $million) at the end of previous fiscal year before the equity offering.

Variables	Mean	Median	Min	Max	Percent Negative
CAR	-0.018***	-0.022***	-0.152	0.153	70
α_0	0.229	0.187	0.007	0.837	
α_1	0.161	0.121	0.006	0.664	
$\Delta\alpha$	0.068***	0.045***	-0.047	0.353	9
$\Delta\alpha_d$	0.039***	0.029***	0.001	0.211	0
$\Delta\alpha_t$	0.028***	0.016***	-0.085	0.297	23.5
δ	0.233	0.185	0.049	2.825	
RUN-UP	0.159***	0.026**	-0.625	2.354	47
Firm size	5.090	4.928	1.110	9.101	

*** The value is statistically significant at 1%; ** The value is statistically significant at 5%.

Table 4-2

Mean and median CARs and numbers of negative and positive CARs for subsamples partitioned by the extent of declines in management ownership and share sales by managers

The announcement period cumulative abnormal return (CAR) is

$$CAR_t \equiv \sum_{t=-1}^{0} (r_{it} - r_{mt})$$

where r_{it} is the rate of return for company i on day t and r_{mt} is the rate of return on the CRSP equally-weighted index on day t. The announcement date in the *Wall Street Journal* is defined as day 0.

	Mean	Median	% CARs < 0	CARs (#<0, #>0)
Panel A				
Decline in management ownership <= sample median	-0.005	-0.019	65.9	(27, 14)
Decline in management ownership > sample median	-0.032***	-0.028***	75	(30,10)
Difference	0.027**	0.009**	-9.1	
Panel B				
Management sells shares	-0.022***	-0.023***	69.4	(43,19)
Management does not sell shares	-0.007	-0.022	73.7	(14,5)
Difference	-0.015	-0.001	-4.3	

*** Statistically significant at 1%; ** Statistically significant at 5%

Table 4-3
Mean and median declines in management ownership for sub-samples partitioned by the sample median cumulative excess stock price run-up from 360 to 10 trading days prior to the equity offering

$\Delta\alpha = \alpha_0 - \alpha_1$ is the total change in management ownership; $\Delta\alpha_d = \alpha_0 - \alpha_d$ measures the dilution effect and $\Delta\alpha_t = \alpha_d - \alpha_1$ measures the management participation effect; α_0 and α_1 are the level of pre- and post-announcement management ownership, respectively, and α_d is the level of management ownership had management remained totally passive during the equity offering. RUNUP is the cumulative excess stock price run-up from 360 to 10 trading days prior to the equity offering.

	$\Delta\alpha$		$\Delta\alpha_d$		$\Delta\alpha_t$	
	Mean	Median	Mean	Median	Mean	Median
RUNUP ≤ median	4.9%***	3.7%***	3.5%***	2.2%***	1.4%***	1.3%***
RUNUP > median	8.7%***	5.3%***	4.4%***	3.1%***	4.3%***	2.6%***
Difference	-3.8%**	-1.6%**	-0.9%	-0.9%	-2.9%**	-1.3%**

*** Statistically significant at 1%; **Statistically significant at 5%; * Statistically significant at 10%.

Table 4-4
OLS estimates of two-day announcement period abnormal returns on pre-announcement management ownership, changes in management ownership, and management participation.

Variable	4.1	4.2	4.3	4.4	4.5	4.6	4.7
Intercept	-0.008	-0.011	0.0009	-0.012	-0.003	-0.011	-0.002
π_1		0.057		0.168		0.076	
π_2		-0.147*		-0.039		-0.092	
π_3		0.149*		0.234**		0.127*	
$\Delta\alpha_d$	-0.023			-0.414*	-0.397		
$\Delta\alpha_t$	-0.263**			-0.235**	-0.243**	-0.232**	-0.240**
α_0			-0.182**		-0.064		-0.106
α_0^2			0.268**		0.236*		0.185
R-square	0.0820	0.0673	0.0546	0.1501	0.1385	0.1180	0.1089
p-value	0.0572	0.1634	0.1252	0.0379	0.0280	0.0571	0.0371

***Statistically significant at 1%; ** Statistically significant at 5%; * Statistically significant at 10%.

α_0 and α_1 are the level of pre- and post-announcement management ownership, respectively, and α_d is the level of management ownership had management remained totally passive during the equity offering. $\Delta\alpha = \alpha_0 - \alpha_1$ is the total change in management ownership; $\Delta\alpha_d = \alpha_0 - \alpha_d$ measures the dilution effect and $\Delta\alpha_t = \alpha_d - \alpha_1$ measures the management participation effect; the π_i's are defined as follows:

$\pi_1 = \alpha_0$ if $\alpha_0 < 0.10$,
$= 0.10$ otherwise;
$\pi_2 = 0$ if $\alpha_0 < 0.10$,
$= \alpha_2 - 0.10$ if $0.10 =< \alpha_0 < 0.35$,
$= 0.25$ if $\alpha_0 >= 0.35$;
$\pi_3 = 0$ if $\alpha_0 < 0.35$,
$= \alpha_0 - 0.35$ if $\alpha_0 > = 0.35$.

These variables define a piecewise linear relationship between management ownership and CAR. The break points .10 and .35 were selected to maximize the R^2. We exclude firms that experience increases in management ownership (i.e., 77 out of 81 firms are used).

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Chapter 5

General Discussion and Conclusions

One of the key functions served by stock markets is to allocate scarce capital resources to their best use by efficiently incorporating into stock prices both market-wide and firm-specific information. Chapter 2 of the thesis is an investigation of forty national stock markets around the world to assess their ability in processing information. We define two measures to gauge stock markets' information content. These measures are higher if stock pricing is more based on firm-specific information rather than market-wide factors. First, we find that the information content measures are higher in more industrialized economies than in emerging economies. This is corroborated by the finding that the allocational efficiency has improved over time from the mid 1920s to the present in the United Sates. Furthermore, we find significant and positive correlations between the information content measures and the extent of legal and institutional sophistication in our sample countries. More specifically, our findings suggest that stock market efficiency critically depends on the following factors: 1) protections of shareholders rights against corporate insiders, 2) respect of law and order, 3) efficient judicial systems, and 4) honest government.

If stock markets are to properly play their major role as an information processing mechanism in allocating scarce capital resources, it is crucial, as suggested by our findings, that national governments should legislate laws protecting minority shareholders' rights, establish efficient judicial systems independent of government interventions, and minimize

government corruption. The improved stock market efficiency, according to economics theory, should lead to better use of capital and hence faster economic growth.

While Chapter 2 debates about stock market efficiency, Chapters 3 and 4 take market efficiency as granted. Since Chapters 3 and 4 address market valuation issues in the United States which has one of the most efficient stock markets in the world, it's probably safe to assume market efficiency. The two chapters address one of the key issues in corporate finance: Given the separation of corporate ownership and control, how important is the agency problem that arises from the separation? More specifically, are decisions made by corporate managers, who may own little equity in the firm, always consistent with shareholders' interest? Chapter 3 examines the question by investigating cross-sectional variations in market reactions to capital investment decisions made by managers. From normative finance theory, one would expect managers to only undertake investment projects that have positive net present values (NPVs), and similarly, abandon projects with negative NPVs. However, if managers pursue their own interests at the expense of shareholders, the expectation may not be fulfilled. Indeed, we find that investment decisions made by managers, on average, do not enhance shareholders' interests. Furthermore, we find that the market conditions its response to investment decisions on management's track record and the extent of alignment of interest between corporate insiders and outside shareholders. More specifically, firms that have invested smartly in the past tend to be much better received by the market when new investments are being made; firms whose managers have higher stakes in them tend to be better received by the market.

Chapter 4 examines the effect of declines in management ownership on share price

revisions in the context of seasoned equity offerings. Seasoned equity offerings typically trigger negative market reactions. The explanation offered most often is that an equity offering is a signal to the market that the stock price is over-valued and hence investors will bid down the stock price. This is because managers, having more information about the firm than investors, tend to issue new shares when they believe the stock price is favorable. In addition to the signaling explanation, we argue that the fall in share prices around equity offerings can be partly due to the worsening agency problem caused by the declines in management ownership. We find that, on average, management ownership decreases substantially after equity offerings. We differentiate firms with initially low management ownership from those with high management ownership, because for firms that have low initial management ownership, the declines in management ownership would most likely worsen the agency problem; however, for firms that have high initial management ownership, which may have protected managers from market pressure, the declines could improve firm value. We find evidence supporting the hypotheses.

The findings in Chapter 3 and 4 provide additional evidence to the empirical corporate finance literature that agency problems due to the separation of corporate control and ownership are one of the major determinants of firm value. The relationship between firm value and management ownership does not seem linear. Low (less than five percent) and extremely high (greater than fifty percent) management ownership seem detrimental to firm value, while median levels of management ownership enhances firm value.