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Information Environment and Equity Risk Premium Volatility Around the World

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This paper examines whether and how differences in investors' information environments (measured by a country's information disclosure, accounting standards, and financial transparency) are related to cross-country differences in the market risk premium volatility. We use the vector-autoregressive and implied cost of capital methods to extract time variation in risk premiums for 41 developed and emerging markets worldwide. Consistent with theoretical predictions, countries with better information environments tend to experience a lower risk premium volatility, even after controlling for various country variables that are potentially associated with variation in risk premiums. Our analysis of two exogenous events, specifically the 1997 Asian financial crisis and 2008 global financial crisis, further corroborates our key finding that information environments play an important role in explaining market risk premium variability.

Key words: market risk premium volatility; information environments; implied cost of capital; VAR
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1. Introduction

There is a growing body of evidence that variation in risk premiums (discount rates) contributes substantially to most return variations (see Cochrane's 2011 American Finance Association presidential address).[1] Specifically, asset valuations move on discount rate news far more than on news of expected cashflows.[2] Furthermore, discount rate news contributed significantly to the technology boom and bust in the late 1990s and early 2000s and that low discount rates drove up the stock market during the credit boom until late 2008 (Campbell et al. 2010).[3] Although there is a voluminous amount of research on the level of risk premiums,[4] to our knowledge, no study has yet looked at what characterize(s) this large risk premium volatility across time and across markets, and the goal of our study is to address this important issue.

Motivated by finance theory, our study explores whether variation in equity risk premiums is determined by investors' information environments in international markets. We focus on the empirical implications of Wang's (1994) dynamic model of competitive trading. His model assumes that investors have different private investment opportunities and different information about stocks' future dividends. Investors rationally trade for both informational and noninformational reasons. His theoretical result implies that the variance of equity risk premiums is determined by the variance of expected returns on private investment opportunities and variance of uninformed investors' estimation errors. Variation in risk premiums would decrease when investors receive less noisy public signals, or when there is a smaller proportion of uninformed investors. We therefore

[1] Throughout this study, our focus is on equity risk premiums or discount rates, and the expressions are used interchangeably.

[2] Because of this large variation in risk premiums, Fama and French (1997, p. 178) point out that "[E]stimates of the cost of equity are distressingly imprecise."

[3] Large variations in discount rates suggest that using constant discount rates can produce large misvaluations and that state-variable hedging will matter for active money managers who are mean-variance optimizers. See Cochrane (2011) for detailed discussions of how such discount rate variations would influence other finance applications.

[4] See Campbell (2000) for an excellent review of the literature.

hypothesize that the higher quality investors' information environment induces a lower variation in risk premiums.

We employ two vastly different approaches to estimating variation in market risk premiums of 41 developed and emerging markets across the world for the period from 1988 to 2009. The first approach is the vector-autoregressive (VAR) approach of Campbell (1991) and Ammer and Mei (1996), and the other is the implied cost of capital (ICOC) method, which is based on analyst earnings forecasts. Although neither methodology is perfect, and there exists no superior approach in estimating the market risk premium,[5] using two different methods ensures robustness of our findings. Both approaches yield consistent evidence that movements in equity risk premiums contribute significantly to variation in stock market prices. Using the VAR approach, variation in risk premiums, on average, accounts for 32.1% of variation of aggregate excess returns. On the other hand, the ICOC method indicates an average of 64.6% of variation in country equity returns due to variation in discount rate news. Our results not only reinforce earlier U.S. studies suggesting that a large proportion of stock market price movements is due to variation in risk premiums (Campbell 1991, Campbell and Ammer 1993, Cochrane 2001, Campbell and Vuolteenaho 2004), but also indicate that this evidence is robust across developed and emerging markets.

We test whether and how cross-country variation in risk premiums is related to international differences in investors' information environments. Drawn from existing literature, we select several proxies for quality of investors' information environments. In countries with transparent information environments, we expect more precise public signals to be readily incorporated into investors' expectations, thereby reducing investors' estimation errors and uncertainty. Consistent with theoretical predictions, we find that countries with greater information disclosure, higher accounting standards, and more financial transparency tend to experience less volatile risk premiums, even after controlling for various country and macroeconomic variables that may potentially be associated with risk premium variation. For example, based on estimates of our models, Argentina can reduce the (log) volatility of its equity risk premiums by about 27.8% if its disclosure requirement index improves from 0.5 to 1.[6] Our main finding is marginally more pronounced in segmented markets and is also robust to effects of the conditional variance and hedging demands on the market risk premium, alternative VAR and ICOC specifications, impact of sluggish analyst earnings forecasts on ICOC estimates, and the unobserved heterogeneity in our analysis.

We also exploit two exogenous events—the 1997 Asian financial crisis and 2008 global financial crisis—to further test the link between investors' information environments and variation in risk premiums. A recent study by Lang and Maffett (2012) finds that information environments matter in crisis periods—firms with greater transparency experience less variation in liquidity, especially in times of crisis. They therefore argue that transparency reduces uncertainty about intrinsic value, potentially lowering liquidity variability during market downturns. Similarly, we expect uncertainty in investors' expectations about future returns to increase in crisis periods, especially in countries with poor information environments. Consistent with our prediction, we find a strong correlation between changes in risk premiums and information environment measures. Evidently, countries with more established institutions, as measured by stringent financial disclosure requirements and high information transparency, experience a significantly less volatile risk premium.

Our study contributes to several strands of literature. First, our research expands the empirical asset-pricing literature in a number of ways. We show that changes in risk premiums contribute substantially to the variance of unexpected stock market returns, and that the finding is pervasive across developed and emerging markets. More importantly, our study offers an informational explanation for variations in risk premiums around the world. We also find that the intertemporal risk–return trade-off shown by Pastor et al. (2008) extends beyond their sample of G-7 countries. The relationship between the equity risk premium and its conditional variance is mainly positive and statistically significant for the majority of our sample of 41 countries.

Second, it adds to the growing literature on the relationship between a country's information environment and its financial market development. Stringent disclosure requirements and transparent information environments can reduce a country's cost of capital and increase market liquidity and equity valuation (Hail and Leuz 2006, Daske et al. 2008, Christensen et al. 2010), attract foreign investors (Gelos and Wei 2005), improve pricing efficiency (Jin and Myers 2006, Daouk et al. 2006), and on the whole benefit stock market developments (La Porta et al. 2006). Our study extends this strand of literature especially by linking the information environment to risk premium volatility. This relationship is further reinforced by our analysis of two financial crises that occurred

[5] Section 3 below discusses the pros and cons associated with using either method.

[6] The disclosure requirements index is from La Porta et al. (2006).

in Asia in 1997 and globally in 2008. During these crises, countries with poorer information environments had experienced larger fluctuations in their market risk premiums. Our findings not only highlight the role of transparency in financial markets, but also offer important policy implications for regulatory authorities.

Third, our focus on marketwide return variation further complements prior research on firm-specific return variation. The volatility of individual stock returns is attributable to both systematic and firm-specific return variations. Many existing studies investigate the underlying drivers behind firm-specific return variation. For example, a high R^2 value from the market model can be due to poor investor protection, lack of transparency (Morck et al. 2000, Jin and Myers 2006), or noise and investors' behavioral biases (Hou et al. 2006). We, however, shed new light on the systematic variation of stock returns by determining the informational sources of this variation. Our findings suggest that improving a country's information environment would reduce variation in market risk premiums, and hence a stock's R^2 value. Lowering marketwide return variation, in turn, increases the relative firm-specific return variation and individual stock price informativeness.

Finally, our work advances the finance and accounting literature that shows the usefulness of ICOC as a proxy for the expected stock return around the world. Hail and Leuz (2006) find that international differences in ICOCs are strongly related to the effectiveness of legal institutions and securities regulation across 40 countries, whereas Pastor et al. (2008) and Lee et al. (2009) show that ICOC outperforms realized returns at detecting firm- and country-level risk–return relationships in G-7 countries. We further provide indirect evidence that ICOC is able to capture variation in the equity risk premium and that cross-country differences in ICOC-based discount rate news volatility are significantly related to the information environment for our sample of countries.

The remainder of this paper proceeds as follows. Section 2 discusses the theoretical link between investors' information environment and market risk premium variation. Section 3 estimates time variation in equity risk premiums using VAR and ICOC approaches. Section 4 examines whether investors' information environments affect variations in risk premiums. Section 5 performs several additional tests, followed by conclusions in the final section.

2. Theoretical Discussion

We build our empirical analysis on Wang's (1994) dynamic model of competitive trading. In his model, investors are heterogeneous in terms of asymmetric information and heterogeneous investment opportunities, and they rationally trade for informational and noninformational motives. Under asymmetric information, investors have different private information and therefore respond differently to the same public information about future dividends. As information asymmetry increases, abnormal trading increases in the magnitude of changes of investors' return expectations. In this section, we discuss the empirical implication of Wang's (1994) dynamic model for the relation between information asymmetry and investors' changing expectations.

Wang's (1994) model assumes an economy with a single consumable or investable good and that there are two types of investors who differ in their information about the state of the economy and their private investment opportunities. Informed investors can invest in a risk-free bond, risky stock, or private investment opportunity, and they know the state of the stock's dividend process and the payoff rate of the private investment opportunity.[7] Uninformed investors, on the other hand, can only invest in bonds and stocks, and they infer the current dividend process and payoff rate of informed investors' private investment opportunity from past dividend payments, stock prices, and public signals. Both the proportion of uninformed investors and the precision of public signals determine the degree of information asymmetry between informed and uninformed investors.

Both informed and uninformed investors have the same utility function of the form

$$E_t\left\{-\sum_{s=0}^{\infty}\rho^s e^{-\gamma C_{t+s}}\right\}, \tag{1}$$

where E_t is the expectations operator conditional on the investors' information at time t, and C_{t+s} is the consumption at $t+s$. Model (1) assumes that all investors have the same relative risk aversion parameter γ and time discount factor ρ.

There are two publicly tradable assets: a risk-free asset and a risky stock. Dividends associated with holding the risky stock are paid at t, and the dividend D_t assumes the process

$$D_t = F_t + \varepsilon_{D,t}, \tag{2}$$

where F_t is the persistent dividend component that follows an AR(1) process,

$$F_t = a_F F_{t-1} + \varepsilon_{F,t}. \tag{3}$$

[7] Here the private investment opportunity is introduced as a reason for noninformational trading by informed investors to balance their portfolios, so it can be interpreted as another hedging demand.

In (2) and (3), $\varepsilon_{D,t}$ and $\varepsilon_{F,t}$ are independent and identically distributed shocks to D_t and F_t, respectively. In addition to the stock, there is the private investment opportunity that is available only to informed investors, and its excess rate of return q_{t+1} is given by

$$q_{t+1} = Z_t + \varepsilon_{q,t}, \tag{4}$$

where Z_t is its risk premium, which assumes an AR(1) process,

$$Z_t = a_Z Z_{t-1} + \varepsilon_{Z,t}. \tag{5}$$

At t, informed investors have private information about F_t and Z_t, but uninformed investors can only infer them from the stock's realized dividend D_t, price P_t, and public or noisy signals S_t, where S_t is given by

$$S_t = F_t + \varepsilon_{S,t}. \tag{6}$$

Wang (1994) shows that, under asymmetric information, the intertemporal equilibrium stock price at t is given by

$$P_t = -p_0 + (a - p_F)\hat{F}_t + p_F F_t - p_Z Z_t, \tag{7}$$

where F_t and $\hat{F}_t$ are, respectively, the informed and uninformed investors' conditional expectations of future dividends. As $p_0, p_Z > 0$ and $(a - p_F) > 0$, the equilibrium stock price will increase if uninformed investors believe that there is a high current level of persistent dividend component, or if informed investors know a good state of the true dividend payment or a low expected rate of return from the private investment opportunity. Wang (1994) further shows that the informed investors' expectation of stock excess return μ_t can be expressed as

$$\mu_t = e_0 + e_Z Z_t - e_\Theta \Theta_t, \tag{8}$$

where e_0 denotes the unconditional risk premium,[8] a fundamental risk reward associated with future cash flows; e_Z is the coefficient of Z_t, Θ_t is equal to $\hat{F}_t - F_t$, which denotes the uninformed investors' estimation error of the dividend process at t; and e_Θ is the coefficient of Θ_t. Given that Z_t and Θ are uncorrelated, the variance of the risk premium can be written as

$$\mathrm{Var}(\mu_t) = e_Z^2 \mathrm{Var}(Z_t) + e_\Theta^2 \mathrm{Var}(\Theta_t). \tag{9}$$

Equation (9) shows that the risk premium variance is determined by both the risk premium variance of the private investment opportunity and the variance of the estimation error. The coefficient of the second term, e_Θ^2, monotonically increases with the degree of information asymmetry associated with the proportion of uninformed investors, and $\mathrm{Var}(\Theta_t)$ reflects the quality of information governed by the precision of public signals. Variation in the risk premium would decrease when the public signals investors receive are less noisy, or when there is a smaller proportion of uninformed investors.[9] Similar implications can be drawn from other dynamic asset pricing models such as those of Veronesi (1999) and Anderson et al. (2009). These models link investors' uncertainty about the economy's future growth rate to the dynamics of equity risk premiums.

The above conditional dynamic models give rise to our testable hypothesis that markets with better information environments are associated with a lower variation in the risk premium. Better information environments help facilitate more precise public signals to be incorporated into the investors' expectations, hence minimizing their estimation errors and uncertainty. In this environment, $\mathrm{Var}(\Theta)$ and e_Θ^2 in Equation (9) should be small. Our empirical design employs several proxies for the investors' information environments.

3. Estimating the Variation of Risk Premiums

We employ two different approaches to estimating variation in risk premiums: the VAR and ICOC methods. Although the two methods are quite extensively employed in their respective finance and accounting literatures, neither of them is perfect. Estimates of the VAR approach are sensitive to the selection of forecasting variables and to the specification of its linear dynamics (Chen and Zhao 2009). It is also possible that the commonly employed forecasting variables might not capture all the information available to investors.[10] Although the ICOC method circumvents the problems associated with the VAR approach, it can only be applicable to firms that have information on earnings forecasts, and hence its reliability depends on the quality of such information (Guay et al. 2005). The accuracy of the ICOC method also depends on a firm's long-term growth rate beyond the analysts' forecast period (Easton et al. 2002). Nevertheless, any consistent results generated by these two different methodologies should suggest robustness of our findings.

[8] Expression (8) can also be viewed from the perspective of an econometrician.

[9] Under symmetric information, public signals are perfectly precise or all investors are informed. In this case, $\mathrm{Var}(\Theta) = 0$ or $e_\Theta^2 = 0$, thus resulting in a constant risk premium under the assumption of no impact from variation of private investment opportunities.

[10] Elton (1999) argues that realized returns are noisy estimates of expected returns, and Lundblad (2007) shows that using realized returns requires a very long sample to obtain stable expected return estimates.

3.1. The VAR Approach

Based on a variant of Campbell's (1991) model, Ammer and Mei (1996) show that an innovation in the domestic stock return can be decomposed into news about future dividends, interest rates, and excess stock return:

$$\tilde{r}_{t+1} = (E_{t+1} - E_t)\left\{\sum_{j=0}^{\infty}\rho^j \Delta d_{t+1+j} - \sum_{j=0}^{\infty}\rho^j i_{t+1+j} - \sum_{j=1}^{\infty}\rho^j r_{t+1+j}\right\}, \tag{10}$$

where the symbol ˜ denotes an innovation in a variable, Δd_{t+1} denotes the log change in real dividends at $t+1$, i_{t+1} represents the log real interest rate at $t+1$, r_{t+1} denotes the log excess stock return at $t+1$, and $(E_{t+1} - E_t)$ represents a revision in expectations between t and $t+1$. The constant discount rate ρ is set equal to a value less than one.[11] The simplified version of the domestic unexpected excess return can be rewritten as

$$\tilde{r} = \tilde{r}_d - \tilde{r}_i - \tilde{r}_r, \tag{11}$$

where $\tilde{r}_d$ denotes news about future dividends, $\tilde{r}_i$ denotes news about future real interest rates, and $\tilde{r}_r$ denotes news about future expected excess returns. Equation (11) indicates that any adjustment in the stock price reflects changes in expectations about both future cash flows and expected excess returns.

Our analysis considers the U.S. stock market as the domestic market benchmark and the rest of the markets as foreign markets. Hence, in a slightly different way, the innovation in the foreign stock return can be expressed as

$$\tilde{r}^f_{t+1} = (E_{t+1} - E_t)\left\{\sum_{j=0}^{\infty}(\rho^*)^j \Delta d^*_{t+1+j} - \sum_{j=0}^{\infty}(\rho^*)^j i_{t+1+j} - \sum_{j=0}^{\infty}(\rho^*)^j \Delta q_{t+1+j} - \sum_{j=1}^{\infty}(\rho^*)^j r^f_{t+1+j}\right\}, \tag{12}$$

where the symbol * denotes a foreign variable, Δq_{t+1} denotes the log change in real exchange rate of the U.S. dollar during period $t+1$, and r^f_{t+1} denotes the log foreign stock excess return during period $t+1$. The unexpected foreign stock return can be simplified as

$$\tilde{r}^f = \tilde{r}^f_d - \tilde{r}^f_i - \tilde{r}^f_q - \tilde{r}^f_r, \tag{13}$$

where $\tilde{r}^f_d$, $\tilde{r}^f_i$, and $\tilde{r}^f_r$ are defined similarly as their domestic counterparts, and $\tilde{r}^f_q$ denotes news about future real exchange rates of the U.S. dollar.

We use the VAR approach to estimate the components of $\tilde{r}$ and $\tilde{r}^f$ in Equations (11) and (13). Assume that z_t represents a vector of state variables at t and that it follows a first-order VAR process,

$$z_{t+1} = Az_t + w_{t+1}, \tag{14}$$

[11] We tried a range of ρ values from 0.9950 to 0.9980, and our results remain substantially unchanged.

where A denotes the coefficient matrix of the VAR system, and w_{t+1} denotes the vector of forecasting errors at $t+1$. Given the VAR structure, the revision in expectations of z_{t+j} at $t+1$ is given by

$$(E_{t+1} - E_t)z_{t+j} = A^{j-1}w_{t+1}. \tag{15}$$

To extract risk premium news from Equation (15), we multiply the state vector z by a column vector ι_1, whose first element is one and whose other elements are zero, yielding

$$\tilde{r}_{r,\,t+1} = \iota_1'\rho A(I - \rho A)^{-1}w_{t+1}, \tag{16}$$

$$\tilde{r}^f_{r,\,t+1} = \iota_1'\rho^* A^*(I - \rho^* A^*)^{-1}w^f_{t+1}. \tag{17}$$

We use the same approach to extract the remaining components of $\tilde{r}$ and $\tilde{r}^f$.[12]

Drawn from the existing literature, the state variables employed in estimating the VAR system of Equations (16) and (17) are world excess stock returns, domestic or foreign excess stock returns,[13] world price-to-earnings ratios (PEs), domestic or foreign PEs (PEs are computed as the current aggregate (price) index divided by the anticipated aggregate (price) earnings ratios over the next 12 months), the real interest rate (one-month U.S. Treasury bill rate deflated by the U.S. consumer price index (CPI)), the relative bill rate (the real interest rate detrended by its one-year backward moving average), the default spread (difference between U.S. Baa and Aaa bond yields from the Federal Reserve Bank of St. Louis), term spread (a 10-year U.S. Treasury bond yield minus the one-month U.S. Treasury bill rate), the excess bond return (a 30-year U.S. Treasury bond return minus the one-month U.S. Treasury bill rate), and, finally, the real exchange rate (the value of one U.S. dollar with respect to the local currency deflated by U.S. and local CPIs was obtained from the IMF International Financial Statistics). All the variables are measured in logs. The PEs and relative bill rate are shown to be good stock-return predictors, whereas the default spread, term spread, and excess bond return capture alternative investment opportunities and also predict future stock returns. The inclusion of world variables assumes that local stock markets are mildly integrated with the world stock market.[14]

[12] See Ammer and Mei (1996) for a detailed description of the approach.

[13] All stock market returns are measured in U.S. dollars minus the one-month U.S. Treasury bill rate, and all the information is available from Datastream.

[14] In a partially integrated global market, shocks to the world stock returns will also affect local stock returns (Bekaert and Harvey 1995).

3.2. The Implied Cost of Capital Method

Following Hail and Leuz (2006) and Lau et al. (2010), we employ four different ICOC models to generate variation in discount rate news. The four approaches are the residual income valuation models of Gebhardt et al. (2001; hereafter, GLS) and Claus and Thomas (2001; hereafter, CT), the abnormal earnings growth valuation model of Ohlson and Juettner-Nauroth (2005; hereafter, OJ), and Easton's (2004) MPEG ratio (price-to-earnings ratios divided by growth rate) model.[15] Based on each model, we back out the discount rate of each firm-month (i.e., ICOC) that equates the current stock price to the present value of expected future sequence of abnormal earnings.

To demonstrate, we use GLS's model to discuss the data required to back out the ICOC,

$$P_t = bv_t + \sum_{\tau=1}^{T} \frac{(eps_{t+\tau} - r_{\mathrm{GLS}} \cdot bv_{t+\tau-1})}{(1+r_{\mathrm{GLS}})^{\tau}} + \frac{(eps_{t+T+1} - r_{\mathrm{GLS}} \cdot bv_{t+T})}{r_{\mathrm{GLS}}(1+r_{\mathrm{GLS}})^{T}},$$

where r_{GLS} is the ICOC, P_t is the market price of a firm's stock at t, $eps_{t+\tau}$ is the expected future earnings per share for period $(t+\tau-1, t+\tau)$, and $bv_{t+\tau-1}$ is the book value per share at $t+\tau-1$. The model obtains the initial three years of expected future residual income from actual bv and eps values up to three years ahead. Assuming clean surplus, future book values are imputed from current book values, forecasted earnings, and dividends. For each year, dividends are set equal to the forecasted earnings multiplied by the average payout ratio of the past three years. Beyond the initial three years, the stream of residual incomes is derived by linearly decreasing the forecasted accounting return on equity over the next nine years to the firm's specific sector's median return on equity determined over the past three years. We classify firms into industrial, service, and financial sectors. If a specific sector's median is negative, then we replace it by the country-year median. Residual income is assumed to remain constant beyond 12 years. With ICOC estimates at t and $t+1$, we can proceed to calculate discount rate news as follows.

Suppose we express an ICOC model as a function of cash flow forecast variables c_t available at t and the discount rate r_t (e.g., r_{GLS}) as follows:[16]

$$P_t = f(c_t, r_t),$$

where P_t is the stock price. Following Hail and Leuz (2009) and Chen and Zhao (2010), we decompose total returns into a cash flow component and a discount rate component as follows:

$$R_{t+1} = \frac{P_{t+1} - P_t}{P_t} \tag{18}$$

$$= \frac{f(c_{t+1}, r_{t+1}) - f(c_t, r_t)}{P_t} \tag{19}$$

$$= \frac{f(c_{t+1}, r_{t+1}) - f(c_t, r_{t+1})}{P_t} - \frac{f(c_t, r_t) - f(c_t, r_{t+1})}{P_t} \tag{20}$$

$$= \tilde{R}_{d,\,t+1} - \tilde{R}_{r,\,t+1}, \tag{21}$$

where the proportional stock price difference is decomposed into cash flow news ($\tilde{R}_{d,\,t+1}$) and discount rate news ($\tilde{R}_{r,\,t+1}$). Note that the numerator of $\tilde{R}_{d,\,t+1}$ is driven by the cash flow difference between $t+1$ and t, holding the discount rate stable at $t+1$, whereas $\tilde{R}_{r,\,t+1}$ is driven by variation in discount rates between $t+1$ and t, holding the cash flow constant. Our focus is on variation of a country's average firm-level $\tilde{R}_{r,\,t+1}$, a proxy for the risk premium movement.

3.3. Variance Decomposition for Country Equity Returns

Table 1 reports the decomposition of country equity returns variance using VAR and ICOC approaches for the period January 1988–December 2009. For VAR

[15] The GLS model is shown in the text, whereas the other three models are defined as follows. CT's model is

$$P_t = bv_t + \sum_{\tau=1}^{T} \frac{(\hat{eps}_{t+\tau} - r_{CT} \cdot bv_{t+\tau-1})}{(1+r_{CT})^{\tau}} + \frac{(\hat{eps}_{t+T} - r_{CT} \cdot bv_{t+T-1})(1+g)}{(r_{CT} - g)(1+r_{CT})^{T}}.$$

CT's model obtains the stream of expected future residual income from actual book values per share and forecasted earnings per share up to five years ahead. Beyond year five, nominal residual income is assumed to grow at the rate g equal to the expected inflation (as proxied by the annualized median of a country's one-year-ahead realized monthly inflation rates). OJ's model is specified as follows:

$$P_t = \frac{\hat{eps}_{t+1}}{r_{OJ}} \cdot \frac{(g_{st} + r_{OJ} \cdot (\hat{d}_{t+1}/\hat{eps}_{t+1}) - g_{lt})}{(r_{OJ} - g_{lt})}.$$

The model uses one-year-ahead forecasted earnings and dividends per share as well as forecasts of short-term and long-term abnormal earnings growth. The short-term growth rate g_{st} is equal to the average of the forecasted percentage change in the first two years of earnings and the five-year growth forecast provided by financial analysts on I/B/E/S. The long-term earnings growth rate g_{lt} is set equal to the annualized country-specific median of one-year-ahead realized monthly inflation rates. Easton's (2004) MPEG model is given by

$$P_t = \frac{(\hat{eps}_{t+2} + r_{\mathrm{MPEG}} \cdot \hat{d}_{t+1} - \hat{eps}_{t+1})}{r_{\mathrm{MPEG}}^2}.$$

The model derives a measure of abnormal earnings growth by using one-year- and two-year-ahead earnings per share forecasts as well as expected dividends per share d_{t+1} in period $t+1$. It assumes perpetual growth in abnormal earnings after the initial period.

[16] For example, c_t includes eps_t, d_t, g_{lt}, bv_t, and g_t, as defined in Footnote 15.

Table 1 Variance Decomposition for Country Excess Stock Returns by Country

Country	Type of market	VAR approach				ICOC approach				
		BDate	$\sigma^2_{\tilde{r}_r}/\sigma^2_{\tilde{r}}$	$\sigma^2_{\tilde{r}_d}/\sigma^2_{\tilde{r}}$	$-2(\sigma_{\tilde{r}_r,\tilde{r}_d}/\sigma^2_{\tilde{r}})$	BDate	#Firms	$\sigma^2_{\tilde{R}_r}/\sigma^2_R$	$\sigma^2_{\tilde{R}_d}/\sigma^2_R$	$-2(\sigma_{\tilde{R}_r,\tilde{R}_d}/\sigma^2_R)$
Argentina	EMG	Oct-93	0.487	1.390	−0.884	Jan-93	23	0.974	0.630	−0.604
Australia	DEV	Jan-88	0.096	0.845	0.042	Jan-88	285	0.614	0.445	−0.059
Austria	DEV	Jan-89	0.244	1.507	−0.745	Jan-89	50	0.367	0.828	−0.196
Belgium	DEV	Jan-88	0.200	1.443	−0.628	Jan-88	66	0.325	0.767	−0.092
Brazil	EMG	Jun-99	0.795	1.032	−0.852	Jan-94	95	0.463	0.432	0.105
Canada	DEV	Jan-88	0.159	1.021	−0.178	Jan-88	452	0.521	0.415	0.064
Chile	EMG	Jan-91	0.441	0.819	−0.259	Oct-92	40	0.818	0.638	−0.456
Colombia	EMG	Jan-97	0.893	2.006	−1.943	Jan-97	15	2.626	2.089	−3.715
Denmark	DEV	Jan-88	0.355	1.596	−0.906	Jan-88	88	0.702	0.739	−0.441
Finland	DEV	Jan-89	0.385	1.748	−1.120	Jan-89	72	0.677	0.940	−0.617
France	DEV	Jan-88	0.124	1.250	−0.345	Jan-88	330	0.456	0.855	−0.312
Germany	DEV	Mar-91	0.334	1.380	−0.693	Jan-88	325	0.568	0.660	−0.228
Greece	DEV	Mar-90	0.294	1.367	−0.676	Dec-92	86	0.354	0.367	0.279
Hong Kong	DEV	Jan-88	0.102	0.687	0.196	Jan-88	191	0.523	0.184	0.294
India	EMG	Jan-92	0.577	0.321	0.119	Jan-93	208	0.480	0.221	0.300
Indonesia	EMG	Jan-92	0.474	0.979	−0.449	Jan-92	75	0.523	0.229	0.248
Ireland	DEV	Jan-94	0.219	1.778	−0.963	Jan-94	40	0.269	0.695	0.035
Israel	EMG	Jan-94	0.154	1.068	−0.180	Sep-95	27	0.899	0.588	−0.486
Italy	DEV	Jan-88	0.137	1.153	−0.292	Jan-88	129	0.284	0.603	0.114
Japan	DEV	Jan-88	0.346	0.664	0.091	Jan-88	813	0.487	0.367	0.146
Malaysia	EMG	Jan-88	0.101	1.075	−0.150	Jan-88	179	0.508	0.260	0.232
Mexico	EMG	Aug-90	0.142	1.090	−0.215	Jun-92	53	0.749	0.587	−0.337
Netherlands	DEV	Jan-88	0.192	1.311	−0.492	Jan-88	124	0.396	0.592	0.012
New Zealand	DEV	Mar-88	0.127	0.892	−0.024	Jan-88	57	0.871	0.716	−0.587
Norway	DEV	Jan-88	0.187	1.215	−0.410	Jan-88	80	0.807	0.562	−0.369
Pakistan	EMG	Jan-93	0.332	0.733	−0.078	Jan-93	25	0.639	0.277	0.084
Peru	EMG	Mar-94	0.377	0.981	−0.366	Jun-94	16	1.054	0.665	−0.719
Philippines	EMG	Jan-90	0.462	1.001	−0.422	Jan-90	46	0.572	0.345	0.083
Portugal	DEV	Mar-90	0.180	1.380	−0.546	Apr-91	32	0.344	0.816	−0.160
Singapore	DEV	Jan-88	0.286	0.911	−0.166	Jan-88	135	0.530	0.273	0.197
South Africa	EMG	Jan-88	0.511	0.513	−0.028	Jan-88	164	0.640	0.382	−0.022
South Korea	EMG	Jan-89	0.157	0.754	0.100	Jan-89	228	0.636	0.303	0.060
Spain	DEV	Jan-88	0.324	1.251	−0.558	Jan-88	100	0.293	0.689	0.018
Sweden	DEV	Jan-88	0.163	1.059	−0.195	Jan-88	125	0.802	0.573	−0.376
Switzerland	DEV	Jan-88	0.373	1.377	−0.685	Jan-88	146	0.538	0.371	0.091
Taiwan	EMG	Jan-90	0.112	0.671	0.266	Jan-90	160	0.683	0.351	−0.034
Thailand	EMG	Jan-90	0.285	0.725	−0.010	Jan-90	125	0.592	0.311	0.097
Turkey	EMG	May-90	0.394	0.565	0.022	Dec-91	94	0.814	0.384	−0.198
United Kingdom	DEV	Jan-88	0.213	1.170	−0.389	Jan-88	857	0.462	0.212	0.326
United States	DEV	Jan-88	0.390	0.941	−0.269	Jan-88	3244	0.454	0.240	0.306
Venezuela	EMG	Jan-96	1.056	1.051	−1.099	Jan-96	12	1.174	0.644	−0.818

Notes. This table presents the variance decomposition for country excess returns using VAR and ICOC approaches. For the VAR approach, we report the variance of $\tilde{r}_r$, variance of $\tilde{r}_d$, and their covariance multiplied by −2 relative to the unexpected excess returns variance; they are denoted by $\sigma^2_{\tilde{r}_r}/\sigma^2_{\tilde{r}}$, $\sigma^2_{\tilde{r}_d}/\sigma^2_{\tilde{r}}$, and $-2(\sigma_{\tilde{r}_r,\tilde{r}_d}/\sigma^2_{\tilde{r}})$, respectively. Correspondingly, for the ICOC method, we measure these components relative to the variance of equity returns, and they are $\sigma^2_{\tilde{R}_r}/\sigma^2_R$, $\sigma^2_{\tilde{R}_d}/\sigma^2_R$, and $-2(\sigma_{\tilde{R}_r,\tilde{R}_d}/\sigma^2_R)$. BDate is the starting date of the available data used for each method, and #Firms presents the number of sample firms used for computing the firm-level ICOC. EMG denotes an emerging market, whereas DEV stands for a developed market. The sample period is from January 1988 to December 2009.

specification, we report only proportions of the three largest components in $\sigma^2_{\tilde{r}}$, namely, variance of $\tilde{r}_r$ ($\sigma^2_{\tilde{r}_r}$), variance of $\tilde{r}_d$ ($\sigma^2_{\tilde{r}_d}$), and their covariance ($\sigma_{\tilde{r}_d,\tilde{r}_r}$); the remaining unreported components contribute little to $\sigma^2_{\tilde{r}}$ with the average absolute contribution of 2.2%. Correspondingly, for ICOC estimation, we measure the variances of $\tilde{R}_r$ and $\tilde{R}_d$ ($\sigma^2_{\tilde{R}_r}$ and $\sigma^2_{\tilde{R}_d}$) and their covariance ($\sigma_{\tilde{R}_r,\tilde{R}_d}$) relative to the returns variance (σ^2_R). The table also presents the start date of the data used for each method (BDate) and the number of firms in our ICOC sample.

Results suggest that variance components of equity returns vary across the two approaches and across countries and that variation in discount rate news contributes quite substantially to the variability of stock market prices. For VAR methodology, the proportion of $\sigma^2_{\tilde{r}_r}$ in $\sigma^2_{\tilde{r}}$ is between 9.6% (Australia) and 105.6% (Venezuela), whereas the proportion of $\sigma^2_{\tilde{r}_d}$ in

$\sigma^2_{\tilde{r}}$ is between 32.1% (India) and 200.6% (Colombia). The cross-country average of the former is 32.1%, and that of the latter is 109.1%. In comparison, the ICOC method yields averages of 64.6% and 54.3% for the proportions of $\sigma^2_{\tilde{R}_r}$ and $\sigma^2_{\tilde{R}_d}$ in $\sigma^2_{\tilde{R}}$, respectively. Whereas discount rate news dominates cash flow news in short-term horizons, cash flow news is shown to be more important in driving stock returns over longer time horizons (Chen and Zhao 2010). Given that our analysis focuses on short-term variation of stock returns, we shall leave the effect of cash flow news on long-term variation of stock returns to future research.

Furthermore, both methods produce a larger variation in discount rate news in emerging than in developed markets. The variance of VAR discount rate news comprises of 43.0% and 23.6% of the variance of $\tilde{r}$ in emerging and developed markets, and their ICOC counterparts comprise 82.5% and 50.6%, respectively. These observations are consistent with our prior that emerging markets with poor information environments have a relatively larger variation in equity risk premiums.

It is straightforward to show that $\sigma_{\tilde{r}_r}$ and $\sigma_{\tilde{R}_r}$ are consistent estimates of the risk premium volatility (σ_{RP}). Thus, our subsequent analyses use the log of the annualized standard deviation of monthly VAR and ICOC discount rate news estimated yearly (hereafter, the VAR- and ICOC-based σ_{RP}) to capture σ_{RP}.

4. The Role of Information Environment

This section tests whether and how the risk premium volatility is associated with investors' information environment using a large sample of markets around the world. To ensure robustness, our tests employ both VAR- and ICOC-based σ_{RP} as dependent variables and several measures of the information environment. We also test whether the finding is robust to exogenous events, namely, the 1997 Asian financial crisis and 2008 global financial crisis. These events offer us an excellent opportunity to study whether there exists any linkage between changes in investors' expectations arising from the crises and countries with different information environments.

4.1. Information Environment and the Risk Premium Volatility

We conduct panel regressions of σ_{RP} on measures of the country-level information environment, together with various controls for country characteristics and year fixed effects, for the 1988–2009 sample period.

Our study employs commonly used disclosure and accounting quality measures as proxies for a country's information environment: (i) a disclosure requirement index, *DReq* (La Porta et al. 2006); (ii) a financial disclosure score, *Disc* (Jin and Myers 2006); (iii) an accounting standards index, *AcStd* (La Porta et al. 1998); (iv) a financial transparency factor, *FTran* (Bushman et al. 2004); and (v) PriceWaterhouseCoopers' opacity index, *PWC* (Kurtzman et al. 2004). These measures are stable across the entire sample period. But one may argue that using such variables could essentially reduce variation in our key variables to the number of countries and potentially inflate the t-statistics of their coefficients. Also, the results may suffer from unobserved heterogeneity using institutional factors specified at the level. To allay these concerns as well as concerns about the possible endogeneity of a country's institutional framework, we also employ two time-variant institutional variables, namely, a capital market governance index, *CMG* (Daouk et al. 2006), and a country-year median firm-level probability of information-based trading, *PIN* (Easley et al. 2002).[17] Given that all these variables substantially measure similar quality of the information environment, our regression model incorporates one variable at a time. A description of the variables, together with the control variables discussed below, is presented in the appendix.

Table 2 reports, by country, levels of time-invariant information proxies (*DReq*, *Disc*, *AcStd*, *FTran*, and *PWC*) and time-series averages of time-variant *CMG* and *PIN*. To understand how time-variant proxies behave during the Asian crisis period, we also present the difference in *PIN* between 1996 and 1998 (Δ*PIN*).[18] We do not report *CMG* because of its fairly stable subcomponents during this period; two of its three subcomponents are indicator variables (insider trading enforcement and feasibility of trading in short sales and put options), and its third component is an earnings transparency index. For the overall sample of countries, the mean *PIN* increases by 0.002 between 1996 and 1998, whereas for East Asian countries (namely, Hong Kong, Indonesia, Korea, Malaysia, the Philippines, Singapore, Thailand, and Taiwan), the average *PIN* rises by 0.06.

Our analysis uses several groups of variables that control for various country characteristics and institutions that can potentially affect variation in market risk premiums as follows: (i) a country's investor protection level (anti-director index (*AntiDir*) from Pagano and Volpin (2005), anti-director index from Spaaman (2010), anti-self-dealing index from Djankov et al. (2008), or corporate governance indexes

[17] A country-year median *PIN* refers to the yearly median firm-level *PIN*; using this median measure ensures that the proxy variable is not tilted toward outliers in the country.

[18] *PIN* estimates are available from 1996 to 2007.

Table 2 Statistics on Information Environment Measures and Control Variables

	Information environment measures								Control variables							
Country	*DReq*	*Disc*	*AcStd*	*FTran*	*PWC*	*CMG*	*PIN*	ΔPIN	*AntiDir*	*NFirms*	*HerfInd*	σ_{ROA}	σ_β	σ_{GDP}	r_{ICOC}	*Inflation*
Argentina	0.500	0.490	0.450	0.217	0.440	0.838	0.402	0.016	4.000	4.790	0.088	0.043	0.974	0.054	0.104	0.058
Australia	0.750	0.630	0.750	0.355	0.210	0.758	0.298	0.011	4.000	7.196	0.026	0.043	0.572	0.012	0.068	0.031
Austria	0.250	0.600	0.540	−0.110	0.230	0.486	0.249	−0.037	2.476	4.587	0.049	0.019	0.555	0.010	0.064	0.022
Belgium	0.417	0.590	0.610	0.497	0.230	0.785	0.275	0.039	2.000	5.145	0.065	0.026	0.522	0.012	0.064	0.021
Brazil	0.250	NA	0.540	0.098	0.400	0.864	0.329	NA	5.000	6.107	0.033	0.044	0.996	0.019	0.124	0.241
Canada	0.917	0.630	0.740	1.171	0.230	0.910	0.256	−0.004	5.000	7.519	0.014	0.038	0.413	0.016	0.067	0.023
Chile	0.583	0.580	0.520	−0.085	0.290	0.681	0.416	0.040	5.000	5.544	0.036	0.025	0.645	0.023	0.073	0.067
Colombia	0.417	0.440	0.500	−1.205	0.430	0.146	NA	NA	5.000	4.795	0.094	0.019	0.555	0.023	0.108	0.076
Denmark	0.583	0.620	0.620	0.475	0.190	0.738	0.327	0.007	2.000	5.417	0.052	0.023	0.542	0.015	0.066	0.023
Finland	0.500	0.650	0.770	0.557	0.130	0.804	0.281	−0.041	3.000	4.647	0.049	0.026	0.773	0.023	0.088	0.020
France	0.750	0.590	0.690	1.265	0.370	0.869	0.263	−0.020	3.364	6.570	0.017	0.022	0.430	0.011	0.059	0.019
Germany	0.417	0.600	0.620	1.617	0.250	0.769	0.180	−0.005	2.545	6.458	0.019	0.026	0.435	0.013	0.053	0.020
Greece	0.333	NA	0.550	−0.874	0.410	0.528	0.227	−0.021	2.750	5.495	0.049	0.027	0.828	0.013	0.078	0.066
Hong Kong	0.917	0.580	0.690	0.663	0.200	0.656	0.320	0.081	5.000	6.455	0.057	0.038	0.752	0.034	0.099	0.036
India	0.917	0.480	0.570	−0.640	0.480	0.543	0.280	0.055	5.000	8.515	0.028	0.024	0.942	0.018	0.108	0.070
Indonesia	0.500	NA	NA	NA	0.590	0.506	0.391	NA	2.833	5.663	0.027	0.035	1.175	0.029	0.127	0.107
Ireland	0.667	0.560	NA	−0.179	0.260	0.520	0.249	NA	4.000	4.201	0.080	0.031	0.583	0.023	0.078	0.026
Israel	0.667	NA	0.640	0.093	0.300	0.854	0.308	−0.026	4.688	6.439	0.047	0.025	0.702	0.021	0.079	0.043
Italy	0.667	NA	0.620	1.157	0.430	0.707	0.215	0.033	3.136	5.539	0.041	0.016	0.603	0.011	0.063	0.033
Japan	0.750	0.560	0.650	0.684	0.280	0.767	0.222	0.029	4.364	7.857	0.007	0.012	0.535	0.015	0.023	0.005
Malaysia	0.917	0.510	0.760	0.234	0.350	0.538	0.291	0.042	4.000	6.426	0.017	0.029	0.816	0.029	0.060	0.029
Mexico	0.583	0.460	0.600	0.386	0.440	0.511	0.360	−0.130	1.450	5.133	0.037	0.038	0.826	0.027	0.091	0.115
Netherlands	0.500	0.610	0.640	1.342	0.240	0.774	0.220	−0.015	2.000	5.337	0.090	0.025	0.383	0.011	0.071	0.021
New Zealand	0.667	0.600	0.700	−0.028	NA	0.162	0.386	0.012	4.000	5.016	0.104	0.027	0.648	0.017	0.065	0.026
Norway	0.583	0.580	0.740	0.279	NA	0.827	0.310	0.051	4.000	5.087	0.087	0.038	0.613	0.012	0.091	0.025
Pakistan	0.583	NA	NA	−1.393	0.450	0.191	NA	NA	5.000	6.565	0.058	0.033	1.003	0.018	0.138	0.083
Peru	0.333	0.460	0.380	−0.644	NA	0.495	NA	NA	3.750	5.369	0.058	0.031	0.687	0.032	0.148	0.047
Philippines	0.833	0.460	0.650	−0.122	0.500	0.179	0.349	0.044	3.000	5.385	0.069	0.027	0.924	0.019	0.093	0.066
Portugal	0.417	0.510	0.360	−0.260	0.350	0.501	0.310	−0.080	3.500	4.589	0.061	0.018	0.558	0.016	0.071	0.039
Singapore	1.000	0.590	0.780	0.459	0.240	0.828	0.294	0.008	4.000	5.712	0.048	0.029	0.594	0.037	0.062	0.017
South Africa	0.833	0.550	0.700	−0.407	0.340	0.513	0.307	−0.010	5.000	6.325	0.023	0.033	0.716	0.016	0.109	0.080
South Korea	0.750	0.470	0.620	−0.493	0.370	0.682	0.251	0.115	2.667	7.008	0.024	0.022	1.207	0.029	0.091	0.043
Spain	0.500	0.560	0.640	0.877	0.340	0.605	0.196	0.005	4.000	6.887	0.042	0.015	0.537	0.012	0.062	0.037
Sweden	0.583	0.630	0.830	0.801	0.190	0.843	0.238	−0.029	3.000	5.504	0.029	0.039	0.612	0.016	0.078	0.026
Switzerland	0.667	0.570	0.680	0.814	0.230	0.748	0.283	−0.133	2.000	5.432	0.046	0.015	0.470	0.013	0.055	0.017
Taiwan	0.750	0.540	0.650	NA	0.340	0.699	0.207	NA	3.000	6.130	0.045	0.030	0.970	0.063	0.062	0.019
Thailand	0.917	0.430	0.640	−0.362	0.350	0.617	0.309	0.068	2.000	5.991	0.043	0.031	1.146	0.032	0.098	0.036
Turkey	0.500	0.510	0.510	−0.789	0.430	0.684	0.203	−0.006	2.000	5.473	0.077	0.058	1.888	0.047	0.171	0.387
United Kingdom	0.833	0.630	0.780	0.754	0.190	0.894	0.237	−0.010	5.000	7.666	0.020	0.038	0.427	0.011	0.067	0.034
United States	1.000	NA	0.710	1.590	0.210	0.922	0.151	−0.018	5.000	8.786	0.004	0.032	0.309	0.012	0.058	0.029
Venezuela	0.167	0.370	0.400	−1.377	0.510	0.159	NA	NA	1.000	4.266	0.111	0.034	0.981	0.049	0.310	0.272

Notes. This table presents annual measures of the proxies for country-level information environment (measured by a disclosure requirement index (*DReq*), a financial disclosure index (*Disc*), an accounting standard index (*AcStd*), a financial transparency factor (*FTran*), an opacity index (*PWC*), a composite capital market governance index (*CMG*), and the probability of information-based trading (*PIN*). Values of *CMG* and *PIN* together with those of control variables (*AntiDir*, *NFirms*; *HerfInd*; *country-year median* σ_{ROA}, σ_β, σ_{GDP}, and r_{ICOC}; and *Inflation*) are time-series average values over the sample period January 1988–December 2009. ΔPIN captures the difference in *PIN* between years 1996 and 1998 (the Asian crisis). NA, not applicable. All variables are defined in the appendix.

Table 3 **Panel Regressions of the Risk Premium Volatility σ_{RP} on Country Information Environment Measures**

	Panel A: Dependent variable—VAR-based σ_{RP}							Panel B: Dependent variable—ICOC-based σ_{RP}						
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14
DReq	−0.645							−0.465						
	(−2.25)							(−3.16)						
Disc		−2.599							−2.162					
		(−2.73)							(−3.95)					
AcStd			−1.275							−1.014				
			(−2.06)							(−3.05)				
FTran				−0.279							−0.164			
				(−3.93)							(−4.22)			
PWC					1.676							1.084		
					(3.06)							(3.33)		
CMG						−0.177							−0.150	
						(−2.41)							(−1.64)	
PIN							2.897							3.669
							(1.83)							(2.20)
AntiDir	0.040	0.035	0.025	−0.015	0.031	−0.017	−0.043	0.023	0.018	0.014	−0.012	0.014	−0.075	−0.036
	(0.98)	(0.84)	(0.62)	(−0.39)	(0.85)	(−0.78)	(−1.14)	(0.90)	(0.74)	(0.63)	(−0.53)	(0.63)	(−2.76)	(−0.88)
NFirms	0.026	−0.037	−0.004	0.025	−0.026	0.076	0.076	−0.022	−0.059	−0.053	−0.032	−0.055	0.007	0.010
	(0.47)	(−0.61)	(−0.06)	(0.45)	(−0.50)	(2.30)	(1.38)	(−0.67)	(−1.71)	(−1.61)	(−1.02)	(−1.73)	(0.18)	(0.18)
HerfInd	−1.143	−0.942	−1.111	−1.220	0.131	−0.961	−1.414	1.793	1.476	1.525	1.640	2.924	3.277	4.588
	(−1.27)	(−1.00)	(−1.28)	(−1.09)	(0.16)	(−2.53)	(−1.49)	(2.77)	(2.30)	(2.55)	(2.19)	(3.45)	(5.69)	(4.59)
σ_{ROA}	0.663	0.618	1.377	1.559	1.582	0.906	1.120	0.293	1.084	0.834	1.200	0.706	0.968	0.984
	(0.88)	(1.08)	(1.64)	(1.54)	(1.98)	(2.85)	(1.82)	(0.81)	(1.89)	(2.43)	(3.32)	(1.84)	(2.68)	(1.53)
σ_{β}	0.332	0.190	0.284	0.141	0.232	0.120	0.050	0.366	0.259	0.356	0.283	0.314	0.251	0.221
	(4.50)	(2.51)	(3.62)	(2.35)	(3.28)	(3.99)	(1.17)	(5.37)	(3.99)	(4.86)	(4.35)	(4.93)	(6.97)	(4.88)
σ_{GDP}	3.494	1.801	1.987	2.161	0.380	1.780	1.437	3.472	1.648	2.163	0.924	1.624	−1.012	−0.398
	(2.08)	(1.24)	(1.16)	(0.83)	(0.24)	(1.94)	(0.94)	(2.93)	(1.10)	(1.69)	(0.71)	(1.36)	(−0.91)	(−0.25)
r_{ICOC}	2.809	1.312	1.961	1.198	2.153	−0.210	−0.097	2.123	1.495	1.829	1.729	0.937	0.452	0.916
	(3.00)	(1.28)	(1.95)	(1.51)	(2.34)	(−0.50)	(−0.11)	(3.73)	(2.00)	(3.17)	(2.61)	(1.58)	(0.91)	(0.94)
Inflation	0.396	0.794	0.544	0.658	0.284	−0.002	0.279	0.011	0.186	0.007	0.036	0.033	0.040	−0.261
	(1.50)	(2.96)	(1.97)	(2.78)	(1.14)	(−0.02)	(1.05)	(0.57)	(0.81)	(0.40)	(1.84)	(1.44)	(1.10)	(−0.93)
Country FEs	No	No	No	No	No	Yes	Yes	No	No	No	No	No	Yes	Yes
NObs	796	674	745	758	736	794	413	799	672	748	762	739	797	414
$\bar{R}^2$ (%)	46.7	50.0	48.2	51.7	52.7	78.7	78.4	48.4	52.9	51.5	50.5	52.5	62.1	64.8

Notes. This table shows regression results of the risk premium volatility σ_{RP} on country-level information environment measures (*DReq*, *Disc*, *AcStd*, *FTran*, *PWC*, *CMG*, and *PIN*) and control variables together with unreported year and country fixed effects (FEs) as well as intercepts. The dependent variables in panels A and B are the VAR- and ICOC-based σ_{RP}, expressed in log. Control variables are *AntiDir*; *NFirms*; *HerfInd*; *country-year median* σ_{ROA}, σ_{β}, σ_{GDP}, and r_{ICOC}; and *Inflation*. All variables are defined in the appendix. The t-statistics reported in parentheses are adjusted for clustered standard errors at the country level. NObs, number of observations; $\bar{R}^2$, adjusted R^2. The sample period is from January 1988 to December 2009.

from Kaufmann et al. (2009));[19] (ii) country size (number of firms (*NFirms*), geographical size, or population); (iii) degree of diversification (Herfindahl index (*HerfInd*), industry Herfindahl index, or country-year median firm-level market capitalization); (iv) firm operating risk (country-year median standard deviation of the return on assets (σ_{ROA}) or standard deviation of changes in ROA); (v) capital market risk (standard deviation of the world market beta (σ_{β}), skewness, or kurtosis); (vi) economic risk (standard deviation of the gross domestic product (GDP) growth, σ_{GDP}); and (vii) others (the level of expected risk premium, as proxied by the implied cost of capital, r_{ICOC}, and inflation). Untabulated results show that our key finding is robust across these different proxy variables. To conserve space, subsequent tables only report results using one proxy variable from each category, and time-series averages of the reported control variables are shown in Table 2.

Table 3 presents main panel regression results, with the VAR-based σ_{RP} as the dependent variable in panel A and the ICOC-based σ_{RP} in panel B. All

[19] These variables control for informed investors' private investment opportunities. Jiang et al. (2010) find that controlling shareholders extract funds from public companies through the use of corporate loans, implying that private investment opportunity may even take the form of corruption in emerging markets. In particular, even though market participants place a high discount rate on those firms with tunnelling potential, their stocks still earn significant negative future stock returns.

t-statistics associated with the coefficient estimates are adjusted for clustered standard errors at the country level. The table reveals a number of interesting results. Consistent with the theoretical prediction, the risk premium volatility is strongly related to most of the information environment measures. The adjusted R^2 values suggest that information environment measures, combined with control variables and fixed effects, on average, explain about 58.1% and 54.7% of the cross-country variation in VAR- and ICOC-based σ_{RP}, respectively. We find that all information environment measures, except for *PIN* in model M7 and *CMG* in model M13, are statistically significant at conventional levels. Countries with more transparent information environment (i.e., high *FTran* or low *PWC*) and with greater information disclosure (i.e., high *DReg*, *Disc*, *CMG*, and *AcStd*, or low *PIN*) tend to have a lower risk premium volatility. For example, the coefficients of *DReq* and *CMG* are −0.645 ($t = -2.25$) and −0.177 ($t = -2.41$) in panel A and −0.465 ($t = -3.16$) and −0.150 ($t = -1.64$) in panel B, respectively. Correspondingly, the coefficients of *PWC* and *PIN* are 1.676 ($t = 3.06$) and 2.897 ($t = 1.83$) in panel A and 1.084 ($t = 3.33$) and 3.669 ($t = 2.20$) in panel B, respectively, suggesting that countries with more opaque information environments or with high intensities of information-based trading tend to have larger risk premium volatility.

Among selected control variables, σ_{ROA} and σ_{β} exhibit a strong positive association with both risk premium volatility measures. Higher variations in ROA and β suggest larger variation in operating uncertainty and market risk exposure, and hence induce a greater variation in risk premiums. The Herfindahl index, *HerfInd*, controls for the dominant effect of large firms in a country, and the results indicate that *HerfInd* is statistically and positively related to the ICOC-based, but not the VAR-based, risk premium volatility. This is consistent with the notion that the ICOC-based approach is tilted toward large firms, whose earnings forecasts are easily available in the Institutional Brokers' Estimate System (I/B/E/S) database.

With a high level of macroeconomic uncertainty, investors may change their expectations of future returns frequently; its proxy, σ_{GDP}, however, exhibits a weak association with the risk premium volatility. Furthermore, we find no evidence that good corporate governance on private investment opportunity, as proxied by *AntiDir*, has any significant relationship with σ_{RP}. Although it is possible that firm-level changes in risk premiums may be diversified away in aggregate portfolios containing a large number of stocks and that cross-country differences in the risk premium volatility are due to the number of stocks in the market index or in the I/B/E/S database, our results show no effect of *NFirms* on σ_{RP}. Finally, our analysis also controls for the level of risk premium, r_{ICOC}, and inflation to capture the strong underlying correlation between the level and volatility of market risk premiums. The r_{ICOC} effect on σ_{RP} is only evident in the presence of time-invariant information environment measures (i.e., *DReg*, *Disc*, *AcStd*, *FTran*, and *PWC*), but not time-variant *CMG* and *PIN* when we include country fixed effects. The coefficient of *Inflation*, although mainly positive, is not robustly associated with σ_{RP}.

In summary, we show that a country's information environment plays a crucial role in explaining the cross-country risk premium volatility. Countries with more stringent disclosure and transparent information environments tend to experience a less volatile market risk premium.

4.2. Evidence from the Asian and Global Financial Crises

4.2.1. The 1997 Asian Financial Crisis. The Asian financial crisis started in Thailand in July 1997, causing crashes in foreign exchange and stock markets of most East Asian countries and ending with rippled effects on other emerging markets such as Brazil in 1999. Previous studies have shown substantial evidence that corporate governance mechanisms explain the extent of the financial crisis. For example, Johnson et al. (2000) provide country-specific evidence that countries with poor protection of minority shareholder rights experience serious exchange rate depreciations and stock market declines during the crisis. Mitton (2002) finds that stocks of firms with higher standard of disclosure, greater outside ownership concentration, or more focused organization perform better during the crisis.

We therefore reexamine our main analysis by focusing only on the period in which the 1997 financial crisis occurred. To facilitate the comparison of our results with those of Johnson et al. (2000), we analyze 20 of their 25 sample countries that are covered in our sample of 41 countries.[20] To distinguish East Asian countries from other markets, we define a dummy variable, *EAsia*, to equal one for Hong Kong, Indonesia, Korea, Malaysia, the Philippines, Singapore, Thailand, and Taiwan and zero otherwise. We also employ the Johnson et al. (2000) approach to construct a similar dependent variable, measured by a change in the risk premium, ΔRP, and add their control variable, a country's central bank's total reserves,

[20] The 20 countries are Argentina, Brazil, Chile, Colombia, Greece, Hong Kong, India, Indonesia, Israel, Korea, Malaysia, Mexico, the Philippines, Portugal, Singapore, South Africa, Taiwan, Thailand, Turkey, and Venezuela. We, however, exclude their sample of five countries (i.e., China, Czech Republic, Hungary, Poland, and Russia), because these countries do not have all the variables required for our analysis.

Table 4 Effects of Information Environment Measures on the Change in Risk Premiums ΔRP During the 1997 Asian Financial Crisis

	Panel A: Dependent variable—VAR-based ΔRP							Panel B: Dependent variable—ICOC-based ΔRP						
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14
DReq	−0.017 (−1.75)							−0.115 (−2.48)						
Disc		−0.080 (−2.55)							−0.446 (−2.38)					
AcStd			−0.041 (−1.92)							−0.179 (−1.47)				
FTran				−0.010 (−3.22)							−0.057 (−3.12)			
PWC					0.056 (2.60)							0.302 (2.77)		
CMG						−0.017 (−2.53)							−0.094 (−2.62)	
PIN							−0.021 (−0.32)							−0.246 (−0.63)
EAsia	0.004 (0.67)	−0.006 (−1.39)	0.004 (0.58)	−0.002 (−0.38)	−0.004 (−0.88)	−0.002 (−0.35)	0.002 (0.44)	0.069 (2.56)	0.011 (0.41)	0.049 (1.47)	0.022 (0.97)	0.021 (0.95)	0.024 (1.05)	0.048 (2.16)
Reserves	−0.009 (−0.08)	0.124 (1.24)	0.005 (0.05)	0.024 (0.19)	0.130 (1.17)	0.035 (0.36)	0.031 (0.27)	−0.522 (−1.18)	0.151 (0.25)	−0.287 (−0.56)	0.133 (0.24)	0.212 (0.43)	−0.031 (−0.07)	−0.079 (−0.15)
NObs	19	16	18	17	19	19	15	20	16	19	18	20	20	16
$\bar{R}^2$ (%)	−2.7	28.8	2.7	35.5	15.5	14.1	−15.8	24.7	16.7	−0.8	34.9	29.7	27.1	10.7

Notes. This table reports cross-sectional regression results of the change in risk premiums ΔRP on country information environment variables (*DReq*, *Disc*, *AcStd*, *FTran*, *PWC*, *CMG*, and *PIN*) and control variables. $\Delta RP = RP_{\text{High'98}} - RP_{\text{Dec'96}}$ for the sample period from 1996 to 1998; $RP_{\text{High'98}}$ is the highest exponential moving average of discount rate news during 1998, and $RP_{\text{Dec'96}}$ is the exponential moving average of discount rate news in December 1996. The control variables and country information environment variables are defined in the appendix. EAsia is equal to one for Hong Kong, Indonesia, Korea, Malaysia, the Philippines, Singapore, Thailand, and Taiwan, and zero otherwise. *Reserves* is the central bank's reserves in billions of U.S. dollars at the end of 1996 and is available from World Development Indicators. Panels A and B employ ΔRP estimated from VAR and ICOC approaches, respectively. All t-statistics are reported in parentheses. NObs, number of observations; $\bar{R}^2$, adjusted R^2.

Reserves, to our set of predetermined control variables. The variable ΔRP is computed as the difference between $RP_{\text{High'98}}$ and $RP_{\text{Dec'96}}$, where $RP_{\text{High'98}}$ is the highest exponential moving average of discount rate news during 1998, and $RP_{\text{Dec'96}}$ is the exponential moving average of discount rate news in December 1996. Reserves are measured in billions of U.S. dollars as of the end of 1996,[21] and untabulated results show that the level of *Reserves* ranges from US$88.0 billion (Taiwan) to US$0.9 billion (South Africa).

Table 4 highlights only coefficient estimates of key variables and the additional control variable, *Reserves*. Results confirm our earlier finding that countries with better information environments would be less susceptible to large changes in risk premiums. Except for *AcStd* in panel B and *PIN*, all information environment measures are significantly related to the change in risk premiums at the 10% level. Overall, these results suggest the importance of countries having transparent information environment and strong institutions during crisis periods—such countries are less prone to experience large swings in their risk premiums.

[21] The information is available from the World Development Indicators.

Consistent with Johnson et al. (2000), we also find that a country's total reserves have no ability to help reduce its ΔRP and that the coefficient of the *EAsia* dummy is robustly insignificant. For further verification, we also performed another regression analysis where we introduced the interaction of the *EAsia* dummy and each information proxy. Unreported results show that none of the interaction terms is statistically significant at conventional levels, suggesting that during the Asian crisis, the change in risk premiums and information proxies are affected similarly across the entire sample and not just for East Asian countries.

4.2.2. The 2008 Global Financial Crisis. The global financial crisis was triggered by a credit crisis or credit crunch, which began in August 2007, when a loss of investors' confidence in the value of U.S. securitized mortgages resulted in a liquidity shortfall in the U.S. banking system. The crisis caused the collapse of large financial institutions, the bailout of banks by national governments, and sharp downturns in equity markets around the world. This exogenous global event offers us an excellent opportunity to test whether the information environment matters for changes in risk premiums during the global financial crisis.

Table 5 **Effects of Information Environment Measures on the Change in Risk Premiums ΔRP During the 2008 Global Financial Crisis**

	Panel A: Dependent variable—VAR-based ΔRP							Panel B: Dependent variable—ICOC-based ΔRP						
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14
DReq	−0.011							−0.027						
	(−4.63)							(−4.22)						
Disc		−0.026							−0.052					
		(−2.83)							(−1.77)					
AcStd			−0.018							−0.048				
			(−4.57)							(−3.92)				
FTran				−0.003							−0.005			
				(−3.78)							(−2.36)			
PWC					0.023							0.010		
					(4.24)							(0.57)		
CMG						−0.005							−0.014	
						(−1.84)							(−1.86)	
PIN							0.061							0.113
							(3.27)							(1.91)
Reserves	0.001	−0.004	−0.002	−0.002	−0.002	0.000	−0.002	−0.002	−0.013	−0.008	−0.009	−0.005	−0.005	−0.006
	(0.41)	(−1.45)	(−0.78)	(−0.86)	(−0.78)	(−0.02)	(−0.73)	(−0.19)	(−1.44)	(−0.95)	(−0.99)	(−0.52)	(−0.48)	(−0.62)
NObs	40	33	37	38	37	40	35	40	33	37	38	37	40	35
$\bar{R}^2$ (%)	47.4	31.2	43.1	39.7	46.0	22.7	27.8	32.1	13.7	33.5	13.9	‘ −2.0	6.7	10.8

Notes. This table reports cross-sectional regression results of ΔRP on country information environment variables (*DReq*, *Disc*, *AcStd*, *FTran*, *PWC*, *CMG*, and *PIN*) and control variables. $\Delta RP = RP_{\text{High'08}} - RP_{\text{Dec'06}}$ for the sample period from 2006 to 2008; $RP_{\text{High'08}}$ is the highest exponential moving average of discount rate news during 2008, and $RP_{\text{Dec'06}}$ is the exponential moving average of discount rate news in December 2006. The control variables and country information environment variables are defined in the appendix. *Reserves* is the central bank's reserves in billions of U.S. dollars at the end of 2006 and is available from World Development Indicators. Panels A and B employ ΔRP estimated from VAR and ICOC approaches, respectively. All t-statistics are reported in parentheses, NObs, number of observations; $\bar{R}^2$, adjusted R^2.

We conduct an analysis similar to what we have done for the Asian crisis. Because the global financial crisis has affected every market across the globe, our panel regressions now include the full sample of countries. The dependent variable, ΔRP, is computed as the difference between $RP_{\text{High'08}}$ and $RP_{\text{Dec'06}}$, where $RP_{\text{High'08}}$ is the highest exponential moving average of discount rate news during 2008, and $RP_{\text{Dec'06}}$ is the exponential moving average of discount rate news in December 2006.[22] Table 5 presents the results, with the same format as that of Table 4, and reveals a number of distinct findings.

First, proxies for the information environment can better explain VAR-based than ICOC-based ΔRP. The average $\bar{R}^2$ in panel A is 36.8%, compared with 15.5% in panel B. Also, in panel A, almost all information environment measures have statistically significant coefficients at the 5% level, as opposed to only three (*DReq*, *AcStd*, and *FTran*) in panel B. Except for the statistically insignificant *PWC* coefficient in model M12, the coefficients of remaining information environment measures are marginally significant. Second, during this global crisis, countries with less stringent disclosure requirements and weaker accounting standards tend to exhibit greater fluctuations in their risk premiums. This result is broadly consistent with that in the Asian financial crisis. On the one hand, unlike Table 4, Table 5 shows a positive and statistically significant coefficient on *PIN*, suggesting that the intensity of information-based trading is associated with variation in risk premiums during crises. On the other hand, similar to those of Table 4, the results of Table 5 also indicate that the amount of a country's reserves plays virtually no role in buffering shocks from the crisis.

In summary, the results from the two financial crises lend further support to our key evidence that there is a significant linkage between the information environment and variation of the market risk premium. The overall evidence has an important implication: countries with more established institutions, as measured by stringent financial disclosure requirements and high information transparency, would experience a significantly less volatile risk premium.

5. Additional Tests

This section performs several additional tests. First, we examine whether the relationship between the information environment and risk premium volatility differs between integrated and segmented markets. Second, we check whether our key finding is driven by the risk–return association in stock returns. Third,

[22] Our results are also robust with different sample selection methods. For example, we also used the highest exponential moving average of discount rate news during the years 2008 and 2009.

Table 6 Additional Tests

	Panel A: Market integration, *Int*				Panel B: Variance-adjusted risk premium				Panel C: Variance, covariance, and hedging demands adjusted risk premium			
	VAR-based σ_{RP}		ICOC-based σ_{RP}		VAR-based σ_{RP}		ICOC-based σ_{RP}		VAR-based σ_{RP}		ICOC-based σ_{RP}	
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
FTran	−0.354		−0.202		−0.282		−0.178		−0.243		−0.174	
	(−4.62)		(−5.32)		(−3.92)		(−4.59)		(−3.13)		(−4.61)	
FTran × *Int*	0.268		0.149									
	(1.77)		(1.51)									
CMG		−0.175		−0.182		−0.173		−0.120		−0.183		−0.117
		(−1.95)		(−1.62)		(−2.36)		(−1.31)		(−2.34)		(−1.29)
CMG × *Int*		−0.005		0.070								
		(−0.05)		(0.49)								
Int	−0.365	−1.348	−0.228	−0.572								
	(−3.28)	(−5.80)	(−3.05)	(−1.98)								
NObs	758	794	762	797	758	794	762	797	758	794	762	797
$\bar{R}^2$ (%)	58.1	78.7	53.2	62.0	50.9	78.9	50.4	62.2	45.8	75.6	50.9	62.3

Notes. This table shows panel regression results of the risk premium volatility σ_{RP} on information environment measures, *FTran* and *CMG*, and unreported predetermined control variables and year fixed effects. Panel A tests the effect of market integration, *Int*; panel B employs conditional variance-adjusted risk premium news as the dependent variable; and panel C employs risk premium news adjusted for conditional variance, covariance, and hedging demands as the dependent variable. *Int* is a time-varying market integration dummy variable that equals to one if the country's segmentation measure for the year is less than its median value and zero otherwise. The segmentation measure, developed by Bekaert et al. (2012), is $Seg_{i,t} = \sum_{j=1}^{N} IW_{i,j,t}|EY_{i,j,t} - EY_{w,j,t}|$, where $IW_{i,j,t}$ is the portfolio weight of industry j in country i for month t, $EY_{i,j,t}$ represents industry j's earnings yield in country i, and $EY_{w,j,t}$ is the counterpart earnings yield in world equity markets. Unreported control variables are *AntiDir*; *NFirms*; *HerfInd*; *country-year median* σ_{ROA}, σ_β, σ_{GDP}, and r_{ICOC}; and *Inflation*. These control variables and country information environment variables are defined in the appendix. All t-statistics are reported in parentheses, and are adjusted for clustered standard errors at the country level. NObs, number of observations; $\bar{R}^2$, adjusted R^2. The sample period is between January 1988 and December 2009.

we test whether our results are sensitive to alternative VAR and ICOC specifications. Fourth, we address the concern that our results may be driven by stale analyst forecasts used in computing ICOC estimates, and finally, we investigate whether the evidence reflects unobserved factors that vary over time.

Table 6 summarizes these additional analyses. Although we conduct robustness tests on the predetermined seven information environment measures, for brevity, we highlight only coefficients of two information environment measures, *FTran* and *CMG*. These two variables are selected because they capture several aspects of a country's information environment. Bushman et al. (2004) use a factor analysis to extract *FTran* from a wide array of country-level measures of firm-specific information. Specifically, *FTran* measures the intensity and timeliness of financial disclosure by firms and their interpretation and dissemination by analysts and media. On the other hand, Daouk et al. (2006) construct *CMG* along three dimensions of security laws: the degree of earnings opacity, enforcement of insider laws, and relaxation of short-selling restrictions. Moreover, effects of *FTran* and *CMG* on the risk premium volatility are consistent and robustly significant.

5.1. Market Integration

Thus far, we have discussed variation of risk premiums for each country in isolation. In a related study, Hail and Leuz (2006) show that capital market effects differ across segmented and integrated markets, suggesting that our main finding may differ across countries with varying degrees of capital market integration. We therefore employ a similar approach to Hail and Leuz (2006) by constructing a binary variable to capture the degree of capital market integration. Our analysis defines the binary variable, *Int*, by using the time-varying segmentation measure developed by Bekaert et al. (2012),

$$Seg_{i,t} = \sum_{j=1}^{N} IW_{i,j,t}|EY_{i,j,t} - EY_{w,j,t}|,$$

where $IW_{i,j,t}$ is the portfolio weight of industry j in country i for month t, $EY_{i,j,t}$ represents industry j's earnings yield in country i, and $EY_{w,j,t}$ is the counterpart earnings yield in world equity markets. If markets are strongly integrated, the earnings yields should be the same across countries. Hence, their weighted sums of these industry level absolute differences should be small and stable. Our annual measure of *Int* is equal to one if the monthly average *Seg* for the year is less than the country-year median value and zero otherwise.

Panel A of Table 6 tabulates test results for market integration, where VAR- and ICOC-based σ_{RP} are regressed, separately, on *FTran* (or *CMG*) and *Int*, as well as the interaction between *FTran* (or *CMG*) and *Int* and predetermined control variables. If markets are increasingly integrated across the world, then the link between a country's information environment and its risk premium volatility should become weaker. Although the coefficients of interaction effects are mainly positive, reflecting a smaller negative impact of *FTran* and *CMG* on σ_{RP}, only the interaction effect of *FTran* and *Int* in model M1 is statistically significant at the 10% level. Thus, to some degree, the increasing market integration attenuates the association between a country's information environment and its risk premium volatility.

5.2. Conditional Market Variance, Covariance, and Hedging Demands

Both VAR and ICOC approaches show that quality of a country's information environment is significantly associated with its market risk premium volatility. However, it can be argued that this association captures the intertemporal trade-off between risk and return found in existing studies. To rule out this possibility, we adjust the risk premium for the conditional variance of stock excess returns and hedging demands.

First, following a similar empirical model of Pastor et al. (2008), we regress the monthly $\tilde{r}_{r,t+1}$ from Equation (16) on monthly changes in the conditional stock market variance, as follows:

$$\tilde{r}_{r,t+1} = a_1 + b_1 \Delta\sigma_t^2 + e_{1,t+1}, \tag{22}$$

where $\Delta\sigma_t^2 = \sigma_t^2 - \sigma_{t-1}^2$, and σ_t^2 is measured with the annualized monthly variance of Datastream country-index daily returns between month t and month $t+1$. We also conduct regression model (22) using $\tilde{R}_{r,t+1}$ from Equation (21) in place of $\tilde{r}_{r,t+1}$. Consistent with the findings of Pastor et al. (2008), our unreported regression results also show a positive risk–return trade-off.[23] We use the resulting residuals from regression model (22) as proxies for risk premiums adjusted for the conditional variance.

Second, extending the work of Campbell (1993, 1996) to an international setting, Hodrick et al. (1999) and Ng (2004) provide some evidence that variation in expected returns on the world market portfolio induces significant intertemporal hedging motives, as reflected in average returns across countries. To rule out this alternative interpretation, we adjust the market risk premium for hedging demands and systematic risk using the Hodrick et al. (1999, Equation (15), p. 608) model,

$$E[\tilde{r}_{i,t+1}] + \frac{\sigma_i^2}{2} = \gamma\sigma_{i,w} + (\gamma-1)\sigma_{i,h}. \tag{23}$$

Equation (23) indicates that a country's expected risk premium $E[\tilde{r}_{i,t+1}]$, adjusted by one-half of its own variance, depends on its covariance with the world market portfolio, $\sigma_{i,w}$, with weight γ, and on its covariance with the innovation in discounted expected future world returns (dynamic hedging components), with weight $(\gamma-1)$. The coefficient of relative risk aversion γ determines the risk premium that compensates investors for bearing the covariance risks.

Hodrick et al. (1999) use the generalized method of moments (GMM) to estimate the econometric specification of (23) by imposing a set of orthogonality conditions. With 41 countries in our sample and 10 VAR forecasting variables,[24] we first forecast world market excess returns using the VAR approach and next estimate each country's future excess returns using GMM. Then, we regress discount rate news on the change in risk premiums, which is adjusted for both the conditional covariance with the world market and hedging demand components. The resulting regression residuals are employed as proxies for risk premium news adjusted for the conditional variance, covariance, and hedging demands.

We construct the annualized volatility of adjusted risk premium news using each series of the above residuals. With these proxies, we replicate M4, M6, M11, and M13 of Table 3. The results are presented in panels B and C of Table 6. Except for the insignificant *CMG* effect on ICOC-based σ_{RP}, the overall results corroborate our key finding that the risk premium volatility is negatively associated with measures of a country's information environment, even after adjusting for the conditional stock market variance, covariance, and hedging demands.

5.3. Alternative VAR and ICOC Specifications

Chen and Zhao (2009) show that the choice of state variables affects VAR estimates of expected returns news obtained through predictive regressions. Thus, any misspecified state variable in return predictive regressions could affect our estimation of expected return news. Our robustness tests, however, show that our main finding is not sensitive to different combinations of the set of VAR forecasting variables used in estimating discount rate news.

Although using the average of four ICOC estimates could mitigate model sensitivity and errors in analyst forecasts, ICOC approaches are also sensitive to their underlying assumption about long-term growth in residual income or abnormal earnings beyond the explicit forecast horizon (see Easton et al. 2002). Arguably, the cross-country difference in variation of

[23] On average, the b_1 estimate is 0.031 when $\tilde{r}_{r,t+1}$ is the dependent variable, and 0.186 when $\tilde{R}_{r,t+1}$ is the dependent variable.

[24] These are the same forecasting variables used in estimating Equation (16) of §3.1.

ICOC-based risk premium news may be driven by the cross-country difference in variation of long-term growth forecast. To address this issue, we first examine our main analysis using the four different ICOCs individually and then adopt the methodologies of Easton (2004) and Easton et al. (2002) to estimate ICOC simultaneously with long-term growth. We also recalculate and value weight the four different ICOCs. The overall unreported results reinforce our earlier findings using the ICOC approach.

5.4. Stale Analyst Forecasts

Implied cost of capital estimates are computed on a monthly basis using analyst forecasts. One concern is that analyst forecasts tend to be sluggish (Guay et al. 2005). Hence, it is plausible that the annual variation in equity risk premium is primarily driven by variation of stock prices, and as a consequence, our results probably reflect the relationship between variation in stock returns instead of expected returns and country information environment measures, especially those time-invariant ones. To address this concern, we follow the approach of Guay et al. (2005) to take into account stale analyst forecasts in estimating cost of capital.

First, we regress monthly country-level ICOC on the last-month country index return and extract the regression residuals, thereby eliminating forecast errors caused by sluggishness of analyst forecasts. Second, we regress the monthly country-level ICOC on one-year-ahead and two-year-ahead country-level average forecast errors and extract regression residuals. One- and two-year-ahead forecast errors of a stock are based on its analysts' consensus forecasts of one-year-ahead and two-year-ahead earnings and then calculated as the analysts' mean earnings forecast minus actual earnings, scaled by price per share. The country-level average forecast error is the average of all stocks' forecast errors. Third, we calculate the monthly country-level weighted average ICOC using the firm-level absolute forecast accuracy as the weight. Finally, instead of using the monthly country-level ICOC, we use quarterly country-level ICOCs in March, June, September, and December and calculate the standard deviation of ICOC using these four observations for each year. Our results remain robust to these approaches.

5.5. Unobservable Factors

Although we introduce country fixed effects to control for unobserved heterogeneity in our regression analyses, it is still likely that our key findings can be driven by some of unobserved factors that change over time, particularly during crisis periods. We address this concern by using two different approaches.

Motivated by the work of Lang and Maffett (2012), our first approach uses liquidity effects to capture any unobserved time-varying heterogeneity in the results. The two authors document that a firm's information environment can affect its liquidity uncertainty and that more transparent firms tend to experience less liquidity variability. We therefore reestimate the results of Tables 3–5 while controlling for Amihud's (2002) illiquidity measure, as employed by Daske et al. (2008), as well as the standard deviation of stock illiquidity. Our key variables continue to be strongly related to the risk premium volatility, thereby mitigating some unobserved heterogeneity concern.

Our second approach uses instruments to address the issue. Bushman et al. (2004) argue that political economy plays an important role in a country's financial transparency. Furthermore, Christensen et al. (2010) show that capital market effects of changes in securities regulation are more pronounced in countries that implement and enforce regulation and government policies. Following Christensen et al. (2010), we employ a regulatory index and a voice and accountability index as instruments; both are obtained from Kaufmann et al. (2009). We reestimate the results of Tables 3–5 using a two-stage least squares method. Untabulated results show that the coefficients of *DReq*, *Disc*, *AcStd*, *FTran*, and *PWC*, together with their associated t-statistics, become larger, but those of *CMG* and *PIN* become mainly smaller and statistical insignificant. It is possible that the two instruments do not vary substantially across time, thereby contributing to the weak relations of *CMG* and *PIN* with the risk premium volatility.

Although the two approaches address the degree of unobserved heterogeneity across time, our main findings may still, in part, be driven by unobservable time-varying factors. Hence, we caution that our results should be interpreted with this issue in mind.

6. Conclusions

Our study examines whether risk premium variability is associated with investors' information environments. Consistent with the theoretical prediction, results show that improving a country's information disclosure and transparency helps reduce the volatility of risk premiums, even after controlling for various variables that are potentially related to risk premium variability. These findings are further confirmed by our analysis of the 1997 Asian financial crisis and 2008 global financial crisis. Countries with more established institutions tend to have less volatile risk premiums during the crises.

Our results offer several implications. First, our evidence provides important insights into the underlying sources that can explain marketwide fluctuations in stock prices. We find evidence that there is a strong linkage between quality of a country's information environment and the volatility of its market risk premium, even after controlling for various country characteristics. Thus, improving a country's information environment can reduce a large component of its stock market volatility, hence decreasing its systematic risk and cost of capital. Second, as implied by theoretical models, the proportion of uninformed investors in a market and precision of public information determine quality of information environments. Policy makers can lower, to a certain extent, market risk premium volatility by promoting firm-level voluntary disclosure and other mechanisms that help improve disclosure standards.

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Appendix. Variable Definition

Information environment measures	
DReq	A disclosure requirement index, which is the average score of six subindexes: prospectus delivering, insider compensations, large shareholder ownership, insider ownership, contracts outside the normal course of business, and related parties' transactions; all of these subindexes are dummy variables, and for each subindex, a value of one is assigned to the index if it signifies high quality disclosure, and zero otherwise (La Porta et al. 2006)
Disc	A financial disclosure index based on survey results about the level and availability of financial disclosure in the annual Global Competitiveness Report issued by the World Economic Forum and then scaled by 10 (Jin and Myers 2006)
AcStd	An accounting standard index that examines and rates companies' 1990 annual reports on 90 items for 42 countries and then scale it by 100 (La Porta et al. 1998)
FTran	A financial transparency factor that gauges the intensity and timeliness of financial disclosure by firms and coverage by analysts and media (Bushman et al. 2004)
PWC	PriceWaterhouseCoopers' opacity index that reflects a country's opacity from corruption in government, legal system, macroeconomics polices, accounting standards, and regulatory regime scaled it by 100 (Kurtzman et al. 2004)
CMG	A composite capital market governance index that captures the degree of earnings opacity, the enforcement of insider laws, and the effect of removing short-selling restrictions. It is a simple average of (i) a dummy that takes the value of one when the country started to enforce insider laws (Bhattacharya and Daouk 2002); (ii) a dummy that takes the value of one when short-sale or put options trading is feasible in the country (Charoenrook and Daouk 2005); and (iii) an earnings transparency index constructed based on earnings aggressiveness, loss avoidance, and earnings smoothing (Worldscope, Leuz et al. 2003). The value of *CMG* ranges from 0 (worst governance) to 1 (best governance) (Daouk et al. 2006).
PIN	The probability of information-based trading measures the fraction of orders that arises from informed investors relative to the overall order flow (Easley et al. 2002); $PIN = \alpha\mu/(\alpha\mu + \varepsilon_S + \varepsilon_B)$, where α is the probability that a private information event occurs at the beginning of the trading day, μ is the daily arrival rate of orders from informed investors, and ε_B and ε_S are the daily arrival rates of buy and sell orders from uninformed investors, respectively (Thomson Reuters Tick History)
Control variarbles	
AntiDir	Anti-director index from Pagano and Volpin (2005) for the years 1993 to 2002; before 1993 and after 2002, we assume the anti-director index to be constant over time
NFirms	Log of the number of listed firms in the country (World Development Indicators)
HerfInd	The Herfindal index computed as the sum of square of a firm's sales share in the country (Worldscope)
σ_{ROA}	Country median standard deviation of firm-level return on assets (ROA) in the last five years (Worldscope)
σ_{β}	Annual standard deviation of monthly world market beta estimated using daily country index returns (Datastream)
σ_{GDP}	Standard deviation of GDP growth in the last five years (World Development Indicators)
r_{ICOC}	Average firm-level implied cost of capital minus U.S. 10-year Treasury bond rate (I/B/E/S)
Inflation	Annual inflation rate of a country (World Development Indicators)

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