NBER WORKING PAPER SERIES

R-SQUARED AROUND THE WORLD: NEW THEORY AND NEW TESTS

Li Jin
Stewart Myers

Working Paper 10453
http://www.nber.org/papers/w10453

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
April 2004

We thank Toby Moskowitz, Rene Stulz, Robert Taggart and Sheridan Titman for helpful comments, and the Research Computing Services Group at Harvard Business School, especially James Zeilter, for help with obtaining and understanding the data used in this paper. Anna Yu and Alvaro Vivanco provided helpful research assistance. The views expressed herein are those of the author(s) and not necessarily those of the National Bureau of Economic Research.

R-Squared Around the World: New Theory and New Tests
Li Jin and Stewart Myers
NBER Working Paper No. 10453
April 2004
JEL No. G12, G14, G15, G38, N20

ABSTRACT

Morck, Yeung and Yu (MYY, 2000) show that R^2 and other measures of stock market synchronicity are higher in countries with less developed financial systems and poorer corporate governance. MYY and Campbell, Lettau, Malkiel and Xu (2001) also find a secular decline in R^2 in the United States over the last century. We develop a model that explains these results and generates additional testable hypotheses.

The model shows how control rights and information affect the division of risk-bearing between inside managers and outside investors. Insiders capture part of the firm's operating cash flows. The limits to capture are based on outside investors' perception of the value of the firm. The firm is not completely transparent, however. Lack of transparency shifts firm-specific risk to insiders and reduces the amount of firm-specific risk absorbed by outside investors. Our model also predicts that "opaque" stocks are more likely to crash, that is, to deliver large negative returns. Crashes occur when insiders have to absorb too much firm-specific bad news and decide to "give up."

We test these predictions using stock returns from all major stock markets from 1990 to 2001. We find strong positive relationships between R^2 and several measures of opaqueness. These measures also explain the frequency of large negative returns.

Li Jin
Harvard Business School
ljin@hbs.edu

Stewart C. Myers
Sloan School of Management
MIT, Room E52-451
50 Memorial Drive
Cambridge, MA 02142-1347
and NBER
scmyers@mit.edu

1. Introduction

Morck et al. 2000 show that R^2 and other measures of stock-market synchronicity are higher in countries with relatively low per-capita GDP and less-developed financial systems. MYY and Campbell et al. 2001 also find a secular decline in R^2s in the United States over the last century. These are intriguing and important results, which suggest that we may be able to learn about corporate finance and governance not just from the level of stock prices, or from short-term event studies, but also from the second or higher moments of stock returns.

Of course there are many possible explanations for the inverse relationship between financial development and R^2s, explanations that have nothing to do with corporate finance or governance. The pattern of R^2s could reflect higher macroeconomic risk or lack of diversification across industries in smaller, less-developed countries. MYY control for such effects assiduously. The cross-country pattern in R^2s remains.

MYY propose that differences in protection for investors' property rights could explain the connection between financial development and R^2. MYY are on the right track, but it turns out that imperfect protection for investors does not affect R^2 if the firm is completely transparent. Some degree of opaqueness (lack of transparency) is essential.

We show how limited information affects the division of risk-bearing between insiders and outside investors. Insiders capture part of the firm's operating cash flows. That is, they extract more cash than they would receive if investors' property rights could be completely protected. The limits to capture are based on outside investors' perception of the firm's cash flow and value. This perception is imperfect. Investors can see some changes in cash flow, but not all changes. When cash flows are higher than investors think, insiders' capture increases. When cash flows are lower than investors think, insiders are forced to reduce capture if they want to keep running the firm. Increased capture therefore reduces the amount of firm-specific risk absorbed by outside investors. An increase in opaqueness, combined with capture by insiders, leads to lower firm-specific risk for investors and to higher R^2s.

1.1. Opaqueness and investor protection

In practice opaqueness and imperfect protection of investors' property rights go together and probably are mutually reinforcing. Insiders may make the firm more opaque to protect their capture of cash flow, for example. We would not expect perfect protection of investors in an opaque firm. Nevertheless, we draw a distinction between opaqueness and poor protection of investors. That distinction is important to our model and tests.

Poor protection without opaqueness is not enough to explain high R^2s. Consider a simple example. Suppose that poor protection of investors' property rights allows insiders to capture half of the firm's cash flows. Outside investors can see all of the firm's cash flows (complete transparency) but can't prevent capture. Therefore the stock-market value of the firm is half its potential value. Market value still fluctuates as cash flows are realized and the firm's overall value is updated, but by only half of the unexpected change in potential value. The *percentage* changes in market value are *not* affected by the insiders' capture, however. Rate-of-return variance is unchanged. Investors capture half of any value change due to firm-specific information, and also half of any value change due to market risk, i.e., market-wide, "macro" information. The *proportions* of firm-specific and local market volatility are unaffected by insiders' capture. R^2 is not affected.

The story changes when the firm is not completely transparent. Change the example so that outside investors can observe all market-wide information, but only part of firm-specific information. Insiders still capture half of the firm's cash flows on average, but they capture more when the hidden firm-specific information is positive and less when it is negative. Opaqueness therefore requires insiders to soak up some firm-specific variance. The firm-specific variance absorbed by investors is correspondingly lower. Of course investors absorb all market risk – macroeconomic information is presumably common knowledge. Thus the ratio of market to total risk is increased by opaqueness. Higher R^2s are caused by opaqueness, not by poor investor protection.

The more opaque the firm, the greater the amount of hidden, firm-specific bad news that may arrive in a given span of time. The amount of bad news that insiders are willing to absorb is limited.[1] But if a sufficiently long run of bad firm-specific news is encountered, insiders give up, and all the bad news comes out at once. Giving up means a large negative outlier in the distribution of returns.

[1] The amount of good news absorbed is, in our model, potentially unlimited. Insiders can hide good news simplyby capturing the increased cash flows.

Therefore we also predict that stocks in more opaque countries are more likely to crash, that is, to deliver large negative returns, than stocks in relatively transparent countries.

But why should insiders absorb any firm-specific risk on the downside? Why don't they hide the upside and reveal the downside? The answer, of course, is that insiders would always report bad news even when the true news is good.[2] Bad news is credible only when reported at a cost -- the cost of hiring credible auditors and opening up the firm's books to outsiders, for example, or the personal costs borne by insiders if they are ejected when bad news is released. These costs set the strike price of the insiders' abandonment option, which is exercised after the insiders soak up a sufficient run of hidden bad news. We discuss this option later.

We have discussed the case of full transparency but limited protection of investors – the case where insiders can capture cash flow in broad daylight with no impact on R^2. Consider the opposite extreme case. Suppose that investors could enforce their property rights fully and costlessly whenever they receive information about cash flows or firm value. They obtain every dollar of cash flow or value that is apparent to them. Nevertheless, if the firm is not completely transparent, insiders can still capture unexpected cash flows that are not perceived by investors. They will soak up some firm-specific risk. Again, the more opaque the firm, the higher its R^2.

There is only one case where greater opaqueness does not reduce R^2. The case is improbable but worth noting for completeness. Imagine an opaque firm run by a saintly manager who always acts in shareholders' interest, never taking a dollar more or less than deserved. That manager does not have to soak up any firm specific risk. All firm-specific good or bad news is absorbed by investors sooner or later, even if they cannot see the news as it happens.

The properties of stock market returns in this case depend on how information is finally released. There are three possibilities. (1) If the saintly manager reports everything promptly and credibly, opaqueness is eliminated and returns are not affected. (2) Suppose that hidden news is revealed after a stable lag. Then the average amount of firm-specific information released in any period is the same as for a transparent firm. Average firm-specific variance and R^2 are not affected by delayed reporting. (3) If a stable lag is implausible, think of good or bad news accumulating within the firm

[2] We assume that insiders can't be forced to report truthfully by some mechanism for punishment after the fact. If such a mechanism exists, it is evidently not effective – otherwise firms would be transparent. In real life they are not transparent, especially in developing economies.

until the difference between intrinsic value and share price reaches a critical value. The news would then be released all at once, like a pressure vessel letting off steam. The releases would not affect average, long-run R^2s, although we would see long tails in the distribution of stock returns. (We will control for kurtosis in our tests.)

1.2. Summary of predictions and results

Our theory makes two basic predictions. (1) Other things equal, R^2s should be higher in countries where firms are more opaque (less transparent) to outside investors. (2) Crashes, that is, large, negative return outliers, should be more common for firms in less transparent countries. These are not market-wide crashes, but large, negative, market-adjusted returns on individual stocks.

We test our model's predictions using returns from all major stock markets from 1990 to 2001. We confirm that R^2 is higher in countries with less developed financial systems, and we find evidence that R^2 is declining over time internationally. We also find a positive relationship between country-average R^2sand several measures of opaqueness. Finally, we show that the frequency of large negative returns is higher in markets with high R^2 and in countries with less developed financial markets. The frequency of large negative returns is also positively related to our measures of opaqueness.

We do not claim that our model is the exclusive explanation of the differences in R^2s across countries or over time. For example, countries with less developed financial markets are more liable to episodes of political risk, which may translate into increased market risk. Higher market risk obviously generates higher R^2s, other things equal. Therefore we will control for cross-country differences in market risk in our tests.

1.3. Prior research

There is not much prior work on our topic. The two leading articles, MYY (2000) and Campbell, *et al.* (2001) were noted above. Related papers include Wurgler (2000), who finds that capital is more efficiently allocated in countries with better legal protection for minority investors and more firm-specific information in stock returns.

MYY (2000) suggest that poor protection of investors could make firm-specific information less useful to risk arbitrageurs, decreasing the number of informed traders relative to noise traders. If the noise traders "herd" and trade the market rather than individual stocks, market risk may be higher in less developed financial markets.[3] Thus poor protection of investors could affect R^2 through two channels. (1) Poor protection could increase market risk. (2) Poor protection could proxy for more opaqueness, which shifts firm-specific risk from outside investors to inside managers. We focus on channel (2), but we will control for channel (1) by including the level of market risk as a control variable.

Bushman et al. (2003) study two kinds of transparency: financial transparency (the intensity and timeliness of financial disclosures, including interpretation and coverage by analysts and the media) and governance transparency (for example, the identity, remuneration, and shareholdings of officers and directors). They find that financial transparency is lower in countries with a high share of state-owned enterprises and in countries where firms are more likely to be harmed by revealing sensitive information to competitors or local governments. Governance transparency is higher in countries with high levels of judicial efficiency and common-law legal origin, and in countries where stock markets are active and well-developed.

Active security analysts should make firms more transparent. Chang et al. (2001) demonstrate a wide variation in the security-analyst activity in 47 countries. They suggest that transparency is primarily influenced by countries' legal systems and information infrastructure. The organizational structure of firms -- whether they operate as groups or conglomerates, for example – seems less important. Our tests will use a measure of transparency based on the dispersion of analysts' forecasts.

Bris, Goetzmann and Zhu (2003) explore international differences in the cost or feasibility of short sales. They find that restrictions on short-selling reduce the amount of cross-sectional variation in

[3] We see no reason why the effects of noise trading should be confined to market returns, however. That result does not follow from De Long et al. (1989, 1990, 1991), despite their suggestion that the risks created by noise traders should be assumed to be market-wide and not firm-specific (1990, p. 707). This paper only considers a single-asset economy.

equity returns. Their results are consistent with our theory if restrictions on short-selling make the firm more opaque.

Our paper also joins a larger number of more general studies of investor protection, corporate governance and the development of financial markets around the world. These include La Porta et al. (2000, 2002), Friedman and Johnson (2000) and Rajan and Zingales (2001).

Our results can also be compared to Easley and O'Hara (2002) and O'Hara (2003), who discuss the effects of public vs. private information on firm value. In these papers, private information gives informed traders an edge in forming optimal portfolios, leaving the uninformed traders with more risk to bear. The uninformed traders demand higher expected returns, thus decreasing the value of firms that generate less public and more private information. We also distinguish public and private information, but assume that *all* outside investors are imperfectly informed. All private information is held by inside managers, so long as the inside managers do not "give up" and release it.

The next section presents our theoretical model. Proofs and technical details have been moved to Appendix A. Section 3 describes the data, explains the setup of the empirical tests and presents our results. Section 4 wraps up the paper and notes several issues open for future research.

2. A model of control and risk-bearing when outside investors have limited information

We extend Myers (2000) to situations where outside investors cannot see what firm value really is. The firm is partly opaque. If good news arrives that investors cannot see, insiders can capture more cash flow than if the firm were completely transparent.

The information received by investors in a particular firm is a combination of macroeconomic and firm-specific news. But the macroeconomic news can be separated, because it is common to all firms. We therefore assume that outside investors can observe a market factor that drives all stocks' returns, as well as *some* firm-specific information. Lacking a more precise estimate, the outside investors replace the missing firm-specific information with its expected value, conditioned on the information that investors do have.

The firm has an operating asset. For simplicity, we ignore depreciation and reinvestment.[4] The outside equity investors own all the firm's shares[5] and can take over the operating asset if they are willing to incur a cost of collective action. Define K_t, the *intrinsic value* of the firm, as the present value of future operating cash flows, discounted by a constant cost of capital r. If future cash flows and firm values are interpreted as certainty equivalents, r is the risk-free rate. Given the information set I_t at date t,

$$K_t(I_t) = PV\{E(C_{t+1}|I_t), E(C_{t+2}|I_t), \ldots; r\} \quad (2.1)$$

The operating asset's existence and ownership are verifiable. The inside managers cannot take the asset, but can intercept cash flow, which is not verifiable. Taking part of the cash flow compensates the insiders for their firm-specific human capital.[6] The insiders will take as much cash as possible, however, up to the point where further capture would jeopardize their continued right to manage the firm and capture cash flow in future periods. Any cash flow not captured is paid out as a dividend.[7]

Outsiders can seize the firm and fire the managers. This requires costly collective action. The net value that outsiders can get by taking over the firm is denoted by αK_t, where $\alpha < 1$ is a parameter measuring the efficiency of corporate control. A low value of α indicates a high cost of collective action.[8]

The ability of outside investors to take over the firm determines its market value. Outsiders will take over unless they expect future dividends with present value at least equal to $\alpha K_t(I_t)$, their

[4] It is easy to introduce depreciation and re-investment according to a pre-defined schedule. But discretionary investment would introduce complications not modeled here. If the decision to invest can be observed, then a new information channel is opened up from the inside managers to outside investors. On the other hand, outside investors may not be able to observe whether an investment has actually been made until the investment project is complete and operating. In that case insiders would have strong incentives to "invest" money into their own pockets. See Myers (2000, pp. 1030-1033).

[5] None of the following analysis is changed if insiders own some of the firm's shares, provided that insiders cannot block outside investors' property rights completely. We can rule that out. Total blockage would mean that the firm has no value to outside investors and that the firm could not go public and enter our sample.

[6] In Myers (2000), the inside manager contributes human capital that augments the firm's operating cash flows by a factor $m \geq 1$. Here we assume $m = 1$ for simplicity.

[7] The model is not restricted to dividend-paying firms. The "dividend" could be an increase in the verifiable value of the operating asset. Investors don't care whether their returns come as cash payouts or as increases in the net value that investors can realize by exercising their control rights.

[8] Jensen and Meckling (1976) would interpret α as the result of outside investors' optimal outlays on monitoring and control. At the optimum, the marginal benefit of monitoring and control equals the marginal cost. Here the marginal benefit is additional cash paid out to investors. Optimal monitoring and control does not force payout of all cash, so the optimal α is less than 1.0.

expected payoff from taking over immediately at date t. Insiders will pay the minimum dividend sufficient to forestall takeover, conditional on what outside investors know. If outside investors have full information, and know that the operating asset is worth $K_t(I_t)$, the minimum dividend Y is $Y = r\alpha K_t(I_t)$.[9]

The insiders can leave the firm at any time, taking all the current-period cash flow with them. There is a cost of departing, however, including the lost opportunity to capture future cash flows for at least one future period. Myers (2000) describes the conditions under which the insiders find it optimal to stick to the firm for one more period, rather than departing and setting up their tents elsewhere. We use his results here.

In summary, the insiders must take one of two actions in each period: (1) pay a dividend sufficient to satisfy investors or (2) capture all current period cash flow, triggering collective action and takeover by outside investors. Action (2), which amounts to exercise of an abandonment option, imposes a cost on the managers, but can relieve them from hiding and absorbing an accumulation of negative, firm-specific information.

We now give a more formal statement of the model.

2.1. Model setup

Assume that the firm's cash-flow generating process is:

$$C_t = K_0 X_t \qquad (2.2)$$

where K_0 is the initial investment, a constant, and X_t captures the random shocks to the cash flow process. Assume that X_t is the sum of three independent shocks:

$$X_t = f_t + \theta_{1,t} + \theta_{2,t} \ , \qquad (2.3)$$

where f_t captures unanticipated changes in a market (macroeconomic) factor that affects all firms and is common knowledge, and $\theta_{1,t}$ and $\theta_{2,t}$ capture firm-specific cash-flow innovations. The

[9] See Myers (2000, p. 1017).

inside managers observe both $\theta_{1,t}$ and $\theta_{2,t}$, but outsiders only observe $\theta_{1,t}$. Since $\theta_{1,t}$ and $\theta_{2,t}$ are independent, observing one gives no information about the other.[10]

We assume that f_t, $\theta_{1,t}$ and $\theta_{2,t}$ are stationary AR(1). For simplicity we also assume that they all have the same AR(1) parameter:

$$f_{t+1} = f_0 + \varphi f_t + \varepsilon_{t+1} \tag{2.4}$$

$$\theta_{1,t+1} = \theta_{1,0} + \varphi\theta_{1,t} + \xi_{1,t+1} \tag{2.5}$$

$$\theta_{2,t+1} = \theta_{2,0} + \varphi\theta_{2,t} + \xi_{2,t+1} \tag{2.6}$$

where $0 < \varphi < 1$. The AR(1) assumption makes sense because profitability should mean-revert as industry capacity responds to changes in costs or demand. Stationarity is particularly useful here because it limits the difference between the investors' and the insiders' valuations of the firm. A potentially unbounded difference between these valuations would stretch our model beyond any reasonable economic interpretation.

The assumptions mean that the distribution of X_t is also stationary AR(1):

$$X_{t+1} = X_0 + \varphi X_t + \lambda_{t+1}, \tag{2.7}$$

where $X_0 = f_0 + \theta_{1,0} + \theta_{2,0}$, and $\lambda_t = \varepsilon_t + \xi_{1,t} + \xi_{2,t}$.

Define the ratio of firm-specific to market variance in the cash flow generating process:

$$\kappa = \frac{Var(\theta_{1,t} + \theta_{2,t})}{Var(f_t)} \tag{2.8}$$

Also define the *transparency* of the firm as the ratio of the variance of $\theta_{1,t}$ to the sum of the variances of $\theta_{1,t}$ and $\theta_{2,t}$:

[10] Think of θ_2 as the forecast error of estimating $\theta_1 + \theta_2$ using θ_1 only. Then by construction θ_2 is uncorrelated with θ_1.

$$\eta = \frac{Var(\theta_{1,t})}{Var(\theta_{1,t} + \theta_{2,t})} = \frac{Var(\theta_{1,t})}{Var(\theta_{1,t}) + Var(\theta_{2,t})} \qquad (2.9)$$

where the last equality follows from the independence of $\theta_{1,t}$ and $\theta_{2,t}$. η close to 1 means that most firm-specific information is revealed to outsiders through accounting reports or other channels. η close to zero means that the firm is almost totally opaque.

The time line of the model is:

C_t, Y_t C_{t+1}, Y_{t+1}

↓ ↓

↑ ↑

K_t (ex-dividend intrinsic value) K_{t+1}

t t^+ t+1 $t+1^+$

At time t, a cash flow C_t is realized. The insiders observe C_t (and all three shocks f_t, $\theta_{1,t}$ and $\theta_{2,t}$) and decides on the dividend Y_t. Outside investors observe f_t and $\theta_{1,t}$ and of course the dividend Y_t. Investors use their information to update their expectations of C_t and K_t, and then decide whether to organize to take over the firm. If outsiders decide to not take over, the sequence repeats at $t + 1$.

2.2. Investors' estimates of cash flow and value

Now we can write out the conditional and unconditional expectations of the firm's cash flow and value. The first step is to show that both cash flow and the intrinsic value of the firm follow an AR(1) process.

Proposition 1: C_t and K_t are AR(1) with parameter φ.

$$E(C_{t+1} \mid C_t) = K_0 X_0 + \varphi C_t = C_0 + \varphi C_t$$

$$E(K_{t+1} \mid K_t) = \frac{1}{r} K_0 X_0 + \varphi K_t \tag{2.10}$$

The *unconditional* means of C_t and K_t are:

$$E(C_t) = \frac{K_0 X_0}{1-\varphi}$$

$$E(K_t) = \frac{1}{r} \frac{K_0 X_0}{1-\varphi} \tag{2.11}$$

Proof: see Appendix A.

Proposition 2: Investors' assessment of the overall value of the firm, conditional on f_t and θ_{1t}, is:

$$\begin{aligned} E(K_t \mid f_t, \theta_{1,t}) &= \frac{1}{r} \frac{K_0 X_0}{1-\varphi} - \frac{\varphi}{1+r-\varphi} \frac{K_0 X_0}{1-\varphi} + \frac{\varphi}{1+r-\varphi} K_0 (f_t + \theta_{1,t} + \frac{\theta_{2,0}}{1-\varphi}) \\ &= \frac{1}{r} \frac{K_0 X_0}{1-\varphi} + \frac{\varphi}{1+r-\varphi} [K_0 (f_t + \theta_{1,t} + \frac{\theta_{2,0}}{1-\varphi}) - \frac{K_0 X_0}{1-\varphi}] \end{aligned} \tag{2.12}$$

Proof: see Appendix A.

The conditional value of K_t, given current-period information about f_t and θ_{1t}, equals the unconditional value $\frac{1}{r} \frac{K_0 X_0}{1-\varphi}$ plus a correction term $\frac{\varphi}{1+r-\varphi} [K_0 (f_t + \theta_{1,t} + \frac{\theta_{2,0}}{1-\varphi}) - \frac{K_0 X_0}{1-\varphi}]$. From the definition of X_t, the bracketed expression in Eq. (2.12) is just the difference between the expectation of X_t, conditional on observing f_t and θ_{1t}, and the unconditional expectation of X_t.

2.3. Equilibrium dividend policy

Define V_t^{ex} as the ex-dividend market value of the firm (its value to outside investors), conditional on $\{f_t, \theta_{1,t}\}$.

$$V_t^{ex}(f_t,\theta_{1,t}) = \frac{E(Y_{t+1} \mid f_t,\theta_{1,t}) + E(V_{t+1}^{ex} \mid f_t,\theta_{1,t})}{1+r}\,, \tag{2.13}$$

where Y_{t+1} is the dividend to be paid in period t+1.

In order for outside investors to be willing to let the inside managers run the firm for another period, the ex-dividend market value of the firm must at least equal the outside investors' expectation of the net liquidation value of the firm, $E(\alpha K_t \mid f_t,\theta_{1,t})$. The insiders will pay a dividend just sufficient to make the outsiders indifferent between taking over and letting the insiders continue. We assume that investors are satisfied and do not intervene if this condition is met. Thus we have:

$$V_t^{ex} = E(\alpha K_t \mid f_t,\theta_{1,t}). \tag{2.14}$$

Any dividend policy that satisfies the two conditions given by Eqs. (2.13) and (2.14) defines an equilibrium. But it turns out that there is only one equilibrium, defined by constant-payout policy, if we rule out equilibria supported by bubbles or empty promises from the manager.

Proposition 3: The equilibrium dividend is a constant fraction α of investors' conditional expectation of cash flow:

$$Y^*_\tau = \alpha E(C_\tau \mid f_t,\theta_{1,t}), \forall \tau \ge t \tag{2.15}$$

This dividend policy is unique if we rule out bubbles and empty promises[11].

Given the cost of collective action, outside investors effectively own a fraction α of the firm. Thus they demand payment of the same fraction of the firm's cash flows. Inside managers are willing to pay this dividend to keep investors quiet and satisfied and to keep them from taking over.

But there may be other equilibria if investors can be swayed by empty promises: managers would like to pay less than the equilibrium dividend today in exchange for a promise to "make it up later."

[11] Here is a sketch of the proof that Eq. (2.15) defines an optimal solution. First plug (2.15) into (2.13) and (2.14). Using the definition of K_t, verify that (2.15) does satisfy the equilibrium conditions. Eq. (2.15) supports a Nash Equilibrium: as long as the unobserved firm-specific shock is not too bad, the insider will find it optimal to stick to the constant dividend payout. Investors have no incentive to deviate either. In addition, Myers (2000) shows that this solution is efficient, because insiders will take all positive-NPV projects. Thus this equilibrium will lead to a Pareto-optimal outcome. There may be other equilibria, but it is natural to assume that the actual equilibrium will settle on this one.

(Note that the dividend shortfall goes directly into the managers' pockets.[12]) But if investors accept such a promise today, they must expect that the managers will play the same game again in the future. If so, the present value of expected future dividends falls below $E(\alpha K_t \mid f_t, \theta_{1,t})$, violating Eq. (2.14) and triggering collective action by investors. In other words, investors' only rational response to an empty promise is immediate takeover, so in equilibrium empty promises will not be tried.

The cash flow captured by inside managers equals overall cash flow minus the dividend:

$$Z_t = C_t - Y_t = C_t - \alpha E(C_t \mid f_t, \theta_{1,t}), \qquad (2.16)$$

where C_t is the firm's actual cash flow, not investors' conditional expectation. When the hidden firm-specific information is bad, the inside managers have to make up the difference between the firm's actual performance and investors' estimate of that performance. Thus Z_t can be small or negative. If it is negative, the insiders have to cut ordinary salaries or come up with other sources of funding. Of course, if the hidden news is bad enough, the insiders abandon the firm to the outside investors.

2.4. R^2

We can now calculate the rate of return on the firm's shares. Define $\tilde{r}_{i,t+1}$ as the realized return in period t + 1.

$$\tilde{r}_{i,t+1} = \frac{V_{t+1}^{ex}(f_{t+1}, \theta_{1,t+1}) + Y_{t+1}(f_{t+1}, \theta_{1,t+1})}{V_t^{ex}(f_t, \theta_{1,t})} - 1 \qquad (2.17)$$

Proposition 4: the return process satisfies:

$$\tilde{r}_{i,t+1} = r + \frac{(1+r)(\tilde{\varepsilon}_{t+1} + \tilde{\xi}_{t+1})}{\frac{X_0(1+r)}{r} + \phi(f_t + \theta_{1t})} \qquad (2.18)$$

[12] A dividend cut that was *invested* could be supported in equilibrium. See fn. 6 above and Myers (2000).

Proof: see Appendix A.

The random component in $\tilde{r}_{i,t+1}$ is caused by innovations of both f_{t+1} and $\theta_{1,t+1}$. The conditional expected return is always *r*, however, regardless of f_t and $\theta_{1,t}$, because the expected values of $\tilde{\varepsilon}_{t+1}$ and $\tilde{\xi}_{t+1}$ are zero. Although the cash flow process is partially predictable (due to the AR(1) processes), there is no return predictability. The market valuation incorporates the predictable component of the cash flows and dividends.

The return on the market portfolio is the same as the return of a stock with no idiosyncratic risk:

$$\tilde{r}_{m,t+1} = r + \frac{(1+r)(\tilde{\varepsilon}_{t+1})}{\frac{X_0(1+r)}{r} + \phi f_t} \tag{2.19}$$

Given stock prices at time t, the t + 1 rate of return for any particular firm depends on two things: a market factor $\tilde{\varepsilon}_{t+1}$, captured by the market return $r_{m,t+1}$, and a firm specific factor $\tilde{\xi}_{t+1}$. Conditional on f_t and $\theta_{1,t}$, the proportion of variance explained by the market is fixed:[13]

$$\mathrm{R}^2 = \frac{Var(\varepsilon_{t+1})}{Var(\varepsilon_{t+1}) + Var(\xi_{t+1})} = \frac{1}{\kappa\eta + 1} \tag{2.20}$$

Eq. (2.20) shows why stocks could have higher R^2s in countries with less developed financial markets. The stocks could have lower κ, that is, less idiosyncratic cash-flow risk relative to market risk, or lower η, that is, lower *observable* idiosyncratic risk.

Notice that α drops out of the expressions for $\tilde{r}_t$ and R^2. Although α affects the proportion of cash flows paid to the outsiders, and thus the level of stock prices, it does not affect percentage returns. We expect low α's in countries with less-developed financial markets and relatively poor investor protection. That by itself does not explain the high R^2s observed in such countries, however. In our model, R^2s are determined by the ratio of observable to unobservable firm-specific risk, that is, by the degree of transparency.

2.5. Abandonment

The insider has an abandonment option. The option is exercised if the insider is forced to absorb a sufficiently long run of firm-specific bad news. We do not model this option specifically. But the option clearly will be exercised from time to time. Exercise will release the accumulated bad news all at once. Therefore we predict a greater frequency of large, negative, firm-specific return outliers in countries where firms are less transparent to outside investors.

Abandonment could mean at least three things. (1) In our model, the inside managers just walk away from the firm, leaving it to outside stockholders or creditors. For example, the managers could refuse to pay the dividends called for by public information, thus triggering the outside investors to organize and take over. (2) The managers could stay with the firm,[14] but incur the cost of opening up the firm to outside investors and convincing them that the bad news is true. (Even if the firm pays, these costs still come out of the manager's' pocket. The managers can take out more cash if the costs are not incurred.) The managers' cost of abandonment may also include the loss of reputation or private benefits. (3) The costs of keeping outside investors ignorant of bad performance may become so high that insiders can't prevent the discharge of accumulated bad news. Note that in our model the costs of hiding good performance are low, because the upside cash flow that is not seen by outside investors disappears into insiders' pockets.

Although we do not solve for the optimal exercise of the abandonment option, we can write down the conditions for the option to be in the money. Suppose the inside managers incur a fixed cost of abandonment *D*. The insider then encounters a negative firm-specific shock θ_{2t}, which is not observed by outside investors. If the insider decides to stick with the firm and absorb the cash flow impacts of this negative shock, they will end up paying a total present value of

$$K_0\theta_{2,t} + \text{PV}\{K_0\, \text{E}(\theta_{2,t+1}|\theta_{2,t}),\, K_0\, \text{E}(\theta_{2,t+2}|\theta_{2,t}),\, \ldots;\, r\} = K_0[\theta_{2t} + \frac{1}{r}\frac{\theta_{20}}{1-\varphi} + \frac{\varphi}{1+r-\varphi}(-\frac{\theta_{20}}{1-\varphi} + \theta_{2t})] \quad (2.21)$$

---

[13] The usual market-model regression of a stock's return on the market return is actually mis-specified, since the derivative of $\tilde{r}_{i,t+1}$ on $\tilde{r}_{m,t+1}$ depends on the realization of f_t and $\theta_{1,t}$ and therefore is not constant over time. But we will follow previous research and use OLS to fit the market model to individual firms.

[14] The managers could run the firm under more stringent control by investors. Once the investors' cost of collective action is sunk, the costs of monitoring and control should fall drastically.

This option is in the money if the value given by Eq. (2.21) is negative and greater, in absolute value, than *D*. We know that the option will be exercised if it is far enough in the money. (The optimal exercise boundary could depend on the insiders' wealth, if they are forced to "prop up" the firm with their own money during a period of hidden bad news.[15])

The cost of abandonment is probably not fixed, but linked to current firm value. In Myers (2000), for example, the defaulting manager takes all of the firm's current-period cash flow, but loses the ability to capture future cash flow by exploiting investors' cost of collective action. The manager is also forced to sit idle for one or more periods before restarting another firm. The loss of captured future cash and the opportunity cost of idleness depend on the current cash flow and the current value of the firm.

Suppose that all abandonment costs add up to a constant fraction *p* of firm value. Then the option is in the money if:

$$K_0[\theta_{2t}+\frac{1}{r}\frac{\theta_{20}}{1-\varphi}+\frac{\varphi}{1+r-\varphi}(-\frac{\theta_{20}}{1-\varphi}+\theta_{2t})]+p\{\frac{1}{r}\frac{K_0X_0}{1-\varphi}+\frac{\varphi}{1+r-\varphi}[-\frac{K_0X_0}{1-\varphi}+K_0(f_t+\theta_{1t}+\theta_{2t})]\}<0,$$

$$\theta_{2t}+\frac{1}{r}\frac{\theta_{20}}{1-\varphi}+\frac{\varphi}{1+r-\varphi}(-\frac{\theta_{20}}{1-\varphi}+\theta_{2t})+p\{\frac{1}{r}\frac{X_0}{1-\varphi}+\frac{\varphi}{1+r-\varphi}[-\frac{X_0}{1-\varphi}+(f_t+\theta_{1t}+\theta_{2t})]\}<0 \quad (2.22)$$

In this case the decision to abandon is affected by both private information from $\theta_{2,t}$ and public information from $f_t + \theta_{1,t}$. The private information determines the amount of negative shock that the insider has to soak up if he stays on. The public information affects the value that insiders have to give up by defaulting. A more negative value of θ_{2t} makes the insider more likely to give up, while a more positive value of θ_{1t} or f_t makes the insider more likely to continue.

Here we encounter some interesting dynamics. If the manager's abandonment costs are positively linked to stock market value, as in Eq. (2.22), we should find fewer crashes (large, negative, firm-specific return outliers) when market returns are positive and the firm's stock price is doing well. This may be worth testing if future research examines individual firm returns, rather than the country averages used in this paper.

[15] Friedman and Johnson (2000) propose a model in which insiders usually tunnel resources out of the firm, but sometimes prop it up, contributing their own money to keep their future tunneling option alive.

These at-the-money calculations use the steady-state distribution of the unobservable firm-specific information. The steady state is not a function of calendar time. That is not quite right when the manager gives up and the firm starts over again. Abandonment reveals all accumulated information, and the AR(1) process starts afresh. The probability of another crash in the next period after a crash is close to zero, although the probability increases as time passes. Thus time can enter investors' valuations.

Ignoring time, and working with the steady-state distribution, may nevertheless be an excellent approximation. It typically takes less than ten periods for the variance of the $\theta_{2,t}$ distribution to reach at least 90 percent of steady-state value. This convergence occurs for a wide range of values of the parameter φ. For example, if θ_{2t} is normal, its distribution is completely characterized by mean and variance, and $E(\theta_{2,t}) = \frac{\theta_{20}(1-\varphi^{t+1})}{1-\varphi}$ and $Var(\theta_{2,t}) = \frac{{\sigma_{2,\xi}}^2(1-\varphi^{2(t+1)})}{1-\varphi^2}$. If we interpret θ_{2t} as the forecast error of an unbiased forecast, then it is natural to assume $\theta_{20} = 0$. Therefore, the mean of the distribution of θ_{2t} is always equal to that of the steady state distribution. Furthermore, given that $\frac{Var(\theta_{2t})}{Var(\theta_{2\infty})} = 1-\varphi^{2(t+1)}$, for φ not larger than about 0.9, it takes less than ten periods after a crash for the variance of the distribution of θ_{2t} to go back to at least 90% of the variance of the steady-state distribution. In our empirical tests, a crash is defined to happen at most once in 100 periods. Therefore we believe that the assumption of a steady-state distribution is reasonable.

This is one advantage of using stationary AR(1) processes rather than a random walk or martingale process for the firm's cash flows. In a nonstationary process, the distribution of $\theta_{2,t}$ will always be a function of time.

Once the steady state is reached, investors will perceive a constant probability of a crash in each period. To compensate for the potential loss to outsiders during a crash, insiders will have to pay a dividend higher than in Eq. (2.15), enough to compensate for the losses incurred if a crash occurs. This higher dividend will be proportional to the dividend given in Eq. (2.15), however. Thus this extra dividend does not affect our predictions about R^2 or the likelihood of crashes.

To summarize, we predict a greater frequency of crashes (large, negative, firm-specific return outliers) in countries where firms are more opaque to outside investors. Crash frequency does not just depend on opaqueness, however. Two firms with the same opaqueness, measured by η in Eq. (2.20), can have different crash frequencies if there are differences in total firm-specific risks or in the costs incurred by insiders when they exercise their abandonment options. Crash frequency should always be positively correlated with opaqueness, however.

2.6. Opaqueness and risk-sharing

In this model, the inside managers have no credible way to convey hidden firm-specific information to outside investors. They are always tempted to report a bad firm-specific shock, bad enough that no dividend need be paid to the outsiders. Outsiders, fully aware of the insiders' temptation to under-report, will demand hard proof for any such claim. Hard proof is costly. In some countries, there may be no practical way to convey information credibly.

Absent abandonment, insiders are forced to insure outside investors against some of the unobservable, firm-specific cash flow shocks. The insiders' inability to convey all the firm-specific information results in inefficient sharing of firm-specific risk. A risk-averse insider would like to commit to credibly convey all firm-specific information. Hiring a credible auditing team might be a pre-commitment to convey inside information, for example. The cost of doing so (and also of maintaining the team's credibility ex post) is probably prohibitive in some countries, however.

Credible auditing may also enhance investors' property rights by reducing costs of monitoring and control of the firm. In our model, this would show up as a higher α, higher dividends and reduced cash flow to insiders. Even if a credible auditing team were available, the manager might not wish to hire it, however. The manager benefits from a lower α once the firm is up and running.[16]

[16] A commitment to provide credible information to investors could also increase α, thereby increasing the value of the firm to outside investors and the amount of outside capital that the firm can raise. New and growing firms that need outside capital have a stronger incentive to establish credibility and transparency. Such firms might end up with lower R^2s for that reason. There might also be differences in R^2s within countries that could be traced to other reasons for differences in opaqueness. The tests in this paper are limited to differences in country averages, however.

3. Empirical Analysis

We predict higher R^2s in countries with less developed financial markets. The reason is not poor protection of investors' property rights in such countries, but lack of transparency. Lack of transparency should also lead to a greater number of stock-price crashes. Insiders do see all firm-specific information, and when the information is sufficiently bad, they will give up and thus let the whole market know.

MYY examine R^2s for a cross section of 40 countries in 1993, 1994 and 1995.[17] R^2 is higher in countries with low per capita GDP and in countries where investors' property rights are not well-protected. They measure investor protection by a Good Governance Index, which combines three measures developed by La Porta et al. (1998): measures of government corruption, the risk of government expropriation of private property and the risk of government repudiation of contracts. Low values are taken to mean lack of protection of private property.

There are many other reasons why R^2s could differ across countries. The scope for diversification is limited in smaller markets. Operating cash flows could be more highly correlated if firms in poorer countries are concentrated in relatively few industries. MYY control for these and other possible explanations. Their basic findings do not change. We use the same controls, which are described below.

Our empirical tests are organized as follows. First we replicate the MYY's results, using their controls, for stocks in a larger sample of 43 countries from 1990 to 2001. We also control for kurtosis. Then we test whether R^2 is also positively related to the frequency of crashes, that is, to cross-country differences in the frequency of large negative outliers in firm-specific returns. As predicted, we find a significant positive relationship.

This result is consistent with our model, but not a direct test. High R^2 is not *caused* by a high likelihood of crashes. Both are caused by opaqueness, that is, reduced information available to investors. Therefore we introduce three measures of the degree of opaqueness. We find that R^2s are higher in more opaque countries. We also find that crashes are more frequent in more opaque

[17] MYY also consider other measures of stock market synchronicity, for example, the average proportion of stocks that move in the same direction (up or down) in a given period. The results for R^2 and these other measures are essentially the same, however. We will concentrate on R^2.

countries. These relationships hold even when we control for local market volatility. We conclude that our results are driven by opaqueness and firm-specific variance, not by correlations with market risk.

3.1. The sample

We started with returns for all the stocks covered by DataStream from January 1990 to December 2001. We use DataStream's total return index (RI), which includes dividends as well as price changes. We have data for stocks in 33 countries for the entire period, and 10 more countries for part of the period. We include stocks in these 10 countries for years when sufficient data are available. Following MYY, we exclude stocks that trade for less than 30 weeks during a particular year. If a country has less than 25 stocks with valid data in a year, we exclude that country for that year. For example, we always excluded Zambia, which never had more than four listed companies in Datastream.

We calculate weekly rates of return (Wednesday to Wednesday) for all stocks in our sample. R^2s and residual returns are calculated from an expanded market model regression similar to MYY's:

$$\begin{aligned} r_{it} = \alpha_i &+ \beta_{1,i} r_{m,jt} + \beta_{2,i}[r_{US,t} + EX_{jt}] + \beta_{3,i} r_{m,j,t-1} + \beta_{4,i}[r_{US,t-1} + EX_{j,t-1}] \\ &+ \beta_5 r_{m,jt-2} + \beta_{6,i}[r_{US,t-2} + EX_{j,t-2}] + \beta_{7,i} r_{m,j,t+1} + \beta_{8,i}[r_{US,t+1} + EX_{j,t+1}] \\ &+ \beta_9 r_{m,jt+2} + \beta_{10,i}[r_{US,t+2} + EX_{j,t+2}] + \varepsilon_{it} \end{aligned} \tag{3.1}$$

where $r_{m,jt}$ is the local market index return for country j during time period t, $r_{US,t}$ is the U.S. market index return (a proxy for the global market), and $EX_{j,t}$ is the change in country j's exchange rate vs. the U.S. dollar. We correct for non-synchronous trading by including two lead and lag terms for the local and U.S. market indexes. We measure the firm-specific return by the residual return from Eq. (3.1). This is the return not explained by the local and U.S. markets. We will use the kurtosis of the residual return as an additional control variable.

Following MYY, we measure a country's stock market synchronicity by its average R^2 for each year that the country appears in our sample. We use equally weighted averages and also averages weighted by each company's total return variance.[18] We found no clear relationships between the R^2 measures and firm size or industry, consistent with Roll (1988). Macroeconomic variables for each country were obtained from the IMF International Financial Statistics database and other sources. These variables include exchange rates, geographical areas and per-capita GDPs.

Altogether we have stock returns for 43 countries. Of these, only 33 countries have data for all the years between 1990 and 2001. Figure 1 plots the mean, median and the 25th and 75th percentiles of R^2 for these 33 countries in each year. Figure 1 also includes a trend line for the mean R^2. The mean falls by about 0.5% each year, and this decrease is statistically significant. R^2 was clearly decreasing over the 1990s, consistent with the evidence reported in MYY and Campbell, et. al. (2001). It appears that the ratio of firm-specific to market risk increases as financial markets develop over time.

3.2. Measuring the frequency of crashes

Our theoretical analysis of capture and risk-absorption by inside managers predicts a higher frequency of crashes in countries where firms are more opaque to outside investors. A crash occurs when managers exercise their abandonment option to avoid absorbing too much firm-specific bad news. We constructed three measures of crash likelihood. The first is the skewness of residual returns. Following Chen, Hong and Stein (2001), we use the third moment of each stock's residual returns, divided by the cubed standard deviation.[19] We calculate an equally weighted average skewness across all stocks in each country for each year.

The second measure, COUNT, is based on the number of residual returns exceeding *k* standard deviations above and below the mean, with *k* chosen to generate frequencies of 0.01%, 0.1% or 1% in the lognormal distribution. We subtract the upside frequencies from the downside frequencies. The difference is averaged across all stocks within each country in each year. A high value of COUNT for a country indicates a high frequency of crashes.

---

[18] MYY used R^2s weighted by each stock's sum of squared total variation of returns. In other words, they used variance weights.

[19] Chen, Hong and Stein (2001) also use the ratio of upside and downside standard deviations. They note that this measure is less likely to capture the effects of extreme outliers. We are particularly interested in outliers, and therefore rejected this alternative measure.

Our third measure, COLLAR, accounts for both the frequency and the severity of crashes. COLLAR is defined as the profit or loss from a strategy of buying an out-of-the-money put option on the residual return and shorting a call option on the residual return. We choose the strike prices of the put so that it would be in the money with frequencies of 0.01%, 0.1% and 1% in a lognormal distribution. Then we set the call's strike prices so that the put-call strategies have zero expected value in a lognormal distribution. In other words, we construct a position that would require zero net investment. Then we calculate the actual profits or losses from the strategy as a percentage of the stock price and average over all stocks within each country and year. High values for COLLAR mean that profits from the downside put outweigh losses from the upside call. A high value of COLLAR for a country and year indicates that crashes in that country were more frequent and/or more severe.

Table 1 contains the sample statistics of the two R^2 measures, excess kurtosis and the three measures of crash likelihood. Mean and median R^2s are about .30 equally weighted and .25 variance weighted. Return distributions are positively skewed and have long tails (excess kurtosis). Both COLLAR and COUNT are negative, as expected with positively skewed returns. Extreme positive residual returns generally outnumber and outweigh extreme negative returns in our overall sample. We are not proposing to explain or exploit the average levels of skewness, COLLAR and COUNT, however, but only differences across countries.

3.3. Replicating MYY's results

The first two columns of Table 2 show results for MYY's specification for 43 countries from 1990 to 2001. The dependent variable is the logistic transformation of the annual values of average R^2s of the countries in our sample. The country averages are either equally weighted (EW) or variance weighted (VW). We fit this and all subsequent specifications using the Fama-MacBeth method, in order to guard against false significance due to cross-correlation and serial correlation of errors in our panel regressions.[20]

[20] Fama and MacBeth (1973). We also checked our results using the clustering method described in Appendix B in Cohen, Polk and Vuolteenaho (2003). This method can accommodate both time series and cross-sectional correlations among error terms. But the clustering gave essentially the same results as Fama-MacBeth. There were no material changes in the signs, magnitudes or significance of estimated coefficients.

The independent variables of most interest are economic development, measured by the log of per-capital GDP, and protection of investors, measured by the Good Government Index. MYY also include several other variables to control for other factors that might affect a country's average R^2. The number of stocks listed in each country is included, because R^2 should increase as the number of stocks declines. The log of country size (geographical area) is included as a proxy for limits on within-country diversification. Firm and industry Herfindal indexes are included: countries with relatively few large firms or industries (and relatively low Herfindal indexes) are expected to have high R^2s. The variance of GDP growth is included because macroeconomic risk may be higher in poorer countries or in countries where investor rights are not well protected. MYY explain these controls in more detail. [21]

The results in the first two columns of Table 2 are by and large consistent with MYY. Countries with high per capita GDP or high scores on the Good Government Index have low R^2s, although the coefficients are not significant in the variance-weighted regression in column 2. None of the control variables is particularly significant except log(country size). Large countries have significantly lower R^2s.

The t-statistics for the Good Government Index increase in columns 3 and 4, where we control for kurtosis in residual returns. The t-statistics for kurtosis are negative and extremely significant. It appears that countries with high kurtosis (long tails in residual return distributions) have low R^2s. We will keep kurtosis as a control in all subsequent tests.

3.4. Crash frequency as a predictor of R^2

Columns 5 and 6 of Table 2 add skewness as a measure of crash likelihood. The coefficient is negative and significant, especially in the regressions for equally weighted R^2s. Lower skewness means relatively more negative outliers in the distribution of residual returns. Lower skewness is associated with higher R^2, controlling for kurtosis and all of MYY's explanatory variables. This is just as we predicted. Correcting for kurtosis and skewness has little impact on the coefficients for

[21] MYY included one further control, an estimate of the co-movement of earnings for firms within a given country. Introducing this variable had little effect on our results, but reduced our sample size by more than 30%. We decided to report results estimated without this additional control.

the Good Government Index and Log(GDP per capita). The coefficients remain negative, consistent with MYY's results, but significant at conventional levels only in the equal-weighted regressions.

The final columns of Table 2 add local market volatility, i.e., the standard deviation of each country's market return, as an additional independent variable. MYY did not include this variable. They interpreted high local market volatility and high R^2s as *results* of poor investor protection and the concentration of noise trading on the market portfolio rather than on individual stocks. Our theory concentrates on firm-specific risk and says nothing about local market volatility. We should include local market volatility as a control, however, to make sure that the variables of interest in our theory are not just proxies for differences in market risk.

Local market volatility is of course positively related to R^2, as shown in columns 7 and 8 of Table 2. The addition of local market volatility does not change the sign or significance of skewness and kurtosis. The log of GDP per capita is no longer significant when local market volatility is included, however, even in the equal-weighted regression. Perhaps that is no surprise, since poor countries are known to have volatile stock markets. The significance of the Good Government Index is reduced in the equal-weighted regression in column 7 and eliminated (with a changed sign) in the variance-weighted regression in column 8. That decline in significance seems consistent with MYY's argument that poor protection of investors leads to high local market volatility and high R^2s. Market risk and the Good Government Index are negatively colinear, so we expect the significance of the good-government coefficient to decline when market risk is added.

Skewness is one measure of the frequency of crashes in firm-specific returns. We have two other measures, COLLAR and COUNT. The effects of COLLAR and COUNT on R^2 are summarized in Table 3. We control for kurtosis, local market volatility and all the other variables used in MMY and in Table 2. Each panel of the table contains six regressions. There are three critical values, corresponding to lognormal frequencies of 0.01, 0.1 and 1%. For each frequency there are both equal- and value-weighted R^2s. Results for COLLAR and COUNT are in panels A and B, respectively. The coefficients on these variables are positive, as predicted, and significant in all regressions. Average R^2s are higher in countries where the frequency and severity of crashes are high.

The coefficients on the Good Government Index remain negative and significant in the regressions for equal-weighted R^2s in Table 3. The index's coefficients disappear in the variance-weighted regressions, however. The coefficients on GDP per capita disappear regardless of the R^2 weights.

This pattern of weaker coefficients in regressions for variance-weighted R^2s will repeat in our later tests. We investigated the reasons for this pattern. It appears that country-average R^2s are much less stable when variance weights are used. For example, the time-series volatility of the year-by-year coefficients on the Good Governance Index is much higher in the variance-weighted regressions, with obvious outliers. We also ranked countries by their average R^2s. The ranks based on equal weights were much more stable over time. The cross-sectional dispersion of country-average R^2s is much higher with variance weights. The difference in dispersion between equal and value weighting is significant with a t-statistic of 5.45.

Looking inside countries, we found a significant negative relationship between individual firms' R^2s and the firms' total variances. This is not surprising, since higher firm-specific variance should mean higher total variance and low R^2s.[22] Variance-weighting thus gives higher weights to firms with lower R^2s. Table 1 confirms that variance weights lead, on average, to lower country-average R^2s.

Since variance weights over-weight firms with high firm-specific risk, it will also over-weight firms for which the market-model regression is a "bad fit" and return outliers or data-entry errors may be more prevalent. We suspect that use of variance weights adds significant noise to our results.

We would pursue these problems further if there were any reason to prefer variance weights in our tests. But variance weights are not the natural choice, given our theory that firm-specific variance depends on opaqueness. Why make the weights used to calculate the dependent variable a function of the independent variable that our theory says is most important?

We will continue to report results for variance-weighted R^2s for consistency with MYY,[23] but we believe that regressions for equal-weighted R^2s are more reliable.[24]

---

[22] This relationship is automatic if firms' market risks are held constant. But we can't logically rule out the possibility that firms' average market and firm-specific risks increase proportionally.
[23] We also calculated average R^2s using market-value weights. Our results using this market-weighted measure are similar to the results reported below.

3.5. The effects of opaqueness on R^2 and crash likelihood

The positive relationship between R^2 and our measures of crash likelihood does not imply causality in either direction. Our theory says that they are both determined by opaqueness. We have two hypotheses: countries where firms are more opaque to investors have (1) higher average R^2s and (2) more frequent crashes in firm-specific returns. We now test these hypotheses directly.

Opaqueness means the lack of information that would enable investors to observe operating cash flow and income and to determine firm value. We are concerned with value-relevant information, which may not be the same thing as accounting detail. Accounting numbers can be meaningless or misleading, even in the U. S., as recent scandals have illustrated. We tried some accounting-based measures of opaqueness, including an index of accounting "opacity" published by PricewaterhouseCoopers (2001), with little success.[25] These measures were at best weakly related to R^2 and our measures of crash frequency.[26]

We use three measures of cross-country differences in opaqueness: (1) a survey-based measure from the Global Competitiveness Report, (2) a measure of auditing activity and (3) a measure based on diversity of analysts' forecasts.

3.5.1. A transparency measure from the Global Competitiveness Report

The Global Competitiveness Reports for 1999 and 2000 include results from surveys about the level and effectiveness of financial disclosure in different countries.[27] The respondents were asked to assess the statement "The level of financial disclosure required is extensive and detailed" on a scale

---

[24] Bris, Goetzman and Zhu (2003) may also have encountered problems with variance weights. They also regressed value-weighted R^2s on the Good Government Index and other variables used by MYY. Their coefficient on the Good Government Index bounces around, depending on specification. They get statistical significance, but with both positive and negative signs.

[25] PricewaterhouseCoopers also published a broader opacity index, which included measures of opaqueness in macroeconomic policy, law, regulation and accounting, plus a measure of corruption. This measure seemed disconnected from R^2 and the other variables used in our tests. It never generated coefficients that were economically or statistically significant.

[26] For example, we tried the average percentage of a country's firms that adopted an international or U.S. accounting standard and the average number of key accounting measures included in company financial statements.

from 1 (strongly disagree) to 7 (strongly agree). Respondents were also asked to assess the "availability of information" in on the same scale. For each country, we took the average response for each question in 1999 and 2000, and averaged again over these two years. The result was a disclosure score (DISCLOSURE) for each of the 43 countries in our sample.[28] Note that high values for DISCLOSURE measure transparency, not opaqueness. High DISCLOSURE scores should predict *low* R^2s.

Table 4.1 tests this prediction. Again we control for kurtosis, local market volatility (in columns 3 and 4) and all of MYY's control variables. As predicted, the coefficients on DISCLOSURE are negative and significant. Effective disclosure means more transparency and lower R^2.

The DISCLOSURE coefficients do not change when local market volatility is added to the regressions. The Good Government Index is no longer significant, however. Perhaps high scores on the index proxy for relatively low macroeconomic risk and for more transparency. In that case adding both local market volatility and a direct measure of transparency should steal index's thunder.

Table 4.1 contains two further surprises. First, kurtosis, which generated extremely high negative t-statistics in Tables 2 and 3, is no longer significant when DISCLOSURE is added.[29] Second, the sign of the coefficient for per-capital GDP changes from negative to positive when both DISCLOSURE and local market volatility are included. The coefficient is not significant, however.

Table 4.2 tests whether DISCLOSURE explains crash likelihoods, measured by skewness, COLLAR and COUNT. R^2 is no longer the dependent variable, so we can eliminate local market volatility and several variables introduced by MYY to control for other determinants of R^2. We retain the Good Government Index, log(GDP per capita) and kurtosis as controls, however. Results for skewness and COLLAR are reported in Panel A. Panel B reports results for COUNT.

The coefficient of DISCLOSURE for skewness is positive, as predicted. That is, companies in more transparent countries have fewer crashes, fewer large downside outliers, and more positive (or less

---

[27]Gelos and Wei (2002) suggest use of the Global Competitiveness Report to measure transparency.
[28] There is no time-series variation in DISCLOSURE. The report's surveys were conducted about one year prior to publication, i.e. in 1998 and 1999. The survey results do not appear in earlier years' reports.

negative) skewness. The coefficients for COLLAR and COUNT are negative, again indicating that extreme negative firm-specific returns are less common in transparent countries. Significance levels are high for skewness and COLLAR, less so for COUNT. The t-statistics for COUNT are above 2.0, however, except for the last regression where the frequency of crashes is calculated at the 1.0% level.[30] We conclude that crashes are less common in transparent countries. But Table 4.2 has one puzzling result: the coefficients for the Good Government Index suggest that crashes are *more* frequent in countries with high good-government scores, once DISCLOSURE and per-capita GDP are controlled for.

3.5.2. Auditing

Bhattacharya, Daouk and Welker (2002) use the number of professional auditors as a proxy for transparency. They report the number of auditors per 100,000 population for 38 different countries, based on data from Saudagaran and Diga (1997). Tables 5.1 and 5.2 use this measure (AUDITOR) to predict R^2 and the frequency of crashes. The format and control variables are identical to Tables 4.1 and 4.2.

AUDITOR is again a measure of transparency, not opaqueness, so we predict negative coefficients for AUDITOR in Table 5.1, where R^2 is the dependent variable. The coefficients are negative and significant, except in column 2, where R^2s are variance-weighted and local market volatility is not included.[31] AUDITOR is highly significant when local market volatility is added in columns 3 and 4. The Good Government Index and per-capita GDP regain sensible and significant coefficients in columns 3 and 4, although kurtosis essentially drops out of the regression in these columns.

The results in Table 5.2 are about the same as in Table 4.2. Higher values for AUDITOR are positively associated with skewness (more transparency means fewer negative outliers) and with lower crash frequencies, as measured by COLLAR and COUNT. The negative coefficients for

[29] We also tested the relationship between kurtosis and our measures of opaqueness. We found that kurtosis increases when opaqueness increases.
[30] We also calculated COLLAR and COUNT at lognormal frequencies of 2.5% to 10% and repeated our regressions. The results were somewhat weaker but otherwise similar to the results reported here.
[31] This is one case where use of the Fama-MacBeth method pushed t-statistics below normal significance levels. The corresponding OLS t-statistic is –3.58. Most OLS t-statistics are considerably higher than the t-statistics reported in this

AUDITOR in the COUNT regressions (Panel B) are now highly significant in all specifications. As in Table 4.1, the coefficients for the Good Government Index suggest that crashes are *more* frequent in countries with high good-government scores, once a direct measure of opaqueness is added to the regression.

3.5.3. Diversity of analyst forecasts

We measure diversity as the standard deviation of analysts' forecasts of the firm's earnings in the following year, normalized by the mean forecast, and then divided by the square root of the number of analysts following that firm:

$$\text{DIVERSITY} = \frac{\hat{\sigma}_S / \hat{\mu}_s}{\sqrt{N}} \tag{3.2}$$

Appendix B shows that this measure is proportional to the standard deviation of hidden firm-specific information. If analysts receive noisy signals about a firm's residual cash flows, then part of each period's change in residual cash flow is revealed to the market. The part that is not revealed remains opaque to investors.

We construct DIVERSITY from analysts' earnings forecasts reported in I/B/E/S international editions from 1990 to 2001. We have such forecasts only for a subset of the firms in our main sample. Only 26 countries have I/B/E/S/ data for the full sample period, and the number of firms covered by I/B/E/S/ is about half the number in Datastream. In addition, we exclude firms in years where the firm's DIVERSITY equals zero, i.e. where all analysts agree. (Complete agreement could reflect full information, but it could also imply total ignorance.)

The results for DIVERSITY are presented in Tables 6.1 and 6.2. The format is identical to Tables 4.1 and 4.2 for DISCLOSURE and Tables 5.1 and 5.2 for AUDITOR. DIVERSITY is a measure of opaqueness, not transparency, however, so we expect the signs of its coefficients to be opposite to the signs for DISCLOSURE and AUDITOR.

---

paper. Use of the Fama-MacBeth method never changed the sign or approximate magnitude of the estimated coefficients, however.

The coefficients for DIVERSITY in Table 6.1 are positive and significant, as predicted. The Good Government Index has significant negative t-statistics, more or less as in Table 5.1. GDP per capita has a significant positive coefficient in columns 3 and 4, where local market volatility enters the regression.

Table 6.2 reports the relationship between DIVERSITY and crash frequency. As expected, the coefficient for skewness is negative (more opaqueness means more negative outliers) and significant. The coefficients for COLLAR and COUNT are positive and significant at all predicted frequencies. The coefficients for the Good Government Index are not significant, however.

Taken together, our tests show that countries where firms are more opaque to outside investors have (1) higher R^2s and (2) higher frequencies of crashes. Conclusion (1) is perhaps not surprising, given MYY's results. We would expect firms to be less transparent in poorer countries with relatively undeveloped financial markets and poor protection of investors' property rights. (Our model draws a logical distinction between the effects of opaqueness and poor protection of investors, but these two factors are probably positively correlated in practice.) Conclusion (2) is new, however. As far as we know, no study has tested the effects of opaqueness in the far-left tail of the distribution of residual returns.

Our tests extend MYY's results. For example, all of our tests control for MYY's chief variable of interest, the Good Governance Index. MYY argue that market risk is higher in less developed countries with ineffective governance and poor protection of investors. That is probably true, but we control for local market risk directly in order to make sure that our measures of opaqueness are not just proxies for the effects that MYY are interested in. The explanatory power of the Good Government Index naturally degrades when we introduce local market volatility and our measures of opaqueness. That does not prove that MYY are wrong, only that opaqueness also matters, even when market volatility and a measure of investor protection are also included.

4. Conclusion

We set out to explain MYY's finding that stock market R^2s are higher in countries with less developed financial systems and poorer corporate governance. The key to our explanation is the effect of opaqueness on the division of risk bearing between inside managers and outside investors. Opaqueness is both good news and bad news for insiders. The good news is that more opaqueness allows insiders to capture more cash flow when the firm is doing well. The bad news is that insiders have to hold a residual claim and absorb downside risk. They can abandon the residual claim and reveal downside news to outside investors, but this abandonment option is costly and not frequently exercised. Exercise of this option causes a crash, that is, a large, negative residual return

We replicated MYY's results for a much larger sample, and showed that higher crash frequencies were associated with higher R^2s. We also developed three measures of opaqueness, and showed that these measures helped explain both R^2 and the frequency of crashes. These latter results are, of course, more direct tests of our theory. All of our results hold when local market volatility is used as a control.

There is plenty more to do. For example, we have used kurtosis only as a control variable. We have not explained how and why it varies so significantly. We have only investigated country averages, as they have varied across countries and (to a lesser extent) over time. There ought to be differences in transparency within countries. For example, firms in some industries may be naturally more transparent. Large, actively traded firms may be more transparent than small, thinly traded firms. Conglomerates may be relatively opaque. Growth companies, which have greater appetites for capital, could choose to become more transparent in order to reassure investors and facilitate financing.

The nature and determinants of crashes deserve further investigation. A crash is defined as a remote outlier in a firm's residual return. We are confident that crashes release firm-specific bad news. The nature of that news has not been investigated here. We interpret it as abandonment by insiders, but there may be other sources of extreme bad news that are firm-specific. Crashes are rare enough that it may be possible to examine them one by one, at least for a sub-sample of countries. That would require research on returns and R^2s for individual companies, however, which will have to wait for another paper.

Appendix A

Proof of proposition 1:

Given the assumptions set out in Section 2,

$$C_{t+1} = K_0 X_{t+1} = K_0 (X_0 + \varphi X_t + \lambda_{t+1}) = K_0 X_0 + \varphi C_t + K_0 \lambda_{t+1} \quad \text{(A.1)}$$

Derive the expected cash flow *k* periods ahead:

$$E(C_{t+k} \mid C_t) = E[K_0(X_0 + \varphi X_{t+k-1} + \lambda_{t+k-1})] = \ldots = \sum_{i=0}^{k-1} K_0 X_0 \varphi^i + \varphi^k K_0 X_t = K_0 X_0 \frac{1-\varphi^k}{1-\varphi} + \varphi^k C_t \quad \text{(A.2)}$$

Combining these results with Eq. (2.1) gives K_t as a function of C_t:

$$K_t(C_t) = PV\{E(C_{t+1} \mid C_t), E(C_{t+2} \mid C_t), \ldots; r\} = \sum_{j=1}^{+\infty} \frac{K_0 X_0 \frac{1-\varphi^j}{1-\varphi} + \varphi^j C_t}{(1+r)^j}, \text{ thus,}$$

$$K_t(C_t) = \frac{1}{r}\frac{K_0 X_0}{1-\varphi} + \frac{\varphi}{1+r-\varphi}\left(-\frac{K_0 X_0}{1-\varphi} + C_t\right) \quad \text{(A.3)}$$

We can also plug in the unconditional expected value of C_t into Eq. (A.3) to obtain the unconditional expected value of K_t:

$$E(K_t) = \frac{1}{r}\frac{K_0 X_0}{1-\varphi} = \frac{1}{r}E(C_t) \quad \text{(A.4)}$$

Eq. (A.3) also gives the K_t as a linear function of C_t:

$$K_t(C_t) = a + bC_t \quad \text{(A.5)}$$

where $a = \frac{K_0 X_0}{1-\varphi}\left(\frac{1}{r} - \frac{\varphi}{1+r-\varphi}\right)$ and $b = \frac{\varphi}{1+r-\varphi}$. Therefore

$E(K_{t+1}|C_t) = E(a + b\, C_{t+1}\, |C_t) = a + bE\,(C_{t+1}|C_t) = a + b(K_0X_0 + \varphi\, C_t) = a + bK_0\, X_0 + b\varphi\; C_t$

Now verify that:

$$a(1-\varphi) + bK_0X_0 = \frac{1}{r}K_0X_0 \qquad \text{(A.6)}$$

From Eq. (A.3), there is a one-on-one relation between C_t and K_t, so:

$E(K_{t+1}|K_t) \quad = E(K_{t+1}\mid C_t) = a + bK_0\, X_0 + b\varphi\; (K_t - a)/b = a(1-\varphi\;) + bK_0\, X_0 + \varphi\; K_t$

$$E(K_{t+1} \mid K_t) = \frac{1}{r}K_0X_0 + \varphi K_t \qquad \text{(A.7)}$$

That is, K_t follows an AR(1) process with parameter φ. Equation (2.11) follows.

Proof of Proposition 2:

The outside investors' estimates of r_t, C_t and K_t are:

1) $E\left(r_t \mid f_t, \theta_{1,t}\right) = f_t + \theta_{1,t} + E\left(\theta_{2,t}\right)$, so:

$$E(r_t \mid f_t, \theta_{1,t}) = f_t + \theta_{1,t} + \frac{\theta_{2,0}}{1-\varphi} \qquad \text{(A.8)}$$

2) $E(C_t \mid f_t, \theta_{1,t}) = E(K_0 r_t \mid f_t + \theta_{1,t})$, so

$$E(C_t \mid f_t, \theta_{1,t}) = K_0(f_t + \theta_{1,t} + \frac{\theta_{2,0}}{1-\varphi}) \qquad \text{(A.9)}$$

$E(C_{t+k} \mid f_t, \theta_{1,t}) = E[E(C_{t+k} \mid C_t) \mid f_t, \theta_{1,t}] = \dfrac{K_0R_0(1-\varphi^k)}{1-\varphi} + \varphi^k E(C_t \mid f_t, \theta_{1,t})$, so

$$E(C_{t+k} \mid f_t, \theta_{1,t}) = \frac{K_0X_0(1-\varphi^k)}{1-\varphi} + \varphi^k K_0(f_t + \theta_{1,t} + \frac{\theta_{2,0}}{1-\varphi}) \qquad \text{(A.10)}$$

And, $E(K_t \mid f_t, \theta_{1,t}) = E[K_t(C_t) \mid f_t, \theta_{1,t}] = \frac{1}{r}\frac{K_0 X_0}{1-\varphi} - \frac{\varphi}{1+r-\varphi}\frac{K_0 X_0}{1-\varphi} + \frac{\varphi}{1+r-\varphi} E(C_t \mid f_t, \theta_{1,t})$, so

$$E(K_t \mid f_t, \theta_{1,t}) = \frac{1}{r}\frac{K_0 X_0}{1-\varphi} - \frac{\varphi}{1+r-\varphi}\frac{K_0 X_0}{1-\varphi} + \frac{\varphi}{1+r-\varphi} K_0 (f_t + \theta_{1,t} + \frac{\theta_{2,0}}{1-\varphi}) \qquad \text{(A.11)}$$

Proof of Proposition 4:

From (2.17) and definition of V_t^{ex},

$$r_{total,t+1} = \frac{E\left(\alpha K_{t+1} \mid f_{t+1}, \theta_{1,t+1}\right) + \alpha E\left(C_{t+1} \mid f_{t+1}, \theta_{1,t+1}\right)}{E\left(\alpha K_t \mid f_t, \theta_{1,t}\right)} - 1 \qquad \text{(A.12)}$$

From (A.10) and (2.12),

$$r_{i,t+1} = \frac{\frac{1}{r}\frac{K_0 X_0}{1-\varphi} - \frac{\varphi}{1+r-\varphi}\frac{K_0 X_0}{1-\varphi} + \frac{1+r}{1+r-\varphi} K_0 \left(f_{t+1} + \theta_{1,t+1}\right)}{\frac{1}{r}\frac{K_0 X_0}{1-\varphi} - \frac{\varphi}{1+r-\varphi}\frac{K_0 X_0}{1-\varphi} + \frac{\varphi}{1+r-\varphi} K_0 \left(f_{t+1} + \theta_{1,t}\right)} - 1 \qquad \text{(A.13)}$$

The denominator can be simplified to:

$$\frac{K_0 X_0}{1-\varphi}\frac{(1+r)(1-\varphi)}{r(1+r-\varphi)} + \frac{\varphi}{1+r-\varphi} K_0 \left(f_t + \theta_{1,t}\right) \qquad \text{(A.14)}$$

After some re-organization, we can write:

$$r_{i,t+1} = r + \frac{-r\frac{K_0 X_0}{1-\varphi}\frac{(1+r)(1-\varphi)}{r(1+r-\varphi)} + K_0 \frac{1+r}{1+r-\varphi}\left[f_{t+1} + \theta_{1,t+1} - \varphi f_t - \varphi\theta_{1,t}\right]}{\frac{K_0 X_0}{1-\varphi}\frac{(1+r)(1-\varphi)}{r(1+r-\varphi)} + \frac{\varphi}{1+r-\varphi} K_0 \left(f_t + \theta_{1,t}\right)} \qquad \text{(A.15)}$$

Using (2.4) and (2.5), the numerator becomes: $\frac{K_0(1+r)}{1+r-\varphi}\left(\varepsilon_{t+1} + \xi_{t+1}\right)$, and

$$r_{i,t+1} = r + \frac{(1+r)(\varepsilon_{t+1} + \xi_{t+1})}{\frac{X_0(1+r)}{r} + \phi(f_t + \theta_{1,t})} \tag{A.16}$$

Appendix B. Diversity of analyst opinion as proxy for opaqueness

Firm cash flows are generated by $C_{t+1} = K_0 X_{t+1}$. Analysts observe signals of X_t. Assume at time t, analyst *i* generates an independent observation, S_{it}, such that $S_{it} = X_t + \gamma_{it}$, where, $\gamma_{it} \sim N(0, \sigma_s^2)$, and is distributed IID over all *i*. Assume also that market observes all S_{it}, at least ex post. Then, the market's ex-post estimate of the signal, X_t, is $\hat{X}_t = \frac{1}{N}\sum_{i=1}^{N} S_{it}$. Define $\theta_{1t} = \hat{X}_t - f_t$, recalling that f_t is the market-factor return, and $\theta_{2t} = X_t - \hat{X}_t$. Thus we have $X_t = f_t + \theta_{1t} + \theta_{2t}$, where f_t is the market component, θ_{1t} is the observable firm-specific component, and θ_{2t} is the unobservable firm-specific component, after the market observes all signals S_{it}. In addition, $\theta_{2t} \sim N(0, \frac{\sigma_s^2}{N})$.

In practice, we estimate σ_s^2 by its sample analogue, $\hat{\sigma}_s^2$, and we define our measure of remaining uncertainty by:

$$\text{DIVERSITY} = \frac{\hat{\sigma}_S / \hat{\mu}_s}{\sqrt{N}}.$$

Where the normalization by $\hat{\mu}_s$ is often used to address the heterogeneity of the size of the forecasts across firms. This proxy for remaining opaqueness can be put in the frameworks of Barry and Jennings (1992, pp. 172-175), who analyze the informativeness of signals using a Bayesian approach.

References

Barry, C., Jennings, R., 1992. Information and Diversity of Analyst Opinion. Journal of Financial and Quantitative Analysis 27, 169-183.

Bhattacharya, U., Daouk, H., Welker, M., 2002. The World Price of Earnings Opacity. Unpublished working paper, Indiana University.

Bris, A., Goetzmann, W., Zhu, N., 2003. Efficiency and the Bear: Short Sales and Markets around the World. NBER working paper No. 9466.

Bushman, R., Piotroski, R., Smith, A., 2003. What Determines Corporate Transparency? Unpublished working paper, University of Chicago.

Campbell, J., Lettau, M., Malkiel, B., Xu, Y., 2001. Have Individual Stocks Become More Volatile? An Empirical Exploration of Idiosyncratic Risk. Journal of Finance 56, 1-43.

Chang, J., Khanna, T., Palepu, K., 2001. Analyst Activity Around the World. Harvard Business School Working paper No. 01-061.

Chen, J., Hong, H., Stein, J., 2001. Forecasting crashes: trading volume, past returns, and conditional skewness in stock prices. Journal of Financial Economics 61, 345-381.

Cohen, R., Polk, C., Vuolteenaho, T., 2003. The Value Spread. Journal of Finance 58, 609-41.

Conrad, J., Kaul, G,. 1988. Time-Variation in Expected Returns. Journal of Business 61, 409-25.

De Long, B., Shleifer, A., Summers, L., Waldmann, R., 1989. The Size and Incidence of the Losses from Noise Trading. Journal of Finance 44, 681-696.

De Long, B., Shleifer, A., Summers, L., Waldmann, R., 1990. Noise Trader Risk in Financial Markets. Journal of Political Economy 98, 703-738.

De Long, B., Shleifer, A., Summers, L., Waldmann, R., 1991. The Survival of Noise Traders in Financial Markets. Journal of Business 64, 1-19.

Dimson, E., 1979. Risk Measurement When Shares are Subject to Infrequent Trading. Journal of Financial Economics 7, 197-226.

Easley, D., O'Hara, M., 2002. Information and the Cost of Capital. Unpublished working paper, Cornell University.

Fama, E., MacBeth, J., 1973. Risk, Return, and Equilibrium: Empirical Tests. Journal of Political Economy 81, 607-36.

Friedman, E., Johnson, S., 2000. Tunneling and Propping. Unpublished working paper, MIT Sloan School of Management.

Jensen, M., Meckling, W., 1976. Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. Journal of Financial Economics 3, 305-60.

La Porta R., Lopez-de-Silanes, F., Shleifer, A., 2002. Government Ownership of Banks. Journal of Finance 57, 265-301.

La Porta R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R., 2000. Investor protection and corporate governance. Journal of Financial Economics 58, 3-27.

Morck, R., Yeung, B., Yu, W., 2000. The information content of stock markets: why do emerging markets have synchronous stock price movements? Journal of Financial Economics 58, 215-260.

Myers, S., 2000. Outside Equity. Journal of Finance 55, 1005-37.

O'Hara, M., 2003. Liquidity and Price Discovery. Journal of Finance, 58, 1335-54.

PriceWaterhouseCoopers, 2001. The Opacity Index. Available at http://www.opacity-index.com/.

Rajan, R., Zingales, L., 2001. Financial systems, industrial structure, and growth. Oxford Review of Economic Policy 17, 467-482.

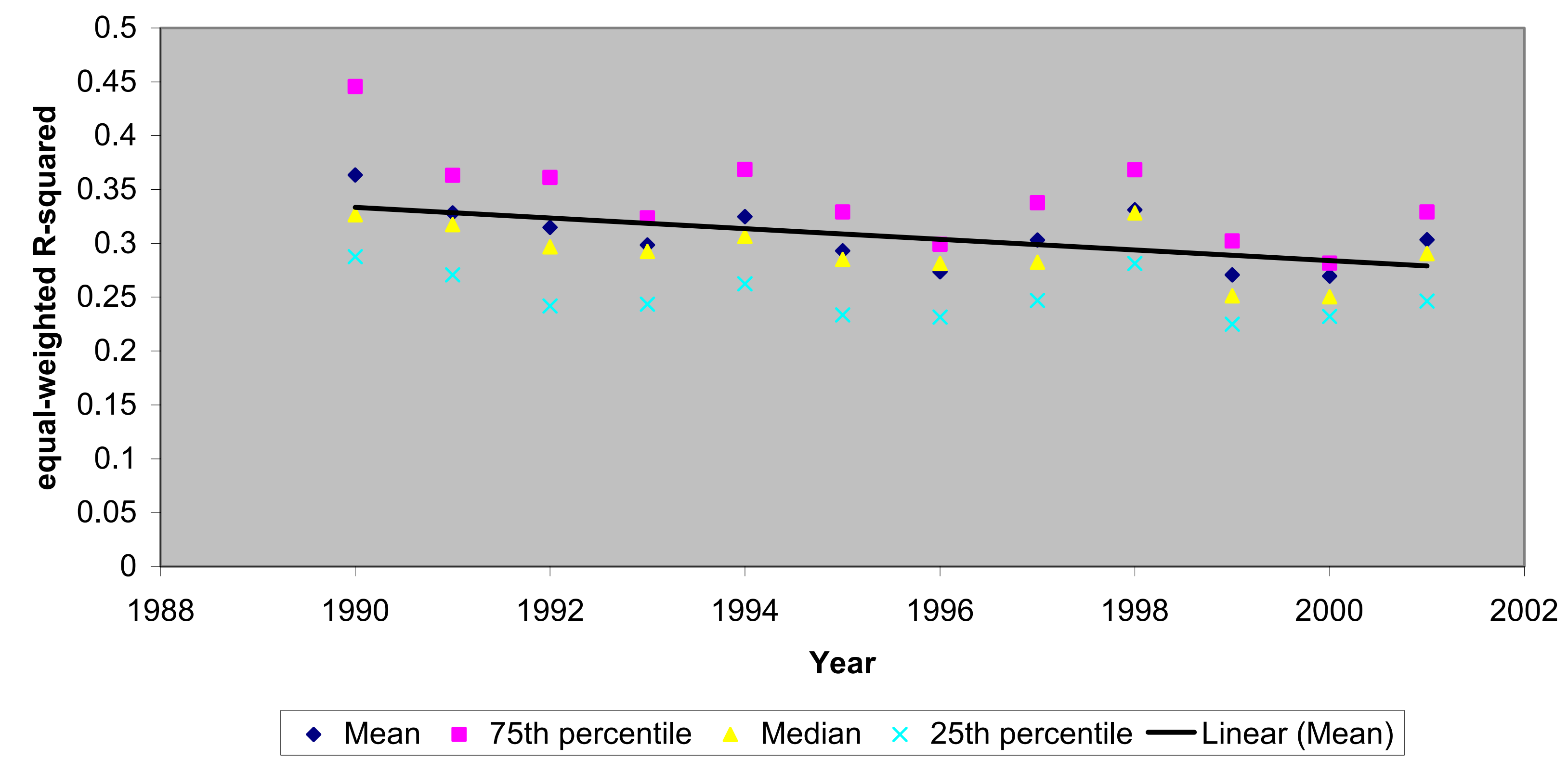
Roll, R., 1988. R-squared. Journal of Finance 43, 541-66.

Saudagaran, S., Diga, J., 1997. Financial Reporting in Emerging Capital Markets: Characteristics and Policy Issues. Accounting Horizons 11, 41-64.

Wei, S., Gelos, R., 2002. Transparency and International Investor Behavior. NBER Working paper No. 9260.

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

Figure 1: Change of average R-squared over time



Plot of the R-squared for the 33 countries for which we have data from 1990-2001. The trend line for the mean of the R-squared is estimated at

$$\text{Average\_R}^2 = 0.33 - 0.00496\ (\text{Year-1990})$$
$$(26.88)\quad (-2.60)$$

where t-statistics in parentheses are below the estimated coefficients

Table 1. Summary Statistics

R2s for individual stocks were averaged, using equal weights or variance weights, for each country and year. The sample includes 33 countries from 1990 to 2001, plus 10 other countries for part of that period. R2s for each country were then averaged across time. Summary statistics were calculated from the cross-sectional distribution of these country averages. Annual values of kurtosis, skewness, COLLAR and COUNT were calculated from each stock's residual returns. Summary statistics for these variables were calculated in the same way as for R2s, but only with equal-weighted country averages. COUNT counts the difference between the numbers of incidences where the residual return is *k* standard deviations below vs. above the mean in a lognormal distribution. The cutoff return *k* is set to generate critical values of 0.01%, 0.1% and 1%. COLLAR is the average payoff from a strategy of buying a put on residual returns, with a strike price chosen to generate payoffs with probabilities of 0.01%, 0.1% and 1% in a lognormal distribution, and selling a call with a strike price that makes the put-call portfolio to have a zero present value.

Variables			Mean	Standard Deviation	Minimum	Median	Maximum
R^2, equal weighted			0.31	0.06	0.20	0.30	0.47
R^2, variance weighted			0.25	0.05	0.18	0.23	0.39
Kurtosis			4.43	2.51	1.66	3.89	13.05
Skewness			0.13	0.17	-0.35	0.15	0.47
COLLAR (x 10^4)	Critical value						
		0.01%	-0.50	0.60	-2.31	-0.47	0.88
		0.10%	-1.16	0.84	-3.43	-0.96	0.85
		1%	-2.88	1.35	-5.74	-2.65	0.41
COUNT (x 10^4)	Critical value						
		0.01%	-6.45	8.54	-24.82	-6.32	16.68
		0.10%	-19.39	12.95	-48.12	-18.12	12.92
		1%	-45.75	24.85	-93.27	-45.08	8.32

Table 2. Explaining differences in country-average R2s across countries and over time. The dependent variables are logistic transformations of equal-weighted (EW) or value-weighted (VW) R2s. The explanatory variables are a Good Government Index based on LaPorta, et al., (1998); the average skewness and kurtosis of residual returns; the log of GDP per capita, and volatility measured by the standard deviation of the local market return. Additional control variables are defined below the table. The first two columns replicate Morck, Yeung and Yu (MYY, 2000), but for a panel of 43 countries from 1990 to 2001. Coefficients were estimated by the Fama-MacBeth (1973) method. t-statistics are reported under each coefficient.

logistic(R-squared)	EW	VR	EW	VR	EW	VR	EW	VR
Independent variables								
Intercept	0.70	-0.96	1.32	-0.21	1.51	-0.05	0.19	-1.43
	(3.79)	-(1.94)	(6.74)	-(0.44)	(6.52)	-(0.10)	(0.56)	-(2.18)
Good Government Index ($x10^{-4}$)	-428.67	-111.04	-485.70	-180.23	-543.49	-227.67	-251.33	78.58
	-(5.32)	-(0.86)	-(6.68)	-(1.58)	-(6.08)	-(1.65)	-(3.47)	(0.47)
Skewness					-0.21	-0.18	-0.22	-0.19
					-(4.51)	-(2.70)	-(5.29)	-(3.04)
Kurtosis ($x10^{-3}$)			-92.15	-111.79	-83.98	-105.09	-67.13	-87.43
			-(14.53)	-(14.31)	-(11.57)	-(11.98)	-(9.32)	-(9.39)
Local market volatility							13.15	13.78
							(5.27)	(3.29)
log (GDP per capita) ($x10^{-4}$)	-235.56	-141.08	-251.32	-160.20	-255.32	-163.48	-101.11	-1.84
	-(4.89)	-(1.66)	-(4.62)	-(1.77)	-(4.51)	-(1.79)	-(1.66)	-(0.02)
log (number of stocks)	-0.06	-0.04	-0.11	-0.10	-0.10	-0.10	-0.07	-0.06
	-(2.28)	-(0.97)	-(4.52)	-(2.45)	-(4.15)	-(2.48)	-(2.18)	-(1.88)
log (country size) ($x10^{-3}$)	-57.50	-43.41	-39.50	-21.57	-37.68	-20.07	-35.87	-18.17
	-(3.62)	-(3.03)	-(3.59)	-(2.35)	-(3.26)	-(2.20)	-(2.77)	-(1.84)
Variance (GDP growth)	0.85	0.71	2.26	2.42	1.19	1.54	-0.40	-0.12
	(0.45)	(0.24)	(2.11)	(1.07)	(0.70)	(0.54)	-(0.27)	-(0.06)
Industry Herfindahl Index	-0.95	-0.11	-0.09	0.94	-0.15	0.89	0.11	1.16
	-(1.42)	-(0.22)	-(0.15)	(2.42)	-(0.22)	(2.09)	(0.13)	(2.73)
Firm Herfindahl Index	-0.34	0.03	-1.86	-1.81	-1.81	-1.77	-1.82	-1.78
	-0.48	0.05	-3.14	-4.30	-2.82	-3.84	-(2.23)	-(3.66)
Adjusted R^2	0.11	0.09	0.34	0.11	0.33	0.12	0.49	0.23
Sample size	344	344	344	344	344	344	344	344

Control variables from MYY (2000):

1. The log of the number of stocks traded in each country and year.
2. Log(country size). Size means geographical area in square kilometers.
3. The variance of the growth rate of each country's GDP, measured in nominal U.S. dollars, from 1990 to 2001.
4. Herfindal Indexes calculated from the distribution of sales of individual firms or industries within each country and year.

Table 3. Testing whether crash frequency, measured by COLLAR and COUNT rather than skewness, explains differences in R2s across countries and over time. The dependent variables are logistic transformations of equal-weighted or value-weighted country-average R2s. All independent variables except for COLLAR and COUNT are as defined in Table 2. COUNT is the difference between the number of positive and negative outliers, defined as residual returns exceeding k standard deviations above or below the mean. The cutoff return k is set to generate critical values of 0.01%, 0.1% and 1% in a lognormal distribution. COLLAR is the average payoff from a strategy of buying a put on residual returns, with a strike price chosen to generate payoffs with probabilities of 0.01%, 0.1% and 1% in a lognormal distribution, and selling a call that would generate payoffs with the same probabilities. Coefficients were estimated by the Fama-MacBeth (1973) method. t-statistics are reported under each coefficient.

Panel A (COLLAR)	Critical value of COLLAR, Equal weights			Critical value of COLLAR, variance weights		
Independent variables	0.01%	0.10%	1%	0.01%	0.10%	1%
Intercept	0.55	0.56	0.57	0.25	0.26	0.27
	(5.25)	(5.14)	(5.37)	(2.20)	(2.20)	(2.34)
COLLAR	45.47	36.06	28.00	36.10	28.64	21.83
	(2.83)	(2.91)	(3.43)	(2.73)	(3.03)	(3.80)
Good Government Index ($x10^{-4}$)	-51.93	-53.55	-56.61	6.15	4.86	2.53
	-(2.09)	-(2.10)	-(2.21)	(0.35)	(0.26)	(0.14)
Kurtosis ($x10^{-3}$)	-21.50	-21.45	-21.56	-15.33	-15.29	-15.40
	-(5.90)	-(5.80)	-(5.71)	-(5.40)	-(5.33)	-(5.21)
Local market volatility	4.50	4.48	4.45	2.80	2.78	2.76
	(4.38)	(4.42)	(4.37)	(2.99)	(3.00)	(2.99)
log(GDP per capita)($x10^{-4}$)	-9.15	-9.14	-9.72	3.65	3.65	3.23
	-(0.32)	-(0.32)	-(0.33)	(0.17)	(0.17)	(0.15)
log (number of stocks)	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	-(1.32)	-(1.34)	-(1.34)	-(1.48)	-(1.50)	-(1.55)
Log (country size) ($x10^{-3}$)	-7.86	-7.86	-7.89	-3.51	-3.51	-3.53
	-(1.60)	-(1.52)	-(1.45)	-(1.18)	-(1.10)	-(1.06)
Variance (GDP growth)	0.12	0.10	0.07	0.12	0.10	0.07
	(0.29)	(0.24)	(0.16)	(0.30)	(0.24)	(0.18)
Industry Herfindahl Index	0.05	0.05	0.05	0.13	0.13	0.13
	(0.28)	(0.27)	(0.23)	(1.24)	(1.11)	(0.89)
Firm Herfindahl Index	-0.50	-0.51	-0.51	-0.35	-0.35	-0.36
	-(2.71)	-(2.88)	-(3.27)	-(3.27)	-(3.66)	-(3.94)
Adjusted R^2	0.64	0.64	0.65	0.53	0.54	0.54
Sample size	344	344	344	344	344	344

Panel B (COUNT)	Critical value of COUNT, Equal weights			Critical value of COUNT, variance weights		
Independent variables	0.01%	0.10%	1%	0.01%	0.10%	1%
Intercept	0.57	0.59	0.62	0.27	0.29	0.30
	(5.46)	(5.75)	(6.44)	(2.27)	(2.49)	(2.83)
COUNT	5.13	4.57	3.58	4.13	3.49	2.45
	(2.58)	(3.34)	(3.33)	(3.04)	(3.77)	(3.18)
Good Government Index (x10 $^{-4}$)	-56.43	-61.92	-66.35	2.51	-1.41	-3.53
	-(2.15)	-(2.35)	-(2.56)	(0.12)	-(0.07)	-(0.20)
Kurtosis (x10 $^{-3}$)	-22.02	-22.30	-23.15	-15.74	-15.98	-16.60
	-(5.33)	-(5.51)	-(5.33)	-(5.10)	-(5.08)	-(4.88)
Local market volatility	4.47	4.42	4.34	2.77	2.74	2.70
	(4.52)	(4.37)	(4.26)	(3.06)	(2.95)	2.95
log(GDP per capita)(x10 $^{-4}$)	-8.31	-9.53	-12.66	4.30	3.42	1.46
	-(0.29)	-(0.32)	-(0.42)	(0.20)	(0.15)	(0.06)
log (number of stocks)	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	-(1.30)	-(1.36)	-(1.22)	-(1.47)	-(1.58)	-(1.58)
Log (country size) (x10 $^{-3}$)	-7.77	-7.81	-7.95	-3.44	-3.46	-3.53
	-(1.48)	-(1.43)	-(1.43)	-(1.10)	-(1.06)	-1.02
Var (GDP growth)	0.04	-0.02	0.01	0.06	0.01	0.04
	(0.11)	-(0.04)	(0.02)	(0.13)	(0.03)	0.08
Industry Herfindahl Index	0.06	0.05	0.06	0.14	0.13	0.15
	(0.29)	(0.22)	(0.25)	(1.03)	(0.78)	(0.82)
Firm Herfindahl Index	-0.51	-0.51	-0.53	-0.36	-0.36	-0.38
	-(2.91)	-(2.64)	-(2.39)	-(4.22)	-(2.94)	-(2.49)
Adjusted R^2	0.65	0.65	0.64	0.54	0.54	0.54
Sample size	344	344	344	344	344	344

Table 4.1. Testing whether opaqueness, measured by DISCLOSURE, explains differences in R2 across countries and over time. The dependent variables are logistic transformations of equal-weighted or value-weighted country-average R2s. DISCLOSURE is an index of the level of financial disclosure and the availability of information, based on the Global Competitiveness Reports (1999, 2000). All independent variables except for DISCLOSURE are as defined in Table 2. Coefficients were estimated by the Fama-MacBeth (1973) method. t-statistics are reported under each coefficient.

Independent variables	Equal weights	Variance weights	Equal weights	Variance weights
Intercept	0.99	0.96	-0.63	-0.84
	(6.13)	(5.01)	-(2.83)	-(4.47)
DISCLOSURE (x10 $^{-3}$)	-28.80	-33.98	-15.38	-15.62
	-(2.54)	-(2.90)	-(3.09)	-(2.86)
Good Government Index (x10 $^{-4}$)	-240.94	-273.20	-36.81	-66.52
	-(3.08)	-(4.03)	-(0.53)	-(1.21)
Kurtosis (x10^{-3})	4.84	6.03	3.23	4.20
	0.45	0.60	0.33	0.47
Local market volatility			14.54	15.88
			(9.08)	(10.39)
log(GDP per capita) (x10^{-4})	-66.58	-48.78	94.98	126.18
	-(1.33)	-(1.00)	(1.74)	(2.32)
log (number of stocks)	-0.04	-0.04	-0.01	-0.01
	-(1.67)	-(2.01)	-(0.43)	-(0.69)
log (country size) (x10 $^{-3}$)	-32.22	-30.01	-27.64	-24.82
	-(2.85)	-(2.87)	-(2.53)	-(2.64)
Variance (GDP growth)	-(0.75)	-(0.55)	-1.68	-1.50
	-(0.56)	-(0.41)	-(2.02)	-(1.86)
Industry Herfindahl Index	-0.91	-0.80	-0.19	0.00
	-(4.05)	-(1.90)	-(1.42)	-(0.01)
Firm Herfindahl Index	0.07	-0.35	-0.58	-1.05
	(0.22)	-(0.75)	-(2.07)	-(3.49)
Adjusted R^2	0.48	0.47	0.68	0.67
Sample size	334	334	334	334

Table 4.2. Testing whether DISCLOSURE and the Good Government Index explain crash frequency, measured by the skewness of residual returns, COLLAR and COUNT. COLLAR and COUNT are defined in Tables 2 and 3. We retain kurtosis and log(GDP per capita) as controls. The other controls in Tables 2, 3 and 4.1 are eliminated, since R2 is no longer the dependent variable. Coefficients were estimated by the Fama-MacBeth (1973) method. t-statistics are reported under each coefficient.

Panel A	Skewness	Critical value of COLLAR		
		0.01%	0.10%	1%
Independent variables				
Intercept	0.68	0.00	0.00	0.00
	(6.18)	-(1.98)	-(5.89)	-(7.70)
DISCLOSURE (x10 $^{-3}$)	36.53	-0.01	-0.02	-0.03
	(3.99)	-(3.19)	-(5.16)	-(3.82)
Good Government Index (x10 $^{-4}$)	-381.66	0.10	0.20	0.39
	-(3.79)	(2.41)	(4.62)	(4.41)
Kurtosis (x10 $^{-3}$)	-13.84	-0.02	-0.02	-0.01
	-(0.79)	-(2.57)	-(2.80)	-(0.88)
log(GDP per capita) (x10 $^{-4}$)	-50.19	-0.01	0.01	0.04
	-(0.89)	-(0.24)	(0.36)	(0.88)
Adjusted R^2	0.35	0.46	0.46	0.33
Sample size	415	415	415	415

Panel B	Critical value of COUNT		
	0.01%	0.10%	1%
Independent variables			
Intercept	0.00	-0.01	-0.01
	-(0.92)	-(2.80)	-(5.61)
DISCLOSURE (x10 $^{-3}$)	-0.29	-0.36	-0.38
	-(2.46)	-(2.18)	-(1.73)
Good Government Index (x10 $^{-4}$)	3.35	5.11	7.13
	(3.75)	(3.79)	(3.77)
Kurtosis (x10 $^{-3}$)	0.07	0.26	0.67
	(0.76)	(2.62)	(4.81)
log(GDP per capita) (x10 $^{-4}$)	-0.24	0.15	0.69
	-(0.56)	(0.24)	(0.68)
Adjusted R^2	0.25	0.28	0.32
Sample size	415	415	415

Table 5.1. Testing whether opaqueness, measured by AUDITOR, explains differences in R2 across countries and over time. The dependent variables are logistic transformations of equal-weighted or value-weighted country-average R2s. AUDITOR is the number of auditors per 100,000 population, based on data from Saudagaran and Diga (1997). All independent variables except for AUDITOR are as defined in Table 2. Coefficients were estimated by the Fama-MacBeth (1973) method. t-statistics are reported under each coefficient.

Independent Variables	Equal weights	Variance weights	Equal weights	Variance weights
Intercept	1.30	0.93	-0.87	-1.41
	(3.50)	(2.50)	-(1.82)	-(2.50)
AUDITOR ($x10^{-6}$)	-350.54	-209.72	-1010.98	-785.17
	-(3.09)	-(1.88)	-(4.91)	-(3.76)
Good Government Index ($x10^{-4}$)	-514.54	-627.00	-202.63	-308.31
	-(6.71)	-(6.39)	-(2.73)	-(2.87)
Kurtosis ($x10^{-3}$)	-92.16	-80.00	6.21	6.98
	-(5.58)	-(5.53)	(0.40)	(0.45)
Local market volatility			10.10	15.19
			(3.78)	(3.42)
log(GDP per capita) ($x10^{-4}$)	45.75	87.08	279.49	319.50
	(0.54)	(1.25)	(2.86)	(2.92)
log (number of stocks)	-0.07	-0.03	0.02	0.05
	-(2.29)	-(0.96)	(0.45)	(1.03)
log (country size) ($x10^{-3}$)	-25.77	-26.74	-46.70	-45.22
	-(2.90)	-(3.51)	-(4.07)	-(3.73)
Variance (GDP growth)	(2.97)	(3.72)	0.53	0.22
	(2.13)	(2.09)	(0.28)	(0.08)
Industry Herfindahl Index	0.23	-0.09	-0.21	-0.49
	(0.46)	-(0.21)	-(0.36)	-(0.80)
Firm Herfindahl Index	-2.62	-1.91	0.73	0.66
	-(1.80)	-(1.52)	(0.45)	(0.45)
Adjusted R^2	0.63	0.63	0.70	0.74
Sample size	255	225	255	225

Table 5.2. Testing whether AUDITOR and the Good Government Index explain crash frequency, measured by the skewness of residual returns, COLLAR and COUNT. COLLAR and COUNT are defined in Tables 2 and 3. Kurtosis and log(GDP per capita) are controls. Other controls are eliminated, since R2 is not the dependent variable. Coefficients were estimated by the Fama-MacBeth (1973) method. t-statistics are reported under each coefficient.

Panel A	Skewness	Critical value of COLLAR		
		0.01%	0.10%	1%
Independent variables				
Intercept	0.78	0.00	0.00	0.00
	4.30	-1.36	-3.12	-4.94
AUDITOR ($x10^{-6}$)	341.08	-0.08	-0.18	-0.40
	3.76	-3.05	-4.04	-4.57
Good Government Index ($x10^{-4}$)	-201.93	0.04	0.10	0.25
	-2.06	1.35	1.98	2.60
Kurtosis ($x10^{-3}$)	20.77	-0.04	-0.05	-0.04
	1.47	-7.68	-5.77	-3.24
log(GDP per capita) ($x10^{-4}$)	24.32	-0.01	-0.02	-0.04
	0.48	-0.59	-0.80	-0.77
Adjusted R^2	0.31	0.59	0.50	0.39
Sample size	258	258	258	258

Panel B	Critical value of COUNT		
	0.01%	0.10%	1%
Independent variables			
Intercept	0.00	-0.01	-0.02
	-4.30	-5.68	-5.58
AUDITOR ($x10^{-6}$)	-2.40	-4.13	-6.91
	-4.50	-4.84	-4.22
Good Government Index ($x10^{-4}$)	1.33	2.87	4.59
	2.51	3.09	2.58
Kurtosis ($x10^{-3}$)	-0.21	0.01	0.61
	-2.41	0.08	2.79
log(GDP per capita) ($x10^{-4}$)	-0.34	-0.52	-0.11
	-1.03	-0.89	-0.10
Adjusted R^2	0.35	0.33	0.33
Sample size	258	258	258

Table 6.1. Testing whether opaqueness, measured by DIVERSITY, explains differences in R2 across countries and over time. The dependent variables are logistic transformations of equal-weighted or value-weighted country-average R2s. DIVERSITY is an index of opaqueness based on the variance of differences is security analysts' earnings forecasts. All independent variables except for DIVERSITY are as defined in Table 2. Coefficients were estimated by the Fama-MacBeth (1973) method. t-statistics are reported under each coefficient.

	Equal weights	Variance weights	Equal weights	Variance weights
Independent Variables				
Intercept	1.32	0.75	-0.84	-1.09
	(7.68)	(3.13)	-(3.68)	-(5.87)
DIVERSITY (x10 $^{-3}$)	1255.11	1536.34	2607.28	1554.65
	(1.84)	(3.08)	(4.55)	(2.75)
Good Government Index (x10 $^{-4}$)	-472.65	-477.48	-135.64	-119.36
	-(10.98)	-(9.62)	-(2.44)	-(2.96)
Kurtosis (x10 $^{-3}$)	-86.71	-81.46	-53.44	-49.90
	-(5.87)	-(4.50)	-(5.87)	-(4.75)
Local market volatility			16.89	17.22
			(8.34)	(8.50)
log(GDP per capita) (x10 $^{-4}$)	-81.56	-26.91	135.15	145.39
	-(1.81)	-(0.53)	(2.55)	(2.98)
log (number of stocks)	-0.10	-0.07	-0.02	-0.01
	-(6.00)	-(4.09)	-(1.07)	-(0.53)
log (country size) (x10 $^{-3}$)	-18.85	-17.31	-15.16	-18.96
	-(1.94)	-(2.08)	-(1.30)	-(2.13)
Variance (GDP growth)	(1.61)	(0.68)	2.35	2.09
	(0.56)	(0.21)	(0.92)	(0.75)
Industry Herfindahl Index	0.03	0.25	0.23	0.50
	(0.09)	(0.55)	(1.30)	(1.43)
Firm Herfindahl Index	-1.31	-1.52	-1.35	-1.89
	-(3.08)	-(2.43)	-(3.80)	-(4.01)
Adjusted R^2	0.51	0.48	0.75	0.68
Sample size	320	320	320	320

Table 6.2. Testing whether DIVERSITY and the Good Government Index explain crash frequency, measured by the skewness of residual returns, COLLAR and COUNT. COLLAR and COUNT are defined in Tables 2 and 3. Kurtosis and log(GDP per capita) are controls. Other controls are eliminated, since R2 is no longer the dependent variable. Coefficients were estimated by the Fama-MacBeth (1973) method. t-statistics are reported under each coefficient.

Panel A	Skewness	Critical value of COLLAR		
		0.01%	0.10%	1%
Independent variables				
Intercept	0.54	0.00	0.00	0.00
	2.26	-0.57	-2.38	-2.64
DIVERSITY (x10 $^{-3}$)	-2357.60	0.80	1.30	2.17
	-4.13	3.91	6.39	3.95
Good Government Index (x10 $^{-4}$)	-56.28	-0.01	0.01	0.09
	-0.44	-0.22	0.33	0.72
Kurtosis (x10 $^{-3}$)	-27.57	-0.01	-0.01	0.00
	-2.55	-2.66	-2.86	-0.39
log(GDP per capita) (x10 $^{-4}$)	-72.72	0.03	0.03	0.05
	-1.72	2.90	3.86	1.13
Adjusted R^2	0.35	0.32	0.32	0.30
Sample size	358	358	358	358

Panel B	Critical value of COUNT		
	0.01%	0.10%	1%
Independent variables			
Intercept	0.00	-0.01	-0.02
	-2.07	-2.98	-4.18
DIVERSITY (x10 $^{-3}$)	13.09	17.29	30.29
	4.34	3.48	2.82
Good Government Index (x10 $^{-4}$)	0.45	1.12	3.12
	0.62	0.96	1.58
Kurtosis (x10 $^{-3}$)	0.09	0.24	0.59
	1.87	2.65	3.62
log(GDP per capita) (x10 $^{-4}$)	0.24	0.42	0.97
	0.91	0.86	1.02
Adjusted R^2	0.32	0.33	0.31
Sample size	358	358	358